

APPENDIX F

Teledyne Brown Engineering Environmental Services Annual 2017 Quality Assurance Report



TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Knoxville Laboratory

4th Quarter 2017 QUALITY ASSURANCE REPORT

January – December 2017

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4th Quarter 2017 Quality Assurance Report

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I. INTRODUCTION

This report covers the Quality Assurance (QA) Program for the Analytical Services function of the Teledyne Brown Engineering Environmental Services (TBE-ES) laboratory for January through December 2017.

A. Operational Quality Control Scope

1. Interlaboratory

The Teledyne Brown Engineering Environmental Services Laboratory Quality Control (QC) Program is designed to monitor the quality of analytical processing associated with environmental, effluent (10CFR Part 50), and waste characterization (10CFR Part 61) samples.

Quality Control of radioanalyses involves the internal process control program, and independent third party programs administered by Analytics and Environmental Resource Associates (ERA).

TBE-ES also participates in the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) administered by the U. S. Department of Energy. The MAPEP is a set of performance evaluation samples (e.g., water, soil, air filters, etc.) designed to evaluate the ability and quality of analytical facilities performing measurement on samples that contain hazardous and radioactive (mixed) analytes.

Quality Control for radioanalyses during this reporting period consisted of internal process check samples. Third-party process checks prepared by Analytics, ERA and the DOE's MAPEP are not reported during the first quarter of the year.

Inter-laboratory cross-check samples are received and reported as follows:

Analytics provides cross check samples quarterly in March, June, September, and November.

MAPEP provides samples semi-annually in February and September with required reporting dates in May and November, respectively, following sample receipt.

ERA provides samples semi-annually in April and October with required reporting dates in May and November, respectively, following sample receipt.

2. Intralaboratory

The internal QC program is designed to include QC functions such as instrumentation checks (to insure proper instrument response), blank samples (to which no analyte radioactivity has been added), for contamination checks, and instrumentation backgrounds. Process controls (or process checks) are either actual samples submitted in duplicate (duplicates) in order to evaluate the precision of laboratory measurements, or blank samples which have been "spiked" with a known quantity of a radioisotope that is of interest to laboratory clients. QC samples are intended to evaluate the entire radiochemical and radiometric process. Process control and qualification analyses samples seek to mimic the media type of those samples submitted for analysis by the various laboratory clients. The magnitude of the process control program combines both internal and external sources targeted at 10% of the routine sample analysis load.

3. Quality Assurance Program

To provide direction and consistency in administering the quality assurance program, TBE-ES has developed and follows a Quality Manual and a set of Standard Operating Procedures (SOP). The plan describes the scheduled frequency and scope of Quality Assurance and Quality Control (QA/QC) considered necessary for an adequate QA/QC program conducted throughout the year.

Internal audits are performed on an annual schedule.

The laboratory may be audited by prospective customers during a pre-contract audit, and/or by existing clients who wish to conduct periodic audits in accordance with their contractual arrangements. State audits are conducted to maintain state certification specific to client requirements and for the National Environmental Laboratory Accreditation Conference (NELAC) accreditation. The Nuclear Utilities Procurement Issues Committee (NUPIC) conducts audits of TBE-ES as a function of a utility's Radiological Environmental Monitoring Program (REMP).

In 2017, an Internal Audit was started on November 13-14, but not completed until February 9, 2018. The purpose of this audit was to verify compliance to requirements stated in Revision 30 of the TBE QA Manual, Sections 1 -16, and implementation of procedures. The results will be included in the 1st Qtr 2018 QA Report.

The following External Audits were hosted by TBE in 2017:

- FEMA Lab Evaluation in support of Calvert Cliffs Ingestion Pathway Exercise (State of Delaware) on September 19
- BWX Technologies (BWXT) on November 6 – 9

- Toxco Materials Management Center (TMMC) Desktop Audit submitted November 30

The FEMA lab evaluation is part of a greater exercise to determine preparedness in case of a radiological emergency around the Calvert Cliffs Nuclear Power Plant. There were no outstanding issues and this audit is considered closed.

The purpose of the BWXT audit was to evaluate the TBE Quality Program and determine, on a sample basis, if the subcontractor is meeting the minimum requirements invoked by their documented quality program, and the requirements stated in active BWXT purchase orders. The audit identified one (1) nonconformity and no observations or suggestions. The finding has been addressed and the audit is considered closed.

The purpose of the Toxco audit was to maintain TBE on TMMC's Approved Suppliers List (ASL) for radiochemical laboratory services. No nonconformities were found and TBE remains on their ASL list for an additional three years. The audit is considered closed.

B. Performance Characteristics

1. Interlaboratory Accuracy

TBE-ES has adopted a QC acceptance protocol based upon two external performance models. For the interlaboratory programs that have established performance criteria (e.g., established warning and failure limits), the laboratory uses those established criteria to evaluate QC sample results. For the interlaboratory QC programs which have no pre-set acceptance criteria (e.g. Analytics Cross Check Program), results are evaluated in accordance with TBE-ES internal acceptance criteria.

a) Analytics' Evaluation Criteria

Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

b) DOE Evaluation Criteria

Handbook for the Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP), Revision 13 (June 2012), pp 37-38, retrieved from <http://www.id.energy.gov/resl/mapep/handbookv13.pdf>

MAPEP's evaluation report provides an acceptance range with associated flag values.

The MAPEP defines three levels of performance: Acceptable (flag = A), Acceptable with Warning (flag = W), and Not Acceptable (flag = N). Performance is considered acceptable when a mean result for the specified analyte is $\pm 20\%$ of the reference value. Performance is acceptable with warning when a mean result falls in the range from $\pm 20\%$ to $\pm 30\%$ of the reference value (i.e., $20\% < \text{bias} < 30\%$). If the bias is greater than 30%, the results are deemed not acceptable.

False-positive/negative testing and sensitivity evaluations are used in radiological performance evaluations. The specific analytes used for testing vary among performance evaluation test sessions.

The MAPEP program uses false-positive testing to identify laboratory results that indicate the presence of a particular radionuclide in a MAPEP sample when, in fact, the actual activity of the radionuclide is far below the detection limit of the measurement. Not Acceptable (N) performance, and hence a false positive result, is indicated when the range encompassing the result, plus or minus the total uncertainty at three standard deviations, does not include zero (i.e. 2.5 ± 0.2 ; range of 1.9–3.1). Statistically, the probability that a result can exceed the absolute value of its total uncertainty at three standard deviations by chance alone is less than 1%. The MAPEP uses a three standard deviation criterion for the false positive test to ensure confidence about issuing a false-positive performance evaluation. A result that is greater than three times the total uncertainty of the measurement represents a statistically- positive detection with over 99% confidence.

Sensitivity evaluations are routinely performed to complement the false-positive tests. In a sensitivity evaluation, the radionuclide is present at or near the detection limit, and the difference between the reported result and the MAPEP reference value is compared to the propagated combined total uncertainties. The results are evaluated at three standard deviations. If the observed difference is greater than three times the combined total uncertainty, the sensitivity evaluation is "Not Acceptable". The probability that such a difference can occur by chance alone is less than 1%. If the participant did not report a statistically-positive result, a "Not Detected" is noted in the text field of the MAPEP performance report. A non-detect is potentially a false-negative result, dependent upon the laboratory's detection limit for the radionuclide.

False-negative tests are also performed in combination with the sensitivity evaluations. In this scenario, the sensitivity of the reported measurement indicates that the known specific activity of the targeted radionuclide in the performance evaluation sample should have been detected, but was not, and a "Not Acceptable" performance evaluation is issued. The uncertainty of the MAPEP reference value and of the reported result at three standard deviations is used for the false-negative test.

The false-positive/negative and sensitivity evaluation tests are conducted in a manner that assists the participants with their measurement uncertainty estimates and helps ensure they are not under estimating or over inflating their total uncertainties. If the total uncertainty is over-inflated in order to pass a false-positive test, it will result in a "Not Detected" if the test is actually a sensitivity evaluation. The opposite is true for a false-positive test. False-negatives and failed sensitivity evaluations can also result from under-estimating the total uncertainty. An accurate estimate of measurement uncertainty is required for consistent performance at the acceptable level.

c) ERA Evaluation Criteria

The ERA evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the US-EPA, NELAC, state-specific performance testing program requirements, or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

d) NRC Resolution

The laboratory also participates in the NRC Resolution Criteria with some laboratory clients to primarily evaluate double-blind 10 CFR Part 50 performance. The NRC Resolution Criteria are based on an empirical relationship, which combines prior experience and the accuracy needs of the program. The data is restricted to the individual client and is not included in this report.

2. Intralaboratory Accuracy Acceptance Criteria

a) Process Controls

For a group of test measurements to a given spike level, the measure of accuracy is the percent recovery of the spike activity

found versus the added spike activity. The percent recovery is calculated as follows:

$$(A_m / A_s) 100$$

Where: A_m = the activity measured

A_s = the spiked activity

Internal Process Control results use TBE-ES acceptance criteria of 70%-130% recovery. Warning limits are set from 70%-80% and 120%-130%. Results evaluated as "Warning" are evaluated for trends of low bias or high bias and are used to detect potential problems. The laboratory's internal acceptance criteria are based on MAPEP's defined performance levels of bias greater than 30%.

A matrix spike (MS) sample is an aliquot of a sample spiked with a known concentration of a target analyte prior to sample preparation and analysis. The matrix spike is used to document the bias of a method in a sample matrix. Matrix spike results use acceptance criteria of 60%–140% recovery.

b) Other Measures

Backgrounds, which represent the ambient signal response recorded by measuring instruments, are independent of radioactivity contributed by the radionuclides being measured in the sample.

Blank samples are acceptable if they do not contain any three-sigma statistically positive activity of the target parameters, unless the associated samples are positive. If all sample results associated with the blank are greater than the MDC, then the blank MDC shall be less than the activity of the least active sample in the work order. If possible, equivalent media for preparing laboratory processing blanks will be used.

Replicate (duplicate [DUP]) and matrix spike duplicates (MSD) samples are produced by taking two aliquots from the same process check sample and assigning each aliquot a different Lab Sample Number. In cases of replicate analyses where there are no "known" values, the analyses will be evaluated for precision only. The matrix spike duplicates are split samples spiked with identical concentrations of a target analyte used to evaluate precision and bias. They are carried through the complete sample preparation and analytical procedure. Precision is evaluated by calculating the Relative Percent Difference (RPD) between the two samples. Relative Percent Difference is calculated as the

absolute difference between two values normalized to the average value, expressed as a percentage:

$$\% \text{ RPD} = (\text{abs}[\text{orig} - \text{dup}] / [\text{orig} + \text{dup}]/2) \times 100$$

The matrix spike duplicate is calculated as the absolute value of the original activity minus the duplicate activity divided by the spike activity expressed as a percentage. If the original activity is not detected then the activity is considered zero (0).

$$\% \text{ MSD} = (\text{abs}[\text{orig activity} - \text{dup activity}] / \text{spike activity}) \times 100$$

(Recovery)

For purposes of analytical reporting, each analytical result specifies the radionuclide concentration and the *a posteriori* Minimum Detectable Concentration (MDC). TBE-ES calculates the *a posteriori* MDC using the sample's actual measurement parameters (i.e., sample volume, chemical recovery, instrument background, etc.) to demonstrate that the Nuclear Regulatory Commission's (NRC's) *a priori* MDC has been met for each radionuclide/sample. By TBE-ES policy, the *a posteriori* MDC must be less than the required NRC *a priori* MDC.

3. Investigations and Nonconformance Reports

QC investigations are initiated when QC results fall outside of the QC criteria. Other investigations may arise from unanticipated situations which are not clearly defined in the procedures or bounded by pre-established performance criteria, but have the potential of becoming QA-related issue(s). The QA investigation is the mechanism to quickly ascertain if there is "due cause" to issue a formal NCR.

An NCR is issued when an investigation finds "due cause" to document formal investigation into the root cause of the failure, the corrective action taken, and the action taken to prevent recurrence. Investigations may include review of procedures, interviews of personnel, review of laboratory and instrument logbooks, observation of analyst techniques and any other items identified as necessary to resolve the issue.

For intercomparison performance evaluation samples it is TBE's policy to issue an NCR for unacceptable results.

II. ANALYTICAL SERVICES QUALITY CONTROL SYNOPSIS

A. Interlaboratory Cross-Check Program

During this reporting period, 25 nuclides associated with six media types (Air Filter, Charcoal [Air Iodine], Milk, Soil, Vegetation and Water) were analyzed. Samples were obtained from Analytics, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) and Environmental Resource Associates (ERA). Media types representative of client analyses performed during this reporting period were selected. The results are presented in Attachment A.

1. Analytics Environmental Cross Check Program

Fifteen nuclides in milk, air particulate, air iodine (charcoal) and water samples were evaluated for four sets of cross-checks during March – December, 2017. All of the environmental analyses performed were reported as within the acceptable/acceptable with warning criteria except for one Cr-51 in soil sample.

NCR 17-16 was initiated to address the in-house Cr-51 failure and a Corrective Action was issued. All raw data and associated QC data were reviewed and fell within acceptance limits.

2. DOE's MAPEP Quality Assessment Program

Thirteen nuclides in water, air particulate, soil, and vegetation samples were evaluated in March – December, 2017. All of the environmental analyses performed were reported as within the acceptable/acceptable with warning criteria except for one U-238 in air particulate sample.

NCR 17-15 was initiated to address the in-house U-238 failure and a Corrective Action was issued. All raw data and associated QC data were reviewed and fell within acceptance limits.

3. ERA Environmental Cross Check Program

Twelve nuclides were evaluated in air particulate and water samples during March – December, 2017. All analyses performed were within the acceptable criteria except for Zn-65, Sr-89 and Sr-90 in water samples (one each).

NCR 17-09 was initiated to address the in-house Zn-65 and Sr-89 failures. Corrective Actions for each nuclide were issued. All raw data and associated QC data were reviewed and fell within acceptance limits.

NCR 17-19 was initiated to address the in-house Sr-90 failure and a Corrective Action was issued. All raw data and associated QC data were reviewed and fell within acceptance limits

B. Intralaboratory Cross-Check Program

During this reporting period, 37 nuclides in various matrices, including air particulate, animal, charcoal, fish, soil/solid, and water, were analyzed by means of the laboratory's internal process control program. The compilation of intralaboratory comparison data for this reporting period is summarized in Attachment B. *(Note: Only gamma nuclides that are typically seen in samples are included in the attachment – a complete list is available upon request).*

The TBE-ES laboratory's internal process control program evaluated 3898 analyses during this period.

1. Blanks

During this reporting period, all 1660 environmental blanks analyzed were less than the MDC.

2. Spikes

During this reporting period, all 1639 environmental spikes and matrix spikes analyzed were within the acceptance criteria.

3. Duplicates

All of the 3788 duplicate sets analyzed were within acceptance criteria.

C. Non-Conformance Reports (NCRs)

Nine new NCRs were issued for this reporting period (total of 19 for 2017). See Attachment C for the non-conformance reports. Section II A gives detailed accounts of the non-conformances initiated for interlaboratory cross-check program failures.

D. Observation Reports

No observation reports were issued for this reporting period.

E. Instrumentation

TBE-ES uses the statistical principle method of evaluation for instrument quality control check data based on the mean, 2-sigma and 3-sigma set point model or uses pre-set tolerance limits. Each detector is checked prior to use for that day and the resulting data points are automatically compared to statistical baselines to determine the instrument's

acceptability for counting. Control charts showing this data are available during audits or upon request.

Gamma Spectroscopy:

Gamma detectors are routinely monitored for energy, full width at half maximum, efficiency, and background. TBE-ES gamma detectors operated without incident during this reporting period. Occasional second runs (as allowed by our QA program) were necessary to verify acceptable operation. Some amplifier fine gain adjustments and liquid nitrogen addition to the dewars were also necessary when data trends indicate an energy drift on the detector.

Liquid Scintillation Counters (LSC):

LSC instruments, used in tritium, C-14, Ni-63 and other low-energy beta-emitters, are monitored for background and efficiency. The reliability of these instruments is exceptional with zero instances of background or efficiency values outside of control limits.

Alpha/Beta Gas Flow Proportional (GFP) Counters:

GFP detectors, used for gross alpha/beta, Sr-89/90, I-131 (Low Level), and other nuclides, are monitored for background and efficiency. TBE-ES GFP detectors operated without incident during this reporting period. Occasionally, second runs (primarily for alpha due to the sensitivity of source placement) were necessary to verify acceptable operation or because of low P-10 pressure. After gas change-out and purging, control check values return to control norms.

Alpha Spectroscopy:

Alpha detectors are routinely monitored for energy, full width at half maximum, efficiency, and background. TBE-ES alpha detectors operated without incident during this reporting period. Occasional second runs (as allowed by our QA program) were necessary to verify acceptable operation.

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ATTACHMENT A

Interlaboratory Quality Control Program Results

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A.1

Analytics Cross Check Program Results

A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)
March 2017	E11811	Milk	Sr-89	pCi/L	87	97.7	0.89	A
			Sr-90	pCi/L	12.4	16.2	0.77	A
	E11812	Milk	Ce-141	pCi/L	135	145	0.93	A
			Co-58	pCi/L	153	150	1.02	A
			Co-60	pCi/L	182	183	1.00	A
			Cr-51	pCi/L	258	290	0.89	A
			Cs-134	pCi/L	104	120	0.87	A
			Cs-137	pCi/L	142	140	1.02	A
			Fe-59	pCi/L	135	129	1.05	A
			I-131	pCi/L	92.6	97.9	0.95	A
			Mn-54	pCi/L	173	164	1.05	A
			Zn-65	pCi/L	208	199	1.04	A
	E11813	Charcoal	I-131	pCi	92	93.9	0.98	A
	E11814	AP	Ce-141	pCi	99.9	101	0.99	A
			Co-58	pCi	95.4	104	0.92	A
			Co-60	pCi	140	127	1.10	A
			Cr-51	pCi	211	201	1.05	A
			Cs-134	pCi	82.1	83.2	0.99	A
			Cs-137	pCi	92.8	97.0	0.96	A
			Fe-59	pCi	107	89.3	1.20	A
			Mn-54	pCi	106	114	0.93	A
			Zn-65	pCi	137	138	0.99	A
	E11816	Soil	Ce-141	pCi/g	0.258	0.250	1.03	A
			Co-58	pCi/g	0.241	0.258	0.93	A
			Co-60	pCi/g	0.312	0.315	0.99	A
			Cr-51	pCi/g	0.439	0.500	0.88	A
			Cs-134	pCi/g	0.176	0.207	0.85	A
			Cs-137	pCi/g	0.304	0.317	0.96	A
			Fe-59	pCi/g	0.210	0.222	0.95	A
			Mn-54	pCi/g	0.292	0.283	1.03	A
			Zn-65	pCi/g	0.353	0.344	1.03	A
	E11815	Water	Fe-55	pCi/L	1600	1890	0.85	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)
June 2017	E11844	Milk	Sr-89	pCi/L	81.3	92.6	0.88	A
			Sr-90	pCi/L	12.1	13.5	0.90	A
	E11846	Milk	Ce-141	pCi/L	142	151	0.94	A
			Co-58	pCi/L	147	155	0.95	A
			Co-60	pCi/L	185	191	0.97	A
			Cr-51	pCi/L	321	315	1.02	A
			Cs-134	pCi/L	168	188	0.89	A
			Cs-137	pCi/L	148	150	0.99	A
			Fe-59	pCi/L	116	115	1.01	A
			I-131	pCi/L	102	93.6	1.09	A
			Mn-54	pCi/L	168	172	0.98	A
			Zn-65	pCi/L	195	204	0.96	A
	E11847	Charcoal	I-131	pCi	87.9	84.8	1.04	A
	E11845	AP	Sr-89	pCi	70.8	79.1	0.90	A
			Sr-90	pCi	9.10	11.5	0.79	W
	E11848	AP	Ce-141	pCi	112	116	0.96	A
			Co-58	pCi	119	119	1.00	A
			Co-60	pCi	171	146	1.17	A
			Cr-51	pCi	270	241	1.12	A
			Cs-134	pCi	152	144	1.05	A
			Cs-137	pCi	114	115	0.99	A
			Fe-59	pCi	94.1	88.3	1.07	A
			Mn-54	pCi	139	132	1.06	A
			Zn-65	pCi	141	156	0.90	A
	E11849	Water	Fe-55	pCi/L	1840	1890	0.97	A
July 2017	E11901	AP	GR-A	pCi	50.1	44.2	1.13	A
			GR-B	pCi	218	233	0.93	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

**A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)
September 2017	E11914	Milk	Sr-89	pCi/L	84.3	82.7	1.02	A
			Sr-90	pCi/L	12.6	12.1	1.04	A
	E11915	Milk	Ce-141	pCi/L	93.9	87.0	1.08	A
			Co-58	pCi/L	115	117	0.98	A
			Co-60	pCi/L	265	262	1.01	A
			Cr-51	pCi/L	273	217	1.26	W
			Cs-134	pCi/L	186	201	0.93	A
			Cs-137	pCi/L	175	172	1.02	A
			Fe-59	pCi/L	137	125	1.09	A
			I-131	pCi/L	78.0	71.0	1.10	A
			Mn-54	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	206	184	1.12	A
	E11916	Charcoal	I-131	pCi	71.9	64.4	1.12	A
	E11917	AP	Ce-141	pCi	80.1	86.3	0.93	A
			Co-58	pCi	110	116	0.95	A
			Co-60	pCi	277	260	1.07	A
			Cr-51	pCi	275	215	1.28	W
			Cs-134	pCi	192	199	0.96	A
			Cs-137	pCi	165	170	0.97	A
			Fe-59	pCi	122	124	0.98	A
			Mn-54	pCi	120	122	0.99	A
			Zn-65	pCi	175	183	0.96	A
	E11918	Water	Fe-55	pCi/L	1630	1630	1.00	A
	E11919	Soil	Ce-141	pCi/g	0.136	0.142	0.96	A
			Co-58	pCi/g	0.179	0.191	0.94	A
			Co-60	pCi/g	0.405	0.429	0.94	A
			Cr-51	pCi/g	0.230	0.355	0.65	N ⁽¹⁾
			Cs-134	pCi/g	0.272	0.328	0.83	A
			Cs-137	pCi/g	0.336	0.356	0.94	A
			Fe-59	pCi/g	0.210	0.205	1.02	A
			Mn-54	pCi/g	0.210	0.201	1.05	A
			Zn-65	pCi/g	0.301	0.301	1.00	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) See NCR 17-16

**A.1 Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)
December 2017	E12054	Milk	Sr-89	pCi/L	92.1	92.3	1.00	A
			Sr-90	pCi/L	18.3	16.9	1.09	A
	E12055	Milk	Ce-141	pCi/L	97.8	98.3	0.99	A
			Co-58	pCi/L	92.3	89.9	1.03	A
			Co-60	pCi/L	176	173	1.02	A
			Cr-51	pCi/L	226	242	0.93	A
			Cs-134	pCi/L	118	125	0.95	A
			Cs-137	pCi/L	148	141	1.05	A
			Fe-59	pCi/L	123	113	1.08	A
			I-131	pCi/L	66.0	57.8	1.14	A
			Mn-54	pCi/L	173	161	1.08	A
			Zn-65	pCi/L	233	211	1.10	A
	E12056	Charcoal	I-131	pCi	48.1	47.5	1.01	A
	E12057A	AP	Ce-141	pCi	108	111	0.97	A
			Co-58	pCi	89.5	102	0.88	A
			Co-60	pCi	223	196	1.14	A
			Cr-51	pCi	311	274	1.13	A
			Cs-134	pCi	141	142	1.00	A
			Cs-137	pCi	162	160	1.01	A
			Fe-59	pCi	121	129	0.94	A
			Mn-54	pCi	177	182	0.97	A
			Zn-65	pCi	203	239	0.85	A
	E12058	Water	Fe-55	pCi/L	1970	1740	1.13	A
	E12059	AP	Sr-89	pCi	71.2	87.4	0.81	A
			Sr-90	pCi	12.9	16.0	0.81	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

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A.2

MAPEP Quality Assessment Program Results

A.2 DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Acceptance Range	Evaluation ^(b)
February 2017	17-MaS36	Soil	Ni-63	Bq/kg	-5.512		(1)	A
			Sr-90	Bq/kg	571	624	437 - 811	A
	17-MaW36	Water	Am-241	Bq/L	0.693	0.846	0.592 - 1.100	A
			Ni-63	Bq/L	13.4	12.2	8.5 - 15.9	A
			Pu-238	Bq/L	0.7217	0.703	0.492 - 0.914	A
			Pu-239/240	Bq/L	0.9277	0.934	0.654 - 1.214	A
	17-RdF36	AP	U-234/233	Bq/sample	0.0911	0.104	0.073 - 0.135	A
			U-238	Bq/sample	0.0967	0.107	0.075 - 0.139	A
	17-RdV36	Vegetation	Cs-134	Bq/sample	6.44	6.95	4.87 - 9.04	A
			Cs-137	Bq/sample	4.61	4.60	3.22 - 5.98	A
			Co-57	Bq/sample	-0.0229		(1)	A
			Co-60	Bq/sample	8.52	8.75	6.13 - 11.38	A
			Mn-54	Bq/sample	3.30	3.28	2.30 - 4.26	A
			Sr-90	Bq/sample	1.30	1.75	1.23 - 2.28	W
			Zn-65	Bq/sample	5.45	5.39	3.77 - 7.01	A
August 2017	17-MaS37	Soil	Ni-63	Bq/kg	1130	1220	854 - 1586	A
			Sr-90	Bq/kg	296	289	202 - 376	A
	17-MaW37	Water	Am-241	Bq/L	0.838	0.892	0.624 - 1.160	A
			Ni-63	Bq/L	-0.096		(1)	A
			Pu-238	Bq/L	0.572	0.603	0.422 - 0.784	A
			Pu-239/240	Bq/L	0.863	0.781	0.547 - 1.015	A
	17-RdF37	AP	U-234/233	Bq/sample	0.103	0.084	0.059 - 0.109	W
			U-238	Bq/sample	0.115	0.087	0.061 - 0.113	N ⁽²⁾
	17-RdV37	Vegetation	Cs-134	Bq/sample	2.34	2.32	1.62 - 3.02	A
			Cs-137	Bq/sample	0.05		(1)	A
			Co-57	Bq/sample	3.32	2.8	2.0 - 3.6	A
			Co-60	Bq/sample	2.09	2.07	1.45 - 2.69	A
			Mn-54	Bq/sample	2.90	2.62	1.83 - 3.41	A
			Sr-90	Bq/sample	1.17	1.23	0.86 - 1.60	A
			Zn-65	Bq/sample	6.07	5.37	3.76 - 6.98	A

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) DOE/MAPEP evaluation:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test

(2) See NCR 17-15

A.3

ERA Cross Check Program Results

A.3 ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Acceptance Limits	Evaluation ^(b)
March 2017	MRAD-26	AP	GR-A	pCi/sample	76.3	85.5	28.6 - 133	A
April 2017	RAD-109	Water	Ba-133	pCi/L	49.2	49.7	40.8 - 55.1	A
			Cs-134	pCi/L	83.2	90.1	74.0 - 99.1	A
			Cs-137	pCi/L	202	206	185 - 228	A
			Co-60	pCi/L	51.2	54.7	49.2 - 62.7	A
			Zn-65	pCi/L	39.3	53.8	47.2 - 65.9	N ⁽¹⁾
			GR-A	pCi/L	53.6	75.0	39.5 - 92.3	A
			GR-B	pCi/L	42.7	38.5	25.5 - 46.0	A
			U-Nat	pCi/L	50.1	55.6	45.2 - 61.7	A
			H-3	pCi/L	7080	6850	5920 - 7540	A
			Sr-89	pCi/L	40.7	66.2	53.8 - 74.3	N ⁽¹⁾
			Sr-90	pCi/L	26.9	26.7	19.3 - 31.1	A
			I-131	pCi/L	26.7	29.9	24.9 - 34.9	A
September 2017	MRAD-27	AP	GR-A	pCi/sample	40.9	50.1	16.8 - 77.8	A
		AP	GR-B	pCi/sample	58.0	61.8	39.1 - 90.1	A
October 2017	RAD-111	Water	Ba-133	pCi/L	71.3	73.7	61.7 - 81.1	A
			Cs-134	pCi/L	43.0	53.0	42.8 - 58.3	A
			Cs-137	pCi/L	48.2	52.9	47.6 - 61.1	A
			Co-60	pCi/L	69.0	69.5	62.6 - 78.9	A
			Zn-65	pCi/L	335	348	313 - 406	A
			GR-A	pCi/L	32.5	35.6	18.3 - 45.8	A
			GR-B	pCi/L	24.3	25.6	16.0 - 33.6	A
			U-Nat	pCi/L	36.6	37.0	30.0 - 40.9	A
			H-3	pCi/L	6270	6250	5390 - 6880	A
			I-131	pCi/L	26.4	24.2	20.1 - 28.7	A
November 2017	111317O	Water	Sr-89	pCi/L	57.1	50.0	39.4 - 57.5	A
			Sr-90	pCi/L	27.1	41.8	30.8 - 48.0	N ⁽²⁾

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

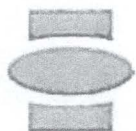
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

(1) See NCR 17-09

(2) See NCR 17-19

A.4

Analytics Cross Check Program Results Client-Supplied Samples



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RESULTS OF RADIOCHEMISTRY CROSS CHECK PROGRAM

XXXXXXXXXX

1st QUARTER 2017

(Ref. Date 17 Feb 2017, Rev. 0)

L.

05 Jun 2017

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	PEACH BOTTOM Value, uCi/ml	EZA Value, uCi/ml	Ratio PEACH BOTTOM / EZA	Resolution	Comparison
A32520 LIQUID	Gross Beta (Cs-137)	8.71E-04	9.00E-04	0.97	17	AGREEMENT

Sample	Analysis	PEACH BOTTOM Value, uCi/ml	EZA Value, uCi/ml	Ratio PEACH BOTTOM / EZA	Resolution	Comparison
A32521 LIQUID	H-3	3.91E-04	5.00E-04	0.78	12.5	AGREEMENT

Sample	Analysis	PEACH BOTTOM Value, uCi	EZA Value, uCi	Ratio PEACH BOTTOM / EZA	Resolution	Comparison
A32522 FILTER	Fe-55	2.41E-03	2.52E-03	0.96	12.5	AGREEMENT



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RESULTS OF RADIOCHEMISTRY CROSS CHECK PROGRAM

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2nd QUARTER 2017

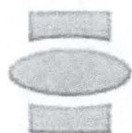
(Ref. Date 12 May 2017, Rev. 1)

L.!W'

05 Jul 2017

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	XXXXXXXXX Value, uCi/ml	EZA Value, uCi/ml	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A32706 LIQUID	Ni-63	4.28E-04	4.44E-04	0.96	12.5	AGREEMENT
	Sr-89	3.70E-03	4.44E-03	0.83	17	AGREEMENT
	Sr-90	3.68E-04	4.46E-04	0.83	12.5	AGREEMENT
Sample	Analysis	XXXXXXXXX Value, uCi/ml	EZA Value, uCi/ml	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A32707 LIQUID	Gross Alpha (Am-241)	6.42E-05	7.00E-05	0.92	12.5	AGREEMENT
Sample	Analysis	XXXXXXXXX Value, uCi	EZA Value, uCi	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A32708 FILTER	Ce-141	3.00E-02	3.13E-02	0.96	20	AGREEMENT
	Co-58	2.23E-02	2.35E-02	0.95	20	AGREEMENT
	Co-60	2.20E-02	2.24E-02	0.98	20	AGREEMENT
	Cr-51	7.0BE-02	7.18E-02	0.98	20	AGREEMENT
	Cs-134	2.16E-D2	2.24E-02	0.96	20	AGREEMENT
	Cs-137	1.70E-02	1.74E-02	0.97	20	AGREEMENT
	Fe-59	1.97E-02	2.04E-02	0.97	20	AGREEMENT
	Mn-54	2.04E-02	2.12E-02	0.96	20	AGREEMENT
	Zn-65	2.45E-02	2.55E-02	0.96	20	AGREEMENT



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RESULTS OF RADIOCHEMISTRY CROSS CHECK PROGRAM

XXXXXXXXXXXX

3rd QUARTER 2017

(Ref. Date 11 Aug 2017, Rev. 1)

L.

19 Sep 2017

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	XXXXXXXXX Value, uCi/ml	EZA Value, uCi/ml	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A33044 LIQUID	Fe-55	2.02E-03	1.78E-03	1.13	12.5	AGREEMENT

Sample	Analysis	XXXXXXXXX Value, uCi/ml	EZA Value, uCi/ml	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A33045 LIQUID	H-3	6.51E-04	7.48E-04	0.87	12.5	AGREEMENT

Sample	Analysis	XXXXXXXXXX Value, uCi	EZA Value, uCi	Ratio XXXXXXXXXX / EZA	Resolution	Comparison
A33046 FILTER	Gross Alpha (Am-241)	6.68E-04	8.01E-04	0.83	12.5	AGREEMENT



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RESULTS OF RADIOCHEMISTRY CROSS CHECK PROGRAM

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4th QUARTER 2017

(Ref. Date 03 Nov 2017, Rev. 1)

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07 Dec2017

Levan Tkavadze , Nuclear Metrologist

		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
		CONCENTRATION	CONCENTRATION	FEED	RECOVERY	COMPLETION
A33328 LIQUID	Ce-141	7.37E-03	8.48E-03	0.87	20	AGREEMENT
	Co-58	4.76E-03	5.24E-03	0.91	20	AGREEMENT
	Co-60	6.81E-03	7.31E-03	0.93	20	AGREEMENT
	Cr-51	2.11E-02	2.37E-02	0.89	20	AGREEMENT
	Cs-134	4.44E-03	5.38E-03	0.83	20	AGREEMENT
	Cs-137	5.41E-03	5.92E-03	0.91	20	AGREEMENT
	Fe-59	7.74E-03	8.04E-03	0.96	20	AGREEMENT
	Mn-54	6.83E-03	7.24E-03	0.94	20	AGREEMENT
	Zn-65	9.29E-03	9.71E-03	0.96	20	AGREEMENT
		XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
		CONCENTRATION	CONCENTRATION	FEED	RECOVERY	COMPLETION
A33329 FILTER	Ni-63	2.56E-03	2.98E-03	0.86	12.5	AGREEMENT
	Sr-89	4.73E-03	5.25E-03	0.90	17	AGREEMENT
	Sr-90	5.01E-04	6.03E-04	0.83	12.5	AGREEMENT

4th QUARTER 2017 (Ref Date 03 Nov 2017, Rev 1)

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A.5

Formal Interlaboratory Quality Control Program Results



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**RESULTS OF ENVIRONMENTAL
CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING**

1ST QUARTER 2017

(Ref. Date 16 MAR 17)

L. Tkavdze

27 Jun 17

L. Tkavdze, Nuclear Metrologist

SAMPLE	ANALYSIS	TBE VALUE	UNCERTAINTY (1 Sigma)	EZA VALUE	UNCERTAINTY (1 Sigma)	RATIO TBE: EZA

E11811	Sr-89	8.70E+01 pCi/L	1.31E+00	9.77E+01 pCi/L	1.63E+00	0.89
Sr-89/90 w/maf*	Sr-90	1.24E+01 pCi/L	3.23E-01	1.62E+01 pCi/L	2.70E-01	0.77
Milk						
* with mixed activation/fission interferences						

E11812	I-131	9.26E+01 pCi/L	8.70E+00	9.79E+01 pCi/L	1.64E+00	0.95
Gamma	Ce-141	1.35E+02 pCi/L	5.78E+00	1.45E+02 pCi/L	2.42E+00	0.93
Milk	Cr-51	2.58E+02 pCi/L	3.02E+01	2.90E+02 pCi/L	4.84E+00	0.89
	Cs-134	1.04E+02 pCi/L	3.01E+00	1.20E+02 pCi/L	2.00E+00	0.87
	Cs-137	1.42E+02 pCi/L	4.52E+00	1.40E+02 pCi/L	2.34E+00	1.02
	Co-58	1.53E+02 pCi/L	5.43E+00	1.50E+02 pCi/L	2.50E+00	1.02
	Mn-54	1.73E+02 pCi/L	4.92E+00	1.64E+02 pCi/L	2.74E+00	1.05
	Fe-59	1.35E+02 pCi/L	6.88E+00	1.29E+02 pCi/L	2.15E+00	1.05
	Zn-65	2.08E+02 pCi/L	9.53E+00	1.99E+02 pCi/L	3.33E+00	1.04
	Co-60	1.82E+02 pCi/L	3.53E+00	1.83E+02 pCi/L	3.05E+00	1.00
	K-40	1.27E+03 pCi/L	4.90E+01	Present - Not Measured		----

E11813	I-131	9.20E+01 pCi	2.06E+00	9.39E+01 pCi	1.57E+00	0.98
I-131						
Cartridge						

E11814	Ce-141	9.99E+01 pCi	6.50E+00	1.01E+02 pCi	1.68E+00	0.99
Gamma	Cr-51	2.11E+02 pCi	3.94E+01	2.01E+02 pCi	3.36E+00	1.05
Filter	Cs-134	8.21E+01 pCi	3.64E+00	8.32E+01 pCi	1.39E+00	0.99
	Cs-137	9.28E+01 pCi	5.95E+00	9.70E+01 pCi	1.62E+00	0.96
	Co-58	9.54E+01 pCi	7.45E+00	1.04E+02 pCi	1.73E+00	0.92
	Mn-54	1.06E+02 pCi	6.05E+00	1.14E+02 pCi	1.90E+00	0.93
	Fe-59	1.07E+02 pCi	9.10E+00	8.93E+01 pCi	1.49E+00	1.20
	Zn-65	1.37E+02 pCi	1.17E+01	1.38E+02 pCi	2.31E+00	0.99
	Co-60	1.40E+02 pCi	2.00E+00	1.27E+02 pCi	2.12E+00	1.10

SAMPLE	ANALYSIS	TBE VALUE	UNCERTAINTY (1 Sigma)	EZA VALUE	UNCERTAINTY (1 Sigma)	RATIO TBE: EZA

E11816	Ce-141	2.58E-01 pCi/g	8.80E-03	2.50E-01 pCi/g	4.17E-03	1.03
Gamma	Cr-51	4.39E-01 pCi/g	7.50E-02	5.00E-01 pCi/g	8.34E-03	0.88
Soil	Cs-134	1.76E-01 pCi/g	7.65E-03	2.07E-01 pCi/g	3.45E-03	0.85
	Cs-137	3.04E-01 pCi/g	1.11E-02	3.17E-01 pCi/g	5.29E-03	0.96
	Co-58	2.41E-01 pCi/g	1.04E-02	2.58E-01 pCi/g	4.31E-03	0.93
	Mn-54	2.92E-01 pCi/g	1.02E-02	2.83E-01 pCi/g	4.73E-03	1.03
	Fe-59	2.10E-01 pCi/g	1.29E-02	2.22E-01 pCi/g	3.70E-03	0.95
	Zn-65	3.53E-01 pCi/g	1.67E-02	3.44E-01 pCi/g	5.74E-03	1.03
	Co-60	3.12E-01 pCi/g	7.65E-03	3.15E-01 pCi/g	5.26E-03	0.99
	K-40	1.06E+00 pCi/g	1.08E-01	Present - Not Measured		----

E11815	Fe-55	1.60E+03 pCi/L	1.68E+02	1.89E+03 pCi/L	3.16E+01	0.85
Fe-55						
Water						

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RESULTS OF ENVIRONMENTAL CROSS CHECK PROGRAM

TELEDYNE BROWN
ENGINEERING

2nd QUARTER 2017

(Ref. Date 08 Jun 2017, Rev. 0)

45

14 Sep 2017

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11844 MILK	Sr-89	8.13E+01	9.26E+01	0.88
	Sr-90	1.21E+01	1.35E+01	0.90
Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11845 FILTER	Sr-89	7.08E+01	7.91E+01	0.90
	Sr-90	9.10E+00	1.15E+01	0.79
Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11846 MILK	Ce-141	1.42E+02	1.51E+02	0.94
	Co-58	1.47E+02	1.55E+02	0.95
	Co-60	1.85E+02	1.91E+02	0.97
	Cr-51	3.21E+02	3.15E+02	1.02
	Cs-134	1.68E+02	1.88E+02	0.89
	Cs-137	1.48E+02	1.50E+02	0.99
	Fe-59	1.16E+02	1.15E+02	1.01
	I-131	1.02E+02	9.36E+01	1.09
	Mn-54	1.68E+02	1.72E+02	0.98
	Zn-65	1.95E+02	2.04E+02	0.96
Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11847 CARTRIDGE	I-131	8.79E+01	8.48E+01	1.04

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11848 FILTER	Ce-141	1.12E+02	1.16E+02	0.96
	Co-58	1.19E+02	1.19E+02	1.00
	Co-60	1.71E+02	1.46E+02	1.17
	Cr-51	2.70E+02	2.41E+02	1.12
	Cs-134	1.52E+02	1.44E+02	1.05
	Cs-137	1.14E+02	1.15E+02	0.99
	Fe-59	9.41E+01	8.83E+01	1.07
	Mn-54	1.39E+02	1.32E+02	1.06
	Zn-65	1.41E+02	1.56E+02	0.90
Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11849 LIQUID	Fe-55	1.84E+03	1.89E+03	0.97

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RESULTS OF ENVIRONMENTAL CROSS CHECK PROGRAM

TELEDYNE BROWN ENGINEERING

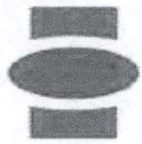
2nd QUARTER 2017

(Ref. Date 10 Jul 2017, Rev. 0)

15 Sep 2017

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11901 FILTER	Alpha (Am-241)	5.01E+01	4.42E+01	1.13
	Beta (Cs-137)	2.18E+02	2.33E+02	0.93



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RESULTS OF ENVIRONMENTAL CROSS CHECK PROGRAM

TELEDYNE BROWN ENGINEERING

3rd QUARTER 2017

(Ref. Date 14 Sep 2017, Rev. 0)

07 Dec 2017

Levan Tkavdze , Nuclear Metrologist

Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11914 MILK	Sr-89	8.43E+01	8.27E+01	1.02
	Sr-90	1.26E+01	1.21E+01	1.04

Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11915 MILK	Ce-141	9.39E+01	8.70E+01	1.08
	Co-58	1.15E+02	1.17E+02	0.98
	Co-60	2.65E+02	2.62E+02	1.01
	Cr-51	2.73E+02	2.17E+02	1.26
	Cs-134	1.86E+02	2.01E+02	0.93
	Cs-137	1.75E+02	1.72E+02	1.02
	Fe-59	1.37E+02	1.25E+02	1.09
	I-131	7.80E+01	7.10E+01	1.10
	K-40	1.32E+03	Not Measured	---
	Mn-54	1.28E+02	1.23E+02	1.04
	Zn-65	2.06E+02	1.84E+02	1.12

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11916 CARTRIDGE	I-131	7.19E+01	6.44E+01	1.12

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E11917 FILTER	Ce-141	8.01E+01	8.63E+01	0.93
	Co-58	1.10E+02	1.16E+02	0.95
	Co-60	2.77E+02	2.60E+02	1.07
	Cr-51	2.75E+02	2.15E+02	1.28
	Cs-134	1.92E+02	1.99E+02	0.96
	Cs-137	1.65E+02	1.70E+02	0.97
	Fe-59	1.22E+02	1.24E+02	0.98
	Mn-54	1.20E+02	1.22E+02	0.99
	Zn-65	1.75E+02	1.83E+02	0.96
Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E11918 LIQUID	Fe-55	1.63E+03	1.63E+03	1.00

Sample	Analysis	ENGINEERING Value, pCi/g	EZA Value, pCi/g	Ratio ENGINEERING: EZA
E11919 SOIL	Ce-141	1.36E-01	1.42E-01	0.96
	Co-58	1.79E-01	1.91E-01	0.94
	Co-60	4.05E-01	4.29E-01	0.94
	Cr-51	2.30E-01	3.55E-01	0.65
	Cs-134	2.72E-01	3.28E-01	0.83
	Cs-137	3.36E-01	2.81E-01	1.20
	Fe-59	2.10E-01	2.05E-01	1.02
	Mn-54	2.10E-01	2.01E-01	1.05
	Zn-65	3.01E-01	3.01E-01	1.00

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**RESULTS OF ENVIRONMENTAL
CROSS CHECK PROGRAM**

**TELEDYNE BROWN
ENGINEERING**

4th QUARTER 2017

(Ref. Date 07 Dec 2017, Rev. 0)

L. Tkavadze

16 Feb 2018

Levan Tkavadze , Nuclear Metrologist

Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E12054 MILK	Sr-89	9.21E+01	9.23E+01	1.00
	Sr-90	1.83E+01	1.69E+01	1.09

Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E12055 MILK	Ce-141	9.78E+01	9.83E+01	0.99
	Co-58	9.23E+01	8.99E+01	1.03
	Co-60	1.76E+02	1.73E+02	1.02
	Cr-51	2.26E+02	2.42E+02	0.93
	Cs-134	1.18E+02	1.25E+02	0.95
	Cs-137	1.48E+02	1.41E+02	1.05
	Fe-59	1.23E+02	1.13E+02	1.08
	I-131	6.60E+01	5.78E+01	1.14
	Mn-54	1.73E+02	1.61E+02	1.08
	Zn-65	2.33E+02	2.11E+02	1.10

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E12056 CARTRIDGE	I-131	4.81E+01	4.75E+01	1.01

Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E12057A FILTER	Ce-141	1.08E+02	1.11E+02	0.97
	Co-58	8.95E+01	1.02E+02	0.88
	Co-60	2.23E+02	1.96E+02	1.14
	Cr-51	3.11E+02	2.74E+02	1.13
	Cs-134	1.41E+02	1.42E+02	1.00
	Cs-137	1.62E+02	1.60E+02	1.01
	Fe-59	1.21E+02	1.29E+02	0.94
	Mn-54	1.77E+02	1.82E+02	0.97
	Zn-65	2.03E+02	2.39E+02	0.85
Sample	Analysis	ENGINEERING Value, pCi/L	EZA Value, pCi/L	Ratio ENGINEERING: EZA
E12058 LIQUID	Fe-55	1.97E+03	1.74E+03	1.13
Sample	Analysis	ENGINEERING Value, pCi	EZA Value, pCi	Ratio ENGINEERING: EZA
E12059 FILTER	Sr-89	7.12E+01	8.74E+01	0.81
	Sr-90	1.29E+01	1.60E+01	0.81



Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP Series 36

(TELE01) TELEDYNE BROWN ENGINEERING - ENVIRONMENTAL SERVICES

2508 Quality Lane

Knoxville, TN 37931-6819

MAPEP-17-MaS36: Radiological and inorganic combined soil standard

Inorganic						Units: (mg/kg)		
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Antimony	NR	37.3				26.1 - 48.5		
Arsenic	NR	95.9				67.1 - 124.7		
Barium	NR	32.7				22.9 - 42.5		
Beryllium	NR	20.4				14.3 - 26.5		
Cadmium	NR	2.26				1.58 - 2.94		
Chromium	NR	38.4				26.9 - 49.9		
Cobalt	NR	131				92 - 170		
Copper	NR	46.4				32.5 - 60.3		
Lead	NR	77.7				54.4 - 101.0		
Mercury	NR	0.0909				0.0636 - 0.1182		
Nickel	NR	4.4				Sensitivity Evaluation		
Selenium	NR	7.11				4.98 - 9.24		
Silver	NR	12.56				8.79 - 16.33		
Technetium-99	NR	1.05E-3				0.00074 - 0.00137		
Thallium	NR	18.1				12.7 - 23.5		
Uranium-235	NR	0.0285				0.0200 - 0.0371		
Uranium-238	NR	3.92				2.74 - 5.10		
Uranium-Total	NR	3.95				2.77 - 5.14		
Vanadium	NR	40.2				28.1 - 52.3		
Zinc	NR	106				74 - 138		

Radiological						Units: (Bq/kg)		
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	NR	67.0				46.9 - 87.1		
Cesium-134	NR	1550				1085 - 2015		
Cesium-137	NR	611				428 - 794		
Cobalt-57	NR					False Positive Test		
Cobalt-60	NR	891				624 - 1158		
Iron-55	NR	812				568 - 1056		
Manganese-54	NR	967				677 - 1257		
Nickel-63	-5.512		A			False Positive Test	20.50	
Plutonium-238	NR	0.41				Sensitivity Evaluation		
Plutonium-239/240	NR	59.8				41.9 - 77.7		
Potassium-40	NR	607				425 - 789		
Strontium-90	571	624	A		-8.5	437 - 811	25.1	A

Issued 6/12/2017

Printed 6/12/2017

Radiological						Units: (Bq/kg)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Technetium-99	NR	656				459 - 853	
Uranium-234/233	NR	48.1				33.7 - 62.5	
Uranium-238	NR	48.8				34.2 - 63.4	
Zinc-65	NR					False Positive Test	

Radiological Reference Date: February 1, 2017

MAPEP-17-MaW36: Radiological and inorganic combined water standard

Inorganic						Units: (mg/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Antimony	NR	10.4				7.3 - 13.5	
Arsenic	NR	1.55				1.09 - 2.02	
Barium	NR	16.8				11.8 - 21.8	
Beryllium	NR	3.89				2.72 - 5.06	
Cadmium	NR	0.34				0.24 - 0.44	
Chromium	NR	1.54				1.08 - 2.00	
Cobalt	NR	17.2				12.0 - 22.4	
Copper	NR	1.50				1.05 - 1.95	
Lead	NR	2.00				1.40 - 2.60	
Mercury	NR	0.0966				0.0676 - 0.1256	
Nickel	NR	0.00217				Sensitivity Evaluation	
Selenium	NR	0.420				0.294 - 0.546	
Technetium-99	NR	10.0E-6				7.00E-6 - 1.30E-5	
Thallium	NR	0.844				0.591 - 1.097	
Uranium-235	NR	6.96E-4				4.87E-4 - 9.05E-4	
Uranium-238	NR	0.097				0.068 - 0.126	
Uranium-Total	NR	0.097				0.068 - 0.126	
Vanadium	NR	11.4				8.0 - 14.8	
Zinc	NR	3.52				2.46 - 4.58	

Radiological						Units: (Bq/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	.693	0.846	A		-18.1	0.592 - 1.100	.0853 A
Cesium-134	NR					False Positive Test	
Cesium-137	NR	11.1				7.8 - 14.4	
Cobalt-57	NR	28.5				20.0 - 37.1	
Cobalt-60	NR	12.3				8.6 - 16.0	
Hydrogen-3	NR	249				174 - 324	
Iron-55	NR	1.7				Sensitivity Evaluation	
Manganese-54	NR	14.9				10.4 - 19.4	
Nickel-63	13.4	12.2	A		9.8	8.5 - 15.9	1.91 A
Plutonium-238	.7217	0.703	A		2.7	0.492 - 0.914	.1287 W
Plutonium-239/240	.9277	0.934	A		-0.7	0.654 - 1.214	.1563 W
Potassium-40	NR	254				178 - 330	
Radium-226	NR	0.504				0.353 - 0.655	

Issued 6/12/2017

Printed 6/12/2017

Radiological						Units: (Bq/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Strontium-90	NR	10.1				7.1 - 13.1	
Technetium-99	NR	6.25				4.38 - 8.13	
Uranium-234/233	NR	1.16				0.81 - 1.51	
Uranium-238	NR	1.20				0.84 - 1.56	
Zinc-65	NR					False Positive Test	

Radiological Reference Date: February 1, 2017

MAPEP-17-RdF36: Radiological air filter

Inorganic						Units: (ug/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Uranium-235	NR	0.0623				0.0436 - 0.0810	
Uranium-238	NR	8.6				6.0 - 11.2	
Uranium-Total	NR	8.7				6.1 - 11.3	

Radiological						Units: (Bq/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	NR	0.0376				0.0263 - 0.0489	
Cesium-134	NR	1.42				0.99 - 1.85	
Cesium-137	NR	0.685				0.480 - 0.891	
Cobalt-57	NR	1.70				1.19 - 2.21	
Cobalt-60	NR	0.78				0.55 - 1.01	
Manganese-54	NR					False Positive Test	
Plutonium-238	NR	0.0598				0.0419 - 0.0777	
Plutonium-239/240	NR	0.0460				0.0322 - 0.0598	
Strontium-90	NR	0.651				0.456 - 0.846	
Uranium-234/233	.0911	0.104	A		-12.4	0.073 - 0.135	.016 W
Uranium-238	.0967	0.107	A		-9.6	0.075 - 0.139	.0166 W
Zinc-65	NR	1.29				0.90 - 1.68	

Radiological Reference Date: February 1, 2017

MAPEP-17-RdV36: Radiological vegetation

Inorganic						Units: (ug/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Uranium-235	NR	0.108				0.076 - 0.140	
Uranium-238	NR	15.0				10.5 - 19.5	
Uranium-Total	NR	15.1				10.6 - 19.6	

Radiological						Units: (Bq/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	NR					False Positive Test	
Cesium-134	6.44	6.95	A		-7.3	4.87 - 9.04	.191 A

Issued 6/12/2017

Printed 6/12/2017

Radiological					Units: (Bq/sample)			
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Cesium-137	4.61	4.60	A		0.2	3.22 - 5.98	.284	A
Cobalt-57	-0.0229		A			False Positive Test	0.0822	
Cobalt-60	8.52	8.75	A		-2.6	6.13 - 11.38	.230	A
Manganese-54	3.30	3.28	A		0.6	2.30 - 4.26	.2697	A
Plutonium-238	NR	0.0598				0.0419 - 0.0777		
Plutonium-239/240	NR	0.089				0.062 - 0.116		
Strontium-90	1.30	1.75	W		-25.7	1.23 - 2.28	.0584	A
Uranium-234/233	NR	0.179				0.125 - 0.233		
Uranium-238	NR	0.186				0.130 - 0.242		
Zinc-65	5.45	5.39	A		1.1	3.77 - 7.01	.532	A

Radiological Reference Date: February 1, 2017

Laboratory Results For MAPEP Series 37

(TELE01) TELEDYNE BROWN ENGINEERING - ENVIRONMENTAL SERVICES

2508 Quality Lane

Knoxville, TN 37931-6819

MAPEP-17-MaS37: Radiological and inorganic combined soil standard

Inorganic						Units: (mg/kg)		
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Antimony	NR	24.1				16.9 - 31.3		
Arsenic	NR	77.1				54.0 - 100.2		
Barium	NR	248				174 - 322		
Beryllium	NR	32.0				22.4 - 41.6		
Cadmium	NR	16.8				11.8 - 21.8		
Chromium	NR	52.3				36.6 - 68.0		
Cobalt	NR	17.2				12.0 - 22.4		
Copper	NR	264				185 - 343		
Lead	NR	52.0				36.4 - 67.6		
Mercury	NR	0.158				0.111 - 0.205		
Nickel	NR	117				82 - 152		
Selenium	NR	10.3				7.2 - 13.4		
Silver	NR	92.3				64.6 - 120.0		
Technetium-99	NR	1.91E-3				0.00134 - 0.00248		
Thallium	NR	128				90 - 166		
Uranium-235	NR	0.0534				0.0374 - 0.0694		
Uranium-238	NR	17.6				12.3 - 22.9		
Uranium-Total	NR	17.7				12.4 - 23.0		
Vanadium	NR	240				168 - 312		
Zinc	NR	283				198 - 368		

Radiological						Units: (Bq/kg)		
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	NR	58.8				41.2 - 76.4		
Cesium-134	NR	448				314 - 582		
Cesium-137	NR	722				505 - 939		
Cobalt-57	NR	1458				1021 - 1895		
Cobalt-60	NR					False Positive Test		
Iron-55	NR	1010				707 - 1313		
Manganese-54	NR	825				578 - 1073		
Nickel-63	1130	1220	A		-7.4	854 - 1586	41.9	A
Plutonium-238	NR	92				64 - 120		
Plutonium-239/240	NR	68.8				48.2 - 89.4		
Potassium-40	NR	592				414 - 770		
Strontium-90	296	289	A		2.4	202 - 376	6.7	A

Radiological						Units: (Bq/kg)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Technetium-99	NR	1195				837 - 1554	
Uranium-234/233	NR	69				48 - 90	
Uranium-238	NR	219				153 - 285	
Zinc-65	NR	559				391 - 727	

Radiological Reference Date: August 1, 2017

MAPEP-17-MaW37: Radiological and inorganic combined water standard							
Inorganic						Units: (mg/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Antimony	NR	18.7				13.1 - 24.3	
Arsenic	NR	0.965				0.676 - 1.255	
Barium	NR	18.0				12.6 - 23.4	
Beryllium	NR	1.80				1.26 - 2.34	
Cadmium	NR					False Positive Test	
Chromium	NR	1.08				0.76 - 1.40	
Cobalt	NR	11.3				7.9 - 14.7	
Copper	NR	18.9				13.2 - 24.6	
Lead	NR	0.898				0.629 - 1.167	
Mercury	NR					False Positive Test	
Nickel	NR	10.1				7.1 - 13.1	
Selenium	NR	0.131				0.092 - 0.170	
Technetium-99	NR	1.07E-5				7.50E-6 - 1.39E-5	
Thallium	NR	3.64				2.55 - 4.73	
Uranium-235	NR	0.000590				4.13E-4 - 7.67E-4	
Uranium-238	NR	0.0836				0.0585 - 0.1087	
Uranium-Total	NR	0.0842				0.0589 - 0.1095	
Vanadium	NR	6.00				4.20 - 7.80	
Zinc	NR	8.08				5.66 - 10.50	

Radiological						Units: (Bq/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	0.838	0.892	A		-6.1	0.624 - 1.160	0.393 N
Cesium-134	NR	11.5				8.1 - 15.0	
Cesium-137	NR	16.3				11.4 - 21.2	
Cobalt-57	NR	12.1				8.5 - 15.7	
Cobalt-60	NR	10.7				7.5 - 13.9	
Hydrogen-3	NR	258				181 - 335	
Iron-55	NR	19.4				13.6 - 25.2	
Manganese-54	NR	14.9				10.4 - 19.4	
Nickel-63	-0.096		A			False Positive Test	0.27
Plutonium-238	0.572	0.603	A		-5.1	0.422 - 0.784	0.228 N
Plutonium-239/240	0.863	0.781	A		10.5	0.547 - 1.015	0.321 N
Potassium-40	NR					False Positive Test	
Radium-226	NR	0.858				0.601 - 1.115	

Radiological						Units: (Bq/L)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Strontium-90	NR	7.77				5.44 - 10.10	
Technetium-99	NR	6.73				4.71 - 8.75	
Uranium-234/233	NR	1.01				0.71 - 1.31	
Uranium-238	NR	1.04				0.73 - 1.35	
Zinc-65	NR	15.5				10.9 - 20.2	

Radiological Reference Date: August 1, 2017

MAPEP-17-RdF37: Radiological air filter							
Inorganic						Units: (ug/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Uranium-235	NR	0.0507				0.0355 - 0.0659	
Uranium-238	NR	7.00				4.90 - 9.10	
Uranium-Total	NR	7.05				4.94 - 9.17	

Radiological						Units: (Bq/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	NR	0.0612				0.0428 - 0.0796	
Cesium-134	NR	1.00				0.70 - 1.30	
Cesium-137	NR	0.82				0.57 - 1.07	
Cobalt-57	NR					False Positive Test	
Cobalt-60	NR	0.68				0.48 - 0.88	
Manganese-54	NR	1.30				0.91 - 1.69	
Plutonium-238	NR	0.0298				0.0209 - 0.0387	
Plutonium-239/240	NR	0.0468				0.0328 - 0.0608	
Strontium-90	NR	0.801				0.561 - 1.041	
Uranium-234/233	0.103	0.084	W		22.6	0.059 - 0.109	0.02 W
Uranium-238	0.115	0.087	N		32.2	0.061 - 0.113	0.025 W
Zinc-65	NR	1.08				0.76 - 1.40	

Radiological Reference Date: August 1, 2017

MAPEP-17-RdV37: Radiological vegetation							
Inorganic						Units: (ug/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Uranium-235	NR	0.095				0.067 - 0.124	
Uranium-238	NR	13.1				9.2 - 17.0	
Uranium-Total	NR	13.2				9.2 - 17.2	

Radiological						Units: (Bq/sample)	
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value Unc Flag
Americium-241	NR	0.077				0.054 - 0.100	
Cesium-134	2.34	2.32	A		0.9	1.62 - 3.02	0.18 A

Radiological					Units: (Bq/sample)			
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Cesium-137	0.05		A			False Positive Test	0.12	
Cobalt-57	3.32	2.8	A		18.6	2.0 - 3.6	0.18	A
Cobalt-60	2.09	2.07	A		1.0	1.45 - 2.69	0.20	A
Manganese-54	2.90	2.62	A		10.7	1.83 - 3.41	0.28	A
Plutonium-238	NR	0.083				0.058 - 0.108		
Plutonium-239/240	NR	0.108				0.076 - 0.140		
Strontium-90	1.17	1.23	A		-4.9	0.86 - 1.60	0.073	A
Uranium-234/233	NR	0.159				0.111 - 0.207		
Uranium-238	NR	0.163				0.114 - 0.212		
Zinc-65	6.07	5.37	A		13.0	3.76 - 6.98	0.55	A

Radiological Reference Date: August 1, 2017

72071



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Knoxville, TN 37931
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MRAD-26  *Final Report*

MRaD™ Proficiency Testing

MRaD™ Study

Reference Date: 03/20/17

Open Date: 03/20/17

Close Date: 05/19/17

Report Issued Date: 05/23/17

Study # : MRAD-26



A Waters Company

MRAD-26 2009 TNI Evaluation Final Complete Report

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EPA ID:
ERA Customer Number:
Report Issued:
Study Dates:

TN11387
T200801
05/23/17
03/20/17 - 05/19/17

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
<i>MRAD Air Filter Gross Alpha/Beta (cat# 801, lot# A026-607)</i>												
2830	Gross Alpha	pCi/Filter	76.3	85.5	28.6 - 133	Acceptable	EPA 900.0 GPC 1980	5/15/2017	-1.07	86.3	9.33	
2840	Gross Beta	pCi/Filter		45.2	28.6 - 65.9	Not Reported				52.4	9.91	





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2009 TNI Evaluation Report

Study: **RAD-109**

ERA Customer Number: **T200801**

Laboratory Name: **Teledyne Brown
Engineering**

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RAD Results



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Study # : RAD-109





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RAD-109 2009 TNI Evaluation Final Complete Report

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EPA ID:
ERA Customer Number:
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Study Dates:

TN11387
T200801
05/30/17
04/10/17 - 05/25/17

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
RAD Gamma EmitterS™ (cat# 808, lot# R109-758)												
2765	Barium-133	pCi/L	49.2	49.7	40.8 - 55.1	Acceptable	EPA 901.1 1980	4/18/2017	0.331	47.7	4.66	
2800	Cesium-134	pCi/L	83.2	90.1	74.0 - 99.1	Acceptable	EPA 901.1 1980	4/18/2017	0.186	82.2	5.43	
2805	Cesium-137	pCi/L	202	206	185 - 228	Acceptable	EPA 901.1 1980	4/18/2017	-0.479	205	7.24	
2815	Cobalt-60	pCi/L	51.2	54.7	49.2 - 62.7	Acceptable	EPA 901.1 1980	4/18/2017	-0.806	54.2	3.73	
3070	Zinc-65	pCi/L	39.3	53.8	47.2 - 65.9	Not Acceptable	EPA 901.1 1980	4/18/2017	-3.08	57.9	6.05	
RAD GroSS™ Alpha/Beta (cat# 809, lot# R109-759)												
2830	Gross Alpha	pCi/L	53.6	75.0	39.5 - 92.3	Acceptable	EPA 900.0 GPC 1980	5/10/2017	-1.73	71.0	10.1	
2840	Gross Beta	pCi/L	42.7	38.5	25.5 - 46.0	Acceptable	EPA 900.0 GPC 1980	5/10/2017	0.728	36.6	8.37	
RAD NaturalS™ (cat# 811, lot# R109-751)												
2965	Radium-226	pCi/L		17.3	12.9 - 19.8	Not Reported				16.8	2.27	
2970	Radium-228	pCi/L		5.49	3.33 - 7.27	Not Reported				5.46	1.07	
3055	Uranium (Nat)	pCi/L	50.1	55.6	45.2 - 61.7	Acceptable	EPA 908.0 1980	4/29/2017	-1.45	54.3	2.86	
3055	Uranium (Nat) mass	µg/L		81.8	66.5 - 90.8	Not Reported				79.2	4.31	
RAD TritiumM™ (cat# 812, lot# R109-752)												
3030	Tritium	pCi/L	7080	6850	5920 - 7540	Acceptable	EPA 906.0 1980	5/9/2017	0.240	6970	464	
RAD Strontium-89/90 (cat# 807, lot# R109-757)												
2995	Strontium-89	pCi/L	40.7	66.2	53.8 - 74.3	Not Acceptable	EPA 905.0 1980	5/15/2017	-2.47	58.5	7.21	
3005	Strontium-90	pCi/L	26.9	26.7	19.3 - 31.1	Acceptable	EPA 905.0 1980	5/15/2017	-0.239	27.4	1.91	
RAD Iodine-131 (cat# 810, lot# R109-750)												
2875	Iodine-131	pCi/L	26.7	29.9	24.9 - 34.9	Acceptable	EPA 600/4/80/32	4/20/2017	-2.29	30.2	1.51	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

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Study # : RAD-109





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MRAD-27 *Final Report*

MRaD™ Proficiency Testing

MRaD™ Study

Reference Date: 09/18/17

Open Date: 09/18/17

Close Date: 11/17/17

Report Issued Date: 11/20/17

Study # : MRAD-27



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MRAD-27 2009 TNI Evaluation Final Complete Report

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EPA ID:
ERA Customer Number:
Report Issued:
Study Dates:

TN11387
T200801
11/20/17
09/18/17 - 11/17/17

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
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MRAD Air Filter Gross Alpha/Beta (cat# 801, lot# A027-607)

2830	Gross Alpha	pCi/Filter	40.9	50.1	16.8 - 77.8	Acceptable	EPA 900.0 GPC 1980	10/17/2017	-0.984	47.7	6.89	
2840	Gross Beta	pCi/Filter	58.0	61.8	39.1 - 90.1	Acceptable	EPA 900.0 GPC 1980	10/17/2017	-0.192	59.7	8.91	



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RAD-111  ***Final Report***

RadChem™ Proficiency Testing

RadChem™ Study

Reference Date: 10/06/17

Open Date: 10/06/17

Close Date: 11/20/17

Report Issued Date: 11/22/17



A Waters Company

RAD-111 2009 TNI Evaluation Final Complete Report

Ver. 1
Page 8 of 12

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EPA ID:
ERA Customer Number:
Report Issued:
Study Dates:

TN11387
T200801
11/22/17
10/06/17 - 11/20/17

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
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RAD Gamma EmitterS™ (cat# 808, lot# R111-758)

2765	Barium-133	pCi/L	71.3	73.7	61.7 - 81.1	Acceptable	EPA 901.0 1980	10/16/2017	-0.0875	71.7	4.02	
2800	Cesium-134	pCi/L	43.0	53.0	42.8 - 58.3	Acceptable	EPA 901.0 1980	10/16/2017	-1.57	49.0	3.85	
2805	Cesium-137	pCi/L	48.2	52.9	47.6 - 61.1	Acceptable	EPA 901.0 1980	10/16/2017	-1.70	53.6	3.20	
2815	Cobalt-60	pCi/L	69.0	69.5	62.6 - 78.9	Acceptable	EPA 901.0 1980	10/16/2017	-0.590	70.7	2.84	
3070	Zinc-65	pCi/L	335	348	313 - 406	Acceptable	EPA 901.0 1980	10/16/2017	-1.37	363	20.6	

RAD GroSS™ Alpha/Beta (cat# 809, lot# R111-759)

2830	Gross Alpha	pCi/L	32.5	35.6	18.3 - 45.8	Acceptable	EPA 900.0 GPC 1980	11/6/2017	0.105	32.0	5.08	
2840	Gross Beta	pCi/L	24.3	25.6	16.0 - 33.6	Acceptable	EPA 900.0 GPC 1980	11/6/2017	0.434	22.0	5.34	

RAD NaturalS™ (cat# 811, lot# R111-751)

2965	Radium-226	pCi/L		14.5	10.8 - 16.7	Not Reported				13.7	1.12	
2970	Radium-228	pCi/L		4.52	2.65 - 6.16	Not Reported				4.63	0.748	
3055	Uranium (Nat)	pCi/L	36.6	37.0	30.0 - 40.9	Acceptable	EPA 908.0 1980	11/14/2017	0.985	34.6	2.01	
3055	Uranium (Nat) mass	µg/L		54.4	44.2 - 60.2	Not Reported				51.9	2.14	

RAD Tritium™ (cat# 812, lot# R111-752)

3030	Tritium	pCi/L	6270	6250	5390 - 6880	Acceptable	EPA 906.0 1980	10/19/2017	0.183	6230	235	
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RAD Iodine-131 (cat# 810, lot# R111-750)

2875	Iodine-131	pCi/L	26.4	24.2	20.1 - 28.7	Acceptable	EPA 901.1 1980	10/22/2017	0.0799	26.2	2.34	
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All analytes except PT catalog numbers 462, 604QR, 929, 731QR, 960, 735QR (PFAS) are included in ERA's A2LA accreditation. Lab Code: 1539-01

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Study # : RAD-111





2009 TNI Evaluation Report

Project Number: 111317O

ERA Customer Number: T200801

**Laboratory Name: Teledyne Brown
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RAD Results





111317O 2009 TNI Evaluation Final Complete Report

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EPA ID:
ERA Customer Number:

TN11387
T200801

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
QR Strontium-89/90 (cat# 757, lot# 111317O) Study Dates: 11/13/17 - 12/28/17												
2995	Strontium-89	pCi/L	57.1	50.0	39.4 - 57.5	Acceptable	EPA 905.0 1980	12/28/2017				
3005	Strontium-90	pCi/L	27.1	41.8	30.8 - 48.0	Not Acceptable	EPA 905.0 1980	12/28/2017				

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All analytes except PT catalog numbers 462, 604QR, 929, 731QR, 960, 735QR (PFAS) are included in ERA's A2LA accreditation. Lab Code: 1539-01
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Project # : 111317O



ATTACHMENT B

Interlaboratory Quality Control Program Results

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Blanks and Spikes

B.1 Am-241
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/17/17	< 0.0393	5.23 ± 0.52	5.26 ± 0.26	99.4
01/24/17	< 0.0434	4.03 ± 0.44	5.26 ± 0.26	76.6
02/01/17	< 0.0337	4.69 ± 0.44	5.26 ± 0.26	89.1
02/14/17	< 0.0399	4.75 ± 0.86	5.26 ± 0.26	90.3
02/22/17	< 0.0309	5.34 ± 0.50	5.26 ± 0.26	101
03/02/17	< 0.0418	5.71 ± 0.95	5.26 ± 0.26	109
03/13/17	< 0.0421	4.81 ± 0.41	5.26 ± 0.26	91.4
03/22/17	< 0.0296	5.39 ± 0.57	5.26 ± 0.26	102
03/24/17	< 0.0269	3.98 ± 0.53	5.26 ± 0.26	75.7
03/30/17	< 0.0285	4.94 ± 0.45	5.26 ± 0.26	93.9
04/06/17	< 0.0333	5.81 ± 0.99	5.26 ± 0.26	110
04/12/17	< 0.0583	4.75 ± 0.49	5.26 ± 0.26	90.3
04/19/17	< 0.0603	5.18 ± 0.49	5.26 ± 0.26	98.5
04/19/17	< 0.0375	4.75 ± 0.46	5.26 ± 0.26	90.3
04/20/17	< 0.0371	4.79 ± 0.47	5.26 ± 0.26	91.1
04/28/17	< 0.0270	5.22 ± 0.44	5.26 ± 0.26	99.2
05/03/17	< 0.0455	4.88 ± 0.47	5.26 ± 0.26	92.8
05/10/17	< 0.0560	5.29 ± 0.55	5.26 ± 0.26	101
05/30/17	< 0.1700	5.08 ± 0.48	5.26 ± 0.26	96.6
05/31/17	< 0.0306	4.98 ± 0.47	5.26 ± 0.26	94.7
06/01/17	< 0.0757	5.31 ± 1.03	5.26 ± 0.26	101
06/12/17	< 0.0365	5.38 ± 0.59	5.26 ± 0.26	102
06/20/17	< 0.1350	4.58 ± 1.28	5.26 ± 0.26	87.1
06/20/17	< 0.1520	6.30 ± 2.37	5.26 ± 0.26	120
06/25/17	< 0.0142	4.62 ± 0.46	5.26 ± 0.26	87.9
06/28/17	< 0.1040	5.97 ± 1.15	5.26 ± 0.26	114
06/29/17	< 0.3030	3.92 ± 1.29	5.26 ± 0.26	74.5
07/07/17	< 0.0275	5.68 ± 0.62	5.26 ± 0.26	108
07/20/17	< 0.0348	4.93 ± 0.91	5.26 ± 0.26	93.8
07/20/17	< 0.0039	4.73 ± 0.48	5.26 ± 0.26	90.0
07/25/17	< 0.1250	4.73 ± 0.59	5.26 ± 0.26	90.0
07/28/17	< 0.0656	4.42 ± 0.87	5.26 ± 0.26	84.1
07/29/17	< 0.0251	4.47 ± 0.50	5.26 ± 0.26	85.0
07/31/17	< 0.0242	4.64 ± 0.61	5.26 ± 0.26	88.3
08/01/17	< 0.0540	4.76 ± 0.61	5.26 ± 0.26	90.5
08/15/17	< 0.0437	5.25 ± 0.53	5.26 ± 0.26	99.9
08/18/17	< 0.1680	4.94 ± 0.48	5.26 ± 0.26	94.0
08/18/17	< 0.0605	4.02 ± 0.41	5.26 ± 0.26	76.5
08/27/17	< 0.0903	4.69 ± 0.54	5.26 ± 0.26	89.2
08/29/17	< 0.0294	4.71 ± 0.66	5.26 ± 0.26	89.6
09/12/17	< 0.1590	5.09 ± 0.65	5.26 ± 0.26	96.8

B.1 Am-241
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
09/14/17	< 0.0744	5.22 ± 0.56	5.26 ± 0.26	99.3
09/28/17	< 0.2330	4.79 ± 0.91	5.26 ± 0.26	91.1
09/28/17	< 0.4970	5.68 ± 2.23	5.26 ± 0.26	108
10/05/17	< 0.0059	5.06 ± 0.54	5.26 ± 0.26	96.3
10/12/17	< 0.0733	5.50 ± 0.60	5.26 ± 0.26	105
10/14/17	< 0.0659	5.12 ± 0.56	5.26 ± 0.26	97.4
10/18/17	< 0.0572	5.40 ± 2.13	5.26 ± 0.26	103
11/01/17	< 0.0755	4.98 ± 0.86	5.26 ± 0.26	94.8
11/02/17	< 0.3020	4.35 ± 1.21	5.26 ± 0.26	82.8
11/07/17	< 0.1190	5.02 ± 0.50	5.26 ± 0.26	95.5
11/08/17	< 0.0622	4.68 ± 0.48	5.26 ± 0.26	89.1
11/15/17	< 0.6680	4.92 ± 0.50	5.26 ± 0.26	93.6
11/15/17	< 0.0219	5.14 ± 0.88	5.26 ± 0.26	97.8
11/16/17	< 0.1480	6.07 ± 0.95	5.26 ± 0.26	116
11/29/17	< 0.0219	5.12 ± 0.86	5.26 ± 0.26	97.4
12/11/17	< 0.0336	4.67 ± 0.39	5.25 ± 0.26	88.9
12/14/17	< 0.0446	4.52 ± 0.42	5.25 ± 0.26	86.0
12/18/17	< 0.0774	4.94 ± 0.45	5.25 ± 0.26	94.0
12/29/17	< 0.3410	4.50 ± 0.91	5.25 ± 0.26	85.6

B.2 C-14
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/10/17	< 0.966	3250 ± 32.6	3140 ± 157	104
01/17/17	< 3.24	1990 ± 17.5	1960 ± 98.0	102
01/31/17	< 4.95	2310 ± 44.5	1960 ± 98.0	118
02/01/17	< 4.63	1930 ± 16.6	1960 ± 98.0	98.5
02/10/17	< 2.99	1950 ± 17.3	1960 ± 98.0	99.5
03/02/17	< 4.19	1880 ± 17.8	1960 ± 98.0	96.0
03/14/17	< 3.25	1710 ± 13.8	1960 ± 98.0	87.3
03/23/17	< 4.51	1650 ± 16.4	1960 ± 98.0	84.2
03/24/17	< 0.882	3030 ± 30.4	3140 ± 157	96.6
04/05/17	< 3.95	1640 ± 19.6	1960 ± 98.0	83.7
04/05/17	< 4.86	1790 ± 17.7	1960 ± 98.0	91.4
04/06/17	< 2.01	2540 ± 25.5	3140 ± 157	81.0
04/06/17	< 2.01	2940 ± 29.5	3140 ± 157	93.7
04/11/17	< 2.09	1760 ± 12.6	1960 ± 98.0	89.8
04/20/17	< 2.84	2090 ± 18.9	1960 ± 98.0	107
04/24/17	< 2.55	3990 ± 40.0	3140 ± 157	127
05/02/17	< 2.35	1770 ± 14.9	1960 ± 98.0	90.3
05/03/17	< 2.12	2760 ± 27.7	3140 ± 157	88.0
05/04/17	< 1.84	1630 ± 105	1940 ± 97.0	84.4
05/10/17	< 2.25	1900 ± 11.2	1960 ± 98.0	97.0
05/15/17	< 1.71	1810 ± 16.1	1960 ± 98.0	92.4
05/16/17	< 1.71	1840 ± 16.2	1960 ± 98.0	93.9
05/22/17	< 1.74	2060 ± 17.1	1960 ± 98.0	105
05/25/17	< 2.08	1530 ± 15.4	1960 ± 98.0	78.1
05/26/17	< 3.39	2020 ± 11.5	1960 ± 98.0	103
06/09/17	< 5.23	1890 ± 16.0	1960 ± 98.0	96.5
06/16/17	< 2.84	1550 ± 12.0	1960 ± 98.0	79.1
06/17/17	< 1.69	1830 ± 16.2	1960 ± 98.0	93.4
06/24/17	< 5.37	1590 ± 16.2	1960 ± 98.0	81.2
06/26/17	< 3.14	3420 ± 16.0	3920 ± 196	87.3
07/07/17	< 1.85	3840 ± 38.5	3137 ± 157	122
07/11/17	< 4.08	1810 ± 15.6	1959 ± 98.0	92.4
07/20/17	< 3.69	1780 ± 11.7	1959 ± 98.0	90.9
07/26/17	< 3.26	1920 ± 12.2	1959 ± 98.0	98.0
08/01/17	< 6.12	1790 ± 18.4	1959 ± 98.0	91.4
08/02/17	< 2.24	817 ± 9.35	980 ± 49.0	83.4
08/15/17	< 4.74	1790 ± 49.1	1959 ± 98.0	91.4
08/25/17	< 4.81	1440 ± 15.0	1959 ± 98.0	73.5
09/18/17	< 1.95	2300 ± 12.6	1959 ± 98.0	117
09/25/17	< 0.68	1180 ± 23.7	980 ± 49.0	120
10/04/17	< 2.79	2000 ± 18.30	1959 ± 98.0	102

B.2 C-14
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
10/12/17	< 2.24	1860 ± 19.9	1959 ± 98.0	94.9
10/19/17	< 3.27	1920 ± 18.4	1959 ± 98.0	98.0
10/24/17	< 1.21	1200 ± 12.0	979.5 ± 49.0	123
10/31/17	< 3.33	3800 ± 25.7	3918 ± 196	97.0
11/07/17	< 4.36	1910 ± 31.8	1959 ± 98.0	97.5
11/09/17	< 2.19	3440 ± 22.1	3137 ± 157	110
11/09/17	< 2.19	6730 ± 30.9	6274 ± 314	107
11/17/17	< 3.16	2070 ± 18.7	1959 ± 98.0	106
11/17/17	< 1.6	2570 ± 25.8	3137 ± 157	81.9
12/15/17	< 2.03	1980 ± 16.4	1959 ± 98.0	101
12/20/17	< 1.45	2920 ± 29.3	3137 ± 157	93.1
12/20/17	< 2.68	2080 ± 19.2	1959 ± 98.0	106

B.3 Cs-137 (RAD)
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
03/03/17	< 1.62	68.1 ± 5.76	62.1 ± 3.10	110
05/09/17	< 0.74	64.4 ± 2.16	61.8 ± 3.09	104
06/01/17	< 0.552	59.5 ± 2.10	61.7 ± 3.09	96.4
06/19/17	< 0.717	68.3 ± 2.42	61.7 ± 3.09	111
06/29/17	< 0.574	68.8 ± 2.35	61.6 ± 3.08	112
07/27/17	< 0.825	65.7 ± 2.14	61.5 ± 3.08	107
11/01/17	< 0.631	71.9 ± 2.57	61.1 ± 3.06	118
11/06/17	< 0.629	70.5 ± 2.71	61.1 ± 3.06	115
11/14/17	< 0.619	66.9 ± 2.55	61.1 ± 3.05	110

B.4 Fe-55
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/12/17	< 22.7	396 ± 121	389 ± 19.5	102
01/18/17	< 23.9	403 ± 157	387 ± 19.4	104
01/26/17	< 22.6	374 ± 174	385 ± 19.3	97.1
01/31/17	< 22.9	330 ± 147	384 ± 19.2	86.0
01/31/17	< 22.7	358 ± 88.1	384 ± 19.2	93.3
02/01/17	< 26.4	377 ± 89.8	384 ± 19.2	98.3
02/10/17	< 28.3	409 ± 159	381 ± 19.1	107
02/14/17	< 32.9	417 ± 212	380 ± 19.0	110
02/16/17	< 22.6	414 ± 227	380 ± 19.0	109
02/16/17	< 17.2	373 ± 88.7	380 ± 19.0	98.3
02/24/17	< 12.7	398 ± 75.8	377 ± 18.9	105
02/28/17	< 33.7	369 ± 135	376 ± 18.8	98.0
03/02/17	< 38.2	405 ± 91.7	376 ± 18.8	108
03/13/17	< 19.4	395 ± 127	373 ± 18.7	106
03/24/17	< 37.9	413 ± 96.7	370 ± 18.5	112
03/30/17	< 25.5	373 ± 184	369 ± 18.4	101
03/31/17	< 54.5	372 ± 227	368 ± 18.4	101
04/07/17	< 42.8	382 ± 96.3	366 ± 18.3	104
04/20/17	< 37.7	389 ± 93.3	363 ± 18.2	107
04/25/17	< 42.6	363 ± 79.0	362 ± 18.1	100
05/01/17	< 56.3	360 ± 163	360 ± 18.0	99.9
05/02/17	< 25.6	339 ± 113	360 ± 18.0	94.2
05/02/17	< 42.4	381 ± 151	360 ± 18.0	106
05/04/17	< 27.5	366 ± 124	360 ± 18.0	102
05/05/17	< 29.6	388 ± 104	359 ± 18.0	108
05/19/17	< 34.1	316 ± 111	356 ± 17.8	88.8
05/23/17	< 27.2	369 ± 94.5	355 ± 17.7	104
05/23/17	< 39.4	371 ± 60.7	355 ± 17.7	105
05/31/17	< 65.1	327 ± 81.4	353 ± 17.6	92.7
06/02/17	< 64.6	370 ± 97.1	352 ± 17.6	105
06/02/17	< 31.7	336 ± 95.5	352 ± 17.6	95.4
06/02/17	< 33.6	341 ± 74.8	352 ± 17.6	96.8
06/02/17	< 33.1	372 ± 151	352 ± 17.6	106
06/12/17	< 34.3	354 ± 150	350 ± 17.5	101
06/19/17	< 27.8	342 ± 157	348 ± 17.4	98.3
06/26/17	< 39.9	337 ± 162	346 ± 17.3	97.3
06/29/17	< 29.6	373 ± 140	346 ± 17.3	108
06/29/17	< 32.0	353 ± 159	346 ± 17.3	102
07/14/17	< 34.5	355 ± 97.3	342 ± 17.1	104
07/18/17	< 31.6	356 ± 83.1	341 ± 17.1	104
07/24/17	< 26.4	361 ± 153	340 ± 17.0	106

B.4 Fe-55
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/25/17	< 35.9	343 ± 77.3	339 ± 17.0	101
07/26/17	< 55.8	339 ± 212	339 ± 17.0	100
07/27/17	< 35.9	347 ± 107	339 ± 16.9	102
08/01/17	< 30.4	364 ± 162	338 ± 16.9	108
08/02/17	< 26.7	350 ± 109	338 ± 16.9	104
08/03/17	< 56.7	338 ± 168	337 ± 16.9	100
08/14/17	< 43.6	336 ± 172	335 ± 16.7	100
08/14/17	< 29.2	355 ± 130	335 ± 16.7	106
08/18/17	< 42.7	351 ± 144	334 ± 16.7	105
08/24/17	< 30.6	339 ± 201	332 ± 16.6	102
08/28/17	< 25.5	353 ± 99.3	331 ± 16.6	107
08/29/17	< 32.6	345 ± 156	331 ± 16.6	104
08/30/17	< 30.1	320 ± 110	331 ± 16.5	96.7
08/30/17	< 31.3	367 ± 171	331 ± 16.5	111
09/12/17	< 39.7	339 ± 123	328 ± 16.4	103
09/14/17	< 36.9	333 ± 109	328 ± 16.4	102
09/21/17	< 47.4	348 ± 153	326 ± 16.3	107
09/27/17	< 36.5	351 ± 91.7	324 ± 16.2	108
09/27/17	< 32.7	331 ± 109	324 ± 16.2	102
09/28/17	< 89.8	349 ± 117	324 ± 16.2	108
10/06/17	< 25.9	407 ± 86.2	322 ± 16.1	126
10/16/17	< 32.1	340 ± 117	320 ± 16.0	106
11/01/17	< 35.0	312 ± 174	317 ± 15.8	98.5
11/01/17	< 41.6	330 ± 133	317 ± 15.8	104
11/01/17	< 21.8	314 ± 132	317 ± 15.8	99.2
11/02/17	< 37.7	326 ± 169	316 ± 15.8	103
11/02/17	< 34.2	355 ± 85.0	316 ± 15.8	112
11/03/17	< 26.9	332 ± 131	316 ± 15.8	105
11/07/17	< 54.1	330 ± 131	315 ± 15.8	105
11/13/17	< 35.5	318 ± 159	314 ± 15.7	101
11/29/17	< 46.9	343 ± 124	310 ± 15.5	111
11/29/17	< 42.1	293 ± 164	310 ± 15.5	94.4
11/29/17	< 57.5	328 ± 140	310 ± 15.5	106
11/30/17	< 48.4	328 ± 177	310 ± 15.5	106
11/30/17	< 40.6	333 ± 187	310 ± 15.5	107
12/19/17	< 50.3	306 ± 130	306 ± 15.3	100
12/21/17	< 51.7	317 ± 160	306 ± 15.3	104
12/22/17	< 40	345 ± 177	305 ± 15.3	113
12/28/17	< 34.7	297 ± 141	304 ± 15.2	97.7

B.5 Gross Alpha
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/05/17	< 0.437	20.2 ± 2.05	26.3 ± 1.32	76.8
01/05/17	< 0.798	24.1 ± 2.33	26.3 ± 1.32	91.6
01/09/17	< 0.684	21.6 ± 2.21	26.3 ± 1.32	82.1
01/19/17	< 0.606	24.2 ± 2.35	26.3 ± 1.32	92.0
01/24/17	< 0.738	21.5 ± 2.21	26.3 ± 1.32	81.7
01/25/17	< 0.399	18.4 ± 1.93	26.3 ± 1.32	70.0
01/25/17	< 0.859	22.9 ± 2.32	26.3 ± 1.32	87.1
01/31/17	< 0.431	19.5 ± 2.06	26.3 ± 1.32	74.1
01/31/17	< 0.436	22.8 ± 2.16	26.3 ± 1.32	86.7
01/31/17	< 0.523	24.1 ± 2.33	26.3 ± 1.32	91.6
02/02/17	< 0.442	22.7 ± 2.29	26.3 ± 1.32	86.3
02/09/17	< 0.675	24.6 ± 2.36	26.3 ± 1.32	93.5
02/15/17	< 0.377	18.5 ± 1.92	26.3 ± 1.32	70.3
02/15/17	< 0.309	19.5 ± 1.95	26.3 ± 1.32	74.1
02/16/17	< 0.670	20.0 ± 2.16	26.3 ± 1.32	76.0
02/21/17	< 0.494	23.4 ± 2.01	26.3 ± 1.32	89.0
02/22/17	< 0.489	21.3 ± 2.15	26.3 ± 1.32	81.0
02/22/17	< 0.698	22.3 ± 2.16	26.3 ± 1.32	84.8
02/27/17	< 0.741	22.5 ± 2.26	26.3 ± 1.32	85.6
02/28/17	< 0.759	23.7 ± 2.32	26.3 ± 1.32	90.1
03/02/17	< 0.702	22.3 ± 2.24	26.3 ± 1.32	84.8
03/06/17	< 0.299	18.5 ± 1.84	26.3 ± 1.32	70.3
03/08/17	< 0.549	18.7 ± 2.04	26.3 ± 1.32	71.1
03/13/17	< 0.672	22.0 ± 2.27	26.3 ± 1.32	83.7
03/14/17	< 0.660	20.1 ± 2.17	26.3 ± 1.32	76.4
03/21/17	< 0.746	22.7 ± 2.28	26.3 ± 1.32	86.3
03/27/17	< 0.432	18.5 ± 1.91	26.3 ± 1.32	70.3
03/28/17	< 0.658	24.5 ± 2.30	26.3 ± 1.32	93.2
03/28/17	< 0.561	22.7 ± 2.24	26.3 ± 1.32	86.3
03/29/17	< 0.676	20.5 ± 2.25	26.3 ± 1.32	77.9
03/30/17	< 0.590	20.6 ± 2.09	26.3 ± 1.32	78.3
04/05/17	< 0.222	18.8 ± 1.94	26.3 ± 1.32	71.5
04/05/17	< 0.770	19.1 ± 2.10	26.3 ± 1.32	72.6
04/14/17	< 0.848	21.6 ± 3.15	26.3 ± 1.32	82.1
04/18/17	< 0.593	23.4 ± 2.33	26.3 ± 1.32	89.0
04/19/17	< 0.575	18.5 ± 1.99	26.3 ± 1.32	70.3
04/20/17	< 0.665	23.5 ± 2.28	26.3 ± 1.32	89.4
04/24/17	< 0.217	19.4 ± 2.03	26.3 ± 1.32	73.8
04/24/17	< 0.357	18.4 ± 1.90	26.3 ± 1.32	70.0
04/24/17	< 0.367	18.9 ± 1.99	26.3 ± 1.32	71.9
04/27/17	< 0.440	18.5 ± 1.92	26.3 ± 1.32	70.3

B.5 Gross Alpha
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
05/01/17	< 0.748	20.0 ± 2.13	26.3 ± 1.32	76.1
05/01/17	< 0.570	19.0 ± 1.98	26.3 ± 1.32	72.2
05/02/17	< 0.670	25.3 ± 2.39	26.3 ± 1.32	96.2
05/03/17	< 0.688	24.8 ± 2.44	26.3 ± 1.31	94.3
05/04/17	< 0.615	24.2 ± 2.32	26.3 ± 1.31	92.0
05/10/17	< 0.405	20.1 ± 2.09	26.3 ± 1.31	76.4
05/11/17	< 0.390	19.1 ± 1.97	26.3 ± 1.31	72.6
05/11/17	< 0.427	18.7 ± 1.95	26.3 ± 1.31	71.1
05/15/17	< 0.628	19.3 ± 2.02	26.3 ± 1.31	73.4
05/18/17	< 0.722	21.4 ± 2.29	26.3 ± 1.31	81.4
05/18/17	< 0.717	22.2 ± 2.23	26.3 ± 1.31	84.4
05/24/17	< 0.506	18.6 ± 1.98	26.3 ± 1.31	70.7
05/30/17	< 0.770	23.7 ± 2.33	26.3 ± 1.31	90.1
05/30/17	< 0.756	23.1 ± 2.29	26.3 ± 1.31	87.8
05/30/17	< 0.315	18.5 ± 1.92	26.3 ± 1.31	70.4
05/30/17	< 0.678	21.3 ± 2.22	26.3 ± 1.31	81.0
05/31/17	< 0.730	23.8 ± 2.36	26.3 ± 1.31	90.5
05/31/17	< 0.440	22.4 ± 2.35	26.3 ± 1.31	85.2
05/31/17	< 0.793	21.0 ± 2.20	26.3 ± 1.31	79.9
06/01/17	< 0.923	21.6 ± 2.27	26.3 ± 1.31	82.1
06/01/17	< 0.575	26.7 ± 2.17	26.3 ± 1.31	102
06/05/17	< 0.624	19.5 ± 2.03	26.3 ± 1.31	74.2
06/07/17	< 0.826	22.7 ± 2.26	26.3 ± 1.31	86.3
06/07/17	< 0.375	25.6 ± 2.61	26.3 ± 1.31	97.4
06/12/17	< 0.238	18.4 ± 1.89	26.3 ± 1.31	70.0
06/12/17	< 0.225	20.6 ± 2.10	26.3 ± 1.31	78.3
06/13/17	< 0.505	18.8 ± 1.99	26.3 ± 1.31	71.5
06/15/17	< 0.501	24.6 ± 2.32	26.3 ± 1.31	93.6
06/15/17	< 0.350	19.0 ± 1.97	26.3 ± 1.31	72.3
06/20/17	< 0.319	18.8 ± 1.86	26.3 ± 1.31	71.5
06/20/17	< 0.494	18.7 ± 1.91	26.3 ± 1.31	71.1
06/22/17	< 0.690	24.5 ± 2.32	26.3 ± 1.31	93.2
06/23/17	< 0.702	19.9 ± 2.06	26.3 ± 1.31	75.7
06/23/17	< 0.495	23.4 ± 2.26	26.3 ± 1.31	89.0
06/23/17	< 0.367	18.5 ± 1.88	26.3 ± 1.31	70.4
06/28/17	< 0.569	25.3 ± 2.39	26.3 ± 1.31	96.2
07/03/17	< 0.333	21.1 ± 2.08	26.3 ± 1.31	80.3
07/10/17	< 0.795	22.4 ± 2.22	26.3 ± 1.31	85.2
07/12/17	< 0.527	24.4 ± 2.21	26.3 ± 1.31	92.8
07/17/17	< 0.507	19.6 ± 2.06	26.3 ± 1.31	74.6
07/17/17	< 0.950	23.9 ± 2.33	26.3 ± 1.31	90.9

B.5 Gross Alpha
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/20/17	< 0.839	22.8 ± 2.30	26.3 ± 1.31	86.7
07/26/17	< 0.695	19.8 ± 2.11	26.3 ± 1.31	75.3
08/01/17	< 0.519	21.3 ± 2.18	26.3 ± 1.31	81.0
08/02/17	< 1.060	23.6 ± 2.36	26.3 ± 1.31	89.8
08/09/17	< 0.384	21.7 ± 2.20	26.3 ± 1.31	82.6
08/09/17	< 0.363	19.0 ± 1.97	26.3 ± 1.31	72.3
08/10/17	< 0.534	21.7 ± 2.14	26.3 ± 1.31	82.6
08/15/17	< 0.532	18.6 ± 1.96	26.3 ± 1.31	70.8
08/15/17	< 0.707	23.8 ± 2.28	26.3 ± 1.31	90.5
08/17/17	< 0.868	19.4 ± 2.11	26.3 ± 1.31	73.8
08/20/17	< 0.336	19.7 ± 2.05	26.3 ± 1.31	74.9
08/20/17	< 0.224	19.1 ± 1.96	26.3 ± 1.31	72.7
08/22/17	< 0.858	22.7 ± 2.32	26.3 ± 1.31	86.4
08/28/17	< 0.431	23.5 ± 2.23	26.3 ± 1.31	89.4
08/28/17	< 0.506	22.3 ± 2.10	26.3 ± 1.31	84.8
08/28/17	< 0.579	21.3 ± 2.18	26.3 ± 1.31	81.0
08/29/17	< 0.560	23.4 ± 2.27	26.3 ± 1.31	89.0
08/29/17	< 0.388	19.5 ± 1.96	26.3 ± 1.31	74.2
08/31/17	< 0.485	23.3 ± 2.23	26.3 ± 1.31	88.6
09/07/17	< 0.375	25.3 ± 2.35	26.3 ± 1.31	96.3
09/12/17	< 0.234	18.8 ± 2.01	26.3 ± 1.31	71.5
09/14/17	< 0.303	18.5 ± 1.92	26.3 ± 1.31	70.4
09/17/17	< 0.608	21.7 ± 2.24	26.3 ± 1.31	82.6
09/17/17	< 0.459	23.9 ± 2.07	26.3 ± 1.31	90.9
09/17/17	< 0.473	27.0 ± 2.19	26.3 ± 1.31	103
09/19/17	< 0.686	22.0 ± 2.25	26.3 ± 1.31	83.7
09/20/17	< 0.508	21.2 ± 2.09	26.3 ± 1.31	80.7
09/25/17	< 0.781	22.0 ± 2.17	26.3 ± 1.31	83.7
09/25/17	< 0.830	19.1 ± 2.06	26.3 ± 1.31	72.7
09/26/17	< 0.768	18.8 ± 1.99	26.3 ± 1.31	71.5
09/26/17	< 0.744	21.4 ± 2.18	26.3 ± 1.31	81.4
09/28/17	< 0.614	26.5 ± 2.39	26.3 ± 1.31	101
10/05/17	< 0.225	21.3 ± 2.05	26.3 ± 1.31	81.0
10/09/17	< 0.694	20.6 ± 2.16	26.3 ± 1.31	78.4
10/16/17	< 0.650	19.0 ± 2.02	26.3 ± 1.31	72.3
10/17/17	< 0.656	23.0 ± 2.31	26.3 ± 1.31	87.5
10/23/17	< 0.459	21.9 ± 2.11	26.3 ± 1.31	83.3
10/23/17	< 0.623	24.0 ± 2.31	26.3 ± 1.31	91.3
10/23/17	< 0.765	24.6 ± 2.32	26.3 ± 1.31	93.6
10/30/17	< 0.434	23.7 ± 2.13	26.3 ± 1.31	90.2
10/31/17	< 0.455	19.0 ± 1.93	26.3 ± 1.31	72.3

B.5 Gross Alpha
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
11/02/17	< 1.070	19.3 ± 2.14	26.3 ± 1.31	73.4
11/02/17	< 0.454	19.9 ± 2.11	26.3 ± 1.31	75.7
11/06/17	< 0.609	22.9 ± 2.24	26.3 ± 1.31	87.1
11/13/17	< 0.849	22.2 ± 2.22	26.3 ± 1.31	84.5
11/14/17	< 0.544	19.7 ± 2.09	26.3 ± 1.31	75.0
11/14/17	< 0.443	21.4 ± 2.07	26.3 ± 1.31	81.4
11/15/17	< 0.378	19.1 ± 1.93	26.3 ± 1.31	72.7
11/22/17	< 0.471	18.5 ± 1.93	26.3 ± 1.31	70.4
11/22/17	< 0.665	23.8 ± 2.32	26.3 ± 1.31	90.6
11/27/17	< 0.496	19.9 ± 1.97	26.3 ± 1.31	75.7
11/28/17	< 0.734	21.4 ± 2.15	26.3 ± 1.31	81.4
11/28/17	< 0.728	22.2 ± 2.21	26.3 ± 1.31	84.5
11/28/17	< 0.708	24.8 ± 2.29	26.3 ± 1.31	94.4
11/30/17	< 0.592	19.4 ± 1.97	26.3 ± 1.31	73.8
12/07/17	< 0.548	22.6 ± 2.11	26.3 ± 1.31	86.0
12/07/17	< 0.467	19.6 ± 2.03	26.3 ± 1.31	74.6
12/11/17	< 0.666	24.4 ± 2.31	26.3 ± 1.31	92.9
12/12/17	< 0.400	18.7 ± 1.95	26.3 ± 1.31	71.2
12/13/17	< 0.608	25.4 ± 2.11	26.3 ± 1.31	96.7
12/14/17	< 0.635	24.0 ± 2.34	26.3 ± 1.31	91.4
12/14/17	< 0.576	19.6 ± 2.06	26.3 ± 1.31	74.6
12/19/17	< 0.569	23.5 ± 2.32	26.3 ± 1.31	89.4
12/21/17	< 0.537	18.5 ± 1.95	26.3 ± 1.31	70.4
12/27/17	< 0.522	24.5 ± 2.35	26.3 ± 1.31	93.3
12/27/17	< 0.424	23.7 ± 2.25	26.3 ± 1.31	90.2

B.6 Gross Beta
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/05/17	< 0.880	25.0 ± 1.48	31.1 ± 1.56	80.3
01/09/17	< 0.702	27.8 ± 1.53	31.1 ± 1.56	89.3
01/16/17	< 0.806	21.9 ± 1.38	31.1 ± 1.56	70.4
01/24/17	< 0.834	28.6 ± 1.57	31.1 ± 1.56	91.9
01/25/17	< 0.865	25.9 ± 1.50	31.1 ± 1.56	83.3
01/25/17	< 0.782	23.4 ± 1.41	31.1 ± 1.56	75.2
01/31/17	< 0.959	26.7 ± 1.54	31.1 ± 1.55	85.9
01/31/17	< 0.837	27.2 ± 1.53	31.1 ± 1.55	87.5
02/02/17	< 0.922	27.9 ± 1.58	31.1 ± 1.55	89.7
02/15/17	< 0.865	24.5 ± 1.45	31.1 ± 1.55	78.9
02/15/17	< 0.797	24.7 ± 1.43	31.1 ± 1.55	79.5
02/16/17	< 0.935	24.8 ± 1.49	31.1 ± 1.55	79.8
02/16/17	< 0.869	22.1 ± 1.40	31.1 ± 1.55	71.1
02/28/17	< 0.888	25.3 ± 1.49	31.0 ± 1.55	81.5
03/06/17	< 0.768	25.0 ± 1.43	31.0 ± 1.55	80.6
03/08/17	< 0.642	27.2 ± 1.50	31.0 ± 1.55	87.7
03/13/17	< 0.871	28.5 ± 1.58	31.0 ± 1.55	91.9
03/14/17	< 0.854	28.5 ± 1.57	31.0 ± 1.55	91.9
03/21/17	< 0.711	23.8 ± 1.40	31.0 ± 1.55	76.8
03/21/17	< 0.846	29.3 ± 1.59	31.0 ± 1.55	94.5
03/27/17	< 0.768	24.1 ± 1.42	31.0 ± 1.55	77.8
03/29/17	< 0.843	28.6 ± 1.60	31.0 ± 1.55	92.3
03/29/17	< 0.780	22.2 ± 1.39	31.0 ± 1.55	71.7
03/30/17	< 0.837	26.6 ± 1.52	31.0 ± 1.55	85.9
04/05/17	< 0.924	26.2 ± 1.51	31.0 ± 1.55	84.6
04/05/17	< 0.785	23.0 ± 1.40	31.0 ± 1.55	74.3
04/14/17	< 0.931	26.1 ± 2.12	31.0 ± 1.55	84.3
04/14/17	< 0.930	26.9 ± 2.15	31.0 ± 1.55	86.9
04/19/17	< 0.746	25.4 ± 1.47	30.9 ± 1.55	82.1
04/24/17	< 0.773	24.1 ± 1.46	30.9 ± 1.55	77.9
04/24/17	< 0.841	24.2 ± 1.43	30.9 ± 1.55	78.2
04/24/17	< 0.820	27.1 ± 1.53	30.9 ± 1.55	87.6
04/27/17	< 0.826	26.3 ± 1.49	30.9 ± 1.55	85.0
05/01/17	< 0.862	26.2 ± 1.50	30.9 ± 1.55	84.7
05/01/17	< 0.900	28.9 ± 1.58	30.9 ± 1.55	93.5
05/03/17	< 0.748	21.9 ± 1.37	30.9 ± 1.55	70.8
05/10/17	< 0.820	28.4 ± 1.55	30.9 ± 1.55	91.9
05/11/17	< 0.837	24.7 ± 1.45	30.9 ± 1.55	79.9
05/11/17	< 0.837	25.9 ± 1.48	30.9 ± 1.55	83.8
05/15/17	< 0.688	24.5 ± 1.43	30.9 ± 1.54	79.3
05/18/17	< 0.877	29.0 ± 1.58	30.9 ± 1.54	93.9

B.6 Gross Beta
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
05/18/17	< 0.880	27.8 ± 1.57	30.9 ± 1.54	90.0
05/24/17	< 0.865	25.3 ± 1.49	30.9 ± 1.54	81.9
05/30/17	< 0.837	28.4 ± 1.57	30.9 ± 1.54	92.0
05/30/17	< 0.779	25.7 ± 1.47	30.9 ± 1.54	83.3
05/31/17	< 0.765	30.5 ± 1.61	30.9 ± 1.54	98.8
05/31/17	< 0.789	24.3 ± 1.51	30.9 ± 1.54	78.7
05/31/17	< 0.914	28.7 ± 1.57	30.9 ± 1.54	93.0
06/05/17	< 0.913	25.8 ± 1.48	30.9 ± 1.54	83.6
06/07/17	< 0.745	29.8 ± 1.69	30.8 ± 1.54	96.6
06/12/17	< 0.691	26.1 ± 1.49	30.8 ± 1.54	84.6
06/12/17	< 0.707	24.7 ± 1.42	30.8 ± 1.54	80.1
06/13/17	< 0.790	24.2 ± 1.44	30.8 ± 1.54	78.5
06/15/17	< 0.799	24.3 ± 1.44	30.8 ± 1.54	78.8
06/20/17	< 0.806	24.6 ± 1.41	30.8 ± 1.54	79.8
06/20/17	< 0.920	24.7 ± 1.44	30.8 ± 1.54	80.1
06/23/17	< 0.815	24.6 ± 1.45	30.8 ± 1.54	79.8
06/23/17	< 0.806	25.6 ± 1.46	30.8 ± 1.54	83.1
06/23/17	< 0.794	28.0 ± 1.54	30.8 ± 1.54	90.9
06/26/17	< 0.769	22.8 ± 1.38	30.8 ± 1.54	74.0
06/26/17	< 0.795	23.6 ± 1.41	30.8 ± 1.54	76.6
07/03/17	< 0.881	28.3 ± 1.53	30.8 ± 1.54	91.9
07/12/17	< 0.846	28.5 ± 1.55	30.8 ± 1.54	92.6
07/13/17	< 0.817	21.6 ± 1.37	30.8 ± 1.54	70.2
07/17/17	< 0.808	24.7 ± 1.46	30.8 ± 1.54	80.3
07/17/17	< 0.863	29.9 ± 1.59	30.8 ± 1.54	97.2
07/20/17	< 0.764	21.6 ± 1.34	30.8 ± 1.54	70.2
07/31/17	< 0.775	22.3 ± 1.37	30.7 ± 1.54	72.5
08/02/17	< 0.919	29.0 ± 1.58	30.7 ± 1.54	94.3
08/09/17	< 0.879	26.2 ± 1.54	30.7 ± 1.54	85.3
08/09/17	< 0.743	26.1 ± 1.48	30.7 ± 1.54	84.9
08/10/17	< 0.762	25.8 ± 1.48	30.7 ± 1.54	84.0
08/15/17	< 0.772	24.5 ± 1.43	30.7 ± 1.54	79.8
08/15/17	< 0.779	22.5 ± 1.37	30.7 ± 1.54	73.3
08/17/17	< 0.792	26.5 ± 1.49	30.7 ± 1.54	86.3
08/20/17	< 0.799	25.1 ± 1.45	30.7 ± 1.54	81.7
08/20/17	< 0.742	25.1 ± 1.46	30.7 ± 1.54	81.7
08/28/17	< 0.925	29.1 ± 1.57	30.7 ± 1.53	94.8
08/29/17	< 0.936	31.1 ± 1.63	30.7 ± 1.53	101.3
08/29/17	< 0.862	25.3 ± 1.44	30.7 ± 1.53	82.4
08/30/17	< 0.716	23.0 ± 1.38	30.7 ± 1.53	75.0
08/31/17	< 0.917	27.2 ± 1.52	30.7 ± 1.53	88.6

B.6 Gross Beta
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
09/12/17	< 0.803	25.4 ± 1.48	30.7 ± 1.53	82.8
09/12/17	< 0.826	23.7 ± 1.44	30.7 ± 1.53	77.3
09/14/17	< 0.918	23.1 ± 1.39	30.7 ± 1.53	75.4
09/17/17	< 0.896	27.9 ± 1.55	30.7 ± 1.53	91.0
09/20/17	< 0.793	25.0 ± 1.45	30.6 ± 1.53	81.6
09/26/17	< 0.924	27.2 ± 1.50	30.6 ± 1.53	88.8
09/26/17	< 0.912	28.5 ± 1.55	30.6 ± 1.53	93.0
09/27/17	< 0.847	22.4 ± 1.39	30.6 ± 1.53	73.1
09/28/17	< 0.858	27.1 ± 1.51	30.6 ± 1.53	88.5
10/04/17	< 0.801	25.4 ± 1.46	30.6 ± 1.53	83.0
10/05/17	< 0.789	26.0 ± 1.47	30.6 ± 1.53	84.9
10/12/17	< 0.741	25.3 ± 1.33	30.6 ± 1.53	83.4
10/12/17	< 0.753	13.4 ± 1.16	15.3 ± 0.77	87.6
10/16/17	< 0.836	26.1 ± 1.47	30.6 ± 1.53	85.3
10/17/17	< 0.840	28.9 ± 1.57	30.6 ± 1.53	94.5
10/23/17	< 0.894	28.2 ± 1.56	30.6 ± 1.53	92.2
10/24/17	< 0.754	23.5 ± 1.40	30.6 ± 1.53	76.8
10/31/17	< 0.793	22.8 ± 1.37	30.6 ± 1.53	74.6
11/02/17	< 0.796	24.7 ± 1.45	30.6 ± 1.53	80.8
11/02/17	< 0.848	27.6 ± 1.53	30.6 ± 1.53	90.3
11/06/17	< 0.940	27.8 ± 1.53	30.6 ± 1.53	91.0
11/13/17	< 0.798	27.0 ± 1.49	30.5 ± 1.53	88.4
11/14/17	< 0.844	24.9 ± 1.45	30.5 ± 1.53	81.5
11/14/17	< 0.780	25.6 ± 1.46	30.5 ± 1.53	83.8
11/15/17	< 0.756	24.4 ± 1.41	30.5 ± 1.53	79.9
11/16/17	< 0.824	26.1 ± 1.34	30.5 ± 1.53	86.1
11/22/17	< 0.789	24.6 ± 1.43	30.5 ± 1.53	80.6
11/28/17	< 0.830	27.4 ± 1.50	30.5 ± 1.53	89.8
11/28/17	< 0.842	29.2 ± 1.55	30.5 ± 1.53	95.7
11/28/17	< 0.840	26.8 ± 1.49	30.5 ± 1.53	87.8
12/07/17	< 0.833	25.3 ± 1.47	30.5 ± 1.52	83.0
12/12/17	< 0.796	24.5 ± 1.42	30.5 ± 1.52	80.4
12/12/17	< 0.765	22.9 ± 1.38	30.5 ± 1.52	75.1
12/14/17	< 0.822	25.2 ± 1.45	30.5 ± 1.52	82.7
12/19/17	< 0.726	28.8 ± 1.55	30.5 ± 1.52	94.5
12/20/17	< 0.815	26.4 ± 1.34	30.5 ± 1.52	87.1
12/21/17	< 0.925	24.4 ± 1.45	30.5 ± 1.52	80.1

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/06/17	< 4.01	22.6 ± 4.23	18.3 ± 0.92	123
01/10/17	< 1.91	20.6 ± 2.67	18.3 ± 0.92	112
01/11/17	< 1.87	22.9 ± 2.89	27.5 ± 1.37	83.3
01/12/17	< 1.90	24.1 ± 3.02	27.5 ± 1.37	87.7
01/13/17	< 1.99	29.6 ± 3.51	36.6 ± 1.83	80.8
01/13/17	< 2.05	27.3 ± 3.39	36.6 ± 1.83	74.6
01/13/17	< 0.91	94.7 ± 1.82	91.5 ± 4.58	103
01/14/17	< 1.39	340 ± 27.4	366 ± 18.3	92.9
01/18/17	< 6.37	134 ± 31.3	183 ± 9.15	73.2
01/19/17	< 2.00	30.4 ± 3.66	36.6 ± 1.83	83.1
01/19/17	< 1.96	31.1 ± 3.66	36.6 ± 1.83	85.0
01/20/17	< 1.95	32.6 ± 3.87	36.6 ± 1.83	89.1
01/23/17	< 1.96	35.5 ± 4.11	36.6 ± 1.83	97.1
01/24/17	< 6.36	156 ± 33.0	183 ± 9.14	85.4
01/24/17	< 1.95	31.0 ± 3.69	36.6 ± 1.83	84.8
01/25/17	< 1.89	31.7 ± 3.73	36.5 ± 1.83	86.7
01/26/17	< 1.92	30.7 ± 3.65	36.5 ± 1.83	84.0
01/26/17	< 1.94	29.4 ± 3.51	36.5 ± 1.83	80.5
01/26/17	< 5.75	159 ± 32.3	183 ± 9.14	87.0
01/28/17	< 1.87	35.1 ± 4.07	36.5 ± 1.83	96.1
01/28/17	< 1.86	34.7 ± 4.00	36.5 ± 1.83	95.0
01/30/17	< 1.87	32.8 ± 3.86	36.5 ± 1.83	89.8
01/31/17	< 4.24	333 ± 18.3	365 ± 18.3	91.2
01/31/17	< 6.09	29.0 ± 7.41	36.5 ± 1.83	79.4
01/31/17	< 1.93	34.5 ± 4.04	36.5 ± 1.83	94.5
02/01/17	< 1.95	33.0 ± 3.86	36.5 ± 1.83	90.4
02/01/17	< 4.39	32.0 ± 5.51	36.5 ± 1.83	87.7
02/02/17	< 1.81	36.5 ± 4.14	36.5 ± 1.83	100
02/02/17	< 1.85	32.8 ± 3.83	36.5 ± 1.83	89.9
02/02/17	< 1.29	27.2 ± 2.58	36.5 ± 1.83	74.5
02/03/17	< 5.54	136 ± 30.1	137 ± 6.85	99.3
02/03/17	< 1.76	26.0 ± 3.08	36.5 ± 1.82	71.2
02/07/17	< 2.00	31.8 ± 3.79	36.5 ± 1.82	87.2
02/08/17	< 1.71	349 ± 35.1	365 ± 18.2	95.7
02/08/17	< 1.89	36.5 ± 4.17	36.5 ± 1.82	100
02/09/17	< 1.86	31.6 ± 3.72	36.5 ± 1.82	86.7
02/14/17	< 1.96	35.7 ± 4.13	36.4 ± 1.82	98.0
02/15/17	< 6.15	149 ± 32.1	182 ± 9.11	81.8
02/15/17	< 8.26	148 ± 36.1	182 ± 9.11	81.3
02/15/17	< 2.52	30.0 ± 3.05	36.4 ± 1.82	82.4
02/17/17	< 1.45	357 ± 28.7	364 ± 18.2	98.0
02/21/17	< 1.80	33.0 ± 3.81	36.4 ± 1.82	90.7

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
02/21/17	< 1.19	67.9 ± 2.02	91.0 ± 4.55	74.6
02/22/17	< 2.88	32.6 ± 4.02	36.4 ± 1.82	89.6
02/22/17	< 1.95	29.6 ± 3.53	36.4 ± 1.82	81.3
02/23/17	< 5.49	173 ± 32.7	182 ± 9.10	95.1
02/24/17	< 1.91	360 ± 30.7	364 ± 18.2	99.0
02/24/17	< 1.89	31.1 ± 3.67	36.4 ± 1.82	85.5
02/27/17	< 2.87	26.9 ± 3.29	36.4 ± 1.82	74.0
02/28/17	< 5.85	168 ± 32.1	182 ± 9.09	92.5
02/28/17	< 1.31	295 ± 24.0	364 ± 18.2	81.1
02/28/17	< 1.93	28.8 ± 3.46	36.4 ± 1.82	79.2
03/01/17	< 1.91	29.3 ± 3.53	36.4 ± 1.82	80.6
03/02/17	< 1.89	35.6 ± 4.12	36.3 ± 1.82	98.0
03/03/17	< 1.92	35.3 ± 4.12	36.3 ± 1.82	97.1
03/07/17	< 1.98	32.8 ± 3.91	36.3 ± 1.82	90.3
03/07/17	< 1.82	31.1 ± 3.67	36.3 ± 1.82	85.6
03/10/17	< 1.91	30.2 ± 3.60	36.3 ± 1.82	83.2
03/11/17	< 6.20	173 ± 34.0	181 ± 9.07	95.3
03/11/17	< 1.87	28.9 ± 3.44	36.3 ± 1.81	79.6
03/11/17	< 1.93	33.1 ± 3.87	36.3 ± 1.81	91.2
03/11/17	< 1.94	27.1 ± 3.28	36.3 ± 1.81	74.7
03/14/17	< 2.00	29.1 ± 3.52	36.3 ± 1.81	80.2
03/15/17	< 1.89	26.5 ± 3.23	36.3 ± 1.81	73.1
03/20/17	< 1.71	323 ± 32.7	362 ± 18.1	89.1
03/21/17	< 2.81	30.7 ± 3.80	36.2 ± 1.81	84.7
03/21/17	< 5.70	28.8 ± 6.79	36.2 ± 1.81	79.5
03/22/17	< 1.91	42.0 ± 4.76	50.9 ± 2.55	82.5
03/24/17	< 6.46	419 ± 48.2	509 ± 25.4	82.3
03/24/17	< 1.88	46.4 ± 5.19	50.9 ± 2.54	91.2
03/24/17	< 4.65	227 ± 14.4	254 ± 12.7	89.2
03/25/17	< 1.90	41.7 ± 4.73	50.9 ± 2.54	82.0
03/25/17	< 1.89	42.90 ± 4.83	50.9 ± 2.54	84.3
03/26/17	< 1.88	44.80 ± 5.01	50.9 ± 2.54	88.1
03/27/17	< 6.47	460 ± 50.1	509 ± 25.4	90.4
03/27/17	< 1.82	446 ± 44.8	509 ± 25.4	87.7
03/27/17	< 1.40	502 ± 40.4	509 ± 25.4	98.7
03/27/17	< 5.73	51.0 ± 10.0	50.9 ± 2.54	100
03/27/17	< 1.87	53.7 ± 5.94	50.9 ± 2.54	106
03/28/17	< 1.84	44.9 ± 5.09	50.9 ± 2.54	88.3
03/29/17	< 2.90	45.9 ± 4.04	50.9 ± 2.54	90.3
03/29/17	< 3.89	40.3 ± 4.71	50.9 ± 2.54	79.2
03/29/17	< 2.91	48.1 ± 5.48	50.9 ± 2.54	94.6

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
03/30/17	< 3.80	903 ± 97.0	1017 ± 50.8	88.8
03/30/17	< 3.40	46.1 ± 4.52	51 ± 2.54	90.7
03/31/17	< 1.64	463 ± 8.58	508 ± 25.4	91.1
03/31/17	< 6.01	39.7 ± 7.24	50.8 ± 2.54	78.1
03/31/17	< 1.91	42.2 ± 4.78	50.8 ± 2.54	83.0
03/31/17	< 7.69	38.7 ± 9.89	50.8 ± 2.54	76.1
04/04/17	< 1.89	41.9 ± 4.73	50.8 ± 2.54	82.5
04/05/17	< 5.87	438 ± 48.3	508 ± 25.4	86.2
04/05/17	< 1.91	42.0 ± 4.82	50.8 ± 2.54	82.7
04/05/17	< 4.06	46.2 ± 5.17	50.8 ± 2.54	91.0
04/06/17	< 6.12	46.9 ± 8.43	50.8 ± 2.54	92.3
04/06/17	< 1.44	243 ± 12.3	254 ± 12.7	95.7
04/06/17	< 1.44	237 ± 12.1	254 ± 12.7	93.3
04/07/17	< 1.83	48.3 ± 5.35	50.8 ± 2.54	95.1
04/07/17	< 1.87	44.5 ± 4.99	50.8 ± 2.54	87.6
04/11/17	< 1.82	46.4 ± 5.23	50.8 ± 2.54	91.4
04/11/17	< 1.06	42.1 ± 4.65	50.8 ± 2.54	83.0
04/12/17	< 6.73	377 ± 46.5	507 ± 25.4	74.3
04/12/17	< 1.91	45.5 ± 5.16	50.7 ± 2.54	89.7
04/12/17	< 1.91	45.5 ± 5.10	50.7 ± 2.54	89.7
04/13/17	< 1.88	45.1 ± 5.06	50.7 ± 2.54	88.9
04/17/17	< 6.37	48.2 ± 8.38	50.7 ± 2.54	95.1
04/18/17	< 2.85	51.6 ± 4.25	50.7 ± 2.53	102
04/18/17	< 5.18	416 ± 43.4	507 ± 25.3	82.1
04/20/17	< 7.14	395 ± 47.7	507 ± 25.3	77.9
04/21/17	< 6.19	414 ± 47.7	507 ± 25.3	81.7
04/22/17	< 1.82	453 ± 8.45	507 ± 25.3	89.4
04/22/17	< 1.47	510 ± 41.1	507 ± 25.3	101
04/24/17	< 4.97	261 ± 15.7	253 ± 12.7	103
04/25/17	< 2.98	46.5 ± 5.24	50.6 ± 2.53	91.8
04/26/17	< 1.88	49.3 ± 5.57	50.6 ± 2.53	97.4
04/26/17	< 1.96	45.9 ± 5.15	50.6 ± 2.53	90.7
04/27/17	< 1.93	38.8 ± 4.54	50.6 ± 2.53	76.6
04/27/17	< 1.92	47.5 ± 5.38	50.6 ± 2.53	93.8
04/28/17	< 1.93	50.2 ± 5.65	50.6 ± 2.53	99.2
04/29/17	< 1.92	41.2 ± 4.70	50.6 ± 2.53	81.4
04/29/17	< 1.93	43.6 ± 4.92	50.6 ± 2.53	86.2
05/01/17	< 1.90	49.4 ± 5.48	50.6 ± 2.53	97.7
05/01/17	< 6.32	49.6 ± 9.82	50.6 ± 2.53	98.0
05/02/17	< 1.94	47.6 ± 5.36	50.6 ± 2.53	94.1
05/02/17	< 5.56	407 ± 46.5	506 ± 25.3	80.5

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
05/03/17	< 1.48	483 ± 39.0	506 ± 25.3	95.5
05/03/17	< 2.22	267 ± 6.80	253 ± 12.6	106
05/04/17	< 1.94	41.3 ± 4.71	50.6 ± 2.53	81.7
05/05/17	< 2.87	45.7 ± 5.25	50.6 ± 2.53	90.4
05/05/17	< 1.85	43.7 ± 4.87	50.6 ± 2.53	86.4
05/08/17	< 1.86	40.6 ± 4.58	50.5 ± 2.53	80.3
05/08/17	< 1.84	41.7 ± 4.74	50.5 ± 2.53	82.5
05/09/17	< 5.37	43.0 ± 6.96	50.5 ± 2.53	85.1
05/11/17	< 1.91	43.6 ± 4.91	50.5 ± 2.53	86.3
05/11/17	< 5.70	423 ± 47.4	505 ± 25.3	83.7
05/15/17	< 1.62	418 ± 7.86	505 ± 25.2	82.8
05/15/17	< 6.20	38.6 ± 7.82	50.5 ± 2.52	76.5
05/16/17	< 1.62	412 ± 7.79	505 ± 25.2	81.6
05/19/17	< 1.91	49.7 ± 5.59	50.5 ± 2.52	98.5
05/19/17	< 1.94	45.1 ± 5.06	50.5 ± 2.52	89.4
05/20/17	< 1.95	48.1 ± 5.37	50.4 ± 2.52	95.3
05/21/17	< 1.43	466 ± 37.6	504 ± 25.2	92.4
05/22/17	< 1.68	451 ± 8.44	504 ± 25.2	89.4
05/23/17	< 1.64	450 ± 8.44	504 ± 25.2	89.2
05/23/17	< 1.87	45.0 ± 5.02	50.4 ± 2.52	89.2
05/24/17	< 1.86	46.3 ± 5.18	50.4 ± 2.52	91.8
05/24/17	< 1.88	48.9 ± 5.44	50.4 ± 2.52	97.0
05/25/17	< 1.70	49.1 ± 5.42	50.4 ± 2.52	97.4
05/25/17	< 1.93	45.1 ± 5.12	50.4 ± 2.52	89.5
05/25/17	< 1.93	40.9 ± 4.71	50.4 ± 2.52	81.1
05/25/17	< 5.53	250 ± 15.5	252 ± 12.6	99.2
05/26/17	< 1.35	451 ± 36.4	504 ± 25.2	89.5
05/30/17	< 5.56	439 ± 48.0	504 ± 25.2	87.2
05/30/17	< 7.20	42.0 ± 9.80	50.4 ± 2.52	83.4
05/30/17	< 6.69	44.7 ± 10.8	50.4 ± 2.52	88.8
05/30/17	< 6.71	51.1 ± 11.8	50.4 ± 2.52	101
05/31/17	< 7.14	55.5 ± 12.0	50.4 ± 2.52	110
05/31/17	< 1.95	47.7 ± 5.52	50.4 ± 2.52	94.7
06/01/17	< 5.07	42.0 ± 7.74	50.3 ± 2.52	83.4
06/01/17	< 5.25	47.8 ± 8.16	50.3 ± 2.52	94.9
06/01/17	< 2.82	42.5 ± 4.24	50.4 ± 2.52	84.4
06/02/17	< 4.73	50.6 ± 7.44	50.3 ± 2.52	101
06/02/17	< 5.24	49.1 ± 8.33	50.3 ± 2.52	97.5
06/02/17	< 2.76	46.6 ± 5.30	50.3 ± 2.52	92.6
06/02/17	< 4.76	468 ± 49.1	503 ± 25.2	93.0
06/04/17	< 1.86	42.9 ± 4.81	50.3 ± 2.52	85.2

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
06/06/17	< 1.88	45.0 ± 5.04	50.3 ± 2.52	89.5
06/06/17	< 4.92	260 ± 26.3	252 ± 12.6	103
06/07/17	< 1.85	45.2 ± 5.10	50.3 ± 2.52	89.8
06/08/17	< 1.89	44.2 ± 4.96	50.3 ± 2.51	87.9
06/09/17	< 5.59	428 ± 47.7	503 ± 25.1	85.1
06/14/17	< 5.76	415 ± 46.9	503 ± 25.1	82.6
06/14/17	< 3.03	47.8 ± 5.29	50.3 ± 2.51	95.1
06/15/17	< 9.05	470 ± 48.9	502 ± 25.1	93.5
06/15/17	< 1.83	49.3 ± 5.46	50.2 ± 2.51	98.1
06/15/17	< 2.88	254 ± 9.27	251 ± 12.6	101
06/17/17	< 1.51	444 ± 8.36	502 ± 25.1	88.4
06/17/17	< 1.42	513 ± 47.9	502 ± 25.1	102
06/17/17	< 1.95	44.4 ± 5.00	50.2 ± 2.51	88.4
06/19/17	< 2.21	225 ± 8.32	251 ± 12.6	89.6
06/26/17	< 5.60	444 ± 48.5	502 ± 25.1	88.5
06/19/17	< 1.88	44.5 ± 5.03	50.2 ± 2.51	88.6
06/20/17	< 1.84	46.1 ± 5.14	50.2 ± 2.51	91.8
06/21/17	< 1.84	46.6 ± 5.23	50.2 ± 2.51	92.8
06/21/17	< 1.98	45.3 ± 5.13	50.2 ± 2.51	90.3
06/23/17	< 5.87	431 ± 48.0	502 ± 25.1	85.9
06/23/17	< 4.38	590 ± 58.4	502 ± 25.1	118
06/23/17	< 1.87	47.2 ± 5.30	50.2 ± 2.51	94.1
06/23/17	< 1.79	45.5 ± 5.05	50.2 ± 2.51	90.7
06/23/17	< 1.71	44.3 ± 4.88	50.2 ± 2.51	88.3
06/26/17	< 2.13	48.1 ± 4.49	50.2 ± 2.51	95.9
06/26/17	< 1.82	40.3 ± 4.56	50.2 ± 2.51	80.3
06/27/17	< 1.86	44.5 ± 4.98	50.1 ± 2.51	88.7
06/27/17	< 1.84	47.8 ± 5.39	50.2 ± 2.51	95.3
06/28/17	< 6.33	47.9 ± 9.66	50.1 ± 2.51	95.5
06/30/17	< 1.92	54.5 ± 6.06	50.1 ± 2.51	109
06/30/17	< 5.97	43.0 ± 7.98	50.1 ± 2.51	85.8
06/30/17	< 1.82	56.8 ± 6.11	50.1 ± 2.51	113
07/01/17	< 1.73	43.1 ± 4.78	50.1 ± 2.51	86.0
07/06/17	< 18.1	475 ± 52.5	501 ± 25.0	94.9
07/06/17	< 2.11	256 ± 6.48	250 ± 12.5	102
07/07/17	< 37.4	428 ± 52.9	501 ± 25.0	85.5
07/10/17	< 1.65	49.0 ± 5.33	50.0 ± 2.50	97.9
07/11/17	< 6.26	410 ± 47.2	500 ± 25.0	81.9
07/11/17	< 1.73	50.5 ± 5.59	50.0 ± 2.50	101
07/12/17	< 1.92	50.4 ± 5.62	50.0 ± 2.50	101
07/12/17	< 1.76	43.6 ± 4.87	50.0 ± 2.50	87.1

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/13/17	< 1.85	47.8 ± 5.36	50.0 ± 2.50	95.5
07/14/17	< 1.36	474 ± 38.2	500 ± 25.0	94.8
07/17/17	< 1.89	45.2 ± 5.12	50.0 ± 2.50	90.4
07/18/17	< 1.82	46.4 ± 5.15	50.0 ± 2.50	92.8
07/19/17	< 1.87	51.5 ± 5.71	50.0 ± 2.50	103
07/19/17	< 1.79	41.0 ± 4.59	50.0 ± 2.50	82.0
07/20/17	< 4.98	400 ± 45.3	500 ± 25.0	80.0
07/21/17	< 6.14	383 ± 45.8	500 ± 25.0	76.7
07/21/17	< 1.88	46.1 ± 5.24	50.0 ± 2.50	92.3
07/21/17	< 4.71	40.3 ± 7.36	50.0 ± 2.50	80.7
07/22/17	< 1.88	50.6 ± 5.67	50.0 ± 2.50	101
07/24/17	< 1.87	46.6 ± 5.25	49.9 ± 2.50	93.3
07/25/17	< 5.56	411 ± 46.8	499 ± 25.0	82.3
07/25/17	< 2.48	43.1 ± 4.84	49.9 ± 2.50	86.3
07/26/17	< 1.79	44.3 ± 5.02	49.9 ± 2.50	88.7
07/26/17	< 1.85	45.9 ± 5.17	49.9 ± 2.50	91.9
07/26/17	< 1.84	49.9 ± 5.57	49.9 ± 2.50	99.9
07/27/17	< 1.85	39.4 ± 4.45	49.9 ± 2.50	78.9
07/28/17	< 1.85	47.1 ± 5.29	49.9 ± 2.50	94.4
07/28/17	< 1.80	47.9 ± 5.36	49.9 ± 2.50	96.0
07/28/17	< 1.83	38.8 ± 4.42	49.9 ± 2.50	77.7
07/29/17	< 1.79	446 ± 8.39	499 ± 25.0	89.4
07/31/17	< 5.93	448 ± 49.1	499 ± 24.9	89.8
07/31/17	< 1.92	38.4 ± 4.42	49.9 ± 2.49	77.0
08/01/17	< 1.72	54.8 ± 5.90	49.9 ± 2.49	110
08/02/17	< 0.69	263 ± 4.00	249 ± 12.5	105
08/03/17	< 1.89	48.1 ± 5.38	49.9 ± 2.49	96.5
08/03/17	< 1.88	46.2 ± 5.20	49.9 ± 2.49	92.6
08/04/17	< 5.33	40.9 ± 9.39	49.9 ± 2.49	82.0
08/10/17	< 1.87	50.1 ± 5.57	49.8 ± 2.49	101
08/11/17	< 1.38	488 ± 39.3	498 ± 24.9	98.0
08/11/17	< 5.83	63.8 ± 9.64	49.8 ± 2.49	128
08/15/17	< 6.49	40.3 ± 8.24	49.8 ± 2.49	81.0
08/15/17	< 1.06	244 ± 3.29	249 ± 12.4	98.1
08/15/17	< 1.06	267 ± 3.44	249 ± 12.4	107
08/16/17	< 5.65	418 ± 47.1	498 ± 24.9	84.0
08/17/17	< 1.85	50.5 ± 5.58	49.8 ± 2.49	102
08/18/17	< 5.74	480 ± 50.0	497 ± 24.9	96.5
08/19/17	< 1.40	508 ± 41.0	497 ± 24.9	102
08/24/17	< 1.94	48.1 ± 5.41	49.7 ± 2.49	96.8
08/24/17	< 1.92	50.8 ± 5.67	49.7 ± 2.49	102

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
08/25/17	< 6.25	447 ± 49.1	497 ± 24.8	89.9
08/25/17	< 4.96	47.3 ± 7.14	49.7 ± 2.48	95.2
08/25/17	< 1.99	47.1 ± 5.34	49.7 ± 2.48	94.8
08/27/17	< 1.91	47.1 ± 5.29	49.7 ± 2.48	94.8
08/28/17	< 1.54	448 ± 8.22	497 ± 24.8	90.2
08/28/17	< 1.72	48.0 ± 5.30	49.7 ± 2.48	96.6
08/28/17	< 1.97	47.5 ± 5.35	49.7 ± 2.48	95.6
08/29/17	< 1.78	46.9 ± 5.23	49.7 ± 2.48	94.4
08/30/17	< 1.78	52.4 ± 5.76	49.7 ± 2.48	105.5
08/30/17	< 1.74	47.6 ± 5.30	49.7 ± 2.48	95.9
08/31/17	< 5.83	39.6 ± 7.75	49.6 ± 2.48	79.8
08/31/17	< 5.78	51.3 ± 8.72	49.7 ± 2.48	103
08/31/17	< 5.53	55.3 ± 8.92	49.6 ± 2.48	111
08/31/17	< 1.89	50.0 ± 5.60	49.7 ± 2.48	101
09/05/17	< 1.91	51.6 ± 5.79	49.6 ± 2.48	104
09/06/17	< 1.77	42.0 ± 4.72	49.6 ± 2.48	84.7
09/06/17	< 5.21	52.7 ± 8.13	49.6 ± 2.48	106
09/07/17	< 6.13	47.9 ± 8.55	49.6 ± 2.48	96.6
09/07/17	< 1.69	49.1 ± 5.40	49.6 ± 2.48	99.0
09/08/17	< 1.90	45.9 ± 5.19	49.6 ± 2.48	92.6
09/09/17	< 1.87	45.2 ± 5.12	49.6 ± 2.48	91.2
09/12/17	< 1.79	43.0 ± 4.84	49.6 ± 2.48	86.8
09/13/17	< 1.86	44.4 ± 4.99	49.5 ± 2.48	89.6
09/14/17	< 1.72	45.2 ± 5.00	49.5 ± 2.48	91.2
09/18/17	< 5.53	469 ± 49.4	495 ± 24.8	94.7
09/21/17	< 5.96	45.3 ± 8.22	49.5 ± 2.47	91.5
09/21/17	< 5.89	36.6 ± 7.52	49.5 ± 2.47	74.0
09/21/17	< 1.74	49.3 ± 5.43	49.5 ± 2.47	99.6
09/21/17	< 5.90	39.2 ± 7.92	49.5 ± 2.47	79.2
09/22/17	< 6.00	496 ± 53.3	495 ± 24.7	100
09/22/17	< 1.32	506 ± 40.9	495 ± 24.7	102
09/22/17	< 1.87	53.2 ± 5.89	49.5 ± 2.47	108
09/23/17	< 1.60	439 ± 8.16	495 ± 24.7	88.7
09/23/17	< 5.09	56.4 ± 8.81	49.5 ± 2.47	114
09/25/17	< 1.95	54.9 ± 6.13	49.5 ± 2.47	111
09/25/17	< 1.70	47.1 ± 5.21	49.5 ± 2.47	95.2
09/25/17	< 0.846	259 ± 26.1	247 ± 12.4	105
09/26/17	< 1.76	46.9 ± 5.25	49.4 ± 2.47	94.9
09/27/17	< 7.15	437 ± 51.6	494 ± 24.7	88.4
09/27/17	< 5.29	46.5 ± 7.73	49.4 ± 2.47	94.1
09/27/17	< 1.92	45.4 ± 5.17	49.4 ± 2.47	91.8

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
09/27/17	< 5.05	47.6 ± 7.75	49.4 ± 2.47	96.3
09/28/17	< 1.81	41.7 ± 4.74	49.4 ± 2.47	84.4
09/28/17	< 0.663	260 ± 5.27	247 ± 12.4	105
09/29/17	< 1.75	41.4 ± 4.65	49.4 ± 2.47	83.8
10/04/17	< 1.90	45.0 ± 5.14	49.4 ± 2.47	91.1
10/05/17	< 7.19	472 ± 53.50	494 ± 24.7	95.6
10/06/17	< 3.54	45.4 ± 5.49	49.4 ± 2.47	92.0
10/06/17	< 5.38	46.2 ± 7.85	49.4 ± 2.47	93.6
10/09/17	< 1.77	57.1 ± 6.23	49.3 ± 2.47	116
10/09/17	< 1.81	42.3 ± 4.81	49.3 ± 2.47	85.7
10/11/17	< 5.50	508 ± 53.20	493 ± 24.7	103
10/12/17	< 1.68	42.6 ± 4.77	49.3 ± 2.47	86.4
10/12/17	< 1.85	42.9 ± 4.86	49.3 ± 2.47	87.0
10/13/17	< 6.63	478 ± 53.00	493 ± 24.7	96.9
10/13/17	< 1.23	463 ± 37.40	493 ± 24.7	93.9
10/13/17	< 3.02	45.1 ± 5.15	49.3 ± 2.47	91.4
10/14/17	< 1.80	43.5 ± 4.92	49.3 ± 2.47	88.2
10/17/17	< 1.78	41.2 ± 4.67	49.3 ± 2.46	83.6
10/17/17	< 1.85	46.4 ± 5.19	49.3 ± 2.46	94.1
10/19/17	< 6.43	482 ± 52.90	493 ± 24.6	97.8
10/20/17	< 1.42	424 ± 7.79	493 ± 24.6	86.1
10/20/17	< 1.91	47.5 ± 5.33	49.3 ± 2.46	96.4
10/20/17	< 2.54	36.8 ± 3.50	49.3 ± 2.46	74.7
10/20/17	< 1.79	45.4 ± 5.05	49.3 ± 2.46	92.2
10/20/17	< 6.70	39.1 ± 9.10	49.3 ± 2.46	79.4
10/24/17	< 5.71	495 ± 52.80	492 ± 24.6	101
10/24/17	< 1.82	242 ± 5.96	246 ± 12.3	98.3
10/25/17	< 1.98	48.7 ± 5.42	49.2 ± 2.46	98.9
10/26/17	< 1.83	44.1 ± 5.01	49.2 ± 2.46	89.6
10/26/17	< 1.82	43.3 ± 4.88	49.2 ± 2.46	88.0
10/26/17	< 1.81	43.4 ± 4.89	49.2 ± 2.46	88.2
10/27/17	< 1.40	472 ± 38.10	492 ± 24.6	95.9
10/28/17	< 1.82	43.2 ± 4.92	49.2 ± 2.46	87.8
10/30/17	< 6.55	471 ± 52.60	492 ± 24.6	95.8
10/31/17	< 1.72	50.1 ± 5.55	49.2 ± 2.46	102
11/01/17	< 1.32	472.0 ± 47.50	492 ± 24.6	96.0
11/01/17	< 1.75	42.7 ± 4.82	49.2 ± 2.46	86.8
11/01/17	< 1.79	43.1 ± 4.87	49.2 ± 2.46	87.7
11/03/17	< 1.79	42.5 ± 4.79	49.2 ± 2.46	86.5
11/03/17	< 1.73	42.1 ± 4.79	49.2 ± 2.46	85.6
11/06/17	< 1.85	46.6 ± 5.22	49.1 ± 2.46	94.8

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
11/07/17	< 5.81	467 ± 51.10	491 ± 24.6	95.1
11/08/17	< 1.71	40.4 ± 4.54	49.1 ± 2.46	82.3
11/09/17	< 1.43	399 ± 7.37	491 ± 24.6	81.2
11/09/17	< 1.43	404 ± 7.43	491 ± 24.6	82.3
11/10/17	< 1.79	44.2 ± 4.97	49.1 ± 2.46	90.0
11/11/17	< 1.80	44.0 ± 4.92	49.1 ± 2.46	89.6
11/15/17	< 6.45	490 ± 53.50	491 ± 24.5	99.9
11/15/17	< 5.83	54.0 ± 9.40	49.1 ± 2.45	110
11/16/17	< 5.61	506 ± 53.20	491 ± 24.5	103
11/16/17	< 1.80	41.8 ± 4.69	49.1 ± 2.45	85.2
11/16/17	< 2.63	44.7 ± 3.89	49.1 ± 2.45	91.1
11/17/17	< 1.82	44.1 ± 4.98	49.1 ± 2.45	89.9
11/17/17	< 3.49	240 ± 14.9	245 ± 12.3	97.9
11/18/17	< 1.34	480 ± 38.7	490 ± 24.5	97.9
11/20/17	< 1.78	473 ± 8.01	490 ± 24.5	96.5
11/21/17	< 3.65	42.7 ± 5.10	49.0 ± 2.45	87.1
11/21/17	< 1.77	43.6 ± 4.92	49.0 ± 2.45	88.9
11/22/17	< 1.79	49.3 ± 5.49	49.0 ± 2.45	101
11/22/17	< 1.81	39.2 ± 4.49	49.0 ± 2.45	80.0
11/22/17	< 1.71	42.2 ± 4.80	49.0 ± 2.45	86.1
11/27/17	< 1.87	41.6 ± 4.77	49.0 ± 2.45	84.9
11/27/17	< 1.77	43.4 ± 4.90	49.0 ± 2.45	88.6
11/29/17	< 5.76	483 ± 52.0	490 ± 24.5	98.6
11/29/17	< 1.70	48.9 ± 5.42	49.0 ± 2.45	99.9
11/29/17	< 1.88	47.5 ± 5.37	49.0 ± 2.45	97.0
11/30/17	< 2.81	46.5 ± 5.30	49.0 ± 2.45	95.0
11/30/17	< 3.09	48.4 ± 5.48	49.0 ± 2.45	98.9
11/30/17	< 2.82	49.6 ± 5.58	49.0 ± 2.45	101
12/01/17	< 1.71	43.7 ± 4.89	49.0 ± 2.45	89.3
12/02/17	< 2.60	48.3 ± 5.48	48.9 ± 2.45	98.7
12/05/17	< 1.77	46.2 ± 5.16	48.9 ± 2.45	94.5
12/06/17	< 1.82	40.8 ± 4.66	48.9 ± 2.45	83.4
12/07/17	< 1.82	42.7 ± 4.87	48.9 ± 2.44	87.3
12/07/17	< 1.90	38.2 ± 4.45	48.9 ± 2.45	78.1
12/12/17	< 6.10	533 ± 55.1	489 ± 24.4	109
12/13/17	< 5.69	43.0 ± 6.91	48.9 ± 2.44	88.0
12/13/17	< 5.92	45.5 ± 7.12	48.9 ± 2.44	93.1
12/14/17	< 1.86	43.9 ± 4.98	48.8 ± 2.44	89.9
12/14/17	< 1.83	40.6 ± 4.57	48.9 ± 2.44	83.1
12/15/17	< 2.13	467 ± 8.24	488 ± 24.4	95.6
12/16/17	< 1.43	493 ± 39.9	488 ± 24.4	101

B.7 H-3
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
12/16/17	< 6.28	46.4 ± 7.52	48.8 ± 2.44	95.0
12/16/17	< 6.31	48.9 ± 7.82	48.8 ± 2.44	100
12/16/17	< 6.27	46.0 ± 7.27	48.8 ± 2.44	94.2
12/18/17	< 1.91	48.3 ± 5.45	48.8 ± 2.44	98.9
12/19/17	< 2.72	45.5 ± 5.20	48.8 ± 2.44	93.2
12/20/17	< 5.92	457 ± 52.0	488 ± 24.4	93.7
12/20/17	< 6.37	36.2 ± 6.87	48.8 ± 2.44	74.2
12/20/17	< 2.70	44.4 ± 5.07	48.8 ± 2.44	91.0
12/20/17	< 1.80	47.1 ± 5.26	48.8 ± 2.44	96.5
12/20/17	< 1.05	248 ± 3.48	244 ± 12.2	102
12/21/17	< 4.34	37.9 ± 6.96	48.8 ± 2.44	77.7
12/21/17	< 3.42	48.7 ± 5.54	48.8 ± 2.44	99.8
12/21/17	< 1.98	43.8 ± 5.00	48.8 ± 2.44	89.8
12/22/17	< 2.24	494 ± 8.79	488 ± 24.4	101
12/22/17	< 1.87	50.9 ± 5.65	48.8 ± 2.44	104
12/22/17	< 1.87	44.7 ± 5.07	48.8 ± 2.44	91.6
12/22/17	< 1.97	45.2 ± 5.13	48.8 ± 2.44	92.7
12/22/17	< 3.58	45.0 ± 4.90	48.8 ± 2.44	92.2
12/23/17	< 5.85	51.5 ± 8.34	48.8 ± 2.44	106
12/28/17	< 1.81	70.3 ± 7.58	97.5 ± 4.87	72.1
12/28/17	< 1.87	45.9 ± 5.14	48.7 ± 2.44	94.2
12/29/17	< 5.59	41.2 ± 7.62	48.7 ± 2.44	84.5
12/29/17	< 5.55	49.2 ± 8.11	48.7 ± 2.44	101

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In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/17/17	< 3.34	57.9 ± 8.57	63.6 ± 3.18	91.0
01/25/17	< 5.21	58.8 ± 15.6	63.6 ± 3.18	92.5
02/14/17	< 3.31	65.2 ± 30.1	63.6 ± 3.18	103
02/23/17	< 2.45	53.8 ± 17.8	63.6 ± 3.18	84.6
02/28/17	< 4.24	64.0 ± 31.6	63.6 ± 3.18	101
03/14/17	< 2.52	57.2 ± 17.0	63.6 ± 3.18	89.9
03/24/17	< 4.74	58.8 ± 23.6	63.6 ± 3.18	92.5
04/06/17	< 7.53	53.7 ± 8.10	63.6 ± 3.18	84.4
04/18/17	< 2.97	62.1 ± 21.5	63.6 ± 3.18	97.6
05/01/17	< 3.32	63.1 ± 13.3	63.6 ± 3.18	99.2
05/10/17	< 1.59	65.6 ± 18.7	63.6 ± 3.18	103
06/01/17	< 3.27	61.5 ± 12.3	63.6 ± 3.18	96.7
06/12/17	< 3.83	56.9 ± 20.6	63.6 ± 3.18	89.5
06/19/17	< 2.08	65.9 ± 14.6	63.6 ± 3.18	104
06/26/17	< 6.17	59.3 ± 22.0	63.6 ± 3.18	93.2
06/29/17	< 4.26	59.6 ± 17.8	63.6 ± 3.18	93.7
07/11/17	< 2.73	57.1 ± 10.1	63.6 ± 3.18	89.8
07/20/17	< 2.67	65.2 ± 22.8	63.6 ± 3.18	103
07/25/17	< 2.96	67.1 ± 15.2	63.6 ± 3.18	106
07/31/17	< 2.16	69.2 ± 19.1	63.6 ± 3.18	109
08/01/17	< 4.10	61.6 ± 16.5	63.6 ± 3.18	96.9
08/15/17	< 2.96	65.7 ± 16.2	63.6 ± 3.18	103
08/29/17	< 2.24	56.3 ± 11.7	63.6 ± 3.18	88.5
09/08/17	< 2.39	64.8 ± 10.7	63.6 ± 3.18	102
09/18/17	< 5.93	65.5 ± 24.6	63.6 ± 3.18	103
09/27/17	< 6.02	67.9 ± 23.7	63.6 ± 3.18	107
10/06/17	< 5.37	68.0 ± 22.9	63.6 ± 3.18	107
10/13/17	< 2.76	69.4 ± 15.4	63.6 ± 3.18	109
10/20/17	< 2.88	60.9 ± 24.7	63.6 ± 3.18	95.8
11/01/17	< 5.13	58.5 ± 11.4	63.6 ± 3.18	92.0
11/10/17	< 7.13	57.2 ± 14.5	63.6 ± 3.18	89.9
11/15/17	< 1.50	58.8 ± 13.1	63.6 ± 3.18	92.5
12/19/17	< 6.31	59.5 ± 15.6	63.6 ± 3.18	93.6

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In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/06/17	< 0.277	56.7 ± 11.1	63.6 ± 3.18	89.2
01/10/17	< 0.373	74.7 ± 11.1	63.6 ± 3.18	117
01/13/17	< 0.790	64.1 ± 7.98	63.6 ± 3.18	101
01/18/17	< 0.831	51.4 ± 19.8	63.6 ± 3.18	80.8
01/20/17	< 0.580	69.7 ± 9.66	63.6 ± 3.18	110
01/30/17	< 0.613	63.2 ± 19.0	63.6 ± 3.18	99.4
02/01/17	< 0.389	72.6 ± 11.2	63.6 ± 3.18	114
02/07/17	< 2.470	67.8 ± 14.5	63.6 ± 3.18	107
02/15/17	< 1.280	69.4 ± 15.1	63.6 ± 3.18	109
02/16/17	< 0.720	65.1 ± 14.8	63.6 ± 3.18	102
02/21/17	< 0.986	63.5 ± 10.6	63.6 ± 3.18	99.8
02/24/17	< 0.491	64.3 ± 14.2	63.6 ± 3.18	101
03/01/17	< 0.607	59.1 ± 20.9	63.6 ± 3.18	92.9
03/09/17	< 3.080	55.5 ± 12.6	63.6 ± 3.18	87.3
03/13/17	< 0.879	64.4 ± 11.8	63.6 ± 3.18	101
03/17/17	< 0.732	59.9 ± 12.1	63.6 ± 3.18	94.2
03/20/17	< 0.684	60.9 ± 24.2	63.6 ± 3.18	95.8
03/24/17	< 0.594	66.8 ± 17.4	63.6 ± 3.18	105
03/28/17	< 0.383	58.3 ± 14.8	63.6 ± 3.18	91.7
03/30/17	< 1.470	64.9 ± 19.6	63.6 ± 3.18	102
04/06/17	< 0.710	66.3 ± 17.8	63.6 ± 3.18	104
04/15/17	< 0.766	54.9 ± 20.6	63.6 ± 3.18	86.3
04/19/17	< 0.312	61.5 ± 15.0	63.6 ± 3.18	96.7
04/21/17	< 0.320	68.6 ± 10.5	63.6 ± 3.18	108
04/27/17	< 0.280	64.9 ± 14.8	63.6 ± 3.18	102
04/30/17	< 0.415	68.3 ± 17.1	63.6 ± 3.18	107
05/04/17	< 0.202	58.7 ± 13.2	63.6 ± 3.18	92.3
05/09/17	< 0.700	68.8 ± 17.0	63.6 ± 3.18	108
05/11/17	< 0.334	60.0 ± 19.3	63.6 ± 3.18	94.3
05/16/17	< 0.748	63.5 ± 24.4	63.6 ± 3.18	99.8
05/18/17	< 0.384	58.7 ± 24.5	63.6 ± 3.18	92.3
05/23/17	< 0.988	62.3 ± 11.8	63.6 ± 3.18	98.0
05/25/17	< 0.583	56.5 ± 28.7	63.6 ± 3.18	88.8
05/30/17	< 0.665	65.4 ± 17.7	63.6 ± 3.18	103
06/01/17	< 0.690	57.9 ± 23.9	63.6 ± 3.18	91.0
06/07/17	< 0.637	65.0 ± 15.5	63.6 ± 3.18	102
06/09/17	< 2.350	58.0 ± 13.9	63.6 ± 3.18	91.2
06/15/17	< 1.02	56.2 ± 11.5	63.6 ± 3.18	88.4
06/20/17	< 0.646	58.3 ± 10.8	63.6 ± 3.18	91.7
06/22/17	< 0.280	65.8 ± 14.5	63.6 ± 3.18	103
06/22/17	< 0.196	62.4 ± 23.3	63.6 ± 3.18	98.1

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In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
06/26/17	< 1.04	66.6 ± 22.6	63.6 ± 3.18	105
06/28/17	< 0.260	68.7 ± 21.6	63.6 ± 3.18	108
07/11/17	< 0.347	61.8 ± 15.0	63.6 ± 3.18	97.2
07/13/17	< 0.605	67.4 ± 18.9	63.6 ± 3.18	106
07/13/17	< 0.885	63.2 ± 10.5	63.6 ± 3.18	99.4
07/14/17	< 0.660	63.9 ± 22.5	63.6 ± 3.18	100
07/18/17	< 0.757	60.4 ± 16.9	63.6 ± 3.18	95.0
07/20/17	< 0.554	68.7 ± 14.4	63.6 ± 3.18	108
07/21/17	< 0.902	62.6 ± 26.6	63.6 ± 3.18	98.4
07/26/17	< 0.850	68.6 ± 20.0	63.6 ± 3.18	108
08/02/17	< 0.586	67.4 ± 20.7	63.6 ± 3.18	106
08/03/17	< 0.752	62.6 ± 14.8	63.6 ± 3.18	98.4
08/08/17	< 1.72	69.9 ± 26.6	63.6 ± 3.18	110
08/10/17	< 0.576	68.3 ± 20.4	63.6 ± 3.18	107
08/14/17	< 0.416	68.6 ± 18.3	63.6 ± 3.18	108
08/17/17	< 0.483	57.4 ± 12.1	63.6 ± 3.18	90.3
08/18/17	< 0.586	57.9 ± 14.0	63.6 ± 3.18	91.0
08/24/17	< 0.418	62.3 ± 16.4	63.6 ± 3.18	98.0
08/27/17	< 0.889	67.4 ± 20.7	63.6 ± 3.18	106
08/28/17	< 0.305	56.6 ± 14.6	63.6 ± 3.18	89.0
08/30/17	< 0.504	60.1 ± 15.1	63.6 ± 3.18	94.5
08/31/17	< 0.805	65.3 ± 15.2	63.6 ± 3.18	103
09/11/17	< 0.543	54.7 ± 31.6	63.6 ± 3.18	86.0
09/12/17	< 0.380	63.6 ± 28.0	63.6 ± 3.18	100
09/14/17	< 0.743	53.5 ± 10.3	63.6 ± 3.18	84.1
09/16/17	< 0.462	67.6 ± 26.4	63.6 ± 3.18	106
09/20/17	< 0.727	64.4 ± 16.5	63.6 ± 3.18	101
09/22/17	< 0.491	62.9 ± 20.8	63.6 ± 3.18	98.9
09/25/17	< 0.632	62.9 ± 14.5	63.6 ± 3.18	98.9
09/28/17	< 1.29	62.6 ± 21.2	63.6 ± 3.18	98.4
10/03/17	< 0.746	52.8 ± 15.8	63.6 ± 3.18	83.0
10/05/17	< 0.439	57.4 ± 14.7	63.6 ± 3.18	90.3
10/10/17	< 0.496	57.2 ± 17.8	63.6 ± 3.18	89.9
10/12/17	< 0.463	64.7 ± 18.8	63.6 ± 3.18	102
10/14/17	< 0.498	70.0 ± 20.3	63.6 ± 3.18	110
10/18/17	< 0.623	68.9 ± 17.6	63.6 ± 3.18	108
10/23/17	< 0.343	65.3 ± 17.3	63.6 ± 3.18	103
10/26/17	< 0.724	65.0 ± 22.2	63.6 ± 3.18	102
10/26/17	< 0.772	64.1 ± 16.2	63.6 ± 3.18	101
10/30/17	< 0.299	54.4 ± 12.9	63.6 ± 3.18	85.5
11/02/17	< 0.245	63.5 ± 27.4	63.6 ± 3.18	99.8

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In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
11/07/17	< 0.300	62.9 ± 18.2	63.6 ± 3.18	98.9
11/17/17	< 0.378	64.0 ± 17.5	63.6 ± 3.18	101
11/17/17	< 0.346	58.3 ± 17.1	63.6 ± 3.18	91.7
11/21/17	< 0.565	64.2 ± 18.9	63.6 ± 3.18	101
11/27/17	< 0.703	59.4 ± 17.9	63.6 ± 3.18	93.4
11/29/17	< 1.07	69.2 ± 19.2	63.6 ± 3.18	109
11/30/17	< 0.556	69.4 ± 16.1	63.6 ± 3.18	109
12/06/17	< 0.155	62.1 ± 24.0	63.6 ± 3.18	97.6
12/07/17	< 0.927	67.0 ± 18.3	63.6 ± 3.18	105
12/12/17	< 1.24	64.9 ± 17.4	63.6 ± 3.18	102
12/14/17	< 0.441	55.4 ± 25.0	63.6 ± 3.18	87.1
12/18/17	< 0.849	69.3 ± 19.0	63.6 ± 3.18	109
12/28/17	< 0.692	62.9 ± 11.7	63.6 ± 3.18	98.9
12/28/17	< 0.777	61.8 ± 13.5	63.6 ± 3.18	97.2

B.10 Ni-63

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/05/17	< 2.87	285 ± 12.5	263 ± 13.1	108.4
01/11/17	< 4.36	203 ± 11.3	263 ± 13.1	77.2
01/17/17	< 3.71	278 ± 12.4	263 ± 13.1	105.8
01/18/17	< 4.86	933 ± 23.8	1050 ± 52.5	88.8
01/27/17	< 3.73	237 ± 12.1	263 ± 13.1	90.2
01/30/17	< 4.21	187 ± 10.8	263 ± 13.1	71.2
02/02/17	< 4.77	213 ± 11.7	263 ± 13.1	81.1
02/02/17	< 4.92	195 ± 11.3	263 ± 13.1	74.2
02/10/17	< 4.28	329 ± 14.1	263 ± 13.1	125.3
02/21/17	< 3.20	285 ± 12.5	263 ± 13.1	108.5
02/23/17	< 4.18	212 ± 11.6	263 ± 13.1	80.7
02/23/17	< 4.41	216 ± 12.2	263 ± 13.1	82.3
02/23/17	< 4.73	240 ± 14.9	263 ± 13.1	91.4
02/27/17	< 4.05	187 ± 10.8	263 ± 13.1	71.2
03/01/17	< 1.03	233 ± 3.51	263 ± 13.1	88.7
03/02/17	< 4.81	213 ± 12.0	263 ± 13.1	81.1
03/09/17	< 3.34	202 ± 11.2	263 ± 13.1	77.0
03/15/17	< 4.33	246 ± 13.2	262 ± 13.1	93.7
03/23/17	< 3.99	188 ± 11.1	262 ± 13.1	71.6
03/30/17	< 4.58	226 ± 12.5	262 ± 13.1	86.1
03/30/17	< 6.52	223 ± 14.0	262 ± 13.1	85.0
04/06/17	< 5.59	258 ± 14.3	262 ± 13.1	98.3
04/20/17	< 3.80	262 ± 13.4	262 ± 13.1	99.9
04/21/17	< 3.12	240 ± 9.07	262 ± 13.1	91.5
05/02/17	< 4.18	230 ± 12.6	262 ± 13.1	87.7
05/02/17	< 4.07	266 ± 13.5	262 ± 13.1	101.4
05/02/17	< 4.16	263 ± 13.7	262 ± 13.1	100.3
05/02/17	< 4.15	240 ± 13.1	262 ± 13.1	91.5
05/03/17	< 1.15	279 ± 4.47	262 ± 13.1	106
05/12/17	< 3.78	243 ± 12.8	262 ± 13.1	92.7
05/17/17	< 2.15	247 ± 3.68	262 ± 13.1	94.2
05/30/17	< 3.52	224 ± 12.4	262 ± 13.1	85.5
05/30/17	< 3.43	268 ± 13.7	262 ± 13.1	102
05/30/17	< 3.42	248 ± 13.1	262 ± 13.1	94.6
05/30/17	< 3.40	262 ± 13.5	262 ± 13.1	100
06/01/17	< 1.36	235 ± 13.2	262 ± 13.1	89.7
06/01/17	< 1.32	259 ± 13.5	262 ± 13.1	98.8
06/09/17	< 4.29	260 ± 13.5	262 ± 13.1	99.2
06/14/17	< 3.91	381 ± 16.1	524 ± 26.2	72.7
06/20/17	< 4.11	263 ± 13.6	262 ± 13.1	100
06/28/17	< 4.41	241 ± 13.0	262 ± 13.1	92.0
06/29/17	< 4.09	256 ± 13.5	262 ± 13.1	97.7
06/29/17	< 4.06	243 ± 13.0	262 ± 13.1	92.8
07/13/17	< 3.85	247 ± 12.7	262 ± 13.1	94.3
07/17/17	< 3.26	277 ± 12.4	262 ± 13.1	106
07/20/17	< 4.07	270 ± 13.5	262 ± 13.1	103

B.10 Ni-63
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/20/17	< 3.78	253 ± 13.1	262 ± 13.1	96.6
07/24/17	< 3.81	247 ± 13.2	262 ± 13.1	94.3
07/28/17	< 4.26	269 ± 13.8	262 ± 13.1	103
07/30/17	< 5.15	229 ± 12.8	262 ± 13.1	87.5
08/01/17	< 4.48	243 ± 13.0	262 ± 13.1	92.8
08/01/17	< 1.86	245 ± 6.52	262 ± 13.1	93.6
08/01/17	< 4.28	238 ± 12.9	262 ± 13.1	90.9
08/02/17	< 4.34	231 ± 12.9	262 ± 13.1	88.2
08/14/17	< 3.33	271 ± 13.9	262 ± 13.1	104
08/18/17	< 4.38	270 ± 13.6	262 ± 13.1	103
08/24/17	< 2.57	261 ± 9.38	262 ± 13.1	99.7
08/28/17	< 4.47	246 ± 13.2	262 ± 13.1	94.0
08/30/17	< 4.40	272 ± 13.7	262 ± 13.1	104
08/30/17	< 4.35	251 ± 13.1	262 ± 13.1	95.9
08/30/17	< 4.34	242 ± 12.9	262 ± 13.1	92.5
09/08/17	< 1.07	240 ± 3.63	262 ± 13.1	91.7
09/08/17	< 1.05	268 ± 3.94	262 ± 13.1	102
09/18/17	< 4.70	247 ± 13.2	262 ± 13.1	94.4
09/24/17	< 4.84	234 ± 12.5	262 ± 13.1	89.5
09/24/17	< 4.90	227 ± 12.4	262 ± 13.1	86.8
09/26/17	< 4.82	237 ± 12.9	262 ± 13.1	90.6
09/26/17	< 4.81	242 ± 12.9	262 ± 13.1	92.5
10/06/17	< 4.42	251 ± 13.2	261.5 ± 13.1	96.0
10/13/17	< 3.81	214 ± 12.0	261.4 ± 13.1	81.9
10/26/17	< 3.93	266 ± 13.5	261.4 ± 13.1	102
10/27/17	< 5.42	239 ± 13.0	261.4 ± 13.1	91.4
10/29/17	< 4.25	265 ± 13.3	261.4 ± 13.1	101
10/29/17	< 4.35	262 ± 13.5	261.4 ± 13.1	100
10/30/17	< 3.74	234 ± 12.4	261.4 ± 13.1	89.5
10/30/17	< 3.67	234 ± 12.1	261.4 ± 13.1	89.5
11/10/17	< 4.92	264 ± 13.7	261.3 ± 13.1	101
11/17/17	< 0.871	268 ± 3.13	261.3 ± 13.1	103
11/17/17	< 5.41	222 ± 12.9	261.3 ± 13.1	85.0
11/20/17	< 1.73	238 ± 5.34	261.2 ± 13.1	91.1
11/27/17	< 5.11	228 ± 12.9	261.2 ± 13.1	87.3
11/27/17	< 4.91	204 ± 12.2	261.2 ± 13.1	78.1
11/28/17	< 1.25	258 ± 4.51	261.2 ± 13.1	98.8
11/29/17	< 4.77	240 ± 13.3	261.2 ± 13.1	91.9
11/29/17	< 4.74	263 ± 14.0	261.2 ± 13.1	101
12/14/17	< 4.90	227 ± 12.8	261.1 ± 13.1	86.9
12/18/17	< 1.28	238 ± 3.82	261.1 ± 13.1	91.2
12/21/17	< 5.40	237 ± 13.2	261.1 ± 13.1	90.8
12/22/17	< 4.20	245 ± 13.2	261.1 ± 13.1	93.8
12/28/17	< 5.22	238 ± 13.3	261.1 ± 13.1	91.2
12/28/17	< 4.96	228 ± 14.2	261.1 ± 13.1	87.3

B.11 Pb-210
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
03/23/17	< 0.750	152 ± 1.66	142 ± 7.12	107
04/11/17	< 0.352	135 ± 4.07	142 ± 7.11	94.9
04/12/17	< 0.355	139 ± 4.01	142 ± 7.11	97.8
08/19/17	< 0.427	115 ± 1.31	141 ± 7.03	81.8
09/13/17	< 0.472	145 ± 1.56	140 ± 7.02	103
09/15/17	< 0.569	120 ± 1.48	140 ± 7.02	85.5
09/16/17	< 1.44	137 ± 4.11	140 ± 7.01	97.7
09/21/17	< 0.543	215 ± 2.01	280 ± 14.0	76.7

B.12 Pu-239/240

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/17/17	< 0.0372	7.26 ± 0.93	6.99 ± 0.35	104
01/24/17	< 0.0739	8.42 ± 1.73	6.99 ± 0.35	121
02/01/17	< 0.0194	7.87 ± 1.25	6.99 ± 0.35	113
02/14/17	< 0.0673	7.57 ± 1.47	6.99 ± 0.35	108
02/22/17	< 0.0625	8.40 ± 1.17	6.99 ± 0.35	120
03/02/17	< 0.1070	6.83 ± 1.59	6.99 ± 0.35	97.8
03/08/17	< 0.0812	6.76 ± 0.97	6.99 ± 0.35	96.8
03/13/17	< 0.0835	7.56 ± 1.17	6.99 ± 0.35	108
03/22/17	< 0.1030	6.77 ± 0.88	6.99 ± 0.35	96.9
03/24/17	< 0.0493	6.66 ± 0.92	6.99 ± 0.35	95.3
03/30/17	< 0.1700	6.75 ± 1.09	6.99 ± 0.35	96.6
04/07/17	< 0.0448	5.77 ± 2.02	6.99 ± 0.35	82.6
04/12/17	< 0.1380	5.70 ± 0.75	6.99 ± 0.35	81.6
04/14/17	< 0.0590	8.15 ± 1.53	6.99 ± 0.35	117
04/19/17	< 0.0456	7.70 ± 0.97	6.99 ± 0.35	110
04/20/17	< 0.0986	7.12 ± 0.85	6.99 ± 0.35	102
04/28/17	< 0.1080	6.55 ± 0.92	6.99 ± 0.35	93.8
05/04/17	< 0.0594	7.54 ± 1.03	6.99 ± 0.35	108
05/10/17	< 0.0593	8.52 ± 1.26	6.99 ± 0.35	122
05/30/17	< 0.0575	7.67 ± 1.36	6.99 ± 0.35	110
06/02/17	< 0.3130	6.53 ± 4.02	6.99 ± 0.35	93.5
06/12/17	< 0.0636	7.99 ± 1.15	6.99 ± 0.35	114
06/20/17	< 0.2540	6.70 ± 2.51	6.99 ± 0.35	95.9
06/20/17	< 0.1100	8.42 ± 3.62	6.99 ± 0.35	121
06/25/17	< 0.0444	7.71 ± 1.01	6.99 ± 0.35	110
06/27/17	< 0.0338	7.77 ± 1.01	6.99 ± 0.35	111
06/29/17	< 0.2510	8.87 ± 2.91	6.99 ± 0.35	127
07/10/17	< 0.0312	6.56 ± 0.94	6.99 ± 0.35	93.9
07/20/17	< 0.0628	8.45 ± 2.54	6.99 ± 0.35	121
07/20/17	< 0.0996	6.41 ± 1.22	6.99 ± 0.35	91.8
07/25/17	< 0.1400	5.91 ± 0.98	6.99 ± 0.35	84.6
07/28/17	< 0.0772	5.42 ± 0.94	6.99 ± 0.35	77.6
07/28/17	< 0.1210	5.77 ± 0.90	6.99 ± 0.35	82.6
07/30/17	< 0.0628	7.73 ± 1.21	6.99 ± 0.35	111
08/02/17	< 0.0725	6.49 ± 1.01	6.99 ± 0.35	92.9
08/15/17	< 0.0573	7.80 ± 1.40	6.99 ± 0.35	112
08/18/17	< 0.0365	6.92 ± 1.28	6.99 ± 0.35	99.1
08/18/17	< 0.1530	7.05 ± 1.36	6.99 ± 0.35	101
08/25/17	< 0.0165	5.31 ± 0.60	6.99 ± 0.35	76.0
08/29/17	< 0.0858	5.10 ± 0.91	6.99 ± 0.35	73.0
09/11/17	< 0.0949	6.24 ± 1.20	6.99 ± 0.35	89.3

B.12 Pu-239/240
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
09/14/17	< 0.0727	6.57 ± 1.08	6.99 ± 0.35	94.1
09/19/17	< 0.0717	5.42 ± 0.99	6.99 ± 0.35	77.6
09/28/17	< 0.0975	6.19 ± 2.56	6.99 ± 0.35	88.6
09/28/17	< 0.0404	6.24 ± 1.54	6.99 ± 0.35	89.3
10/05/17	< 0.0106	5.77 ± 0.77	6.99 ± 0.35	82.6
10/12/17	< 0.0821	5.60 ± 0.85	6.99 ± 0.35	80.2
10/13/17	< 0.0572	7.33 ± 0.93	6.99 ± 0.35	105
10/18/17	< 0.0266	7.91 ± 0.88	6.99 ± 0.35	113
10/25/17	< 0.1160	6.01 ± 0.73	6.99 ± 0.35	86.0
11/02/17	< 0.1790	5.52 ± 1.58	6.99 ± 0.35	79.0
11/07/17	< 0.0983	6.62 ± 1.12	6.99 ± 0.35	94.8
11/08/17	< 0.0545	6.17 ± 1.16	6.99 ± 0.35	88.3
11/14/17	< 0.0601	5.08 ± 0.94	6.99 ± 0.35	72.7
11/16/17	< 0.0808	5.48 ± 1.13	6.99 ± 0.35	78.5
11/17/17	< 0.0694	12.1 ± 3.23	14.0 ± 0.70	86.6
11/29/17	< 0.140	5.32 ± 0.88	6.99 ± 0.35	76.2
12/11/17	< 0.0443	6.32 ± 0.86	6.99 ± 0.35	90.5
12/14/17	< 0.0297	5.88 ± 0.72	6.99 ± 0.35	84.2
12/18/17	< 0.0554	5.83 ± 0.81	6.99 ± 0.35	83.5
12/29/17	< 0.257	6.23 ± 3.52	6.99 ± 0.35	89.2

B.13 Sr-89

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/09/17	< 3.79	194 ± 13.4	201 ± 10.0	96.7
01/16/17	< 3.70	92.1 ± 8.24	91.0 ± 4.55	101
01/17/17	< 3.48	176 ± 13.0	180 ± 9.00	97.8
01/23/17	< 4.45	170 ± 12.5	166 ± 8.28	103
01/25/17	< 1.07	61.9 ± 2.57	80.5 ± 4.03	76.9
01/26/17	< 4.64	154 ± 11.8	159 ± 7.96	96.7
01/30/17	< 3.95	154 ± 11.7	151 ± 7.53	102
01/31/17	< 3.82	149 ± 11.7	148 ± 7.42	100
02/01/17	< 4.78	62.2 ± 7.49	73.2 ± 3.66	85.0
02/01/17	< 3.82	147 ± 11.4	146 ± 7.32	100
02/02/17	< 3.86	128 ± 10.3	144 ± 7.22	88.7
02/03/17	< 4.24	141 ± 11.6	143 ± 7.13	98.8
02/09/17	< 4.20	46.4 ± 7.26	65.5 ± 3.27	70.9
02/09/17	< 3.59	132 ± 11.9	131 ± 6.55	101
02/14/17	< 3.45	126 ± 11.1	122 ± 6.12	103
02/14/17	< 1.16	44.3 ± 6.25	61.2 ± 3.06	72.4
02/14/17	< 2.99	125 ± 11.0	122 ± 6.12	102
02/21/17	< 4.54	40.7 ± 6.25	55.6 ± 2.78	73.2
02/21/17	< 4.23	121 ± 10.6	111 ± 5.56	109
02/22/17	< 3.76	111 ± 10.6	110 ± 5.48	101
02/27/17	< 3.96	102 ± 10.2	103 ± 5.13	99.4
02/28/17	< 4.06	105 ± 9.70	101 ± 5.05	104
03/01/17	< 4.16	91.2 ± 9.09	99.6 ± 4.98	91.6
03/01/17	< 3.28	92.4 ± 8.76	99.7 ± 4.98	92.7
03/13/17	< 4.00	89.8 ± 8.82	84.5 ± 4.22	106
03/14/17	< 3.59	94.1 ± 9.88	83.4 ± 4.17	113
03/14/17	< 3.40	81.6 ± 9.33	83.4 ± 4.17	97.9
03/20/17	< 4.02	74.4 ± 8.80	76.8 ± 3.84	96.9
03/21/17	< 4.24	73.5 ± 8.41	75.9 ± 3.79	96.9
03/21/17	< 4.39	68.4 ± 7.98	75.8 ± 3.79	90.3
03/27/17	< 5.16	74.9 ± 8.73	69.9 ± 3.49	107
03/28/17	< 3.40	68.6 ± 7.25	68.8 ± 3.44	99.7
03/29/17	< 3.75	70.3 ± 8.16	67.9 ± 3.39	104
04/07/17	< 3.66	64.5 ± 7.96	60.2 ± 3.01	107
04/10/17	< 4.10	63.9 ± 7.30	57.6 ± 2.88	111
04/10/17	< 4.47	51.7 ± 7.03	57.6 ± 2.88	89.8
04/18/17	< 3.56	52.0 ± 7.12	51.6 ± 2.58	101
04/20/17	< 3.72	37.8 ± 5.80	50.2 ± 2.51	75.3
04/20/17	< 3.88	48.7 ± 7.31	50.3 ± 2.51	96.9
04/24/17	< 3.61	36.8 ± 5.54	47.5 ± 2.38	77.4
04/24/17	< 3.47	46.6 ± 6.65	47.6 ± 2.38	97.9
04/25/17	< 4.43	43.1 ± 7.33	46.8 ± 2.34	92.1
04/27/17	< 3.64	33.6 ± 5.27	45.6 ± 2.28	73.7
05/01/17	< 4.21	51.2 ± 6.97	43.2 ± 2.16	118

B.13 Sr-89
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
05/02/17	< 3.95	30.1 ± 5.08	42.6 ± 2.13	70.7
05/02/17	< 3.84	1220 ± 30.3	1348 ± 67.4	90.5
05/03/17	< 5.51	35.4 ± 7.52	42.0 ± 2.10	84.3
05/03/17	< 3.85	1300 ± 33.4	1329 ± 66.5	97.8
05/04/17	< 3.73	1150 ± 32.6	1309 ± 65.5	87.8
05/04/17	< 3.84	35.0 ± 6.17	41.4 ± 2.07	84.6
05/10/17	< 4.43	1300 ± 33.1	1207 ± 60.3	108
05/11/17	< 3.48	1140 ± 32.0	1192 ± 59.6	95.6
05/15/17	< 2.16	890 ± 14.7	1126 ± 56.3	79.0
05/15/17	< 5.02	873 ± 18.5	1126 ± 56.3	77.5
05/18/17	< 3.93	1000 ± 31.2	1083 ± 54.2	92.3
05/22/17	< 4.39	873 ± 33.8	1024 ± 51.2	85.3
05/22/17	< 5.87	1810 ± 46.9	2051 ± 103	88.3
05/24/17	< 3.30	729 ± 28.3	996 ± 49.8	73.2
05/24/17	< 4.41	754 ± 24.0	997 ± 49.9	75.6
05/25/17	< 4.06	959 ± 27.4	980 ± 49.0	97.9
05/25/17	< 3.76	452 ± 8.38	486 ± 24.3	93.0
05/30/17	< 4.98	790 ± 26.7	916 ± 45.8	86.3
05/31/17	< 2.86	719 ± 23.7	905 ± 45.2	79.5
05/31/17	< 3.82	915 ± 30.7	903 ± 45.2	101
06/01/17	< 4.93	890 ± 27.4	892 ± 44.6	99.8
06/01/17	< 6.54	652 ± 25.6	891 ± 44.6	73.2
06/01/17	< 5.94	626 ± 24.7	891 ± 44.6	70.2
06/02/17	< 4.01	853 ± 27.7	881 ± 44.0	96.9
06/06/17	< 3.65	775 ± 25.4	833 ± 41.7	93.0
06/12/17	< 4.31	643 ± 23.2	768 ± 38.4	83.8
06/13/17	< 5.24	366 ± 18.7	378 ± 18.9	96.8
06/13/17	< 3.36	668 ± 25.3	758 ± 37.9	88.2
06/14/17	< 4.09	430 ± 18.8	373 ± 18.7	115
06/19/17	< 4.03	649 ± 23.9	697 ± 34.9	93.1
06/19/17	< 5.01	689 ± 23.7	697 ± 34.9	98.8
06/20/17	< 5.77	608 ± 22.2	678 ± 33.9	89.7
06/21/17	< 4.83	720 ± 25.8	678 ± 33.9	106
06/26/17	< 4.25	611 ± 22.7	634 ± 31.7	96.4
06/27/17	< 4.11	578 ± 24.2	625 ± 31.2	92.5
06/28/17	< 4.14	358 ± 16.2	308 ± 15.4	116
06/28/17	< 3.72	438 ± 20.0	615 ± 30.8	71.2
06/29/17	< 4.11	544 ± 24.1	607 ± 30.4	89.6
07/06/17	< 5.33	541 ± 22.8	553 ± 27.6	97.9
07/12/17	< 3.56	438 ± 19.2	508 ± 25.4	86.2
07/12/17	< 4.31	493 ± 21.3	509 ± 25.5	96.8
07/17/17	< 4.20	449 ± 19.4	475 ± 23.8	94.5
07/18/17	< 4.50	459 ± 20.1	469 ± 23.4	97.9

B.13 Sr-89

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/18/17	< 3.60	422 ± 18.1	456 ± 22.8	92.6
07/19/17	< 4.20	406 ± 18.1	456 ± 22.8	89.1
07/20/17	< 4.57	427 ± 19.2	456 ± 22.8	93.6
07/25/17	< 4.04	403 ± 17.4	421 ± 21.0	95.8
07/26/17	< 7.70	441 ± 22.9	425 ± 21.3	104
07/26/17	< 4.23	411 ± 19.1	420 ± 21.0	97.9
07/27/17	< 5.08	417 ± 19.7	414 ± 20.7	101
07/31/17	< 3.33	402 ± 17.6	392 ± 19.6	103
07/31/17	< 4.04	389 ± 19.6	392 ± 19.6	99.2
08/01/17	< 3.66	332 ± 17.0	387 ± 19.3	85.9
08/01/17	< 3.37	210 ± 13.8	191 ± 9.53	110
08/02/17	< 3.60	170 ± 13.3	191 ± 9.53	89.2
08/09/17	< 4.98	316 ± 17.5	347 ± 17.3	91.2
08/14/17	< 4.34	315 ± 16.3	324 ± 16.2	97.3
08/16/17	< 3.82	256 ± 13.7	310 ± 15.5	82.5
08/17/17	< 3.01	263 ± 14.1	310 ± 15.5	84.8
08/17/17	< 4.00	292 ± 16.0	311 ± 15.5	93.9
08/18/17	< 3.83	266 ± 14.4	307 ± 15.4	86.6
08/22/17	< 3.87	143 ± 10.5	145 ± 7.24	98.7
08/23/17	< 4.27	259 ± 15.2	286 ± 14.3	90.5
08/28/17	< 4.28	268 ± 15.3	267 ± 13.4	100
08/29/17	< 4.84	198 ± 12.8	263 ± 13.2	75.2
08/29/17	< 6.04	256 ± 15.2	263 ± 13.2	97.3
08/29/17	< 4.14	157 ± 11.0	132 ± 6.58	119
08/30/17	< 4.00	250 ± 14.7	260 ± 13.0	96.3
08/30/17	< 5.28	241 ± 16.0	260 ± 13.0	92.6
08/30/17	< 4.28	270 ± 15.3	259 ± 13.0	104
09/11/17	< 5.27	214 ± 14.3	221 ± 11.0	97.0
09/14/17	< 6.32	213 ± 14.7	212 ± 10.6	101
09/14/17	< 4.03	188 ± 12.8	211 ± 10.6	88.9
09/18/17	< 5.21	221 ± 13.3	200 ± 10.0	110
09/19/17	< 3.37	86.4 ± 7.04	98.7 ± 4.93	87.6
09/20/17	< 5.18	211 ± 14.4	195 ± 9.74	108
09/20/17	< 4.16	180 ± 6.49	195 ± 9.74	92.4
09/21/17	< 3.90	158 ± 11.3	192 ± 9.60	82.3
09/25/17	< 5.62	183 ± 12.5	182 ± 9.10	101
09/26/17	< 4.83	174 ± 13.2	179 ± 8.97	97.0
09/26/17	< 4.61	144 ± 10.2	179 ± 8.96	80.4
09/27/17	< 4.13	179 ± 12.7	177 ± 8.84	101
09/28/17	< 3.37	178 ± 12.5	174 ± 8.72	102
10/05/17	< 4.63	181 ± 13.9	159 ± 7.95	114
10/09/17	< 5.70	146 ± 12.9	150 ± 7.50	97.3
10/10/17	< 4.05	146 ± 11.4	148 ± 7.41	98.6

B.13 Sr-89
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
10/10/17	< 3.56	109 ± 4.11	146 ± 7.29	74.7
10/13/17	< 3.79	130 ± 10.0	142 ± 7.12	91.3
10/13/17	< 3.87	139 ± 11.5	142 ± 7.12	97.6
10/16/17	< 4.47	146 ± 11.4	137 ± 6.83	107
10/20/17	< 3.86	139 ± 11.7	129 ± 6.47	107
10/24/17	< 4.14	124 ± 10.6	122 ± 6.12	101
10/25/17	< 6.87	132 ± 10.0	119 ± 5.94	111
10/26/17	< 6.10	104 ± 8.34	119 ± 5.94	87.6
10/30/17	< 7.80	116 ± 18.8	113 ± 5.63	103
10/31/17	< 4.25	107 ± 9.90	111 ± 5.55	96.4
10/31/17	< 4.33	115 ± 10.5	111 ± 5.54	104
11/01/17	< 4.21	113 ± 9.93	110 ± 5.48	103
11/01/17	< 4.57	114 ± 10.2	109 ± 5.47	104
11/02/17	< 6.08	115 ± 9.72	108 ± 5.39	107
11/06/17	< 3.68	100 ± 9.47	102 ± 5.12	97.3
11/10/17	< 4.23	91.7 ± 9.03	97.0 ± 4.85	94.5
11/13/17	< 4.43	83.8 ± 8.69	93.0 ± 4.65	90.1
11/14/17	< 4.08	90.7 ± 9.25	91.8 ± 4.59	98.8
11/14/17	< 5.41	73.6 ± 8.38	91.6 ± 4.58	80.4
11/17/17	< 3.40	96.1 ± 9.06	88.2 ± 4.41	109
11/20/17	< 4.19	48.6 ± 6.62	42.2 ± 2.11	115
11/21/17	< 5.58	81.9 ± 9.32	83.3 ± 4.16	98.3
11/21/17	< 3.80	42.3 ± 6.17	41.6 ± 2.08	102
11/27/17	< 4.32	37.9 ± 5.75	38.3 ± 1.92	98.9
11/27/17	< 4.21	80.3 ± 8.48	76.7 ± 3.84	105
11/27/17	< 3.51	71.3 ± 7.61	76.6 ± 3.83	93.1
11/28/17	< 5.56	70.0 ± 9.45	75.6 ± 3.78	92.6
11/29/17	< 3.55	80.6 ± 8.32	74.6 ± 3.73	108
11/29/17	< 4.28	83.1 ± 8.89	74.6 ± 3.73	111
11/29/17	< 2.00	73.5 ± 4.11	74.4 ± 3.72	98.8
11/30/17	< 3.84	71.4 ± 8.21	73.7 ± 3.68	96.9
11/30/17	< 3.70	75.0 ± 7.60	73.7 ± 3.68	102
12/05/17	< 5.19	68.0 ± 8.46	68.8 ± 3.44	98.9
12/11/17	< 4.69	60.1 ± 8.19	63.3 ± 3.16	95.0
12/12/17	< 3.45	59.5 ± 7.28	62.4 ± 3.12	95.4
12/13/17	< 3.57	51.9 ± 6.95	61.5 ± 3.08	84.3
12/18/17	< 5.25	58.2 ± 7.47	57.5 ± 2.88	101
12/21/17	< 0.864	48.4 ± 6.76	55.8 ± 2.79	86.7
12/21/17	< 1.02	53.8 ± 7.06	55.8 ± 2.79	96.4
12/27/17	< 5.18	49.4 ± 6.46	50.7 ± 2.53	97.5
12/27/17	< 4.33	50.3 ± 7.00	50.7 ± 2.53	99.3
12/27/17	< 5.09	54.9 ± 7.45	50.8 ± 2.54	108
12/28/17	< 5.37	55.6 ± 7.82	50.1 ± 2.51	111

B.14 Sr-90
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/04/17	< 1.45	37.1 ± 4.29	47.5 ± 2.38	78.1
01/09/17	< 1.79	52.4 ± 5.79	47.5 ± 2.38	110
01/16/17	< 1.19	40.6 ± 3.85	47.5 ± 2.37	85.5
01/16/17	< 1.07	36.5 ± 3.78	47.5 ± 2.37	76.9
01/17/17	< 1.80	51.5 ± 5.75	47.5 ± 2.37	108
01/23/17	< 2.25	46.8 ± 5.88	47.5 ± 2.37	98.6
01/25/17	< 1.13	33.5 ± 3.65	47.5 ± 2.37	70.6
01/26/17	< 1.98	60.6 ± 5.82	47.5 ± 2.37	128
01/30/17	< 1.82	49.7 ± 5.09	47.4 ± 2.37	105
01/31/17	< 1.60	50.1 ± 5.42	47.4 ± 2.37	106
02/01/17	< 2.03	48.5 ± 5.21	47.4 ± 2.37	102
02/01/17	< 2.88	57.2 ± 6.24	47.4 ± 2.37	121
02/01/17	< 2.03	36.4 ± 4.43	47.4 ± 2.37	76.7
02/02/17	< 1.57	51.9 ± 5.30	47.4 ± 2.37	109
02/03/17	< 2.39	52.5 ± 6.39	47.4 ± 2.37	111
02/09/17	< 4.26	34.3 ± 6.53	47.4 ± 2.37	72.3
02/09/17	< 2.60	48.3 ± 8.47	47.4 ± 2.37	102
02/14/17	< 1.85	50.5 ± 6.13	47.4 ± 2.37	107
02/14/17	< 1.66	53.7 ± 5.74	47.4 ± 2.37	113
02/14/17	< 0.39	53.9 ± 5.06	47.4 ± 2.37	114
02/21/17	< 1.71	49.5 ± 5.27	47.4 ± 2.37	104
02/21/17	< 2.01	38.3 ± 4.96	47.4 ± 2.37	80.8
02/22/17	< 1.78	53.9 ± 5.67	47.4 ± 2.37	114
02/27/17	< 2.71	52.3 ± 6.94	47.4 ± 2.37	110
02/28/17	< 1.90	48.8 ± 5.50	47.4 ± 2.37	103
03/01/17	< 1.71	38.9 ± 4.63	47.4 ± 2.37	82.2
03/01/17	< 2.28	42.5 ± 5.66	47.4 ± 2.37	89.8
03/07/17	< 2.48	47.4 ± 5.74	47.3 ± 2.37	100
03/13/17	< 1.75	50.3 ± 5.25	47.3 ± 2.37	106
03/14/17	< 2.06	52.1 ± 5.95	47.3 ± 2.37	110
03/14/17	< 1.98	45.3 ± 5.42	47.3 ± 2.37	95.8
03/20/17	< 1.51	45.8 ± 4.61	47.3 ± 2.36	96.9
03/21/17	< 2.08	47.3 ± 5.58	47.3 ± 2.36	100
03/21/17	< 1.82	38.5 ± 4.95	47.3 ± 2.36	81.4
03/27/17	< 2.70	46.6 ± 5.83	47.3 ± 2.36	98.6
03/28/17	< 1.71	43.2 ± 5.07	47.3 ± 2.36	91.4
03/29/17	< 1.53	47.7 ± 5.40	47.3 ± 2.36	101
04/07/17	< 2.83	51.8 ± 7.03	47.2 ± 2.36	110
04/10/17	< 2.25	42.5 ± 5.85	47.2 ± 2.36	90.0
04/10/17	< 1.76	45.4 ± 5.06	47.2 ± 2.36	96.1
04/18/17	< 1.55	37.3 ± 4.00	47.2 ± 2.36	79.0
04/20/17	< 2.43	50.8 ± 6.37	47.2 ± 2.36	108
04/20/17	< 1.42	38.2 ± 4.42	47.2 ± 2.36	80.9
04/24/17	< 2.57	46.6 ± 6.03	47.2 ± 2.36	98.8
04/24/17	< 1.58	36.6 ± 4.37	47.2 ± 2.36	77.6
04/25/17	< 1.83	57.7 ± 5.75	47.2 ± 2.36	122

B.14 Sr-90

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
04/27/17	< 1.41	33.1 ± 4.12	47.2 ± 2.36	70.2
05/01/17	< 1.81	51.0 ± 5.59	47.2 ± 2.36	108
05/02/17	< 1.25	38.7 ± 4.26	47.2 ± 2.36	82.1
05/02/17	< 1.90	48.7 ± 5.29	47.2 ± 2.36	103
05/03/17	< 1.92	45.0 ± 5.95	47.2 ± 2.36	95.4
05/03/17	< 1.77	54.3 ± 5.52	47.2 ± 2.36	115
05/04/17	< 1.50	33.8 ± 4.41	47.1 ± 2.36	71.7
05/04/17	< 1.57	45.8 ± 5.28	47.1 ± 2.36	97.1
05/10/17	< 1.56	56.0 ± 5.81	47.1 ± 2.36	119
05/11/17	< 2.59	37.7 ± 5.75	47.1 ± 2.36	80.0
05/15/17	< 1.21	46.9 ± 3.22	47.1 ± 2.36	99.5
05/15/17	< 5.57	40.6 ± 6.47	47.1 ± 2.36	86.2
05/18/17	< 2.52	51.7 ± 6.35	47.1 ± 2.36	110
05/22/17	< 3.27	96.8 ± 9.90	94.2 ± 4.71	103
05/22/17	< 2.80	51.6 ± 5.89	47.1 ± 2.35	110
05/24/17	< 1.85	46.4 ± 6.11	47.1 ± 2.35	98.5
05/24/17	< 1.83	35.1 ± 5.25	47.1 ± 2.35	74.5
05/25/17	< 1.59	45.7 ± 4.72	47.1 ± 2.35	97.1
05/25/17	< 1.67	38.0 ± 4.83	47.1 ± 2.35	80.7
05/30/17	< 1.83	52.2 ± 5.49	47.1 ± 2.35	111
05/31/17	< 1.83	55.8 ± 6.17	47.1 ± 2.35	119
05/31/17	< 1.56	36.8 ± 4.40	47.1 ± 2.35	78.2
06/01/17	< 3.08	35.0 ± 5.54	47.1 ± 2.35	74.4
06/01/17	< 1.95	33.1 ± 4.18	47.1 ± 2.35	70.3
06/01/17	< 1.84	47.3 ± 4.72	47.1 ± 2.35	101
06/01/17	< 7.51	41.4 ± 7.89	47.1 ± 2.35	88.0
06/02/17	< 1.78	43.8 ± 4.69	47.1 ± 2.35	93.1
06/06/17	< 1.67	55.3 ± 5.49	47.0 ± 2.35	118
06/12/17	< 2.07	47.5 ± 5.50	47.0 ± 2.35	101
06/13/17	< 1.75	39.1 ± 4.52	47.0 ± 2.35	83.2
06/13/17	< 2.10	53.5 ± 6.32	47.0 ± 2.35	114
06/14/17	< 1.74	35.0 ± 4.42	47.0 ± 2.35	74.4
06/19/17	< 2.25	54.3 ± 5.86	47.0 ± 2.35	116
06/19/17	< 2.44	45.6 ± 6.02	47.0 ± 2.35	97.0
06/20/17	< 4.29	34.9 ± 5.21	47.0 ± 2.35	74.3
06/21/17	< 2.65	35.9 ± 4.67	47.0 ± 2.35	76.4
06/26/17	< 2.56	51.5 ± 5.76	47.0 ± 2.35	110
06/27/17	< 1.93	44.9 ± 5.23	47.0 ± 2.35	95.6
06/28/17	< 2.24	51.3 ± 5.56	47.0 ± 2.35	109
06/28/17	< 1.70	36.2 ± 4.31	47.0 ± 2.35	77.1
06/29/17	< 1.85	45.8 ± 5.82	47.0 ± 2.35	97.5
07/06/17	< 2.07	44.7 ± 5.08	47.0 ± 2.35	95.2
07/12/17	< 1.43	47.6 ± 4.91	46.9 ± 2.35	101
07/12/17	< 1.78	50.8 ± 5.48	46.9 ± 2.35	108
07/17/17	< 1.54	45.5 ± 4.75	46.9 ± 2.35	97.0
07/18/17	< 1.53	35.5 ± 3.17	46.9 ± 2.35	75.7

B.14 Sr-90

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
07/18/17	< 2.40	45.8 ± 5.65	46.9 ± 2.35	97.6
07/19/17	< 2.02	34.0 ± 4.47	46.9 ± 2.35	72.5
07/20/17	< 2.90	47.3 ± 6.17	46.9 ± 2.35	101
07/25/17	< 2.08	34.7 ± 4.87	46.9 ± 2.34	74.0
07/26/17	< 2.12	46.9 ± 5.55	46.9 ± 2.34	100
07/26/17	< 4.24	49.2 ± 7.26	46.9 ± 2.34	105
07/27/17	< 1.96	53.9 ± 5.49	46.9 ± 2.34	115
07/31/17	< 1.64	41.3 ± 4.43	46.9 ± 2.34	88.1
07/31/17	< 1.55	48.4 ± 5.41	46.9 ± 2.34	103
08/01/17	< 1.85	38.5 ± 5.39	46.9 ± 2.34	82.1
08/01/17	< 1.87	50.4 ± 5.91	46.9 ± 2.34	108
08/02/17	< 1.87	40.5 ± 5.54	46.9 ± 2.34	86.4
08/09/17	< 2.10	37.2 ± 4.88	46.8 ± 2.34	79.4
08/14/17	< 2.18	59.5 ± 6.36	46.8 ± 2.34	127
08/16/17	< 1.61	51.4 ± 5.95	46.8 ± 2.34	110
08/17/17	< 1.43	40.9 ± 4.10	46.8 ± 2.34	87.4
08/17/17	< 1.72	47.2 ± 5.35	46.8 ± 2.34	101
08/18/17	< 2.17	42.2 ± 5.80	46.8 ± 2.34	90.1
08/22/17	< 1.39	33.7 ± 3.75	46.8 ± 2.34	72.0
08/23/17	< 1.69	46.6 ± 5.59	46.8 ± 2.34	99.6
08/28/17	< 1.95	48.5 ± 5.58	46.8 ± 2.34	104
08/29/17	< 2.33	46.7 ± 5.83	46.8 ± 2.34	99.8
08/29/17	< 1.56	47.5 ± 5.07	46.8 ± 2.34	102
08/29/17	< 1.84	34.2 ± 4.18	46.8 ± 2.34	73.1
08/30/17	< 2.51	56.4 ± 7.28	46.8 ± 2.34	121
08/30/17	< 2.88	43.2 ± 6.02	46.8 ± 2.34	92.3
08/30/17	< 1.88	42.5 ± 4.45	46.8 ± 2.34	90.9
09/11/17	< 1.81	51.0 ± 5.48	46.7 ± 2.34	109
09/14/17	< 2.52	49.3 ± 5.36	46.7 ± 2.34	105
09/14/17	< 2.10	49.6 ± 6.28	46.7 ± 2.34	106
09/18/17	< 2.08	55.0 ± 5.83	46.7 ± 2.34	118
09/19/17	< 1.31	37.6 ± 3.36	46.7 ± 2.34	80.5
09/20/17	< 1.06	51.0 ± 4.42	46.7 ± 2.34	109
09/20/17	< 2.25	45.7 ± 5.54	46.7 ± 2.34	97.8
09/21/17	< 1.34	52.1 ± 4.53	46.7 ± 2.34	112
09/25/17	< 2.21	49.1 ± 5.01	46.7 ± 2.34	105
09/26/17	< 1.74	36.5 ± 4.28	46.7 ± 2.33	78.2
09/26/17	< 2.13	54.2 ± 5.90	46.7 ± 2.33	116
09/27/17	< 1.83	48.1 ± 5.36	46.7 ± 2.33	103
09/28/17	< 2.25	52.7 ± 6.25	46.7 ± 2.33	113
10/05/17	< 2.91	57.8 ± 7.20	46.7 ± 2.33	124
10/09/17	< 2.23	50.9 ± 6.17	46.7 ± 2.33	109
10/10/17	< 1.57	37.2 ± 4.15	46.7 ± 2.33	79.7
10/10/17	< 1.90	52.4 ± 5.86	46.7 ± 2.33	112
10/13/17	< 3.08	51.2 ± 7.74	46.6 ± 2.33	110
10/13/17	< 2.27	39.9 ± 5.93	46.6 ± 2.33	85.5

B.14 Sr-90
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
10/16/17	< 2.48	49.1 ± 6.38	46.6 ± 2.33	105
10/20/17	< 2.68	54.4 ± 6.86	46.6 ± 2.33	117
10/24/17	< 1.87	53.1 ± 5.75	46.6 ± 2.33	114
10/25/17	< 2.60	34.4 ± 6.36	46.6 ± 2.33	73.8
10/26/17	< 2.22	33.6 ± 3.68	46.6 ± 2.33	72.1
10/30/17	< 3.32	51.2 ± 10.5	46.6 ± 2.33	110
10/31/17	< 1.74	44.2 ± 4.94	46.6 ± 2.33	94.9
10/31/17	< 1.55	44.4 ± 4.84	46.6 ± 2.33	95.3
11/01/17	< 1.78	44.7 ± 4.93	46.6 ± 2.33	96.0
11/01/17	< 2.94	45.9 ± 6.22	46.6 ± 2.33	98.5
11/01/17	< 2.62	51.5 ± 5.12	46.6 ± 2.33	111
11/01/17	< 1.79	41.8 ± 4.92	46.6 ± 2.33	89.7
11/06/17	< 2.37	50.1 ± 6.24	46.6 ± 2.33	108
11/10/17	< 2.65	47.3 ± 6.11	46.6 ± 2.33	102
11/13/17	< 2.82	51.1 ± 6.76	46.5 ± 2.33	110
11/14/17	< 2.81	55.0 ± 6.38	46.5 ± 2.33	118
11/14/17	< 1.63	46.7 ± 5.58	46.5 ± 2.33	100
11/17/17	< 3.56	46.9 ± 7.14	46.5 ± 2.33	101
11/20/17	< 2.06	53.8 ± 6.00	46.5 ± 2.33	116
11/21/17	< 2.30	49.5 ± 5.88	46.5 ± 2.33	106
11/21/17	< 1.76	32.7 ± 8.46	46.5 ± 2.33	70.3
11/27/17	< 1.52	52.1 ± 5.12	46.5 ± 2.33	112
11/27/17	< 0.953	50.0 ± 4.37	46.5 ± 2.33	108
11/27/17	< 1.29	44.7 ± 4.10	46.5 ± 2.33	96.1
11/28/17	< 2.65	54.2 ± 5.98	46.5 ± 2.33	117
11/29/17	< 0.602	41.4 ± 2.26	46.5 ± 2.32	89.0
11/29/17	< 1.60	50.6 ± 5.09	46.5 ± 2.33	109
11/29/17	< 4.50	38.1 ± 7.65	46.5 ± 2.33	81.9
11/30/17	< 3.76	44.4 ± 7.14	46.5 ± 2.32	95.5
11/30/17	< 2.01	48.7 ± 5.49	46.5 ± 2.32	105
12/05/17	< 2.41	49.0 ± 5.66	46.5 ± 2.32	105
12/05/17	< 1.35	36.1 ± 3.81	46.5 ± 2.32	77.7
12/11/17	< 2.19	49.7 ± 5.81	46.5 ± 2.32	107
12/12/17	< 1.28	50.5 ± 4.58	46.5 ± 2.32	109
12/13/17	< 1.27	53.4 ± 5.46	46.5 ± 2.32	115
12/18/17	< 2.39	42.1 ± 5.28	46.4 ± 2.32	90.7
12/20/17	< 0.221	40.6 ± 4.73	46.4 ± 2.32	87.4
12/20/17	< 0.200	41.8 ± 4.32	46.4 ± 2.32	90.0
12/27/17	< 1.51	34.6 ± 4.15	46.4 ± 2.32	74.6
12/27/17	< 0.628	34.9 ± 4.04	46.4 ± 2.32	75.2
12/28/17	< 1.04	50.0 ± 5.69	46.4 ± 2.32	108
12/29/17	< 1.76	46.90 ± 5.21	46.4 ± 2.32	101

B.15 Tc-99
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/18/17	< 1.68	353 ± 28.6	335 ± 16.7	106
02/02/17	< 1.67	347 ± 28.1	335 ± 16.7	104
02/10/17	< 1.58	70.2 ± 6.06	66.9 ± 3.35	105
02/28/17	< 1.64	300 ± 24.4	335 ± 16.7	89.7
03/10/17	< 1.67	331 ± 26.9	335 ± 16.7	98.9
03/23/17	< 1.56	337 ± 27.3	335 ± 16.7	101
04/07/17	< 1.59	323 ± 26.1	335 ± 16.7	96.5
04/07/17	< 1.08	307 ± 24.9	335 ± 16.7	91.8
04/10/17	< 1.55	367 ± 29.8	335 ± 16.7	110
04/20/17	< 1.62	315 ± 25.6	335 ± 16.7	94.2
05/02/17	< 1.64	330 ± 26.7	335 ± 16.7	98.6
05/10/17	< 1.69	324 ± 26.3	335 ± 16.7	96.8
05/26/17	< 1.54	286 ± 23.3	335 ± 16.7	85.5
06/09/17	< 1.66	331 ± 26.9	335 ± 16.7	98.9
06/15/17	< 1.71	323 ± 26.3	335 ± 16.7	96.5
06/22/17	< 1.64	320 ± 25.9	335 ± 16.7	95.6
06/25/17	< 1.43	325 ± 26.3	335 ± 16.7	97.1
07/11/17	< 1.57	348 ± 28.3	335 ± 16.7	104
07/20/17	< 1.61	336 ± 27.2	335 ± 16.7	100
07/25/17	< 1.59	306 ± 24.8	335 ± 16.7	91.5
07/31/17	< 1.74	347 ± 28.2	335 ± 16.7	104
08/15/17	< 1.70	330 ± 26.8	335 ± 16.7	98.6
08/24/17	< 1.55	319 ± 25.8	335 ± 16.7	95.3
09/18/17	< 1.49	308 ± 24.9	335 ± 16.7	92.1
10/05/17	< 1.47	320 ± 25.9	335 ± 16.7	95.6
10/12/17	< 1.43	340 ± 27.6	335 ± 16.7	102
10/19/17	< 1.52	345 ± 28.0	335 ± 16.7	103
10/30/17	< 1.52	319 ± 25.9	335 ± 16.7	95.3
11/06/17	< 1.65	364 ± 29.4	335 ± 16.7	109
11/28/17	< 1.58	335 ± 27.2	335 ± 16.7	100
12/19/17	< 1.58	327 ± 26.5	335 ± 16.7	97.7

B.16 Th-230
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/19/17	< 0.1480	2.90 ± 0.49	4.03 ± 0.20	72.0
03/01/17	< 0.0252	3.81 ± 0.60	4.03 ± 0.20	94.6
03/28/17	< 0.0246	3.87 ± 0.34	4.03 ± 0.20	96.0
05/04/17	< 0.0590	3.53 ± 0.52	4.03 ± 0.20	87.6
05/18/17	< 0.1240	3.57 ± 0.48	4.03 ± 0.20	88.6
06/01/17	< 0.3010	3.56 ± 0.36	4.03 ± 0.20	88.4
07/06/17	< 0.0327	3.66 ± 0.27	4.03 ± 0.20	90.8
08/01/17	< 0.0419	4.09 ± 0.38	4.03 ± 0.20	102
09/18/17	< 0.0499	4.07 ± 0.42	4.03 ± 0.20	101
09/25/17	< 0.0636	3.75 ± 0.42	4.03 ± 0.20	93.1
11/02/17	< 0.138	3.71 ± 0.42	4.03 ± 0.20	92.1
11/17/17	< 0.183	4.29 ± 0.84	4.03 ± 0.20	106
12/01/17	< 0.117	3.96 ± 0.68	4.03 ± 0.20	98.3
12/28/17	< 0.081	3.94 ± 0.68	4.03 ± 0.20	97.8

B.17 U-238

In-House Water Blank and Spike Program

Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
01/12/17	< 0.0226	5.46 ± 1.02	6.04 ± 0.302	90.4
01/19/17	< 0.0405	6.08 ± 0.54	6.04 ± 0.302	101
01/24/17	< 0.1120	6.19 ± 0.63	6.04 ± 0.302	102
02/02/17	< 0.0326	6.00 ± 0.49	6.04 ± 0.302	99.3
02/17/17	< 0.0355	6.37 ± 0.52	6.04 ± 0.302	105
03/02/17	< 0.0706	6.76 ± 1.09	6.04 ± 0.302	112
03/09/17	< 0.0365	6.42 ± 0.54	6.04 ± 0.302	106
03/12/17	< 0.0161	6.00 ± 0.49	6.04 ± 0.302	99.3
03/15/17	< 0.0171	6.29 ± 0.52	6.04 ± 0.302	104
03/27/17	< 0.0330	6.22 ± 0.54	6.04 ± 0.302	103
03/30/17	< 0.0494	6.18 ± 0.55	6.04 ± 0.302	102
04/10/17	< 0.0329	6.07 ± 0.49	6.04 ± 0.302	101
04/11/17	< 0.0349	5.96 ± 0.48	6.04 ± 0.302	98.7
04/14/17	< 0.0721	5.93 ± 0.50	6.04 ± 0.302	98.2
04/14/17	< 0.0332	5.88 ± 0.50	6.04 ± 0.302	97.4
04/19/17	< 0.0358	6.17 ± 0.51	6.04 ± 0.302	102
04/26/17	< 0.0650	6.07 ± 0.50	6.04 ± 0.302	101
05/18/17	< 0.0387	6.48 ± 0.55	6.04 ± 0.302	107
05/19/17	< 0.0346	6.48 ± 0.55	6.04 ± 0.302	107
05/19/17	< 0.0572	5.81 ± 0.50	6.04 ± 0.302	96.2
06/02/17	< 0.0755	6.83 ± 1.53	6.04 ± 0.302	113
06/20/17	< 0.1740	6.77 ± 1.70	6.04 ± 0.302	112
06/20/17	< 0.1800	5.51 ± 1.45	6.04 ± 0.302	91.2
06/30/17	< 0.0508	5.00 ± 1.34	6.04 ± 0.302	82.8
07/07/17	< 0.0601	6.33 ± 0.54	6.04 ± 0.302	105
07/07/17	< 0.0802	6.07 ± 0.63	6.04 ± 0.302	101
07/20/17	< 0.0434	5.70 ± 0.60	6.04 ± 0.302	94.4
07/28/17	< 0.0198	5.75 ± 0.95	6.04 ± 0.302	95.2
08/02/17	< 0.0527	5.60 ± 0.47	6.04 ± 0.302	92.7
08/14/17	< 0.0416	5.91 ± 0.52	6.04 ± 0.302	97.9
08/18/17	< 0.0619	5.79 ± 0.60	6.04 ± 0.302	95.9
08/18/17	< 0.0246	6.59 ± 1.12	6.04 ± 0.302	109
08/28/17	< 0.0305	7.10 ± 0.64	6.04 ± 0.302	118
08/29/17	< 0.0274	6.02 ± 0.51	6.04 ± 0.302	99.7
09/15/17	< 0.0276	5.68 ± 0.53	6.04 ± 0.302	94.0
09/15/17	< 0.0412	6.76 ± 0.66	6.04 ± 0.302	112
09/21/17	< 0.0120	6.57 ± 0.85	6.04 ± 0.302	109
09/22/17	< 0.0370	6.72 ± 0.80	6.04 ± 0.302	111
09/23/17	< 0.0081	6.51 ± 0.61	6.04 ± 0.302	108
10/20/17	< 0.0645	5.42 ± 0.54	6.04 ± 0.302	89.7
10/20/17	< 0.0353	5.89 ± 0.60	6.04 ± 0.302	97.5

B.17 U-238
In-House Water Blank and Spike Program
Teledyne Brown Engineering Environmental Services QC Program

Count Date	Blank (pCi)	Spike		% Recovery
		Found (pCi)	Known (pCi)	
10/20/17	< 0.0669	5.72 ± 0.75	6.04 ± 0.302	94.7
10/30/17	< 0.0507	6.36 ± 0.58	6.04 ± 0.302	105
10/31/17	< 0.0294	6.51 ± 1.11	6.04 ± 0.302	108
11/01/17	< 0.0263	5.88 ± 0.68	6.04 ± 0.302	97.4
11/14/17	< 0.0347	6.87 ± 0.97	6.04 ± 0.302	114
11/17/17	< 0.0507	5.72 ± 1.24	6.04 ± 0.302	94.7
11/21/17	< 0.1710	6.07 ± 1.66	6.04 ± 0.302	101
11/28/17	< 0.0803	7.12 ± 0.71	6.04 ± 0.302	118
11/30/17	< 0.0183	6.76 ± 1.13	6.04 ± 0.302	112
12/11/17	< 0.0472	6.23 ± 0.62	6.04 ± 0.302	103
12/18/17	< 0.0751	5.39 ± 0.90	6.04 ± 0.302	89.2
12/21/17	< 0.0558	6.38 ± 1.21	6.04 ± 0.302	106
12/29/17	< 0.0263	5.84 ± 0.67	6.04 ± 0.302	96.7

Duplicates

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Be-7 (Gamma)	01/06/17	0.0479 ± 0.0168	0.0393 ± 0.0172	pCi/cu m	0.092	(1)
	01/10/17	0.0612 ± 0.0162	0.0487 ± 0.0156	pCi/cu m	0.075	(1)
	01/12/17	0.1146 ± 0.0265	0.0694 ± 0.0363	pCi/cu m	0.155	(1)
	01/12/17	0.1029 ± 0.0352	0.0956 ± 0.0240	pCi/cu m	0.191	(1)
	01/12/17	0.0577 ± 0.0169	0.0611 ± 0.0172	pCi/cu m	0.118	(1)
	01/12/17	0.0720 ± 0.0137	0.0975 ± 0.0238	pCi/cu m	0.073	30.0
	01/12/17	0.0713 ± 0.0147	0.0606 ± 0.0182	pCi/cu m	0.067	16.2
	01/16/17	0.0808 ± 0.0223	0.0880 ± 0.0300	pCi/cu m	0.138	(1)
	01/17/17	0.0742 ± 0.0160	0.0893 ± 0.0197	pCi/cu m	0.057	18.5
	01/18/17	0.1116 ± 0.0408	0.0840 ± 0.0278	pCi/cu m	0.200	(1)
	01/19/17	0.1331 ± 0.0232	0.1384 ± 0.0297	pCi/cu m	0.081	3.9
	01/19/17	0.1074 ± 0.0235	0.1203 ± 0.0283	pCi/cu m	0.104	11.3
	01/19/17	0.1254 ± 0.0200	0.1398 ± 0.0258	pCi/cu m	0.087	10.9
	01/20/17	0.0830 ± 0.0355	0.0848 ± 0.0443	pCi/cu m	0.304	(1)
	02/03/17	0.1193 ± 0.0500	0.1187 ± 0.0387	pCi/cu m	0.223	(1)
	03/21/17	< 3.938	< 4.462	pCi/cu m	19.7	(2)
	04/11/17	0.0553 ± 0.0136	0.0677 ± 0.0187	pCi/cu m	0.069	(1)
	04/13/17	0.1008 ± 0.0169	0.1074 ± 0.0315	pCi/cu m	0.051	6.3
	04/18/17	0.0692 ± 0.0193	0.0722 ± 0.0200	pCi/cu m	0.117	(1)
	04/18/17	0.1584 ± 0.0214	0.1597 ± 0.0266	pCi/cu m	0.068	0.8
	04/19/17	0.0702 ± 0.0174	0.0938 ± 0.0230	pCi/cu m	0.094	(1)
	04/19/17	0.0861 ± 0.0299	0.1008 ± 0.0335	pCi/cu m	0.176	(1)
	04/27/17	0.1245 ± 0.0246	0.1257 ± 0.0233	pCi/cu m	0.103	1.0
	04/27/17	0.1338 ± 0.0286	0.1264 ± 0.0238	pCi/cu m	0.193	(1)
	05/02/17	0.1249 ± 0.0272	0.0927 ± 0.0222	pCi/cu m	0.155	(1)
	05/02/17	0.1265 ± 0.0407	0.0998 ± 0.0283	pCi/cu m	0.253	(1)
	7/12/2017	0.0616 ± 0.0188	0.0739 ± 0.0171	pCi/cu m	0.102	18.1
	7/12/2017	0.0954 ± 0.0211	0.0724 ± 0.0162	pCi/cu m	0.091	27.4
	7/13/2017	0.2120 ± 0.0444	0.1560 ± 0.0361	pCi/cu m	0.165	30.4
	7/13/2017	0.0995 ± 0.0178	0.0884 ± 0.0175	pCi/cu m	0.072	11.8
	7/13/2017	0.0965 ± 0.0239	0.0941 ± 0.0282	pCi/cu m	0.157	2.5
	7/13/2017	0.0799 ± 0.0210	0.0660 ± 0.0260	pCi/cu m	0.121	(1)
	7/14/2017	0.1279 ± 0.0220	0.1193 ± 0.0209	pCi/cu m	0.079	7.0
	7/14/2017	0.1074 ± 0.0188	0.1207 ± 0.0231	pCi/cu m	0.075	11.7
	7/14/2017	0.1262 ± 0.0289	0.1337 ± 0.0264	pCi/cu m	0.123	5.8
	7/17/2017	0.1514 ± 0.0204	0.1766 ± 0.0300	pCi/cu m	0.110	15.4
	7/17/2017	0.0919 ± 0.0240	0.0876 ± 0.0277	pCi/cu m	0.151	4.8
	7/18/2017	0.1571 ± 0.0393	0.1536 ± 0.0437	pCi/cu m	0.198	2.3
	7/20/2017	0.1601 ± 0.0362	0.1882 ± 0.0577	pCi/cu m	0.206	(1)
	7/25/2017	0.1415 ± 0.0232	0.1677 ± 0.0258	pCi/cu m	0.130	17.0
	7/28/2017	1.35E-13 ± 4.85E-14	1.42E-13 ± 4.06E-14	uCi/cc	1.80E-13	(1)

*RPD = Relative Percent Difference

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B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Be-7 (Gamma)	10/12/17	0.1412 ± 0.0242	0.1167 ± 0.0328	pCi/cu m	0.075	19
	10/18/17	0.1016 ± 0.0387	0.1627 ± 0.0332	pCi/cu m	0.184	(1)
	10/20/17	0.1300 ± 0.0314	0.1359 ± 0.0386	pCi/cu m	0.154	(1)
	10/20/17	0.1273 ± 0.0253	0.1427 ± 0.0353	pCi/cu m	0.148	(1)
	10/25/17	0.0779 ± 0.0205	0.0771 ± 0.0234	pCi/cu m	0.120	(1)
	10/27/17	0.1357 ± 0.0272	0.1150 ± 0.0265	pCi/cu m	0.086	16.5
	10/30/17	0.1455 ± 0.0261	0.1124 ± 0.0209	pCi/cu m	0.107	25.7
	10/30/17	0.1279 ± 0.0408	0.1118 ± 0.0288	pCi/cu m	0.147	(1)
	11/03/17	0.0753 ± 0.0184	0.0615 ± 0.0189	pCi/cu m	0.055	20.3
	11/03/17	0.0819 ± 0.0255	0.0726 ± 0.0273	pCi/cu m	0.128	(1)
	11/03/17	0.1448 ± 0.0673	0.1232 ± 0.0451	pCi/cu m	0.214	(1)
	11/03/17	0.0796 ± 0.0246	0.0901 ± 0.0256	pCi/cu m	0.132	(1)
Gross Alpha	01/25/17	< 4.21E-14	< 4.21E-14	uCi/cc	2.11E-13	(2)
	02/09/17	< 6.89E-15	< 6.97E-15	uCi/cc	3.45E-14	(2)
	02/22/17	< 6.69E-14	< 6.93E-14	uCi/cc	3.35E-13	(2)
	03/02/17	< 1.69E-14	< 1.64E-14	uCi/cc	8.45E-14	(2)
	04/20/17	< 3.66E-14	< 3.66E-14	uCi/cc	1.83E-13	(2)
	05/03/17	< 3.61E-15	< 3.59E-15	uCi/cc	1.81E-14	(2)
	05/04/17	< 3.64E-15	< 3.63E-15	uCi/cc	1.82E-14	(2)
	06/01/17	< 1.87E-14	< 1.89E-14	uCi/cc	9.35E-14	(2)
	06/07/17	< 3.74E-13	< 3.69E-13	uCi/cc	1.87E-12	(2)
	07/26/17	< 4.67E-14	< 4.67E-14	uCi/cc	2.34E-13	(2)
	08/29/17	< 2.27E-14	< 2.27E-14	uCi/cc	1.14E-13	(2)
	10/24/17	< 1.29E-14	< 1.29E-14	uCi/cc	6.45E-14	(2)
	10/30/17	< 2.80E-15	< 2.80E-15	uCi/cc	1.40E-14	(2)
	11/28/17	< 2.04E-14	< 2.05E-14	uCi/cc	1.02E-13	(2)
	12/27/17	< 1.69E-14	< 1.66E-14	uCi/cc	8.30E-14	(2)
Gross Beta	01/03/17	0.017 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0073	8.4
	01/03/17	0.020 ± 0.005	0.023 ± 0.005	pCi/cu m	0.0286	(1)
	01/03/17	0.027 ± 0.005	0.027 ± 0.005	pCi/cu m	0.0205	1.1
	01/03/17	0.017 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0077	2.4
	01/03/17	0.018 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0125	3.4
	01/03/17	0.021 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0112	7.0
	01/04/17	0.019 ± 0.004	0.022 ± 0.005	pCi/cu m	0.0224	(1)
	01/04/17	0.017 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0156	22.1
	01/04/17	0.014 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0172	(1)
	01/04/17	0.016 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0159	23.5
	01/04/17	0.015 ± 0.005	0.015 ± 0.005	pCi/cu m	0.0276	(1)
	01/04/17	0.020 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0190	8.3

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B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	01/09/17	0.013 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0088	11.9
	01/09/17	0.024 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0179	17.5
	01/10/17	0.009 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0285	(1)
	01/10/17	0.014 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0215	(1)
	01/10/17	0.009 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0161	(1)
	01/10/17	0.014 ± 0.005	0.013 ± 0.005	pCi/cu m	0.0307	(1)
	01/11/17	0.011 ± 0.004	0.009 ± 0.004	pCi/cu m	0.0287	(1)
	01/11/17	0.014 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0122	21.3
	01/11/17	0.008 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0173	(1)
	01/11/17	0.007 ± 0.003	0.007 ± 0.003	pCi/cu m	0.0168	(1)
	01/11/17	0.009 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0116	(1)
	01/11/17	0.018 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0172	8.5
	01/16/17	0.012 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0096	6.4
	01/16/17	0.011 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0282	(1)
	01/17/17	0.009 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0166	(1)
	01/17/17	0.022 ± 0.005	0.024 ± 0.005	pCi/cu m	0.0232	6.5
	01/17/17	0.008 ± 0.003	0.011 ± 0.004	pCi/cu m	0.0226	(1)
	01/17/17	0.013 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0162	(1)
	01/17/17	0.010 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0101	13.6
	01/18/17	0.027 ± 0.005	0.028 ± 0.005	pCi/cu m	0.0212	5.4
	01/19/17	< 0.007	0.008 ± 0.005	pCi/cu m	0.0355	(2)
	01/19/17	0.013 ± 0.005	0.016 ± 0.005	pCi/cu m	0.0301	(1)
	01/19/17	0.019 ± 0.005	0.017 ± 0.004	pCi/cu m	0.0260	(1)
	01/19/17	0.021 ± 0.005	0.022 ± 0.005	pCi/cu m	0.0256	(1)
	01/23/17	0.018 ± 0.003	0.020 ± 0.004	pCi/cu m	0.0145	9.8
	01/23/17	0.015 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0105	7.0
	01/24/17	0.011 ± 0.004	0.015 ± 0.005	pCi/cu m	0.0298	(1)
	01/24/17	0.011 ± 0.002	0.015 ± 0.003	pCi/cu m	0.0133	27.9
	01/24/17	0.013 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0103	1.6
	01/24/17	0.011 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0153	(1)
	01/25/17	0.013 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0082	16.9
	01/30/17	0.026 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0185	13.5
	01/30/17	0.019 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0169	6.6
	01/30/17	0.011 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0078	9.6
	01/30/17	0.016 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0158	9.8
	01/30/17	0.010 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0132	(1)
	01/30/17	0.013 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0167	(1)
	01/30/17	0.018 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0189	7.2
	01/30/17	0.021 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0196	9.9
	01/30/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0191	(1)
	01/31/17	0.023 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0186	13.3

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B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	01/31/17	0.022 ± 0.005	0.019 ± 0.004	pCi/cu m	0.0217	17.0
	02/02/17	0.015 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0201	(1)
	02/02/17	0.014 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0210	(1)
	02/02/17	0.006 ± 0.003	0.010 ± 0.004	pCi/cu m	0.0237	(1)
	02/06/17	0.014 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0106	4.8
	02/08/17	0.006 ± 0.002	0.007 ± 0.002	pCi/cu m	0.0155	(1)
	02/09/17	0.008 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0112	(1)
	02/09/17	0.012 ± 0.003	0.011 ± 0.002	pCi/cu m	0.0134	(1)
	02/09/17	0.007 ± 0.002	0.007 ± 0.002	pCi/cu m	0.0097	(1)
	02/13/17	0.013 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0068	8.0
	02/14/17	0.020 ± 0.002	0.020 ± 0.002	pCi/cu m	0.0065	2.5
	02/16/17	0.014 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0173	19.4
	02/16/17	0.012 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0164	(1)
	02/16/17	0.009 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0227	(1)
	02/16/17	0.014 ± 0.003	0.011 ± 0.002	pCi/cu m	0.0123	18.5
	02/16/17	0.011 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0214	(1)
	02/16/17	0.013 ± 0.005	0.011 ± 0.005	pCi/cu m	0.0312	(1)
	02/16/17	0.012 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0162	(1)
	02/16/17	0.009 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0290	(1)
	02/16/17	0.011 ± 0.006	0.011 ± 0.006	pCi/cu m	0.0388	(1)
	02/16/17	0.019 ± 0.004	0.022 ± 0.005	pCi/cu m	0.0231	(1)
	02/17/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0213	(1)
	02/17/17	0.016 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0205	(1)
	02/17/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0267	(1)
	02/17/17	0.031 ± 0.006	0.030 ± 0.006	pCi/cu m	0.0321	(1)
	02/17/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0149	4.0
	02/21/17	0.022 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0082	5.6
	02/23/17	0.016 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0156	22.7
	02/23/17	0.013 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0121	13.2
	02/23/17	0.013 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0241	(1)
	02/23/17	0.014 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0158	(1)
	02/23/17	0.015 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0078	2.0
	02/23/17	0.010 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0083	20.1
	02/24/17	0.019 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0173	15.5
	02/24/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0192	(1)
	02/24/17	0.017 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0195	(1)
	02/24/17	0.019 ± 0.004	0.022 ± 0.004	pCi/cu m	0.0226	(1)
	02/27/17	0.019 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0118	1.1
	02/28/17	0.017 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0152	17.1
	02/28/17	0.011 ± 0.003	0.011 ± 0.002	pCi/cu m	0.0140	(1)
	02/28/17	0.015 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0176	(1)

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B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	02/28/17	0.016 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0176	(1)
	03/02/17	0.020 ± 0.005	0.021 ± 0.005	pCi/cu m	0.0246	(1)
	03/02/17	0.016 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0221	(1)
	03/06/17	0.021 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0189	8.3
	03/06/17	0.030 ± 0.005	0.025 ± 0.005	pCi/cu m	0.0266	16.3
	03/06/17	0.013 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0095	12.6
	03/06/17	0.016 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0249	(1)
	03/13/17	0.023 ± 0.005	0.026 ± 0.005	pCi/cu m	0.0209	11.6
	03/13/17	0.022 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0138	4.0
	03/13/17	0.022 ± 0.004	0.024 ± 0.004	pCi/cu m	0.0199	9.2
	03/13/17	0.013 ± 0.002	0.009 ± 0.002	pCi/cu m	0.0101	(1)
	03/13/17	0.019 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0161	6.4
	03/13/17	0.012 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0211	(1)
	03/13/17	0.019 ± 0.004	0.024 ± 0.004	pCi/cu m	0.0204	22.0
	03/14/17	0.013 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0161	(1)
	03/14/17	0.013 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0199	(1)
	03/14/17	0.016 ± 0.003	0.017 ± 0.004	pCi/cu m	0.0160	3.7
	03/14/17	0.013 ± 0.004	0.015 ± 0.005	pCi/cu m	0.0264	(1)
	03/15/17	0.014 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0091	26.8
	03/16/17	0.012 ± 0.005	0.018 ± 0.005	pCi/cu m	0.0343	(1)
	03/16/17	0.015 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0199	(1)
	03/16/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0202	(1)
	03/16/17	0.014 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0187	(1)
	03/16/17	0.010 ± 0.004	0.009 ± 0.004	pCi/cu m	0.0234	(1)
	03/16/17	0.010 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0240	(1)
	03/16/17	0.012 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0098	5.0
	03/20/17	0.015 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0085	10.5
	03/22/17	0.018 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0175	6.3
	03/22/17	0.010 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0165	(1)
	03/22/17	0.015 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0208	(1)
	03/22/17	0.022 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0163	26.7
	03/22/17	0.021 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0206	(1)
	03/23/17	0.017 ± 0.004	0.014 ± 0.003	pCi/cu m	0.0183	(1)
	03/23/17	0.013 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0204	(1)
	03/27/17	0.010 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0187	(1)
	03/27/17	0.022 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0085	12.8
	03/27/17	0.014 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0214	(1)
	03/28/17	0.017 ± 0.002	0.019 ± 0.002	pCi/cu m	0.0056	8.3
	03/28/17	0.018 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0100	20.8
	03/28/17	0.018 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0124	8.0
	03/30/17	0.014 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0167	(1)

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B.18 Air Particulates
In-House Duplicates
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Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	03/30/17	0.014 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0107	14.9
	04/03/17	0.015 ± 0.005	0.016 ± 0.005	pCi/cu m	0.0298	(1)
	04/03/17	0.009 ± 0.004	0.008 ± 0.004	pCi/cu m	0.0247	(1)
	04/03/17	0.019 ± 0.005	0.020 ± 0.005	pCi/cu m	0.0287	(1)
	04/03/17	0.016 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0092	6.1
	04/03/17	0.015 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0233	(1)
	04/03/17	0.016 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0234	(1)
	04/03/17	0.014 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0226	(1)
	04/03/17	0.016 ± 0.005	0.014 ± 0.005	pCi/cu m	0.0288	(1)
	04/04/17	0.014 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0204	(1)
	04/06/17	0.016 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0122	15.6
	04/07/17	0.011 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0302	(1)
	04/07/17	0.015 ± 0.005	0.011 ± 0.004	pCi/cu m	0.0292	(1)
	04/10/17	0.011 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0162	(1)
	04/10/17	0.010 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0090	11.0
	04/10/17	0.018 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0161	12.8
	04/10/17	0.016 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0164	(1)
	04/10/17	0.017 ± 0.005	0.018 ± 0.005	pCi/cu m	0.0348	(1)
	04/11/17	0.012 ± 0.001	0.013 ± 0.002	pCi/cu m	0.0052	8.1
	04/11/17	0.019 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0205	(1)
	04/11/17	0.007 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0158	(1)
	04/11/17	0.014 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0201	(1)
	04/15/17	0.009 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0093	(1)
	04/15/17	0.008 ± 0.004	0.008 ± 0.004	pCi/cu m	0.0310	(1)
	04/17/17	0.011 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0119	(1)
	04/17/17	0.011 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0205	(1)
	04/17/17	< 0.005	0.010 ± 0.004	pCi/cu m	0.0273	(1)
	04/17/17	0.011 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0169	(1)
	04/17/17	0.011 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0210	(1)
	04/18/17	0.009 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0156	(1)
	04/19/17	0.009 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0084	13.3
	04/20/17	0.007 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0179	(1)
	04/20/17	0.010 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0240	(1)
	04/20/17	0.015 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0133	10.3
	04/23/17	0.009 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0230	(1)
	04/23/17	0.008 ± 0.004	0.009 ± 0.005	pCi/cu m	0.0315	(1)
	04/24/17	0.013 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0082	16.6
	04/25/17	0.016 ± 0.004	0.014 ± 0.003	pCi/cu m	0.0166	(1)
	04/25/17	0.014 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0184	(1)
	04/25/17	0.016 ± 0.003	0.018 ± 0.003	pCi/cu m	0.0150	12.5
	04/25/17	0.014 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0152	16.3

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	04/25/17	0.010 ± 0.002	0.009 ± 0.002	pCi/cu m	0.0113	(1)
	04/26/17	0.011 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0240	(1)
	04/26/17	0.012 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0268	(1)
	04/27/17	0.012 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0268	(1)
	04/27/17	0.011 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0225	(1)
	05/01/17	0.009 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0083	2.3
	05/02/17	0.020 ± 0.004	0.019 ± 0.003	pCi/cu m	0.0151	9.2
	05/02/17	0.006 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0127	(1)
	05/02/17	0.009 ± 0.002	0.009 ± 0.002	pCi/cu m	0.0125	(1)
	05/02/17	0.010 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0184	(1)
	05/02/17	0.007 ± 0.003	0.005 ± 0.002	pCi/cu m	0.0148	(1)
	05/02/17	0.017 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0154	14.2
	05/04/17	0.015 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0204	(1)
	05/04/17	0.012 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0209	(1)
	05/04/17	0.010 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0284	(1)
	05/04/17	0.010 ± 0.003	0.013 ± 0.004	pCi/cu m	0.0206	(1)
	05/04/17	0.012 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0265	(1)
	05/04/17	0.013 ± 0.004	0.009 ± 0.003	pCi/cu m	0.0213	(1)
	05/05/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0204	(1)
	05/05/17	< 0.006	< 0.006	pCi/cu m	0.0320	(2)
	05/08/17	0.010 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0096	2.9
	05/09/17	0.009 ± 0.004	0.009 ± 0.004	pCi/cu m	0.0244	(1)
	05/09/17	0.016 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0148	19.6
	05/09/17	0.009 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0251	(1)
	05/09/17	0.013 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0153	(1)
	05/09/17	0.012 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0135	16.6
	05/10/17	0.007 ± 0.002	0.006 ± 0.002	pCi/cu m	0.0148	(1)
	05/10/17	0.008 ± 0.005	< 0.007	pCi/cu m	0.0354	(1)
	05/10/17	< 0.007	0.011 ± 0.005	pCi/cu m	0.0367	(1)
	05/15/17	0.011 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0101	3.9
	05/16/17	0.007 ± 0.003	0.005 ± 0.003	pCi/cu m	0.0217	(1)
	05/16/17	0.007 ± 0.002	0.006 ± 0.002	pCi/cu m	0.0096	(1)
	05/16/17	0.010 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0195	(1)
	05/16/17	0.007 ± 0.002	0.009 ± 0.003	pCi/cu m	0.0156	(1)
	05/16/17	0.008 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0192	(1)
	05/16/17	0.012 ± 0.005	0.009 ± 0.005	pCi/cu m	0.0315	(1)
	05/16/17	0.010 ± 0.005	0.008 ± 0.005	pCi/cu m	0.0361	(1)
	05/16/17	0.008 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0195	(1)
	05/16/17	0.006 ± 0.003	0.006 ± 0.003	pCi/cu m	0.0157	(1)
	05/22/17	0.014 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0227	(1)
	05/22/17	0.006 ± 0.002	0.007 ± 0.002	pCi/cu m	0.0099	(1)

*RPD = Relative Percent Difference

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B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	05/22/17	0.018 ± 0.004	0.015 ± 0.003	pCi/cu m	0.0162	20.9
	05/22/17	0.007 ± 0.003	0.006 ± 0.003	pCi/cu m	0.0165	(1)
	05/22/17	0.016 ± 0.005	0.014 ± 0.004	pCi/cu m	0.0261	(1)
	05/23/17	0.008 ± 0.002	0.009 ± 0.002	pCi/cu m	0.0139	(1)
	05/23/17	0.009 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0155	(1)
	05/23/17	0.007 ± 0.002	0.007 ± 0.002	pCi/cu m	0.0150	(1)
	05/30/17	0.014 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0100	14.0
	05/30/17	0.020 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0153	2.6
	05/30/17	0.005 ± 0.002	0.004 ± 0.002	pCi/cu m	0.0102	(1)
	05/30/17	0.005 ± 0.002	0.006 ± 0.002	pCi/cu m	0.0085	(1)
	05/30/17	0.015 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0180	(1)
	05/31/17	0.019 ± 0.003	0.018 ± 0.002	pCi/cu m	0.0082	5.9
	05/31/17	0.014 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0206	(1)
	05/31/17	0.010 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0160	(1)
	05/31/17	0.016 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0126	5.5
	06/05/17	0.010 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0066	1.9
	06/05/17	0.007 ± 0.004	< 0.005	pCi/cu m	0.0269	(1)
	06/05/17	0.018 ± 0.004	0.020 ± 0.005	pCi/cu m	0.0240	(1)
	06/05/17	0.015 ± 0.004	0.014 ± 0.003	pCi/cu m	0.0189	(1)
	06/05/17	0.018 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0210	(1)
	06/05/17	< 0.006	< 0.006	pCi/cu m	0.0277	(2)
	06/05/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0179	(1)
	06/06/17	0.005 ± 0.002	0.004 ± 0.002	pCi/cu m	0.0168	(1)
	06/06/17	< 0.007	< 0.007	pCi/cu m	0.0330	(2)
	06/06/17	0.008 ± 0.004	0.007 ± 0.004	pCi/cu m	0.0229	(1)
	06/06/17	0.016 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0154	6.6
	06/07/17	0.012 ± 0.004	0.009 ± 0.004	pCi/cu m	0.0265	(1)
	06/07/17	0.011 ± 0.004	0.008 ± 0.003	pCi/cu m	0.0210	(1)
	06/07/17	0.011 ± 0.004	0.008 ± 0.003	pCi/cu m	0.0206	(1)
	06/07/17	0.006 ± 0.003	0.008 ± 0.004	pCi/cu m	0.0244	(1)
	06/07/17	0.010 ± 0.004	0.008 ± 0.004	pCi/cu m	0.0248	(1)
	06/07/17	0.008 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0183	(1)
	06/07/17	0.014 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0255	(1)
	06/12/17	0.009 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0094	(1)
	06/12/17	0.010 ± 0.003	0.015 ± 0.004	pCi/cu m	0.0201	(1)
	06/13/17	0.008 ± 0.002	0.007 ± 0.002	pCi/cu m	0.0109	(1)
	06/13/17	0.010 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0087	0.0
	06/13/17	0.008 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0127	(1)
	06/13/17	0.006 ± 0.002	0.005 ± 0.002	pCi/cu m	0.0147	(1)
	06/13/17	0.008 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0134	(1)
	06/13/17	0.010 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0204	(1)

*RPD = Relative Percent Difference

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(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	06/19/17	0.013 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0061	16.3
	06/20/17	0.009 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0173	(1)
	06/20/17	0.009 ± 0.004	0.007 ± 0.004	pCi/cu m	0.0308	(1)
	06/20/17	0.021 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0213	(1)
	06/20/17	0.014 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0216	(1)
	06/20/17	0.012 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0069	12.1
	06/21/17	0.016 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0200	(1)
	06/21/17	0.012 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0195	(1)
	06/21/17	0.007 ± 0.003	0.007 ± 0.003	pCi/cu m	0.0159	(1)
	06/21/17	0.014 ± 0.005	0.011 ± 0.005	pCi/cu m	0.0310	(1)
	06/21/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0162	(1)
	06/21/17	0.013 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0188	(1)
	06/22/17	0.017 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0196	(1)
	06/22/17	0.016 ± 0.005	0.011 ± 0.005	pCi/cu m	0.0341	(1)
	06/26/17	0.019 ± 0.003	0.018 ± 0.003	pCi/cu m	0.0116	8.7
	06/26/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0269	(1)
	06/26/17	0.015 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0099	2.7
	06/26/17	0.012 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0244	(1)
	06/26/17	0.017 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0140	(1)
	06/27/17	0.010 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0146	(1)
	06/27/17	0.015 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0167	(1)
	06/27/17	0.013 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0086	28.1
	06/27/17	0.011 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0146	(1)
	06/28/17	0.012 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0214	(1)
	07/03/17	0.012 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0077	13.9
	07/03/17	0.013 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0097	22.6
	07/10/17	0.014 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0108	23.8
	07/10/17	0.011 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0224	(1)
	07/10/17	0.015 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0154	(1)
	07/10/17	0.012 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0074	10.7
	07/10/17	0.013 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0207	(1)
	07/10/17	0.010 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0220	(1)
	07/10/17	0.013 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0234	(1)
	07/11/17	0.014 ± 0.005	0.013 ± 0.004	pCi/cu m	0.0294	(1)
	07/11/17	0.012 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0101	15.8
	07/11/17	0.012 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0249	(1)
	07/11/17	0.010 ± 0.004	0.008 ± 0.004	pCi/cu m	0.0225	(1)
	07/11/17	0.021 ± 0.006	0.025 ± 0.006	pCi/cu m	0.0346	(1)
	07/11/17	0.007 ± 0.003	0.008 ± 0.004	pCi/cu m	0.0225	(1)
	07/11/17	0.008 ± 0.003	0.009 ± 0.003	pCi/cu m	0.0210	(1)
	07/11/17	0.015 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0098	15.2

*RPD = Relative Percent Difference

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(2) NA - One or both results are non-detect

B.18 Air Particulates

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	07/11/17	0.012 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0176	(1)
	07/12/17	0.012 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0216	(1)
	07/12/17	0.013 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0276	(1)
	07/12/17	0.013 ± 0.005	0.009 ± 0.005	pCi/cu m	0.0361	(1)
	07/13/17	0.013 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0189	(1)
	07/13/17	0.020 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0226	(1)
	07/17/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0123	0.7
	07/18/17	0.020 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0210	(1)
	07/18/17	0.012 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0091	9.1
	07/18/17	0.014 ± 0.003	0.018 ± 0.003	pCi/cu m	0.0143	(1)
	07/18/17	0.013 ± 0.004	0.011 ± 0.003	pCi/cu m	0.0191	(1)
	07/20/17	0.019 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0204	(1)
	07/20/17	0.017 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0251	(1)
	07/24/17	0.014 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0092	7.5
	07/26/17	0.016 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0197	(1)
	07/26/17	0.013 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0160	(1)
	07/26/17	0.011 ± 0.005	0.010 ± 0.005	pCi/cu m	0.0355	(1)
	07/26/17	0.019 ± 0.003	0.016 ± 0.002	pCi/cu m	0.0098	12.0
	07/26/17	0.017 ± 0.006	0.015 ± 0.006	pCi/cu m	0.0402	(1)
	07/26/17	0.015 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0091	5.3
	07/26/17	0.015 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0197	(1)
	07/26/17	0.024 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0180	19.4
	07/26/17	0.023 ± 0.005	0.019 ± 0.004	pCi/cu m	0.0225	18.1
	07/27/17	0.022 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0169	16.8
	07/27/17	0.014 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0207	(1)
	07/27/17	0.024 ± 0.005	0.021 ± 0.005	pCi/cu m	0.0227	15.6
	07/27/17	0.014 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0252	(1)
	07/31/17	0.016 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0091	8.5
	07/31/17	0.019 ± 0.004	0.016 ± 0.003	pCi/cu m	0.0156	21.1
	07/31/17	0.010 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0163	(1)
	08/01/17	0.019 ± 0.005	0.016 ± 0.005	pCi/cu m	0.0275	(1)
	08/01/17	0.015 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0247	(1)
	08/01/17	0.014 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0089	5.8
	08/01/17	0.021 ± 0.004	0.021 ± 0.004	pCi/cu m	0.0189	1.0
	08/01/17	0.024 ± 0.003	0.024 ± 0.003	pCi/cu m	0.0157	2.1
	08/01/17	0.014 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0201	(1)
	08/02/17	0.018 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0211	(1)
	08/02/17	0.019 ± 0.004	0.021 ± 0.004	pCi/cu m	0.0213	(1)
	08/03/17	0.015 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0170	(1)
	08/07/17	0.011 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0139	(1)
	08/07/17	0.006 ± 0.003	0.005 ± 0.003	pCi/cu m	0.0192	(1)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	08/07/17	0.010 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0158	(1)
	08/07/17	0.012 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0138	(1)
	08/07/17	0.016 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0081	1.9
	08/08/17	0.011 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0077	8.9
	08/08/17	0.014 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0248	(1)
	08/08/17	0.010 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0125	(1)
	08/09/17	0.014 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0215	(1)
	08/10/17	0.011 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0225	(1)
	08/10/17	0.014 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0182	(1)
	08/14/17	0.011 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0147	(1)
	08/14/17	0.012 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0101	0.87
	08/14/17	0.013 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0185	(1)
	08/14/17	0.020 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0098	11.9
	08/14/17	0.017 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0250	(1)
	08/15/17	0.016 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0247	(1)
	08/15/17	0.013 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0257	(1)
	08/16/17	0.012 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0294	(1)
	08/17/17	0.014 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0250	(1)
	08/17/17	0.007 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0279	(1)
	08/17/17	0.019 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0163	0.5
	08/21/17	0.017 ± 0.002	0.019 ± 0.003	pCi/cu m	0.0077	9.0
	08/22/17	0.017 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0219	(1)
	08/22/17	0.017 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0099	3.6
	08/22/17	0.014 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0143	20.0
	08/22/17	0.021 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0220	(1)
	08/22/17	0.012 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0143	(1)
	08/22/17	0.022 ± 0.006	0.018 ± 0.005	pCi/cu m	0.0342	(1)
	08/23/17	0.018 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0215	(1)
	08/23/17	0.022 ± 0.005	0.019 ± 0.004	pCi/cu m	0.0251	(1)
	08/24/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0222	(1)
	08/28/17	0.016 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0105	7.8
	08/28/17	0.016 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0085	4.4
	08/28/17	0.019 ± 0.004	0.017 ± 0.003	pCi/cu m	0.0154	13.3
	08/28/17	0.017 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0150	21.8
	08/28/17	0.014 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0185	(1)
	08/29/17	0.020 ± 0.005	0.018 ± 0.004	pCi/cu m	0.0235	(1)
	08/29/17	0.013 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0186	(1)
	08/31/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0277	(1)
	08/31/17	0.018 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0181	5.0
	08/31/17	0.021 ± 0.005	0.023 ± 0.005	pCi/cu m	0.0159	(1)
	08/31/17	0.016 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0258	(1)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	09/05/17	0.015 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0182	(1)
	09/05/17	0.014 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0087	1.4
	09/05/17	0.019 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0158	13.0
	09/05/17	0.012 ± 0.005	0.011 ± 0.005	pCi/cu m	0.0322	(1)
	09/05/17	0.010 ± 0.005	0.013 ± 0.005	pCi/cu m	0.0374	(1)
	09/05/17	0.015 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0204	(1)
	09/05/17	0.021 ± 0.004	0.024 ± 0.004	pCi/cu m	0.0160	12.6
	09/05/17	0.008 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0097	(1)
	09/06/17	0.010 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0234	(1)
	09/07/17	0.019 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0205	(1)
	09/11/17	0.015 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0075	12.8
	09/11/17	0.012 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0163	(1)
	09/11/17	0.011 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0150	(1)
	09/11/17	0.018 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0242	(1)
	09/11/17	0.013 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0134	(1)
	09/12/17	0.013 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0091	7.5
	09/12/17	0.020 ± 0.005	0.016 ± 0.004	pCi/cu m	0.0246	(1)
	09/12/17	0.028 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0088	26.7
	09/12/17	0.019 ± 0.004	0.020 ± 0.005	pCi/cu m	0.0236	(1)
	09/13/17	0.017 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0084	3.6
	09/13/17	0.011 ± 0.002	0.013 ± 0.003	pCi/cu m	0.0137	(1)
	09/18/17	0.012 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0077	4.1
	09/18/17	0.017 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0250	(1)
	09/19/17	0.013 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0159	(1)
	09/19/17	0.012 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0151	(1)
	09/19/17	0.007 ± 0.005	0.007 ± 0.005	pCi/cu m	0.0327	(1)
	09/19/17	0.010 ± 0.003	0.008 ± 0.003	pCi/cu m	0.0225	(1)
	09/19/17	0.011 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0155	(1)
	09/19/17	0.015 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0200	(1)
	09/20/17	0.029 ± 0.004	0.032 ± 0.005	pCi/cu m	0.0182	9.7
	09/21/17	0.014 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0249	(1)
	09/21/17	0.011 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0138	(1)
	09/25/17	0.020 ± 0.003	0.024 ± 0.003	pCi/cu m	0.0091	17.4
	09/25/17	0.020 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0164	13.6
	09/25/17	0.019 ± 0.003	0.021 ± 0.004	pCi/cu m	0.0138	10.4
	09/25/17	0.010 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0137	(1)
	09/25/17	0.017 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0136	2.4
	09/26/17	0.016 ± 0.003	0.018 ± 0.003	pCi/cu m	0.0137	6.5
	09/26/17	0.022 ± 0.005	0.023 ± 0.005	pCi/cu m	0.0238	(1)
	09/26/17	0.030 ± 0.005	0.032 ± 0.006	pCi/cu m	0.0239	7.7
	09/26/17	0.019 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0166	24.9

*RPD = Relative Percent Difference

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(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	09/27/17	0.020 ± 0.004	0.022 ± 0.004	pCi/cu m	0.0223	(1)
	09/28/17	0.024 ± 0.004	0.027 ± 0.005	pCi/cu m	0.0198	13
	10/02/17	0.013 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0164	11.2
	10/02/17	0.017 ± 0.003	0.022 ± 0.004	pCi/cu m	0.0122	23.5
	10/02/17	0.019 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0110	1.1
	10/02/17	0.020 ± 0.006	0.018 ± 0.006	pCi/cu m	0.0340	(1)
	10/02/17	0.025 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0074	15.8
	10/03/17	0.015 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0111	12.4
	10/03/17	0.019 ± 0.003	0.022 ± 0.003	pCi/cu m	0.0103	12.6
	10/03/17	0.010 ± 0.005	0.008 ± 0.005	pCi/cu m	0.0368	(1)
	10/03/17	0.023 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0096	6.0
	10/04/17	0.016 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0145	17.9
	10/05/17	0.023 ± 0.005	0.023 ± 0.005	pCi/cu m	0.0229	(1)
	10/09/17	0.025 ± 0.003	0.027 ± 0.003	pCi/cu m	0.0096	6.6
	10/09/17	0.022 ± 0.003	0.023 ± 0.003	pCi/cu m	0.0097	3.6
	10/09/17	0.008 ± 0.002	0.009 ± 0.003	pCi/cu m	0.0142	9.8
	10/09/17	0.012 ± 0.004	0.015 ± 0.005	pCi/cu m	0.0278	19.1
	10/10/17	0.014 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0123	19.0
	10/10/17	0.018 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0212	(1)
	10/10/17	0.020 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0191	17.1
	10/10/17	0.013 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0106	9.1
	10/11/17	0.013 ± 0.002	0.017 ± 0.003	pCi/cu m	0.0124	27.6
	10/12/17	0.014 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0222	(1)
	10/12/17	0.013 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0235	(1)
	10/16/17	0.022 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0199	9.3
	10/16/17	0.011 ± 0.003	0.009 ± 0.002	pCi/cu m	0.0141	(1)
	10/16/17	0.013 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0173	(1)
	10/16/17	0.015 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0187	(1)
	10/16/17	0.012 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0266	(1)
	10/18/17	0.015 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0090	11.2
	10/18/17	0.021 ± 0.005	0.020 ± 0.005	pCi/cu m	0.0248	(1)
	10/18/17	0.016 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0248	(1)
	10/18/17	0.016 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0114	1.9
	10/23/17	< 0.003 ± 0.002	0.005 ± 0.002	pCi/cu m	0.0139	(1)
	10/23/17	0.016 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0087	5.6
	10/23/17	0.014 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0085	7.4
	10/23/17	0.010 ± 0.004	0.010 ± 0.003	pCi/cu m	0.0225	(1)
	10/23/17	0.009 ± 0.003	0.007 ± 0.003	pCi/cu m	0.0194	(1)
	10/23/17	0.015 ± 0.003	0.017 ± 0.003	pCi/cu m	0.0157	(1)
	10/24/17	0.013 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0105	13.0
	10/24/17	0.009 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0243	(1)

*RPD = Relative Percent Difference

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(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	10/25/17	0.017 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0210	(1)
	10/25/17	0.011 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0109	(1)
	10/25/17	0.010 ± 0.005	0.009 ± 0.004	pCi/cu m	0.0297	(1)
	10/26/17	0.014 ± 0.004	0.013 ± 0.004	pCi/cu m	0.0202	(1)
	10/30/17	0.015 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0092	1.3
	10/30/17	0.025 ± 0.003	0.023 ± 0.003	pCi/cu m	0.0161	7.0
	10/30/17	0.022 ± 0.005	0.027 ± 0.005	pCi/cu m	0.0295	(1)
	10/30/17	0.017 ± 0.004	0.015 ± 0.003	pCi/cu m	0.0193	(1)
	10/30/17	0.018 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0182	(1)
	10/31/17	0.017 ± 0.002	0.020 ± 0.003	pCi/cu m	0.0103	16.6
	11/01/17	0.015 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0230	(1)
	11/01/17	0.021 ± 0.005	0.022 ± 0.005	pCi/cu m	0.0271	(1)
	11/01/17	0.012 ± 0.005	0.013 ± 0.005	pCi/cu m	0.0347	(1)
	11/01/17	0.020 ± 0.004	0.022 ± 0.004	pCi/cu m	0.0214	(1)
	11/06/17	0.011 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0091	8.1
	11/06/17	0.011 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0244	(1)
	11/06/17	0.011 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0140	(1)
	11/06/17	0.009 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0087	(1)
	11/06/17	0.016 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0069	9.1
	11/06/17	0.014 ± 0.005	0.010 ± 0.005	pCi/cu m	0.0336	(1)
	11/06/17	0.014 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0127	9.2
	11/07/17	0.009 ± 0.005	0.009 ± 0.005	pCi/cu m	0.0325	(1)
	11/07/17	0.010 ± 0.002	0.008 ± 0.002	pCi/cu m	0.0102	(1)
	11/07/17	0.008 ± 0.002	0.009 ± 0.002	pCi/cu m	0.0102	(1)
	11/09/17	0.009 ± 0.004	0.010 ± 0.004	pCi/cu m	0.0217	(1)
	11/09/17	0.012 ± 0.004	0.011 ± 0.004	pCi/cu m	0.0207	(1)
	11/13/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0151	(1)
	11/13/17	0.015 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0087	4.1
	11/13/17	0.016 ± 0.004	0.012 ± 0.004	pCi/cu m	0.0269	(1)
	11/13/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0151	(1)
	11/13/17	0.010 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0193	(1)
	11/14/17	0.022 ± 0.004	0.024 ± 0.004	pCi/cu m	0.0184	8.9
	11/14/17	0.013 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0095	12.6
	11/15/17	0.013 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0117	14.8
	11/15/17	0.019 ± 0.004	0.019 ± 0.004	pCi/cu m	0.0174	0.5
	11/20/17	0.016 ± 0.003	0.018 ± 0.004	pCi/cu m	0.0159	9.5
	11/20/17	0.015 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0159	(1)
	11/20/17	0.014 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0166	(1)
	11/20/17	0.013 ± 0.003	0.013 ± 0.003	pCi/cu m	0.0179	(1)
	11/21/17	0.012 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0100	18.2
	11/21/17	0.012 ± 0.002	0.012 ± 0.002	pCi/cu m	0.0103	0.8

*RPD = Relative Percent Difference

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(2) NA - One or both results are non-detect

B.18 Air Particulates

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	11/21/17	0.021 ± 0.005	0.021 ± 0.005	pCi/cu m	0.0241	(1)
	11/26/17	0.004 ± 0.001	0.004 ± 0.001	pCi/cu m	0.0061	(1)
	11/26/17	0.010 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0144	(1)
	11/26/17	0.025 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0174	8.4
	11/26/17	0.012 ± 0.002	0.011 ± 0.002	pCi/cu m	0.0111	3.5
	11/27/17	0.025 ± 0.003	0.025 ± 0.003	pCi/cu m	0.0088	1.6
	11/28/17	0.012 ± 0.003	0.014 ± 0.004	pCi/cu m	0.0212	(1)
	11/28/17	0.009 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0127	(1)
	11/28/17	0.026 ± 0.004	0.026 ± 0.004	pCi/cu m	0.0143	0.4
	11/28/17	0.014 ± 0.003	0.012 ± 0.003	pCi/cu m	0.0138	13.5
	11/28/17	0.016 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0134	4.4
	11/28/17	0.023 ± 0.004	0.025 ± 0.005	pCi/cu m	0.0203	6.6
	11/29/17	0.022 ± 0.004	0.017 ± 0.004	pCi/cu m	0.0199	22.8
	11/29/17	0.020 ± 0.004	0.023 ± 0.004	pCi/cu m	0.0199	10.2
	11/29/17	0.024 ± 0.005	0.022 ± 0.005	pCi/cu m	0.0215	10.0
	12/04/17	0.017 ± 0.005	0.020 ± 0.005	pCi/cu m	0.0280	(1)
	12/04/17	0.019 ± 0.005	0.019 ± 0.005	pCi/cu m	0.0314	(1)
	12/04/17	0.016 ± 0.003	0.019 ± 0.003	pCi/cu m	0.0100	13.1
	12/04/17	0.021 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0094	0.5
	12/04/17	0.024 ± 0.004	0.021 ± 0.004	pCi/cu m	0.0170	14.8
	12/04/17	0.025 ± 0.005	0.027 ± 0.005	pCi/cu m	0.0230	5.7
	12/04/17	0.026 ± 0.003	0.025 ± 0.003	pCi/cu m	0.0128	4.4
	12/05/17	0.013 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0086	3.0
	12/05/17	0.015 ± 0.005	0.012 ± 0.004	pCi/cu m	0.0295	(1)
	12/05/17	0.014 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0086	7.0
	12/06/17	0.017 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0218	(1)
	12/11/17	0.023 ± 0.003	0.026 ± 0.003	pCi/cu m	0.0143	11.5
	12/11/17	0.016 ± 0.002	0.017 ± 0.002	pCi/cu m	0.0080	8.6
	12/11/17	0.014 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0094	14.2
	12/11/17	0.022 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0099	8.9
	12/11/17	0.014 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0139	2.8
	12/11/17	0.022 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0149	10.4
	12/12/17	0.017 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0228	(1)
	12/12/17	0.019 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0201	(1)
	12/13/17	0.018 ± 0.005	0.017 ± 0.004	pCi/cu m	0.0247	(1)
	12/13/17	0.015 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0097	3.4
	12/13/17	0.015 ± 0.002	0.015 ± 0.002	pCi/cu m	0.0094	1.3
	12/14/17	0.020 ± 0.004	0.022 ± 0.004	pCi/cu m	0.0207	(1)
	12/18/17	0.021 ± 0.003	0.023 ± 0.003	pCi/cu m	0.0100	5.5
	12/18/17	0.015 ± 0.003	0.015 ± 0.003	pCi/cu m	0.0141	3.3
	12/18/17	0.018 ± 0.004	0.015 ± 0.004	pCi/cu m	0.0173	20.4

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	12/18/17	0.011 ± 0.002	0.013 ± 0.002	pCi/cu m	0.0076	15.4
	12/18/17	0.020 ± 0.005	0.020 ± 0.005	pCi/cu m	0.0303	(1)
	12/18/17	0.015 ± 0.004	0.014 ± 0.004	pCi/cu m	0.0180	(1)
	12/19/17	0.016 ± 0.002	0.014 ± 0.002	pCi/cu m	0.0099	17.0
	12/19/17	0.015 ± 0.002	0.016 ± 0.002	pCi/cu m	0.0101	4.6
	12/19/17	0.019 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0226	(1)
	12/20/17	0.021 ± 0.004	0.025 ± 0.004	pCi/cu m	0.0199	18.2
	12/27/17	0.019 ± 0.003	0.021 ± 0.003	pCi/cu m	0.0083	10.6
	12/27/17	0.020 ± 0.003	0.020 ± 0.003	pCi/cu m	0.0133	4.0
	12/27/17	0.010 ± 0.003	0.011 ± 0.003	pCi/cu m	0.0176	(1)
	12/27/17	0.012 ± 0.003	0.010 ± 0.003	pCi/cu m	0.0160	(1)
	12/27/17	0.014 ± 0.004	0.018 ± 0.004	pCi/cu m	0.0219	(1)
	12/27/17	0.018 ± 0.004	0.020 ± 0.004	pCi/cu m	0.0175	11.2
	12/27/17	0.014 ± 0.003	0.016 ± 0.003	pCi/cu m	0.0142	8.1
	12/27/17	0.010 ± 0.005	0.013 ± 0.005	pCi/cu m	0.0324	(1)
	12/27/17	0.015 ± 0.003	0.014 ± 0.003	pCi/cu m	0.0117	6.4
	12/27/17	0.012 ± 0.002	0.010 ± 0.002	pCi/cu m	0.0111	18.7
	12/28/17	0.020 ± 0.004	0.016 ± 0.004	pCi/cu m	0.0208	(1)
	12/28/17	0.009 ± 0.003	0.007 ± 0.003	pCi/cu m	0.0212	(1)
Sr-89	01/09/17	< 5.27E-14	< 5.24E-14	uCi/cc	2.64E-13	(2)
	01/17/17	< 6.43E-05	< 6.67E-05	uCi/Total	3.22E-04	(2)
	01/23/17	< 6.66E-14	< 7.53E-14	uCi/cc	3.33E-13	(2)
	01/30/17	< 8.20E-05	< 6.38E-05	uCi/Total	4.10E-04	(2)
	01/31/17	< 3.05E-14	< 3.17E-14	uCi/cc	1.53E-13	(2)
	02/01/17	< 4.76E-14	< 4.09E-14	uCi/cc	2.38E-13	(2)
	02/02/17	< 3.05E-14	< 3.68E-14	uCi/cc	1.53E-13	(2)
	02/09/17	< 1.73E-14	< 1.25E-14	uCi/cc	8.65E-14	(2)
	02/14/17	< 6.20E-14	5.40E-14 ± 3.37E-14	uCi/cc	3.10E-13	(1)
	02/21/17	< 3.20E-14	< 3.73E-14	uCi/cc	1.60E-13	(2)
	02/22/17	< 4.28E-14	< 5.79E-14	uCi/cc	2.14E-13	(2)
	02/28/17	< 7.07E-12	< 7.30E-12	uCi/cc	3.54E-11	(2)
	03/01/17	< 1.02E-13	< 1.18E-13	uCi/cc	5.10E-13	(2)
	03/13/17	< 5.13E-14	< 5.19E-14	uCi/cc	2.57E-13	(2)
	03/14/17	1.28E-04 ± 5.95E-05	1.13E-04 ± 5.48E-05	uCi/Total	3.60E-04	(1)
	03/14/17	< 6.66E-14	< 7.63E-14	uCi/cc	3.33E-13	(2)
	03/21/17	< 6.79E-14	< 6.10E-14	uCi/cc	3.40E-13	(2)
	03/27/17	< 7.36E-14	< 7.44E-14	uCi/cc	3.68E-13	(2)
	03/28/17	< 2.74E-14	< 2.59E-14	uCi/cc	1.37E-13	(2)
	04/20/17	< 5.56E-04	< 3.10E-04	uCi/Total	2.78E-03	(2)
	05/01/17	< 9.56E-05	< 7.20E-05	uCi/Total	4.78E-04	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-89	05/02/17	< 1.42E-14	< 1.91E-14	uCi/cc	7.10E-14	(2)
	05/03/17	< 9.62E-14	< 5.86E-14	uCi/cc	4.81E-13	(2)
	05/11/17	< 7.55E-05	< 9.97E-05	uCi/Total	3.78E-04	(2)
	05/18/17	< 2.62E-14	< 4.02E-14	uCi/cc	1.31E-13	(2)
	05/22/17	< 6.56E-05	< 6.80E-05	uCi/Total	3.28E-04	(2)
	05/30/17	< 1.48E-14	< 1.47E-14	uCi/cc	7.40E-14	(2)
	05/31/17	< 8.42E-14	< 8.42E-14	uCi/cc	4.21E-13	(2)
	06/02/17	< 1.71E-14	< 1.33E-14	uCi/cc	8.55E-14	(2)
	06/12/17	< 8.06E-14	< 9.34E-14	uCi/cc	4.03E-13	(2)
	06/26/17	< 6.56E-05	< 5.79E-05	uCi/Total	3.28E-04	(2)
	07/12/17	< 5.60E-14	< 6.53E-14	uCi/cc	2.80E-13	(2)
	07/17/17	< 2.69E-14	< 3.14E-14	uCi/cc	1.35E-13	(2)
	07/18/17	< 5.90E-14	< 6.11E-14	uCi/cc	2.95E-13	(2)
	07/27/17	< 1.71E-14	< 1.93E-14	uCi/cc	8.55E-14	(2)
	07/31/17	6.22E-05 ± 3.76E-05	7.85E-05 ± 4.41E-05	uCi/Total	2.44E-04	(1)
	08/01/17	< 6.32E-15	< 7.40E-15	uCi/cc	3.16E-14	(2)
	08/09/17	< 6.19E-05	< 6.12E-05	uCi/Total	3.06E-04	(2)
	08/17/17	< 6.62E-14	< 6.20E-14	uCi/cc	3.10E-13	(2)
	08/29/17	< 2.81E-14	< 3.09E-14	uCi/cc	1.41E-13	(2)
	08/30/17	< 6.48E-05	< 9.94E-05	uCi/Total	3.24E-04	(2)
	08/30/17	< 6.34E-05	< 7.11E-05	uCi/Total	3.17E-04	(2)
	09/11/17	< 5.84E-14	< 6.09E-14	uCi/cc	2.92E-13	(2)
	09/14/17	< 2.70E-14	< 3.00E-14	uCi/cc	1.35E-13	(2)
	09/20/17	< 2.00E-14	< 2.36E-14	uCi/cc	1.00E-13	(2)
	09/25/17	< 1.95E-14	< 1.93E-14	uCi/cc	9.65E-14	(2)
	09/26/17	< 2.64E-13	< 2.89E-13	uCi/cc	1.32E-12	(2)
	09/27/17	< 2.53E-14	< 2.52E-14	uCi/cc	1.26E-13	(2)
	09/28/17	< 6.90E-05	< 5.77E-05	uCi/Total	2.89E-04	(2)
	10/09/17	< 5.42E-14	< 5.38E-14	uCi/cc	2.69E-13	(2)
	10/10/17	< 4.78E-15	< 5.06E-15	uCi/cc	2.39E-14	(2)
	10/24/17	< 9.07E-05	< 1.16E-04	uCi/Total	4.54E-04	(2)
	10/30/17	< 2.69E-14	< 2.77E-14	uCi/cc	1.35E-13	(2)
	10/31/17	< 8.52E-05	< 7.42E-05	uCi/Total	3.71E-04	(2)
	11/01/17	< 7.47E-05	< 7.70E-05	uCi/Total	3.74E-04	(2)
	11/01/17	< 1.35E-14	< 1.47E-14	uCi/cc	6.75E-14	(2)
	11/14/17	< 3.90E-14	5.07E-14 ± 2.86E-14	uCi/cc	1.72E-13	(1)
	11/21/17	< 8.10E-05	< 5.51E-05	uCi/Total	2.76E-04	(2)
	11/27/17	< 3.34E-12	< 3.35E-12	uCi/cc	1.67E-11	(2)
	11/28/17	< 2.46E-14	< 3.14E-14	uCi/cc	1.23E-13	(2)
	11/29/17	< 3.01E-14	< 3.67E-14	uCi/cc	1.51E-13	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

**B.18 Air Particulates
In-House Duplicates**

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-89	11/29/17	< 1.73E-14	< 1.76E-14	uCi/cc	8.65E-14	(2)
	11/30/17	< 5.59E-05	< 7.79E-05	uCi/Total	2.80E-04	(2)
	12/11/17	< 5.80E-14	< 5.56E-14	uCi/cc	2.78E-13	(2)
	12/18/17	< 5.66E-05	7.43E-05 ± 4.42E-05	uCi/Total	2.83E-04	(1)
	12/27/17	< 5.25E-14	< 4.76E-14	uCi/cc	2.38E-13	(2)
	12/28/17	4.46E-03 ± 2.74E-04	3.59E-03 ± 2.14E-04	uCi/Total	2.70E-04	21.6
Sr-90	01/09/17	< 1.26E-14	< 1.26E-14	uCi/cc	6.30E-14	(2)
	01/17/17	< 2.14E-05	< 1.78E-05	uCi/Total	1.07E-04	(2)
	01/23/17	< 2.31E-14	< 1.81E-14	uCi/cc	1.16E-13	(2)
	01/30/17	< 1.88E-05	< 1.50E-05	uCi/Total	9.40E-05	(2)
	01/31/17	< 3.74E-15	< 5.54E-15	uCi/cc	1.87E-14	(2)
	02/01/17	< 1.07E-14	< 1.09E-14	uCi/cc	5.35E-14	(2)
	02/02/17	< 1.15E-14	< 1.24E-14	uCi/cc	5.75E-14	(2)
	02/09/17	< 4.29E-15	< 3.54E-15	uCi/cc	2.15E-14	(2)
	02/14/17	< 5.33E-15	< 4.88E-15	uCi/cc	2.67E-14	(2)
	02/21/17	< 4.45E-15	< 3.84E-15	uCi/cc	2.23E-14	(2)
	02/22/17	< 5.99E-15	< 8.29E-15	uCi/cc	3.00E-14	(2)
	02/28/17	< 9.40E-13	< 7.33E-13	uCi/cc	4.70E-12	(2)
	03/01/17	< 2.79E-14	< 2.76E-14	uCi/cc	1.40E-13	(2)
	03/13/17	< 1.24E-14	< 1.14E-14	uCi/cc	6.20E-14	(2)
	03/14/17	< 2.23E-14	< 2.32E-14	uCi/cc	1.12E-13	(2)
	03/14/17	< 1.60E-05	< 2.00E-05	uCi/Total	8.00E-05	(2)
	03/21/17	< 1.97E-14	< 1.54E-14	uCi/cc	9.85E-14	(2)
	03/27/17	< 3.20E-14	< 1.79E-14	uCi/cc	1.60E-13	(2)
	03/28/17	< 1.22E-14	< 1.06E-14	uCi/cc	6.10E-14	(2)
	04/20/17	< 4.52E-05	< 2.41E-05	uCi/Total	2.26E-04	(2)
	05/01/17	< 2.09E-05	< 1.32E-05	uCi/Total	1.05E-04	(2)
	05/02/17	< 2.90E-15	< 4.13E-15	uCi/cc	1.45E-14	(2)
	05/03/17	< 3.24E-14	< 1.79E-14	uCi/cc	1.62E-13	(2)
	05/11/17	< 2.69E-05	< 2.77E-05	uCi/Total	1.35E-04	(2)
	05/18/17	< 1.04E-14	< 1.22E-14	uCi/cc	5.20E-14	(2)
	05/22/17	< 2.90E-05	< 2.69E-05	uCi/Total	1.45E-04	(2)
	05/31/17	< 8.55E-15	< 9.37E-15	uCi/cc	4.28E-14	(2)
	06/01/17	< 3.24E-15	< 1.72E-15	uCi/cc	1.62E-14	(2)
	06/02/17	< 2.36E-15	< 1.43E-15	uCi/cc	1.18E-14	(2)
	06/12/17	< 1.69E-14	< 2.08E-14	uCi/cc	8.45E-14	(2)
	06/26/17	< 2.27E-05	< 2.00E-05	uCi/Total	1.14E-04	(2)
	07/12/17	< 1.92E-14	< 1.60E-14	uCi/cc	8.00E-14	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.18 Air Particulates
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-90	07/17/17	< 9.04E-15	< 9.32E-15	uCi/cc	4.66E-14	(2)
	07/18/17	< 1.44E-14	< 1.35E-14	uCi/cc	6.75E-14	(2)
	07/27/17	< 3.31E-15	< 3.45E-15	uCi/cc	1.73E-14	(2)
	07/31/17	< 2.14E-05	< 1.48E-05	uCi/Total	7.40E-05	(2)
	08/01/17	< 1.94E-15	< 1.83E-15	uCi/cc	9.15E-15	(2)
	08/09/17	< 2.24E-05	< 1.83E-05	uCi/Total	9.15E-05	(2)
	08/17/17	< 1.79E-14	< 1.25E-14	uCi/cc	6.25E-14	(2)
	08/29/17	< 2.94E-15	< 3.82E-15	uCi/cc	1.91E-14	(2)
	08/30/17	< 1.68E-05	< 1.52E-05	uCi/Total	7.60E-05	(2)
	08/30/17	< 1.25E-13	< 5.18E-14	uCi/cc	2.59E-13	(2)
	08/30/17	< 1.42E-05	< 1.63E-05	uCi/Total	8.15E-05	(2)
	09/11/17	< 1.84E-14	< 2.20E-14	uCi/cc	1.10E-13	(2)
	09/14/17	< 6.90E-15	< 8.31E-15	uCi/cc	4.16E-14	(2)
	09/20/17	< 1.84E-15	< 2.26E-15	uCi/cc	1.13E-14	(2)
	09/25/17	< 4.44E-15	< 3.44E-15	uCi/cc	1.72E-14	(2)
	09/26/17	< 2.55E-14	< 2.43E-14	uCi/cc	1.22E-13	(2)
	09/27/17	< 8.05E-15	< 7.83E-15	uCi/cc	3.92E-14	(2)
	09/28/17	< 2.67E-05	< 2.22E-05	uCi/Total	1.11E-04	(2)
	10/09/17	< 1.80E-14	< 1.39E-14	uCi/cc	6.95E-14	(2)
	10/10/17	< 1.13E-15	< 1.14E-15	uCi/cc	5.65E-15	(2)
	10/24/17	< 2.35E-05	< 1.72E-05	uCi/Total	8.60E-05	(2)
	10/30/17	< 5.11E-15	< 5.59E-15	uCi/cc	2.56E-14	(2)
	10/31/17	< 2.10E-05	< 1.81E-05	uCi/Total	9.05E-05	(2)
	11/01/17	< 2.02E-05	< 1.63E-05	uCi/Total	8.15E-05	(2)
	11/01/17	< 2.27E-15	< 2.41E-15	uCi/cc	1.14E-14	(2)
	11/14/17	< 6.17E-15	< 5.94E-15	uCi/cc	2.97E-14	(2)
	11/21/17	< 2.66E-05	< 1.42E-05	uCi/Total	7.10E-05	(2)
	11/27/17	< 3.53E-13	< 2.91E-13	uCi/cc	1.46E-12	(2)
	11/28/17	< 3.53E-15	< 3.37E-15	uCi/cc	1.69E-14	(2)
	11/29/17	< 1.95E-15	< 1.31E-15	uCi/cc	6.55E-15	(2)
	11/29/17	< 2.45E-14	< 2.89E-14	uCi/cc	1.23E-13	(2)
	11/30/17	< 2.00E-05	< 1.86E-05	uCi/Total	9.30E-05	(2)
	12/05/17	< 1.60E-14	< 1.58E-14	uCi/cc	7.90E-14	(2)
	12/11/17	< 1.33E-14	< 1.50E-14	uCi/cc	6.65E-14	(2)
	12/18/17	< 2.11E-05	< 1.70E-05	uCi/Total	8.50E-05	(2)
	12/27/17	< 1.53E-14	< 1.05E-14	uCi/cc	5.25E-14	(2)
	12/29/17	< 2.05E-05	< 1.69E-05	uCi/Total	8.45E-05	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.19 Animals
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40	02/23/17	2720 ± 250	2700 ± 273	pCi/kg Wet	355	1.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - One or both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	01/03/17	< 4.77E-02	< 1.39E-02	pCi/cu m	2.38E-01	(2)
	01/06/17	< 2.41E-02	< 2.49E-02	pCi/cu m	1.21E-01	(2)
	01/06/17	< 2.58E-02	< 1.73E-02	pCi/cu m	1.29E-01	(2)
	01/06/17	< 7.90E-03	< 1.04E-02	pCi/cu m	3.95E-02	(2)
	01/06/17	< 1.16E-02	< 1.38E-02	pCi/cu m	5.79E-02	(2)
	01/09/17	< 1.38E-02	< 2.57E-02	pCi/cu m	6.88E-02	(2)
	01/09/17	< 2.64E-02	< 1.38E-02	pCi/cu m	1.32E-01	(2)
	01/09/17	< 4.24E-03	< 8.73E-03	pCi/cu m	2.12E-02	(2)
	01/09/17	< 3.20E-03	< 1.16E-02	pCi/cu m	1.60E-02	(2)
	01/09/17	< 1.05E-02	< 9.62E-03	pCi/cu m	5.25E-02	(2)
	01/10/17	< 9.25E-03	< 2.07E-02	pCi/cu m	4.63E-02	(2)
	01/11/17	< 1.13E-02	< 7.23E-03	pCi/cu m	5.66E-02	(2)
	01/11/17	< 1.45E-02	< 1.27E-02	pCi/cu m	7.26E-02	(2)
	01/12/17	< 1.79E-02	< 1.48E-02	pCi/cu m	8.97E-02	(2)
	01/16/17	< 2.26E-02	< 2.32E-02	pCi/cu m	1.13E-01	(2)
	01/16/17	< 1.83E-02	< 1.76E-02	pCi/cu m	9.13E-02	(2)
	01/16/17	< 1.58E-02	< 3.14E-02	pCi/cu m	7.88E-02	(2)
	01/16/17	< 1.57E-02	< 1.32E-02	pCi/cu m	7.85E-02	(2)
	01/16/17	< 5.78E-03	< 6.92E-03	pCi/cu m	2.89E-02	(2)
	01/17/17	< 6.78E-03	< 5.13E-03	pCi/cu m	3.39E-02	(2)
	01/17/17	< 1.70E-02	< 2.09E-02	pCi/cu m	8.51E-02	(2)
	01/17/17	< 1.24E-02	< 1.15E-02	pCi/cu m	6.18E-02	(2)
	01/18/17	< 2.20E-02	< 1.57E-02	pCi/cu m	1.10E-01	(2)
	01/19/17	< 1.73E-02	< 1.21E-02	pCi/cu m	8.66E-02	(2)
	01/19/17	< 1.07E-02	< 1.12E-02	pCi/cu m	5.33E-02	(2)
	01/19/17	< 1.07E-02	< 1.06E-02	pCi/cu m	5.36E-02	(2)
	01/20/17	< 1.22E-02	< 7.49E-03	pCi/cu m	6.08E-02	(2)
	01/20/17	< 6.15E-03	< 1.05E-02	pCi/cu m	3.08E-02	(2)
	01/23/17	< 1.36E-02	< 1.23E-02	pCi/cu m	6.78E-02	(2)
	01/24/17	< 2.50E-02	< 1.64E-02	pCi/cu m	1.25E-01	(2)
	01/24/17	< 1.68E-02	< 1.26E-02	pCi/cu m	8.42E-02	(2)
	01/25/17	< 1.62E-02	< 1.49E-02	pCi/cu m	8.09E-02	(2)
	01/25/17	< 1.18E-02	< 1.49E-02	pCi/cu m	5.91E-02	(2)
	01/26/17	< 2.37E-02	< 1.95E-02	pCi/cu m	1.18E-01	(2)
	01/26/17	< 1.67E-02	< 1.51E-02	pCi/cu m	8.34E-02	(2)
	01/26/17	< 6.46E-03	< 1.71E-02	pCi/cu m	3.23E-02	(2)
	01/26/17	< 1.82E-02	< 2.21E-02	pCi/cu m	9.11E-02	(2)
	01/30/17	< 1.77E-02	< 2.19E-02	pCi/cu m	8.87E-02	(2)
	01/31/17	< 2.31E-02	< 3.10E-02	pCi/cu m	1.15E-01	(2)
	01/31/17	< 5.60E-03	< 8.40E-03	pCi/cu m	2.80E-02	(2)
	01/31/17	< 1.29E-02	< 1.08E-02	pCi/cu m	6.44E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	02/01/17	< 2.40E-02	< 2.03E-02	pCi/cu m	1.20E-01	(2)
	02/01/17	< 7.79E-03	< 8.89E-03	pCi/cu m	3.89E-02	(2)
	02/01/17	< 1.43E-02	< 6.26E-03	pCi/cu m	7.15E-02	(2)
	02/02/17	< 3.15E-03	< 1.03E-02	pCi/cu m	1.57E-02	(2)
	02/02/17	< 1.66E-02	< 1.70E-02	pCi/cu m	8.30E-02	(2)
	02/03/17	< 2.05E-02	< 1.47E-02	pCi/cu m	1.02E-01	(2)
	02/03/17	< 1.70E-02	< 1.75E-02	pCi/cu m	8.48E-02	(2)
	02/06/17	< 1.85E-02	< 5.57E-02	pCi/cu m	9.23E-02	(2)
	02/07/17	< 1.49E-02	< 1.43E-02	pCi/cu m	7.46E-02	(2)
	02/07/17	< 1.45E-02	< 1.65E-02	pCi/cu m	7.23E-02	(2)
	02/08/17	< 2.45E-02	< 2.55E-02	pCi/cu m	1.22E-01	(2)
	02/09/17	< 1.43E-02	< 2.08E-02	pCi/cu m	7.15E-02	(2)
	02/09/17	< 1.30E-02	< 9.76E-03	pCi/cu m	6.50E-02	(2)
	02/09/17	< 1.72E-02	< 1.18E-02	pCi/cu m	8.62E-02	(2)
	02/09/17	< 1.15E-02	< 1.11E-02	pCi/cu m	5.73E-02	(2)
	02/13/17	< 1.13E-02	< 1.36E-02	pCi/cu m	5.64E-02	(2)
	02/13/17	< 1.66E-02	< 1.42E-02	pCi/cu m	8.32E-02	(2)
	02/14/17	< 1.84E-02	< 1.91E-02	pCi/cu m	9.20E-02	(2)
	02/15/17	< 1.36E-02	< 1.11E-02	pCi/cu m	6.78E-02	(2)
	02/15/17	< 7.99E-03	< 9.49E-03	pCi/cu m	3.99E-02	(2)
	02/15/17	< 8.64E-03	< 1.00E-02	pCi/cu m	4.32E-02	(2)
	02/16/17	< 2.16E-02	< 1.19E-02	pCi/cu m	1.08E-01	(2)
	02/21/17	< 2.10E-02	< 4.19E-02	pCi/cu m	1.05E-01	(2)
	02/21/17	< 2.85E-02	< 3.17E-02	pCi/cu m	1.42E-01	(2)
	02/21/17	< 2.41E-02	< 3.42E-02	pCi/cu m	1.21E-01	(2)
	02/21/17	< 2.49E-02	< 1.72E-02	pCi/cu m	1.25E-01	(2)
	02/21/17	< 8.20E-03	< 1.99E-02	pCi/cu m	4.10E-02	(2)
	02/21/17	< 1.93E-02	< 2.16E-02	pCi/cu m	9.63E-02	(2)
	02/22/17	< 1.13E-02	< 8.67E-03	pCi/cu m	5.66E-02	(2)
	02/23/17	< 1.87E-02	< 2.11E-02	pCi/cu m	9.33E-02	(2)
	02/23/17	< 2.54E-02	< 1.75E-02	pCi/cu m	1.27E-01	(2)
	02/23/17	< 1.21E-02	< 2.39E-02	pCi/cu m	6.05E-02	(2)
	02/24/17	< 1.15E-02	< 1.05E-02	pCi/cu m	5.77E-02	(2)
	02/24/17	< 1.32E-02	< 1.71E-02	pCi/cu m	6.61E-02	(2)
	02/24/17	< 1.01E-02	< 8.43E-03	pCi/cu m	5.06E-02	(2)
	02/27/17	< 1.89E-02	< 1.83E-02	pCi/cu m	9.43E-02	(2)
	02/27/17	< 6.49E-03	< 5.62E-03	pCi/cu m	3.25E-02	(2)
	02/27/17	< 7.27E-03	< 6.29E-03	pCi/cu m	3.63E-02	(2)
	02/28/17	< 1.64E-02	< 1.39E-02	pCi/cu m	8.20E-02	(2)
	03/01/17	< 8.79E-03	< 1.25E-02	pCi/cu m	4.40E-02	(2)
	03/01/17	< 1.04E-02	< 9.43E-03	pCi/cu m	5.19E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	03/02/17	< 1.21E-02	< 1.39E-02	pCi/cu m	6.04E-02	(2)
	03/02/17	< 1.02E-02	< 1.10E-02	pCi/cu m	5.11E-02	(2)
	03/02/17	< 1.39E-02	< 1.50E-02	pCi/cu m	6.96E-02	(2)
	03/03/17	< 2.42E-02	< 2.03E-02	pCi/cu m	1.21E-01	(2)
	03/03/17	< 2.82E-02	< 2.24E-02	pCi/cu m	1.41E-01	(2)
	03/06/17	< 1.67E-02	< 1.54E-02	pCi/cu m	8.37E-02	(2)
	03/07/17	< 1.77E-02	< 1.94E-02	pCi/cu m	8.84E-02	(2)
	03/08/17	< 1.24E-02	< 1.61E-02	pCi/cu m	6.22E-02	(2)
	03/08/17	< 9.91E-03	< 8.89E-03	pCi/cu m	4.96E-02	(2)
	03/09/17	< 1.20E-02	< 1.24E-02	pCi/cu m	6.01E-02	(2)
	03/09/17	< 1.76E-02	< 1.58E-02	pCi/cu m	8.81E-02	(2)
	03/10/17	< 1.24E-02	< 1.56E-02	pCi/cu m	6.19E-02	(2)
	03/10/17	< 6.95E-03	< 8.02E-03	pCi/cu m	3.47E-02	(2)
	03/13/17	< 2.52E-02	< 3.50E-02	pCi/cu m	1.26E-01	(2)
	03/13/17	< 2.84E-02	< 1.65E-02	pCi/cu m	1.42E-01	(2)
	03/13/17	< 1.62E-02	< 1.50E-02	pCi/cu m	8.10E-02	(2)
	03/14/17	< 1.53E-02	< 1.51E-02	pCi/cu m	7.65E-02	(2)
	03/14/17	< 1.83E-02	< 2.29E-02	pCi/cu m	9.14E-02	(2)
	03/14/17	< 1.47E-02	< 1.51E-02	pCi/cu m	7.37E-02	(2)
	03/15/17	< 1.91E-02	< 1.46E-02	pCi/cu m	9.55E-02	(2)
	03/16/17	< 1.80E-02	< 2.06E-02	pCi/cu m	8.99E-02	(2)
	03/16/17	< 1.40E-02	< 1.65E-02	pCi/cu m	7.01E-02	(2)
	03/16/17	< 1.76E-02	< 1.84E-02	pCi/cu m	8.79E-02	(2)
	03/20/17	< 1.60E-02	< 2.55E-02	pCi/cu m	7.99E-02	(2)
	03/20/17	< 2.28E-02	< 1.84E-02	pCi/cu m	1.14E-01	(2)
	03/20/17	< 1.37E-02	< 1.66E-02	pCi/cu m	6.83E-02	(2)
	03/20/17	< 2.03E-02	< 1.99E-02	pCi/cu m	1.02E-01	(2)
	03/20/17	< 1.26E-02	< 1.47E-02	pCi/cu m	6.31E-02	(2)
	03/22/17	< 1.31E-02	< 1.66E-02	pCi/cu m	6.54E-02	(2)
	03/23/17	< 3.11E-02	< 2.22E-02	pCi/cu m	1.56E-01	(2)
	03/23/17	< 1.55E-02	< 1.24E-02	pCi/cu m	7.76E-02	(2)
	03/23/17	< 1.79E-02	< 1.54E-02	pCi/cu m	8.97E-02	(2)
	03/24/17	< 5.23E-03	< 8.28E-03	pCi/cu m	2.61E-02	(2)
	03/24/17	< 4.23E-03	< 1.02E-02	pCi/cu m	2.12E-02	(2)
	03/27/17	< 2.41E-02	< 1.33E-02	pCi/cu m	1.21E-01	(2)
	03/28/17	< 1.54E-02	< 1.41E-02	pCi/cu m	7.69E-02	(2)
	03/28/17	< 2.29E-02	< 1.55E-02	pCi/cu m	1.14E-01	(2)
	03/28/17	< 1.49E-02	< 1.73E-02	pCi/cu m	7.47E-02	(2)
	03/29/17	< 1.20E-02	< 7.09E-03	pCi/cu m	6.00E-02	(2)
	03/29/17	< 7.29E-03	< 1.10E-02	pCi/cu m	3.65E-02	(2)
	03/30/17	< 1.47E-02	< 9.04E-03	pCi/cu m	7.36E-02	(2)

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	03/31/17	< 1.92E-02	< 1.70E-02	pCi/cu m	9.59E-02	(2)
	03/31/17	< 6.48E-03	< 8.72E-03	pCi/cu m	3.24E-02	(2)
	04/03/17	< 1.13E-02	< 1.54E-02	pCi/cu m	5.66E-02	(2)
	04/03/17	< 2.06E-02	< 1.31E-02	pCi/cu m	1.03E-01	(2)
	04/04/17	< 2.32E-02	< 1.35E-02	pCi/cu m	1.16E-01	(2)
	04/04/17	< 2.65E-02	< 2.61E-02	pCi/cu m	1.33E-01	(2)
	04/04/17	< 1.80E-02	< 1.36E-02	pCi/cu m	8.99E-02	(2)
	04/05/17	< 1.53E-02	< 9.48E-03	pCi/cu m	7.66E-02	(2)
	04/06/17	< 9.87E-03	< 1.47E-02	pCi/cu m	4.94E-02	(2)
	04/07/17	< 8.02E-03	< 1.19E-02	pCi/cu m	4.01E-02	(2)
	04/07/17	< 1.61E-02	< 1.35E-02	pCi/cu m	8.05E-02	(2)
	04/07/17	< 4.45E-03	< 7.36E-03	pCi/cu m	2.23E-02	(2)
	04/07/17	< 1.81E-02	< 1.66E-02	pCi/cu m	9.05E-02	(2)
	04/10/17	< 2.38E-02	< 2.77E-02	pCi/cu m	1.19E-01	(2)
	04/11/17	< 1.13E-02	< 9.02E-03	pCi/cu m	5.67E-02	(2)
	04/12/17	< 9.83E-03	< 1.04E-02	pCi/cu m	4.92E-02	(2)
	04/13/17	< 1.83E-02	< 1.26E-02	pCi/cu m	9.16E-02	(2)
	04/13/17	< 1.33E-02	< 7.97E-03	pCi/cu m	6.66E-02	(2)
	04/14/17	< 1.22E-02	< 1.68E-02	pCi/cu m	6.12E-02	(2)
	04/14/17	< 7.89E-03	< 1.26E-02	pCi/cu m	3.95E-02	(2)
	04/14/17	< 5.65E-03	< 6.11E-03	pCi/cu m	2.83E-02	(2)
	04/17/17	< 1.16E-02	< 1.44E-02	pCi/cu m	5.81E-02	(2)
	04/17/17	< 1.64E-02	< 1.90E-02	pCi/cu m	8.19E-02	(2)
	04/18/17	< 8.88E-03	< 1.56E-02	pCi/cu m	4.44E-02	(2)
	04/19/17	< 1.10E-02	< 8.11E-03	pCi/cu m	5.50E-02	(2)
	04/19/17	< 9.61E-03	< 7.43E-03	pCi/cu m	4.80E-02	(2)
	04/20/17	< 9.63E-03	< 1.35E-02	pCi/cu m	4.81E-02	(2)
	04/21/17	< 4.31E-03	< 8.90E-03	pCi/cu m	2.15E-02	(2)
	04/21/17	< 1.12E-02	< 1.21E-02	pCi/cu m	5.60E-02	(2)
	04/24/17	< 1.65E-02	< 1.30E-02	pCi/cu m	8.25E-02	(2)
	04/24/17	< 1.28E-02	< 7.65E-03	pCi/cu m	6.40E-02	(2)
	04/25/17	< 8.19E-03	< 5.43E-03	pCi/cu m	4.10E-02	(2)
	04/25/17	< 1.05E-02	< 8.45E-03	pCi/cu m	5.26E-02	(2)
	04/27/17	< 1.10E-02	< 1.10E-02	pCi/cu m	5.50E-02	(2)
	04/27/17	< 9.64E-03	< 5.15E-03	pCi/cu m	4.82E-02	(2)
	04/27/17	< 1.00E-02	< 1.04E-02	pCi/cu m	5.00E-02	(2)
	04/27/17	< 3.10E-02	< 3.13E-02	pCi/cu m	1.55E-01	(2)
	04/27/17	< 1.93E-02	< 1.72E-02	pCi/cu m	9.67E-02	(2)
	04/28/17	< 1.55E-02	< 1.36E-02	pCi/cu m	7.75E-02	(2)
	04/28/17	< 2.10E-02	< 2.47E-02	pCi/cu m	1.05E-01	(2)
	05/01/17	< 1.05E-02	< 7.77E-03	pCi/cu m	5.23E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	05/02/17	< 1.59E-02	< 1.87E-02	pCi/cu m	7.93E-02	(2)
	05/02/17	< 2.49E-02	< 2.54E-02	pCi/cu m	1.24E-01	(2)
	05/02/17	< 1.88E-02	< 2.06E-02	pCi/cu m	9.40E-02	(2)
	05/02/17	< 9.29E-03	< 1.92E-02	pCi/cu m	4.65E-02	(2)
	05/03/17	< 1.43E-02	< 2.00E-02	pCi/cu m	7.13E-02	(2)
	05/04/17	< 1.32E-02	< 1.04E-02	pCi/cu m	6.61E-02	(2)
	05/05/17	< 2.53E-02	< 2.40E-02	pCi/cu m	1.27E-01	(2)
	05/05/17	< 2.36E-02	< 2.16E-02	pCi/cu m	1.18E-01	(2)
	05/05/17	< 1.47E-02	< 1.96E-02	pCi/cu m	7.34E-02	(2)
	05/08/17	< 1.73E-02	< 1.30E-02	pCi/cu m	8.67E-02	(2)
	05/08/17	< 2.47E-02	< 1.23E-02	pCi/cu m	1.23E-01	(2)
	05/08/17	< 1.42E-02	< 1.64E-02	pCi/cu m	7.10E-02	(2)
	05/10/17	< 9.00E-03	< 1.12E-02	pCi/cu m	4.50E-02	(2)
	05/10/17	< 1.42E-02	< 1.24E-02	pCi/cu m	7.10E-02	(2)
	05/11/17	< 2.23E-02	< 1.26E-02	pCi/cu m	1.12E-01	(2)
	05/11/17	< 1.88E-02	< 2.25E-02	pCi/cu m	9.39E-02	(2)
	05/11/17	< 2.22E-02	< 1.56E-02	pCi/cu m	1.11E-01	(2)
	05/11/17	< 1.80E-02	< 1.75E-02	pCi/cu m	8.98E-02	(2)
	05/11/17	< 1.58E-02	< 3.05E-02	pCi/cu m	7.90E-02	(2)
	05/12/17	< 1.96E-02	< 1.22E-02	pCi/cu m	9.79E-02	(2)
	05/12/17	< 1.82E-02	< 1.53E-02	pCi/cu m	9.09E-02	(2)
	05/15/17	< 1.09E-02	< 1.97E-02	pCi/cu m	5.46E-02	(2)
	05/16/17	< 2.08E-02	< 1.35E-02	pCi/cu m	1.04E-01	(2)
	05/17/17	< 1.22E-02	< 1.21E-02	pCi/cu m	6.11E-02	(2)
	05/18/17	< 1.88E-02	< 2.05E-02	pCi/cu m	9.41E-02	(2)
	05/18/17	< 6.77E-03	< 1.03E-02	pCi/cu m	3.39E-02	(2)
	05/22/17	< 3.10E-02	< 3.00E-02	pCi/cu m	1.55E-01	(2)
	05/22/17	< 1.62E-02	< 8.65E-03	pCi/cu m	8.12E-02	(2)
	05/22/17	< 1.26E-02	< 2.97E-02	pCi/cu m	6.29E-02	(2)
	05/25/17	< 1.14E-02	< 9.21E-03	pCi/cu m	5.70E-02	(2)
	05/25/17	< 1.24E-02	< 1.80E-02	pCi/cu m	6.20E-02	(2)
	05/25/17	< 1.07E-02	< 6.86E-03	pCi/cu m	5.35E-02	(2)
	05/26/17	< 8.07E-03	< 1.78E-02	pCi/cu m	4.04E-02	(2)
	05/31/17	< 2.55E-02	< 1.32E-02	pCi/cu m	1.27E-01	(2)
	05/31/17	< 3.05E-02	< 3.28E-02	pCi/cu m	1.52E-01	(2)
	05/31/17	< 1.63E-02	< 2.93E-02	pCi/cu m	8.17E-02	(2)
	05/31/17	< 2.33E-02	< 3.49E-02	pCi/cu m	1.17E-01	(2)
	05/31/17	< 1.36E-02	< 1.17E-02	pCi/cu m	6.81E-02	(2)
	06/01/17	< 1.02E-02	< 1.71E-02	pCi/cu m	5.08E-02	(2)
	06/01/17	< 2.06E-02	< 2.55E-02	pCi/cu m	1.03E-01	(2)
	06/01/17	< 5.95E-03	< 9.58E-03	pCi/cu m	2.97E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	06/01/17	< 5.55E-03	< 7.27E-03	pCi/cu m	2.77E-02	(2)
	06/01/17	< 1.75E-02	< 2.76E-02	pCi/cu m	8.76E-02	(2)
	06/01/17	< 9.27E-03	< 1.13E-02	pCi/cu m	4.64E-02	(2)
	06/02/17	< 6.64E-03	< 8.94E-03	pCi/cu m	3.32E-02	(2)
	06/02/17	< 1.13E-02	< 1.56E-02	pCi/cu m	5.64E-02	(2)
	06/02/17	< 1.35E-02	< 1.91E-02	pCi/cu m	6.76E-02	(2)
	06/05/17	< 1.63E-02	< 1.67E-02	pCi/cu m	8.16E-02	(2)
	06/05/17	< 1.55E-02	< 1.41E-02	pCi/cu m	7.76E-02	(2)
	06/06/17	< 1.72E-02	< 2.08E-02	pCi/cu m	8.58E-02	(2)
	06/07/17	< 1.06E-02	< 2.14E-02	pCi/cu m	5.28E-02	(2)
	06/07/17	< 2.24E-02	< 1.82E-02	pCi/cu m	1.12E-01	(2)
	06/07/17	< 1.75E-02	< 1.23E-02	pCi/cu m	8.75E-02	(2)
	06/08/17	< 1.65E-02	< 1.12E-02	pCi/cu m	8.25E-02	(2)
	06/08/17	< 7.53E-03	< 1.11E-02	pCi/cu m	3.77E-02	(2)
	06/09/17	< 7.06E-03	< 4.77E-03	pCi/cu m	3.53E-02	(2)
	06/09/17	< 7.78E-03	< 5.80E-03	pCi/cu m	3.89E-02	(2)
	06/09/17	< 1.94E-02	< 1.12E-02	pCi/cu m	9.71E-02	(2)
	06/12/17	< 1.65E-02	< 3.30E-02	pCi/cu m	8.26E-02	(2)
	06/13/17	< 1.54E-02	< 1.47E-02	pCi/cu m	7.68E-02	(2)
	06/13/17	< 2.25E-02	< 1.45E-02	pCi/cu m	1.13E-01	(2)
	06/13/17	< 1.61E-02	< 1.17E-02	pCi/cu m	8.06E-02	(2)
	06/14/17	< 5.78E-03	< 6.59E-03	pCi/cu m	2.89E-02	(2)
	06/15/17	< 1.03E-02	< 1.42E-02	pCi/cu m	5.15E-02	(2)
	06/16/17	< 9.76E-03	< 1.62E-02	pCi/cu m	4.88E-02	(2)
	06/16/17	< 1.09E-02	< 1.09E-02	pCi/cu m	5.45E-02	(2)
	06/16/17	< 1.07E-02	< 1.51E-02	pCi/cu m	5.37E-02	(2)
	06/16/17	< 1.85E-02	< 1.72E-02	pCi/cu m	9.25E-02	(2)
	06/19/17	< 8.27E-03	< 1.35E-02	pCi/cu m	4.14E-02	(2)
	06/19/17	< 1.59E-02	< 1.63E-02	pCi/cu m	7.96E-02	(2)
	06/21/17	< 1.41E-02	< 7.90E-03	pCi/cu m	7.06E-02	(2)
	06/21/17	< 2.12E-02	< 2.94E-02	pCi/cu m	1.06E-01	(2)
	06/22/17	< 1.63E-02	< 1.15E-02	pCi/cu m	8.15E-02	(2)
	06/22/17	< 1.90E-02	< 1.32E-02	pCi/cu m	9.50E-02	(2)
	06/23/17	< 8.33E-03	< 1.24E-02	pCi/cu m	4.16E-02	(2)
	06/23/17	< 1.19E-02	< 1.50E-02	pCi/cu m	5.94E-02	(2)
	06/23/17	< 7.24E-03	< 8.85E-03	pCi/cu m	3.62E-02	(2)
	06/26/17	< 1.57E-02	< 1.47E-02	pCi/cu m	7.84E-02	(2)
	06/26/17	< 1.75E-02	< 1.58E-02	pCi/cu m	8.74E-02	(2)
	06/27/17	< 2.17E-02	< 1.79E-02	pCi/cu m	1.08E-01	(2)
	06/27/17	< 1.58E-02	< 2.03E-02	pCi/cu m	7.91E-02	(2)
	06/28/17	< 1.64E-02	< 1.08E-02	pCi/cu m	8.18E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	06/28/17	< 1.52E-02	< 7.69E-03	pCi/cu m	7.62E-02	(2)
	06/28/17	< 1.56E-02	< 2.07E-02	pCi/cu m	7.80E-02	(2)
	06/29/17	< 1.70E-02	< 2.04E-02	pCi/cu m	8.49E-02	(2)
	06/29/17	< 3.36E-03	< 6.60E-03	pCi/cu m	1.68E-02	(2)
	06/29/17	< 4.16E-03	< 5.58E-03	pCi/cu m	2.08E-02	(2)
	07/05/17	< 2.14E-02	< 1.69E-02	pCi/cu m	8.43E-02	(2)
	07/05/17	< 2.10E-02	< 1.65E-02	pCi/cu m	8.25E-02	(2)
	07/05/17	< 3.69E-02	< 2.33E-02	pCi/cu m	1.16E-01	(2)
	07/05/17	< 1.26E-02	< 1.74E-02	pCi/cu m	6.31E-02	(2)
	07/05/17	< 2.18E-02	< 2.41E-02	pCi/cu m	1.09E-01	(2)
	07/06/17	< 1.87E-02	< 1.63E-02	pCi/cu m	8.17E-02	(2)
	07/06/17	< 8.02E-03	< 1.14E-02	pCi/cu m	4.01E-02	(2)
	07/06/17	< 1.82E-02	< 1.07E-02	pCi/cu m	5.36E-02	(2)
	07/07/17	< 1.71E-02	< 1.29E-02	pCi/cu m	6.47E-02	(2)
	07/07/17	< 2.42E-02	< 2.51E-02	pCi/cu m	1.21E-01	(2)
	07/11/17	< 1.59E-02	< 1.34E-02	pCi/cu m	6.72E-02	(2)
	07/11/17	< 1.58E-02	< 1.31E-02	pCi/cu m	6.53E-02	(2)
	07/11/17	< 1.68E-02	< 1.03E-02	pCi/cu m	5.15E-02	(2)
	07/12/17	< 1.09E-02	< 2.78E-02	pCi/cu m	5.47E-02	(2)
	07/12/17	< 9.08E-03	< 1.08E-02	pCi/cu m	4.54E-02	(2)
	07/13/17	< 1.12E-02	< 1.55E-02	pCi/cu m	5.62E-02	(2)
	07/14/17	< 1.01E-02	< 1.09E-02	pCi/cu m	5.07E-02	(2)
	07/14/17	< 1.02E-02	< 1.55E-02	pCi/cu m	5.10E-02	(2)
	07/14/17	< 5.17E-03	< 1.07E-02	pCi/cu m	2.59E-02	(2)
	07/17/17	< 1.68E-02	< 2.43E-02	pCi/cu m	8.39E-02	(2)
	07/17/17	< 2.11E-02	< 2.43E-02	pCi/cu m	1.05E-01	(2)
	07/17/17	< 1.87E-02	< 1.61E-02	pCi/cu m	8.04E-02	(2)
	07/18/17	< 2.54E-02	< 3.67E-02	pCi/cu m	1.27E-01	(2)
	07/18/17	< 1.83E-02	< 2.57E-02	pCi/cu m	9.14E-02	(2)
	07/20/17	< 1.08E-02	< 1.86E-02	pCi/cu m	5.39E-02	(2)
	07/20/17	< 3.58E-03	< 6.91E-03	pCi/cu m	1.79E-02	(2)
	07/20/17	< 1.17E-02	< 8.58E-03	pCi/cu m	4.29E-02	(2)
	07/20/17	< 1.38E-02	< 1.91E-02	pCi/cu m	6.90E-02	(2)
	07/21/17	< 2.50E-02	< 1.71E-02	pCi/cu m	8.54E-02	(2)
	07/21/17	< 1.72E-02	< 1.40E-02	pCi/cu m	7.00E-02	(2)
	07/24/17	< 1.06E-02	< 2.37E-02	pCi/cu m	5.29E-02	(2)
	07/25/17	< 2.13E-02	< 2.88E-02	pCi/cu m	1.06E-01	(2)
	07/25/17	< 3.80E-02	< 2.23E-02	pCi/cu m	1.11E-01	(2)
	07/26/17	< 1.28E-02	< 2.89E-02	pCi/cu m	6.39E-02	(2)
	07/27/17	< 8.25E-03	< 8.11E-03	pCi/cu m	4.06E-02	(2)
	07/27/17	< 7.76E-03	< 7.05E-03	pCi/cu m	3.52E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	07/27/17	< 5.32E-03	< 8.96E-03	pCi/cu m	2.66E-02	(2)
	07/27/17	< 1.41E-02	< 1.01E-02	pCi/cu m	5.04E-02	(2)
	07/27/17	< 1.50E-02	< 1.43E-02	pCi/cu m	7.17E-02	(2)
	07/31/17	< 1.77E-02	< 2.50E-02	pCi/cu m	8.86E-02	(2)
	08/01/17	< 1.54E-02	< 1.84E-02	pCi/cu m	7.69E-02	(2)
	08/01/17	< 1.86E-02	< 1.77E-02	pCi/cu m	8.84E-02	(2)
	08/02/17	< 7.54E-03	< 1.09E-02	pCi/cu m	3.77E-02	(2)
	08/02/17	< 2.04E-02	< 2.52E-02	pCi/cu m	1.02E-01	(2)
	08/03/17	< 1.06E-02	< 9.00E-03	pCi/cu m	4.50E-02	(2)
	08/03/17	< 1.86E-02	< 1.72E-02	pCi/cu m	8.59E-02	(2)
	08/04/17	< 1.32E-02	< 1.05E-02	pCi/cu m	5.27E-02	(2)
	08/04/17	< 4.77E-03	< 9.15E-03	pCi/cu m	2.38E-02	(2)
	08/07/17	< 1.78E-02	< 1.44E-02	pCi/cu m	7.20E-02	(2)
	08/07/17	< 1.31E-02	< 1.15E-02	pCi/cu m	5.76E-02	(2)
	08/08/17	< 1.75E-02	< 1.59E-02	pCi/cu m	7.93E-02	(2)
	08/08/17	< 1.45E-02	< 1.95E-02	pCi/cu m	7.23E-02	(2)
	08/10/17	< 1.22E-02	< 1.02E-02	pCi/cu m	5.09E-02	(2)
	08/10/17	< 9.21E-03	< 1.32E-02	pCi/cu m	4.61E-02	(2)
	08/10/17	< 1.68E-02	< 8.12E-03	pCi/cu m	8.41E-02	(2)
	08/11/17	< 1.85E-02	< 1.49E-02	pCi/cu m	7.45E-02	(2)
	08/11/17	< 1.80E-02	< 1.86E-02	pCi/cu m	8.98E-02	(2)
	08/14/17	< 2.80E-02	< 2.66E-02	pCi/cu m	1.33E-01	(2)
	08/14/17	< 2.45E-02	< 3.35E-02	pCi/cu m	1.23E-01	(2)
	08/14/17	< 2.43E-02	< 2.88E-02	pCi/cu m	1.22E-01	(2)
	08/14/17	< 8.68E-03	< 9.37E-03	pCi/cu m	4.34E-02	(2)
	08/15/17	< 1.16E-02	< 8.40E-03	pCi/cu m	4.20E-02	(2)
	08/15/17	< 1.76E-02	< 1.50E-02	pCi/cu m	7.52E-02	(2)
	08/17/17	< 2.77E-02	< 2.71E-02	pCi/cu m	1.36E-01	(2)
	08/17/17	< 2.50E-02	< 1.53E-02	pCi/cu m	7.64E-02	(2)
	08/17/17	< 1.27E-02	< 1.33E-02	pCi/cu m	6.36E-02	(2)
	08/18/17	< 1.24E-02	< 1.02E-02	pCi/cu m	5.09E-02	(2)
	08/18/17	< 6.34E-03	< 1.00E-02	pCi/cu m	3.17E-02	(2)
	08/21/17	< 1.83E-02	< 2.17E-02	pCi/cu m	9.14E-02	(2)
	08/21/17	< 2.09E-02	< 1.91E-02	pCi/cu m	9.55E-02	(2)
	08/22/17	< 2.45E-02	< 2.01E-02	pCi/cu m	1.01E-01	(2)
	08/22/17	< 2.64E-02	< 2.74E-02	pCi/cu m	1.32E-01	(2)
	08/23/17	< 1.11E-02	< 9.24E-03	pCi/cu m	4.62E-02	(2)
	08/23/17	< 1.06E-02	< 6.48E-03	pCi/cu m	3.24E-02	(2)
	08/24/17	< 1.83E-02	< 1.53E-02	pCi/cu m	7.64E-02	(2)
	08/24/17	< 1.04E-02	< 1.06E-02	pCi/cu m	5.20E-02	(2)
	08/24/17	< 1.41E-02	< 1.54E-02	pCi/cu m	7.07E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	08/24/17	< 7.88E-03	< 7.81E-03	pCi/cu m	3.90E-02	(2)
	08/28/17	< 1.52E-02	< 3.12E-02	pCi/cu m	7.61E-02	(2)
	08/28/17	< 2.93E-02	< 2.74E-02	pCi/cu m	1.37E-01	(2)
	08/29/17	< 3.24E-02	< 2.21E-02	pCi/cu m	1.11E-01	(2)
	08/29/17	< 3.19E-02	< 4.34E-02	pCi/cu m	1.59E-01	(2)
	08/30/17	< 1.62E-02	< 1.73E-02	pCi/cu m	8.10E-02	(2)
	08/30/17	< 2.80E-02	< 1.49E-02	pCi/cu m	7.45E-02	(2)
	08/31/17	< 2.40E-02	< 2.41E-02	pCi/cu m	1.20E-01	(2)
	09/01/17	< 1.23E-02	< 1.28E-02	pCi/cu m	6.13E-02	(2)
	09/01/17	< 1.59E-02	< 1.29E-02	pCi/cu m	6.47E-02	(2)
	09/01/17	< 1.13E-02	< 7.63E-03	pCi/cu m	3.81E-02	(2)
	09/05/17	< 1.87E-02	< 1.66E-02	pCi/cu m	8.31E-02	(2)
	09/05/17	< 2.17E-02	< 3.69E-02	pCi/cu m	1.09E-01	(2)
	09/06/17	< 2.16E-02	< 2.45E-02	pCi/cu m	1.08E-01	(2)
	09/07/17	< 1.36E-02	< 2.28E-02	pCi/cu m	6.80E-02	(2)
	09/07/17	< 6.88E-03	< 6.68E-03	pCi/cu m	3.34E-02	(2)
	09/07/17	< 7.91E-03	< 1.23E-02	pCi/cu m	3.95E-02	(2)
	09/08/17	< 1.75E-02	< 1.16E-02	pCi/cu m	5.81E-02	(2)
	09/08/17	< 2.26E-02	< 3.65E-02	pCi/cu m	1.13E-01	(2)
	09/11/17	< 2.40E-02	< 2.64E-02	pCi/cu m	1.20E-01	(2)
	09/11/17	< 2.04E-02	< 2.80E-02	pCi/cu m	1.02E-01	(2)
	09/11/17	< 1.20E-02	< 1.77E-02	pCi/cu m	6.02E-02	(2)
	09/12/17	< 4.70E-03	< 1.12E-02	pCi/cu m	2.35E-02	(2)
	09/12/17	< 2.44E-02	< 1.70E-02	pCi/cu m	8.50E-02	(2)
	09/12/17	< 1.66E-02	< 2.58E-02	pCi/cu m	8.28E-02	(2)
	09/13/17	< 1.41E-02	< 8.93E-03	pCi/cu m	4.47E-02	(2)
	09/14/17	< 1.27E-02	< 9.54E-03	pCi/cu m	4.77E-02	(2)
	09/15/17	< 1.55E-02	< 1.94E-02	pCi/cu m	7.74E-02	(2)
	09/15/17	< 1.37E-02	< 1.51E-02	pCi/cu m	6.87E-02	(2)
	09/19/17	< 2.03E-02	< 2.87E-02	pCi/cu m	1.01E-01	(2)
	09/19/17	< 2.26E-02	< 2.49E-02	pCi/cu m	1.13E-01	(2)
	09/19/17	< 4.85E-02	< 2.23E-02	pCi/cu m	1.12E-01	(2)
	09/19/17	< 2.69E-02	< 2.33E-02	pCi/cu m	1.16E-01	(2)
	09/19/17	< 6.46E-03	< 1.29E-02	pCi/cu m	3.23E-02	(2)
	09/21/17	< 1.05E-02	< 1.24E-02	pCi/cu m	5.23E-02	(2)
	09/21/17	< 9.53E-03	< 1.39E-02	pCi/cu m	4.76E-02	(2)
	09/21/17	< 1.57E-02	< 1.71E-02	pCi/cu m	7.84E-02	(2)
	09/21/17	< 5.90E-03	< 6.62E-03	pCi/cu m	2.95E-02	(2)
	09/22/17	< 3.48E-02	< 2.34E-02	pCi/cu m	1.17E-01	(2)
	09/22/17	< 2.24E-02	< 1.84E-02	pCi/cu m	9.22E-02	(2)
	09/25/17	< 1.67E-02	< 2.72E-02	pCi/cu m	8.33E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	09/26/17	< 1.78E-02	< 2.68E-02	pCi/cu m	8.91E-02	(2)
	09/27/17	< 3.56E-02	< 2.03E-02	pCi/cu m	1.02E-01	(2)
	09/27/17	< 3.17E-02	< 1.74E-02	pCi/cu m	8.71E-02	(2)
	09/27/17	< 2.25E-02	< 1.28E-02	pCi/cu m	6.41E-02	(2)
	09/27/17	< 1.71E-02	< 2.46E-02	pCi/cu m	8.53E-02	(2)
	09/28/17	< 6.73E-03	< 9.47E-03	pCi/cu m	3.36E-02	(2)
	09/28/17	< 2.14E-02	< 3.23E-02	pCi/cu m	1.07E-01	(2)
	09/29/17	< 3.88E-02	< 3.11E-02	pCi/cu m	1.56E-01	(2)
	10/02/17	< 2.52E-02	< 3.02E-02	pCi/cu m	1.26E-01	(2)
	10/02/17	< 3.01E-02	< 1.63E-02	pCi/cu m	8.16E-02	(2)
	10/03/17	< 8.32E-03	< 4.07E-02	pCi/cu m	2.03E-01	(2)
	10/03/17	< 2.48E-02	< 1.73E-02	pCi/cu m	8.63E-02	(2)
	10/03/17	< 2.21E-02	< 1.76E-02	pCi/cu m	8.79E-02	(2)
	10/05/17	< 1.48E-02	< 1.13E-02	pCi/cu m	5.64E-02	(2)
	10/05/17	< 3.50E-02	< 1.29E-02	pCi/cu m	6.44E-02	(2)
	10/06/17	< 2.49E-02	< 1.89E-02	pCi/cu m	9.47E-02	(2)
	10/06/17	< 7.73E-03	< 1.42E-02	pCi/cu m	7.12E-02	(2)
	10/06/17	< 2.05E-02	< 1.98E-02	pCi/cu m	9.91E-02	(2)
	10/09/17	< 3.24E-02	< 2.26E-02	pCi/cu m	1.13E-01	(2)
	10/09/17	< 2.64E-02	< 1.34E-02	pCi/cu m	1.32E-01	(2)
	10/10/17	< 1.56E-02	< 2.68E-02	pCi/cu m	7.78E-02	(2)
	10/10/17	< 2.63E-02	< 1.85E-02	pCi/cu m	9.24E-02	(2)
	10/11/17	< 2.11E-02	< 1.80E-02	pCi/cu m	9.00E-02	(2)
	10/12/17	< 1.84E-02	< 1.95E-02	pCi/cu m	9.18E-02	(2)
	10/12/17	< 9.80E-03	< 8.74E-03	pCi/cu m	4.37E-02	(2)
	10/12/17	< 1.59E-02	< 1.01E-02	pCi/cu m	5.07E-02	(2)
	10/12/17	< 1.06E-02	< 8.66E-03	pCi/cu m	4.33E-02	(2)
	10/13/17	< 3.43E-02	< 2.27E-02	pCi/cu m	1.14E-01	(2)
	10/16/17	< 1.23E-02	< 8.66E-03	pCi/cu m	4.33E-02	(2)
	10/17/17	< 1.19E-02	< 2.33E-02	pCi/cu m	5.95E-02	(2)
	10/17/17	< 1.57E-02	< 1.11E-02	pCi/cu m	5.56E-02	(2)
	10/18/17	< 3.42E-02	< 2.20E-02	pCi/cu m	1.10E-01	(2)
	10/18/17	< 9.85E-03	< 1.55E-02	pCi/cu m	4.92E-02	(2)
	10/18/17	< 7.24E-03	< 1.03E-02	pCi/cu m	3.62E-02	(2)
	10/18/17	< 1.65E-02	< 1.83E-02	pCi/cu m	8.27E-02	(2)
	10/18/17	< 1.22E-02	< 1.82E-02	pCi/cu m	6.10E-02	(2)
	10/20/17	< 9.74E-03	< 1.05E-02	pCi/cu m	4.87E-02	(2)
	10/20/17	< 6.75E-03	< 1.36E-02	pCi/cu m	3.37E-02	(2)
	10/23/17	< 1.69E-02	< 1.68E-02	pCi/cu m	8.42E-02	(2)
	10/23/17	< 3.00E-02	< 1.42E-02	pCi/cu m	7.09E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	10/24/17	< 2.16E-02	< 2.60E-02	pCi/cu m	1.08E-01	(2)
	10/25/17	< 1.62E-02	< 1.03E-02	pCi/cu m	5.13E-02	(2)
	10/25/17	< 1.45E-02	< 8.47E-03	pCi/cu m	4.23E-02	(2)
	10/25/17	< 1.74E-02	< 1.83E-02	pCi/cu m	8.70E-02	(2)
	10/26/17	< 4.96E-03	< 1.48E-02	pCi/cu m	2.48E-02	(2)
	10/26/17	< 2.73E-02	< 1.85E-02	pCi/cu m	9.26E-02	(2)
	10/27/17	< 1.31E-02	< 1.69E-02	pCi/cu m	6.54E-02	(2)
	10/30/17	< 1.55E-02	< 1.69E-02	pCi/cu m	7.73E-02	(2)
	10/30/17	< 1.68E-02	< 1.92E-02	pCi/cu m	8.40E-02	(2)
	10/30/17	< 2.52E-02	< 1.08E-02	pCi/cu m	5.41E-02	(2)
	10/30/17	< 3.05E-02	< 2.34E-02	pCi/cu m	1.17E-01	(2)
	10/31/17	< 1.92E-02	< 2.13E-02	pCi/cu m	9.61E-02	(2)
	11/01/17	< 2.19E-02	< 1.31E-02	pCi/cu m	6.56E-02	(2)
	11/02/17	< 9.84E-03	< 1.79E-02	pCi/cu m	4.92E-02	(2)
	11/02/17	< 1.23E-02	< 9.82E-03	pCi/cu m	4.91E-02	(2)
	11/03/17	< 2.64E-02	< 1.61E-02	pCi/cu m	8.05E-02	(2)
	11/03/17	< 1.14E-02	< 1.01E-02	pCi/cu m	5.04E-02	(2)
	11/03/17	< 6.63E-03	< 1.07E-02	pCi/cu m	3.31E-02	(2)
	11/03/17	< 9.93E-03	< 1.31E-02	pCi/cu m	4.96E-02	(2)
	11/07/17	< 2.32E-02	< 1.81E-02	pCi/cu m	9.05E-02	(2)
	11/07/17	< 2.98E-02	< 2.45E-02	pCi/cu m	1.22E-01	(2)
	11/07/17	< 1.91E-02	< 3.09E-02	pCi/cu m	9.57E-02	(2)
	11/09/17	< 1.14E-02	< 1.07E-02	pCi/cu m	5.35E-02	(2)
	11/09/17	< 2.39E-02	< 3.75E-02	pCi/cu m	1.20E-01	(2)
	11/09/17	< 2.02E-02	< 1.45E-02	pCi/cu m	7.26E-02	(2)
	11/09/17	< 3.72E-02	< 2.27E-02	pCi/cu m	1.13E-01	(2)
	11/10/17	< 3.28E-02	< 1.92E-02	pCi/cu m	9.59E-02	(2)
	11/10/17	< 2.37E-02	< 8.50E-03	pCi/cu m	4.25E-02	(2)
	11/13/17	< 3.08E-02	< 1.49E-02	pCi/cu m	7.46E-02	(2)
	11/14/17	< 2.84E-02	< 9.88E-03	pCi/cu m	4.94E-02	(2)
	11/14/17	< 2.19E-02	< 2.18E-02	pCi/cu m	1.09E-01	(2)
	11/15/17	< 1.26E-02	< 8.16E-03	pCi/cu m	4.08E-02	(2)
	11/15/17	< 1.18E-02	< 1.44E-02	pCi/cu m	5.91E-02	(2)
	11/16/17	< 5.68E-03	< 8.81E-03	pCi/cu m	2.84E-02	(2)
	11/16/17	< 2.02E-02	< 2.05E-02	pCi/cu m	1.01E-01	(2)
	11/17/17	< 1.70E-02	< 2.86E-02	pCi/cu m	8.50E-02	(2)
	11/20/17	< 3.18E-03	< 4.86E-03	pCi/cu m	1.59E-02	(2)
	11/20/17	< 2.26E-02	< 1.74E-02	pCi/cu m	8.69E-02	(2)
	11/20/17	< 1.55E-02	< 1.42E-02	pCi/cu m	7.10E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	11/20/17	< 1.05E-02	< 2.61E-02	pCi/cu m	5.25E-02	(2)
	11/21/17	< 1.59E-02	< 1.59E-02	pCi/cu m	7.97E-02	(2)
	11/21/17	< 1.95E-02	< 2.99E-02	pCi/cu m	9.77E-02	(2)
	11/22/17	< 1.92E-02	< 1.65E-02	pCi/cu m	8.26E-02	(2)
	11/22/17	< 2.54E-02	< 2.45E-02	pCi/cu m	1.22E-01	(2)
	11/22/17	< 1.37E-02	< 8.99E-03	pCi/cu m	4.49E-02	(2)
	11/27/17	< 3.20E-02	< 1.73E-02	pCi/cu m	8.67E-02	(2)
	11/27/17	< 2.78E-02	< 2.68E-02	pCi/cu m	1.34E-01	(2)
	11/27/17	< 2.62E-02	< 1.37E-02	pCi/cu m	6.87E-02	(2)
	11/28/17	< 2.22E-02	< 1.64E-02	pCi/cu m	8.21E-02	(2)
	11/29/17	< 2.17E-02	< 2.24E-02	pCi/cu m	1.12E-01	(2)
	11/29/17	< 1.64E-02	< 2.27E-02	pCi/cu m	8.20E-02	(2)
	11/29/17	< 2.04E-02	< 1.64E-02	pCi/cu m	8.18E-02	(2)
	11/29/17	< 9.35E-03	< 1.11E-02	pCi/cu m	5.53E-02	(2)
	11/30/17	< 3.42E-02	< 1.82E-02	pCi/cu m	9.11E-02	(2)
	11/30/17	< 1.12E-02	< 7.76E-03	pCi/cu m	3.88E-02	(2)
	12/01/17	< 2.27E-02	< 2.33E-02	pCi/cu m	1.13E-01	(2)
	12/04/17	< 1.58E-02	< 1.18E-02	pCi/cu m	5.92E-02	(2)
	12/04/17	< 3.33E-02	< 5.20E-02	pCi/cu m	1.67E-01	(2)
	12/05/17	< 2.74E-02	< 1.90E-02	pCi/cu m	1.37E-01	(2)
	12/05/17	< 1.39E-02	< 9.79E-03	pCi/cu m	4.89E-02	(2)
	12/05/17	< 2.44E-02	< 1.56E-02	pCi/cu m	7.79E-02	(2)
	12/06/17	< 9.69E-03	< 1.24E-02	pCi/cu m	4.84E-02	(2)
	12/06/17	< 1.22E-02	< 1.26E-02	pCi/cu m	6.10E-02	(2)
	12/06/17	< 3.31E-02	< 3.11E-02	pCi/cu m	1.56E-01	(2)
	12/07/17	< 6.04E-03	< 8.97E-03	pCi/cu m	3.02E-02	(2)
	12/07/17	< 4.84E-03	< 1.33E-02	pCi/cu m	2.42E-02	(2)
	12/08/17	< 2.00E-02	< 2.70E-02	pCi/cu m	1.00E-01	(2)
	12/11/17	< 2.01E-02	< 2.71E-02	pCi/cu m	1.01E-01	(2)
	12/11/17	< 2.18E-02	< 2.71E-02	pCi/cu m	1.09E-01	(2)
	12/12/17	< 3.12E-02	< 2.93E-02	pCi/cu m	1.47E-01	(2)
	12/13/17	< 1.65E-02	< 1.06E-02	pCi/cu m	5.30E-02	(2)
	12/13/17	< 1.53E-02	< 1.16E-02	pCi/cu m	5.82E-02	(2)
	12/13/17	< 1.05E-02	< 1.61E-02	pCi/cu m	5.26E-02	(2)
	12/13/17	< 1.64E-02	< 2.15E-02	pCi/cu m	8.19E-02	(2)
	12/13/17	< 2.07E-02	< 2.16E-02	pCi/cu m	1.03E-01	(2)
	12/15/17	< 7.65E-03	< 9.94E-03	pCi/cu m	3.83E-02	(2)
	12/15/17	< 2.14E-02	< 1.37E-02	pCi/cu m	6.86E-02	(2)
	12/18/17	< 1.27E-02	< 1.09E-02	pCi/cu m	5.44E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.20 Charcoal
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit NA)
I-131 (Gamma)	12/19/17	< 1.50E-02	< 1.39E-02	pCi/cu m	6.93E-02	(2)
	12/19/17	< 2.73E-02	< 2.51E-02	pCi/cu m	1.26E-01	(2)
	12/20/17	< 2.80E-02	< 1.97E-02	pCi/cu m	9.83E-02	(2)
	12/20/17	< 1.42E-02	< 7.83E-03	pCi/cu m	3.91E-02	(2)
	12/20/17	< 8.25E-03	< 1.10E-02	pCi/cu m	4.12E-02	(2)
	12/21/17	< 4.05E-03	< 1.23E-02	pCi/cu m	2.02E-02	(2)
	12/21/17	< 5.43E-03	< 1.04E-02	pCi/cu m	2.71E-02	(2)
	12/22/17	< 1.36E-02	< 1.26E-02	pCi/cu m	6.32E-02	(2)
	12/22/17	< 1.31E-02	< 1.35E-02	pCi/cu m	6.54E-02	(2)
	12/22/17	< 8.58E-03	< 1.42E-02	pCi/cu m	4.29E-02	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.21 Feed, Food, Vegetation

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 50)
Be-7 (Gamma)	VT	01/23/17	< 290	< 245	pCi/kg Wet	1450	(2)
	VT	03/13/17	1135 ± 206	1202 ± 191	pCi/kg Wet	820	5.7
	VT	04/12/17	< 156	< 152	pCi/kg Wet	780	(2)
	FV	05/24/17	1581 ± 382	1537 ± 251	pCi/kg Wet	1415	2.8
	FL	07/06/17	< 304	< 244	pCi/kg Wet	1218	(2)
	FL	07/17/17	< 342	< 236	pCi/kg Wet	1179	(2)
	FV	07/24/17	< 163	< 181	pCi/kg Wet	813	(2)
	FV	07/26/17	601 ± 261	697 ± 302	pCi/kg Wet	1395	(1)
	FL	08/01/17	< 193	< 208	pCi/kg Wet	964	(2)
	FL	08/01/17	< 208	< 203	pCi/kg Wet	1013	(2)
	FL	08/01/17	< 333	< 310	pCi/kg Wet	1549	(2)
	FV	08/08/17	< 268	< 368	pCi/kg Wet	1340	(2)
	FE	08/17/17	< 334	< 324	pCi/Total	1621	(2)
	VA	08/25/17	217 ± 108	307 ± 119	pCi/kg Wet	647	(1)
	FD	09/21/17	< 262	< 150	pCi/kg Wet	749	(2)
	FD	09/22/17	< 167	< 228	pCi/kg Wet	834	(2)
	FV	09/29/17	< 196	< 188	pCi/kg Wet	941	(2)
	FL	10/03/17	< 287	< 269	pCi/kg Wet	1347	(2)
	FL	10/04/17	< 261	< 287	pCi/kg Wet	1305	(2)
	VT	10/13/17	< 0.102	< 0.258	pCi/g Wet	0.51	(2)
	VA	10/18/17	< 0.161	< 0.228	pCi/g Wet	0.81	(2)
	FL	11/01/17	< 143	< 174	pCi/kg Wet	715	(2)
	FL	11/30/17	< 241	< 191	pCi/kg Wet	953	(2)
	VA	12/12/17	< 231	< 257	pCi/kg Wet	1156	(2)
	VT	12/15/17	1479 ± 339	1154 ± 238	pCi/kg Wet	1123	24.7
	VT	12/27/17	4213 ± 126	4041 ± 101	pCi/kg Wet	227	4.2
K-40 (Gamma)	VT	01/23/17	3822 ± 646	3719 ± 537	pCi/kg Wet	1050	2.7
	VT	03/13/17	6758 ± 544	6927 ± 554	pCi/kg Wet	865	2.5
	VT	04/12/17	4798 ± 528	5052 ± 469	pCi/kg Wet	1035	5.2
	FV	05/24/17	5373 ± 658	5079 ± 554	pCi/kg Wet	1495	5.6
	FL	07/06/17	3101 ± 799	3770 ± 649	pCi/kg Wet	1583	19.5
	FL	07/17/17	3583 ± 539	3375 ± 567	pCi/kg Wet	831	6.0
	FV	07/24/17	1285 ± 327	1541 ± 376	pCi/kg Wet	603	18.1
	FV	07/26/17	4950 ± 625	4431 ± 582	pCi/kg Wet	1407	11.1
	FL	08/01/17	2214 ± 411	1739 ± 371	pCi/kg Wet	753	24.0
	FL	08/01/17	2256 ± 433	2189 ± 454	pCi/kg Wet	753	3.0
	FL	08/01/17	6189 ± 857	5575 ± 736	pCi/kg Wet	1513	10.4
	FV	08/08/17	4108 ± 610	4082 ± 660	pCi/kg Wet	1254	0.6
	FE	08/17/17	1001 ± 326	778 ± 265	pCi/Total	865	25.1
	VA	08/25/17	2709 ± 293	2548 ± 347	pCi/kg Wet	657	6.1

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.21 Feed, Food, Vegetation
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 50)
K-40 (Gamma)	FD	09/21/17	2739 ± 460	2508 ± 397	pCi/kg Wet	800	8.8
	FD	09/22/17	726 ± 244	708 ± 274	pCi/kg Wet	604	2.6
	FV	09/29/17	2124 ± 341	1831 ± 368	pCi/kg Wet	808	14.8
	FL	10/04/17	6212 ± 648	6239 ± 684	pCi/kg Wet	1002	0.4
	VT	10/13/17	1.40 ± 0.44	1.56 ± 0.35	pCi/g Wet	0.528	10.6
	VA	10/18/17	6.72 ± 0.57	7.01 ± 0.63	pCi/g Wet	0.807	4.2
	FL	11/01/17	1851 ± 327	2078 ± 355	pCi/kg Wet	567	11.6
	FL	11/30/17	4439 ± 525	4106 ± 490	pCi/kg Wet	397	7.8
	VA	12/12/17	4509 ± 368	4085 ± 459	pCi/kg Wet	759	9.9
	VT	12/15/17	4927 ± 822	4715 ± 550	pCi/kg Wet	1002	4.4
	VT	12/27/17	2962 ± 155	2889 ± 119	pCi/kg Wet	202	2.5

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.22 Fish, Shellfish

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	FI	05/01/17	3137 ± 863	3478 ± 749	pCi/kg Wet	2115	10.3
	FI	05/11/17	2543 ± 806	2784 ± 676	pCi/kg Wet	2115	9.1
	SF	05/22/17	1302 ± 407	1134 ± 682	pCi/kg Wet	1012	13.8
	SF	06/29/17	1.96 ± 0.849	2.12 ± 0.565	pCi/g Wet	2.67	(1)
	FI	09/19/17	3916 ± 952	3028 ± 1243	pCi/kg Wet	2999	25.6
	SF	09/22/17	2.64 ± 0.939	2.71 ± 0.729	pCi/g Wet	2.41	2.5
	FI	10/24/17	3043 ± 663	3703 ± 888	pCi/kg Wet	1901	19.6
	SF	10/25/17	2981 ± 868	2269 ± 621	pCi/kg Wet	1751	27.1
	FI	10/26/17	4359 ± 920	5445 ± 1172	pCi/kg Wet	2113	22.2
	FI	11/01/17	4933 ± 1008	4564 ± 885	pCi/kg Wet	1013	7.8

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.23 Milk
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	01/03/17	1043 ± 161	1055 ± 134	pCi/L	348	1.1
	01/10/17	1324 ± 142	1174 ± 187	pCi/L	301	12.0
	01/10/17	1929 ± 231	1435 ± 184	pCi/L	330	29.4
	01/11/17	1122 ± 179	1289 ± 211	pCi/L	307	13.9
	02/07/17	1174 ± 138	1230 ± 165	pCi/L	296	4.7
	02/09/17	1276 ± 187	1337 ± 177	pCi/L	211	4.7
	02/13/17	1662 ± 165	1513 ± 201	pCi/L	353	9.4
	03/06/17	1511 ± 159	1483 ± 170	pCi/L	277	1.9
	03/08/17	1383 ± 165	1231 ± 189	pCi/L	285	11.6
	03/09/17	1307 ± 215	1186 ± 176	pCi/L	507	9.7
	03/13/17	1342 ± 94.1	1307 ± 94.9	pCi/L	171	2.6
	03/22/17	1324 ± 74.3	1250 ± 82.9	pCi/L	153	5.8
	03/28/17	1155 ± 172	1340 ± 170	pCi/L	444	14.8
	04/04/17	1470 ± 195	1526 ± 182	pCi/L	274	3.7
	04/05/17	1050 ± 182	1116 ± 166	pCi/L	383	6.1
	04/07/17	1280 ± 145	1453 ± 163	pCi/L	191	12.7
	04/10/17	1337 ± 140	1577 ± 172	pCi/L	196	16.5
	04/11/17	1393 ± 212	1435 ± 139	pCi/L	382	3.0
	04/13/17	1476 ± 157	1446 ± 121	pCi/L	216	2.1
	04/19/17	1365 ± 149	1277 ± 154	pCi/L	303	6.7
	04/25/17	1296 ± 168	1304 ± 177	pCi/L	389	0.6
	05/01/17	1171 ± 153	1161 ± 200	pCi/L	276	0.9
	05/03/17	1351 ± 156	1294 ± 192	pCi/L	278	4.3
	05/04/17	1054 ± 182	1338 ± 177	pCi/L	251	23.8
	05/09/17	1624 ± 195	1699 ± 181	pCi/L	379	4.5
	05/10/17	1450 ± 160	1491 ± 192	pCi/L	316	2.8
	05/15/17	1353 ± 166	1435 ± 166	pCi/L	304	5.9
	05/30/17	1363 ± 192	1447 ± 167	pCi/L	297	6.0
	05/31/17	1212 ± 157	1440 ± 192	pCi/L	324	17.2
	06/01/17	1429 ± 212	1258 ± 209	pCi/L	460	12.7
	06/06/17	1223 ± 192	1161 ± 164	pCi/L	457	5.2
	06/07/17	1439 ± 222	1384 ± 213	pCi/L	470	3.9
	06/12/17	1843 ± 179	1766 ± 209	pCi/L	482	4.3
	06/14/17	1246 ± 163	1381 ± 188	pCi/L	333	10.3
	06/15/17	1130 ± 160	1304 ± 195	pCi/L	386	14.3
	06/15/17	1316 ± 76.5	1066 ± 108	pCi/L	152	21.0
	06/20/17	1319 ± 140	1316 ± 177	pCi/L	277	0.2
	06/23/17	1306 ± 183	1375 ± 191	pCi/L	460	5.2
	06/26/17	1290 ± 180	1238 ± 167	pCi/L	330	4.1
	06/27/17	1338 ± 148	1244 ± 121	pCi/L	275	7.3
	07/05/17	1354 ± 182	1522 ± 196	pCi/L	334	11.7

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.23 Milk
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	07/10/17	1305 ± 150	1533 ± 210	pCi/L	270	16.1
	07/11/17	1450 ± 188	1363 ± 171	pCi/L	179	6.2
	07/12/17	1372 ± 158	1291 ± 177	pCi/L	291	6.1
	07/19/17	889 ± 161	916 ± 160	pCi/L	304	3.0
	07/19/17	1365 ± 135	1289 ± 163	pCi/L	244	5.7
	07/20/17	1195 ± 127	1369 ± 199	pCi/L	227	13.6
	07/21/17	1368 ± 162	1406 ± 224	pCi/L	269	2.7
	07/28/17	1095 ± 187	1297 ± 161	pCi/L	205	16.9
	08/02/17	1327 ± 199	1503 ± 170	pCi/L	373	12.4
	08/04/17	1346 ± 154	1256 ± 193	pCi/L	238	6.9
	08/09/17	1238 ± 167	1258 ± 177	pCi/L	268	1.6
	08/10/17	1217 ± 167	1103 ± 194	pCi/L	423	9.8
	08/18/17	1369 ± 199	1508 ± 188	pCi/L	335	9.7
	08/21/17	1216 ± 158	1241 ± 211	pCi/L	278	2.0
	08/25/17	1202 ± 156	1467 ± 194	pCi/L	412	19.9
	08/28/17	1535 ± 223	1276 ± 184	pCi/L	518	18.4
	08/28/17	1105 ± 201	1172 ± 182	pCi/L	466	5.9
	08/29/17	1306 ± 166	1393 ± 215	pCi/L	295	6.5
	09/01/17	1370 ± 223	1380 ± 174	pCi/L	241	0.7
	09/05/17	1255 ± 166	1178 ± 180	pCi/L	352	6.3
	09/07/17	1079 ± 139	1126 ± 192	pCi/L	232	4.3
	09/08/17	1109 ± 191	1321 ± 176	pCi/L	395	17.5
	09/12/17	1188 ± 211	1293 ± 187	pCi/L	433	8.5
	09/12/17	1454 ± 189	1128 ± 133	pCi/L	396	25.3
	09/13/17	1246 ± 158	1323 ± 172	pCi/L	246	6.0
	09/13/17	1617 ± 212	1362 ± 179	pCi/L	338	17.1
	09/18/17	1344 ± 102	1219 ± 127	pCi/L	182	9.8
	09/25/17	1287 ± 166	1368 ± 141	pCi/L	230	6.1
	09/26/17	1365 ± 120	1188 ± 103	pCi/L	207	13.9
	09/27/17	1220 ± 162	1263 ± 177	pCi/L	344	3.5
	09/27/17	1395 ± 174	1177 ± 167	pCi/L	242	17.0
	09/27/17	1231 ± 143	1286 ± 152	pCi/L	113	4.4
	09/27/17	1553 ± 185	1571 ± 149	pCi/L	274	1.2
	09/27/17	1171 ± 140	1331 ± 161	pCi/L	282	12.8
	09/28/17	1226 ± 147	1266 ± 140	pCi/L	268	3.2
	09/29/17	1378 ± 153	1368 ± 165	pCi/L	344	0.7
	10/03/17	1114 ± 169	1284 ± 173	pCi/L	310	14.2
	10/04/17	1297 ± 191	1160 ± 116	pCi/L	274	11.2
	10/06/17	1458 ± 195	1387 ± 175	pCi/L	328	5.0
	10/06/17	1244 ± 187	1252 ± 167	pCi/L	421	0.6
	10/09/17	1299 ± 178	1186 ± 174	pCi/L	347	9.1

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.23 Milk
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	10/09/17	1137 ± 132	1086 ± 155	pCi/L	260	4.6
	10/10/17	1335 ± 179	1320 ± 171	pCi/L	301	1.1
	10/10/17	1934 ± 189	1773 ± 226	pCi/L	332	8.7
	10/11/17	1393 ± 161	1129 ± 171	pCi/L	327	20.9
	10/12/17	934 ± 118	1025 ± 162	pCi/L	280	9.3
	10/13/17	1156 ± 159	1188 ± 204	pCi/L	351	2.7
	10/16/17	1050 ± 143	1101 ± 165	pCi/L	327	4.7
	10/17/17	1290 ± 182	1254 ± 181	pCi/L	324	2.8
	10/19/17	1260 ± 188	1134 ± 137	pCi/L	277	10.5
	10/19/17	1377 ± 188	1332 ± 158	pCi/L	370	3.3
	10/19/17	1283 ± 178	1295 ± 174	pCi/L	318	0.9
	10/24/17	1295 ± 132	1469 ± 148	pCi/L	203	12.6
	10/25/17	1289 ± 178	1201 ± 178	pCi/L	322	7.1
	10/27/17	1220 ± 181	1197 ± 177	pCi/L	476	1.9
	10/30/17	1237 ± 188	1217 ± 145	pCi/L	315	1.6
	11/02/17	1205 ± 169	1233 ± 149	pCi/L	281	2.3
	11/07/17	1332 ± 172	1172 ± 198	pCi/L	412	12.8
	11/09/17	1237 ± 172	1150 ± 209	pCi/L	380	7.3
	11/09/17	1261 ± 153	1008 ± 179	pCi/L	380	22.3
	11/14/17	1315 ± 164	1288 ± 204	pCi/L	413	2.1
	11/14/17	1229 ± 159	1566 ± 179	pCi/L	249	24.1
	11/14/17	1301 ± 172	1342 ± 178	pCi/L	354	3.1
	11/15/17	1225 ± 194	1268 ± 138	pCi/L	205	3.5
	11/16/17	1090 ± 151	1152 ± 156	pCi/L	201	5.5
	11/16/17	1502 ± 153	1353 ± 191	pCi/L	260	10.4
	11/17/17	1310 ± 149	1385 ± 175	pCi/L	232	5.6
	11/20/17	1710 ± 161	1688 ± 225	pCi/L	363	1.3
	11/22/17	1231 ± 176	1213 ± 188	pCi/L	439	1.5
	11/27/17	1266 ± 169	1238 ± 173	pCi/L	411	2.2
	11/29/17	1244 ± 171	1146 ± 178	pCi/L	374	8.2
	12/04/17	1273 ± 171	1319 ± 197	pCi/L	361	3.6
	12/05/17	924 ± 136	1113 ± 138	pCi/L	189	18.6
	12/05/17	1425 ± 169	1193 ± 182	pCi/L	400	17.7
	12/08/17	1343 ± 184	1196 ± 179	pCi/L	398	11.6
	12/08/17	1347 ± 150	1451 ± 171	pCi/L	183	7.4
	12/12/17	1386 ± 185	1492 ± 210	pCi/L	364	7.4
	12/13/17	1313 ± 142	1302 ± 143	pCi/L	211	0.8
	12/14/17	1270 ± 173	1208 ± 170	pCi/L	479	5.0
	12/21/17	1456 ± 176	1322 ± 173	pCi/L	318	9.7
	12/22/17	1154 ± 161	1327 ± 200	pCi/L	348	14.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.24 Sediment, Soil, Solid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 50)
C-14 (RAD)	SD	01/11/17	< 0.958	< 0.910	pCi/gWet	4.79	(2)
	SD	03/24/17	< 0.802	< 0.445	pCi/gWet	4.01	(2)
	S	04/06/17	51.3 ± 1.54	43.9 ± 1.41	pCi/gWet	4.88	15.6
	S	04/06/17	1.64 ± 0.64	< 0.915	pCi/gWet	4.81	(1)
	SD	04/24/17	< 1.15	< 1.17	pCi/gWet	5.75	(2)
	SD	05/03/17	13.8 ± 0.99	10.6 ± 0.92	pCi/gDry	5.20	26.2
	SD	05/25/17	< 0.973	< 0.990	pCi/gWet	4.87	(2)
	SD	07/07/17	< 0.934	< 0.868	pCi/gWet	4.34	(2)
	SD	08/01/17	3.27 ± 0.73	< 0.937 ±	pCi/gWet	4.69	(1)
	SD	09/22/17	0.74 ± 0.22	1.840 ± 0.357	pCi/gWet	2.68	(1)
	SD	10/24/17	< 0.350	< 0.480	pCi/gWet	1.75	(2)
	SD	12/20/17	72.0 ± 1.54	86.5 ± 1.76	pCi/gWet	3.33	18.3
Cs-137 (Gamma)	SD	01/11/17	< 0.460	< 0.458	Bq/Kg	2.30	(2)
	SS	02/15/17	< 33.0	< 41.2	pCi/kg Dry	165	(2)
	SS	03/14/17	< 0.091	< 0.074	pCi/g Dry	0.46	(2)
	SS	03/14/17	< 0.092	< 0.098	pCi/g Dry	0.46	(2)
	SS	03/14/17	0.165 ± 0.080	0.108 ± 0.067	pCi/g Dry	0.354	(1)
	SH	03/16/17	< 81.9	< 97.5	pCi/kg Dry	410	(2)
	SS	07/31/17	< 0.047	< 0.066	pCi/g Dry	0.23	(2)
	SS	07/31/17	< 0.098	< 0.075	pCi/g Dry	0.49	(2)
	SS	08/22/17	< 0.057	< 0.043	pCi/g Dry	0.29	(2)
	SS	10/04/17	< 64.0	< 73.7	pCi/kg Dry	320	(2)
	SS	11/09/17	< 86.2	< 60.3	pCi/kg Dry	302	(2)
	SS	11/10/17	< 53.9	< 67.5	pCi/kg Dry	269	(2)
	SS	12/12/17	< 77.9	< 77.3	pCi/kg Dry	386	(2)
H-3 (RAD)	SD	01/14/17	< 0.902	< 0.858	pCi/gWet	4.51	(2)
	SD	03/24/17	< 2.33	< 2.36	pCi/gWet	11.7	(2)
	S	04/06/17	2.10 ± 0.565	< 0.658	pCi/gWet	3.46	(1)
	S	04/06/17	535 ± 26.8	511 ± 9.26	pCi/gWet	15.4	4.6
	SD	04/24/17	< 2.25	< 5.90	pCi/gWet	11.3	(2)
	SD	05/03/17	< 1.09	< 1.09	pCi/gDry	5.45	(2)
	SD	05/26/17	< 2.59	< 2.63	pCi/gWet	13.0	(2)
	SD	06/06/17	< 0.984	< 0.980	pCi/gWet	4.92	(2)
	SD	06/16/17	< 0.625	< 0.502	pCi/gWet	3.13	(2)
	SD	06/19/17	< 0.378	< 0.389	pCi/gWet	1.89	(2)
	SD	07/06/17	< 0.954	< 0.886	pCi/gWet	4.77	(2)
	SD	08/02/17	< 0.311	< 0.289	pCi/gWet	1.56	(2)
	SD	09/22/17	< 0.336	1.01 ± 0.379	pCi/gWet	1.68	(1)
	SD	10/24/17	< 0.53	< 0.72	pCi/gWet	2.64	(2)
	SD	12/20/17	3.32 ± 0.40	3.49 ± 0.43	pCi/gWet	2.42	5.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.24 Sediment, Soil, Solid

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 50)
K-40 (Gamma)	SD	01/11/17	< 9.60	< 8.81	Bq/Kg	48.0	(2)
	SS	02/15/17	1720 ± 468	1600 ± 449	pCi/kg Dry	1290	7.1
	SH	03/16/17	17300 ± 1650	18940 ± 1940	pCi/kg Dry	2140	9.3
	SS	08/22/17	19.2 ± 1.62	21.5 ± 1.49	pCi/g Dry	2.23	11.3
	S	10/02/17	11.5 ± 0.857	11.5 ± 0.928	pCi/g Dry	1.37	0.3
	SS	10/04/17	14700 ± 1555	12240 ± 1198	pCi/kg Dry	2743	18.3
	SS	11/09/17	16390 ± 1701	14350 ± 1322	pCi/kg Dry	2254	13.3
	SS	11/10/17	11040 ± 1181	10060 ± 1492	pCi/kg Dry	1779	9.3
	SS	12/12/17	11420 ± 1508	8588 ± 1285	pCi/kg Dry	2632	28.3
Pb-210	SS	03/21/17	0.241 ± 0.060	0.233 ± 0.074	pCi/gDry	0.494	(1)
	SS	03/21/17	41.2 ± 0.401	41.2 ± 0.395	pCi/gDry	0.585	0.0
	SS	04/11/17	24.4 ± 0.717	23.3 ± 0.730	pCi/gDry	1.20	4.6
	SS	04/11/17	0.290 ± 0.042	0.344 ± 0.041	pCi/gDry	0.302	(1)
	SS	04/12/17	< 0.060	0.091 ± 0.034	pCi/gDry	0.300	(1)
	SS	04/12/17	21 ± 0.657	27.1 ± 0.762	pCi/gDry	1.16	25.4
	SS	08/19/17	0.81 ± 0.07	0.719 ± 0.066	pCi/gDry	0.48	12.2
	SS	09/13/17	0.82 ± 0.08	0.722 ± 0.091	pCi/gDry	0.59	13.1
	SS	09/13/17	23.8 ± 0.29	27.0 ± 0.318	pCi/gDry	0.55	12.6
	SS	09/15/17	31.2 ± 0.37	29.9 ± 0.361	pCi/gDry	0.66	4.3
	SS	09/15/17	< 0.13	0.265 ± 0.080	pCi/gDry	0.63	(1)
	S	09/21/17	0.196 ± 0.056	0.210 ± 0.058	pCi/gDry	0.47	(1)
S-35 (RAD)	SD	04/23/17	< 12.6	< 13.2	pCi/gWet	63.0	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

**B.25 Water, Liquid
In-House Duplicates**

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
C-14	U	01/31/17	< 4950	< 4950	pCi/L	24800	(2)
	U	05/04/17	< 1840	< 1840	pCi/L	9200	(2)
	U	05/25/17	< 3720	< 3720	pCi/L	18600	(2)
	U	06/18/17	< 1690	< 1690	pCi/L	8450	(2)
	U	11/06/17	< 1730	< 1710	pCi/L	8650	(2)
	U	11/07/17	< 1730	< 1710	pCi/L	8650	(2)
	U	11/09/17	< 2190	< 2190	pCi/L	10950	(2)
	U	11/10/17	< 2190	< 2190	pCi/L	10950	(2)
	U	12/15/17	< 2120	< 2160	pCi/L	10600	(2)
FE-55	WG	02/28/17	< 114	< 187	pCi/L	570	(2)
	WG	06/02/17	< 355	< 178	pCi/L	1780	(2)
	WG	09/14/17	< 171	< 167	pCi/L	837	(2)
	WG	12/21/17	< 198	< 190	pCi/L	951	(2)
GR-A	WG	01/05/17	< 1.65	< 1.66	pCi/L	8.25	(2)
	PT	01/25/17	< 1.86	< 1.56	pCi/L	9.30	(2)
	WG	01/31/17	< 1.59	< 1.58	pCi/L	7.95	(2)
	WO	02/16/17	< 1.05	< 1.04	pCi/L	5.25	(2)
	WO	02/16/17	< 2.00	< 1.13	pCi/L	10.0	(2)
	PT	02/17/17	< 2.29	< 3.02	pCi/L	11.5	(2)
	WG	02/22/17	3.53 ± 1.16	2.85 ± 1.05	pCi/L	2.8	21.3
	WG	03/06/17	< 1.14	< 1.13	pCi/L	5.7	(2)
	WG	04/05/17	< 0.82	< 0.81	pCi/L	4.1	(2)
	PT	04/19/17	< 2.48	< 2.51	pCi/L	12.4	(2)
	WG	05/01/17	< 1.98	< 1.97	pCi/L	9.9	(2)
	PT	05/11/17	< 1.82	< 1.77	pCi/L	9.1	(2)
	WG	05/24/17	< 1.79	< 1.78	pCi/L	9.0	(2)
	WG	06/01/17	2.59 ± 1.01	2.61 ± 1.20	pCi/L	2.9	(1)
	PT	06/15/17	< 1.33	< 1.35	pCi/L	6.7	(2)
	WO	06/23/17	18.6 ± 1.89	19.2 ± 1.92	pCi/L	1.9	3.2
	WG	07/12/17	< 1.98	< 2.01	pCi/L	9.9	(2)
	PT	08/10/17	< 1.57	< 1.69	pCi/L	7.9	(2)
	WG	09/12/17	< 0.80	< 0.81	pCi/L	4.0	(2)
	WG	09/17/17	2.86 ± 1.21	3.36 ± 1.22	pCi/L	4.2	(2)
	PT	09/20/17	< 2.05	< 2.11	pCi/L	10.3	(2)
	WG	10/05/17	< 0.80	< 0.81	pCi/L	4.0	(2)
	PT	10/16/17	< 2.10	< 2.81	pCi/L	10.5	(2)
	WG	10/31/17	< 1.64	< 1.66	pCi/L	8.2	(2)
	PT	11/16/17	< 1.56	< 1.53	pCi/L	7.7	(2)
	PT	12/07/17	< 1.74	< 1.68	pCi/L	8.4	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
GR-A	WG	12/13/17	< 1.45	< 1.47	pCi/L	7.3	(2)
	WG	12/21/17	< 1.77	< 1.80	pCi/L	8.9	(2)
GR-B	WG	01/05/17	< 2.47	< 2.49	pCi/L	12.4	(2)
	WD	01/16/17	< 1.50	< 1.52	pCi/L	7.5	(2)
	PT	01/25/17	7.18 ± 2.05	5.46 ± 1.99	pCi/L	12.2	(1)
	WD	01/26/17	3.83 ± 1.80	3.78 ± 1.69	pCi/L	12.3	(1)
	WG	01/31/17	< 2.30	< 2.28	pCi/L	11.5	(2)
	WO	02/16/17	3.20 ± 1.54	< 2.21	pCi/L	10.2	(1)
	WO	02/16/17	< 2.02	< 2.01	pCi/L	10.1	(2)
	PT	02/17/17	8.55 ± 2.12	7.34 ± 2.37	pCi/L	11.9	(1)
	WG	02/24/17	< 3.47	< 3.23	pCi/L	17.4	(2)
	WD	03/01/17	3.54 ± 1.57	2.64 ± 1.54	pCi/L	10.6	(1)
	WG	03/06/17	< 2.16	< 2.14	pCi/L	10.8	(2)
	WT	03/21/17	2.06 ± 1.16	1.85 ± 1.14	pCi/L	7.9	(1)
	WG	03/29/17	3.47 ± 2.13	2.76 ± 2.07	pCi/L	15.0	(1)
	WG	04/05/17	< 2.18	< 2.15	pCi/L	10.9	(2)
	WD	04/14/17	< 2.60	3.32 ± 1.68	pCi/L	13.0	(1)
	PT	04/19/17	7.57 ± 2.06	5.88 ± 1.96	pCi/L	11.8	(1)
	WG	05/01/17	2.47 ± 1.62	< 2.31	pCi/L	11.6	(1)
	WT	05/03/17	6.72 ± 2.18	6.54 ± 2.16	pCi/L	13.3	(1)
	PT	05/11/17	5.81 ± 2.03	5.10 ± 1.94	pCi/L	12.6	(1)
	WG	05/24/17	< 2.34	< 2.34	pCi/L	11.7	(2)
	WG	05/31/17	< 3.83	< 3.71	pCi/L	19.2	(2)
	PT	06/15/17	5.74 ± 1.94	8.33 ± 2.16	pCi/L	11.9	(1)
	WD	06/23/17	2.76 ± 1.38	< 1.89	pCi/L	9.45	(1)
	WD	06/26/17	< 1.89	< 1.90	pCi/L	9.45	(2)
	WG	07/12/17	2.73 ± 1.66	3.80 ± 1.76	pCi/L	11.8	(1)
	WD	07/13/17	< 1.40	< 1.51	pCi/L	7.00	(2)
	WT	07/20/17	5.70 ± 1.88	3.23 ± 1.70	pCi/L	11.5	(1)
	WT	07/31/17	8.34 ± 2.13	8.29 ± 2.19	pCi/L	11.5	(1)
	PT	08/10/17	6.05 ± 2.08	5.27 ± 2.14	pCi/L	13.3	(1)
	WD	08/15/17	2.72 ± 1.40	2.29 ± 1.36	pCi/L	9.40	(1)
	WG	09/12/17	< 2.15	< 2.16	pCi/L	10.8	(2)
	WG	09/12/17	11.5 ± 2.78	14.4 ± 2.92	pCi/L	15.6	(1)
	PT	09/20/17	5.84 ± 1.95	4.75 ± 1.91	pCi/L	12.0	(1)
	WT	09/27/17	4.69 ± 2.04	6.42 ± 2.20	pCi/L	13.2	(1)
	WT	10/04/17	3.65 ± 1.77	4.28 ± 1.79	pCi/L	11.7	(1)
	WG	10/05/17	< 2.14	< 2.17	pCi/L	10.7	(2)
	WD	10/13/17	< 1.78	< 1.80	pCi/L	8.9	(2)
	WD	10/13/17	3.52 ± 1.38	2.63 ± 1.32	pCi/L	8.7	(1)

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
GR-B	PT	10/16/17	8.25 ± 2.05	7.16 ± 2.10	pCi/L	11.1	(1)
	WT	10/24/17	4.06 ± 1.63	4.39 ± 1.63	pCi/L	10.2	(1)
	WG	10/31/17	< 2.18	< 2.20	pCi/L	10.9	(2)
	WD	11/16/17	< 2.31	< 2.25	pCi/L	11.3	(2)
	PT	11/16/17	7.39 ± 2.01	6.69 ± 1.93	pCi/L	11.3	(1)
	PT	12/07/17	6.00 ± 1.93	6.33 ± 1.91	pCi/L	11.5	(1)
	WD	12/12/17	< 1.57	< 2.15	pCi/L	7.9	(2)
	WG	12/13/17	10.40 ± 2.59	12.50 ± 2.89	pCi/L	14.5	(1)
	WD	12/20/17	< 2.35	4.06 ± 1.72	pCi/L	11.3	(1)
	WG	12/21/17	< 2.42	< 2.45	pCi/L	12.1	(2)
H-3	WT	01/06/17	< 396	< 396	pCi/L	1980	(2)
	WD	01/10/17	< 192	< 193	pCi/L	960	(2)
	WT	01/11/17	< 191	< 188	pCi/L	955	(2)
	WG	01/12/17	9080 ± 958	9030 ± 955	pCi/L	2530	0.6
	WD	01/13/17	611 ± 153	626 ± 153	pCi/L	1000	(1)
	WP	01/13/17	< 196	< 196	pCi/L	980	(2)
	WP	01/14/17	< 145	< 145	pCi/L	725	(2)
	WR	01/19/17	< 199	< 192	pCi/L	995	(2)
	WT	01/19/17	612 ± 149	859 ± 162	pCi/L	975	(1)
	WD	01/21/17	< 196	< 193	pCi/L	980	(2)
	WG	01/23/17	260 ± 132	< 193	pCi/L	1300	(1)
	WG	01/24/17	8540 ± 903	6610 ± 714	pCi/L	2145	25.5
	WT	01/25/17	< 195	< 194	pCi/L	975	(2)
	WG	01/27/17	< 194	< 190	pCi/L	970	(2)
	WT	01/27/17	< 195	< 191	pCi/L	975	(2)
	WG	01/28/17	39000 ± 3940	37400 ± 3780	pCi/L	4860	4.2
	WG	01/29/17	< 191	< 188	pCi/L	955	(2)
	U	01/31/17	< 0.0048	< 0.0050	uCi/L	0.0241	(2)
	WG	01/31/17	< 191	< 192	pCi/L	955	(2)
	WG	01/31/17	636 ± 154	410 ± 139	pCi/L	965	(1)
	WG	01/31/17	< 611	< 616	pCi/L	3060	(2)
	WG	02/01/17	3730 ± 429	3600 ± 417	pCi/L	1640	3.6
	WG	02/03/17	< 183	196 ± 122	pCi/L	910	(1)
	WG	02/03/17	5400 ± 584	5320 ± 576	pCi/L	1745	1.5
	WG	02/03/17	< 184	< 183	pCi/L	920	(2)
	WT	02/03/17	< 128	< 129	pCi/L	640	(2)
	U	02/08/17	< 2280	< 2310	pCi/L	11400	(2)
	WD	02/08/17	< 187	< 195	pCi/L	935	(2)
	WD	02/09/17	< 189	< 193	pCi/L	945	(2)
	WD	02/09/17	< 186	< 191	pCi/L	930	(2)

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	WG	02/15/17	8650 ± 917	7780 ± 833	pCi/L	2400	10.6
	WT	02/15/17	637 ± 152	421 ± 185	pCi/L	980	(1)
	WG	02/16/17	< 252	< 290	pCi/L	1260	(2)
	WG	02/19/17	< 147	235 ± 99.1	pCi/L	730	(1)
	WT	02/21/17	1020 ± 165	999 ± 161	pCi/L	905	2.1
	WG	02/22/17	1370 ± 203	1190 ± 187	pCi/L	1040	14.1
	U	02/24/17	< 0.0021	< 0.0021	uCi/L	0.0106	(2)
	WP	02/24/17	< 190	< 188	pCi/L	950	(2)
	WT	02/27/17	< 280	< 278	pCi/L	1400	(2)
	WP	02/28/17	< 190	< 192	pCi/L	950	(2)
	WG	03/01/17	< 134	< 137	pCi/L	670	(2)
	WG	03/01/17	17600 ± 1810	16100 ± 1650	pCi/L	3290	8.9
	WD	03/02/17	241 ± 130	< 189	pCi/L	945	(1)
	WD	03/03/17	352 ± 137	468 ± 142	pCi/L	965	(1)
	WG	03/07/17	< 197	< 196	pCi/L	985	(2)
	WD	03/10/17	< 196	< 195	pCi/L	980	(2)
	WT	03/10/17	< 189	< 187	pCi/L	945	(2)
	WG	03/11/17	195000 ± 19200	217000 ± 21500	pCi/L	11100	10.7
	WG	03/12/17	< 190	< 190	pCi/L	950	(2)
	WG	03/13/17	< 189	< 194	pCi/L	945	(2)
	WG	03/15/17	735 ± 154	751 ± 151	pCi/L	925	(1)
	WT	03/15/17	395 ± 137	285 ± 136	pCi/L	945	(1)
	U	03/20/17	< 1830	< 1850	pCi/L	9150	(2)
	WT	03/21/17	< 276	< 277	pCi/L	1380	(2)
	WG	03/22/17	< 560	< 573	pCi/L	2800	(2)
	WG	03/23/17	< 193	< 190	pCi/L	965	(2)
	WO	03/23/17	< 269	< 189	pCi/L	1350	(2)
	WG	03/25/17	< 188	< 187	pCi/L	940	(2)
	WG	03/25/17	< 190	197 ± 127	pCi/L	950	(1)
	U	03/27/17	< 0.0019	< 0.0020	uCi/L	0.0097	(2)
	WT	03/27/17	< 142	< 141	pCi/L	710	(2)
	WG	03/27/17	< 187	< 190	pCi/L	935	(2)
	WG	03/27/17	< 583	< 576	pCi/L	2920	(2)
	WG	03/28/17	< 522	< 518	pCi/L	2610	(2)
	WG	03/29/17	890 ± 164	752 ± 152	pCi/L	980	(1)
	WG	03/29/17	< 386	< 387	pCi/L	1930	(2)
	WO	03/29/17	493 ± 208	485 ± 206	pCi/L	1410	(1)
	WG	03/30/17	< 289	< 287	pCi/L	1450	(2)
	WG	03/31/17	365 ± 237	595 ± 253	pCi/L	1700	(1)
	WG	03/31/17	< 566	< 563	pCi/L	2830	(2)
	WO	03/31/17	< 764	< 739	pCi/L	3820	(2)

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B.25 Water, Liquid

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	U	04/01/17	29900 ± 2490	28900 ± 2460	pCi/L	8950	3.4
	WD	04/05/17	432 ± 137	355 ± 134	pCi/L	930	(1)
	WG	04/05/17	< 191	< 194	pCi/L	955	(2)
	WT	04/05/17	< 410	< 413	pCi/L	2050	(2)
	WG	04/06/17	< 604	< 599	pCi/L	3020	(2)
	WG	04/07/17	362 ± 131	486 ± 139	pCi/L	915	(1)
	WT	04/07/17	< 188	< 184	pCi/L	940	(2)
	WD	04/11/17	660 ± 128	680 ± 124	pCi/L	845	(1)
	WD	04/11/17	830 ± 155	777 ± 150	pCi/L	945	(1)
	WG	04/13/17	7260 ± 786	7000 ± 761	pCi/L	2425	3.7
	WP	04/13/17	< 189	< 190	pCi/L	945	(2)
	WG	04/14/17	491 ± 142	373 ± 134	pCi/L	940	(1)
	WO	04/17/17	< 638	< 629	pCi/L	3190	(2)
	WR	04/18/17	< 285	< 297	pCi/L	1430	(2)
	U	04/22/17	< 0.0021	< 0.0020	uCi/l	0.0105	(2)
	WP	04/22/17	< 146	< 146	pCi/L	730	(2)
	WT	04/25/17	< 269	< 269	pCi/L	1350	(2)
	WG	04/26/17	< 193	< 201	pCi/L	965	(2)
	WG	04/26/17	7760 ± 835	7140 ± 771	pCi/L	2420	8.3
	WG	04/27/17	64600 ± 6500	68000 ± 6380	pCi/L	6800	5.1
	WG	04/28/17	12700 ± 1330	12700 ± 1330	pCi/L	3230	0.0
	WG	04/28/17	< 196	< 191	pCi/L	980	(2)
	WG	04/29/17	3110 ± 377	3470 ± 412	pCi/L	1770	10.9
	WG	04/29/17	< 192	< 190	pCi/L	960	(2)
	WT	05/01/17	< 619	< 633	pCi/L	3095	(2)
	WG	05/02/17	< 196	< 192	pCi/L	980	(2)
	WG	05/03/17	< 194	200 ± 129	pCi/L	970	(1)
	WP	05/04/17	< 146	< 145	pCi/L	730	(2)
	WD	05/04/17	614 ± 148	586 ± 148	pCi/L	955	(1)
H-3	WG	05/05/17	1880 ± 284	1930 ± 284	pCi/L	1415	2.6
	WD	05/08/17	< 192	260 ± 132	pCi/L	960	(1)
	WO	05/09/17	< 533	< 530	pCi/L	2670	(2)
	WP	05/09/17	< 186	< 182	pCi/L	930	(2)
	WG	05/12/17	238 ± 130	365 ± 139	pCi/L	960	(1)
	WO	05/15/17	< 598	< 609	pCi/L	3000	(2)
	U	05/16/17	< 1790	< 1760	pCi/L	8950	(2)
	U	05/16/17	< 1850	< 1850	pCi/L	9250	(2)
	WG	05/20/17	< 197	< 197	pCi/L	985	(2)
	WG	05/20/17	< 191	< 191	pCi/L	955	(2)
	WG	05/21/17	< 144	< 148	pCi/L	720	(2)
	WG	05/21/17	< 196	214 ± 131	pCi/L	980	(1)

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(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	U	05/22/17	< 0.0017	< 0.0020	uCi/L	0.0085	(2)
	U	05/23/17	5.25E-06 ± 1.45E-06	4.99E-06 ± 1.44E-06	uCi/ml	9.05E-06	(1)
	WG	05/23/17	381 ± 134	408 ± 134	pCi/L	915	6.8
	WD	05/24/17	< 190	< 188	pCi/L	950	(2)
	WG	05/24/17	33500 ± 3370	35700 ± 3610	pCi/L	4640	6.4
	WD	05/25/17	859 ± 151	824 ± 147	pCi/L	910	(1)
	WD	05/25/17	< 196	< 196	pCi/L	980	(2)
	WG	05/25/17	1840 ± 248	2030 ± 266	pCi/L	1260	9.8
	WG	05/26/17	< 139	< 137	pCi/L	700	(2)
	WG	05/30/17	29400 ± 2990	32800 ± 3330	pCi/L	4490	10.9
	WG	05/31/17	2430 ± 759	1960 ± 702	pCi/L	3360	(1)
	WG	05/31/17	< 688	< 712	pCi/L	3440	(2)
	WG	05/31/17	< 714	< 707	pCi/L	3570	(2)
	WG	06/01/17	< 521	< 522	pCi/L	2610	(2)
	WG	06/01/17	203 ± 130	237 ± 133	pCi/L	990	(1)
	WG	06/01/17	< 197	< 198	pCi/L	985	(2)
	WG	06/01/17	< 294	< 297	pCi/L	1470	(2)
	WG	06/02/17	< 565	< 563	pCi/L	2830	(2)
	WO	06/02/17	49.6 ± 8.41	48.1 ± 8.17	pCi/L	26	3.1
	WO	06/02/17	< 279	< 278	pCi/L	1400	(2)
	WT	06/04/17	485 ± 141	386 ± 133	pCi/L	920	(1)
	WG	06/07/17	248 ± 131	269 ± 130	pCi/L	940	(1)
	WG	06/08/17	328 ± 131	352 ± 132	pCi/L	940	(1)
	WG	06/09/17	1080 ± 176	940 ± 163	pCi/L	955	13.9
	WG	06/14/17	< 185	< 185	pCi/L	925	(2)
	WG	06/15/17	< 199	< 182	pCi/L	995	(2)
	WP	06/17/17	174 ± 95	263 ± 99	pCi/L	720	(1)
	U	06/18/17	< 1540	< 1570	pCi/L	7700	(2)
	WG	06/18/17	< 195	< 195	pCi/L	975	(2)
	WG	06/20/17	< 187	< 191	pCi/L	935	(2)
	WG	06/20/17	927 ± 162	781 ± 156	pCi/L	955	(1)
	WG	06/21/17	< 186	< 182	pCi/L	930	(2)
	WG	06/22/17	250 ± 135	249 ± 132	pCi/L	980	(1)
	WG	06/23/17	3560 ± 410	3560 ± 409	pCi/L	1580	0.0
	WP	06/23/17	< 178	< 182	pCi/L	890	(2)
	WG	06/24/17	< 185	< 184	pCi/L	925	(2)
	WD	06/26/17	653 ± 146	542 ± 139	pCi/L	910	(1)
	WD	06/26/17	< 241	< 207	pCi/L	1205	(2)
	WG	06/26/17	< 371	< 184	pCi/L	1860	(2)
	WG	06/27/17	887 ± 158	993 ± 168	pCi/L	940	11.3
	WT	06/28/17	< 632	< 645	pCi/L	3160	(2)

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B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	WG	06/30/17	< 593	< 594	pCi/L	2965	(2)
	WG	06/30/17	1910 ± 248	1790 ± 239	pCi/L	1210	6.5
	WG	07/01/17	< 190	205 ± 128	pCi/L	950	(1)
	WT	07/01/17	373 ± 131	498 ± 136	pCi/L	895	(1)
	WT	07/07/17	< 380	< 387	pCi/L	1900	(2)
	WG	07/10/17	1410 ± 197	1310 ± 189	pCi/L	1010	7.4
	WD	07/12/17	424 ± 130	499 ± 137	pCi/L	880	(1)
	WG	07/12/17	1490 ± 218	1670 ± 234	pCi/L	1220	11.4
	WT	07/12/17	< 175	< 176	pCi/L	875	(2)
	WG	07/13/17	13000 ± 1340	11500 ± 1200	pCi/L	2800	12.2
	WP	07/15/17	214 ± 94.0	191 ± 93	pCi/L	695	(1)
	WD	07/17/17	< 185	< 191	pCi/L	925	(2)
	WD	07/20/17	< 187	324 ± 127	pCi/L	915	(1)
	WG	07/20/17	< 179	< 177	pCi/L	885	(2)
	WD	07/21/17	< 190	< 189	pCi/L	945	(2)
	WG	07/22/17	8120 ± 869	7340 ± 792	pCi/L	2400	10.1
	WR	07/22/17	< 481	< 475	pCi/L	2375	(2)
	WG	07/25/17	< 249	< 251	pCi/L	1245	(2)
	WP	07/25/17	< 183	< 186	pCi/L	915	(2)
	WD	07/26/17	< 186	< 182	pCi/L	910	(2)
	WT	07/26/17	248 ± 123	190 ± 118	pCi/L	890	(1)
	WG	07/27/17	< 186	< 184	pCi/L	920	(2)
	WG	07/27/17	< 178	< 178	pCi/L	890	(2)
	WD	07/28/17	< 181	< 182	pCi/L	905	(2)
	WT	07/28/17	< 186	< 186	pCi/L	930	(2)
	U	07/29/17	< 0.0021	< 0.0020	uCi/L	0.0102	(2)
	WG	08/01/17	1560 ± 254	1410 ± 208	pCi/L	1165	10.1
	WG	08/01/17	14900 ± 1530	15700 ± 1620	pCi/L	3195	5.2
	WD	08/03/17	< 187	< 188	pCi/L	935	(2)
	WG	08/03/17	6860 ± 741	7050 ± 761	pCi/L	2255	2.7
	WG	08/04/17	1720 ± 464	1870 ± 494	pCi/L	2675	(1)
	WG	08/10/17	14100 ± 1460	14500 ± 1510	pCi/L	3170	2.8
	WP	08/11/17	< 594	< 585	pCi/L	2970	(2)
	WP	08/12/17	< 139	< 140	pCi/L	695	(2)
	WO	08/15/17	< 646	< 629	pCi/L	3145	(2)
	WG	08/18/17	14400 ± 1490	14600 ± 1500	pCi/L	3120	1.4
	WG	08/20/17	170 ± 92.3	255 ± 96	pCi/L	700	(1)
	WG	08/24/17	495 ± 145	406 ± 138	pCi/L	970	(1)
	WT	08/24/17	< 191	< 195	pCi/L	955	(2)
	WT	08/24/17	< 565	< 551	pCi/L	2755	(2)
	WG	08/25/17	4890 ± 552	5620 ± 623	pCi/L	2040	13.9

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B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	U	08/28/17	< 0.0016	< 0.0016	uCi/L	0.0080	(2)
	WG	08/28/17	538 ± 130	537 ± 139	pCi/L	845	(1)
	WG	08/28/17	11700 ± 1220	10300 ± 1070	pCi/L	2505	12.7
	WG	08/28/17	487 ± 140	392 ± 136	pCi/L	955	(1)
	WD	08/29/17	< 179	< 181	pCi/L	895	(2)
	WG	08/30/17	488 ± 134	284 ± 123	pCi/L	895	(1)
	WG	08/31/17	458 ± 134	458 ± 137	pCi/L	920	(1)
	WG	08/31/17	< 573	< 578	pCi/L	2865	(2)
	WG	08/31/17	5240 ± 577	5090 ± 561	pCi/L	1905	2.9
	WG	08/31/17	< 564	< 571	pCi/L	2820	(2)
	WG	08/31/17	< 572	< 560	pCi/L	2800	(2)
	WG	09/06/17	< 192	< 189	pCi/L	945	(2)
	WG	09/06/17	< 250	< 248	pCi/L	1240	(2)
	WO	09/06/17	< 519	< 529	pCi/L	2595	(2)
	WG	09/07/17	< 176	< 177	pCi/L	880	(2)
	WG	09/08/17	< 172	< 173	pCi/L	860	(2)
	WT	09/08/17	372 ± 131	369 ± 133	pCi/L	925	(1)
	WG	09/09/17	9550 ± 1010	8990 ± 956	pCi/L	2735	6.0
	WG	09/13/17	4860 ± 539	4960 ± 547	pCi/L	1865	2.0
	WG	09/14/17	4110 ± 460	4350 ± 485	pCi/L	1640	5.7
	WG	09/14/17	2390 ± 300	2240 ± 286	pCi/L	1385	6.5
	WG	09/21/17	6560 ± 970	7530 ± 1030	pCi/L	2945	13.8
	WP	09/21/17	< 175	< 173	pCi/L	865	(2)
	WG	09/22/17	< 583	< 589	pCi/L	2915	(2)
	WG	09/22/17	< 584	< 579	pCi/L	2895	(2)
	U	09/23/17	< 0.0017	< 0.0017	uCi/L	0.0085	(2)
	WP	09/23/17	290 ± 93.3	279 ± 96	pCi/L	670	(1)
	WG	09/23/17	< 184	< 186	pCi/L	920	(2)
	WG	09/23/17	< 511	< 519	pCi/L	2555	(2)
	WG	09/26/17	< 193	< 196	pCi/L	965	(2)
	WT	09/26/17	1000 ± 164	915 ± 156	pCi/L	925	8.9
	WD	09/27/17	470 ± 130	356 ± 125	pCi/L	885	(1)
	WT	09/27/17	< 516	< 512	pCi/L	2560	(2)
	WT	09/27/17	3410 ± 686	3820 ± 710	pCi/L	2580	11
	WG	09/28/17	258 ± 120	< 196	pCi/L	885	(1)
	WD	09/29/17	583 ± 136	638 ± 138	pCi/L	875	(1)
	WG	09/29/17	< 182	< 183	pCi/L	910	(2)
	WG	10/05/17	24600 ± 2520	25500 ± 2600	pCi/L	4445	3.6
	WG	10/06/17	626 ± 413	682 ± 422	pCi/L	2650	8.6
	WG	10/10/17	< 178	< 179	pCi/L	890	(2)
	WG	10/10/17	1110 ± 179	987 ± 168	pCi/L	1020	11.7

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	WG	10/12/17	302 ± 113	242 ± 118	pCi/L	800	(1)
	WG	10/13/17	< 183	< 183	pCi/L	915	(2)
	WT	10/13/17	< 309	< 295	pCi/L	1475	(2)
	WP	10/14/17	575 ± 101	605 ± 103	pCi/L	640	(1)
	WD	10/14/17	< 184	< 186	pCi/L	920	(2)
	WP	10/17/17	< 181	< 178	pCi/L	890	(2)
	WG	10/18/17	862 ± 156	830 ± 155	pCi/L	960	(1)
	U	10/20/17	< 0.0016	0.0017 ± 0.0011	uCi/l	0.0078	(1)
	WD	10/20/17	1760 ± 235	1770 ± 236	pCi/L	1185	0.6
	WG	10/20/17	699 ± 211	578 ± 202	pCi/L	1295	(1)
	WT	10/20/17	2770 ± 783	2990 ± 814	pCi/L	3305	(1)
	WG	10/22/17	< 189	< 184	pCi/L	920	(2)
	WG	10/27/17	< 181	< 176	pCi/L	880	(2)
	WG	10/27/17	< 185	< 183	pCi/L	915	(2)
	WG	10/27/17	< 187	< 187	pCi/L	935	(2)
	WG	10/27/17	4210 ± 481	4170 ± 475	pCi/L	1835	1.0
	WT	10/28/17	< 140	< 141	pCi/L	700	(2)
	WG	10/28/17	< 180	< 181	pCi/L	900	(2)
	WG	10/31/17	< 171	< 177	pCi/L	855	(2)
	WP	11/01/17	406 ± 105	429 ± 105	pCi/L	740	(1)
	WD	11/01/17	1970 ± 259	1850 ± 247	pCi/L	1290	6.3
	WD	11/02/17	1160 ± 180	1090 ± 175	pCi/L	1015	6.2
	WG	11/04/17	4670 ± 524	4860 ± 542	pCi/L	1915	4.0
	WT	11/04/17	219 ± 119	204 ± 119	pCi/L	885	(1)
	WG	11/07/17	1040 ± 206	1020 ± 172	pCi/L	1025	1.9
	U	11/09/17	< 1550	< 1570	pCi/L	7750	(2)
	WG	11/09/17	< 171	< 170	pCi/L	850	(2)
	U	11/10/17	< 1540	< 1540	pCi/L	7700	(2)
	WD	11/10/17	1510 ± 213	1380 ± 201	pCi/L	1090	9.0
	WT	11/11/17	< 183	< 175	pCi/L	875	(2)
	WG	11/15/17	< 571	< 576	pCi/L	2855	(2)
	WR	11/16/17	< 263	< 257	pCi/L	1285	(2)
	WD	11/17/17	1350 ± 195	1520 ± 211	pCi/L	1055	11.9
	WG	11/18/17	< 183	< 184	pCi/L	915	(2)
	WG	11/19/17	193 ± 90	153 ± 87	pCi/L	670	(1)
	U	11/20/17	< 0.0021	< 0.0021	uCi/l	0.0104	(2)
	WO	11/21/17	< 363	< 367	pCi/L	1815	(2)
	WG	11/22/17	< 180	< 184	pCi/L	900	(2)
	WG	11/23/17	< 188	< 177	pCi/L	885	(2)
	WG	11/23/17	3580 ± 416	3840 ± 442	pCi/L	1675	7.0
	WG	11/24/17	< 184	< 174	pCi/L	870	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.25 Water, Liquid
In-House Duplicates
Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	WG	11/28/17	< 191	< 186	pCi/L	930	(2)
	WG	11/28/17	< 180	< 180	pCi/L	900	(2)
	WG	11/29/17	< 172	< 168	pCi/L	840	(2)
	WG	11/29/17	< 190	< 192	pCi/L	950	(2)
	WG	11/30/17	525 ± 209	445	pCi/L	1400	(1)
	WO	11/30/17	< 282	< 278	pCi/L	1390	(2)
	WG	12/01/17	< 275	< 281	pCi/L	1375	(2)
	WT	12/01/17	< 167	< 166	pCi/L	830	(2)
	WT	12/03/17	< 264	< 264	pCi/L	1320	(2)
	WG	12/06/17	3770 ± 430	4060 ± 460	pCi/L	1645	7.4
	WG	12/07/17	< 183	< 188	pCi/L	915	(2)
	WG	12/08/17	< 186	< 190	pCi/L	930	(2)
	WP	12/08/17	< 182	< 183	pCi/L	910	(2)
	WG	12/13/17	1360 ± 489	1640 ± 508	pCi/L	2840	(1)
	WG	12/14/17	< 177	< 178	pCi/L	885	(2)
	WG	12/14/17	< 574	< 571	pCi/L	2855	(2)
	WG	12/15/17	< 511	< 626	pCi/L	2555	(2)
	WG	12/15/17	< 641	< 637	pCi/L	3185	(2)
	WG	12/15/17	284 ± 127	< 490	pCi/L	930	(1)
	U	12/16/17	2.33E-04 ± 6.36E-06	2.48E-04 ± 6.64E-06	uCi/ml	1.21E-05	6.2
	WP	12/16/17	637 ± 113	494 ± 109	pCi/L	735	(1)
	WG	12/16/17	< 639	< 631	pCi/L	3155	(2)
	WG	12/19/17	< 195	< 196	pCi/L	975	(2)
	WG	12/19/17	< 273	< 270	pCi/L	1350	(2)
	WG	12/19/17	< 274	< 271	pCi/L	1355	(2)
	WG	12/20/17	1290 ± 470	1050 ± 443	pCi/L	3175	(1)
	WR	12/20/17	< 648	< 434	pCi/L	2170	(2)
	WD	12/21/17	605 ± 142	613 ± 141	pCi/L	910	(1)
	WG	12/21/17	< 339	< 343	pCi/L	1695	(2)
	WT	12/21/17	< 196	< 197	pCi/L	980	(2)
	U	12/22/17	< 0.0025	< 0.0025	uCi/l	0.0125	(2)
	WG	12/22/17	< 188	< 190	pCi/L	940	(2)
	WP	12/22/17	< 199	< 195	pCi/L	975	(2)
	WG	12/23/17	1760 ± 244	1640 ± 230	pCi/L	1230	7.1
	WT	12/23/17	< 576	< 588	pCi/L	2880	(2)
	WT	12/28/17	< 189	< 190	pCi/L	945	(2)
	WG	12/29/17	< 181	< 185	pCi/L	905	(2)
	WG	12/29/17	1090 ± 486	829 ± 457	pCi/L	2795	(1)
	WG	12/29/17	761 ± 446	891 ± 463	pCi/L	2785	(1)

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.25 Water, Liquid

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	WT	01/06/17	< 31.9	< 50.5	pCi/L	160	(2)
	WT	01/10/17	< 17.1	< 43.9	pCi/L	85.5	(2)
	WD	01/16/17	< 102	< 123	pCi/L	510	(2)
	WG	01/17/17	< 74.2	< 58.0	pCi/L	371	(2)
	WG	01/20/17	< 87.9	< 44.9	pCi/L	440	(2)
	WG	01/26/17	< 91.5	< 45.8	pCi/L	458	(2)
	WG	01/27/17	< 39.7	< 111	pCi/L	199	(2)
	WT	01/30/17	< 39.1	< 78.3	pCi/L	196	(2)
	WG	01/31/17	< 85.7	< 60.4	pCi/L	429	(2)
	WT	01/31/17	< 33.3	< 66.3	pCi/L	167	(2)
	WG	02/03/17	< 93.8	< 68.4	pCi/L	469	(2)
	WG	02/06/17	< 79.5	< 127	pCi/L	398	(2)
	WT	02/06/17	< 58.9	< 80.1	pCi/L	295	(2)
	WT	02/09/17	< 154	< 60.4	pCi/L	770	(2)
	SE	02/10/17	< 191	< 166	pCi/L	955	(2)
	WD	02/10/17	< 129	< 78.9	pCi/L	645	(2)
	WG	02/16/17	< 82.4	< 119	pCi/L	412	(2)
	WD	02/21/17	< 111	< 141	pCi/L	555	(2)
	WR	02/22/17	< 91.7	< 84.8	pCi/L	459	(2)
	WG	02/27/17	< 138	< 109	pCi/L	690	(2)
	WG	02/28/17	< 86.4	< 64.0	pCi/L	432	(2)
	PT	03/01/17	< 58.8	< 47.7	pCi/L	294	(2)
	WT	03/02/17	< 112	< 147	pCi/L	560	(2)
	WT	03/02/17	< 140	< 162	pCi/L	700	(2)
	WT	03/06/17	< 86.8	< 68.9	pCi/L	434	(2)
	WT	03/06/17	251 ± 98.8	252 ± 89.30	pCi/L	407	(1)
	WT	03/10/17	< 61.2	< 44.5	pCi/L	306	(2)
	WG	03/13/17	< 85.4	< 136	pCi/L	427	(2)
	WG	03/15/17	< 75.3	< 90.0	pCi/L	377	(2)
	WT	03/21/17	< 65.7	< 44.6	pCi/L	329	(2)
	WD	03/23/17	< 42.6	< 67.9	pCi/L	213	(2)
	WT	03/30/17	< 87.8	< 148	pCi/L	439	(2)
	WG	04/03/17	< 79.4	< 112	pCi/L	397	(2)
	WS	04/04/17	227 ± 118	274 ± 81.20	pCi/L	283	(1)
	WT	04/04/17	< 115	< 90.0	pCi/L	575	(2)
	WT	04/06/17	< 92.7	< 131	pCi/L	464	(2)
	WG	04/10/17	< 94.7	< 143	pCi/L	474	(2)
	WG	04/11/17	< 80.6	< 41.8	pCi/L	403	(2)
	WG	04/11/17	< 93.2	< 57.1	pCi/L	466	(2)
	WD	04/17/17	< 54.3	< 137	pCi/L	272	(2)
	WG	04/18/17	< 67.9	< 128	pCi/L	340	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.25 Water, Liquid

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	WG	04/18/17	< 154	< 90.2	pCi/L	770	(2)
	WG	04/20/17	< 138	< 129	pCi/L	690	(2)
	WT	04/20/17	< 36.8	< 48.1	pCi/L	184	(2)
	WT	04/25/17	< 43.1	< 101	pCi/L	216	(2)
	WG	04/27/17	< 44.5	< 59.0	pCi/L	223	(2)
	WG	04/27/17	< 44.2	< 83.4	pCi/L	221	(2)
	WT	05/02/17	187 ± 82.6	< 74.0	pCi/L	370	(1)
	WT	05/02/17	< 58.3	< 92.2	pCi/L	292	(2)
	WG	05/03/17	< 31.8	< 79.3	pCi/L	159	(2)
	WG	05/03/17	< 46.1	< 80.2	pCi/L	231	(2)
	WG	05/04/17	< 79.2	< 123	pCi/L	396	(2)
	WT	05/04/17	< 147	< 132	pCi/L	735	(2)
	WD	05/08/17	< 96.8	< 45.6	pCi/L	484	(2)
	WG	05/10/17	< 76.5	< 48.3	pCi/L	383	(2)
	WD	05/11/17	< 48.3	< 135	pCi/L	242	(2)
	WG	05/12/17	< 75.6	< 44.1	pCi/L	378	(2)
	WO	05/15/17	< 145	< 138	pCi/L	725	(2)
	WG	05/18/17	< 45.4	< 52.6	pCi/L	227	(2)
	WG	05/23/17	< 52.9	< 46.4	pCi/L	265	(2)
	WT	05/23/17	191 ± 75.5	< 66.6	pCi/L	333	(1)
	WG	05/24/17	< 36.3	< 61.5	pCi/L	182	(2)
	WG	05/24/17	< 23.4	< 45.8	pCi/L	117	(2)
	WG	05/25/17	< 124	< 48.1	pCi/L	620	(2)
	WT	05/25/17	< 42.6	63.5 ± 34.7	pCi/L	172	(1)
	WG	06/05/17	< 54.1	< 40.9	pCi/L	271	(2)
	WS	06/05/17	228 ± 120	302 ± 104	pCi/L	418	(1)
	WT	06/06/17	< 145	< 192	pCi/L	725	(2)
	PT	06/07/17	< 95.4	< 46.1	pCi/L	477	(2)
	WG	06/07/17	< 73.2	< 95.0	pCi/L	366	(2)
	WT	06/07/17	< 98.3	< 29.3	pCi/L	492	(2)
	WG	06/08/17	< 38.6	< 40.7	pCi/L	193	(2)
	SE	06/08/17	< 338	< 303	pCi/L	1690	(2)
	WR	06/09/17	< 86.6	< 126	pCi/L	433	(2)
	WG	06/12/17	< 83.8	< 52.4	pCi/L	419	(2)
	WT	06/14/17	< 58.8	< 137	pCi/L	294	(2)
	WD	06/16/17	< 145	< 140	pCi/L	725	(2)
	WT	06/16/17	< 135	< 83.8	pCi/L	675	(2)
	U	06/22/17	< 405	< 898	pCi/L	2030	(2)
	WG	06/22/17	< 72.8	< 29.1	pCi/L	364	(2)
	WG	06/23/17	< 107	< 81.2	pCi/L	535	(2)
	WT	06/28/17	< 52.5	< 63.9	pCi/L	263	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.25 Water, Liquid

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	WG	06/30/17	< 24.0	< 36.9	pCi/L	120	(2)
	WS	06/30/17	319 ± 98.2	246 ± 92.4	pCi/L	295	25.7
	WG	07/05/17	< 120	< 40.4	pCi/L	202	(2)
	WT	07/05/17	277 ± 110	234 ± 127	pCi/L	266	17.0
	WT	07/07/17	< 147	< 114	pCi/L	569	(2)
	SE	07/07/17	< 144	< 248	pCi/L	722	(2)
	U	07/12/17	1910 ± 914	2542 ± 1095	pCi/L	2635	(1)
	WT	07/14/17	< 120	< 130	pCi/L	599	(2)
	WG	07/17/17	< 70.0	< 85	pCi/L	350	(2)
	WG	07/18/17	< 108	< 147	pCi/L	542	(2)
	WG	07/24/17	< 99.4	< 107	pCi/L	497	(2)
	WO	07/25/17	< 88.4	< 127	pCi/L	442	(2)
	WS	07/27/17	403.1 ± 115	313 ± 73	pCi/L	223	25.0
	WD	07/31/17	< 118	< 112	pCi/L	560	(2)
	WG	07/31/17	< 55.3	< 139	pCi/L	277	(2)
	WO	07/31/17	< 148	< 300	pCi/L	739	(2)
	WO	08/01/17	< 132	< 148	pCi/L	662	(2)
	WO	08/01/17	< 231	< 313	pCi/L	1153	(2)
	WG	08/02/17	< 146	< 134	pCi/L	671	(2)
	WO	08/02/17	1100 ± 484	1148 ± 333	pCi/L	1333	(1)
	WT	08/03/17	< 140	< 128	pCi/L	640	(2)
	WG	08/08/17	< 76.6	< 150	pCi/L	383	(2)
	SE	08/11/17	< 145	< 274	pCi/L	723	(2)
	WT	08/14/17	< 84.6	< 53	pCi/L	263	(2)
	WG	08/16/17	< 91.8	< 144	pCi/L	459	(2)
	WS	08/17/17	346 ± 97.4	294 ± 101	pCi/L	272	16.3
	PT	09/01/17	< 141	< 164	pCi/L	706	(2)
	WT	09/05/17	< 44.5	< 149	pCi/L	223	(2)
	WG	09/07/17	< 33.6	< 136	pCi/L	168	(2)
	WT	09/08/17	< 85.0	< 74.8	pCi/L	374	(2)
	WT	09/14/17	109 ± 68.3	< 48.2	pCi/L	241	(1)
	WS	10/05/17	309 ± 79.9	262 ± 111	pCi/L	280	16.5
	PT	10/05/17	< 114	< 53	pCi/L	266	(2)
	WG	10/11/17	< 148	< 154	pCi/L	739	(2)
	U	10/24/17	1869 ± 475	1457 ± 680	pCi/L	1406	24.8
	WG	10/26/17	< 88.4	< 132	pCi/L	442	(2)
	WG	10/27/17	< 48.0	< 53.5	pCi/L	240	(2)
	WT	11/02/17	< 99.7	< 132	pCi/L	499	(2)
	WG	11/16/17	< 100	< 29.2	pCi/L	146	(2)
	WS	11/27/17	262 ± 105	309 ± 105	pCi/L	256	16.8
	WG	11/28/17	< 91.6	< 62.0	pCi/L	310	(2)

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

**B.25 Water, Liquid
In-House Duplicates**

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
K-40 (Gamma)	WT	11/29/17	< 122	< 175	pCi/L	609	(2)
	WD	11/30/17	< 144	< 84.2	pCi/L	421	(2)
	WT	12/01/17	< 97.9	< 64.3	pCi/L	321	(2)
	WT	12/06/17	< 153	< 87.0	pCi/L	435	(2)
	WT	12/11/17	< 65.1	< 34.5	pCi/L	172	(2)
	WT	12/11/17	< 91.2	< 129	pCi/L	456	(2)
	WG	12/28/17	< 70.6	111 ± 53.5	pCi/L	291	(1)
Ni-63	WG	03/01/17	< 2.88	< 2.91	pCi/L	14.4	(2)
	WG	06/01/17	< 4.66	< 4.77	pCi/L	23.3	(2)
	WG	09/08/17	< 3.34	< 3.49	pCi/L	16.7	(2)
	WG	12/21/17	< 4.71	< 4.65	pCi/L	23.3	(2)
Sr-89	WG	02/14/17	< 3.91	< 3.56	pCi/L	19.6	(2)
	WG	02/21/17	< 6.83	< 5.50	pCi/L	34.2	(2)
	WG	03/21/17	< 5.22	< 3.93	pCi/L	26.1	(2)
	WG	03/21/17	< 6.03	< 2.10	pCi/L	30.2	(2)
	WG	04/10/17	< 8.17	< 4.75	pCi/L	40.9	(2)
	WG	04/20/17	< 6.04	< 7.16	pCi/L	30.2	(2)
	WG	04/25/17	< 7.14	< 7.19	pCi/L	35.7	(2)
	WG	04/27/17	< 4.46	< 4.57	pCi/L	22.3	(2)
	WG	05/02/17	< 4.47	< 4.47	pCi/L	22.4	(2)
	WG	05/03/17	< 3.48	< 5.10	pCi/L	17.4	(2)
	WG	05/16/17	< 1.83	< 1.52	pCi/L	9.15	(2)
	WG	05/23/17	< 3.92	< 4.33	pCi/L	19.6	(2)
	WG	05/25/17	< 5.63	< 5.78	pCi/L	28.2	(2)
	WG	05/26/17	< 3.67	< 3.85	pCi/L	18.4	(2)
	WG	06/01/17	< 8.60	< 6.98	pCi/L	43	(2)
	WG	06/06/17	< 6.84	< 5.32	pCi/L	34.2	(2)
	WG	06/14/17	< 5.66	< 6.06	pCi/L	28.3	(2)
	WG	06/15/17	< 6.98	< 7.41	pCi/L	34.9	(2)
	WG	06/21/17	< 5.34	< 5.84	pCi/L	26.7	(2)
	WG	06/22/17	< 7.18	< 6.66	pCi/L	35.9	(2)
	WG	06/29/17	< 7.13	< 5.13	pCi/L	35.7	(2)
	WG	07/18/17	< 12.7	< 11.5	pCi/L	57.5	(2)
	WG	07/26/17	< 3.32	< 3.78	pCi/L	16.6	(2)
	WG	08/02/17	< 7.21	< 7.78	pCi/L	36.1	(2)
	WG	08/18/17	< 9.28	< 10.9	pCi/L	46.4	(2)
	WG	09/15/17	< 4.24	8.48 ± 2.57	pCi/L	21.2	(1)
	WG	09/16/17	< 7.14	< 9.51	pCi/L	35.7	(2)
	WG	09/26/17	< 4.03	< 5.33	pCi/L	20.2	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

**B.25 Water, Liquid
In-House Duplicates**

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-89	WG	10/26/17	< 16.4	< 11.1	pCi/L	55.5	(2)
	WG	11/20/17	< 3.78	< 4.10	pCi/L	18.9	(2)
	WP	11/29/17	< 4.29	< 4.86	pCi/L	21.5	(2)
	WG	12/21/17	< 6.05	< 9.28	pCi/L	30.3	(2)
Sr-90	WG	02/14/17	< 0.721	1.33 ± 0.497	pCi/L	3.61	(1)
	WG	02/21/17	< 0.798	< 0.867	pCi/L	3.99	(2)
	WG	03/21/17	< 0.431	< 0.743	pCi/L	2.16	(2)
	WG	03/21/17	< 0.804	0.742 ± 0.303	pCi/L	2.28	(1)
	WG	04/10/17	< 0.764	< 0.490	pCi/L	3.82	(2)
	WG	04/20/17	< 0.612	< 0.755	pCi/L	3.06	(2)
	WG	04/24/17	< 0.683	< 0.548	pCi/L	3.42	(2)
	WG	04/27/17	< 0.591	< 0.569	pCi/L	2.96	(2)
	WG	05/02/17	< 0.600	< 0.531	pCi/L	3.00	(2)
	WG	05/03/17	< 0.543	< 0.692	pCi/L	2.72	(2)
	WG	05/15/17	< 0.995	< 0.856	pCi/L	4.98	(2)
	WG	05/22/17	< 0.406	< 0.468	pCi/L	2.03	(2)
	WG	05/23/17	< 0.492	< 0.819	pCi/L	2.46	(2)
	WG	05/24/17	< 0.704	< 0.650	pCi/L	3.52	(2)
	WG	05/25/17	< 0.843	< 0.739	pCi/L	4.22	(2)
	WG	05/31/17	< 0.921	< 0.677	pCi/L	4.61	(2)
	WG	06/01/17	< 0.902	< 0.739	pCi/L	4.51	(2)
	WG	06/13/17	< 0.541	0.81 ± 0.367	pCi/L	2.71	(1)
	WG	06/14/17	< 0.880	1.26 ± 0.531	pCi/L	4.4	(1)
	WG	06/20/17	< 0.586	< 0.710	pCi/L	2.93	(2)
	WG	06/21/17	< 0.951	< 0.759	pCi/L	4.76	(2)
	WG	06/28/17	< 0.805	< 0.647	pCi/L	4.03	(2)
	WG	07/18/17	< 2.38	< 2.82	pCi/L	11.9	(2)
	WG	07/25/17	< 0.626	1.29 0.49	pCi/L	3.1	(1)
	WG	08/02/17	< 2.25	< 2.37	pCi/L	11.3	(2)
	WG	08/17/17	< 1.23	< 0.738	pCi/L	3.7	(2)
	WG	09/14/17	< 0.825	< 0.640	pCi/L	3.2	(2)
	WG	09/15/17	< 0.846	< 0.564	pCi/L	2.8	(2)
	WG	09/26/17	< 0.411	0.985 0.344	pCi/L	2.1	(1)
	WG	10/26/17	< 1.41	< 1.30	pCi/L	6.5	(2)
	WG	11/20/17	< 0.92	< 0.70	pCi/L	3.5	(2)
	WP	11/29/17	< 0.60	< 0.77	pCi/L	3.0	(2)
	WG	12/20/17	< 0.41	< 0.95	pCi/L	2.1	(2)
	WG	12/27/17	< 1.37	< 1.21	pCi/L	6.1	(2)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.26 Other
In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Matrix	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3 (RAD)	LO	02/22/17	< 396000	< 396000	pCi/L	1980000	(1)
	LO	08/15/17	4000 ± 2280	6060 ± 2200	pCi/L	17000	(2)
	LO	08/15/17	< 3140	4770 2140	pCi/L	15700	(2)
	LO	09/22/17	< 2080	< 2080	pCi/L	10400	(2)
S-35 (RAD)	LR	03/13/17	8.43E-06 ± 4.41E-07	9.50E-06 ± 4.39E-07	uCi/ml	1.03E-06	11.9

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Am-241 (AS)	01/17/17	5.25 ± 0.53	4.97 ± 0.42	pCi/Total	0.142	5.5
	01/24/17	4.04 ± 0.44	4.93 ± 0.49	pCi/Total	0.195	19.9
	02/01/17	4.71 ± 0.44	5.30 ± 0.46	pCi/Total	0.128	11.8
	02/14/17	4.77 ± 0.86	4.65 ± 0.97	pCi/Total	0.281	2.6
	02/22/17	5.36 ± 0.50	4.77 ± 0.45	pCi/Total	0.172	11.6
	03/02/17	5.73 ± 0.95	4.75 ± 1.18	pCi/Total	0.315	18.8
	03/13/17	4.83 ± 0.41	4.79 ± 0.40	pCi/Total	0.167	0.7
	03/22/17	5.41 ± 0.57	4.62 ± 0.39	pCi/Total	0.230	15.8
	03/24/17	4.00 ± 0.53	4.75 ± 0.41	pCi/Total	0.326	17.3
	03/30/17	4.96 ± 0.46	4.90 ± 0.44	pCi/Total	0.169	1.2
	04/06/17	5.83 ± 0.99	5.33 ± 0.44	pCi/Total	0.578	9.0
	04/12/17	4.77 ± 0.50	4.69 ± 0.50	pCi/Total	0.205	1.7
	04/19/17	5.20 ± 0.49	4.98 ± 0.46	pCi/Total	0.246	4.5
	04/19/17	4.78 ± 0.46	4.79 ± 0.42	pCi/Total	0.178	0.4
	04/20/17	4.81 ± 0.47	5.20 ± 0.59	pCi/Total	0.182	7.8
	04/29/17	5.25 ± 0.44	5.24 ± 0.45	pCi/Total	0.150	0.1
	05/03/17	4.90 ± 0.47	4.55 ± 0.42	pCi/Total	0.264	7.3
	05/10/17	5.31 ± 0.56	5.11 ± 0.65	pCi/Total	0.283	3.9
	05/30/17	5.00 ± 0.47	4.82 ± 0.46	pCi/Total	0.162	3.6
	05/30/17	5.11 ± 0.48	4.83 ± 0.46	pCi/Total	0.162	5.7
	06/01/17	5.33 ± 1.04	4.61 ± 0.77	pCi/Total	0.342	14.6
	06/12/17	5.40 ± 0.59	5.00 ± 0.48	pCi/Total	0.222	7.7
	06/20/17	4.60 ± 1.29	5.53 ± 2.15	pCi/Total	1.09	18.4
	06/20/17	6.33 ± 2.38	4.86 ± 1.30	pCi/Total	1.06	26.2
	06/26/17	4.65 ± 0.46	4.92 ± 0.68	pCi/Total	0.410	5.7
	06/27/17	6.00 ± 1.16	5.30 ± 0.93	pCi/Total	1.59	12.5
	06/29/17	3.92 ± 1.29	5.06 ± 1.39	pCi/Total	0.29	24.9
	07/07/17	5.71 ± 0.63	4.75 ± 0.45	pCi/Total	0.226	18.4
	07/20/17	4.76 ± 0.48	4.15 ± 0.71	pCi/Total	0.183	13.6
	07/20/17	4.95 ± 0.92	5.25 ± 1.15	pCi/Total	0.344	5.8
	07/25/17	4.75 ± 0.59	4.47 ± 0.77	pCi/Total	0.289	6.0
	07/28/17	4.44 ± 0.88	5.80 ± 0.88	pCi/Total	0.788	26.6
	07/28/17	4.49 ± 0.50	5.12 ± 0.75	pCi/Total	0.214	13.0
	07/31/17	4.67 ± 0.62	4.84 ± 0.45	pCi/Total	0.414	3.7
	08/01/17	4.78 ± 0.61	4.80 ± 0.48	pCi/Total	0.290	0.4
	08/15/17	5.28 ± 0.53	4.77 ± 0.62	pCi/Total	0.236	10.0
	08/18/17	4.96 ± 0.48	5.36 ± 0.46	pCi/Total	0.105	7.8
	08/18/17	4.04 ± 0.41	4.66 ± 0.45	pCi/Total	0.211	14.4
	08/25/17	4.71 ± 0.54	4.94 ± 0.61	pCi/Total	0.300	4.7
	08/29/17	4.73 ± 0.66	5.26 ± 0.54	pCi/Total	0.240	10.6
	09/11/17	5.12 ± 0.65	4.99 ± 1.03	pCi/Total	0.489	2.5

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Am-241 (AS)	09/15/17	5.25 ± 0.56	5.55 ± 0.64	pCi/Total	0.14	5.5
	09/28/17	5.71 ± 2.24	5.61 ± 1.84	pCi/Total	1.13	1.7
	09/28/17	4.81 ± 0.91	4.93 ± 0.95	pCi/Total	0.21	2.3
	10/05/17	5.09 ± 0.54	4.46 ± 0.92	pCi/Total	0.35	13.0
	10/12/17	5.53 ± 0.61	4.99 ± 0.46	pCi/Total	0.19	10.2
	10/13/17	5.15 ± 0.56	4.88 ± 0.48	pCi/Total	0.27	5.49
	10/20/17	5.43 ± 2.14	4.20 ± 0.47	pCi/Total	0.29	25.6
	10/24/17	5.01 ± 0.87	5.80 ± 0.84	pCi/Total	0.51	14.6
	11/02/17	4.37 ± 1.22	4.15 ± 2.03	pCi/Total	1.06	5.21
	11/07/17	5.05 ± 0.51	4.22 ± 0.43	pCi/Total	0.19	17.9
	11/08/17	4.71 ± 0.48	4.67 ± 0.56	pCi/Total	0.19	0.9
	11/14/17	4.95 ± 0.50	5.05 ± 1.20	pCi/Total	0.19	2.1
	11/16/17	6.11 ± 0.95	5.65 ± 2.14	pCi/Total	0.52	7.8
	11/29/17	5.15 ± 0.87	5.37 ± 0.90	pCi/Total	0.12	4.2
	12/11/17	4.70 ± 0.39	4.81 ± 0.46	pCi/Total	0.15	2.4
	12/14/17	4.55 ± 0.42	5.00 ± 0.60	pCi/Total	0.18	9.5
	12/18/17	4.96 ± 0.46	5.10 ± 0.49	pCi/Total	0.38	2.7
	12/29/17	4.53 ± 0.91	5.69 ± 1.51	pCi/Total	0.64	23
C-14 (RAD)	01/18/17	1990 ± 17.5	1750 ± 22.5	pCi/Total	16.3	12.8
	02/01/17	1930 ± 16.6	1630 ± 19.7	pCi/Total	15.9	16.9
	02/10/17	1950 ± 17.3	1720 ± 18.7	pCi/Total	15.4	12.5
	03/02/17	1880 ± 17.8	1930 ± 20.1	pCi/Total	17.6	2.6
	03/10/17	1710 ± 13.8	1710 ± 19.3	pCi/Total	11.9	0.0
	03/23/17	1650 ± 16.4	1510 ± 20.9	pCi/Total	17.7	8.9
	04/05/17	1790 ± 17.7	1630 ± 18.9	pCi/Total	18.7	9.4
	04/11/17	1760 ± 12.6	1680 ± 14.2	pCi/Total	13.4	4.7
	04/20/17	2090 ± 18.9	1770 ± 22.2	pCi/Total	18.5	16.6
	05/02/17	1770 ± 14.9	2030 ± 14.4	pCi/Total	18.6	13.7
	05/11/17	1900 ± 11.2	1960 ± 13.5	pCi/Total	10.1	3.1
	05/26/17	2020 ± 11.5	1930 ± 13.2	pCi/Total	9.65	4.6
	06/09/17	1890 ± 16.0	1880 ± 17.3	pCi/Total	15.0	0.5
	06/16/17	1550 ± 12.0	1770 ± 12.3	pCi/Total	14.0	13.3
	06/24/17	1590 ± 16.2	2080 ± 21.1	pCi/Total	20.7	26.7
	06/26/17	3420 ± 16.0	2860 ± 15.2	pCi/Total	11.4	17.8
	07/11/17	1810 ± 15.6	1850 ± 17.7	pCi/Total	14.6	2.2
	07/20/17	1780 ± 11.7	1880 ± 13.1	pCi/Total	11.6	5.5
	07/26/17	1920 ± 12.2	1950 ± 13.3	pCi/Total	11.9	1.6
	08/01/17	1790 ± 18.4	1780 ± 17.6	pCi/Total	19.0	0.6
	08/22/17	1790 ± 49.1	2010 ± 51.7	pCi/Total	51.5	11.6
	08/25/17	1440 ± 15.0	1480 ± 14.9	pCi/Total	16.2	2.7
	09/18/17	2300 ± 12.6	2110 ± 13.4	pCi/Total	9.4	8.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
C-14 (RAD)	10/04/17	2000 ± 18.3	1940 ± 19.2	pCi/Total	17.1	3.1
	10/12/17	1860 ± 19.9	1960 ± 18.4	pCi/Total	14.7	5.2
	10/19/17	1920 ± 18.4	2290 ± 21.0	pCi/Total	17.3	17.6
	10/31/17	3800 ± 25.7	3850 ± 27.3	pCi/Total	17.3	1.3
	11/10/17	1910 ± 31.8	1530 ± 21.0	pCi/Total	30.7	22.1
	11/17/17	2070 ± 18.7	2080 ± 21.6	pCi/Total	18.6	0.5
	12/20/17	2080 ± 19.2	2070 ± 19.4	pCi/Total	17.0	0.5
Cs-137 (RAD)	03/03/17	83.4 ± 7.06	78.7 ± 6.95	pCi/Total	10.2	5.8
	05/09/17	79.2 ± 2.66	73.1 ± 2.60	pCi/Total	3.33	8.0
	06/01/17	73.3 ± 2.59	73.5 ± 2.70	pCi/Total	4.44	0.3
	06/19/17	84.2 ± 2.98	82.5 ± 2.98	pCi/Total	5.10	2.0
	06/29/17	84.9 ± 2.90	75.7 ± 2.72	pCi/Total	4.82	11.5
	07/27/17	81.3 ± 2.65	77.5 ± 2.63	pCi/Total	3.08	4.8
	11/01/17	89.4 ± 3.20	86.6 ± 3.47	pCi/Total	4.70	3.18
	11/06/17	87.8 ± 3.37	78.4 ± 3.35	pCi/Total	5.05	11.3
	11/14/17	83.3 ± 3.18	69.4 ± 2.72	pCi/Total	4.51	18.2
Fe-55	01/12/17	839 ± 257	945 ± 510	pCi/Total	993	(1)
	01/18/17	858 ± 335	876 ± 462	pCi/Total	1519	(1)
	01/26/17	801 ± 373	940 ± 311	pCi/Total	1203	(1)
	01/31/17	709 ± 315	816 ± 264	pCi/Total	819	(1)
	01/31/17	768 ± 189	878 ± 265	pCi/Total	1203	(1)
	02/01/17	809 ± 193	921 ± 328	pCi/Total	667	13.0
	02/10/17	885 ± 343	812 ± 292	pCi/Total	1245	(1)
	02/14/17	904 ± 460	934 ± 279	pCi/Total	1611	(1)
	02/24/17	868 ± 166	998 ± 175	pCi/Total	482	13.9
	02/28/17	809 ± 296	870 ± 208	pCi/Total	1120	(1)
	03/02/17	888 ± 201	896 ± 260	pCi/Total	346	1.0
	03/13/17	873 ± 280	891 ± 299	pCi/Total	543	2.1
	03/15/17	879 ± 209	801 ± 284	pCi/Total	448	9.3
	03/24/17	919 ± 215	997 ± 210	pCi/Total	2414	(1)
	03/30/17	834 ± 411	819 ± 346	pCi/Total	1811	(1)
	03/31/17	833 ± 508	768 ± 414	pCi/Total	2914	(1)
	04/07/17	859 ± 217	905 ± 232	pCi/Total	349	5.2
	04/20/17	882 ± 212	864 ± 289	pCi/Total	986	(1)
	04/25/17	826 ± 180	878 ± 227	pCi/Total	1499	(1)
	05/01/17	823 ± 372	865 ± 297	pCi/Total	1109	(1)
	05/02/17	873 ± 345	875 ± 437	pCi/Total	1450	(1)
	05/02/17	776 ± 259	758 ± 176	pCi/Total	1631	(1)
	05/04/17	840 ± 285	888 ± 249	pCi/Total	807	5.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Fe-55	05/05/17	889 ± 239	861 ± 261	pCi/Total	546	3.2
	05/19/17	732 ± 258	734 ± 258	pCi/Total	837	(1)
	05/23/17	857 ± 220	769 ± 249	pCi/Total	1867	(1)
	05/23/17	863 ± 141	825 ± 225	pCi/Total	342	4.5
	05/31/17	763 ± 190	745 ± 249	pCi/Total	1948	(1)
	06/02/17	798 ± 175	793 ± 179	pCi/Total	2099	(1)
	06/02/17	786 ± 223	805 ± 304	pCi/Total	718	2.4
	06/02/17	866 ± 227	881 ± 335	pCi/Total	2192	(1)
	06/02/17	871 ± 353	867 ± 254	pCi/Total	2081	(1)
	06/12/17	834 ± 353	785 ± 451	pCi/Total	3791	(1)
	06/19/17	810 ± 371	836 ± 406	pCi/Total	3371	(1)
	06/26/17	801 ± 385	813 ± 192	pCi/Total	2247	(1)
	06/29/17	889 ± 333	844 ± 428	pCi/Total	2516	(1)
	06/29/17	842 ± 380	872 ± 261	pCi/Total	2078	(1)
	07/14/17	854 ± 234	812 ± 245	pCi/Total	2101	(1)
	07/18/17	861 ± 201	841 ± 299	pCi/Total	1751	(1)
	07/25/17	834 ± 188	801 ± 248	pCi/Total	1710	(1)
	07/26/17	824 ± 515	887 ± 412	pCi/Total	3711	(1)
	07/27/17	845 ± 260	853 ± 382	pCi/Total	929	(1)
	08/01/17	889 ± 395	900 ± 327	pCi/Total	3118	(1)
	08/01/17	854 ± 266	831 ± 434	pCi/Total	608	2.7
	08/03/17	825 ± 410	842 ± 350	pCi/Total	4022	(1)
	08/14/17	874 ± 321	823 ± 420	pCi/Total	2982	(1)
	08/14/17	828 ± 423	824 ± 289	pCi/Total	2632	(1)
	08/18/17	867 ± 357	829 ± 458	pCi/Total	2144	(1)
	08/24/17	841 ± 499	908 ± 387	pCi/Total	2133	(1)
	08/28/17	877 ± 247	884 ± 284	pCi/Total	2477	(1)
	08/29/17	859 ± 389	882 ± 282	pCi/Total	3317	(1)
	08/30/17	913 ± 425	811 ± 317	pCi/Total	1398	(1)
	08/30/17	798 ± 275	797 ± 397	pCi/Total	3466	(1)
	09/12/17	852 ± 309	770 ± 250	pCi/Total	3578	(1)
	09/14/17	837 ± 275	823 ± 397	pCi/Total	1729	(1)
	09/22/17	881 ± 387	877 ± 270	pCi/Total	1897	(1)
	09/27/17	892 ± 233	802 ± 256	pCi/Total	1994	(1)
	09/27/17	840 ± 278	884 ± 291	pCi/Total	3071	(1)
	09/28/17	888 ± 298	824 ± 219	pCi/Total	2851	(1)
	10/06/17	1041 ± 220	877 ± 281	pCi/Total	389	17.2
	10/16/17	875 ± 302	855 ± 356	pCi/Total	2549	(1)
	11/01/17	818 ± 343	836 ± 368	pCi/Total	1334	(1)
	11/01/17	858 ± 345	857 ± 446	pCi/Total	2352	(1)
	11/01/17	811 ± 452	873 ± 358	pCi/Total	1193	(1)
	11/02/17	926 ± 222	792 ± 348	pCi/Total	1437	(1)

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Fe-55	11/03/17	849 ± 441	986 ± 225	pCi/Total	2277	(1)
	11/03/17	867 ± 342	855 ± 359	pCi/Total	1206	(1)
	11/07/17	862 ± 341	812 ± 416	pCi/Total	1290	(1)
	11/13/17	835 ± 416	867 ± 429	pCi/Total	3412	(1)
	11/29/17	870 ± 372	864 ± 382	pCi/Total	1221	(1)
	11/29/17	909 ± 328	901 ± 426	pCi/Total	2211	(1)
	11/29/17	778 ± 435	791 ± 431	pCi/Total	1642	(1)
	11/30/17	872 ± 469	787 ± 462	pCi/Total	1572	(1)
	11/30/17	885 ± 497	804 ± 378	pCi/Total	1670	(1)
	12/19/17	824 ± 349	881 ± 398	pCi/Total	1558	(1)
	12/22/17	931 ± 478	906 ± 367	pCi/Total	1570	(1)
	12/28/17	804 ± 381	883 ± 470	pCi/Total	1327	(1)
Gross Alpha	01/09/17	21.7 ± 2.22	19.5 ± 2.09	pCi/Total	3.61	10.7
	01/24/17	21.6 ± 2.22	20.4 ± 2.22	pCi/Total	3.62	5.7
	01/31/17	19.6 ± 2.07	19.2 ± 2.06	pCi/Total	2.18	2.1
	02/02/17	22.8 ± 2.30	19.1 ± 2.09	pCi/Total	2.31	17.7
	03/08/17	18.8 ± 2.05	19.3 ± 2.07	pCi/Total	2.83	2.6
	03/13/17	22.1 ± 2.28	20.3 ± 2.17	pCi/Total	3.51	8.5
	03/14/17	20.2 ± 2.18	19.8 ± 2.14	pCi/Total	3.25	2.0
	03/21/17	22.8 ± 2.29	19.3 ± 2.13	pCi/Total	3.66	16.6
	03/27/17	18.6 ± 1.92	18.7 ± 1.94	pCi/Total	2.25	0.5
	03/29/17	20.6 ± 2.26	18.9 ± 2.07	pCi/Total	3.70	8.6
	03/30/17	20.7 ± 2.10	19.2 ± 2.05	pCi/Total	2.96	7.5
	04/05/17	19.2 ± 2.11	18.9 ± 2.09	pCi/Total	3.87	1.6
	04/14/17	21.7 ± 3.16	20.5 ± 2.20	pCi/Total	6.05	5.7
	04/24/17	19.5 ± 2.04	19.6 ± 2.05	pCi/Total	1.24	0.5
	04/24/17	19.0 ± 2.00	18.5 ± 1.95	pCi/Total	2.09	2.7
	04/24/17	18.5 ± 1.91	19.1 ± 2.02	pCi/Total	1.96	3.2
	04/27/17	18.6 ± 1.93	18.8 ± 1.97	pCi/Total	2.28	1.1
	05/01/17	20.1 ± 2.14	21.2 ± 2.19	pCi/Total	3.80	5.3
	05/10/17	20.2 ± 2.10	20.6 ± 2.14	pCi/Total	2.17	2.0
	05/11/17	19.2 ± 1.98	19.8 ± 2.03	pCi/Total	2.02	3.1
	05/15/17	19.4 ± 2.03	21.7 ± 2.12	pCi/Total	3.15	11.2
	05/18/17	22.3 ± 2.24	22.0 ± 2.27	pCi/Total	3.58	1.4
	05/18/17	21.5 ± 2.30	21.5 ± 2.26	pCi/Total	3.89	0.0
	05/30/17	18.6 ± 1.93	19.5 ± 1.96	pCi/Total	1.63	4.7
	05/30/17	21.4 ± 2.23	19.9 ± 2.12	pCi/Total	3.21	7.3
	05/31/17	23.9 ± 2.37	20.1 ± 2.18	pCi/Total	3.73	17.3
	05/31/17	21.1 ± 2.21	21.5 ± 2.20	pCi/Total	3.88	1.9
	05/31/17	22.5 ± 2.36	19.9 ± 2.08	pCi/Total	2.82	12.3
	06/05/17	19.6 ± 2.04	20.6 ± 2.10	pCi/Total	3.15	5.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Alpha	06/07/17	25.7 ± 2.62	24.1 ± 2.46	pCi/Total	2.65	6.4
	06/12/17	20.7 ± 2.11	20.5 ± 2.04	pCi/Total	1.26	1.0
	06/12/17	18.5 ± 1.90	19.4 ± 1.99	pCi/Total	1.13	4.8
	06/13/17	18.9 ± 2.00	23.1 ± 2.22	pCi/Total	2.68	20.0
	06/20/17	18.8 ± 1.92	19.9 ± 2.04	pCi/Total	2.50	5.7
	06/20/17	18.9 ± 1.87	22.0 ± 2.13	pCi/Total	1.51	15.2
	06/23/17	18.6 ± 1.89	19.2 ± 1.92	pCi/Total	1.92	3.2
	06/23/17	20.0 ± 2.07	22.1 ± 2.19	pCi/Total	2.12	10.0
	07/03/17	21.2 ± 2.09	18.7 ± 1.99	pCi/Total	1.20	12.5
	07/17/17	24.0 ± 2.34	21.1 ± 2.19	pCi/Total	4.67	12.9
	07/17/17	19.7 ± 2.07	18.9 ± 1.98	pCi/Total	2.75	4.2
	08/02/17	23.7 ± 2.37	19.8 ± 2.14	pCi/Total	4.70	17.9
	08/09/17	19.1 ± 1.98	19.3 ± 2.01	pCi/Total	2.04	1.0
	08/10/17	21.8 ± 2.15	20.3 ± 2.08	pCi/Total	2.70	7.1
	08/15/17	18.7 ± 1.97	19.2 ± 2.02	pCi/Total	2.87	2.6
	08/17/17	19.5 ± 2.12	20.2 ± 2.18	pCi/Total	4.50	3.5
	08/20/17	19.8 ± 2.06	19.9 ± 2.05	pCi/Total	1.75	0.5
	08/20/17	19.2 ± 1.97	21.6 ± 2.10	pCi/Total	1.18	11.8
	08/28/17	23.6 ± 2.24	21.7 ± 2.15	pCi/Total	2.12	8.4
	08/29/17	19.6 ± 1.97	18.7 ± 1.95	pCi/Total	1.98	4.7
	08/29/17	23.5 ± 2.28	21.8 ± 2.20	pCi/Total	2.83	7.5
	08/31/17	23.4 ± 2.24	19.9 ± 2.05	pCi/Total	2.46	16.2
	09/14/17	18.6 ± 1.93	18.8 ± 1.99	pCi/Total	2.00	1.1
	09/17/17	24.0 ± 2.08	25.0 ± 2.12	pCi/Total	2.30	4.1
	09/17/17	21.8 ± 2.25	22.6 ± 2.27	pCi/Total	2.94	3.6
	09/26/17	21.5 ± 2.19	20.9 ± 2.21	pCi/Total	3.74	2.8
	09/26/17	18.9 ± 2.00	18.9 ± 2.07	pCi/Total	3.52	0
	09/28/17	26.6 ± 2.40	21.6 ± 2.19	pCi/Total	3.03	20.8
	10/17/17	23.10 ± 2.32	24.10 ± 2.30	pCi/Total	3.29	4.24
	10/23/17	24.70 ± 2.33	21.00 ± 2.15	pCi/Total	3.85	16.2
	11/02/17	19.40 ± 2.15	21.00 ± 2.22	pCi/Total	5.20	7.92
	11/02/17	20.00 ± 2.12	19.70 ± 2.12	pCi/Total	2.57	1.51
	11/06/17	23.00 ± 2.25	19.70 ± 2.07	pCi/Total	3.02	15.5
	11/13/17	22.30 ± 2.23	23.10 ± 2.25	pCi/Total	4.18	3.52
	11/14/17	19.80 ± 2.10	20.20 ± 2.15	pCi/Total	2.83	2
	11/14/17	21.50 ± 2.08	19.20 ± 2.00	pCi/Total	2.31	11.3
	11/22/17	18.60 ± 1.94	18.70 ± 1.95	pCi/Total	2.32	0.54
	11/28/17	22.30 ± 2.22	20.50 ± 2.12	pCi/Total	3.68	8.41
	11/28/17	21.50 ± 2.16	21.90 ± 2.18	pCi/Total	3.62	1.84
	11/28/17	24.90 ± 2.30	20.70 ± 2.11	pCi/Total	3.58	18.4
	11/30/17	19.50 ± 1.98	19.40 ± 1.96	pCi/Total	2.96	0.51
	12/12/17	18.80 ± 1.96	19.50 ± 1.96	pCi/Total	1.95	3.66
	12/14/17	19.70 ± 2.07	20.00 ± 2.08	pCi/Total	3.01	1.51

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Alpha	12/19/17	23.60 ± 2.33	24.20 ± 2.36	pCi/Total	2.92	2.51
Gross Beta	01/09/17	33.9 ± 1.87	32.8 ± 1.83	pCi/Total	3.59	3.3
	01/24/17	35.0 ± 1.92	33.5 ± 1.90	pCi/Total	4.14	4.4
	01/31/17	32.7 ± 1.88	34.5 ± 1.93	pCi/Total	4.82	5.4
	02/02/17	34.1 ± 1.93	32.7 ± 1.88	pCi/Total	4.70	4.2
	03/08/17	33.3 ± 1.84	34.5 ± 1.87	pCi/Total	3.25	3.5
	03/13/17	34.9 ± 1.94	33.8 ± 1.90	pCi/Total	4.44	3.2
	03/14/17	34.9 ± 1.93	32.9 ± 1.87	pCi/Total	4.24	5.9
	03/21/17	36.0 ± 1.95	36.0 ± 1.95	pCi/Total	4.20	0.0
	03/27/17	29.6 ± 1.74	30.1 ± 1.76	pCi/Total	3.91	1.7
	03/29/17	35.1 ± 1.96	33.9 ± 1.89	pCi/Total	4.37	3.5
	03/30/17	32.7 ± 1.86	32.0 ± 1.85	pCi/Total	4.20	2.2
	04/05/17	32.2 ± 1.86	33.5 ± 1.89	pCi/Total	4.63	4.0
	04/14/17	33.1 ± 2.64	34.3 ± 1.92	pCi/Total	6.60	3.6
	04/24/17	29.8 ± 1.76	31.5 ± 1.84	pCi/Total	4.41	5.6
	04/24/17	33.3 ± 1.88	31.4 ± 1.82	pCi/Total	4.34	5.9
	04/24/17	29.6 ± 1.79	30.1 ± 1.81	pCi/Total	4.11	1.7
	04/27/17	32.3 ± 1.83	30.1 ± 1.78	pCi/Total	4.20	7.1
	05/01/17	35.5 ± 1.94	34.3 ± 1.90	pCi/Total	4.53	3.4
	05/10/17	35.0 ± 1.91	35.1 ± 1.92	pCi/Total	4.22	0.3
	05/11/17	31.9 ± 1.82	31.1 ± 1.81	pCi/Total	4.26	2.5
	05/15/17	30.2 ± 1.76	34.9 ± 1.88	pCi/Total	3.45	14.4
	05/18/17	34.2 ± 1.93	34.2 ± 1.92	pCi/Total	4.54	0.0
	05/18/17	35.7 ± 1.94	32.7 ± 1.88	pCi/Total	4.38	8.8
	05/30/17	35.0 ± 1.93	35.5 ± 1.94	pCi/Total	4.10	1.4
	05/30/17	31.7 ± 1.81	33.7 ± 1.86	pCi/Total	3.95	6.1
	05/31/17	30.0 ± 1.86	32.3 ± 1.86	pCi/Total	4.42	7.4
	05/31/17	35.4 ± 1.94	34.5 ± 1.91	pCi/Total	4.53	2.6
	05/31/17	37.6 ± 1.98	34.1 ± 1.90	pCi/Total	3.86	9.8
	06/05/17	31.8 ± 1.82	31.3 ± 1.82	pCi/Total	4.59	1.6
	06/07/17	36.7 ± 2.08	32.8 ± 1.94	pCi/Total	4.38	11.2
	06/12/17	32.2 ± 1.84	32.0 ± 1.81	pCi/Total	3.63	0.6
	06/12/17	30.4 ± 1.75	31.2 ± 1.79	pCi/Total	3.46	2.6
	06/13/17	29.8 ± 1.77	32.4 ± 1.85	pCi/Total	4.06	8.4
	06/20/17	30.3 ± 1.74	32.7 ± 1.85	pCi/Total	3.93	7.6
	06/20/17	30.5 ± 1.78	30.8 ± 1.81	pCi/Total	4.63	1.0
	06/23/17	34.5 ± 1.90	35.6 ± 1.95	pCi/Total	4.23	3.1
	06/23/17	31.6 ± 1.80	32.1 ± 1.81	pCi/Total	4.11	1.6
	06/26/17	29.1 ± 1.74	27.6 ± 1.71	pCi/Total	4.00	5.3
	07/03/17	34.9 ± 1.89	30.4 ± 1.79	pCi/Total	3.74	13.8
	07/17/17	30.5 ± 1.81	31.4 ± 1.81	pCi/Total	4.18	2.9

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Gross Beta	07/17/17	36.9 ± 1.96	35.0 ± 1.91	pCi/Total	4.29	5.3
	08/02/17	35.9 ± 1.95	32.9 ± 1.86	pCi/Total	4.36	8.7
	08/09/17	32.3 ± 1.83	30.4 ± 1.79	pCi/Total	3.91	6.1
	08/10/17	31.9 ± 1.83	33.2 ± 1.86	pCi/Total	3.83	4.0
	08/15/17	30.3 ± 1.77	31.0 ± 1.80	pCi/Total	4.01	2.3
	08/17/17	32.8 ± 1.85	34.4 ± 1.90	pCi/Total	4.02	4.8
	08/20/17	31.1 ± 1.79	31.9 ± 1.82	pCi/Total	4.09	2.5
	08/20/17	31.1 ± 1.81	30.9 ± 1.80	pCi/Total	3.78	0.7
	08/28/17	36.0 ± 1.95	37.0 ± 1.98	pCi/Total	4.60	2.7
	08/29/17	31.4 ± 1.79	30.0 ± 1.78	pCi/Total	4.18	4.6
	08/29/17	38.6 ± 2.02	37.9 ± 2.00	pCi/Total	4.70	1.8
	08/30/17	28.5 ± 1.71	29.2 ± 1.73	pCi/Total	3.78	2.4
	08/31/17	33.7 ± 1.88	33.2 ± 1.86	pCi/Total	4.61	1.5
	09/14/17	28.7 ± 1.72	29.2 ± 1.79	pCi/Total	3.98	1.7
	09/17/17	34.6 ± 1.92	33.4 ± 1.89	pCi/Total	4.41	3.5
	09/26/17	33.8 ± 1.86	35.6 ± 1.94	pCi/Total	4.46	5.2
	09/26/17	35.4 ± 1.93	32.6 ± 1.87	pCi/Total	4.57	8.2
	09/28/17	33.6 ± 1.87	32.4 ± 1.85	pCi/Total	4.27	3.6
	10/17/17	35.9 ± 1.95	33.7 ± 1.87	pCi/Total	4.21	6.3
	10/23/17	35.1 ± 1.94	35.4 ± 1.94	pCi/Total	4.48	0.9
	11/02/17	34.3 ± 1.90	32.9 ± 1.86	pCi/Total	4.19	4.2
	11/02/17	30.7 ± 1.80	30.2 ± 1.80	pCi/Total	4.18	1.6
	11/06/17	34.6 ± 1.91	34.2 ± 1.90	pCi/Total	4.68	1.2
	11/13/17	33.6 ± 1.86	34.6 ± 1.88	pCi/Total	3.96	2.9
	11/14/17	31.9 ± 1.82	29.4 ± 1.76	pCi/Total	3.96	8.2
	11/14/17	31.0 ± 1.80	29.9 ± 1.78	pCi/Total	4.30	3.6
	11/22/17	30.7 ± 1.78	30.8 ± 1.78	pCi/Total	3.91	0.3
	11/28/17	33.4 ± 1.86	33.5 ± 1.86	pCi/Total	4.22	0.3
	11/28/17	34.1 ± 1.87	33.1 ± 1.84	pCi/Total	4.17	3.0
	11/28/17	36.4 ± 1.93	33.6 ± 1.86	pCi/Total	4.19	8.0
	12/12/17	30.5 ± 1.77	30.3 ± 1.75	pCi/Total	3.93	0.7
	12/14/17	31.5 ± 1.81	33.6 ± 1.87	pCi/Total	4.18	6.5
	12/19/17	35.9 ± 1.93	35.0 ± 1.91	pCi/Total	3.67	2.5
H-3	01/18/17	381 ± 89.1	378 ± 88.9	pCi/Total	449	(1)
	01/24/17	445 ± 93.9	410 ± 91.6	pCi/Total	451	(1)
	01/26/17	453 ± 91.9	399 ± 87.7	pCi/Total	412	12.7
	02/03/17	251 ± 55.4	227 ± 53.6	pCi/Total	255	(1)
	02/15/17	423 ± 103	418 ± 103	pCi/Total	585	(1)
	02/15/17	426 ± 91.7	460 ± 94.0	pCi/Total	438	(1)
	02/23/17	494 ± 93.5	377 ± 84.9	pCi/Total	391	26.9

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	03/03/17	481 ± 91.8	421 ± 87.9	pCi/Total	384	13.3
	03/11/17	495 ± 97.4	404 ± 90.8	pCi/Total	448	20.2
	03/24/17	418 ± 48.1	418 ± 48.0	pCi/Total	161	0
	03/27/17	460 ± 50.1	446 ± 49.3	pCi/Total	161	3.1
	03/30/17	903 ± 97.0	885 ± 95.9	pCi/Total	191	2.01
	03/31/17	42.2 ± 4.78	45.9 ± 5.15	pCi/Total	18	8.4
	04/05/17	438 ± 48.3	426 ± 47.9	pCi/Total	147	2.8
	04/12/17	378 ± 46.6	445 ± 49.7	pCi/Total	169	16.3
	04/18/17	417 ± 43.5	433 ± 44.3	pCi/Total	130	3.8
	04/20/17	396 ± 47.8	446 ± 50.2	pCi/Total	179	11.9
	04/21/17	415 ± 47.8	373 ± 45.6	pCi/Total	156	10.7
	05/02/17	409 ± 46.7	434 ± 48.0	pCi/Total	140	5.9
	05/05/17	43.9 ± 4.90	42.8 ± 4.78	pCi/Total	17.3	2.5
	05/11/17	426 ± 47.7	431 ± 47.9	pCi/Total	144	1.2
	05/30/17	443 ± 48.4	420 ± 47.2	pCi/Total	141	5.3
	06/02/17	472 ± 49.6	448 ± 48.7	pCi/Total	118	5.2
	06/02/17	49.6 ± 8.41	48.1 ± 8.17	pCi/Total	26.8	3.1
	06/09/17	433 ± 48.2	486 ± 50.6	pCi/Total	142	11.5
	06/14/17	420 ± 47.4	462 ± 49.5	pCi/Total	146	9.5
	06/15/17	475 ± 49.5	435 ± 47.7	pCi/Total	131	8.8
	06/23/17	598 ± 59.2	586 ± 58.0	pCi/Total	112	2.0
	06/23/17	437 ± 48.6	461 ± 49.6	pCi/Total	149	5.4
	06/26/17	450 ± 49.1	471 ± 50.0	pCi/Total	142	4.6
	07/11/17	416 ± 47.9	465 ± 50.3	pCi/Total	158	11.1
	07/20/17	407 ± 46.1	458 ± 48.6	pCi/Total	127	11.8
	07/21/17	390 ± 46.6	393 ± 46.8	pCi/Total	156	0.8
	07/25/17	418 ± 47.6	411 ± 47.2	pCi/Total	142	1.7
	07/31/17	456 ± 50.0	486 ± 51.5	pCi/Total	151	6.4
	08/16/17	427 ± 48.1	499 ± 51.3	pCi/Total	145	15.6
	08/18/17	490 ± 51.1	461 ± 49.8	pCi/Total	147	6.1
	08/25/17	457 ± 50.2	463 ± 50.7	pCi/Total	160	1.3
	09/18/17	482 ± 50.7	433 ± 48.4	pCi/Total	143	10.7
	09/22/17	510 ± 54.8	454 ± 52.1	pCi/Total	155	11.6
	09/27/17	449 ± 53.0	483 ± 54.8	pCi/Total	185	7.3
	10/05/17	486 ± 55.1	482 ± 54.9	pCi/Total	187	0.8
	10/11/17	523 ± 54.8	475 ± 52.3	pCi/Total	142	9.6
	10/13/17	493 ± 54.6	532 ± 56.2	pCi/Total	170	7.6
	10/19/17	497 ± 54.6	501 ± 54.7	pCi/Total	166	0.8
	10/24/17	511 ± 54.5	498 ± 53.7	pCi/Total	147	2.6
	10/30/17	487 ± 54.4	465 ± 53.1	pCi/Total	169	4.6
	11/07/17	483 ± 52.9	462 ± 51.9	pCi/Total	149	4.4

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(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
H-3	11/15/17	508 ± 55.4	474 ± 53.5	pCi/Total	166	6.9
	11/16/17	524 ± 55.1	486 ± 53.1	pCi/Total	145	7.5
	11/29/17	501 ± 54.0	512 ± 54.8	pCi/Total	148	2.2
	12/12/17	554 ± 57.3	562 ± 57.5	pCi/Total	159	1.4
	12/20/17	476 ± 54.2	516 ± 56.3	pCi/Total	153	8.1
I-129	01/06/17	56.7 ± 11.1	66.0 ± 12.9	pCi/Total	21.8	15.2
	01/10/17	74.7 ± 11.1	61.3 ± 11.2	pCi/Total	21.0	19.7
	01/16/17	64.1 ± 7.98	59.3 ± 11.2	pCi/Total	9.19	7.8
	01/17/17	57.9 ± 8.57	59.9 ± 12.7	pCi/Total	18.5	3.4
	01/18/17	51.4 ± 19.8	68.8 ± 15.6	pCi/Total	62.0	(1)
	01/23/17	69.7 ± 9.66	72.2 ± 17.8	pCi/Total	8.05	3.5
	01/25/17	58.8 ± 15.6	55.4 ± 12.4	pCi/Total	48.1	6.0
	01/30/17	63.2 ± 19.0	67.8 ± 21.9	pCi/Total	63.7	7.0
	02/02/17	72.7 ± 11.2	60.2 ± 15.8	pCi/Total	25.1	18.8
	02/07/17	67.8 ± 14.5	69.7 ± 21.8	pCi/Total	57.8	2.8
	02/13/17	69.4 ± 15.1	72.1 ± 8.65	pCi/Total	53.3	3.8
	02/14/17	65.2 ± 30.1	63.3 ± 23.7	pCi/Total	84.5	(1)
	02/16/17	65.2 ± 14.8	66.1 ± 22.3	pCi/Total	38.8	1.4
	02/21/17	63.5 ± 10.6	64.6 ± 11.3	pCi/Total	25.8	1.8
	02/23/17	53.8 ± 17.8	50.9 ± 12.8	pCi/Total	45.2	5.6
	02/27/17	64.3 ± 14.3	61.6 ± 14.3	pCi/Total	23.9	4.2
	02/28/17	64.0 ± 31.6	62.3 ± 14.8	pCi/Total	55.5	2.7
	03/02/17	59.1 ± 20.9	52.7 ± 15.8	pCi/Total	44.0	11.5
	03/08/17	55.5 ± 12.6	59.6 ± 14.8	pCi/Total	39.1	7.1
	03/13/17	64.4 ± 11.8	62.4 ± 34.1	pCi/Total	31.8	3.2
	03/14/17	57.2 ± 17.0	66.5 ± 13.2	pCi/Total	29.3	15.1
	03/16/17	59.9 ± 12.1	52.4 ± 9.94	pCi/Total	27.5	13.3
	03/21/17	60.9 ± 24.2	63.1 ± 17.6	pCi/Total	64.6	(1)
	03/23/17	66.8 ± 17.4	60.2 ± 13.2	pCi/Total	47.8	10.4
	03/24/17	58.8 ± 23.6	63.6 ± 25.8	pCi/Total	42.5	7.8
	03/28/17	58.3 ± 14.8	64.6 ± 15.5	pCi/Total	24.5	10.2
	03/30/17	64.9 ± 19.6	65.2 ± 19.6	pCi/Total	43.4	0.4
	04/06/17	53.7 ± 8.10	54.9 ± 17.6	pCi/Total	22.7	2.0
	04/06/17	66.3 ± 17.8	58.9 ± 10.4	pCi/Total	33.6	11.9
	04/17/17	54.9 ± 20.6	68.0 ± 12.8	pCi/Total	52.4	21.2
	04/18/17	62.1 ± 21.5	59.9 ± 14.9	pCi/Total	38.6	3.5
	04/19/17	61.5 ± 15.0	58.5 ± 12.1	pCi/Total	45.1	5.1
	04/20/17	68.6 ± 10.6	72.2 ± 30.0	pCi/Total	33.2	5.1
	04/27/17	64.9 ± 14.8	56.3 ± 15.2	pCi/Total	55.2	14.2
	05/01/17	63.1 ± 13.3	68.3 ± 14.4	pCi/Total	15.4	8.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
I-129	05/01/17	68.3 ± 17.1	71.7 ± 10.8	pCi/Total	47.7	4.9
	05/04/17	58.7 ± 13.2	64.0 ± 12.9	pCi/Total	29.9	8.6
	05/09/17	68.8 ± 17.0	60.1 ± 8.67	pCi/Total	50.6	13.5
	05/10/17	65.6 ± 18.8	58.6 ± 16.9	pCi/Total	54.3	11.2
	05/11/17	60.0 ± 19.3	65.2 ± 20.4	pCi/Total	55.4	8.3
	05/16/17	63.5 ± 24.4	56.1 ± 17.2	pCi/Total	74.7	(1)
	05/18/17	58.7 ± 24.5	57.4 ± 12.7	pCi/Total	43.1	2.3
	05/25/17	56.5 ± 28.7	58.9 ± 7.33	pCi/Total	102	4.2
	05/25/17	65.4 ± 17.7	53.7 ± 5.98	pCi/Total	31.4	19.7
	05/25/17	62.3 ± 11.8	67.8 ± 12.3	pCi/Total	31.8	8.3
	06/01/17	61.5 ± 12.3	61.4 ± 14.5	pCi/Total	34.0	0.1
	06/01/17	57.9 ± 23.9	65.7 ± 19.4	pCi/Total	58.3	(1)
	06/07/17	65.0 ± 15.5	55.3 ± 11.5	pCi/Total	39.0	16.1
	06/09/17	58.1 ± 14.0	54.9 ± 6.08	pCi/Total	26.8	5.7
	06/12/17	56.9 ± 20.6	62.0 ± 20.6	pCi/Total	29.7	8.5
	06/15/17	56.2 ± 11.5	61.4 ± 12.8	pCi/Total	43.2	8.8
	06/19/17	65.9 ± 14.6	56.5 ± 13.4	pCi/Total	51.0	15.3
	06/20/17	58.3 ± 10.8	52.8 ± 20.9	pCi/Total	42.8	9.9
	06/21/17	62.4 ± 23.3	66.4 ± 20.5	pCi/Total	77.1	(1)
	06/23/17	65.8 ± 14.5	65.6 ± 18.7	pCi/Total	48.0	0.3
	06/26/17	59.3 ± 22.0	69.3 ± 11.2	pCi/Total	41.2	15.5
	06/26/17	66.6 ± 22.6	69.3 ± 16.1	pCi/Total	43.0	3.9
	06/28/17	68.7 ± 21.7	66.4 ± 38.5	pCi/Total	36.3	3.5
	06/29/17	59.6 ± 17.8	64.3 ± 16.6	pCi/Total	76.1	(1)
	07/07/17	63.2 ± 10.5	67.4 ± 22.4	pCi/Total	66.6	6.5
	07/11/17	61.8 ± 15.0	69.2 ± 16.3	pCi/Total	44.6	11.2
	07/11/17	57.1 ± 10.1	61.5 ± 11.5	pCi/Total	14.1	7.3
	07/13/17	67.4 ± 18.9	66.7 ± 23.3	pCi/Total	69.9	(1)
	07/14/17	63.9 ± 22.5	64.7 ± 15.6	pCi/Total	49.8	1.3
	07/18/17	60.5 ± 16.9	56.6 ± 14.9	pCi/Total	40.7	6.5
	07/20/17	68.7 ± 14.4	66.0 ± 10.1	pCi/Total	52.6	4.1
	07/20/17	65.2 ± 22.8	69.2 ± 19.5	pCi/Total	68.4	(1)
	07/21/17	62.6 ± 26.6	64.3 ± 22.3	pCi/Total	127.9	(1)
	07/25/17	67.1 ± 15.2	61.2 ± 15.1	pCi/Total	32.7	9.2
	07/26/17	68.6 ± 20.0	66.9 ± 13.8	pCi/Total	54.1	2.5
	07/31/17	69.2 ± 19.1	64.3 ± 9.16	pCi/Total	54.8	7.4
	07/31/17	67.4 ± 20.7	63.6 ± 19.2	pCi/Total	44.4	5.9
	08/01/17	61.6 ± 16.5	58.7 ± 12.5	pCi/Total	36.7	4.9
	08/03/17	62.7 ± 14.8	66.3 ± 17.5	pCi/Total	30.9	5.6
	08/08/17	70.0 ± 26.6	61.8 ± 16.6	pCi/Total	99.7	(1)
	08/10/17	68.3 ± 20.4	68.9 ± 18.8	pCi/Total	30.7	0.9

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
I-129	08/14/17	68.6 ± 18.3	67.2 ± 17.8	pCi/Total	59.7	2.1
	08/15/17	65.7 ± 16.2	58.7 ± 20.6	pCi/Total	49.2	11.1
	08/16/17	57.4 ± 12.1	56.4 ± 11.8	pCi/Total	13.8	1.7
	08/22/17	57.9 ± 14.0	53.9 ± 7.84	pCi/Total	45.5	7.0
	08/25/17	62.3 ± 16.4	58.9 ± 10.8	pCi/Total	26.7	5.5
	08/28/17	67.4 ± 20.7	58.6 ± 13.3	pCi/Total	41.4	14.0
	08/28/17	56.6 ± 14.6	63.6 ± 25.5	pCi/Total	18.4	11.8
	08/29/17	56.3 ± 11.7	58.6 ± 13.6	pCi/Total	27.5	4.0
	08/30/17	60.1 ± 15.1	57.0 ± 24.4	pCi/Total	44.0	5.4
	09/01/17	65.3 ± 15.2	61.2 ± 15.2	pCi/Total	36.9	6.6
	09/08/17	54.7 ± 31.6	61.5 ± 14.7	pCi/Total	78.7	(1)
	09/08/17	64.8 ± 10.7	69.3 ± 10.2	pCi/Total	31.2	6.7
	09/12/17	63.6 ± 28.1	62.1 ± 20.4	pCi/Total	98.3	(1)
	09/14/17	53.5 ± 10.3	52.5 ± 14.0	pCi/Total	21.6	1.9
	09/15/17	67.6 ± 26.4	60.4 ± 24.2	pCi/Total	68.3	(1)
	09/18/17	65.5 ± 24.6	67.1 ± 18.9	pCi/Total	71.4	(1)
	09/20/17	64.4 ± 16.5	65.8 ± 16.7	pCi/Total	44.3	2.3
	09/25/17	62.9 ± 20.9	66.9 ± 22.2	pCi/Total	56.8	6.1
	09/25/17	62.9 ± 14.5	69.1 ± 30.0	pCi/Total	35.9	9.4
	09/27/17	67.9 ± 23.7	57.8 ± 9.65	pCi/Total	70.8	(1)
	09/29/17	62.6 ± 21.2	63.6 ± 10.4	pCi/Total	52.4	1.7
	10/03/17	52.8 ± 15.8	59.4 ± 15.2	pCi/Total	32.8	11.8
	10/05/17	57.4 ± 14.7	56.4 ± 18.3	pCi/Total	34.3	1.8
	10/06/17	68.0 ± 22.9	66.6 ± 15.5	pCi/Total	35.0	2.2
	10/10/17	57.2 ± 17.8	60.8 ± 17.0	pCi/Total	44.7	6.2
	10/12/17	64.7 ± 18.8	62.4 ± 6.75	pCi/Total	12.9	3.7
	10/13/17	69.4 ± 15.4	60.2 ± 17.4	pCi/Total	45.3	14.2
	10/13/17	70.0 ± 20.3	65.9 ± 24.8	pCi/Total	36.5	6.0
	10/18/17	68.9 ± 17.6	60.4 ± 12.0	pCi/Total	18.0	13.0
	10/20/17	61.0 ± 24.7	66.2 ± 18.6	pCi/Total	29.9	8.3
	10/23/17	65.3 ± 17.4	65.7 ± 22.0	pCi/Total	56.0	0.6
	10/25/17	64.1 ± 16.2	62.7 ± 15.1	pCi/Total	30.8	2.3
	10/27/17	65.0 ± 22.2	59.2 ± 16.9	pCi/Total	36.9	9.3
	10/30/17	54.5 ± 12.9	61.2 ± 13.6	pCi/Total	18.8	11.7
	11/01/17	58.5 ± 11.4	57.7 ± 11.5	pCi/Total	30.8	1.4
	11/03/17	63.5 ± 27.4	60.5 ± 10.4	pCi/Total	20.5	4.9
	11/08/17	62.9 ± 18.2	58.9 ± 8.73	pCi/Total	15.5	6.6
	11/10/17	57.2 ± 14.5	57.0 ± 12.1	pCi/Total	33.6	0.3
	11/15/17	58.8 ± 13.1	61.2 ± 28.2	pCi/Total	25.0	4.0
	11/15/17	58.3 ± 17.1	60.5 ± 19.4	pCi/Total	31.5	3.6
	11/17/17	64.0 ± 17.5	62.3 ± 17.0	pCi/Total	34.2	2.8

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
I-129	11/21/17	64.2 ± 18.9	59.1 ± 13.6	pCi/Total	26.2	8.3
	11/28/17	59.4 ± 18.0	62.5 ± 27.7	pCi/Total	36.0	5.1
	11/30/17	69.2 ± 19.2	64.1 ± 16.0	pCi/Total	39.7	7.7
	12/01/17	69.4 ± 16.2	67.1 ± 18.9	pCi/Total	37.5	3.4
	12/06/17	62.1 ± 24.0	69.1 ± 18.3	pCi/Total	51.5	10.7
	12/07/17	67.0 ± 18.3	63.1 ± 12.0	pCi/Total	17.2	6.0
	12/12/17	64.9 ± 17.4	60.3 ± 22.6	pCi/Total	33.8	7.2
	12/14/17	55.5 ± 25.0	56.3 ± 12.7	pCi/Total	29.0	1.5
	12/18/17	69.3 ± 19.0	64.4 ± 26.4	pCi/Total	54.7	7.4
	12/19/17	59.5 ± 15.6	66.9 ± 21.3	pCi/Total	32.8	11.7
	12/27/17	61.8 ± 13.5	68.0 ± 16.6	pCi/Total	21.8	9.6
	12/28/17	63.0 ± 11.7	78.4 ± 31.3	pCi/Total	27.9	21.9
Ni-63	01/05/17	342 ± 15.0	329 ± 14.7	pCi/Total	17.2	3.9
	01/11/17	243 ± 13.5	239 ± 13.5	pCi/Total	23.0	1.7
	01/17/17	334 ± 14.9	340 ± 15.1	pCi/Total	22.3	1.8
	01/18/17	1120 ± 28.5	1280 ± 30.6	pCi/Total	28.2	13.3
	01/27/17	284 ± 14.5	365 ± 16.8	pCi/Total	19.8	25.0
	01/31/17	224 ± 13.0	222 ± 13.2	pCi/Total	20.7	0.9
	02/02/17	256 ± 14.1	240 ± 13.8	pCi/Total	28.6	6.5
	02/02/17	234 ± 13.6	239 ± 13.7	pCi/Total	28.8	2.1
	02/10/17	395 ± 16.9	347 ± 15.8	pCi/Total	24.2	12.9
	02/21/17	342 ± 15.0	335 ± 14.9	pCi/Total	19.2	2.1
	02/23/17	255 ± 13.9	255 ± 13.8	pCi/Total	24.2	0.0
	03/01/17	280 ± 4.22	275 ± 4.16	pCi/Total	6.15	1.8
	03/02/17	225 ± 13.0	231 ± 13.2	pCi/Total	23.0	2.6
	03/02/17	256 ± 14.4	261 ± 14.5	pCi/Total	29.6	1.9
	03/09/17	243 ± 13.4	243 ± 13.5	pCi/Total	19.3	0.0
	03/15/17	295 ± 15.8	287 ± 15.5	pCi/Total	24.3	2.8
	03/23/17	226 ± 13.3	229 ± 13.4	pCi/Total	24.2	1.3
	03/30/17	271 ± 15.0	266 ± 15.1	pCi/Total	25.8	1.9
	03/30/17	268 ± 16.8	253 ± 15.8	pCi/Total	42.0	5.8
	04/06/17	310 ± 17.2	330 ± 17.7	pCi/Total	33.8	6.3
	04/20/17	315 ± 16.1	289 ± 15.6	pCi/Total	22.4	8.6
	04/21/17	289 ± 10.9	283 ± 10.9	pCi/Total	18.8	2.1
	05/02/17	289 ± 15.7	310 ± 16.0	pCi/Total	25.3	7.0
	05/02/17	276 ± 15.1	285 ± 15.3	pCi/Total	24.7	3.2
	05/02/17	316 ± 16.5	315 ± 16.3	pCi/Total	25.6	0.3
	05/02/17	320 ± 16.2	303 ± 15.7	pCi/Total	24.4	5.5
	05/03/17	335 ± 5.37	340 ± 5.04	pCi/Total	8.05	1.5
	05/12/17	292 ± 15.4	281 ± 15.1	pCi/Total	22.9	3.8

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Ni-63	05/17/17	297 ± 4.42	287 ± 4.39	pCi/Total	6.50	3.4
	05/30/17	322 ± 16.5	309 ± 16.0	pCi/Total	20.9	4.1
	05/30/17	269 ± 14.9	305 ± 16.0	pCi/Total	20.4	12.5
	05/30/17	315 ± 16.2	324 ± 16.5	pCi/Total	20.8	2.8
	05/30/17	298 ± 15.8	323 ± 16.5	pCi/Total	20.7	8.1
	06/01/17	311 ± 16.2	319 ± 16.9	pCi/Total	28.1	2.5
	06/01/17	283 ± 15.9	303 ± 16.3	pCi/Total	29.6	6.8
	06/09/17	313 ± 16.2	262 ± 15.3	pCi/Total	26.3	17.7
	06/14/17	459 ± 19.4	468 ± 19.6	pCi/Total	22.9	1.9
	06/20/17	317 ± 16.4	288 ± 15.7	pCi/Total	25.2	9.6
	06/28/17	290 ± 15.7	330 ± 17.0	pCi/Total	26.5	12.9
	06/29/17	308 ± 16.2	307 ± 16.1	pCi/Total	24.8	0.3
	06/29/17	292 ± 15.7	302 ± 15.9	pCi/Total	24.6	3.4
	07/13/17	297 ± 15.3	258 ± 14.5	pCi/Total	22.0	14.1
	07/17/17	308 ± 16.2	317 ± 16.4	pCi/Total	25.0	2.9
	07/17/17	334 ± 14.9	348 ± 15.2	pCi/Total	19.6	4.1
	07/20/17	325 ± 16.3	288 ± 15.8	pCi/Total	23.2	12.1
	07/24/17	297 ± 15.9	266 ± 14.9	pCi/Total	23.5	11.0
	07/28/17	324 ± 16.6	325 ± 16.6	pCi/Total	26.3	0.3
	07/30/17	276 ± 15.4	293 ± 15.8	pCi/Total	31.0	6.0
	08/01/17	293 ± 15.7	312 ± 16.1	pCi/Total	25.9	6.3
	08/01/17	295 ± 7.85	290 ± 7.77	pCi/Total	11.1	1.7
	08/01/17	287 ± 15.5	316 ± 16.3	pCi/Total	25.7	9.6
	08/02/17	278 ± 15.5	297 ± 15.8	pCi/Total	26.9	6.6
	08/14/17	326 ± 16.7	326 ± 16.7	pCi/Total	20.1	0.0
	08/18/17	325 ± 16.4	331 ± 16.5	pCi/Total	26.0	1.8
	08/24/17	314 ± 11.3	314 ± 11.3	pCi/Total	15.4	0.0
	08/28/17	297 ± 15.9	293 ± 15.8	pCi/Total	27.0	1.4
	08/30/17	303 ± 15.8	293 ± 15.6	pCi/Total	25.6	3.4
	08/30/17	292 ± 15.6	299 ± 15.7	pCi/Total	25.9	2.4
	08/30/17	328 ± 16.5	309 ± 16.1	pCi/Total	25.9	6.0
	09/08/17	323 ± 4.75	304 ± 4.58	pCi/Total	6.2	6.1
	09/08/17	289 ± 4.38	311 ± 4.62	pCi/Total	5.9	7.3
	09/18/17	298 ± 15.9	354 ± 17.3	pCi/Total	29.0	17.2
	09/24/17	274 ± 14.9	282 ± 15.2	pCi/Total	28.1	2.9
	09/24/17	282 ± 15.1	258 ± 14.6	pCi/Total	27.9	8.9
	09/26/17	286 ± 15.6	242 ± 14.0	pCi/Total	28.7	16.7
	09/26/17	292 ± 15.6	297 ± 15.8	pCi/Total	28.2	1.7
	10/06/17	303 ± 15.9	310 ± 16.3	pCi/Total	25.7	2.3
	10/13/17	258 ± 14.5	260 ± 14.6	pCi/Total	22.6	0.8
	10/26/17	321 ± 16.3	340 ± 16.8	pCi/Total	23.0	5.8

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Ni-63	10/27/17	288 ± 15.7	308 ± 16.1	pCi/Total	32.2	6.7
	10/29/17	316 ± 16.3	302 ± 15.7	pCi/Total	25.0	4.5
	10/29/17	320 ± 16.0	324 ± 16.9	pCi/Total	24.8	1.2
	10/30/17	282 ± 15.0	281 ± 14.8	pCi/Total	23.0	0.4
	10/30/17	282 ± 14.6	285 ± 14.7	pCi/Total	21.8	1.1
	11/07/17	319 ± 16.5	288 ± 15.8	pCi/Total	31.9	10.2
	11/17/17	323 ± 3.78	305 ± 3.72	pCi/Total	5.2	5.7
	11/17/17	268 ± 15.6	293 ± 15.9	pCi/Total	30.4	8.9
	11/20/17	287 ± 6.45	299 ± 6.60	pCi/Total	10.4	4.1
	11/27/17	246 ± 14.7	305 ± 16.3	pCi/Total	30.1	21.4
	11/27/17	275 ± 15.6	304 ± 16.3	pCi/Total	30.1	10.0
	11/28/17	312 ± 5.44	336 ± 5.62	pCi/Total	7.4	7.4
	11/29/17	317 ± 16.9	324 ± 17.1	pCi/Total	29.2	2.2
	11/29/17	290 ± 16.1	318 ± 16.9	pCi/Total	28.8	9.2
	12/14/17	274 ± 15.4	286 ± 15.8	pCi/Total	28.7	4.3
	12/18/17	288 ± 4.61	298 ± 4.70	pCi/Total	7.7	3.4
	12/22/17	296 ± 16.0	273 ± 15.7	pCi/Total	24.8	8.1
	12/28/17	275 ± 17.1	257 ± 16.6	pCi/Total	33.5	6.8
	12/28/17	288 ± 16.1	257 ± 15.5	pCi/Total	28.9	11.4
Pu-239/240 (AS)	01/17/17	7.26 ± 0.93	8.21 ± 1.04	pCi/Total	0.20	12.3
	01/24/17	8.43 ± 1.74	7.88 ± 1.84	pCi/Total	0.50	6.8
	02/01/17	7.87 ± 1.25	7.65 ± 0.87	pCi/Total	0.27	2.9
	02/14/17	7.57 ± 1.47	7.70 ± 2.51	pCi/Total	0.11	1.6
	02/22/17	8.40 ± 1.17	8.46 ± 1.05	pCi/Total	0.32	0.6
	03/02/17	6.84 ± 1.59	8.18 ± 2.38	pCi/Total	0.39	17.9
	03/08/17	6.76 ± 0.98	6.39 ± 0.83	pCi/Total	0.25	5.6
	03/13/17	7.56 ± 1.17	6.69 ± 0.79	pCi/Total	0.28	12.2
	03/22/17	6.78 ± 0.88	7.02 ± 1.15	pCi/Total	0.27	3.6
	03/24/17	6.66 ± 0.92	7.22 ± 0.99	pCi/Total	0.24	8.0
	03/30/17	6.75 ± 1.09	7.37 ± 1.38	pCi/Total	0.40	8.8
	04/07/17	5.77 ± 2.02	7.35 ± 3.02	pCi/Total	0.41	24.0
	04/12/17	5.71 ± 0.75	5.91 ± 0.81	pCi/Total	0.15	3.5
	04/14/17	8.16 ± 1.53	6.56 ± 0.89	pCi/Total	1.04	21.8
	04/19/17	7.71 ± 0.97	8.60 ± 1.09	pCi/Total	0.22	11.0
	04/20/17	7.12 ± 0.85	7.05 ± 0.91	pCi/Total	0.21	1.0
	04/28/17	6.56 ± 0.92	8.25 ± 1.31	pCi/Total	0.28	22.9
	05/04/17	7.55 ± 1.03	8.17 ± 1.06	pCi/Total	0.36	7.9
	05/10/17	8.53 ± 1.26	7.74 ± 1.03	pCi/Total	0.27	9.7
	05/30/17	7.68 ± 1.36	7.73 ± 1.02	pCi/Total	0.37	0.6
	06/02/17	6.54 ± 4.02	7.34 ± 3.61	pCi/Total	4.48	11.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Pu-239/240 (AS)	06/12/17	8.00 ± 1.15	8.32 ± 1.18	pCi/Total	0.24	4.0
	06/20/17	8.43 ± 3.62	7.05 ± 2.53	pCi/Total	0.80	17.8
	06/20/17	6.70 ± 2.51	7.01 ± 2.59	pCi/Total	1.25	4.4
	06/25/17	7.71 ± 1.01	8.44 ± 1.30	pCi/Total	0.17	9.0
	06/27/17	7.78 ± 1.01	7.65 ± 0.92	pCi/Total	0.18	1.6
	06/29/17	8.88 ± 2.91	8.57 ± 3.85	pCi/Total	0.88	3.5
	07/07/17	6.57 ± 0.94	7.77 ± 1.00	pCi/Total	0.16	16.8
	07/20/17	8.46 ± 2.54	8.20 ± 2.40	pCi/Total	0.22	3.1
	07/20/17	6.42 ± 1.22	7.25 ± 1.63	pCi/Total	0.27	12.2
	07/25/17	5.91 ± 0.98	6.76 ± 0.93	pCi/Total	0.27	13.4
	07/28/17	5.77 ± 0.90	7.61 ± 1.35	pCi/Total	0.37	27.4
	07/28/17	5.42 ± 0.94	6.73 ± 1.02	pCi/Total	0.32	21.5
	07/29/17	7.74 ± 1.21	8.47 ± 1.37	pCi/Total	0.25	9.1
	08/01/17	6.50 ± 1.02	7.74 ± 1.26	pCi/Total	0.27	17.4
	08/15/17	7.81 ± 1.40	8.48 ± 1.49	pCi/Total	0.34	8.3
	08/18/17	6.93 ± 1.28	7.69 ± 1.76	pCi/Total	0.44	10.5
	08/18/17	7.06 ± 1.36	6.38 ± 1.11	pCi/Total	0.38	10.0
	08/25/17	5.31 ± 0.60	5.49 ± 0.85	pCi/Total	0.34	3.2
	08/29/17	5.11 ± 0.91	5.49 ± 0.35	pCi/Total	1.15	7.2
	09/11/17	6.25 ± 1.20	5.43 ± 1.37	pCi/Total	0.36	14.0
	09/14/17	6.58 ± 1.08	7.77 ± 1.41	pCi/Total	0.43	16.7
	09/19/17	5.42 ± 1.00	5.02 ± 0.78	pCi/Total	0.34	7.6
	09/28/17	6.20 ± 2.56	7.08 ± 3.06	pCi/Total	0.99	13.3
	09/28/17	6.24 ± 1.54	6.89 ± 1.84	pCi/Total	0.16	9.9
	10/05/17	5.77 ± 0.77	6.13 ± 0.95	pCi/Total	0.39	6.0
	10/12/17	5.61 ± 0.85	5.62 ± 1.03	pCi/Total	0.26	0.2
	10/13/17	7.34 ± 0.93	5.59 ± 1.10	pCi/Total	0.37	27.1
	10/18/17	7.92 ± 0.88	6.57 ± 0.89	pCi/Total	0.34	18.5
	10/25/17	6.01 ± 0.73	6.43 ± 0.72	pCi/Total	0.34	6.7
	11/02/17	5.53 ± 1.58	6.49 ± 1.91	pCi/Total	0.57	16.1
	11/07/17	6.63 ± 1.12	6.03 ± 1.36	pCi/Total	0.41	9.5
	11/08/17	6.17 ± 1.16	4.98 ± 0.76	pCi/Total	0.34	21.3
	11/14/17	5.09 ± 0.94	4.97 ± 2.23	pCi/Total	0.47	2.4
	11/16/17	5.48 ± 1.13	4.96 ± 0.67	pCi/Total	0.27	10.0
	11/29/17	5.33 ± 0.88	5.14 ± 0.78	pCi/Total	0.35	3.6
	12/11/17	6.32 ± 0.86	5.82 ± 0.85	pCi/Total	0.24	8.3
	12/14/17	5.89 ± 0.72	6.05 ± 0.93	pCi/Total	0.19	2.7
	12/18/17	5.84 ± 0.81	7.29 ± 0.97	pCi/Total	0.18	22.1
	12/29/17	6.24 ± 3.52	5.11 ± 1.58	pCi/Total	0.59	19.8
Sr-89	01/16/17	54300 ± 4860	41900 ± 4140	pCi/Total	7650	25.8
	01/25/17	41200 ± 1710	42100 ± 1730	pCi/Total	3940	2.2

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-89	01/26/17	104000 ± 7940	99600 ± 7530	pCi/Total	11850	4.3
	02/01/17	45600 ± 5490	52800 ± 5640	pCi/Total	11600	14.6
	02/03/17	106000 ± 8750	99500 ± 8920	pCi/Total	14850	6.3
	02/14/17	110000 ± 9620	117000 ± 9460	pCi/Total	16450	6.2
	02/14/17	38900 ± 5480	42100 ± 5450	pCi/Total	15300	7.9
	02/27/17	107000 ± 10700	117000 ± 10700	pCi/Total	20450	8.9
	03/01/17	98200 ± 9790	86000 ± 9940	pCi/Total	18750	13.3
	03/29/17	111000 ± 12900	111000 ± 13600	pCi/Total	28500	0.0
	04/07/17	115000 ± 14200	104000 ± 13700	pCi/Total	33450	10.1
	04/10/17	119000 ± 13600	109000 ± 14300	pCi/Total	26200	8.8
	04/18/17	108000 ± 14800	103000 ± 14100	pCi/Total	62500	4.7
	04/24/17	105000 ± 15000	117000 ± 15400	pCi/Total	39900	10.8
	04/25/17	98700 ± 16800	122000 ± 17000	pCi/Total	92500	21.1
	05/04/17	90800 ± 16000	80400 ± 13200	pCi/Total	49200	12.2
	05/04/17	1820 ± 51.4	2030 ± 52.3	pCi/Total	28.8	10.9
	05/10/17	2220 ± 56.6	2170 ± 58.3	pCi/Total	28.7	2.3
	05/15/17	1630 ± 26.9	1700 ± 29.2	pCi/Total	17.5	4.2
	05/25/17	2020 ± 57.7	1830 ± 63.1	pCi/Total	32.8	9.9
	06/01/17	1510 ± 59.2	1470 ± 55.7	pCi/Total	47.7	2.7
	06/01/17	2060 ± 63.5	1960 ± 62.6	pCi/Total	38.9	5.0
	06/01/17	1450 ± 57.2	1480 ± 58.6	pCi/Total	44.8	2.1
	06/06/17	1920 ± 63.0	1480 ± 56.9	pCi/Total	41.6	25.9
	06/13/17	1820 ± 69.0	2000 ± 72.7	pCi/Total	52.5	9.4
	06/19/17	2040 ± 70.1	1940 ± 69.2	pCi/Total	47.8	5.0
	06/19/17	1920 ± 70.6	1650 ± 60.4	pCi/Total	53.5	15.1
	06/27/17	1910 ± 80.0	1710 ± 69.5	pCi/Total	69.0	11.1
	06/28/17	1470 ± 67.0	1490 ± 66.3	pCi/Total	54.5	1.4
	06/29/17	1850 ± 82.1	1790 ± 73.2	pCi/Total	76.5	3.3
	07/06/17	2020 ± 85.3	1990 ± 84	pCi/Total	71.0	1.5
	07/12/17	1780 ± 77.8	1630 ± 70.7	pCi/Total	64.5	8.8
	07/20/17	1930 ± 86.8	1840 ± 85.2	pCi/Total	68.0	4.8
	07/20/17	1840 ± 81.8	1880 ± 83.4	pCi/Total	82.0	2.2
	07/25/17	2140 ± 111	2150 ± 98.7	pCi/Total	106	0.5
	07/26/17	2020 ± 93.9	2050 ± 97.5	pCi/Total	86.5	1.5
	07/31/17	2120 ± 93.0	1960 ± 87.9	pCi/Total	84.0	7.8
	08/02/17	1140 ± 74.9	1050 ± 72.8	pCi/Total	249	8.2
	08/14/17	2010 ± 104	1970 ± 103	pCi/Total	107	2.0
	08/17/17	1700 ± 91.4	2040 ± 120	pCi/Total	103	18.2
	08/18/17	1790 ± 96.5	1750 ± 92.6	pCi/Total	101	2.3
	08/22/17	1020 ± 75.0	961 ± 69.7	pCi/Total	119	6.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-89	08/23/17	1870 ± 110	1720 ± 102	pCi/Total	126	8.4
	08/28/17	2070 ± 118	2060 ± 118	pCi/Total	150	0.5
	08/29/17	1550 ± 100	1580 ± 99.5	pCi/Total	116	1.9
	08/29/17	1230 ± 86.5	1030 ± 81.6	pCi/Total	128	17.7
	09/18/17	2280 ± 137	2030 ± 129	pCi/Total	171	11.6
	09/19/17	904 ± 73.6	735 ± 27.2	pCi/Total	250	20.6
	09/20/17	1910 ± 68.8	1720 ± 66.1	pCi/Total	80	10.5
	09/21/17	1700 ± 121	1820 ± 135	pCi/Total	186	6.82
	10/05/17	2350 ± 181	2080 ± 159	pCi/Total	268	12.2
	10/11/17	1540 ± 58.1	1450 ± 61.8	pCi/Total	97.5	6.0
	10/13/17	2020 ± 167	1900 ± 148	pCi/Total	254	6.1
	10/16/17	2200 ± 173	1960 ± 156	pCi/Total	257	11.5
	10/20/17	2220 ± 186	1880 ± 165	pCi/Total	315	16.6
	10/26/17	2300 ± 174	2170 ± 316	pCi/Total	275	5.8
	10/31/17	2140 ± 195	1880 ± 178	pCi/Total	366	12.9
	11/02/17	2200 ± 186	2150 ± 169	pCi/Total	278	2.3
	11/06/17	2010 ± 191	1810 ± 178	pCi/Total	377	10.5
	11/10/17	1950 ± 192	2190 ± 208	pCi/Total	385	11.6
	11/13/17	1860 ± 193	2030 ± 226	pCi/Total	404	8.7
	11/14/17	1660 ± 189	1450 ± 155	pCi/Total	354	13.5
	11/17/17	2250 ± 212	1860 ± 184	pCi/Total	391	19.0
	11/21/17	1050 ± 153	1120 ± 147	pCi/Total	404	6.5
	11/27/17	1920 ± 205	1660 ± 206	pCi/Total	415	14.5
	11/27/17	1020 ± 155	1220 ± 162	pCi/Total	448	17.9
	11/30/17	2000 ± 230	2350 ± 248	pCi/Total	460	16.1
	12/05/17	2040 ± 254	1930 ± 255	pCi/Total	1095	5.5
	12/12/17	1970 ± 241	2170 ± 250	pCi/Total	600	9.7
	12/13/17	1740 ± 233	1450 ± 184	pCi/Total	447	18.2
	12/20/17	1990 ± 261	2030 ± 263	pCi/Total	675	2.0
	12/27/17	2050 ± 285	2250 ± 297	pCi/Total	820	9.3
Sr-90	01/04/17	49.4 ± 5.71	52.3 ± 6.00	pCi/Total	12.8	5.7
	01/16/17	48.6 ± 5.04	46.0 ± 4.72	pCi/Total	7.65	5.5
	01/16/17	54.1 ± 5.13	59.0 ± 5.31	pCi/Total	8.25	8.7
	01/25/17	44.7 ± 4.87	45.1 ± 4.85	pCi/Total	7.75	0.9
	01/26/17	80.7 ± 7.76	60.5 ± 6.26	pCi/Total	14.8	28.6
	02/01/17	48.5 ± 5.90	46.4 ± 6.00	pCi/Total	13.4	4.4
	02/01/17	76.2 ± 8.32	60.5 ± 6.32	pCi/Total	17.2	23.0
	02/03/17	70.0 ± 8.52	67.2 ± 8.44	pCi/Total	20.1	4.1
	02/14/17	71.9 ± 6.75	78.3 ± 6.96	pCi/Total	9.50	8.5

*RPD = Relative Percent Difference

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(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-90	02/14/17	67.4 ± 8.18	57.5 ± 6.87	pCi/Total	14.4	15.9
	02/27/17	69.8 ± 9.27	55.6 ± 7.73	pCi/Total	23.6	22.7
	03/01/17	52.0 ± 6.19	62.7 ± 7.24	pCi/Total	10.7	18.7
	03/07/17	63.4 ± 7.67	47.2 ± 6.04	pCi/Total	18.0	29.3
	03/29/17	63.9 ± 7.23	57.8 ± 6.97	pCi/Total	16.0	10.0
	04/07/17	69.3 ± 9.41	67.3 ± 9.33	pCi/Total	18.4	2.9
	04/10/17	56.9 ± 7.83	54.8 ± 8.18	pCi/Total	16.8	3.8
	04/18/17	50.0 ± 5.36	54.9 ± 5.39	pCi/Total	11.3	9.3
	04/24/17	62.5 ± 8.09	63.4 ± 7.88	pCi/Total	15.2	1.4
	04/25/17	77.3 ± 7.71	67.8 ± 7.11	pCi/Total	11.3	13.1
	05/04/17	45.4 ± 5.91	46.9 ± 5.29	pCi/Total	11.2	3.3
	05/04/17	61.5 ± 7.08	73.9 ± 7.06	pCi/Total	15.9	18.3
	05/11/17	75.1 ± 7.80	78.8 ± 7.40	pCi/Total	13.7	4.8
	05/15/17	63.0 ± 4.32	60.1 ± 4.34	pCi/Total	10.2	4.7
	05/25/17	61.4 ± 6.34	80.6 ± 8.06	pCi/Total	12.9	27.0
	05/31/17	49.4 ± 5.91	52.8 ± 6.01	pCi/Total	10.3	6.7
	06/01/17	55.6 ± 10.6	50.7 ± 10.6	pCi/Total	32.1	9.2
	06/01/17	47.0 ± 7.44	54.9 ± 7.81	pCi/Total	22.0	15.5
	06/01/17	63.6 ± 6.35	50.0 ± 5.66	pCi/Total	12.5	23.9
	06/06/17	74.3 ± 7.38	75.1 ± 7.50	pCi/Total	10.8	1.1
	06/13/17	72.0 ± 8.50	66.0 ± 8.12	pCi/Total	14.6	8.7
	06/19/17	61.4 ± 8.10	61.9 ± 8.19	pCi/Total	17.8	0.8
	06/19/17	73.1 ± 7.89	59.2 ± 6.41	pCi/Total	16.7	21.0
	06/27/17	60.5 ± 7.04	62.4 ± 6.64	pCi/Total	15.9	3.1
	06/28/17	69.1 ± 7.49	61.7 ± 6.90	pCi/Total	11.4	11.3
	06/29/17	61.7 ± 7.83	58.3 ± 6.67	pCi/Total	19.1	5.7
	07/06/17	60.2 ± 6.8	62.7 ± 6.9	pCi/Total	12.1	4.07
	07/12/17	64.1 ± 6.62	51.3 ± 5.74	pCi/Total	10.0	22.2
	07/19/17	45.9 ± 6.02	44.4 ± 5.93	pCi/Total	11.7	3.3
	07/20/17	63.8 ± 8.32	73.7 ± 9.39	pCi/Total	15.7	14.4
	07/25/17	66.4 ± 9.79	67.7 ± 7.59	pCi/Total	23.5	1.9
	07/26/17	63.2 ± 7.48	63.5 ± 7.40	pCi/Total	17.2	0.5
	07/31/17	55.7 ± 5.98	52.0 ± 5.53	pCi/Total	12.6	6.9
	08/01/17	52.0 ± 7.28	47.7 ± 6.47	pCi/Total	14.7	8.6
	08/14/17	80.3 ± 8.59	62.0 ± 7.28	pCi/Total	18.0	25.7
	08/17/17	69.4 ± 8.04	73.5 ± 7.16	pCi/Total	15.5	5.7
	08/18/17	57.0 ± 7.83	72.3 ± 8.79	pCi/Total	14.8	23.7
	08/22/17	45.5 ± 5.07	50.8 ± 7.19	pCi/Total	10.0	11.0
	08/23/17	63.0 ± 7.56	60.2 ± 7.33	pCi/Total	12.6	4.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Sr-90	08/28/17	65.5 ± 7.54	62.2 ± 7.03	pCi/Total	15.3	5.2
	08/29/17	46.2 ± 5.65	47.4 ± 7.47	pCi/Total	9.9	2.6
	08/29/17	64.2 ± 6.86	65.5 ± 6.67	pCi/Total	9.5	2.0
	09/18/17	74.5 ± 7.89	60.5 ± 6.84	pCi/Total	14.8	20.7
	09/19/17	50.9 ± 4.55	52.9 ± 4.94	pCi/Total	7.2	3.9
	09/20/17	69.1 ± 5.99	63.9 ± 5.77	pCi/Total	7.7	7.8
	09/21/17	70.5 ± 6.14	71.1 ± 6.74	pCi/Total	9.6	0.9
	10/05/17	78.4 ± 9.76	69.0 ± 8.79	pCi/Total	16.3	12.8
	10/10/17	50.4 ± 5.63	50.3 ± 3.00	pCi/Total	5.4	0.2
	10/13/17	69.4 ± 10.5	68.0 ± 9.20	pCi/Total	18.0	2.0
	10/16/17	66.6 ± 8.65	64.5 ± 8.09	pCi/Total	14.7	3.2
	10/20/17	73.8 ± 9.31	60.6 ± 8.24	pCi/Total	16.2	19.6
	10/25/17	46.7 ± 8.63	48.1 ± 6.18	pCi/Total	12.9	3.0
	10/31/17	60.3 ± 6.57	55.4 ± 5.88	pCi/Total	9.1	8.5
	11/01/17	62.3 ± 8.44	55.5 ± 8.47	pCi/Total	16.2	11.5
	10/31/17	69.9 ± 6.95	62.0 ± 8.29	pCi/Total	10.4	12.0
	11/06/17	68.0 ± 8.47	61.2 ± 7.90	pCi/Total	14.8	10.5
	11/10/17	64.3 ± 8.30	61.5 ± 7.97	pCi/Total	18.7	4.5
	11/13/17	69.5 ± 9.19	70.6 ± 9.56	pCi/Total	18.7	1.6
	11/14/17	74.8 ± 8.67	62.0 ± 6.93	pCi/Total	11.3	18.7
	11/17/17	63.7 ± 9.71	69.8 ± 9.68	pCi/Total	19.3	9.1
	11/22/17	44.4 ± 11.5	53.6 ± 13.0	pCi/Total	22.0	18.8
	11/27/17	60.8 ± 5.58	51.8 ± 4.78	pCi/Total	6.5	16.0
	11/27/17	68.0 ± 5.95	72.4 ± 6.72	pCi/Total	7.3	6.3
	11/30/17	60.4 ± 9.71	73.5 ± 11.1	pCi/Total	19.8	19.6
	12/05/17	66.7 ± 7.70	69.5 ± 7.99	pCi/Total	13.4	4.1
	12/12/17	68.7 ± 6.23	63.2 ± 5.90	pCi/Total	8.1	8.3
	12/13/17	72.7 ± 7.43	58.5 ± 5.94	pCi/Total	8.7	21.7
	12/20/17	57.0 ± 5.88	53.7 ± 5.63	pCi/Total	10.1	6.0
	12/27/17	68.1 ± 7.75	67.3 ± 7.82	pCi/Total	12.3	1.2
Tc-99	01/18/17	353 ± 28.6	314 ± 25.6	pCi/Total	42.8	11.7
	02/10/17	70.2 ± 6.06	66.2 ± 5.75	pCi/Total	18.5	5.9
	02/28/17	300 ± 24.4	294 ± 23.9	pCi/Total	38.6	2.0
	03/10/17	331 ± 26.9	327 ± 26.5	pCi/Total	41.4	1.2
	03/24/17	337 ± 27.3	362 ± 29.3	pCi/Total	38.9	7.2
	04/07/17	307 ± 24.9	299 ± 24.2	pCi/Total	36.3	2.6
	04/07/17	323 ± 26.1	334 ± 27.1	pCi/Total	38.6	3.4
	04/20/17	315 ± 25.6	329 ± 26.7	pCi/Total	39.0	4.4

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
Tc-99	05/02/17	330 ± 26.7	321 ± 26.1	pCi/Total	40.2	2.8
	05/10/17	324 ± 26.3	315 ± 25.7	pCi/Total	41.3	2.8
	05/26/17	286 ± 23.3	316 ± 25.6	pCi/Total	35.4	10.0
	06/09/17	331 ± 26.9	338 ± 27.4	pCi/Total	41.0	2.1
	06/15/17	323 ± 26.3	327 ± 26.7	pCi/Total	41.7	1.2
	06/25/17	325 ± 26.3	340 ± 27.6	pCi/Total	34.9	4.5
	07/11/17	348 ± 28.3	338 ± 27.4	pCi/Total	39.8	2.9
	07/20/17	336 ± 27.2	286 ± 23.3	pCi/Total	39.9	16.1
	07/25/17	306 ± 24.8	341 ± 27.6	pCi/Total	37.7	10.8
	07/31/17	347 ± 28.2	327 ± 26.5	pCi/Total	44.0	5.9
	08/15/17	330 ± 26.8	349 ± 28.3	pCi/Total	41.7	5.6
	08/24/17	319 ± 25.8	334 ± 27.1	pCi/Total	37.4	4.6
	09/18/17	308 ± 24.9	326 ± 26.4	pCi/Total	35.4	5.7
	10/05/17	320 ± 25.9	319 ± 25.9	pCi/Total	35.7	0.3
	10/12/17	340 ± 27.6	354 ± 28.6	pCi/Total	35.8	4.0
	10/19/17	345 ± 28.0	340 ± 27.6	pCi/Total	37.9	1.5
	10/30/17	319 ± 25.9	330 ± 26.7	pCi/Total	36.9	3.4
	11/07/17	364 ± 29.4	326 ± 26.5	pCi/Total	40.5	11.0
	11/28/17	335 ± 27.2	361 ± 29.1	pCi/Total	39.3	7.5
	12/19/17	327 ± 26.5	327 ± 26.5	pCi/Total	38.8	0.0
Th-230 (AS)	01/19/17	2.90 ± 0.487	3.43 ± 0.329	pCi/Total	0.744	16.9
	03/01/17	3.81 ± 0.598	3.93 ± 0.559	pCi/Total	1.42	3.2
	03/28/17	3.87 ± 0.338	3.59 ± 0.430	pCi/Total	0.241	7.6
	05/04/17	3.54 ± 0.515	3.62 ± 0.333	pCi/Total	0.572	2.4
	05/18/17	3.57 ± 0.482	4.08 ± 0.520	pCi/Total	1.13	13.4
	06/01/17	3.56 ± 0.363	3.89 ± 0.607	pCi/Total	0.245	8.9
	07/06/17	3.66 ± 0.27	3.72 ± 0.28	pCi/Total	0.292	1.6
	08/01/17	4.09 ± 0.38	4.03 ± 0.47	pCi/Total	0.301	1.7
	09/18/17	4.07 ± 0.42	3.64 ± 0.50	pCi/g	0.298	11.1
	11/02/17	3.71 ± 0.42	3.49 ± 0.33	pCi/Total	0.481	6.2
	12/01/17	3.96 ± 0.68	3.59 ± 0.49	pCi/Total	0.516	9.9
	12/28/17	3.94 ± 0.68	3.75 ± 0.47	pCi/Total	0.518	4.8
U-238 (AS)	01/12/17	5.46 ± 1.023	5.67 ± 0.589	pCi/Total	0.827	3.7
	01/19/17	6.08 ± 0.544	6.02 ± 0.513	pCi/Total	0.137	1.0
	01/24/17	6.20 ± 0.627	5.85 ± 0.550	pCi/Total	0.288	5.8
	02/02/17	6.01 ± 0.487	5.79 ± 0.529	pCi/Total	0.127	3.7
	02/17/17	6.37 ± 0.521	6.19 ± 0.502	pCi/Total	0.159	3.0

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
U-238 (AS)	03/09/17	6.42 ± 0.540	6.36 ± 0.545	pCi/Total	0.172	1.0
	03/12/17	6.00 ± 0.487	6.39 ± 0.504	pCi/Total	0.155	6.3
	03/15/17	6.29 ± 0.517	6.37 ± 0.495	pCi/Total	0.161	1.3
	03/27/17	6.22 ± 0.541	6.21 ± 0.509	pCi/Total	0.178	0.3
	03/30/17	6.18 ± 0.552	6.08 ± 0.522	pCi/Total	0.314	1.8
	04/10/17	6.07 ± 0.492	5.19 ± 0.412	pCi/Total	0.123	15.8
	04/11/17	5.96 ± 0.479	6.02 ± 0.516	pCi/Total	0.125	1.0
	04/14/17	5.93 ± 0.495	6.58 ± 0.547	pCi/Total	0.247	10.4
	04/14/17	5.89 ± 0.501	6.23 ± 0.555	pCi/Total	0.146	5.7
	04/19/17	6.17 ± 0.506	5.68 ± 0.486	pCi/Total	0.131	8.3
	05/18/17	6.48 ± 0.546	5.93 ± 0.489	pCi/Total	0.156	8.9
	05/19/17	6.48 ± 0.554	6.14 ± 0.548	pCi/Total	0.187	5.4
	05/19/17	5.81 ± 0.503	6.23 ± 0.515	pCi/Total	0.259	7.0
	06/02/17	6.83 ± 1.63	5.51 ± 0.929	pCi/Total	0.887	21.4
	06/20/17	5.51 ± 1.45	6.59 ± 1.49	pCi/Total	0.672	17.7
	06/20/17	6.77 ± 1.70	6.42 ± 1.37	pCi/Total	0.846	5.4
	06/30/17	5.00 ± 1.34	5.84 ± 1.04	pCi/Total	0.736	15.6
	07/07/17	6.33 ± 0.54	5.69 ± 0.45	pCi/Total	0.256	10.8
	07/07/17	6.07 ± 0.63	6.11 ± 1.01	pCi/Total	0.215	0.6
	07/20/17	5.70 ± 0.60	5.55 ± 1.14	pCi/Total	0.272	2.7
	07/28/17	5.75 ± 0.95	5.73 ± 0.47	pCi/Total	0.094	0.3
	08/02/17	5.60 ± 0.47	6.01 ± 0.56	pCi/Total	0.118	7.0
	08/14/17	5.91 ± 0.52	5.76 ± 0.58	pCi/Total	0.153	2.6
	08/15/17	5.70 ± 0.44	6.00 ± 0.48	pCi/Total	0.113	5.0
	08/18/17	6.59 ± 1.12	6.66 ± 1.12	pCi/Total	0.089	1.0
	08/18/17	5.79 ± 0.60	5.86 ± 0.50	pCi/Total	0.351	1.2
	08/28/17	7.10 ± 0.64	7.15 ± 0.67	pCi/Total	0.157	0.8
	08/29/17	6.02 ± 0.51	5.20 ± 0.33	pCi/Total	0.220	14.6
	09/15/17	6.76 ± 0.66	6.45 ± 0.64	pCi/Total	0.299	4.8
	09/15/17	5.68 ± 0.53	5.50 ± 0.90	pCi/Total	0.193	3.2
	09/22/17	6.72 ± 0.79	6.15 ± 0.52	pCi/Total	0.328	8.8
	09/22/17	6.57 ± 0.85	6.09 ± 0.70	pCi/Total	0.474	7.6
	10/20/17	5.72 ± 0.75	5.87 ± 0.54	pCi/Total	0.298	2.6
	10/20/17	5.42 ± 0.54	6.46 ± 0.67	pCi/Total	0.276	17.4
	10/23/17	5.90 ± 0.60	5.98 ± 0.59	pCi/Total	0.289	1.5
	10/30/17	6.36 ± 0.58	6.50 ± 0.64	pCi/Total	0.178	2.1
	10/30/17	5.88 ± 0.68	5.73 ± 0.65	pCi/Total	0.492	2.6
	10/31/17	6.51 ± 1.11	6.51 ± 1.08	pCi/Total	0.095	0.0
	11/14/17	6.87 ± 0.97	6.24 ± 0.87	pCi/Total	0.555	9.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

B.27 Laboratory Control Spike (LCSD)

In-House Duplicates

Teledyne Brown Engineering Environmental Services QC Program

Nuclide	Count Date	Original	Duplicate	Units	5X MDC	RPD* (limit 30)
U-238 (AS)	11/21/17	6.07 ± 1.66	7.22 ± 2.47	pCi/Total	0.783	17.4
	11/28/17	7.12 ± 0.71	7.64 ± 0.86	pCi/Total	0.185	7.0
	11/30/17	6.76 ± 1.13	6.45 ± 1.10	pCi/Total	0.118	4.6
	12/11/17	6.23 ± 0.62	5.80 ± 0.52	pCi/Total	0.207	7.1
	12/18/17	5.39 ± 0.89	6.39 ± 1.16	pCi/Total	0.364	16.9
	12/21/17	6.38 ± 1.21	6.51 ± 0.76	pCi/Total	0.309	2.0
	12/29/17	5.84 ± 0.67	5.80 ± 0.50	pCi/Total	0.183	0.6

*RPD = Relative Percent Difference

(1) NE - Not evaluated. Results are < 5x the MDC and are not evaluated for precision

(2) NA - Both results are non-detect

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ATTACHMENT C

Non-Conformance Reports

NONCONFORMANCE REPORT FORM


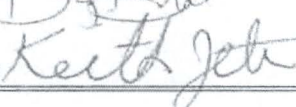
1. NCR No.: 17-1

2. Responsible Manager:

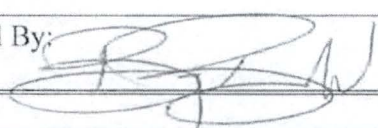
PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental	4. Client Affected: State of Tennessee Audit
5. Reference: QA Manual	6. Affected Data: NA
7. Description of Nonconformance: Procedure was missing section on delayed counting for GR-A	
8. Prepared By: Brandy Bicoll	9. Date: 01/05/2017

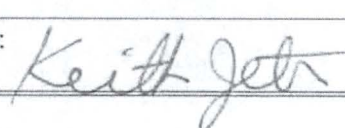
PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: 	13. Date: 2/10/17
14. Approved By: 	15. Date: 2/10/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)	
<input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: 	18. Date: 2/10/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification <input type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: 	22. Date: 2/10/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

TBE-2008 Rev 8 did not have a section on delayed counting for GR-A by EPA 900.0.

Cause:

Although TBE was aware of the 72 hour delayed counting for GR-A in drinking water, it was not properly documented in procedure TBE-2008.

Corrective Action to Prevent Recurrence:

During the audit, procedure TBE-2008 was updated to state that samples may be counted for beta activity immediately after drying; but alpha counting should be delayed at least 72 hours until equilibrium has occurred.

Objective Evidence:

A copy of page 35 of the TBE-2008 procedure is included



Department Manager or Designee



Date



Quality Assurance Manager or Designee



Date

Procedure	Number: TBE-2008	Revision: 9
	Issue Date: 12/05/03 (reissue)	Revision Date: 09/01/2016
Responsible Individual:	Laboratory Production Manager	Review Date: 09/01/2019
Subject:	Gross Alpha and/or Gross Beta Activity in Various Matrices	

A1.3.5 Cool, weigh, and count at the alpha and the beta activities.

NOTE: Enter sample information and weights in the laboratory logbook and/or LIMS. Print the worksheet. See note (b) under procedure A1.1.3 above.

NOTE: Samples may be counted for beta activity immediately after drying; but alpha counting should be delayed at least 72 hours until equilibrium has occurred.

A1.3.6 If sample particles tend to be airborne, treat the sample with a few drops of Lucite solution, air-dry, and count.

A1.4 Calculation and Reporting

A1.4.1 Alpha Activity

Calculate alpha activity, in pCi/L, by the equation

$$Alpha = \frac{net\ cpm \times 1,000}{2.22\ \epsilon\ v}$$

Where: ϵ = calibrated overall counter efficiency (A1.6)
 v = volume of sample counted, in ml.

Express the counting error as described in A1.4.3 below. Similarly, calculate and report the alpha activity in picocuries per kilogram of moist biologic material or per kilogram of moist and per kilogram of dry silt.

NOTE: The DEP suggests reporting detection limits when no activity is found. The 4.66 sigma criterion is most common when assigning detection limits.

A1.4.2 Beta Activity

Calculate and report the gross beta activity and counting error in picocuries per liter of water or fluid, per kilogram of moist (live weight) biologic material, or per kilogram of moist and per kilogram of dry silt, according to A1.4.1 and A1.4.3.

To calculate picocuries of beta activity per liter, determine the value of ϵ in the above equation as described in A1.6.

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-2

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected: ~~XXXXXXXX~~

5. Reference: QA Manual

6. Affected Data: L70587

7. Description of Nonconformance: Rerun for H-3 did not match original count

8. Prepared By: Brandy Bicoll

9. Date: 03/29/2017

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By:

13. Date: 4/8/17

14. Approved By:

15. Date: 6/8/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☒ Accepted ☐ Rejected ☐ Follow-up Required

17. Prepared By:

18. Date: 4/8/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification

☐ YES

☐ NO

If yes, describe:

20. Evaluated for Potential 10CFR21 Reportability

☐ YES

☐ NO

If 10CFR21 report required, describe:

NOT A REPORTABLE ISSUE.

21. Prepared By:

22. Date: 6/8/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The client requested a rerun for H-3 for sample L70587-1. The rerun result did not confirm the original result.

Cause:

The sample had a larger quenching interference than the QC or other samples in the workgroup.

Corrective Action:

The sample was reran with a smaller aliquot minimizing the quenching interference.

All associated raw data and QA results were reviewed and found acceptable.

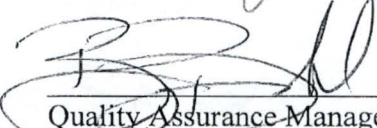
TBE feels this is an isolated incident considering this has never been observed before.



Department Manager or Designee

6/8/17

Date



Quality Assurance Manager or Designee

6/8/17

Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-3

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L71856
7. Description of Nonconformance: Wrong calculation used for MDC	
8. Prepared By: Brandy Bicol	9. Date: 04/04/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L. Northcutt</i> for Brandy Bicol	13. Date: 10/5/17
14. Approved By: <i>Keith Jett</i>	15. Date: 10/5/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable)	
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input checked="" type="checkbox"/> Follow-up Required (IT program)	
17. Prepared By: <i>Sharon L. Northcutt</i> for Brandy Bicol	18. Date: 10/5/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
If yes, describe: <i>Email by Rebecca Charles</i>	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jett</i>	22. Date: 10/5/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The client called to inform TBE that they were not getting the same result for the MDC that TBE had reported for Gr-A (L71856).

Cause:

2.71 was used in the MDC calculation for the sample. This factor should only be used when background counts are 0. This sample had detectable background counts.

Corrective Action to Prevent Recurrence:

The calculation program will be modified to assess background and determine whether 2.71 should be used (i.e. background \neq 0).

Keith J. [Signature] 10/5/17
Department Manager or Designee Date

Sharon L. [Signature] 10/5/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-4

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXX
5. Reference: QA Manual	6. Affected Data:
7. Description of Nonconformance: Failed Analytics Cross Checks from 2016	
8. Prepared By: Brandy Bicoll	9. Date: 04/11/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L Northcutt</i> ^{for Brandy Bicoll}	13. Date: 10/5/17
14. Approved By: <i>Keith Jeth</i>	15. Date: 10/5/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon L Northcutt</i> ^{for Brandy Bicoll}	18. Date: 10/5/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jeth</i>	22. Date: 10/5/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

In mid-April 2017, the client sent Analytics data from 2016 to QA for the REMP Reports. This data included six failures from March to September of 2016 (highlighted in yellow below). The other data points are TBE's Analytics results for samples prior, concurrent with, and through the last study with results.

Cause:

The E&Z Analytics evaluation report does not assign flag values based upon a ratio (only acceptable/unacceptable); therefore, according to the TBE Quarterly/ Annual QA Reports, these results are evaluated based upon internal QC requirements which follow the DOE MAPEP criteria as follows:

Acceptable = mean result (MR) within 20% of known reference value (0.80-1.20)

Acceptable with Warning = MR ranges between 20-30% of known value (0.70-1.30)

Not Acceptable = MR is >30% of the known value

Analytics AP Co-60	Date	TBE	TRUE	Ratio	Analytics Soil Ce-141	Date	TBE	TRUE	Ratio
E11357	Dec, 2015	138	139	0.99	E11353	Dec, 2015	0.252	0.222	1.13
E11479	Mar, 2016	209	201	1.04	E11481	Mar, 2016	0.227	0.186	1.22
E11540	June, 2016	143	124	1.15					
E11543	June, 2016	165	129	1.28					
E11544	June, 2016	175	136	1.29					
E11545	June, 2016	167	124	1.35					
E11612	Sep, 2016	119	91.9	1.29	E11614	Sep, 2016	0.153	0.175	0.88
					E11636	Sep, 2016	0.138	0.175	0.79
E11702	Dec, 2016	151	122	1.24					
E11814	Mar, 2017	140	127	1.10	E11816	Mar, 2017	0.258	0.25	1.03
E11848	June, 2017	171	146	1.17					
Analytics AP Zn-65	Date	TBE	TRUE	Ratio	Analytics Milk Ce-141	Date	TBE	TRUE	Ratio
E11357	Dec, 2015	173	162	1.07	E11355	Dec, 2015	117	129	0.91
E11479	Mar, 2016	193	179	1.08	E11477	Mar, 2016	106	98.4	1.08
E11463	Mar, 2016	81	102	0.79					
E11540	June, 2016	174	169	1.03	E11538	June, 2016	129	139	0.93
E11612	Sep, 2016	140	122	1.15	E11610	Sep, 2016	81.3	93.2	0.87
					E11632	Sep, 2016	103	132	0.79
E11702	Dec, 2016	176	167	1.05	E11700	Dec, 2016	136	143	0.95
E11814	Mar, 2017	137	138	0.99	E11812	Mar, 2017	135	145	0.99
E11848	June, 2017	141	156	0.90	E11846	June, 2017	142	151	0.94

Corrective Action to Prevent Recurrence:

Due to the delay in notification of the failures, prompt corrective action could not be taken. All associated raw data and QA results were reviewed and found acceptable. The associated cross-check samples for the isotopes in question over the same time frame (and extending 6 months prior and afterwards), show that TBE has passed each one with an "acceptable" score from Analytics.

Keith Jeth 10/5/17
Department Manager or Designee Date

Sharon L Northcott 10/5/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-5

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected:

5. Reference: QA Manual

6. Affected Data:

7. Description of Nonconformance: TBE failed to order replacement AP for the ICP

8. Prepared By: Brandy Bicoll

9. Date: 04/18/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By:

Keith Jett

13. Date:

4/19/17

14. Approved By:

[Signature]

15. Date:

4/19/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☐ Accepted ☐ Rejected ☐ Follow-up Required

17. Prepared By:

18. Date:

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification

☐ YES

☐ NO

If yes, describe:

20. Evaluated for Potential 10CFR21 Reportability

☒ YES

☐ NO

If 10CFR21 report required, describe:

NOT A REPORTABLE ISSUE.

21. Prepared By:

Keith Jett

22. Date:

4/19/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

MAPEP notified TBE in the 3rd Qt of 2016 that the Gr-Alpha/Beta air filter sample (GrF) has been dropped from MAPEP until further notice due to DOE/MAPEP funding issues.

TBE failed to order a replacement filter.

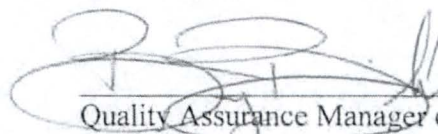
Cause:

Gr-Alpha/Beta air filter sample (GrF) has been dropped from MAPEP until further notice due to DOE/MAPEP funding issues.

Corrective Action to Prevent Recurrence:

A replacement filter will be ordered from another vendor until MAPEP puts the Gr-A/B filter back in production.

 4/19/17
Department Manager or Designee Date

 4/19/17
Quality Assurance Manager or Designee Date

IMPORTANT INFORMATION

Dear MAPEP Participants,

All international MAPEP samples, domestic organic samples (OrW and OrS), domestic gross alpha/beta water samples (GrW), domestic gross alpha/beta air filter samples (GrF), and domestic strontium air filter samples (SrF) have been dropped from MAPEP test session 35. These samples are suspended until further notice due to DOE/MAPEP funding issues. We apologize for any inconvenience this may cause our participants.

Sincerely,

MAPEP Team

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-6

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXX
5. Reference: QA Manual	6. Affected Data: L72131-2
7. Description of Nonconformance: Incorrect collection data logged into LIMS.	
8. Prepared By: Brandy Bicoll	9. Date: 04/18/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L. Bickel</i> for Brandy B. coll	13. Date: 10/5/17
14. Approved By: <i>Keith Jeter</i>	15. Date: 10/5/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon L. Bickel</i> for Brandy B. coll	18. Date: 10/5/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe: <i>Email by Rebecca Charles</i>	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jeter</i>	22. Date: 10/5/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The incorrect collection date was logged into LIMS for sample L72131-2.

Cause:

Due to human error/typo at login and the mistake was not caught in review. As a result, Sr-89/90 results were decay corrected to the wrong date.

Corrective Action to Prevent Recurrence:

The login was corrected and the results recalculated.

Results remained non-detect and required MDC's were met (see below):

	<u>Sr-89</u>	<u>Sr-90</u>
Original result:	4.86 E-14	1.85 E-14
Recalculated result:	5.89 E-14	1.85 E-14

QA will track future occurrences through the NCR system to determine if further action should be taken. All associated raw data and QA results were reviewed and found acceptable. The report was revised and resubmitted to the client.

Keith Jeter 10/5/17
Department Manager or Designee Date

Sharon L. Brooks 10/5/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-7

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L67271
7. Description of Nonconformance: Client notified TBE that K-40 results were abnormally low.	
8. Prepared By: Brandy Bicolli	9. Date: 04/18/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon M. Northcutt for Brandy Bicolli</i>	13. Date: 10/5/17
14. Approved By: <i>Keith Jeltz</i>	15. Date: 10/5/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input checked="" type="checkbox"/> Follow-up Required (IT dept)	
17. Prepared By: <i>Sharon M. Northcutt for Brandy Bicolli</i>	18. Date: 10/5/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe: <i>Email by Rebecca Charles</i>	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jeltz</i>	22. Date: 10/5/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

Client notified TBE that the K-40 results for sample 3 looked unusually low.

Cause:

It was determined that the weights for sample number 2 and sample number 3 had been switched during sample prep (human error).

Corrective Action to Prevent Recurrence:

We will implement barcode scanning during tare and final weighing during sample prep to eliminate human error.

We will program our LIMS to give a notification to project management if a sample with a soil matrix has been dried and entered into LIMS with a weight of > 500g (typically should be using about 300g).

For this sample, the correct weights were entered into LIMS and the samples reprocessed. All associated raw data and QA results were reviewed and found acceptable.

Keith Jeter 10/5/17
Department Manager or Designee Date

Abraham L. Northcutt 10/5/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-8

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected: Teledyne

5. Reference: QA Manual

6. Affected Data:

7. Description of Nonconformance: Three findings for TBE 2016 Internal Audit

8. Prepared By: Brandy Bicoll

9. Date: 06/08/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By:

13. Date: 6/8/17

14. Approved By:

15. Date: 6/8/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☒ Accepted ☐ Rejected ☐ Follow-up Required

17. Prepared By:

18. Date:

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification ☐ YES ☐ NO
If yes, describe:

20. Evaluated for Potential 10CFR21 Reportability ☒ YES ☐ NO
If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.

21. Prepared By:

22. Date:

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

In October and November of 2016, Terry Owens conducted an internal audit on TBE-Knoxville. Three findings occurred at this time.

1. No records could be found for technician training of TBE-2001, revision 13, TBE-2013 revision 5, TBE- 4006, revision 7 or TBE 5001, revision 5.
2. Client requires gamma sample preservation for various water tests. Receipt Inspector stated she has not done any sample preservation since she started working there in July 2016, however, water samples from the client have been rec'd that require pH check per contract since that time.
3. A.) Maintenance Log books have been scanned and now reside on the Knoxville server. The Alpha Spectrometer Detector 27 had a sign on it saying it was out of service. The Maintenance Log gave no explanation about it being out of service. B.) For Alpha-Beta only the G3 Maintenance Log was filled in (T4 and G2 Maintenance Logs were not found).

Cause:

1. During the transition of QA management, several training records were not able to be located.
2. Due to an oversight in training, the instruction to check the pH level of certain samples for an individual client was not passed on to the new sample receiving technician.
3. Though the detector 27 being down is noted in the electronic logbook, there was no description as to why the detector was down.

No maintenance needed in over 3 years for T4 and G2. There are no records to record. There is a location for T4 and G2 records to be recorded when maintenance is performed.

Corrective Action to Prevent Recurrence:

1. All procedure-training files have been reviewed and the three files listed as missing have been retrained and signed by the technicians.
2. The sample-receiving technician has been retrained to procedure TBE-4003. A program was put into place to alert the sample-receiving technician when a sample needs preservation. The client was notified and no additional action was needed.

3. The count-room technicians were instructed to be more detailed in the logging of maintenance done on the count room equipment. Retraining was done on how to use the electronic maintenance logs.

Objective Evidence:

1. A copy of the three missing training files are included.
2. A copy of the sample receiving training document for TBE-4003.
3. A screen shot of the program to alert technician that a sample needs to be preserved.
4. A copy of TBE-4003 section 9.2
5. A copy of the training file for the electronic maintenance log.

Keith Jeter
Department Manager or Designee

6/8/17
Date

[Signature]
Quality Assurance Manager or Designee

6/8/17
Date

TBE-ES GROUP TRAINING RECORD

TITLE: Alpha Isotopic and Pu-241

PROCEDURE NO. TBE-2001 Rev # 13

DATE: 01-19-17

INSTRUCTOR: Brandy Bicoll

ATTENDEES:

Signature

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Print

Kristen Carlson

Melia Baker

TBE-ES GROUP TRAINING RECORD

TITLE: Radionickel Activity in Various Matrices

PROCEDURE NO. TBE-2013 Rev # 5

DATE: 6/12/17

INSTRUCTOR: Brandy Bicol

ATTENDEES:

Signature

Belinda K. Beane
Kristen Coulston

Print

Belinda K. Beane
Kristen Coulston

KQA-8 Rev 1 09/28/05

TBE-ES GROUP TRAINING RECORD

TITLE: Inter-Laboratory Performance Evaluation Programs

PROCEDURE NO. TBE-4006 Rev # 7 01/19/17

DATE: _____

INSTRUCTOR: Brandy Bicoll

ATTENDEES:

Signature

- 1 [Signature]
- 2 Cindy Hill
- 3 Donna A. Webb
- 4 Susan V Ogletre
- 5 Rebecca Charles
- 6 Deanna Kohler
- 7 Belinda Beane
- 8 [Signature]
- 9 Melba Baker
- 10 Kristen Carlston
- 11 Ch [Signature]
- 12 Tamie Wheeler
- 13 Sharon Northcutt
- 14 Kelly Wright
- 15 Shannon Cooper
- 16 Karli Arterburn
- 17 Kimberly O Thuman
- 18 _____
- 19 _____
- 20 _____
- 21 _____
- 22 _____

Print

- 1 MARTIN V. WEBB
- 2 Cindy Hill
- 3 Donna A. Webb
- 4 Susan V Ogletre
- 5 Rebecca Charles
- 6 Deanna Kohler
- 7 Belinda Beane
- 8 Chris Foell
- 9 Melba Baker
- 10 Kristen Carlston
- 11 Chad Garrison
- 12 Tamie Wheeler
- 13 Sharon Northcutt
- 14 Kelly Wright
- 15 Shannon Cooper
- 16 Karli Arterburn
- 17 Kimberly D. Thuman
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TBE-ES GROUP TRAINING RECORD

TITLE: Laboratory Hood Operations
 PROCEDURE NO. TBE-5001 Rev # 5
 DATE: 01/19/12
 INSTRUCTOR: Brandy Bicolli
 ATTENDEES:

Signature

- 1 [Signature]
- 2 Cindy Hill
- 3 Donna A. Webb
- 4 Susan V. Ogletree
- 5 Rebecca Charles
- 6 Deanna Kellner
- 7 Belinda Beane
- 8 Chris Ford
- 9 Keith Jeter
- 10 Kristen Coulston
- 11 Chase Garrison
- 12 James C. Wright
- 13 Jamie Wheeler
- 14 Sharon Northcutt
- 15 Shannon Cooper
- 16 Karli Arterburn
- 17 Kimberly D Thurman
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Print

MARTIN V. WEBB
Cindy Hill
Donna A. Webb
Susan V. Ogletree
Rebecca Charles
Deanna Kellner
Belinda Beane
Chris Ford
Keith Jeter
Kristen Coulston
Chase Garrison
James C. Wright
Jamie Wheeler
Sharon Northcutt
Shannon Cooper
Karli Arterburn
Kimberly D Thurman

TBE-ES GROUP TRAINING RECORD

TITLE: Sample Receipt and Control Section 9.2

PROCEDURE NO. TBE-4003 Rev # 11

DATE: _____

INSTRUCTOR: Brandy Bicoll

ATTENDEES:

Signature

- 1 Shannon Cooper
- 2 Karl Arterburn
- 3 Sharon Northcutt
- 4 Kimberly D. Thuesman
- 5 _____
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Print

Shannon Cooper
Karl Arterburn
Sharon Northcutt
Kimberly D. Thuesman

Sort by

- ☒ Matrix/Product
- ☐ Product/Matrix
- ☐ Site/Product
- ☐ Site/Matrix

Pricing

Flag Values

ions

2-3ERGWMPRB-13

Flag Values

ct. #	Project #	Station	Orig. Mat.	Preserve Y/N	Parameter	Gar e] Y/N	High Val.	Units	(ctrl e] High Comm	Action Item Value	Action Item Comments	Email Y/N	Email Comment
102	EN002-3ERGWMPRB-13		E	WG	Y	BA-140	Y	200	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	CM-242 (AS)	N						
102	EN002-3ERGWMPRB-13		E	WG	Y	CM-243/244 (AS)	N						
102	EN002-3ERGWMPRB-13		E	WG	Y	CO-58	Y	1000	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	CO-60	Y	300	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	CS-134	Y	30	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	CS-137	Y	50	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	FE-55	N						
102	EN002-3ERGWMPRB-13		E	WG	Y	FE-59	Y	400	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	GELI	Y						
102	EN002-3ERGWMPRB-13		E	WG	Y	GR-A	Y						
102	EN002-3ERGWMPRB-13		E	WG	N	H-3 (DIST)	N	1000000	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	I-131	Y	20	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	N	I-131 (LOW LVL)	N	20	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	LA-140	Y	200	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	MN-54	Y	1000	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	NB-95	Y	400	pCi/L				
102	EN002-3ERGWMPRB-13		E	WG	Y	NI-63	N						

Procedure	Number: TBE-4003	Revision: 110
	Issue Date: 12/05/03 (reissue)	Revision Date: 05/140/20152
Responsible Individual:	Laboratory Operations Manager	Review Date: 05/140/20185
Subject:	Sample Receipt and Control	

9.1.119.1.10 Sign and date all forms in the space provided. Copy all paperwork received with samples for sample receiving area records. [The laboratory's internal COC is hard copy documentation or in LIMS.]

9.2 Verification of Sample Preservation

9.2.1 ✓ Check pH of liquid samples for customers requiring verification of sample preservation. Use pH paper to verify pH of <2. Do not place pH paper directly in client container. Instead, transfer a small amount of sample to check pH. A clean disposable pipette may be used to transfer sample to pH paper. The pH is noted on the customer paperwork.

9.2.2 If the pH does not conform to customer requirements, note on the Sample Receipt Verification/Variance Report form. The PM will contact the customer regarding the variance.

9.2.29.2.3 For clients that require sample preservation at receipt, preserve as stated in 9.2.4.1.

9.2.39.2.4 State Reportable Drinking Water Samples

9.2.3.19.2.4.1 If the samples are received out of pH specifications (<2), the laboratory will acidify with nitric acid within five (5) days and then analyze after at least sixteen (16) hours have elapsed. The dates and times must be documented. The holding time for Iodine analyses is eight (8) days. (Do not acidify samples for H-3 or Iodine analysis.) This will be documented in the Sample Receipt Verification/Variance Report form.

9.2.3.29.2.4.2 The acids used for preservation and analyses must be checked for purity and documented. In the laboratory, this is done through the analysis of a method blank sample using the same lot of acid used for the preservation. If the samples are preserved prior to receipt at the laboratory, a trip blank must accompany the samples.

9.2.3.39.2.4.3 If the samples are out of holding time or improperly preserved, the PM will contact the client and inform them that any sample analysis conducted cannot be used for compliance purposes. This will be documented in the Sample Receipt Verification/Variance Report form. Samples out of holding time or with other flags cannot be reported as compliance samples.

TBE-ES GROUP TRAINING RECORD

TITLE: Electronic Log Book (How To Properly Log Detailed Entries)

PROCEDURE NO. NA Rev # NA

DATE: _____

INSTRUCTOR: Brandy Bicoll

ATTENDEES:

Signature

Print

1 Ch
2 Kelly Waight
3 Keith Jeter
4 Susan V. Webb
5 MARTINE V. WEBB
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22 _____

Chave Garrison
Kelly Waight
Keith Jeter
Susan V. Webb
MARTINE V. WEBB

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-9

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: Teledyne
5. Reference: QA Manual	6. Affected Data: L72350
7. Description of Nonconformance: Failed Zn-65 and Sr-89 ERA Crosscheck	
8. Prepared By: Brandy Bicoll	9. Date: 06/07/2017

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Tham Northcutt</i>	13. Date: <i>10/5/17</i>
14. Approved By: <i>Keith Jett</i>	15. Date: <i>10/5/17</i>

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input checked="" type="checkbox"/> Follow-up Required (<i>Review schk in Nov</i>)	
17. Prepared By: <i>Tham Northcutt</i>	18. Date: <i>10/5/17</i>

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jett</i>	22. Date: <i>10/5/17</i>

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

Results of semi-annual ERA cross-check samples for Zn-65 and Sr-89 were reported as "Not Acceptable".

Cause:

Zn-65 – The known value for Zn-65 was usually low for this study. The detector chosen for reporting gamma isotopes had a 46% error for Zn-65. The sample was run in duplicate on another higher efficiency detector which had an error of 13.9% for Zn-65. The Zn-65 activity found on this detector was 59.3 or 110.2% of the known value (53.8).

Sr-89 – After review of the associated QC samples (Blank, LCS, Dup) and the chemical recovery, no apparent cause for the failure can be determined. It is interesting to note that for this study, the known value was 66.2 (acceptable range 53.8-74.3) and the study mean (from all labs reporting) was 58.5.

Corrective Action to Prevent Recurrence:

Zn-65 - In evaluating gamma data to report, the associated errors must be evaluated for impact on the isotope result. When possible, reported data will have a <20% error.

Sr-89 – We feel that this failure was an anomaly when viewed in the light of previous results. The prior 3 ERA cross check results for Sr-89 were:

<u>Date</u>	<u>TBE</u>	<u>Known</u>	<u>Ratio</u>	<u>Study Mean</u>
November, 2016	43.0	43.3	99%	38.2
May, 2016	48.9	48.2	101%	47.5
November, 2015	40.9	35.7	115%	38.1

We have another cross check sample due in November and will investigate further pending the outcome of its result.

Keith Jeter
Department Manager or Designee

10/5/17
Date

Sharon L. Booth
Quality Assurance Manager or Designee

10/5/17
Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-10

2. Responsible Manager:

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXX
5. Reference: QA Manual	6. Affected Data: Analytics
7. Description of Nonconformance: Failed Gr-A, Ni-63 and Sr-89 crosscheck	
8. Prepared By: Brandy Bicoll	9. Date: 07/19/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>BSB</i>	13. Date: 7/25/17
14. Approved By: <i>Keith Jeto</i>	15. Date: 7/25/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>BSB</i>	18. Date: 7/25/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jeto</i>	22. Date: 7/25/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The Client notified TBE of three failed crosschecks. A Sr-89 failure in 1st quarter of 2017, Gross Alpha failure in the 3rd quarter of 2016 and Ni-63 failure in the 4th quarter of 2016.

Cause:

For Gross Alpha (L69627) and Ni-63 (L71040), the technicians entered the incorrect aliquot into the LIMS system. Due to activity differences between Analytics samples and typical effluent samples, aliquots must be adjusted to achieve the best statistical results.

The Sr-89 (L72288) result of 0.70 is considered to be within TBE's limits. TBE considers ratios at or above 0.70 as acceptable with warning.

Corrective Action to Prevent Recurrence:

A program has been put into place that will prompt the technician to verify all cross check aliquot data that was entered into the LIMS system before they can exit the screen.

The Gross Alpha sample was recalculated using the correct aliquot and a revised report was sent to the client.

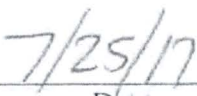
The Ni-63 and Sr-89 samples were reran and a revised report was sent to the client.

All associated raw data and QA results were reviewed and found acceptable.

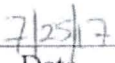
Objective Evidence:

1. A screen shot of the verification program.


Department Manager or Designee


Date


Quality Assurance Manager or Designee


Date

Note: You must supply both login # and analysis to use default values.

Report Status

Open

Report ID

Print only WG# ☒ (Y/N)

Print by Mount Date

• (mnddy)

PRINT

Exit

Printer **KNO IT**

Defaults

Analyst:

Date _____

Scavenge

Milking

Query

Save

Verify Aliquot volume for cross check sample(s)

Sample#	Mat	Prod
---------	-----	------

WG24481-1	WO	FE-55
WG24481-2	WO	FE-55
WG24481-3	WO	FE-55
71692-3	AP	FE-55
71695-2	LR	FE-55
71708-3	AP	FE-55
71720-1	FT	FE-55
71770-1	LR	FE-55
71771-1	LR	FE-55
71781-1	SW	FE-55
71781-2	SW	FE-55
71782-1	WT	FE-55
71799-1	LR	FE-55
71834-1	RS	FE-55
71834-2	RS	FE-55
71834-3	RS	FE-55
71834-4	RS	FE-55
71834-5	RS	FE-55
71837-2	LR	FE-55
71913-1	RS	FE-55
71913-2	RS	FE-55
71919-1	RS	FE-55
71945-1	RS	FE-55



Is this a valid aliquot for the cross check sample(s): L71695-2
3 ml; L71708-3 10 %?

☐ **Yes**

No

Units

Int

%	BKE
%	BKE
%	BKE
%	BKE
ml	BKE
%	BKE
%	BKE
ml	BKE
ml	BKE
%	BKE
%	BKE
ml	BKE
ml	BKE
g wet	BKE
g wet	BKE
g wet	BKE
g wet	BKE
g wet	BKE
ml	BKE
g wet	BKE
g wet	BKE
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g wet	BKE

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-11

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L74346
7. Description of Nonconformance: Incorrect Sample Date Entered at Login	
8. Prepared By: Sharon Northcutt	9. Date: 11/28/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon Northcutt</i>	13. Date: 12/4/17
14. Approved By: <i>Sharon Northcutt</i>	15. Date: 12/4/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable)	
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon Northcutt</i>	18. Date: 12/4/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jett</i>	22. Date: 12/12/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The Client notified TBE of incorrect sample date on the report.

Cause:

Sample was logged in by hand (instead of uploaded) and the error was not caught at login review. As a result, the results were decay-corrected to the wrong date.

Corrective Action to Prevent Recurrence:

Project Managers will continue to review login sheets. This particular chain of custody is supposed to be uploadable from the collectors so that there are no errors at login, but we did not receive it in an electronic format.

QA will monitor login errors to determine if further action should be taken. All associated raw data and QA results were reviewed and found acceptable. The report was revised and resubmitted to the client.

Keith J. Jett 12/12/17
Department Manager or Designee Date

Sharon L. Kowalczyk 12/14/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-12

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXXXXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L72648
7. Description of Nonconformance: Incorrect Sample Date Entered at Login	
8. Prepared By: Sharon Northcutt	9. Date: 12/04/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon Northcutt</i>	13. Date: 12/4/17
14. Approved By: <i>Sharon Northcutt</i>	15. Date: 12/4/17

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable)	
<input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon Northcutt</i>	18. Date: 12/4/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input type="checkbox"/> YES <input type="checkbox"/> NO	
If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Keith Jett</i>	22. Date: 12/12/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The Client notified TBE of incorrect sample date on the report.

Cause:

Sample was logged in by hand (instead of uploaded) and all errors were corrected at login review except for two samples. As a result, the results were decay-corrected to the wrong date.

Corrective Action to Prevent Recurrence:

Project Managers will continue to review login sheets. This particular chain of custody is supposed to be uploadable from the collectors so that there are no errors at login, but we did not receive it in an electronic format.

QA will monitor login errors to determine if further action should be taken. All associated raw data and QA results were reviewed and found acceptable. The report was revised and resubmitted to the client.

Keith Jeth 12/4/17
Department Manager or Designee Date

Sharon L. Albrecht 12/4/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-13

2. Responsible Manager: Rebecca Charles

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected: ~~XXXXXXXXXX~~

5. Reference: QA Manual

6. Affected Data: L74113

7. Description of Nonconformance: Incorrect results reported due to extra count time needed (Rush sample)

8. Prepared By: Sharon Northcutt

9. Date: 12/04/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By: *Sharon L Northcutt*

13. Date: *12/6/17*

14. Approved By: *Sharon L Northcutt*
Keith Jetr

15. Date: *12/6/17* *SD 12/4/17*

12/4/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☐ Accepted ☐ Rejected ☒ Follow-up Required - *LIMS programming needed*

17. Prepared By: *Sharon L Northcutt*

18. Date: *12/04/17*

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification ☒ YES ☐ NO

If yes, describe: *Revised Report*

20. Evaluated for Potential 10CFR21 Reportability ☒ YES ☐ NO

If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.

21. Prepared By: *Sharon L Northcutt*

22. Date: *12/6/17*

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The Client notified TBE that the Pu-241 result for L74113-1 was the same for the final result as for the raw data (Co-60 and Fe-55 subtraction factor not there).

Cause:

In an effort to meet the 7-day requested turnaround for this sample, the lab failed to make the adjustment for Co-60 and Fe-55.

Corrective Action to Prevent Recurrence:

For urine or fecal samples, LIMS will be programmed to email the project manager and the lab manager when Pu-241 results are uploaded to verify cross-contamination evaluation and correction if necessary.

All associated raw data and QA results were reviewed and found acceptable. The report was revised and resubmitted to the client.

Keith Jelt 12/4/17
Department Manager or Designee Date

Sharon L. Newhouse 12/4/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-14

2. Responsible Manager: Rebecca Charles

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L74559
7. Description of Nonconformance: Incorrect cross-check results	
8. Prepared By: Sharon Northcutt	9. Date: 12/04/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L Northcutt</i>	13. Date: <i>11/06/17</i>
14. Approved By: <i>Keith Jobe</i>	15. Date: <i>3/7/18</i>

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon L Northcutt</i>	18. Date: <i>03/07/18</i>

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <i>(Rebecca)</i> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Sharon L Northcutt</i>	22. Date: <i>03/07/18</i>

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The client notified TBE that the Fe-55 results of L74559 (cross-check sample) were not within the Analytics acceptance limits.

Cause:

Original result (09/28/17) – 4.11 E-5 uCi/ml (unacceptable)
Reanalysis result (11/10/17) – 2.20 E-5 uCi/ml (acceptable)

All associated QC data was reviewed and found acceptable. The original sample plate was recounted on 12/15/17 with a result of 2.55 E-5 uCi/ml, which would have been acceptable for the client. The result of our investigation was that this sample was labelled incorrectly in the software and was reported with incorrect results.

Corrective Action to Prevent Recurrence:

The technician responsible for analysis and sending data for Fe-55 has been made aware of the error.

All associated raw data and QA results were reviewed and found acceptable. The report was revised and resubmitted to the client.

Keith Jett 3/7/18
Department Manager or Designee Date

Shawn L. Abbott 03/07/18
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-15

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: TBE-MAPEP
5. Reference: QA Manual	6. Affected Data: L74388
7. Description of Nonconformance: Failed cross-check for AP U-238	
8. Prepared By: Sharon Northcutt	9. Date: 12/05/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L Northcutt</i>	13. Date: <i>12/11/17</i>
14. Approved By: <i>Keith Jett</i>	15. Date: <i>12/11/17</i>

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable) <i>NA</i>	
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon L Northcutt</i>	18. Date: <i>12/11/17</i>

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input type="checkbox"/> YES <input checked="" type="checkbox"/> <i>NA</i> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Sharon L Northcutt</i>	22. Date: <i>12/11/17</i>

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

In-house (MAPEP) AP cross-check for U-238 failed high.

TBE value: 0.115 ± 0.025 Bq/sample

MAPEP known value: 0.087 ± 0.002 Bq/sample

Ratio: 1.32

Cause:

TBE's result with error easily overlaps with the MAPEP acceptable range.

MAPEP spiked this sample at a very low (2.35 pCi) level. U-238 LCS is around 6 pCi.

Corrective Action to Prevent Recurrence:

TBE evaluates this result as a passing value and sees no further corrective action possible.

All associated raw data and QA results were reviewed and found acceptable.

Keith Jobe 12/11/17
Department Manager or Designee Date

Sharon L. Abma 12/11/17
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-16

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected: TBE-Analytics

5. Reference: QA Manual

6. Affected Data: L74447

7. Description of Nonconformance: Failed cross-check for Soil Cr-51 (GELI)

8. Prepared By: Sharon Northcutt

9. Date: 12/07/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By:

Sharon Northcutt

13. Date: 12/11/17

14. Approved By:

Keith Jett

15. Date: 12/11/17

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☐ Accepted ☐ Rejected ☐ Follow-up Required

17. Prepared By:

Sharon Northcutt

18. Date: 12/11/17

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification

☐ YES

☒ NO

If yes, describe:

20. Evaluated for Potential 10CFR21 Reportability

☐ YES

☐ NO

If 10CFR21 report required, describe:

NOT A REPORTABLE ISSUE.

21. Prepared By:

Sharon Northcutt

22. Date:

12/11/17

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

In-house (Analytics) soil cross-check for Cr-51 (GELI) failed low.

TBE value: 0.0230 ± 0.0144 pCi/g

EZA known value: 0.0355 ± 0.00592 pCi/g

Ratio: 0.65

Cause:

The sample was counted overnight for 14 hours, however, the Cr-51 was spiked at a very low level and had a counting error of 65%. Also, Cr-51 has a 27-day half-life, making low-level quantification even more difficult.

Corrective Action to Prevent Recurrence:

Effective corrective action cannot be taken for this specific sample for the following reasons:

- a) The error does not appear to be taken into consideration for these results (only the reported value). When the error is taken into account for Cr-51, the highest value would be 105% of the reference value, which is acceptable.
- b) The known result is significantly lower than TBE's typical MDC for Cr-51 in a soil matrix and would not typically be reported to clients (unless specified).

The failure is specific to this sample and has no impact upon actual client samples. TBE will further evaluate this NCR based upon the results of the next soil cross-check sample for Cr-51.

All associated raw data and QA results were reviewed and found acceptable.


Department Manager or Designee

12/11/17
Date


Quality Assurance Manager or Designee

12/11/17
Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-17

2. Responsible Manager: Rebecca Charles

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental

4. Client Affected: ~~XXXXXXXXXX~~

5. Reference: QA Manual

6. Affected Data: L74935

7. Description of Nonconformance: Sample result higher than expected and re-run was non-detect

8. Prepared By: Sharon Northcutt

9. Date: 12/18/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence:
See attached Supplemental Sheet

11. Planned Completion Date(s) for Action(s):

12. Prepared By: *Sharon L Northcutt*

13. Date: *01/15/18*

14. Approved By: *Keith Jett*

15. Date: *1/15/18*

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable)

☒ Accepted ☐ Rejected ☐ Follow-up Required

17. Prepared By: *Sharon L Northcutt*

18. Date: *1/15/18*

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification ☒ YES ☐ NO

If yes, describe: *Revised Report*

20. Evaluated for Potential 10CFR21 Reportability ☐ YES ☐ NO

If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.

21. Prepared By: *Sharon L Northcutt*

22. Date: *1/15/18*

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

The Ni-63 result for L74935-1 appeared to be higher than expected ($3.69\text{E-}04 \pm 1.64\text{E-}05$). The sample was rerun and the result was non-detect ($<4.50\text{E-}06$).

Cause:

The results were not in agreement due to sample matrix interference (oil matrix).

Corrective Action to Prevent Recurrence:

For oil samples, a rerun will be performed to verify a positive result..

All associated raw data and QA results were reviewed and found acceptable.

Keith Jete 1/15/18
Department Manager or Designee Date

Sharon L. Northcutt 01/15/18
Quality Assurance Manager or Designee Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-18

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT	
3. Laboratory Area: Environmental	4. Client Affected: XXXXXXXXXX
5. Reference: QA Manual	6. Affected Data: L74884
7. Description of Nonconformance: Data calculation incorrect due to incorrect sample date in LIMS	
8. Prepared By: Sharon Northcutt	9. Date: 12/28/17

PART 2. COMPLETED BY RESPONSIBLE PERSON	
10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon L Northcutt</i>	13. Date: <i>12/28/17</i>
14. Approved By: <i>Keith Jelt</i>	15. Date: <i>12/28/17</i>

PART 3. COMPLETED BY QUALITY MANAGER	
16. Review and Verification of Corrective Action (If Applicable)	
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon L Northcutt</i>	18. Date: <i>12/28/17</i>

PART 4. COMPLETED BY RESPONSIBLE MANAGER	
19. Client Notification <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
If yes, describe: <i>Revised Report</i>	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Sharon L Northcutt</i>	22. Date: <i>12/28/17</i>

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

I-131 and gamma calculations were reported incorrectly for the K-15 site (L74884-4) due to incorrect sample time in LIMS.

Cause:

The original chain of custody collection information did not match the sample container. A variance was done at login on 10/13/17 and the collector was contacted via email to verify the information. He sent an updated CofC on 10/16/17, which matched the sample label info, but this was not entered into the LIMS at that time by the new project manager, who was in training at the time.

Corrective Action to Prevent Recurrence:

The project manager is aware of the importance of following up immediately with any change in information from collectors/clients and will be more diligent.

All associated raw data and QA results were reviewed and found acceptable. The results were not affected since the collection time was only changed by 15 minutes. A revised report was sent to the client.

Keith Geb
Department Manager or Designee

12/28/17
Date

Sharon L. Northcutt
Quality Assurance Manager or Designee

12/28/17
Date

NONCONFORMANCE REPORT FORM

1. NCR No.: 17-19

2. Responsible Manager: Sharon Northcutt

PART 1. COMPLETED BY ORIGINATOR OF NONCONFORMANCE REPORT

3. Laboratory Area: Environmental	4. Client Affected: TBE - ERA
5. Reference: QA Manual	6. Affected Data: L75321
7. Description of Nonconformance: Failed cross-check for Sr-90	
8. Prepared By: Sharon Northcutt	9. Date: 12/28/17

PART 2. COMPLETED BY RESPONSIBLE PERSON

10. Root Cause, Corrective Action, Action to Prevent Recurrence: See attached Supplemental Sheet	
11. Planned Completion Date(s) for Action(s):	
12. Prepared By: <i>Sharon Northcutt</i>	13. Date: <i>12/28/17</i>
14. Approved By: <i>Keith Jobe</i>	15. Date: <i>3/7/18</i>

PART 3. COMPLETED BY QUALITY MANAGER

16. Review and Verification of Corrective Action (If Applicable) <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Follow-up Required	
17. Prepared By: <i>Sharon Northcutt</i>	18. Date: <i>03/07/18</i>

PART 4. COMPLETED BY RESPONSIBLE MANAGER

19. Client Notification <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, describe:	
20. Evaluated for Potential 10CFR21 Reportability <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If 10CFR21 report required, describe: NOT A REPORTABLE ISSUE.	
21. Prepared By: <i>Sharon Northcutt</i>	22. Date: <i>03/07/18</i>

KQA-9 Rev 4 07/29/11

Description of Nonconformance:

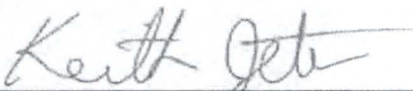
Result of the semi-annual ERA cross-check sample for Sr-90 was reported as "Not Acceptable".


Cause:

TBE reported 27.1 pCi/L and the known result was 41.8 pCi/L (range 39.4 – 57.5). Instrument daily checks and backgrounds were reviewed and passed. Our internal QC showed a low bias for Sr-90 at 74.5%, which passes the TBE criterion (70% – 130%). Our ERA Sr-90 is also low at 64.8% of the known value. All of the sample we received was consumed in the original analysis so a rerun was not possible.

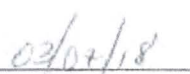
Corrective Action to Prevent Recurrence:

A rerun analysis would have helped to determine the validity of the original result. Preparation of future cross-check samples will be modified such that sufficient sample remains for reruns if necessary. LIMS programming will be enhanced to include an auto-generated LCSD when a workgroup includes cross-check samples (as opposed to having a choice between LCSD or DUP).


Department Manager or Designee


Date


Quality Assurance Manager or Designee


Date

ATTACHMENT D

Observation Reports

**THERE WERE NO OBSERVATION REPORTS
ISSUED FOR THIS PERIOD**

ATTACHMENT E

Audit Reports

Intentionally Left Blank

E.1

INTERNAL AUDITS

**THERE WERE NO INTERNAL AUDIT REPORTS
COMPLETED FOR THIS PERIOD**

E.2

EXTERNAL AUDITS

Intentionally left blank

DELAWARE – FEMA AUDIT

3.3.3 Private Jurisdictions

3.3.3.1 Teledyne-Brown Laboratories

3.3.3.1.1 Teledyne Brown Laboratories

Criterion: 1e1

In support of the CALVEX17 Plume and Ingestion Pathway exercise, the Teledyne Brown Engineering radiological laboratory successfully demonstrated that equipment, maps, displays, monitoring instruments, dosimetry, Potassium Iodide (KI), and other supplies were sufficient to support emergency operations. This demonstration was conducted as an out of sequence activity on September 19, 2017.

The Teledyne Brown Engineering laboratory is located in Knoxville, TN. The State of Delaware had a letter of agreement dated July 7, 2017 with Teledyne Brown Engineering to provide laboratory analysis services to support the Delaware Radiological Emergency Plan.

Available equipment was sufficient to support sample receipt, preparation for counting, analysis and archival activities. Specific equipment and supplies demonstrated under this criterion include potassium iodide, dosimetry, monitoring equipment, and other equipment, as follows:

Potassium Iodide: The Teledyne Brown Engineering laboratory was located in Knoxville, TN, approximately 200 miles southwest of the Calvert Cliffs Nuclear Power Plant. Potassium iodide was not issued, stored or required at this location.

Dosimetry: Each individual working at the Teledyne Brown Engineering laboratory who entered areas where radioactive materials were handled was issued a Permanent Record Dosimeter (PRD). Several PRDs were inspected and found to have the individual's name and were dated Jul 01, 2017 – Dec 31, 2017. The Radiation Safety Officer (RSO) said that PRDs are changed every six months. The RSO said that the laboratory's maximum annual reported dose to an individual was 22 millirem. They did not use Direct-Reading Dosimeters (DRD), and did not have them for normal laboratory operations. If he determined that they needed them for radiation exposure monitoring in support of Delaware, he would contact Ludlum Measurements located in Knoxville to obtain DRDs.

Monitoring Instruments: The laboratory had two sets of hand held radiation survey instruments. One set was in use, the other was available for backup. The "in use" set of instruments was inspected. They had a Ludlum Model 19 microRoentgen survey meter, a Ludlum Model 3 survey meter with Model 44-9 detector (pancake Geiger-muller) and 44-38 detector (side window Geiger-Muller), and a Ludlum Model 4 with a 44-90 detector (alpha scintillation). All three survey instruments were labeled with a sticker showing they were calibrated on January 31, 2017. A laboratory technician conducted operational and source checks at the beginning of the day, each work day. All operational checks had already been done before the evaluation, so the technician demonstrated how she would do the instrument source check. The technician used appropriate radioactive check sources to verify that each instrument operated within an acceptable "range of readings" contained on a reference table for use during source checks. The range of readings criteria was determined by the Radiation Safety Officer

when the instrument(s) were returned from annual calibration. He appropriately explained that he used a radioactive check source to obtain a reference reading, then he established a range of readings that was +/- 20% of the measured value.

Additional Equipment and Supplies: The laboratory had signs on doors that posted radiation areas and radioactive materials areas. Additional supplies were available to set up more stringent contamination controls for processing post-accident samples (signs, step off pads, floor coverings, waste containers). They had four high efficiency particulate air hoods where they would open sample shipping containers and prepare samples for analysis. They had appropriate personal protective equipment (lab coats, Tyvek suits, gloves, protective eyewear).

Additionally, the laboratory had extensive radiological sample preparation and analysis equipment. They had multiple drying ovens, 15 in service gamma spectroscopy detectors (Canberra and Ortec), Ortec and Tennelec gross alpha/beta gas flow proportional counters, alpha spectroscopy and liquid scintillation counting systems. They had a variety of containers with appropriate geometries for analyzing field samples (one liter, four liter, 150 milliliter, 300 milliliter, and petri dishes). They also had multiple commercial refrigerators and freezers, a large warehouse sized storage room for sample archival, and containers/space to store radioactive waste.

All activities were based on the plans and procedures and completed as they would have been in an actual event, except where noted in the extent of play agreement.

3.3.3.1.2 Teledyne Brown Laboratories

Criterion: 3a1

In support of the CALVEX17 Plume and Ingestion Pathway exercise, the Teledyne Brown Engineering radiological laboratory successfully demonstrated the use of appropriate dosimetry, Potassium Iodide (KI) and procedures, and management of radiological exposure to radiation workers. This demonstration was conducted as an out of sequence activity on September 19, 2017.

The Teledyne Brown Engineering radiological laboratory had 20 employees. Seventeen employees were considered occupationally exposed radiation workers and were issued a Permanent Record Dosimeter (PRD) to wear while they were in radiologically controlled areas of the laboratory. Each person's PRD had their name printed on it and was dated Jul 01, 2017 – Dec 31, 2017. All laboratory personnel wore dosimetry on the front of their body in the chest area. Permanent Record Dosimeters were exchanged and read every six months. The Radiation Safety Officer (RSO) kept radiation dose records for all occupationally exposed employees.

The RSO explained that the laboratory used an administrative radiation exposure limit of 600 millirem/year. He had worked as the laboratory RSO for 15+ years and explained that the highest ever annual dose to a worker was 22 millirem. He said that a worker could be extended above annual limit of 600 millirem. He was authorized to approve radiation dose up to 4000 millirem (annually). The Teledyne Brown Engineering corporate RSO would have to approve any radiation dose above that (up

to 5000 millirem/year, the occupational radiation dose limit). He also explained that the laboratory had a lower radiation dose limit for declared pregnant females consistent with the requirements of Regulatory Guide 8.13, Instruction Regarding Prenatal Radiation Exposure.

The RSO explained that they did not have Direct-Reading Dosimeters (DRD) for use on a routine basis. If they determined they might need them due to processing a large volume of highly radioactive samples, he would contact Ludlum Measurements in Knoxville, TN to obtain the required equipment. Additionally, he could contact his counterpart at Oakridge National Laboratory and request loan of DRDs.

Several packages from various nuclear power plants were being processed during the demonstration. All sample shipping containers were surveyed upon receipt. A sample receipt technician surveyed containers for both radiation levels and contamination. The lab had sample receipt and holding areas for both low level environmental samples and "in-plant" samples that measured higher radiation levels. All sample containers were surveyed and compared to receipt criteria posted in the sample receiving area. The technical would contact the RSO for direction if any sample container measured above 0.5 milliRoentgen/hour (mR/hr). The laboratory could receive and process samples with contact radiation levels measuring up to 100 mR/hr. They had a holding area for samples with higher contact radiation levels.

The RSO also explained the facility's routine survey program. Areas where radioactive material was handled were surveyed weekly (radiation levels and removable contamination); administrative and non-radioactive materials areas were surveyed monthly. Routine radiation surveys were provided for review and found to be thorough and appropriate to be used in managing dose radiation to workers and contamination within the facility.

The Teledyne Brown Engineering laboratory was located in Knoxville, TN, approximately 200 miles southwest of the Calvert Cliffs Nuclear Power Plant. Potassium iodide was not issued, stored or required at this location.

All activities were based on the plans and procedures and completed as they would have been in an actual event, except where noted in the extent of play agreement.

3.3.3.1.3 Teledyne Brown Laboratories

Criterion: 4c1

In support of the CALVEX17 Plume and Ingestion Pathway exercise, the Teledyne Brown Engineering radiological laboratory successfully demonstrated the capability of performing required radiological analyses to support protective action decisions. This demonstration was conducted as an out of sequence activity on September 19, 2017.

The Teledyne Brown Engineering radiological laboratory was located in an industrial area outside of Knoxville, TN. It was a contract laboratory that received and processed both low level environmental samples and higher radiation level "in plant" samples from various nuclear power plants. The laboratory supported Radiological Environmental Monitoring Program (REMP) monitoring programs as well as doing isotopic analysis for radioactive waste shipments. The State of Delaware had a Memorandum of Understanding dated July 7, 2017 with Teledyne Brown Engineering to provide radiological laboratory analysis services to support the Delaware Radiological Emergency Plan. The laboratory's agreement with the State of Delaware included an estimated 24-hour turnaround time for sample results once samples were received by the laboratory.

Sample Receipt: The laboratory building had a delivery bay with a roll up door where samples were delivered from FedEx, UPS and private carriers. The entire laboratory facility was under negative air pressure to ensure that all air flowed into the building and there was no effluent out. The laboratory had an area to process low level environmental samples and another room to process higher level "in plant" samples. Both rooms connected to the receipt bay. It was noted by the Laboratory Operations Manager that they routinely received and processed higher activity samples. He also explained that approximately 80% of their business was from nuclear power plants and nuclear plant personnel did a good job in packaging to ensure the exterior of the sample containers were below their receipt contamination limit of 1000 disintegrations per minute/100 square centimeters (dpm/100 cm²).

During the evaluation, several deliveries were made to the facility and sample packages received by a laboratory receipt technician. The technician did both radiation and contamination surveys on each outer package. Survey acceptance criteria was posted above the survey meter work station. She was to contact the Radiation Safety Officer (RSO) if any package measured above 0.5 milliRoengen/hour (mR/hr) or had removable contamination above 1000 dpm/100 cm². The RSO said that anything above those levels would likely be opened and the interior sample containers surveyed in the "in plant" room. The laboratory's contact radiation exposure rate limit on an individual sample was 100 mR/hr.

All samples received had appropriate chain of custody paperwork that included the requested analysis (e.g. gamma, tritium, Sr90, etc.). The Quality Assurance Manager and laboratory receipt technician provided a sample of a sample chain of custody for review. The Quality Assurance Manager said in most cases, they received an electronic copy for review prior to receipt of samples. A signed paper chain of custody form was included the package with the samples.

When samples were received, they were logged into the Laboratory Information Management System (LIMS). A bar coded label was printed and affixed to the sample. The sample location and processing status could be looked up in LIMS. It was also used to track whether an aliquot of a sample was taken; all parts were accounted for and ultimately resulted in displaying the final sample storage location (post processing).

During the demonstration, the receipt technician had multiple samples being received and processed. They included milk, water, various fruits and vegetables, fish, soil and vegetation. It was noted that the samples the laboratory routinely handles were of the type to be received and analyzed in a nuclear

power plant post-accident response. Therefore, sample types and activity levels being shipped from Delaware for plume or ingestion phase analysis would not be atypical for this laboratory.

Sample Preparation: Once sample shipping containers were opened, chain of custody paperwork reviewed and entered into LIMS, the samples were removed from the shipping container and each sample inspected and surveyed. Laboratory technicians would typically wear a lab coat, gloves and protective eyewear. "In plant" samples, such as those for radioactive waste shipments, would be opened and processed in an adjacent room. The sample receipt and preparation areas had work areas with negative pressure hoods using High Efficiency Particulate Air (HEPA) filtration. The Radiation Safety Officer said they would set up a contamination control area in the "in plant" sample preparation room, complete with signs, step off pad and the requirement for additional protective clothing. Contamination surveys would be performed to ensure contamination was not being spread. They would also store samples being processed in an area in the sample preparation room to prevent an increase in background radiation levels for the workers. It was noted by the evaluator that there was ample room to accomplish this task.

Based on the requested analysis, the sample container would be opened and the sample contents transferred to a container with the appropriate counting geometry. The Laboratory Operations Manager said that they used a variety of geometries for gamma analysis that would be appropriate for samples received from the State of Delaware. They had one and four-liter Marinelli containers, 150 and 300 milliliter bottles, small scintillation vials and petri dishes. Most of the leafy vegetation samples would be counted in the four-liter Marinelli. During sample preparation, the laboratory technician would break down the food product as specified in the agreement with the customer. For example, he might shuck corn or filet fish to ensure they analyzed only the eatable portion of the sample.

Samples requiring simple gamma analysis needed little preparation other than sometimes adding a chemical preservative, cutting up (e.g. corn stalks, meat), and putting into analysis containers. Sometimes the client specified that the sample (such as soil) be dried prior to counting. Samples needing complex analysis, such as for Sr-90, would take longer to prepare. For example, a milk sample would have to be evaporated slowly to remove all of the water. At too high a temperature, the iodine would volatilize out of the milk. A milk sample for Sr-90 analysis could take up to two weeks. It was noted that the laboratory had extensive cold storage available for sample preservation. They had several refrigerators and freezers in the "in plant" preparation room, and another large room with multiple commercial refrigerators and freezers. The second room was primarily used to retain/archive samples after they were processed. The laboratory also had a program for disposal of radioactive waste and shipment to a waste processing facility. The laboratory would work out final radioactive waste disposal protocols with the State of Delaware.

Sample Counting: Once samples were prepared for counting they were transferred to the next room; the counting laboratory. This laboratory had extensive equipment such as gamma spectroscopy detectors, automatic gas flow proportional counters used to count particulate samples for gross alpha and beta, scintillation counters that would be used for beta analysis such as Sr-89/90, alpha spectroscopy systems that would be used to analyze for transuranics. Laboratory counting equipment was within current calibration and had operational/source checks conducted daily/prior to use.

The laboratory primarily analyzed samples for gamma isotopes. They had 15 operational high purity germanium (HPGe) detectors (Canberra and Ortec). All HPGe detectors were housed inside steel or lead lined caves to shield out background radiation. One HPGe detector was selected for review of calibration records, daily checks, system operation and sample analysis reports. The HPGe detector was calibrated to count samples in multiple geometries – as described in the sample preparation section above. Calibration sources were made by taking aliquots from two different Analytics mixed gamma sources. The Analytics gamma standards made by Eckert & Zeigler maintained traceability to the National Institute of Standards and Technology (NIST) as described in Regulatory Guide 4.15. The reference dates on the samples inspected were January 1, 2014 and July 1, 2011. Calibrations were done on the gamma spectroscopy equipment and compared with the documentation provided with the NIST gamma standard. Daily background and operational checks were done prior to equipment use. If the gamma spectroscopy system was out of specification, minor gain adjustments would be made by the Laboratory Operations Manager. As long as the spectroscopy equipment passed its performance tests, a full recalibration was not required on a specific frequency.

Samples were counted using a system comprised of the HPGe detector and Canberra counting and analysis software. It was noted by the Laboratory Operations Manager, that they had made modifications to the data entry portion of the software to make it more efficient. Canberra had reviewed and approved the modification.

Per laboratory analysis procedures, the laboratory would use a default 100-minute count time unless otherwise specified by the customer. The 100 second count time, and associated detection capability per isotope are documented in, "Gamma Emitting Radioisotope Analysis, TBE 2007, Revision 8." It is noted that the default count time and associated Minimum Detectable Activity (MDA) are to meet routine environmental monitoring criteria and are much lower than would be needed for accident analysis. Count times would be adjusted based on client input and the specified MDA by sample type and isotope. Likely Delaware post-accident sample count times could be adjusted to 10-15 minutes and meet the standards needed for calculation of projected doses from airborne radioactivity, ground deposition and ingestion of food products. Specifying a lower count time (and associated MDA) could significantly reduce the time for doing doses projections and making protective action recommendations to decision makers.

Unless specified otherwise, the laboratory would use their nuclear power plant isotopic library to compare sample counts against and generate a report of activity by sample type. The analysis library was reviewed and found to contain the key isotopes expected in a nuclear power plant accident.

Analysis Review: Once a sample was counted, a report was generated, and could be customized to the client's specification. The report would be reviewed and signed by both the radiochemist and the Laboratory Operations Manager. The Laboratory Operations Manager reviewed a printout of a recent water sample and explained all of the parameters he reviewed prior to signing the document. Some of the items verified were that the count met the customers specification for MDA for critical isotopes and the calculated activity was in the client specified units. It was noted that if an isotope was not contained in the analysis library, and significant counts were collected in that channel, the software would include a listing of possible isotopes that could be included in a re-analysis of the spectrum.

The LIMS information, collected gamma spectrum and associated reports were saved electronically. Electronic files were backed up nightly to Teledyne Brown Engineering servers located in Huntsville, AL. Paper copies of analysis reports were maintained on file in the laboratory or transferred to an archival storage facility nearby. It was noted that some clients required the laboratory maintain records for 60+ years.

Sending results to Delaware: Once laboratory reports were reviewed and signed, the signed copy would be scanned into a Portable Document Format (PDF) file. The PDF and a Comma Separated Values (CSV) file would be sent to the client. The Laboratory Project Manager said that the CSV file, or an Excel file could be customized so the client received a spreadsheet with the isotopes of interest, the sample results in the units needed for dose calculations, and the associated MDAs. An example was provided for review. Having a customized electronic report formatted for the State of Delaware would significantly reduce the time required to do data entry for dose projections (the data from an Excel file could be copied/pasted into a calculation spreadsheet).

Training and Qualification: The Teledyne Brown Engineering laboratory had a training and qualification program for laboratory personnel. Personnel underwent extensive training and had a qualification document completed and signed for each task they were qualified to perform. A signed qualification record for the laboratory radiochemist was provided for review.

All activities were based on the plans and procedures and completed as they would have been in an actual event, except where noted in the extent of play agreement.

In summary, the status of DHS/FEMA criteria for the Private jurisdiction is as follows:

- a. MET: 1.e.1, 3.a.1, 4.c.1
- b. LEVEL 1 FINDINGS: NONE
- c. LEVEL 2 FINDINGS: NONE
- d. PLAN ISSUES: NONE
- e. PRIOR ISSUES: RESOLVED: NONE
- f. PRIOR ISSUES: UNRESOLVED: NONE

State of Delaware Extent of Play

All activities will be based on the ORO's plans and procedures and completed as they would be in an actual emergency except as indicated below.

Two sampling teams will be evaluated. They will be demonstrated out of sequence on September 13, 2017.

Communications from the EOC to the sampling teams will be simulated. Sampling location(s) will be determined in advance and may not coincide with the footprint of the plume. The teams will collect one or more samples based on the crops in the field at the time [soil, water, milk, leafy vegetation, crops]. Teams will split up the sample types (both teams do not need to collect all sample types). Sample transport to the analysis lab will be simulated.

Milk sampling will not be demonstrated at a farm but will be done by interview – a field team member(s) will explain the process of sampling to the evaluator.

If required by the Technical Assessment Center, sampling team will demonstrate donning anti-contamination equipment, but will not wear them during sample collection or other field activities. Booties and gloves will be worn as per Delaware SOP's and as directed by the Technical Assessment Center. An inventory list will be available with protective equipment.

Locations Evaluated

State Ingestion Sampling Teams

Outstanding Issues

None

Sub-element 4.c – Laboratory Operations

Criterion 4.c.1: The laboratory is capable of performing required radiological analyses to support protective action decisions.

Intent

This sub-element is derived from NUREG-0654, which provides that Offsite Response Organizations (OROs) should have the capability to perform laboratory analyses of radioactivity in air, liquid, and environmental samples to support protective action decision-making.

Extent-Of-Play

Assessment of this Demonstration Criterion may be accomplished during a biennial, tabletop

exercise, or an actual event. Other means may include drills, seminars, or training activities that would fully demonstrate technical proficiency.

The laboratory staff must demonstrate the capability to follow appropriate procedures for receiving samples, including logging information, preventing contamination of the laboratory(ies), preventing buildup of background radiation due to stored samples, preventing cross contamination of samples, preserving samples that may spoil (e.g., milk), and keeping track of sample identity. In addition, the laboratory staff must demonstrate the capability to prepare samples for conducting measurements.

The laboratory(ies) must be appropriately equipped to provide, upon request, timely analyses of media of sufficient quality and sensitivity to support assessments and decisions anticipated in the ORO's plans/procedures. The laboratory instrument calibrations must be traceable to standards provided by the National Institute of Standards and Technology. Laboratory methods used to analyze typical radionuclides released in a reactor incident must be as described in the plans/procedures. New or revised methods may be used to analyze atypical radionuclide releases (e.g., transuranics or as a result of a terrorist incident) or if warranted by incident circumstances. Analysis may require resources beyond those of the ORO.

The laboratory staff must be qualified in radioanalytical techniques and contamination control procedures. OROs will use Federal resources as identified in the NRF Nuclear/Radiological Incident Annex and other resources (e.g., compacts, the licensee, or nuclear insurers) as needed. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.

All activities must be based on the ORO's plans/procedures and completed as they would be in an actual emergency, unless noted above or otherwise specified in the Extent-of-Play Agreement.

State of Delaware Extent of Play

All activities will be performed in accordance with the ORO's plans/procedures and completed as they would be in an actual emergency except as indicated below.

Laboratory operations will be evaluated out of sequence at the Teledyne-Brown facility.

Location Evaluated

Teledyne-Brown

Outstanding Issues

None

BWXT AUDIT

Northcutt, Sharon

From: Morse, Cynthia F <cfmorse@bwxt.com>
Sent: Tuesday, February 06, 2018 12:44 PM
To: Northcutt, Sharon
Cc: Smith, Lynn M; Brown, Mary J
Subject: Teledyne Brown Audit

Good Afternoon Ms. Northcutt,

The management review of the Teledyne Brown audit report and response is now complete. BWXT considers this audit to be closed as of January 8, 2018.

Thank you,
Cindy Morse
BWXT
Quality Engineering Lead Auditor
434-522-5168

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December 5, 2017

Mary Brown
Quality Engineering Lead Auditor
BWX Technologies, Inc.
Nuclear Operations Group
P.O. Box 785 (MC 16)
Lynchburg, Virginia 24505

Dear Mrs. Brown,

Please find attached the corrective action package, which was prepared in response to the BWX Technologies audit report issued on November 9, 2017. The audit was conducted at our facility on November 6 – November 9, 2015.

This package addresses the one nonconformity found during the audit.

We appreciate the identification of these opportunities for improvement, as well as your department's assistance in our BWXT approval process. Please do not hesitate to contact us with any questions regarding this transmittal or with any request for additional information.

Sincerely,

Sharon Northcutt
Quality Assurance Manager
Teledyne Brown Engineering
Ph: (865) 934-0374

BWX Technologies, Inc. Nuclear Operations Group Lynchburg, Virginia	Quality Control Department Quality Engineering Section	Quality Systems Audit Teledyne Brown Engineering November 6 - 9, 2017
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I. PURPOSE

Evaluate the Teledyne Brown Engineering quality program and determine, on a sample basis, if the subcontractor is meeting the minimum requirements invoked by their documented quality program, and the requirements stated in active BWXT purchase orders.

II. PERSONNEL CONDUCTING THE EVALUATION

NAME	SIGNATURE	TITLE
Mary Brown		BWXT, Quality Eng. Lead Auditor
Lynn M. Smith		BWXT, Senior Health Physicist

III. PERSONNEL CONTACTED DURING THE EVALUATION (AND AT THE WRAP-UP MEETING)

NAME	SIGNATURE	TITLE
Sharon Northcutt		Quality Manager
Keith O. Jeter		Operations Manager
Rebecca L. Charles		Project Manager

IV. ELEMENTS EVALUATED

1. Control of Documents
2. Control of Records
3. Qualification and Training
4. Identification and Traceability of Samples
5. Control and Maintenance of Calibration Standards
6. Procurement of Materials
7. Inspection and Testing of Materials and Equipment
8. Corrective Action/Preventive Action
9. Organization and Management Responsibilities
10. Documentation of MDA(s), LLD(s), and other Statistical Parameters
11. Inter-laboratory Comparisons (Inter-laboratory Performance Evaluation Program)
12. Intra-laboratory Comparisons (Blanks, Replicates and Spikes)
13. Independent Verification of Results
11. Prevention of Deliberate Malpractice
12. Follow-ups to Previous Audit Findings and Commitments

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V. SUMMARY

The quality evaluation of Teledyne Brown Engineering (TBE) began the afternoon of Monday, November 6, 2017 with a brief kick-off meeting followed by a tour of the labs at the Knoxville, TN facility. The audit concluded with a wrap-up meeting held the morning of Thursday, November 9, 2017.

The audit elements listed in section IV of this report were evaluated as they relate to BWXT product.

The audit team noted the following best practices:

- 1) TBE's willingness to immediately make corrections to procedures to better improve their program.
- 2) The lab was very clean and well organized.

The audit included surveillances in the labs and document review as applicable to each audit topic. Interviews with lab personnel and management confirmed that Teledyne Brown Engineering employees are knowledgeable and committed to providing thorough detail concerning the sampling and inspections they perform. The audit confirmed that both management and staff are very dedicated in following all quality procedures and safety requirements.

The quality evaluation resulted in one nonconformity and no observations. Teledyne Brown Engineering has thirty days to submit its first status report in response to the nonconformity documented within this report. All status reports shall be electronically forwarded to mjbrown@bwxt.com. Status reports shall continue every thirty days until complete. In no case shall the audit remain open more than 120 days.

The contents of this report are considered by BWXT to be within the contractual scope of existing contracts and therefore, does not involve or authorize any delay in delivery or cost to BWXT, either direct or indirect.

Teledyne Brown Engineering agrees that this report may be distributed to the Contracting Agencies, GQAR, and other BWXT divisions based upon "Need-to-know" as deemed appropriate by BWXT NOG-L.

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Personnel Contacted

NAME	TITLE
Kristen Coulston	Lab Technician
Cindy Hill	Lab Technician
Donna Webb	Lab Technician
Jim Wright	IT Specialist

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VI. NONCONFORMITY

Nonconformity VI-01

Description: Teledyne Brown Engineering could not provide evidence that the QA Manager is tracking preventive actions per the procedure.

Requirements: TBE-1012 Revision 6, paragraph 5.7.3, states that "Preventive actions tracking by the Quality Assurance Manager shall include the initiation of such actions and application of controls to ensure that they are effective."

Discussion: While reviewing documentation for preventive actions it was noted that preventive actions tracking documentation could not be provided for review. A discussion with the current QA Manager revealed that due to recent personnel change of QA Managers that documentation is difficult to locate at this time.

Vendor's Response: The tracking form was located and updated. SEE ATTACHED

Cause: Former QA Manager's last day on-site was Aug 15 and new QA Manager did not start until Nov 6. No instructions available for this form at the time of the audit.

Immediate Corrective Action: Form was located and updated.

Corrective Action to Prevent Recurrence: Currently in the process of updating QA Office procedures to include instructions for tracking, document locations, etc.

Describe the actions taken to determine whether a similar issue exists elsewhere: NA

Describe why this issue does or does not affect product conformance to requirements: No effect on product conformance to requirements (paperwork and organization issue in the QA office). TBE considers this nonconformity closed.

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VII. OBSERVATION

Observation VII-01: N/A

Description:

Requirement:

Discussion:

Vendor's Response:

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VIII. METHODS OF EVALUATION

Control of Documents

- Confirmed that Procedures and Quality Manual have an identifying code, date of issue and the Operations Manager's signature.
- Confirmed that changes in procedures are identified by a vertical line in the right margin for easy identification.
- Confirmed that Procedure Manuals and Quality Manuals are placed on the share drive in .pdf format and are accessible by lab technicians.
- Confirmed that annual reviews of specified procedures are performed.
- Confirmed that obsolete manuals and procedures are maintained and removed from the share drive.
- Confirmed that Procedures and Quality Manual are reviewed and updated as required per the procedure.
- Verified that the TBE QA Manager and the TBE Operations Manager approves all changes in procedures.

Control of Records

- Confirmed that results are collected and reviewed by the Project Manager and the Operations Manager.
- Confirmed all records are maintained in files and in backup electronic copies.
- Confirmed that TBE disposes of samples after required hold times.
- Reviewed data packages and confirmed all original observations, calculations, derived data, calibration data and test reports are included.
- Reviewed log of software program changes and confirmed it contained all of the required information per the procedure.
- Confirmed that required forms for access to Laboratory Information Management System (LIMS) are filled out and maintained at the Huntsville facility.

Qualification and Training

- Confirmed that the Quality Assurance Manager maintains a training matrix indicating the training status of all personnel.
- Confirmed that analysts and technical personnel have formal qualifications.
- Confirmed that internal audits are performed by the Quality Assurance (QA) Manager.
- Confirmed that training to the radiological safety program is conducted annually.
- Confirmed that all training is documented and retained by the QA Manager.
- Confirmed that all personnel received annual safety training.
- Confirmed that personnel performing work are qualified and trained to do the work performed.
- Confirmed that the QA Manager reviews training and certifications annually.
- Reviewed forms KQA-1 and KQA-6 to verify individual Demonstration of Capability.

Identification and Traceability of Samples (Chain of Custody)

- Confirmed that incoming samples are inspected for damage or tampering.
- Confirmed that the customer Chain of Custody (COC) is signed and dated upon receipt of samples.
- Confirmed that acceptable samples are entered into the LIMS system which generates the bar coded labels.
- Confirmed that unacceptable samples are entered into LIMS with a variance report to notify the Project Manager of the nonconforming condition.
- Confirmed that the Project Manager plans work and assures LIMS contain any special instructions.
- Confirmed that LIMS assigns numbers for sample identification throughout all operations to record data.
- Confirmed that each sample is assigned a sample storage location which is printed on the bar coded sample label.
- Confirmed that information present in LIMS included all pertinent sample information data per the procedure.
- Confirmed that a request for analysis (RFA) form is created for incoming samples and is reviewed by the Project Manager prior to further sample processing.

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VIII. METHODS OF EVALUATION (Continued)

Control and Maintenance of Calibration Standards

- Confirmed that radionuclide standards used for calibrations are traceable to NIST.
- Reviewed the calibration certificate for the source used during analysis of BWXT NOG-L bioassay samples.
- Confirmed that calibration records are maintained.
- Confirmed that background counts are performed to check for radioactive contamination.
- Confirmed that spike and tracer solutions are marked with expiration dates by reviewing the labels in the lab.
- Confirmed that standard expiration dates are maintained in LIMS.
- Confirmed that LIMS pipette check module contains required information fields per the procedure.
- Verified that all nonfunctioning equipment is removed from service and labeled out of service by laboratory personnel.
- Confirmed that each standard bears a unique identifier and expiration date.
- Confirmed that bioassay glassware is cleaned and stored in a separate area from general glassware.
- Confirmed that records maintained for reagents and standards contain the required information per the procedure.

Procurement of Materials

- Confirmed that procured items and services are received at the lab where receiving checks and inspections are made.
- Confirmed that QA maintains a list of approved vendors and records of evaluations performed.
- Confirmed that all entries on the requisition are clearly identified.
- Confirmed that requisitions for radioactive standards or services related to the calibration of equipment are reviewed by the QA Manager.

Inspection and Testing of Materials and Equipment

- Reviewed BWXT sample analysis and verified that the tracer for uranium was added as required by the procedure.
- Confirmed that the test method used to process uranium bioassay (urine) samples has not changed in over 17 years.
- Confirmed that access and usage of the LIMS system requires security access.
- Confirmed that the computer/server housing the LIMS system is located in a temperature controlled environment.
- Confirmed that checks and balances have been written into the LIMS software to ensure data does not get overwritten.

Corrective Action/Preventive Action

- Reviewed a sample of TBE nonconformance reports (NCR's) that were issued by TBE personnel for detector efficiency curve issues, chain of custody issues and customer complaints.
- Confirmed that upon receipt of a corrective action, TBE operations performs a causal analysis where root causes are identified.
- Verified that all steps are documented, appropriate follow-up actions are monitored by the Quality Manager.
- Reviewed the TBE NCR log and verified that it contains the appropriate level of information on each NCR reviewed.
- Verified that all TBE NCR's are evaluated for potential reportability as per 10CFR21 requirements.

Organization and Management Responsibilities

- Reviewed Complaint log and verified that appropriate documentation is being completed for each customer complaint. Note: BWXT did not have any complaints within the last two years.
- Confirmed that several customer complaints were appropriately investigated via the NCR system and corrective actions were completed.

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VIII. METHODS OF EVALUATION (Continued)

Documentation of MDA(s), LLD(s), and other Statistical Parameters

- Confirmed that there has been no significant change in the test method for analysis of isotopic uranium and therefore no recalculation of the MDA was required.
- Confirmed that the MDA for the analysis of urine has been optimized appropriately.
- Confirmed that the Canberra alpha spectroscopy software performs the verification and validation of the MDA for the method.
- Reviewed BWXT NOG-L sample reports L70490, L71055, and L74688 to verify that the MDC for each sample met the BWXT requirement.

Inter-laboratory Comparisons (Inter-laboratory Performance Evaluation Program)

- Confirmed that TBE participates in the Inter-laboratory Performance Evaluation Program.
- Reviewed the Annual 2016 Quality Assurance Report for applicable quality issues that could relate to analysis of BWXT samples.
- Reviewed the 1st and 2nd Quarter 2017 Inter-laboratory comparison results.
- Confirmed that failures of Inter-laboratory comparison results are documented in NCRs and that the reasons for the failures are investigated.

Intra-laboratory Comparisons (Blanks, Replicates and Spikes)

- Confirmed that blank samples, blank spiked samples and blank spiked duplicate samples are used for each group of bioassay samples.
- Reviewed results of QC samples used for BWXT NOG-L sample reports L70490, L71055, and L74688.
- Confirmed that the QC samples are prepared and counted in the same manner as the samples submitted for analysis.
- Confirmed that the uranium standard used to prepare the laboratory control sample (LCS) is independent of the laboratory standard used for instrument calibration.
- Confirmed that the lab control sample spike solution is of appropriate activity for BWXT bioassay samples.

Independent Verification of Results

- Confirmed that personnel using LIMS currently have a user name and password that are unique to the individual.
- Confirmed that personnel using LIMS are trained in its use and operation.
- Reviewed data packages and verified that worksheets were reviewed prior to transferring results to LIMS.
- Confirmed that results obtained from analytical efforts are reviewed by the Operations and the Project Manager.

Prevention of Deliberate Malpractice

- Verified a sample of TBE employee records to ensure they are cognizant of the Fraud and Falsification statement.
- Verified the Fraud and Falsification statement is present on TBE's documents.

Follow-ups of the Previous Audit Findings and Commitments

- All commitments to the previous BWXT audit were verified and completed as stated.

2017 NCR's

NCR Number	Date of Input	Originator	Date of Non-conformance	Description of Nonconformance	Client affected	Nuclide/L # affected	Corrective Action (Y/N)	Revised Report (Y/N)	Failure Code	Complete	EA Number	IA Number	CC Log Number	Codes	
NCR 17-1	1/5/2017	BNB	1/5/2017	TBE-2008 missing instruction for delayed count time.	NA	GR-A\EPA 900.0	Y	NA	EA-9	Y	EA-9			IC	In-house cross checks failure
NCR 17-2	3/28/2017	RC	3/28/2017	Client requested rerun for H-3 did not match original result.	****	H-3/L70587	Y	Y	EF-3	Y				CCC	Client cross checks failure
														HE	Human Error
NCR 17-3	4/7/2017	RC	4/4/2017	Wrong calculation used for MDC	****	WG71856	Y	Y	HE-I	Y			17-3	HE-D	Reference dates wrong
														HE-V	Allquot (volumes) wrong
NCR 17-4	4/11/2017	BB	1/1/2017	Failed Client Analytics from 2016 (Was not informed until 2017)	****	NA	N	N	CCC	Y				HE-S	Sample switching
														HE-F	Sending wrong data file to LIMS
NCR 17-5	4/18/2017	RC	2nd half 2016	TBE failed to order a replacement AP for Gr-B cross check.	****	Gr-B	Y	NA	QA	Y			17-4	HE-L	Sample lost (destroyed) in process
														HE-G	Wrong Geometry
NCR 17-6	5/16/2017	RC	5/12/2017	Date entered wrong at login. Client notified TBE	****	L72131	Y	Y	HE	Y				HE-I	Incorrect Data Entry
NCR 17-7	5/22/2017	RC	3/7/2017	Client notified that K-40 results were low weights switched when entering into LIMS	****	L67271	Y	Y	HE-V	Y				EF-1	Equipment Failure
														EF-2	Reagent Failure
NCR 17-8	6/7/2017	BB	2/2/2017	Three findings from an internal audit in 2016	NA	NA	Y	NA	IAF	Y				EF-3	Equipment Issue
NCR 17-9	6/7/2017	BB	5/30/2017	Failed Zn-65 for Gamma and Sr-89 RAD/Both results were low.	NA	L72350	Y	NA	IC	Y				NA	Not Applicable
														SAF	External Audit Finding
NCR 17-10	7/19/2017	BB	6/22/2017	Failed cross-checks for Gr-A, Ni-63 & Sr-89	****	L69627, L71040, L72288	Y	Y	HE-1	Y				IAF	Internal Audit Finding
														QA	QA related failure
NCR 17-11	11/28/2017	SN	11/15/2017	Date entered wrong at login. Client notified TBE	****	L74346	Y	Y	HE	Y			17-20	OI	Outside Interference
NCR 17-12	12/4/2017	SN	8/3/2017	Date entered wrong at login. Client notified TBE	****	L72648	Y	Y	HE	Y			17-14	UD	Unable to Determine
NCR 17-13	12/4/2017	RC	9/13/2017	Incorrect results due to extra count time needed	****	L74113	Y	Y	QA				17-16	Yellow box means that the NCR is not complete.	
NCR 17-14	12/4/2017	RC	11/1/2017	Failed client cross-check for Fe-55	****	L74559	Y	Y	CCC				17-18	CA	Corrective Action
														EA	External Audit
														IA	Internal Audit
														CC	Customer Complaint
														QUARTERS	
														1Q	
														2Q	
														3Q	
														4Q	

2017 Customer Complaint Log

CC Number	Date	Company	Person Filing Complaint	Complaint	Linked NCR	Attachments Y/N	CODE	Codes	
CC 17-1	1/11/2017	****	****	Client supplied wrong result to E&Z for crosscheck.	NA	Y	CI	IC	In-house cross checks failure
								CCC	Client cross checks failure
								CI	Client Issue found by Teledyne
CC 17-2	1/31/2017	****	****	Result for Co-60 in disagreement originally, client sample issue	NA	Y	CI	HE	Human Error
								HE-D	Reference dates wrong
CC 17-3	2/7/2017	****	****	COC provided by client had DEC Should have been Jan	NA	Y	CI	HE-V	Aliquot (volumes) wrong
								HE-S	Sample switching
CC 17-4	2/13/2017	****	****	Gamma was not scheduled for samples in work order L70336	NCR 17-5	Y	HE-LI	HE-F	Sending wrong data file to LIMS
								HE-L	Sample lost (destroyed) in process
								HE-G	Wrong Geometry
CC 17-5	2/22/2017	****	****	Did not meet client detection limits	NA	Y	CI	HE-I	Incorrect Data Entry
								HE-LI	Log in Issue
CC 17-6	3/23/2017	****	****	Limerick supplied wrong result to E&Z for crosscheck.	NA	Y	CI	EF-1	Equipment Failure
								EF-2	Reagent Failure
CC 17-7	4/4/2017	****	****	Incorrect MDA calculation	NCR 17-3	Y	HE-LI	EF-3	Equipment Issue
CC 17-8	5/2/2017	****	****	Wrong sample location was logged	NA	Y	HE-LI	NA	Not Applicable
								EAF	External Audit Finding
CC 17-9	5/2/2017	****	****	Wrong sample location was logged	NA	Y	HE-LI	IAF	Internal Audit Finding
								QA	QA related failure
CC 17-10	5/8/2017	****	****	Failed to meet detection level	NA	Y	NA	OI	Outside Interference
CC 17-11	5/11/2017	****	****	Did not put name of sample on report	NA	Y	HE		
CC 17-12	7/6/2017	****	****	Ni-63 not analyzed for liquid sample	NA	N	HE-LI		
CC 17-13	7/17/2017	****	****	Incorrect units reported for Ce-144	NA	Y	HE-F		
CC 17-14	8/3/2017	****	****	Incorrect collection date logged	NCR 17-11	Y	HE-LI		
CC 17-15	8/18/2017	****	****	Qtrly Sample description logged incorrectly	NA	Y	HE-LI		
CC 17-16	9/13/2017	****	****	Pu-241 result not calculated correctly	NCR 17-13	Y	QA		
CC 17-17	9/22/2017	****	****	Fe-55 not analyzed for composite	NA	Y	CI		
CC 17-18	11/13/2017	****	****	Fe-55 cross-check failure	NCR 17-14	Y	CCC		
CC 17-19	11/13/2017	****	****	Ni-63 rerun did not match original	NCR 17-10	Y			
CC 17-20	11/15/2017	****	****	Incorrect collection date logged	NCR 17-11	Y	HE-LI		

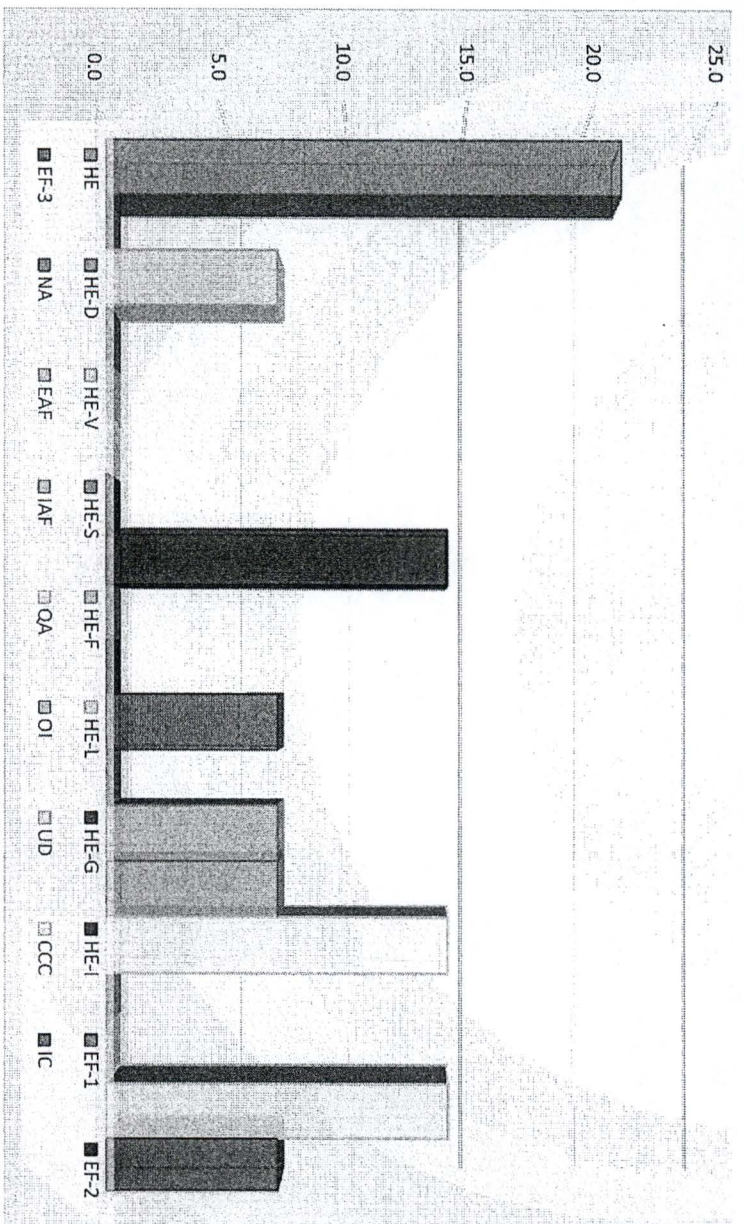
Internal Audits

[illegible]

External Audits

EA Tracking Number	Finding Input Date	Date of Audit	Auditing Unit	Finding number	Finding	associated CA number	Date Implemented	Client Issued	Nuclide affected	10CFR21 (Safety Related)	Failure Code		Types of failures
EA-1	7/28/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-15 Supplemental	NCR-16-15	7/28/2016	NUPIC	NA	N		IC	In-house cross checks
												CC	Client cross checks
EA-2	7/28/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-16 Supplemental	NCR-16-16	7/28/2016	NUPIC	NA	N		HE	Human Error
												HE-D	Reference dates wrong
EA-3	7/28/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-17 Supplemental	NCR-16-17	7/28/2016	NUPIC	NA	N		HE-V	Aliquot (volumes) wrong
												HE-S	Sample switching
EA-4	7/28/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-18 Supplemental	NCR-16-18	7/28/2016	NUPIC	NA	N		HE-F	Sending wrong data file to LIMS
												HE-L	Sample lost (destroyed) during process
EA-5	7/29/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-19 Supplemental	NCR-16-19	7/29/2016	NUPIC	NA	N		EF	Equipment Failure
												RF	Reagent Failure
EA-6	7/29/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-20 Supplemental	NCR-16-20	7/29/2016	NUPIC	NA	N		Not Applicable	NA
EA-7	7/29/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-21 Supplemental	NCR-16-21	7/29/2016	NUPIC	NA	N			
EA-8	7/29/2016	June 6-10	NUPIC	VA-CAR-2016-	See NCR 16-22 Supplemental	NCR-16-22	7/29/2016	NUPIC	NA	N			
EA-9	1/5/2017	Sep-17	State of	Deviation 1	See NCR 17-1 Supplemental	NCR-17-1	1/5/2017	TN	NA	N			

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13	Column14	Column15	Failure Codes	Types of failures
	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	1-Dec	Percent			
HE					1			1			1.00		3	21.4	HE	Human Error
HE-D													0	0.0	HE-D	Reference dates wrong
HE-V			1										1	7.1	HE-V	Aliquot (volumes) wrong
HE-S													0	0.0	HE-S	Sample switching
HE-F													0	0.0	HE-F	Sending wrong data file to LIMS
HE-L													0	0.0	HE-L	Sample lost (destroyed) in process
HE-G													0	0.0	HE-G	Wrong Geometry
HE-I				1		1							2	14.3	HE-I	Incorrect Data Entry
EF-1													0	0.0	EF-1	Equipment Failure
EF-2													0	0.0	EF-2	Reagent Failure
EF-3			1										1	7.1	EF-3	Equipment Issue
NA													0	0.0	NA	Not Applicable
EAF	1												1	7.1	EAF	External Audit Finding
IAF		1											1	7.1	IAF	Internal Audit Finding
QA				1					1				2	14.3	QA	QA related failure
OI													0	0.0	OI	Outside Interference
UD													0	0.0	UD	Unable to Determine
CCC							1				1		2	14.3	IC	In-house cross checks failure
IC					1								1	7.1	CCC	Client cross checks failure
Total Incidences													14	100.00		



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**TOXCO MATERIALS MANAGEMENT
CENTER (TMMC) AUDIT**

Northcutt, Sharon

From: Greg Kirk <gkirk@toxcommc.com>
Sent: Wednesday, December 13, 2017 2:48 PM
To: Northcutt, Sharon
Cc: jeter, Keith; Alan Duff
Subject: Supplier Evaluation 2017

Ms. Northcutt,

Thank you for the timely submittal of the requested documentation concerning the TBE quality assurance program. Based upon reviews and evaluation of the submitted documentation, certifications and performance history, TBE will remain on Toxco's Approved Supplier List (ASL) for additional three (3) years.

Thanks and regards,

Greg Kirk | QA Manager/FSO

Toxco Materials Management Center | www.toxcommc.com
109 Flint Road | Oak Ridge, TN 37830
O. 865-482-5532 F. 865-482-5605 E. gkirk@toxcommc.com

Affiliates | www.kinsbursky.com | www.retrievtech.com

From: Northcutt, Sharon [mailto:Sharon.Northcutt@Teledyne.com]
Sent: Thursday, November 30, 2017 11:14 AM
To: Greg Kirk <gkirk@toxcommc.com>
Cc: jeter, Keith <keith.jeter@Teledyne.com>
Subject: FW: TBE QA Audit Cancellation

Mr. Kirk,

Please find the completed questionnaire and associated requested documents attached. You had requested our QA Manual Rev 30 (which I included), but we have a recently updated version (also attached). Please let me know if you need anything else. Have a great rest of the day!

Thanks!

Sharon L Northcutt

Quality Assurance Manager
Teledyne Brown Engineering
2508 Quality Lane
Knoxville, TN 37931
865 934-0374

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