HITACHI

EFFLUENT MONITORING AND ENVIRONMENTAL SURVEILLANCE PROGRAMS

ANNUAL REPORT

2017

GE Hitachi Nuclear Energy, LLC

NOTICE AND DISCLAIMER

The GE-Hitachi Nuclear Energy, LLC (GEH) prepared this document. GEH and contributors to this document do not:

- make any warranty or representation, expressed or implied, that the use of any information disclosed may not infringe privately owned rights; or
- assume responsibility for liability or damage of any kind, which may result from the use of any information disclosed.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

ABSTRACT

Annual, 2017

This report presents the data collected for the calendar year of 2017. The original copies of laboratory reports are on file at VNC.

Treated sanitary and industrial wastewater was disposed of on-site by an irrigation system. No surface runoff of sanitary or industrial wastes was observed during the report period.

Based on the analytical results of non-radiological samples collected from locations on- site during the reporting period, VNC was out of compliance with the limitations set in the Water Discharge Permit No. GE-R2-2008-0079 issued by the California Regional Water Quality Control Board, San Francisco Bay Region.

Based on the analytical results of radiological samples collected from locations on- and off-site during the reporting period, VNC was in compliance with licenses issued by the U.S. Nuclear Regulatory Commission and California Department of Health, Radiologic Health Branch.

1.0 INTRODUCTION

This report summarizes activities performed and data collected for the Effluent Monitoring and Environmental Surveillance Programs at Vallecitos Nuclear Center (VNC). This section presents background information about the Programs. Data collected during the reporting period are presented in Section 4.0. This report has been prepared in compliance with Waste Water Permit requirements.

The VNC site is several hundred acres in size. It is located on the northern side of Vallecitos Valley as shown in Figure 1, a topographic map of VNC and the surrounding area. The majority of the site is undeveloped with hills ranging in elevation from approximately 1,000 to 1,300 feet above mean sea level. Approximately 135 acres in the southwest corner and situated between the 400- and 600-foot topographic contours are developed. The ground surface of this portion of the site slopes to the southwest.

VNC utilizes three drainage systems: industrial, sanitary, and storm. The industrial and sanitary systems discharge effluent into one of four 50,000-gallon retention basins located in the southwest corner of the site (Figure 2). The storm drainage system, essentially natural ditches, discharges storm water into a ditch parallel with Vallecitos Road (State Route 84). Storm drains from Buildings 103, 104 and 106 discharge to the west drainage ditch, while some storm drains in the Building 102, 105, 200 and 300 areas discharge to the east drainage ditch. As shown in Figures 2 and 3, these ditches merge prior to exiting the site.

Groundwater levels of the developed site vary from 2 to 3 feet below ground surface (during winter near Retention Basins 2 and 3) to 30 to 40 feet (during the summer northwest of the road leading to the water tank). A USGS geology study shows that groundwater generally flows toward the southwest. The velocity of groundwater is estimated by USGS to be about 0.01 ft/day in clays to 8 ft/day in gravels. In areas where gravels with a considerable mixture of clay (most of developed site) are saturated close to the land surface, southwesterly movement would occur at an average rate of approximately 2 ft/day[1].

1.1 Effluent Monitoring Program

The purpose of the Effluent Monitoring Program is to ensure that VNC site release limits for effluent are not exceeded. The Program includes measuring radioactive and non-radioactive constituents in water discharged through the site sanitary and industrial wastewater systems. Measurements are determined by collecting samples of effluent. The schedule of sample collection is presented in Table 1.

The California Regional Water Quality Control Board (CRWQCB) has established release limits for numerous non-radiological constituents through Water Discharge Permit No. R2-2008-0079. A copy of the 2008 permit is on file at VNC and CRWQCB. The California State Department of Health Services (CSDHS) and the United States Nuclear Regulatory Commission (NRC) have established radiological release limits. These limits are listed in 10CFR20, Appendix B.

Effluent Characteristics

Effluent discharge from VNC is made up of industrial wastewater and clean water. Discharges of industrial wastewater consist primarily of non-contact cooling water. The discharges are either held in one of three available 50,000-gallon retention basins or used for non-potable purposes, such as landscape watering. After July 1st, 2003 no discharges to surface waters have been made from these sources. Samples are collected from each basin prior to discharge to on site irrigation. In addition, samples from all basin discharges are accumulated and analyzed at specified intervals for a variety of constituents.

Discharges of clean water consist of storm water runoff and small quantities of water known to contain no contaminants (such as irrigation runoff). These waters flow directly to drainage ditches that enter Vallecitos Creek.

Sanitary Waste Handling

Sanitary waste (sludge) is collected in an Imhoff tank before undergoing sand filtration and chlorination (by addition of sodium hypochlorite solution). Samples of sanitary waste (sludge) are collected before each Imhoff

[1] A delay of over 2 years from the nearest postulated spill point to the site boundary.

Tank clean-out. There were no clean-outs performed on the Imhoff tank during 2017. Processed sanitary waste water is sprayed onto VNC property by an irrigation system in a designated area (Figure 2). The procedure is monitored so that no surface runoff occurs.

1.2 Environmental Surveillance Program

The purpose of the Environmental Surveillance Program is to determine if discharges from VNC are detectable in the environment. The Program includes measuring both radioactive and non-radioactive constituents in neighboring streams, wells, and soils at locations near or beyond the site perimeter. Samples of groundwater, stream bottom sediments, and vegetation are collected. The schedule of sample collection is presented in Table 1.

Groundwater Monitoring

Groundwater is monitored by collecting and analyzing samples from ten wells located on or near VNC. Samples are analyzed for State water permit effluent parameters as well as radiological contaminants. Well identification numbers, corresponding California State Well Numbers, and descriptions of locations are listed in Table 2. It should be noted that the wells installed in the early 1970s in and around Building 102 are checked on a quarterly basis for water. Some of these wells have been dry for several years and sampling is not possible. When samples are collected from these sources, they are sent to the counting lab on site for analysis.

Vegetation Monitoring

Vegetation is monitored by collecting and analyzing samples of vegetation at two locations designated V-2 and Val-IV. The locations are shown in Figure 3.

Stream Bottom Sediment Monitoring

Stream bottom sediment is monitored by collecting and analyzing samples at one location designated as S-4. The location is at the outfall of the retention basins at south boundary of site, which is shown in Figure 3.

Air Monitoring

There are four air monitoring stations, designated as A-1 through A-4, across the site. The stations are positioned approximately 90° apart around the operating facilities of the site. The locations of the stations are shown in Figure 4.

To collect samples, each station is equipped with a membrane filter and an activated charcoal cartridge. The filter is changed weekly[2] and counted for gross alpha and gross beta-gamma radiation. The cartridge is removed and analyzed only in the event of a suspected radioactive iodine release.

Gamma Monitoring

There are 20 monitoring stations on site for measuring gamma radiation in the environment. Each station is constructed of a steel mailbox and equipped with a dosimeter. The dosimeter is sealed in plastic. The dosimeters are exchanged annually. The locations of the stations are shown in Figure 4.

For reporting purposes, the dosimeters are distributed as follows:

- South Boundary - Stations 1, 2, 3
- East Boundary - Stations 4,5,6
- North Boundary - Stations 7,12,13
- West Boundary - Stations 8,9,10,11
- Background Dosimeters - Stations 14,15,16,17,18,19,20

The dosimeter vendor reports the measurements of each dosimeter and determines the background measurement. Background is determined by using a dosimeter that has been exposed to background radiation at this facility and is from the same batch of OSL material as the dosimeters exposed at VNC.

[2] During dusty conditions, the filters are changed as determined by the RMT, Facilities Protection.

Gaseous Effluent Monitoring

Several operations at the site utilize exhaust stacks. Air is collected from single or multiple operating areas via a ventilation system. The ventilation system is generally comprised of ductwork, particulate filtration systems, blowers, and an exhaust stack. The gaseous effluent is monitored. The specifications of each stack are listed in Table 3.

The various site operating licenses (SNM-960, R-33, and State 0017-01) and federal regulations require that the gaseous effluents released to unrestricted areas be limited and controlled to maintain the concentrations of radioactive material in the unrestricted area as low as reasonably achievable but at least no greater than the values in Appendix B, Table II of 10CFR20.

The method by which releases are determined to be within these limits is to establish average release limits and control values for each stack and then measure the average releases through monitoring and/or sampling of the effluents. The control values are, in general, established as 10% of the license release limits.

Both sampling and monitoring techniques are used to determine gaseous effluent releases. Release results reported to regulatory agencies for particulates and halogens are obtained from sampling systems. Noble gas results are obtained from charts or electronic integrators on monitoring equipment.

The COMPLY computer code is run to determine the dose at the site boundary from annual airborne effluents. This evaluation was formerly required when 40CFR61 Subpart I applied to NRC licensees, which included VNC. The regulation was amended to exclude NRC licensees. However, VNC has continued to run the COMPLY code to demonstrate compliance with the constraint rule per Regulatory Guide 4.20 and 10CFR20.1101d. Verifying compliance with annual public dose per 10CFR20.1301, "Dose limits for individual members of the Public'.

1.3 Laboratory Analyses

On-site and external laboratories perform the analyses of samples collected at VNC as required for the programs. Samples analyzed by the on-site laboratory are reported as measured value or less than minimum detectable activity (MDA) values, while samples analyzed by the external laboratories are reported as actual measured values. Values within the statistical background may be listed as zero or as a positive or negative numbers. All analyses are performed using approved USEPA methodology with minimum sensitivities equal to or less than permit limits. All records of analytical results are maintained at VNC.

On-site Laboratory Analyses

The following list of analyses are performed by the on-site laboratory:

- pH
- Dissolved Oxygen
- Temperature
- Conductivity
- Total Alpha-Emitting Radioactivity
- Total Beta-Gamma-Emitting Radioactivity

Off-site Laboratory Analyses

The three external State-certified laboratories that have been contracted to analyze samples collected for the program are TestAmerica Laboratories, Inc., Alpha Analytical Laboratories, Inc. and Davi Lab. Alpha Labs, located in Livermore, California, performs Total Ammonia (as N), Nitrates (as NO3) Total Dissolved Solids, total coliform, and analyses of water samples as required. Test America, located in Pleasanton, California, performs identical analysis and services to Alpha Labs. Davi Lab, located in Hercules, California, performs most radiological analyses on samples of water, stream bottom and vegetation.

2.0 EFFLUENT MONITORING DATA

This section presents the discharge information and analytical results for samples collected for the Effluent Monitoring Program during the reporting period.

Effluent Data

Compliance Summary

Required samples were collected during the reporting period and the analytical results of tests did exceed Permit limits. During the months of January to November, no exceedances were identified. For the month of December, a review of monthly discharge volumes identified a Nitrate (as NO_3) exceedance for waste water. Treated sanitary and industrial wastewater was disposed of on-site by an irrigation system. No surface runoff of sanitary or industrial wastes was observed during the report period.

Based on the analytical results of non-radiological samples collected from locations on-site during the reporting period, VNC was in compliance with the limitations set in the Waste Water Permit No. GE-R2-2008-0079.

Based on the analytical results of radiological samples collected from locations on and off-site during the reporting period, VNC was in compliance with all licenses issued by the U.S. Nuclear Regulatory Commission and California Department of Health, Radiologic Health Branch.

Discharge Volume Data

Industrial and sanitary wastewater discharge volumes are summarized in Table 4.

Non-radiological Analytical Results

Summaries of data relating to non-radioactive effluent parameters are given in Table 5 through 9. The results indicate that for the month of December, Nitrate (as NO_3) was released greater than permit limit. No other constituents were released equal to or greater than regulatory limits for any other time during 2017.

Radiological Analytical Results

Radioactivity measurements for effluent waters are summarized in Table 10. The data are derived by summing data obtained from measurements of short-interval (daily) water releases. Many of these measurements were less than the detection limits of the laboratory's measurement methods. The data listed as "less than" numbers necessarily include the summation of these detection limits (i.e., a summation of "less than" numbers) and represent maximum possible values for the sample analyses. The results indicate that no radiological material was released equal to or greater than regulatory limits.

3.0 ENVIRONMENTAL SURVEILLANCE DATA

This section presents the analytical results for samples of ground water, stream bottom sediments, and vegetation collected for the Environmental Surveillance Program during the reporting period.

3.1 Groundwater

Analytical results of groundwater samples collected from the designated wells during the reporting period are listed in Table 11.

3.2 Stream Bottom Sediments

Analytical results of stream bottom sediment samples collected during the reporting period are listed in Table 12.

3.3 Vegetation

Analytical results of vegetation samples collected during the reporting period are listed in Table 13.

3.4 Gamma Monitoring

The results of gamma monitoring during the reporting period are listed in Table 14.

3.5 Ambient Air Monitoring

Analytical results of environmental air samples collected during the reporting period are graphically presented in Figure 5, data in Table 15.

3.6 Gaseous Effluent Monitoring

Stack Monitoring

Analytical results of gaseous effluent samples collected for stack monitoring during the reporting period are graphically presented in Figures 6 through 8.

Effective Dose Equivalent

The calculated Effective Dose Equivalent at Screening Level 2 resulting from the annual measured releases, as calculated by the Comply Code, are:

Property Line

- 0.8 mRem/year due to all emissions, and
- 4.6E-04 mRem/year from iodine.

Industrial Area Boundary

- 5.1 mRem/year due to all emissions, and
- 3.0E-03 mRem/year from iodine.

These numbers are less than the EPA emission standards[3] of 10 mRem/year total dose and 3 mRem/year due to iodine.

[3] Established in 40CFR61.102

4.0 METEOROLOGY

This section presents meteorological data collected during the reporting period. Meteorological data are collected using a weather station manufactured by Davis Instruments of Hayward, California. The station is located on a knoll southeast of the main site area. A portion of the meteorological data collection system is computerized. Software provided by the manufacturer is used to build a database of meteorological data, specifically the amount of rainfall over time.

4.1 Rainfall Data

Rainfall data collected at VNC since January 2002 are presented in Table 16.

5.0 DEFICIENCIES

This section presents anomalies, deficiencies or deviation in adherence to the Effluent Monitoring and Environmental Surveillance Programs at VNC for the reporting period.

5.1 December NO_3 Wastewater Effluent Exceedance

In January of 2018, review of preceding month's wastewater discharges found that limit for nitrates (as NO_3) was exceeded. Per California State Order No. R2-2008-0079, the SF Bay RWQCB was contacted by telephone and notified of the event. A Corrective Action Report (CR) was created to track the conditions that caused the event and associated remedial actions to closure, Condition Report #27586.

5.2 Year of 2017 Missed DO Measurements

In January of 2018, review of previous year's discharge logs identified missing DO measurements for the months of March 2017 and December of 2017. All affected employees were coached on performing DO measurements, and one instance of retraining was performed on usage of the DO meter and data logging process. DO measurements for 2017 are in Table 5 of this report. A calendar item to review discharge logs on a biweekly basis was created as a preventative action, see Action #5, Condition Report #27586.

5.3 Annual Environmental Gamma Monitoring Observation

In January of 2018, it was observed that one of the annual environmental dosimetry badges had been changed in October of 2017 instead of December of 2017. The employee responsible for the change out was coached on proper practice, and a CR created to track the condition to trend, Condition Report #27665. Gamma monitoring measurements for 2017 are in Table 14 of this report.

5.4 Well 102A Elevated Gross Beta Count

In the generation of this report, it was observed that the third quarter, 2017 Gross Beta count for Well 102A showed an elevated value, 90.10 pCi/ml. The well was dry during the following fourth quarter sampling. A condition report was generated to investigate the well result, Condition Report #28006. Quarterly ground water radiological monitoring results for 2017 are in Table 11 of this report.

6.0 SUMMARY

This section presents a summary of the results of the water Monitoring Program for the reporting period.

The analytical results of non-radiological samples collected during the reporting period indicate that effluent discharges were within Waste Water Permit limits during months of January to November, and exceeded the limit for Nitrate (as NO_3) during the month of December.

The analytical results of radiological samples collected during the reporting period indicate that effluent discharges from VNC were in compliance with Water Permit limits and airborne releases were in compliance with licenses issued by the U.S. Nuclear Regulatory Commission.

Additionally, neither surface runoff of processed sanitary wastewater, nor industrial wastewater was observed. The Effluent Monitoring and Environmental Surveillance Programs continue to be effective.

TABLE 1. SAMPLE COLLECTION SCHEDULE

Designation Location	Constituent	Sample Type	Frequency
E-001 and E-002 From Basin 1 - 4	Gross Alpha	Grab	As Released
	Gross Beta/Gamma	Grab	As Released
	Gross Alpha	Composite	Monthly
	Gross Beta/Gamma	Composite	Monthly
E-001 Basin 1	Flow[1]	Measurement	Each discharge
	Total Coliform[2]	Grab	Monthly
	PH	Grab	Each discharge
	Dissolved Oxygen	Grab	Monthly
	Total Dissolved Solids	Grab	Monthly
	Nitrate (as NO_3)	Grab	Monthly
	Ammonia as N	Grab	Monthly
	Standard observations	Grab	Each discharge
E-002-L Basin 2, 3 or 4	Flow	Measurement	Each discharge
	PH	Grab	Each discharge
	Total Dissolved Solids	Grab	Monthly
	Nitrate (as NO_3)	Grab	Monthly
	Standard observations	Grab	Each
Station E-003 Storm Water	Flow	Measurement	Each occurrence
	PH	Grab	Each occurrence
	Oil & Grease	Grab	Twice each half of reporting year
	Total Suspended Solids	Grab	Twice each half of reporting year
	Gross Alpha	Grab	Twice each half of reporting year
	Gross Beta/Gamma	Grab	Twice each half of reporting year
	Standard observations	Grab	Each occurence
S-4 Stream Bottom Sediments -	Gross Alpha	Grab	Annually, usually First week in May
	Gross Beta/Gamma	Grab	Annually, usually First week in May
	Co-60, Cs-137		
V-2 & VAL IV Vegetation	Gross Alpha	Grab	Annually, usually First week in April
	Gross Beta/Gamma	Grab	Annually, usually First week in April

FOOTNOTES FOR TABLE 1

[1] Flow Monitoring: The volume of each basin discharge shall be recorded. The following information shall also be recorded when discharged for the quarterly report:

Average Daily Flow (mgd)
Maximum Daily Flow (mgd)
Minimum Daily Flow (mgd)

[2] Samples are required for each constituent twice during each half of reporting year in accordance with Part XI Section B.2 of the storm water permit. For safety reasons, the Discharger may choose to sample only storms occurring during daylight hours. The Discharger shall collect grab samples during the first four hours of discharge or start of facility operations if a Qualifying Storm Event (QSE) occurs within previous 12-hour period, unless it can explain why this was not possible. The Discharger shall also conduct visual observations at least monthly during each reporting year.

TABLE 2 – GROUNDWATER WELL INFORMATION

Site Well No.	California State Well No.	Location Description
GN	4S/1E-2N1	Southeast of Building 105
GA	4S/1E-10A1	southwest of Building 102
GP	4S/1E-10P3	0.6 miles southwest of site entrance on private property
MW-1	4S/1E3R2	Bldg. 102 Parking Lot
MW-2	4S/1E-10A2	North Side of Sanitary Discharge Field
MW-3	4S/1E-10A3	West side of Sanitary Discharge Field
MW-4	4S/1E-10A4	South Side of Sanitary Discharge Field
MW-5	4S/1E-10H2	West side of Industrial Discharge Field
MW-6	4S/1E-10H3	South side of Industrial Discharge Field
MW-7	4S/1E-10G3	Southwest from Basins
102A	N/A	Bldg. 102 Pool Area
102E	N/A	Bldg. 102 A by the Stairs
102G	N/A	Bldg. 102 Equipment Storage Area
102K	N/A	Bldg. 102 Yard (Cask Storage Area)
B-2	N/A	Well located at the GETR control room

TABLE 3 – STACK SPECIFICATIONS

Stack Number	Location	Components Serviced	Height (feet ags)	Diameter (inches)	Flow Rate (cfm)
4	Bldg. 102A	Remote Handling Operation, Isotope Production Facility, Radiochemistry, Remote Handling Operations Radioactive Materials Storage Room	75	66	34,531.2
12	Bldg. 103	Metallurgy and Ceramics Laboratories, Chemistry Laboratories	48	60	31,352.8
16	Bldg. 105	Nuclear Test Reactor	45	13.5x13.5	1,428.2
26	Area 200	General Electric Test Reactor (GETR)	29	19	4,506.8
30	Waste Evaporator	Liquid Waste Evaporator	25	13x17.75	3,202.7
34	Waste Storage	Waste Storage Facility (Sandblast Room)	25	13x17.75	1,969.5
37	HSF Bunker	Bunker Area of Hillside Storage Facility	40	35	21,145.4

Notes:
ags – above ground surface
cfm – cubic feet per minute
For stack 26, value listed is from 2016; stack did not operate during 2017.

TABLE 4 – EFFLUENT VOLUMES

(gallons)

Month	Sanitary Discharge Volumes		Industrial Discharge Volumes		Sanitary & Industrial Total Discharges On-site Irrigation	
	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average
January	360,000	11,613	790,000	25,484	1,150,000	37,097
February	325,000	11,607	1,180,000	42,143	1,505,000	53,750
March	105,000	3,387	775,000	25,000	880,000	28,387
April	80,000	2,667	535,000	17,833	615,000	20,500
May	0	0	470,000	15,161	470,000	15,161
June	45,000	1,500	500,000	16,667	545,000	18,167
July	0	0	100,000	3,226	100,000	3,226
August	0	0	100,000	3,226	100,000	3,226
September	0	0	150,000	5,000	150,000	5,000
October	0	0	100,000	3,226	100,000	3,226
November	0	0	40,000	1,333	40,000	1,333
December	10,000	323	50,000	1,613	60,000	1,936
Annual Totals:	925,000	2,591	4,790,000	13,326	5,715,000	15,917

TABLE 5 – DISSOLVED OXYGEN
(E-001 [Sanitary]
Parameter requirement is for sample to be >1 mg/l dissolved oxygen.

Month	E-001(Min) DO (PPM)	Lower Limit (PPM)
January	7.7	>1
February	7.8	>1
March[2]		>1
April	9.8	>1
May[1]	N/A	>1
June	7.6	>1
July[1]	N/A	>1
August[1]	N/A	>1
September[1]	N/A	>1
October[1]	N/A	>1
November[1]	N/A	>1
December[2]		>1

Footnotes for Table 5:

[1] There were no sanitary discharges made during months of May, July, August, September, October or November.

[2] Dissolved Oxygen measurements were not performed during these periods.

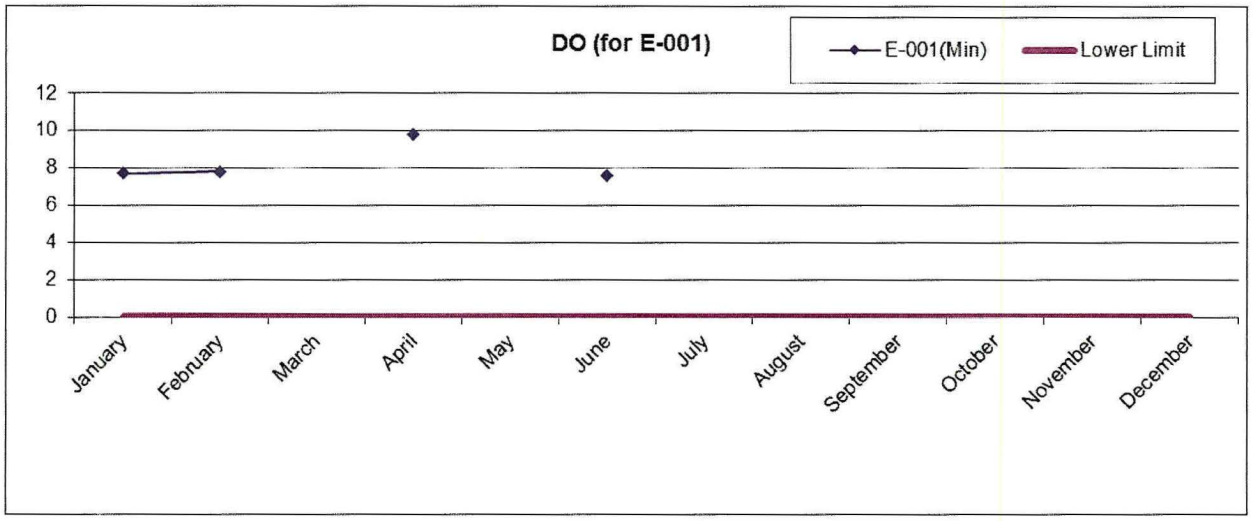


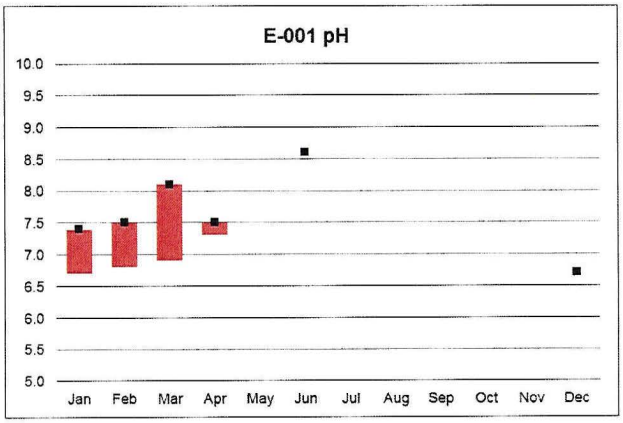
TABLE 6 – WASTEWATER pH SAMPLES

Parameter requirements ≥6 and ≤9 pH

Date	E-001			E-002-L		
	No. Samples	pH Max	pH Min	No. Samples	pH Max	pH Min
Jan	7	7.4	6.7	11	7.5	7.0
Feb	6	7.5	6.8	20	7.4	6.8
Mar	2	8.1	6.9	15	7.7	6.3
Apr	2	7.5	7.3	10	8.5	7.4
May	0	N/A	N/A	9	8.5	7.7
Jun	1	8.6	8.6	9	8.6	7.8
Jul[1]	0	N/A	N/A	2	8.5	8.0
Aug	0	N/A	N/A	2	8.5	8.5
Sep[1]	0	N/A	N/A	3	8.6	8.0
Oct	0	N/A	N/A	3	8.2	7.9
Nov	0	N/A	N/A	3	8.6	8.2
Dec	1	6.7	6.7	1	8.2	8.2

Footnotes for Table 6:

[1] There were no sanitary discharges made during months of May, July, August, September, October or November.



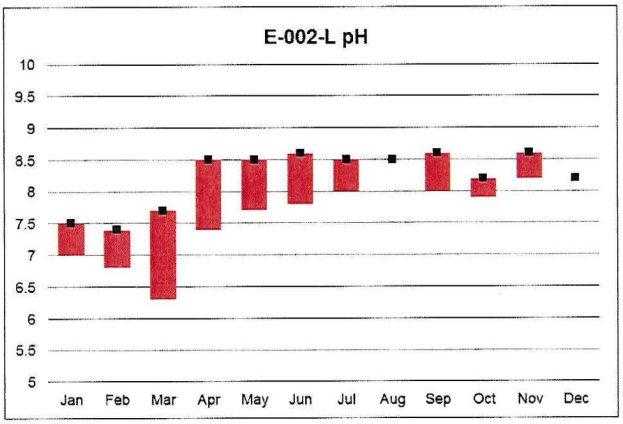


TABLE 7 – FECAL COLIFORM

(Maintain the limit of two consecutive samples ≤ 240 mpn/100ml
or 7 sample median ≤ 23 mpn/100ml)

(mpn/100ml)

Date	Sample	Median	2-Sample
1/9/2017	<2	2	2
2/1/2017	<2	2	2
3/1/2017	<2	2	2
4/5/2017	<2	2	2
N/A[1]	N/A	N/A	N/A
6/7/2017	<2	2	2
N/A[1]	N/A	N/A	N/A
N/A[1]	N/A	N/A	N/A
N/A[1]	N/A	N/A	N/A
N/A[1]	N/A	N/A	N/A
N/A[1]	N/A	N/A	N/A
12/15/2017	<2	2	2

Footnotes for Table 7:

[1] There were no sanitary discharges made during months of May, July, August, September, October or November.

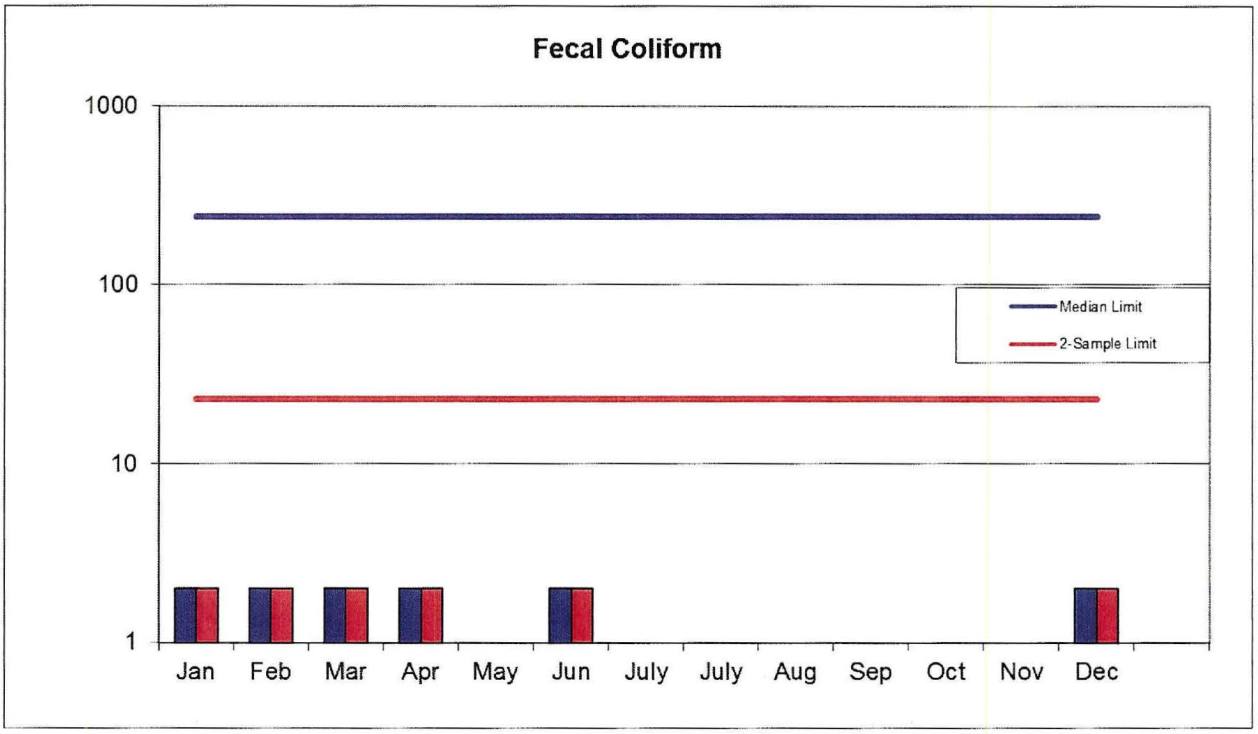


TABLE 8 – TOTAL DISSOLVED SOLIDS – COMBINED LAND DISCHARGE

(Parameter ≤ 500 mg/l)

(Average weighted by volume of E-001 and E-002-L)

Month	Average TDS (mg/l)
Jan-17	**454.8**
Feb-17	**463.0**
Mar-17	**317.6**
Apr-17	**416.8**
May-17	**220.0**
Jun-17	**320.2**
Jul-17	**170.0**
Aug-17	**170.0**
Sep-17	**170.0**
Oct-17	**240.0**
Nov-17	**250.0**
Dec-17	**391.7**

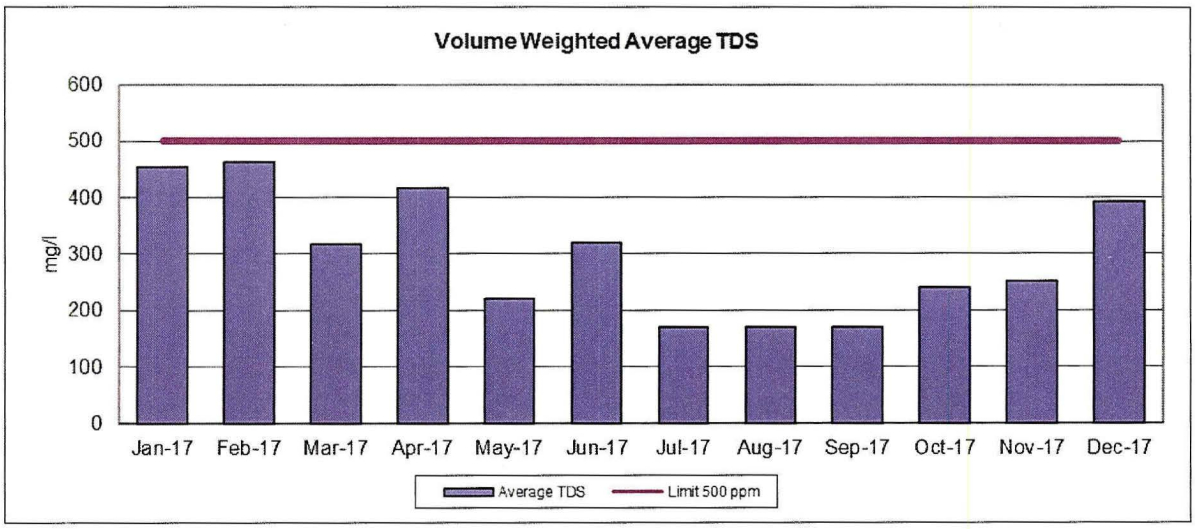


TABLE 9 – NITRATES (as NO_3) – COMBINED LAND DISCHARGE

(Parameter ≤ 45 mg/L)

(Average weighted by volume of E-001 and E-002-L)

Month	Average NO_3 (mg/l)
Jan-17	**36.4**
Feb-17	**28.9**
Mar-17	**19.8**
Apr-17	**8.8**
May-17	**8.1**
Jun-17	**44.3**
Jul-17	**2.1**
Aug-17	**2.1**
Sep-17	**1.0**
Oct-17	**2.0**
Nov-17	**2.1**
Dec-17	**54.9**

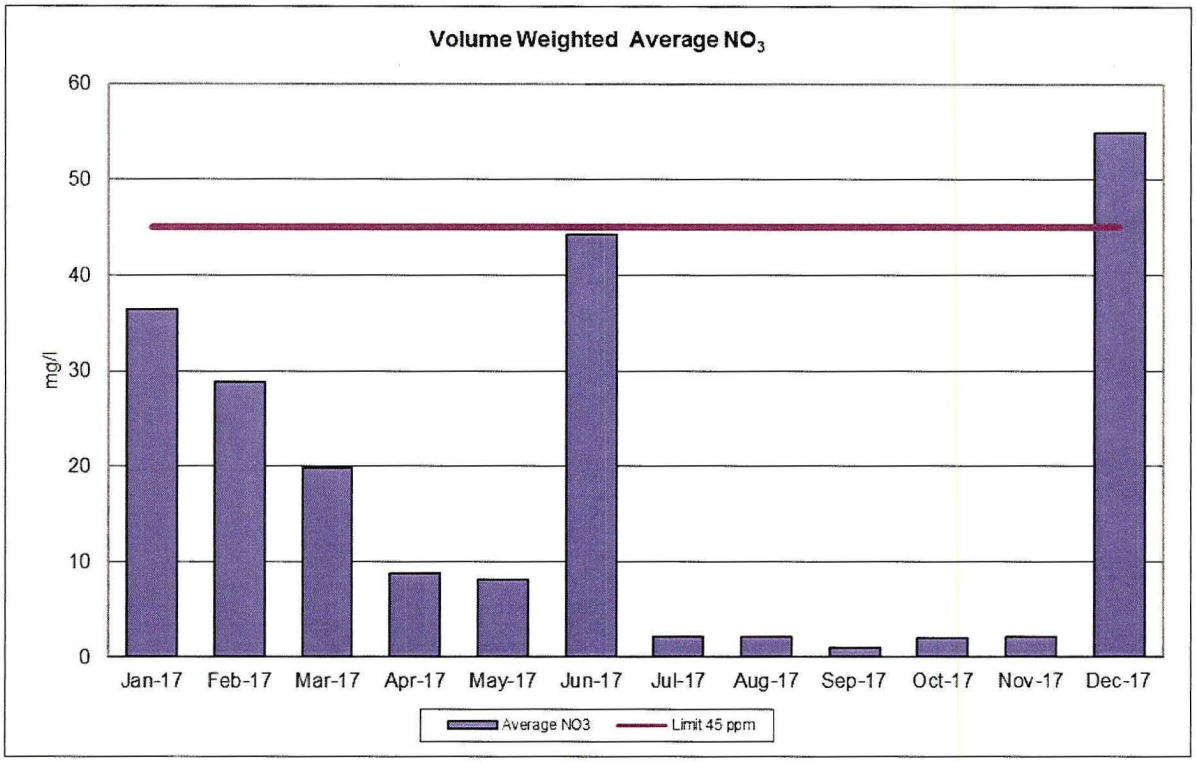


TABLE 10 – MONTHLY RADIOLOGICAL EFFLUENT SAMPLES, E-001

Action Levels Gross Alpha (3.0×10^{-8} µCi/cc = 30 pCi/l) Gross Beta (5.0×10^{-8} µCi/cc = 50 pCi/l)

	Contract Service Data			Internal Data						
	Sanitary Monthly Effluent Composite Sample (pCi/L)			Sanitary Daily Basin Samples (pCi/L)						
				No. of	α			β–γ		
Month	α	β–γ	Tritium	Samples	Max.	Min.	Ave.	Max.	Min.	Ave.
January	2.38	7.35	3003	7	<20	<20	<20	<50	<50	<50
February	5.99	3.23	360	6	<20	<20	<20	<50	<50	<50
March	5.49	3.68	299	2	<20	<20	<20	<50	<50	<50
April	0.94	0.48	589	2	<20	<20	<20	<50	<50	<50
May[1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
June	1.69	5.59	349	1	<20	<20	<20	<50	<50	<50
July[1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
August [1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
September[1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
October[1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
November[1]	N/A	N/A	N/A	0	<20	<20	<20	<50	<50	<50
December	3.53	2.68	187	1	<20	<20	<20	<50	<50	<50

Footnotes for Table 10:

[1] There were no sanitary discharges made during months of May, July, August, September, October or November.

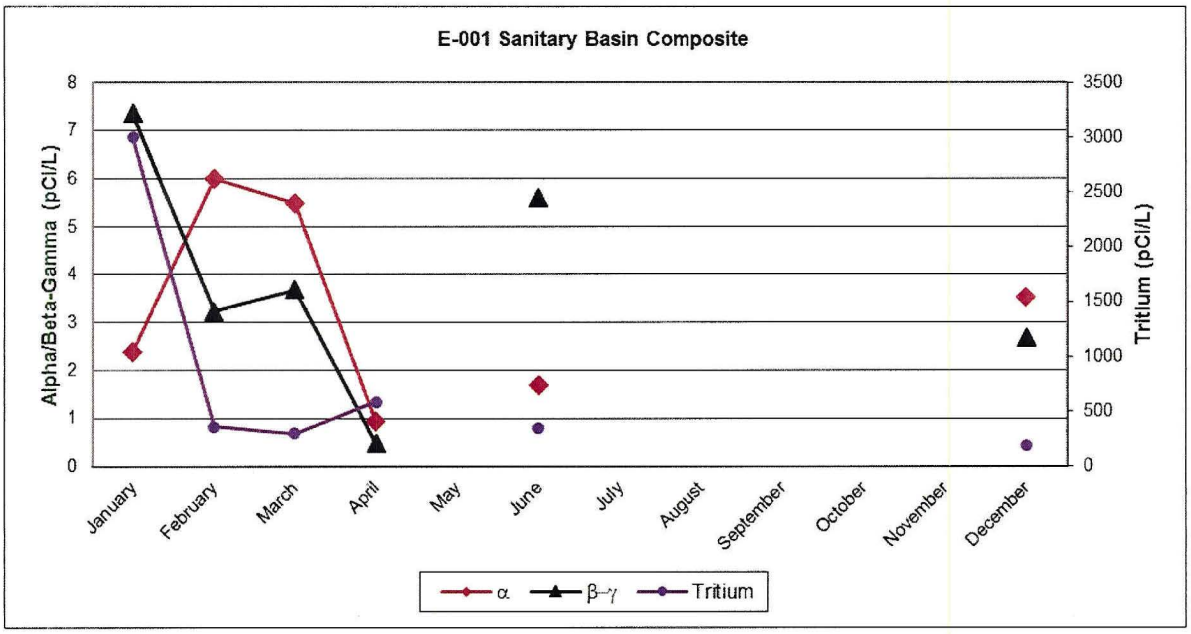


TABLE 10 – MONTHLY RADIOLOGICAL EFFLUENT SAMPLES, E-002-L

Action Levels Gross Alpha (3.0×10^{-8} µCi/cc = 30 pCi/l) Gross Beta (5.0×10^{-8} µCi/cc = 50 pCi/l)

	Contract Service Data			Internal Data						
	Industrial Monthly Effluent Composite Sample (pCi/L)			Industrial Daily Basin Samples (pCi/L)						
				No. of	α			β–γ		
Month	α	β–γ	Tritium	Samples	Max.	Min.	Ave.	Max.	Min.	Ave.
January	3.03	6.05	407	11	<20	<20	<20	<50	<50	<50
February	4.69	2.66	153	20	<20	<20	<20	<50	<50	<50
March	5.27	2.51	223	15	<20	<20	<20	<50	<50	<50
April	0.34	0.00	134	10	<20	<20	<20	<50	<50	<50
May	1.18	1.32	304	9	<20	<20	<20	<50	<50	<50
June	0.74	4.86	784	9	<20	<20	<20	<50	<50	<50
July	1.85	1.66	0.00	2	<20	<20	<20	<50	<50	<50
August	1.99	1.89	254	2	<20	<20	<20	<50	<50	<50
September	3.41	1.28	802	3	<20	<20	<20	<50	<50	<50
October	2.70	4.45	438	3	<20	<20	<20	<50	<50	<50
November	0.00	0.00	56	3	<20	<20	<20	<50	<50	<50
December	1.16	14.38	0.00	1	<20	<20	<20	<50	<50	<50

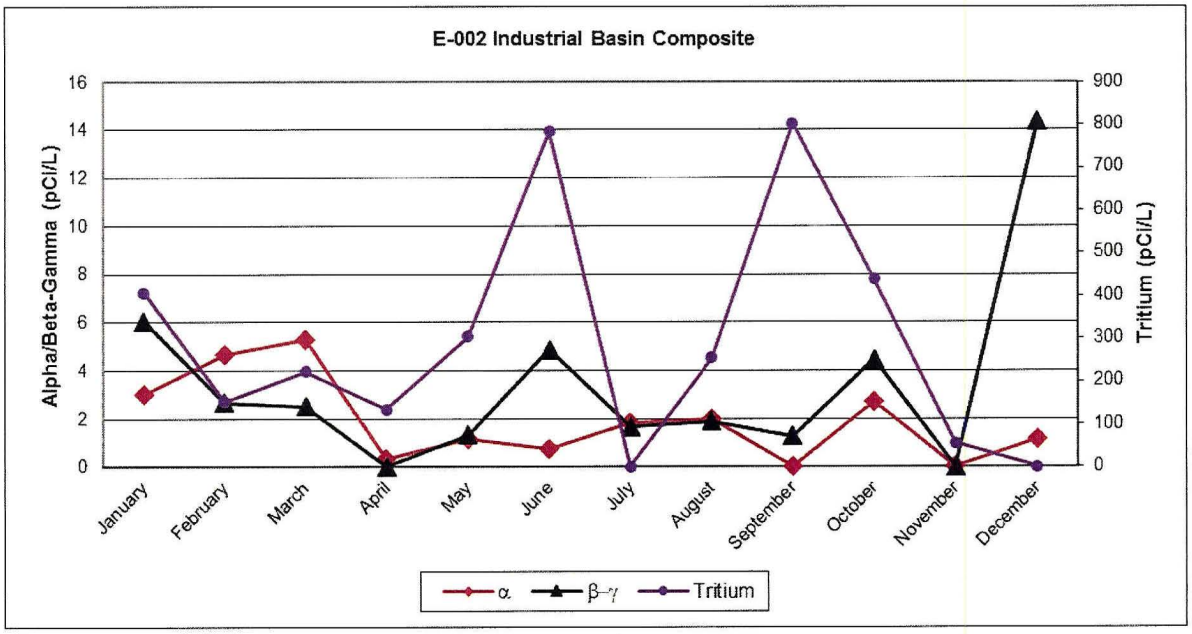
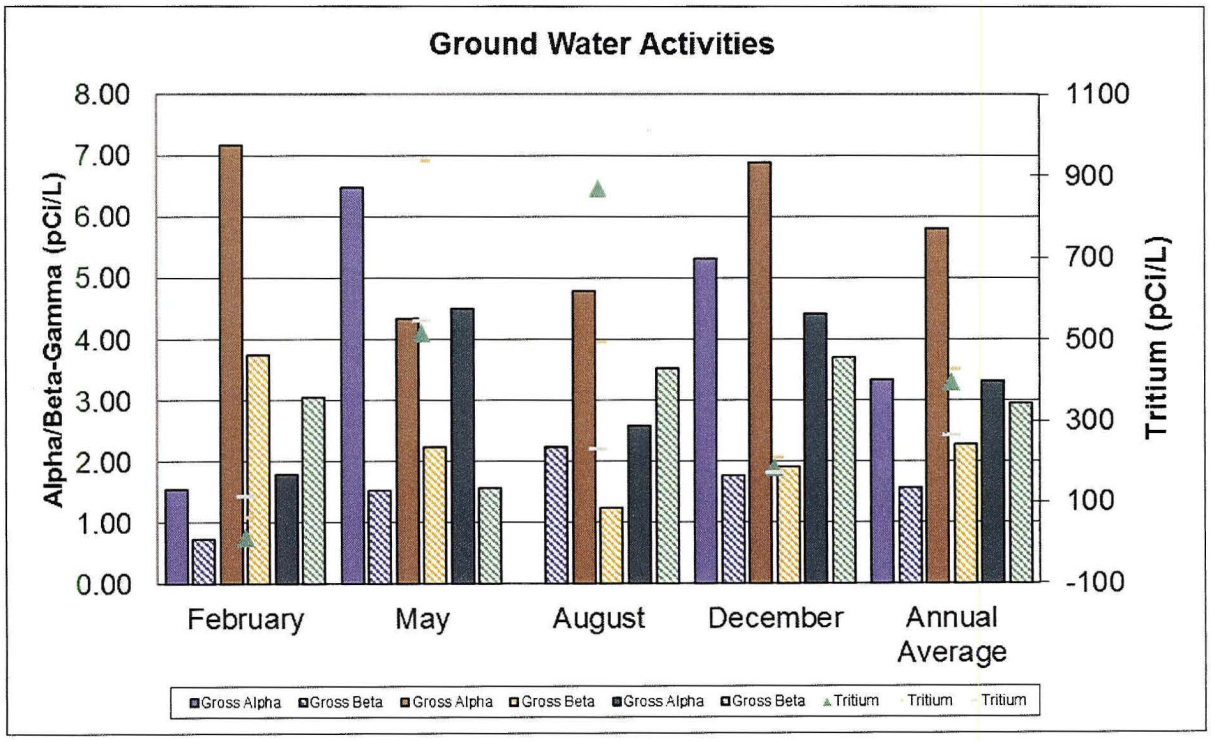


TABLE 11 – QUARTERLY RADIOLOGICAL GROUND WATER SAMPLES

Action Levels Gross Alpha (3.0×10^{-8} µCi/cc = 30 pCi/l) Gross Beta (5.0×10^{-8} µCi/cc = 50 pCi/l)

Month	GN (pCi/l) Gross Alpha	GN (pCi/l) Gross Beta	GN (pCi/l) Tritium	GA (pCi/l) Gross Alpha	GA (pCi/l) Gross Beta	GA (pCi/l) Tritium	GP (pCi/l) Gross Alpha	GP (pCi/l) Gross Beta	GP (pCi/l) Tritium
February	1.54	0.73	63	7.18	3.74	13	1.79	3.06	114
May	6.48	1.53	936	4.34	2.23	517	4.51	1.56	546
August	0.00	2.23	494	4.79	1.24	871	2.59	3.52	232
December	5.31	1.78	210	6.88	1.91	185	4.42	3.70	174
Annual Average	3.33	1.57	426	5.80	2.28	397	3.33	2.96	267



Wells around Building 102

Month	102A (pCi/l) Gross Alpha	102A (pCi/l) Gross Beta	102A (pCi/l) Tritium	102E (pCi/l) Gross Alpha	102E (pCi/l) Gross Beta	102E (pCi/l) Tritium	102G (pCi/l) Gross Alpha	102G (pCi/l) Gross Beta	102G (pCi/l) Tritium	102K (pCi/l) Gross Alpha	102K (pCi/l) Gross Beta	102K (pCi/l) Tritium
February	ND	0.89	NA	No Water			5.46	10.95	265	No Water		
May	ND	0.55	NA	No Water				No Water		No Water		
August	2.61	90.10	NA	No Water				No Water		No Water		
November	NA	NA	NA	No Water				No Water		NA	NA	0.00
Annual Average	2.61	30.5	NA	NA	NA	NA	5.46	10.95	265	NA	NA	0

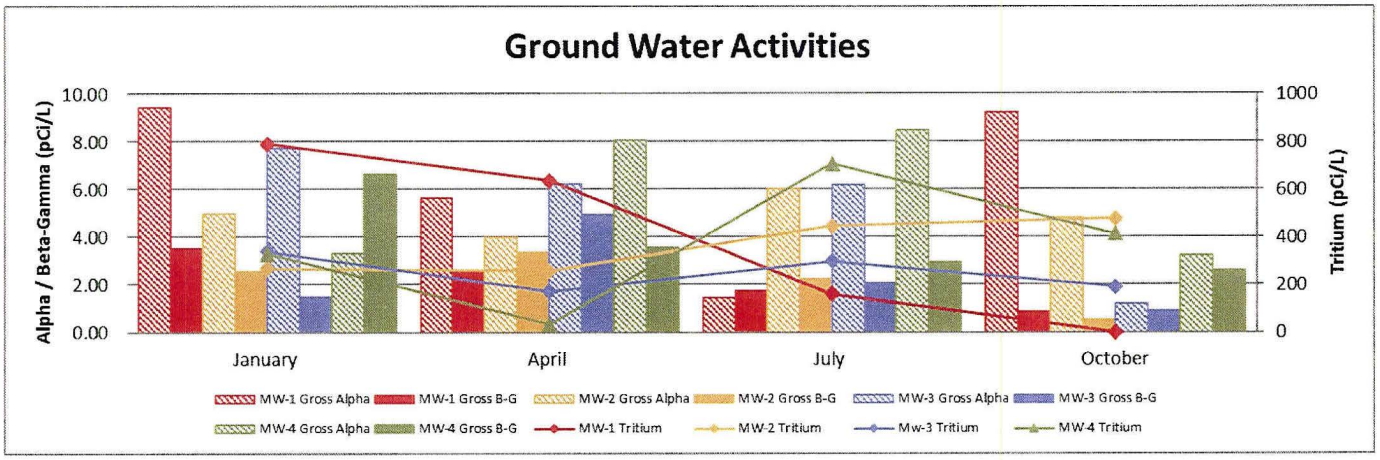
102A Bldg. 102 Pool Area
102E Bldg. 102A
102G Bldg. 102 Equipment Storage Area
102K Bldg. 102 Cask Storage Area

TABLE 11 – CONTINUED- QUARTERLY RADIOLOGICAL GROUND WATER SAMPLES

	MW-1 (1E-3R2)			MW-2 (1E-10A2)		
	(pCi/l)			(pCi/l)		
Month	**Gross Alpha**	**Gross Beta**	**Tritium**	**Gross Alpha**	**Gross Beta**	**Tritium**
January '17	9.43	3.51	790	4.97	2.57	267
April '17	5.63	2.61	636	3.98	3.35	258
July '17	1.42	1.74	160	6.00	2.24	445
Oct '17	9.24	0.84	0	4.81	0.51	478
Annual Average	**6.43**	**2.18**	**397**	**4.94**	**2.17**	**362**

MW-3 (1E-10A3)			MW-4 (1E-10A4)		
(pCi/l)			(pCi/l)		
Gross Alpha	**Gross Beta**	**Tritium**	**Gross Alpha**	**Gross Beta**	**Tritium**
7.71	1.47	338	3.32	6.64	329
6.21	4.94	171	8.06	3.55	32
6.17	2.07	297	8.46	2.92	708
1.20	0.89	191	3.22	2.60	413
5.32	**2.34**	**249**	**5.77**	**3.93**	**371**

MW-5 (1E-10H2)			MW-6 (1E-10H3)			MW-7 (1E-10G3)		
(pCi/l)			(pCi/l)			(pCi/l)		
Gross Alpha	**Gross Beta**	**Tritium**	**Gross Alpha**	**Gross Beta**	**Tritium**	**Gross Alpha**	**Gross Beta**	**Tritium**
6.16	5.55	728	7.73	4.03	132	0.70	1.31	553
2.87	3.71	452	1.93	2.41	42	5.56	5.23	720
10.10	1.12	491	4.93	1.51	263	5.58	2.20	445
2.24	2.05	521	1.44	1.24	278	3.87	1.26	0
5.34	**3.11**	**548**	**4.01**	**2.30**	**179**	**3.93**	**2.50**	**430**



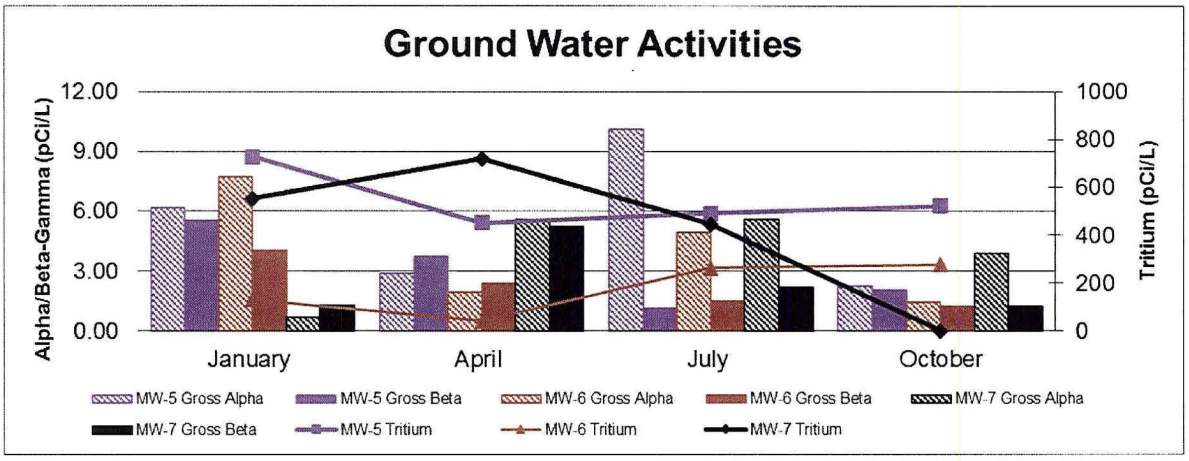


TABLE 12 – RADIOLOGICAL STREAM BOTTOM SEDIMENT SAMPLES

Sample Number	Date Collected	Gross α (ρCi/g)	Gross β/γ (ρCi/g)	Co-60 (ρCi/g)	Cs-137 (ρCi/g)
Action Level		30	N/A	8	15
S-4	5/08/2017	5.00	7.28	0.00	0.00

TABLE 13 – RADIOLOGICAL VEGETATION SAMPLES

Sample Number	Date Collected	Gross α (ρCi/g)	Gross β/γ (ρCi/g)
Action level		10	50
V-2	3/30/2017	0. 19	2.51
Val-IV	3/30/2017	1.66	3.32

TABLE 14 – DOSIMETRY RESULTS
GAMMA MONITORING
2017

South Boundary		East Boundary		West Boundary		North Boundary		Background Dosimeters	
Station No.	(mRem/yr)	Station No.	(mRem/yr)	Station No.	(mRem/yr)	Station No.	(mRem/yr)	Station No.	(mRem/yr)
1	66.9	4	66.5	7	35.9 *	8	71.3	14	65.8
2	64.4	5	63.7	12	69.9	9	61.6	15	66.2
3	66.0	6	70.2	13	78.9	10	70.8	16	65.1
						11	69.7	17	74.0
								18	65.2
								19	67.1
								20	67.6

Notes: * Dose > Control Dosimeter
See Figure 4 for location, zones demarcated by red lines.
The dosimeters at each station were collected on December 6, 2017 Except for Badge # 7 that was collected in error on October 1, 2017. CR # 27665 was generated to document the finding.
Gross Values Represented (No background subtracted from control readings).
Control Dosimeter reads 85.0 mRem/yr (Control Badge is located in building 102B).
Missing dosimeters lost due environmental conditions.

TABLE 15 – RADIOLOGICAL AMBIENT AIR MONITORING

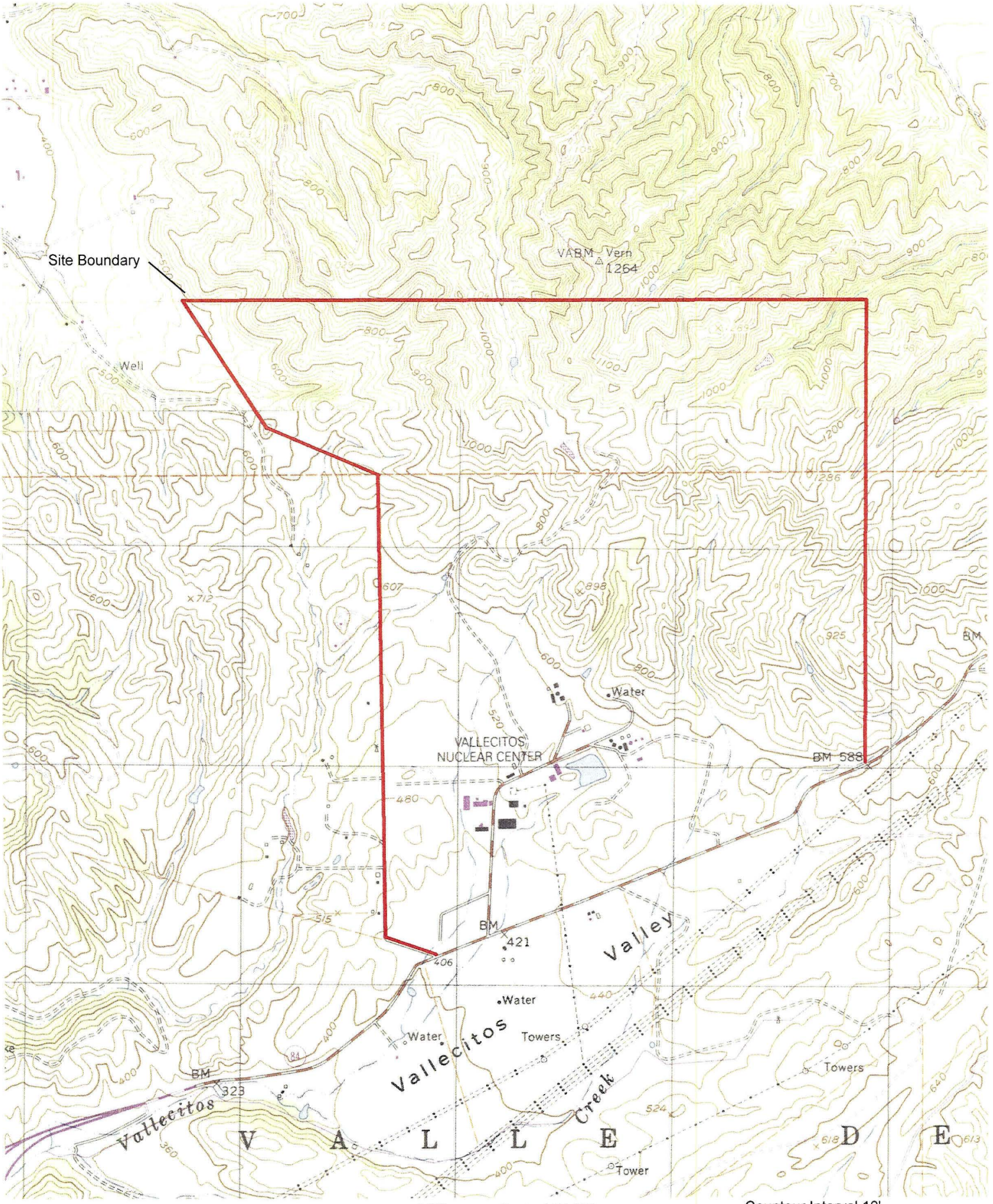
Action Levels Beta (3×10^{-12}) Alpha (1×10^{-14})

MONTH	STATION ONE		STATION TWO		STATION THREE		STATION FOUR	
	BETA	ALPHA	BETA	ALPHA	BETA	ALPHA	BETA	ALPHA
JAN	1.34E-14	5.25E-16	1.76E-14	3.50E-16	1.02E-14	6.78E-16	1.79E-14	9.61E-16
FEB	7.25E-15	5.05E-16	3.36E-14	1.01E-15	1.13E-14	1.05E-15	1.05E-14	6.81E-16
MAR	9.64E-15	7.98E-16	1.63E-14	8.83E-16	1.28E-14	1.26E-15	1.26E-14	8.60E-16
APR	1.29E-14	2.78E-16	1.17E-14	4.42E-16	2.24E-14	9.07E-16	1.05E-14	4.85E-16
MAY	7.35E-15	1.11E-15	1.04E-14	8.85E-16	7.66E-15	7.57E-16	1.30E-14	6.45E-16
JUN	9.46E-15	3.14E-16	1.01E-14	1.05E-15	3.14E-14	3.37E-16	1.19E-14	9.12E-16
JUL	1.77E-14	4.21E-16	1.62E-14	1.39E-15	1.06E-15	1.06E-15	1.01E-14	6.69E-16
AUG	1.48E-14	8.55E-16	1.28E-14	1.14E-15	1.49E-14	8.69E-16	1.85E-14	2.06E-15
SEP	1.71E-14	1.61E-15	1.75E-14	2.45E-15	1.39E-14	1.53E-15	3.60E-14	2.64E-15
OCT	2.28E-14	3.03E-16	2.29E-14	1.36E-15	2.61E-14	1.54E-15	2.58E-14	9.98E-16
NOV	1.68E-14	6.84E-16	1.95E-14	1.51E-15	1.83E-14	1.51E-15	2.21E-14	1.24E-15
DEC	5.37E-14	3.15E-15	4.17E-14	3.22E-15	4.68E-14	4.04E-15	4.92E-14	4.05E-15
AVERAGE	1.69E-14	8.80E-16	1.92E-14	1.31E-15	1.81E-14	1.29E-15	1.98E-14	1.35E-15

Notes: See Figure 4 for location, zones demarcated by black lines.
See Figure 5 for graphical representation

TABLE 16 – RAINFALL DATA

Period	Rainfall Amount (Inches)
January 2002 to December 2002	14.7
January 2003 to December 2003	15.3
January 2004 to December 2004	15.65
January 2005 to December 2005	26.50
January 2006 to December 2006	20.10
January 2007 to December 2007	11.90
January 2008 to December 2008	12.65
January 2009 to December 2009	13.40
January 2010 to December 2010	21.40
January 2011 to December 2011	14.50
January 2012 to December 2012	20.40
January 2013 to December 2013	4.60
January 2014 to December 2014	18.20
January 2015 to December 2015	12.95
January 2016 to December 2016	27.20
January 2017 to December 2017	24.50



1 Mile Scale 1:24,000

Countour Interval 10'

based on USGS Maps, Lacosta Valley and Livermore, CA

Figure 1 Topograghic Map of GE Vallecitos Nuclear Center

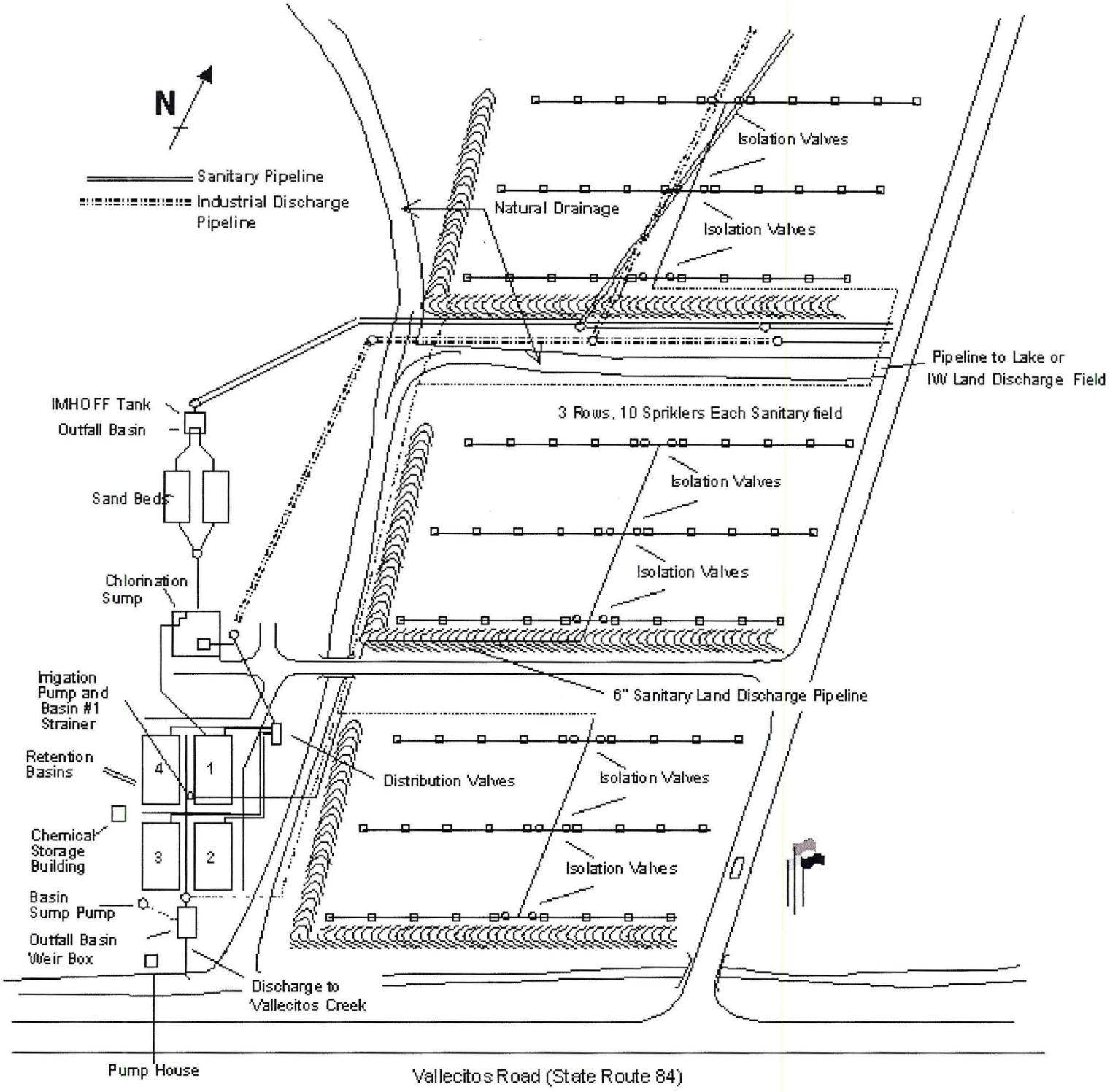


Figure 2 Sanitary and Industrial Discharge Treatment Facility

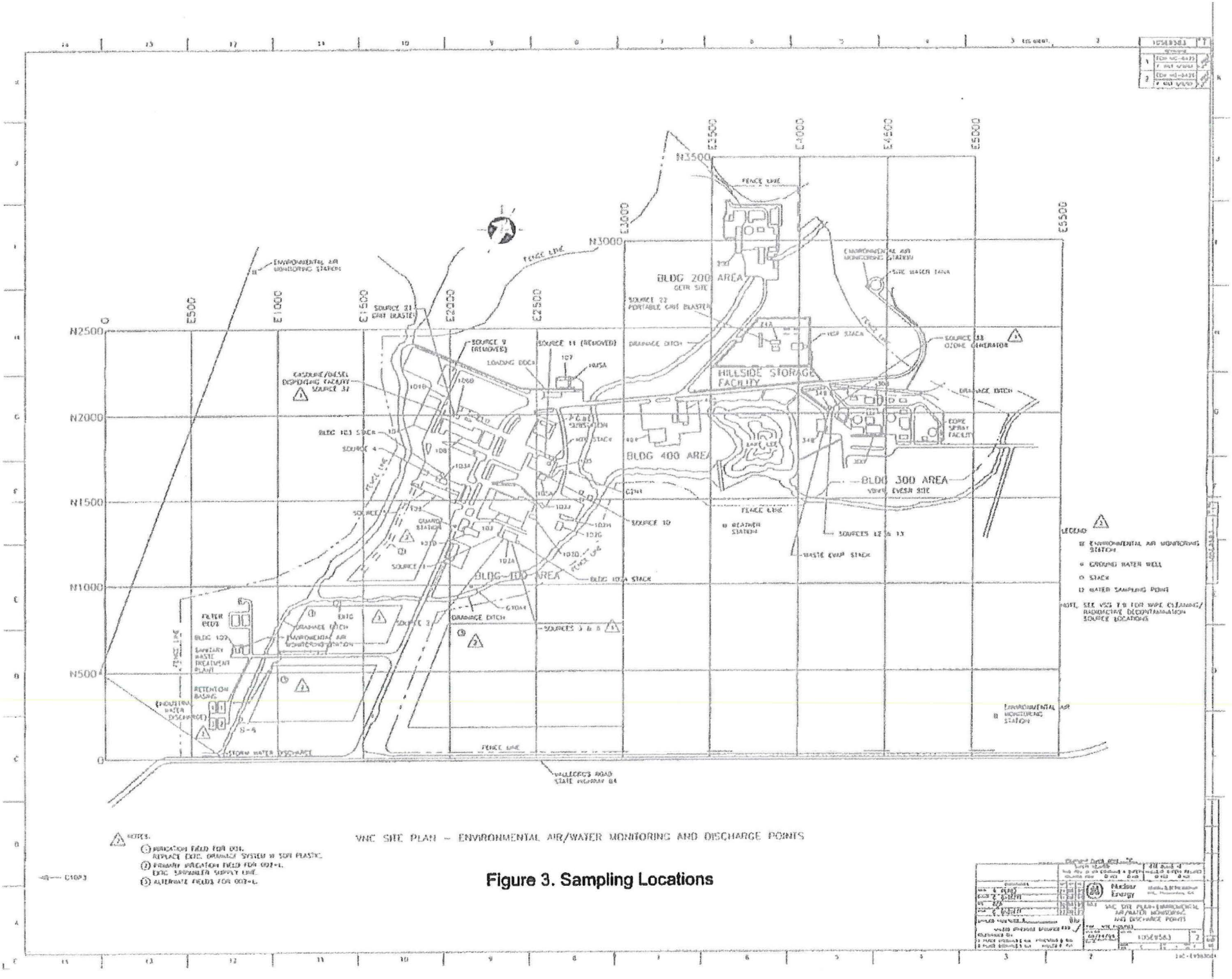
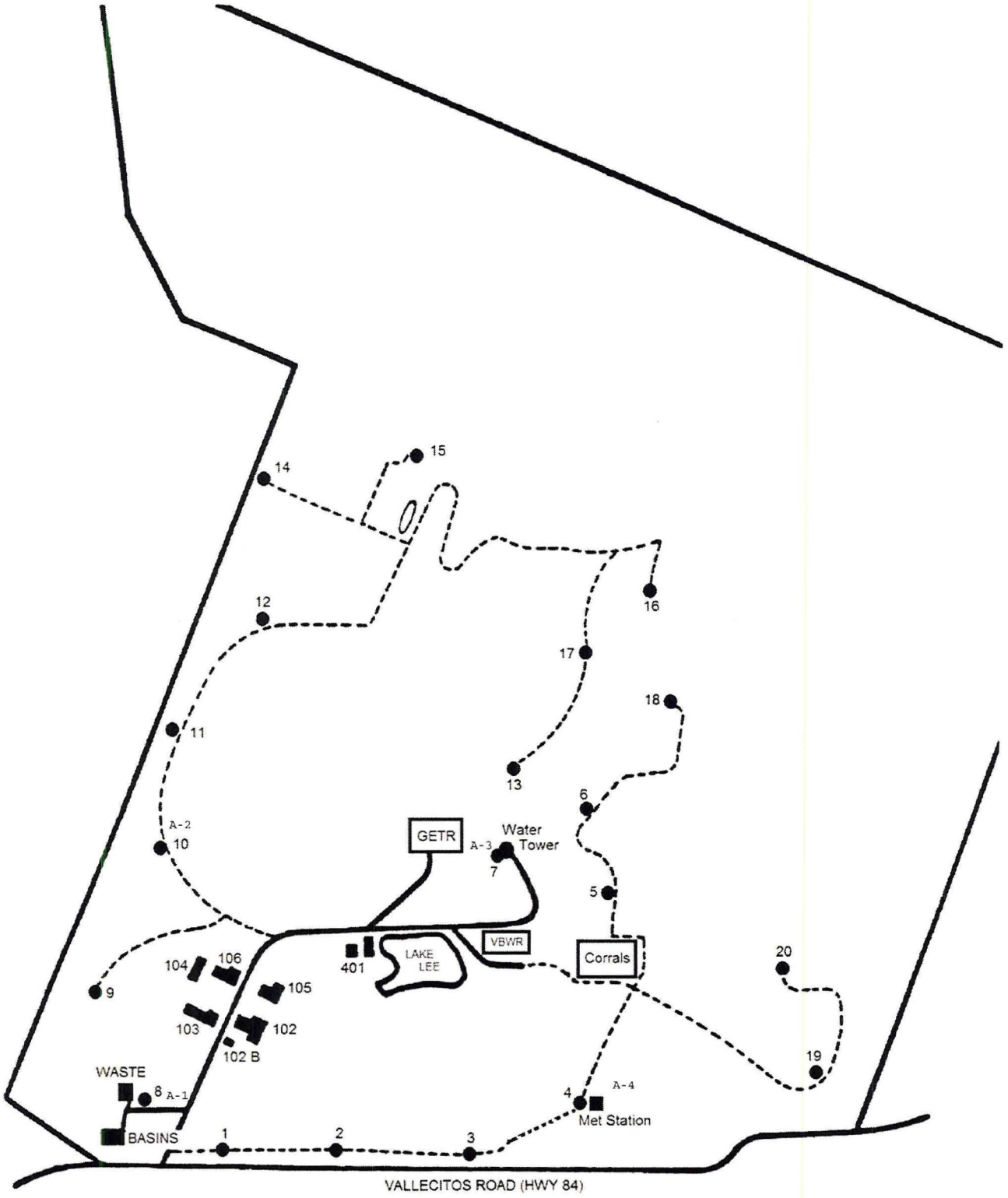
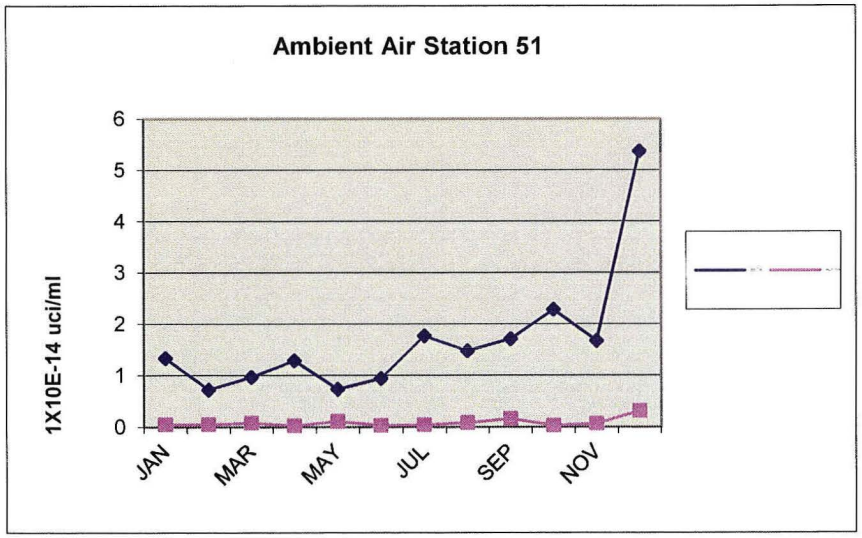


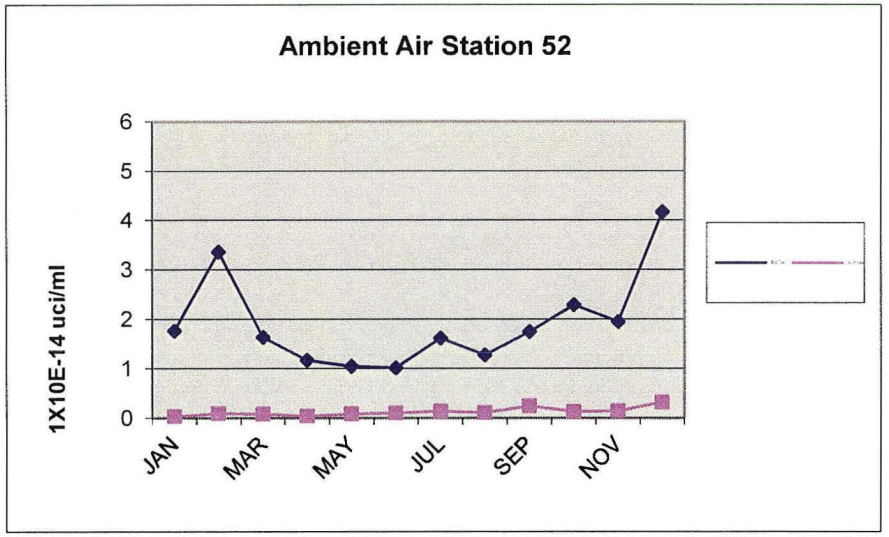
Figure 3. Sampling Locations

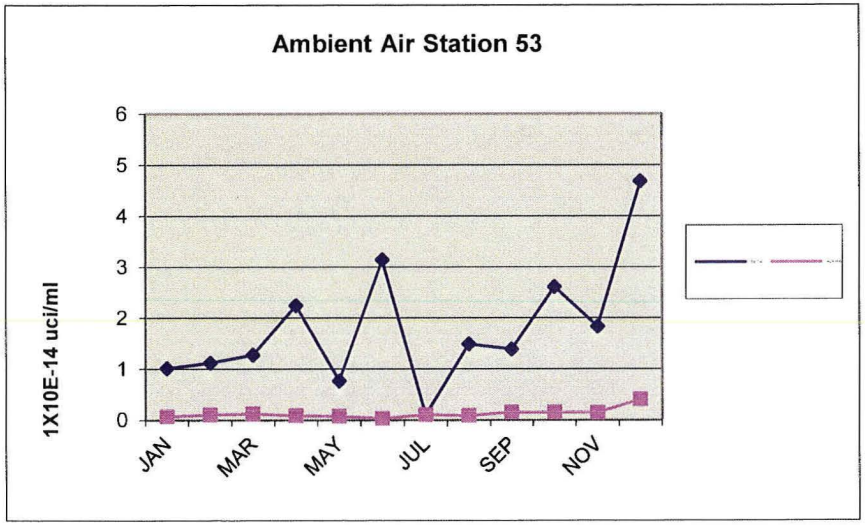


Gamma Monitoring Points 1-20
Air Sampling Stations A1-A4
FIGURE 4

VALLECITOS NUCLEAR CENTER
ENVIRONMENTAL DOSIMETER LOCATIONS







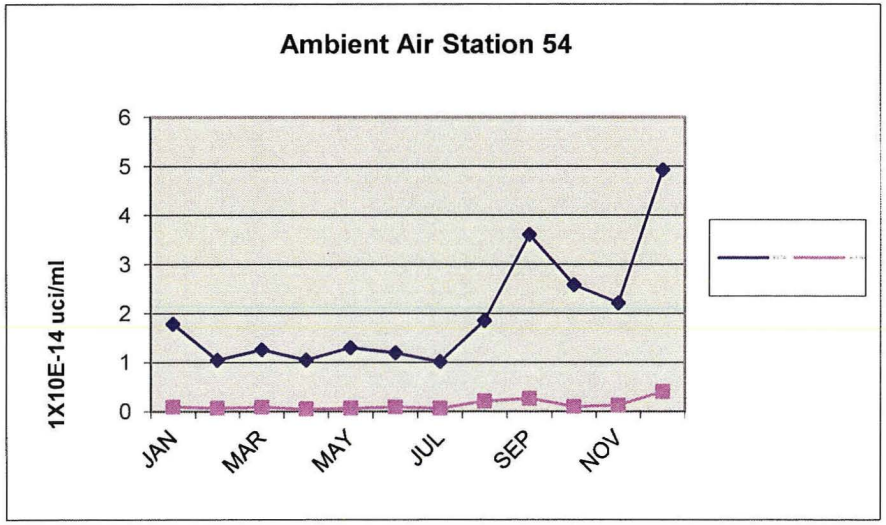
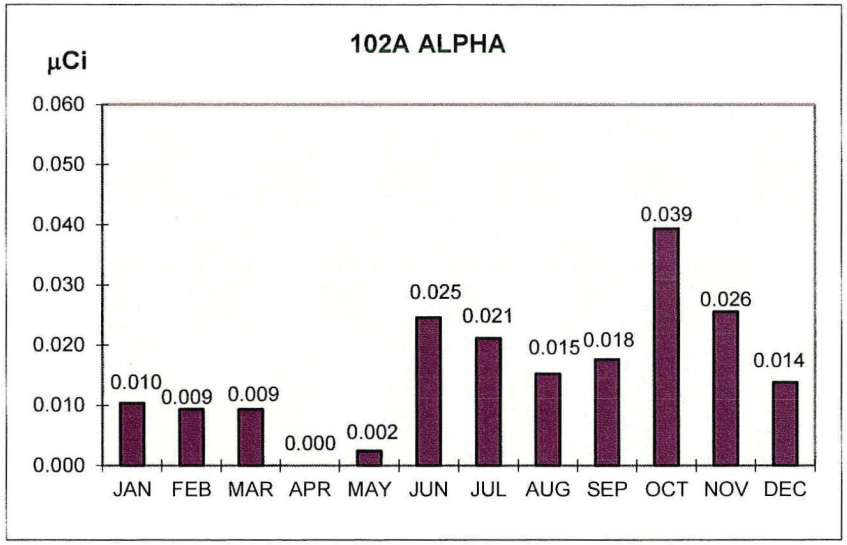
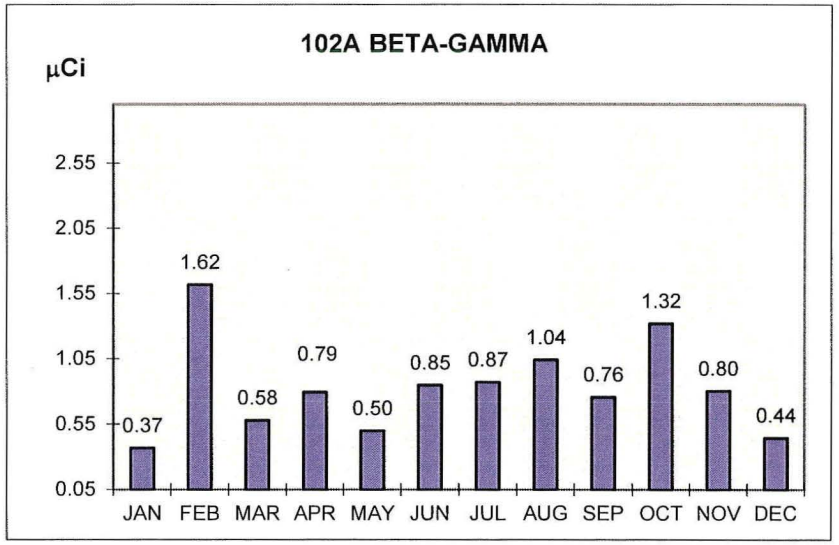


Figure 5, Analytical Results, Environmental Air Station Particulates



Limit = 3.6 µCi / Week (14.4 µCi / Month)

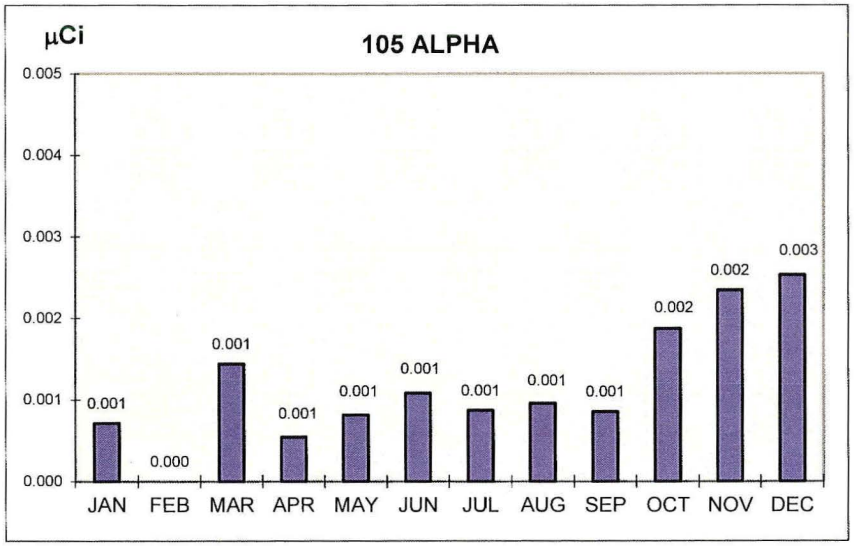


Limit = 360 µCuries / Week (1,440 µCuries / Month)

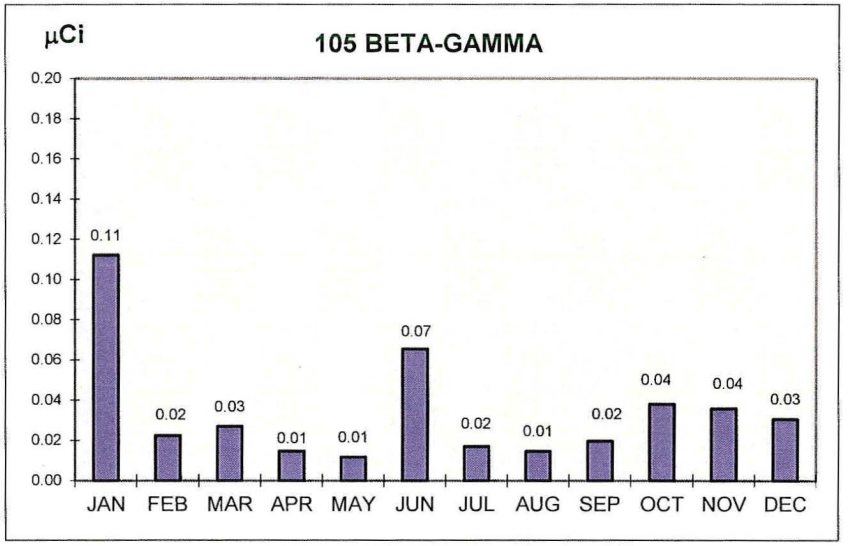
All results for I-131 are less than or equal to Minimum Detectable Concentration (MDC)

Limit = 73 mCi / Week (292 mCi / Month)

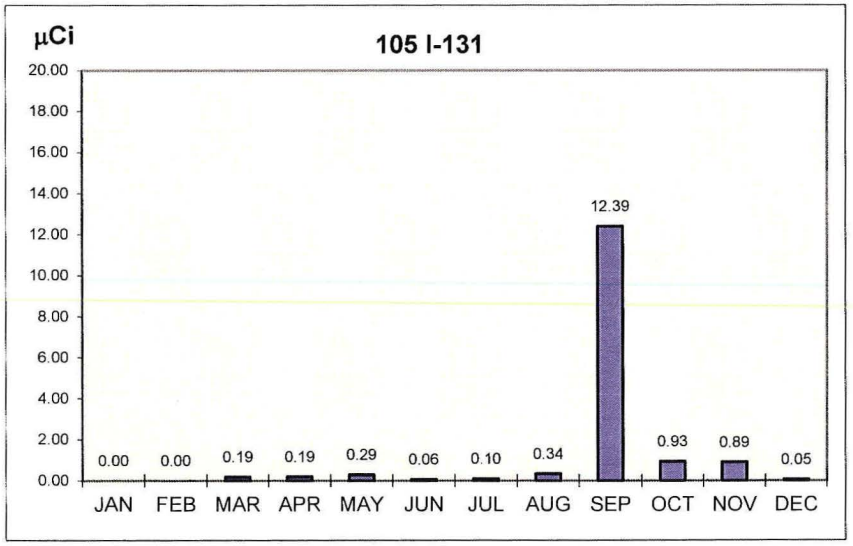
Figure 6. Analytical Results, Stack monitoring (Stack 4, Bldg. 102)



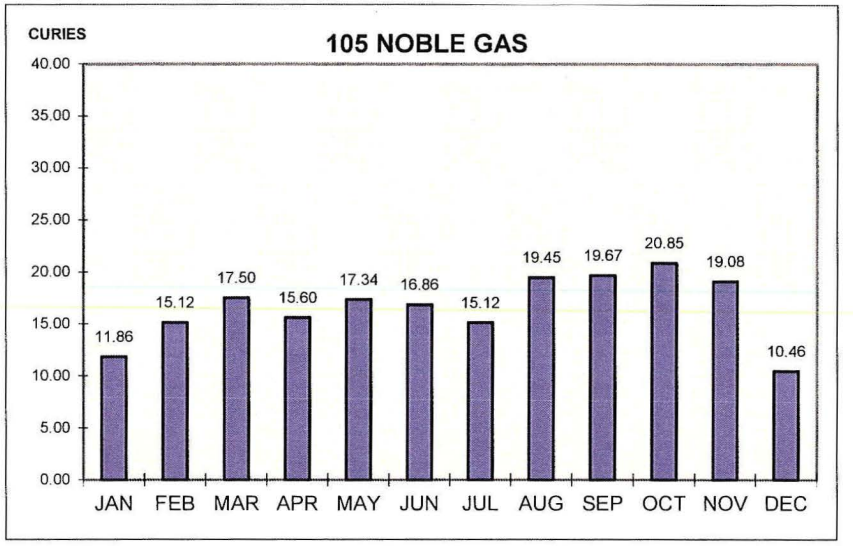
Limit = 8.6 µCi / Week (34.4 µCi / Month)



Limit = 860 µCuries / Week (3,440 µCuries / Month)

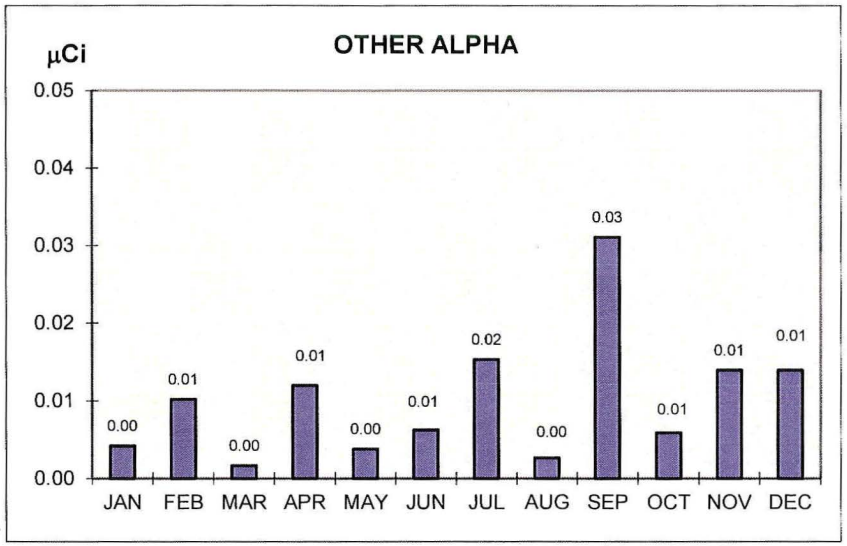


Limit = 170 mCi / Week (680 mCi / Month)

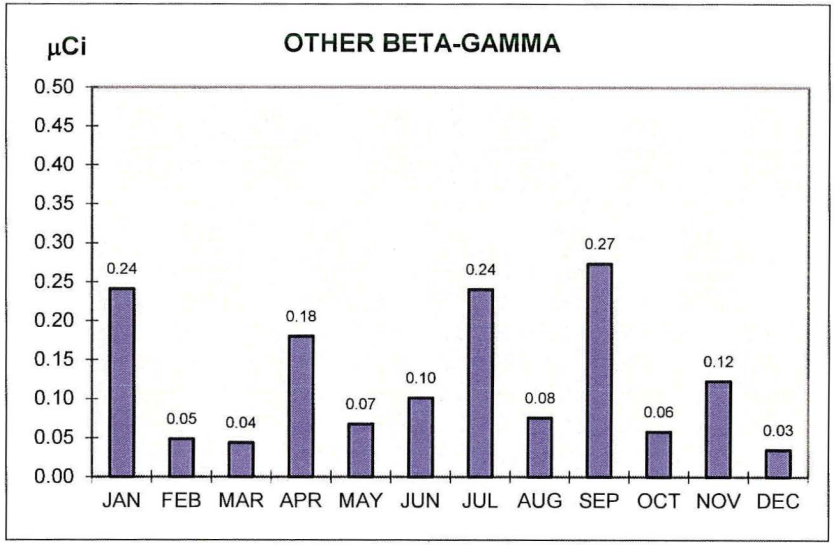


Limit = 18 Curies / Week (72 Curies / Month)

Figure 7. Analytical results, Stack Monitoring (Stack 16, NTR)



Limit = 10.8 µCi / Week (43.2 µCi / Month)



Limit = 1,080 µCuries / Week (4,320 µCuries / Month)

All results for I-131 are less than or equal to Minimum Detectable Concentration (MDC)

Limit = 146 mCi / Week (584 mCi / Month)

Figure 8. Analytical Results, Stack Monitoring Composite (All except Stacks 4 and 16)