Radiological Environmental Operating Report

Photo By: Gwenna Kelton

Chapter 6

PROGRAM DESCRIPTION

The South Texas Project initiated a comprehensive pre-operational Radiological Environmental Monitoring Program in July 1985. That program terminated on March 7, 1988, when the operational program was implemented. The pre-operational monitoring program data forms the baseline against which operational changes are measured.

Analysis of the environmental pathways requires that samples be taken from water, air, and land environments. These samples are obtained to evaluate potential radiation exposure to people. Sample types are based on established pathways and experience gained at other nuclear facilities. Sample locations were determined after considering site meteorology, site hydrology, local demography, and land use. Sampling locations are further evaluated and modified according to field and analysis experience. Table 1 at the end of this section lists the required sampling locations and frequency of collection. Additional discretionary samples were also collected.

Sampling locations consist of indicator and control stations. Indicator stations are locations on or off the site that may be influenced by plant discharges during plant operation. Control stations are located beyond the measurable influence of the South Texas Project. Although most samples analyzed are accompanied by a control sample, it should be noted that this practice is not always possible or meaningful with all sample types. Fluctuations in the concentration of radionuclides and direct radiation exposure at indicator stations are evaluated in relation to historical data and against the control stations. Indicator stations are compared with characteristics identified during the pre-operational program to monitor for radiological effects from plant operation.

Two sample identification methods are used in the program. Figures 6-1 and 6-2 are maps that identify permanent sample stations. Descriptions of sample stations shown on Figure 6-1 and 6-2 are found in Table 2. Table 2 also includes supplemental sampling locations and media types that may be used for additional information. Figure 6-3 illustrates zones that may be used instead of permanent, numbered sample stations.

Photo By: Mike LeMay

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM DESIGNATED SAMPLE LOCATION MAP

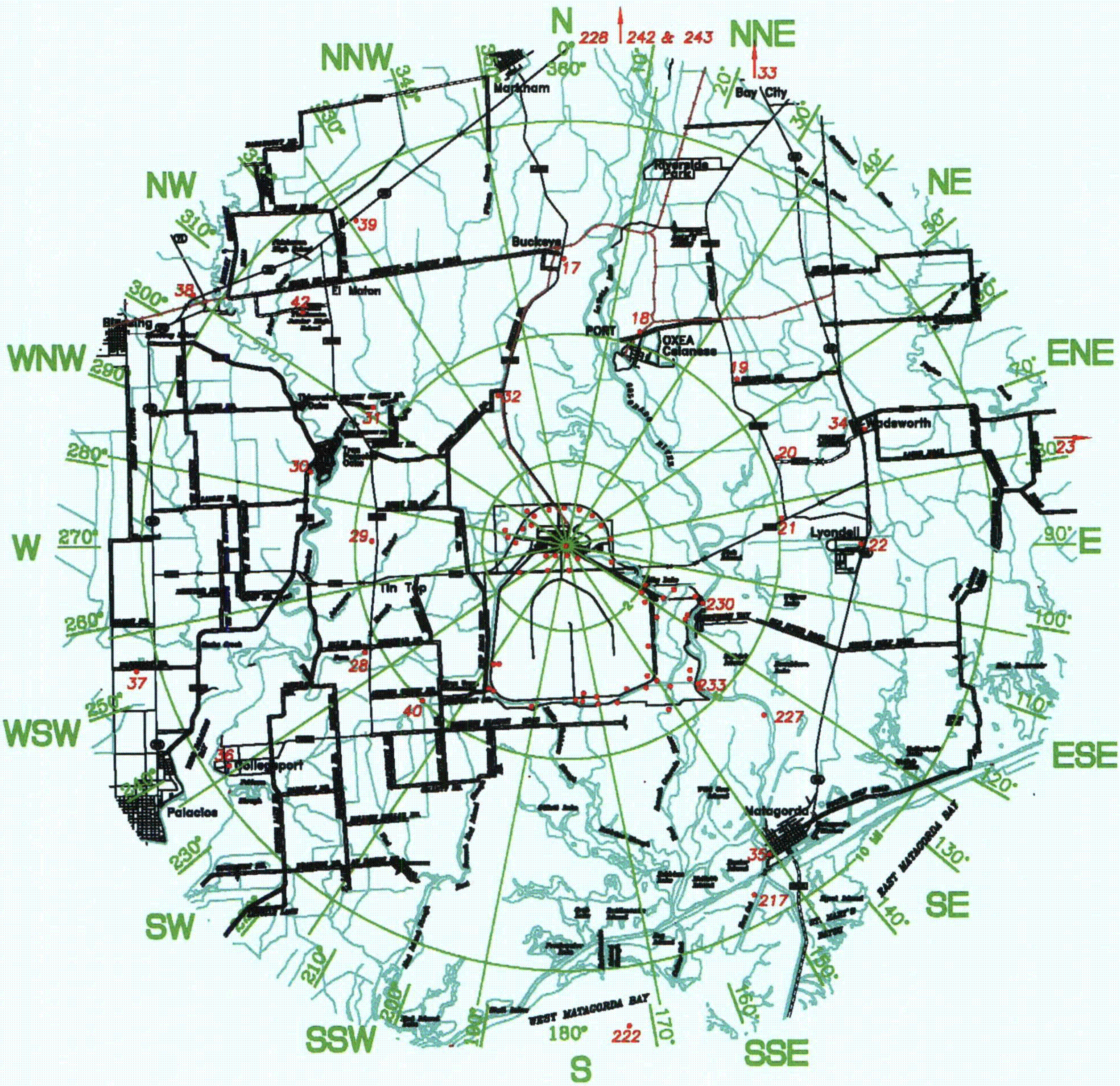


Figure 6-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ONSITE SAMPLE LOCATION MAP

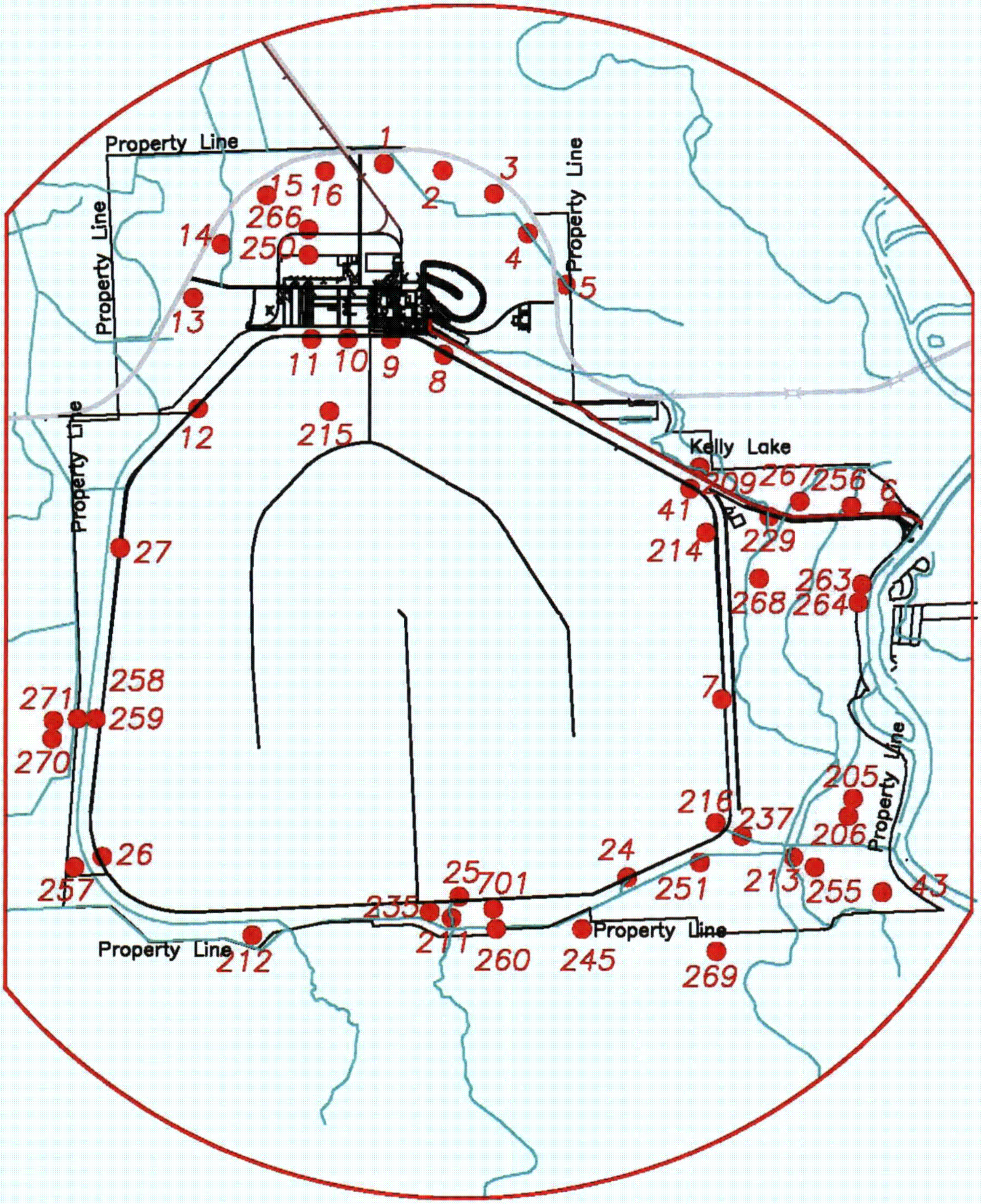
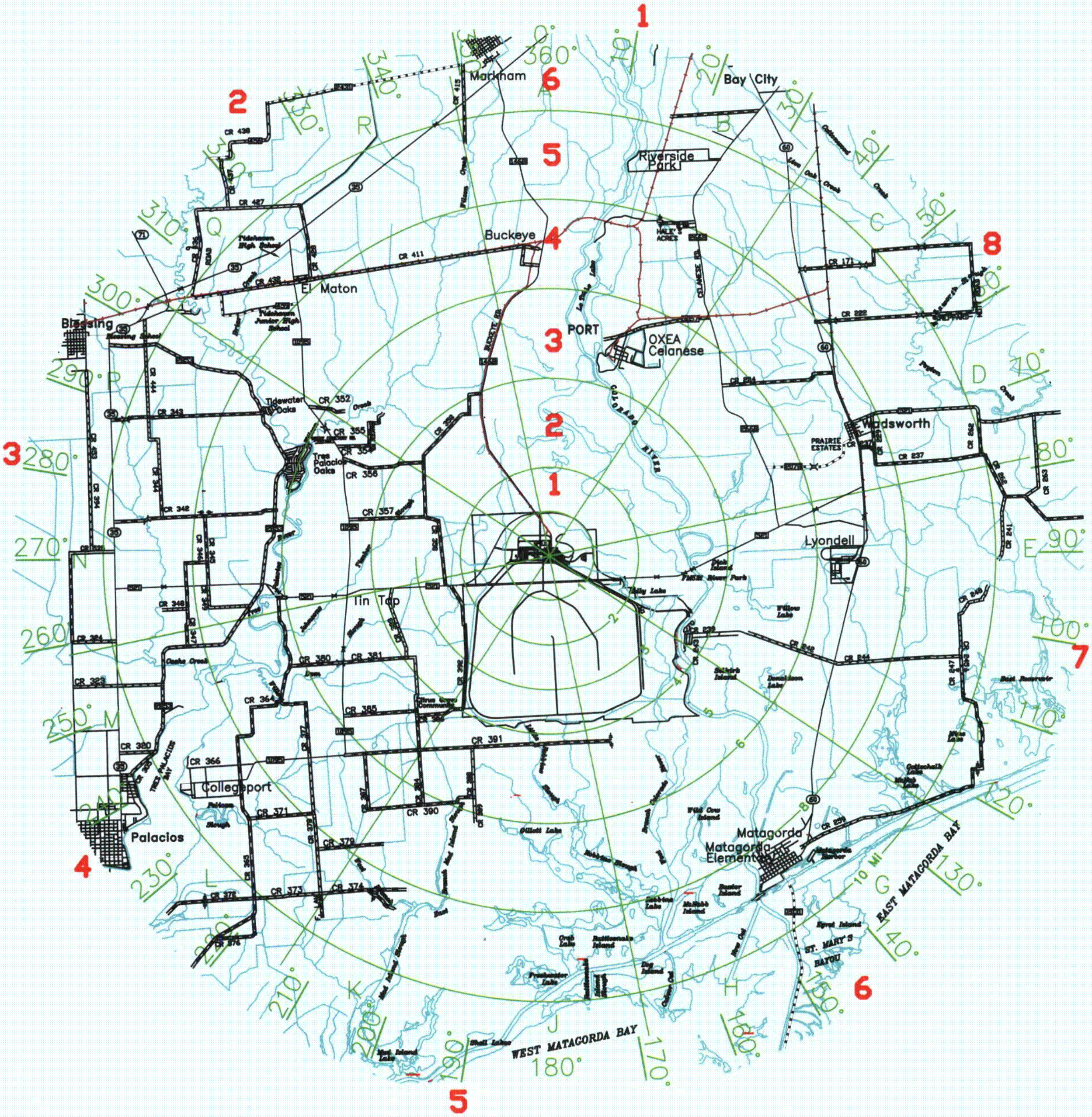


Figure 6-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ZONE LOCATION MAP



The zone station is determined in the following manner:

* The first character of the station number "Z" to identify it as a zone station.
* The second character is the direction coordinate number 1-8.
* The third character is the distance from the site number 1-6.

Figure 6-3

ANALYSIS OF RESULTS AND TRENDS

Environmental samples from areas surrounding the South Texas Project continue to indicate no radiological effects from plant operation. Analytical values from offsite indicator sample stations continue to trend with the control stations. Measurements from onsite indicator samples continued to increase or decrease within their expected values.

Average quarterly air particulate sample beta activity from three onsite indicator stations and a single control station have been compared historically from 2001 through 2011 (see Figure 6-4). The average of the onsite indicators trends closely with the offsite control values. The comparison illustrates that plant operations are not having an impact on air particulate activity even at the Sensitive Indicator Stations (#1, #15, and #16). These stations are located near the site boundary downwind from the plant, based on the prevailing wind direction. The beta activity measured in the air particulate samples is from natural radioactive material. Gamma analysis is performed on quarterly composites of the air particulate samples to determine if any activity is from the South Texas Project. The gamma analyses revealed no radioactivity from the South Texas Project. However, effects from the radiological event at the Fukushima Daiichi nuclear power station in Japan following the earthquake and tsunami on March 11, 2011 were noticed throughout the North American continent. The Fukushima results are discussed in a later section.

Historical Comparison of Average Quarterly Beta Activity from Indicator and Control Air Samples 2001 - 2011

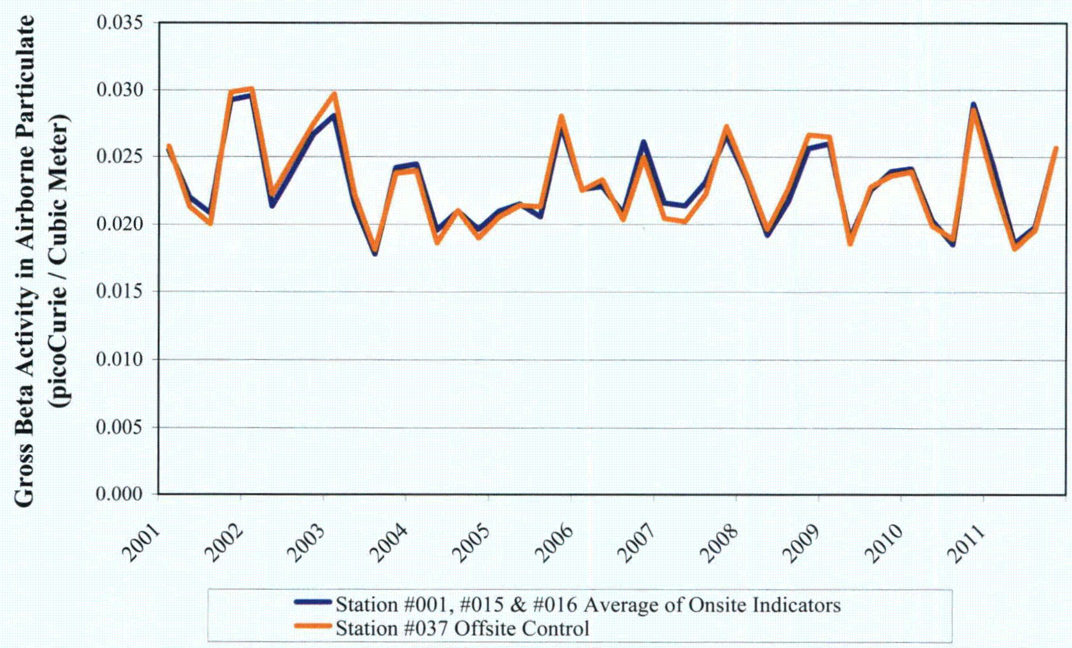


Figure 6-4

Direct gamma radiation is monitored in the environment by thermoluminescent dosimeters located at 40 sites. The natural direct gamma radiation varies according to location because of differences in the natural radioactive materials in the soil, soil moisture content, and other factors. Figure 6-5 compares the amount of direct gamma radiation measured at the plant since the fourth quarter of 2001 for three different types of stations. The Control Stations, Stations #23 and #37, are greater than 10 miles from the site in the minimal wind direction. The least frequent direction into which the wind blew in 2011 was the ENE sector. The prevailing wind direction is into the NNW sector. The Sensitive Indicator Stations are one mile NW, NNW, and N from the power plants on FM 521 at Stations # 15, # 16 and #1 respectively. The Indicator Stations are the remainder of the required stations. The values plotted are the averages for all of the stations according to type. Thermoluminescent Dosimeter Station # 9 saw an increase in direct radiation two times higher than the normal quarterly average of 14 milliroentgen. Station # 9 is located on site 0.25 miles south of the units on the reservoir embankment facing the temporary storage building just outside Unit 2 which housed the old reactor vessel heads. Direct radiation values returned to normal following removal of the old reactor vessel heads from site. The average of the Control Stations is higher than the other stations because station #23 is in an area that has a slightly higher natural background radiation. The trends of Figure 6-5 clearly show that the power plants are not adding to the direct radiation in the offsite environment.

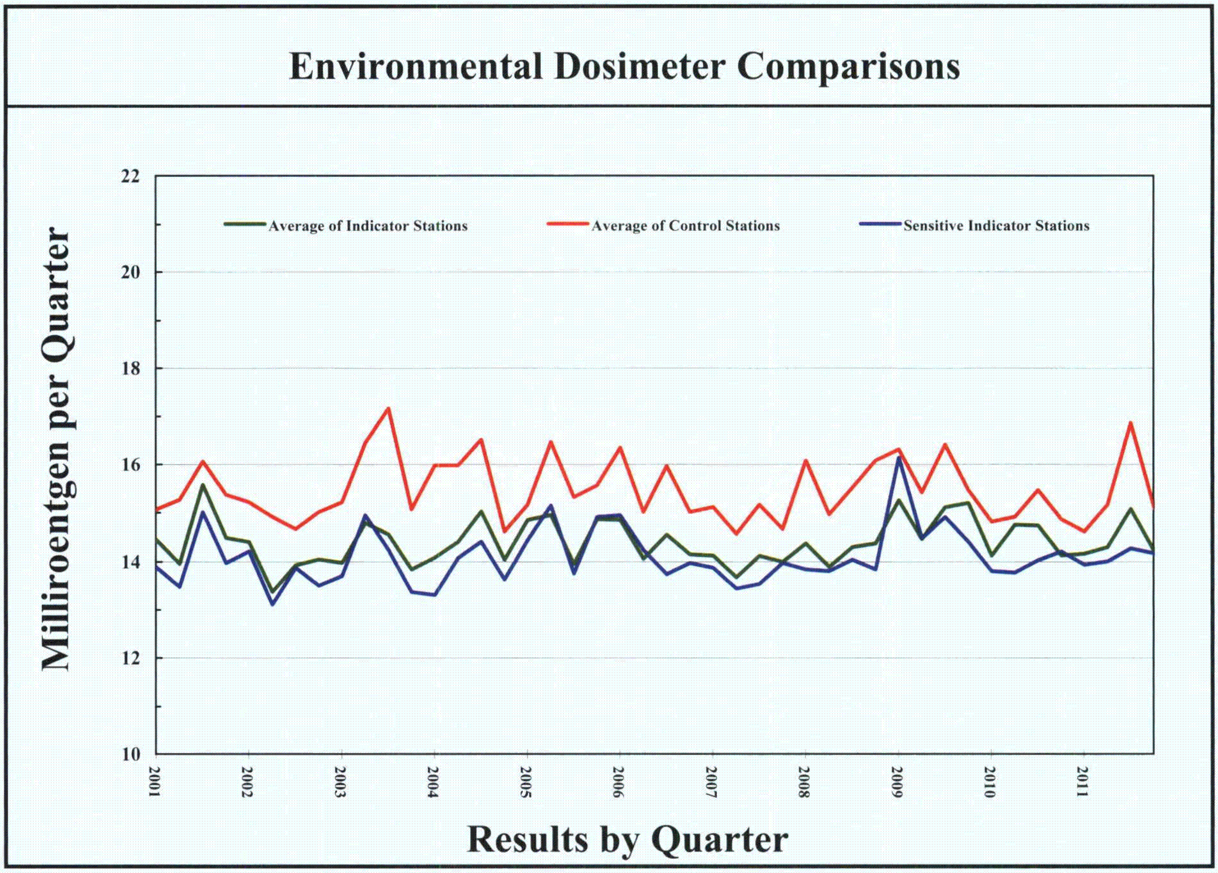


Figure 6-5

Bottom sediment samples are taken from the Main Cooling Reservoir each year. Figure 6-6 shows the positive results from the plant-produced radioactive material Cobalt-60. The Cobalt-60 inventory in the reservoir has decreased since 1992 because of radioactive decay and equipment installed to reduce radioactive effluents. Although the total activity of Cobalt-60 has decreased over time, there is an inventory of Cobalt-60 still in the reservoir as seen at Stations # 215 and # 216. In 2011, Cobalt-60 was identified in four of six samples. Figure 6-7 demonstrates the calculated decline in the total amount of Cobalt-60 in the reservoir.

Cesium-137 was measured in five of six bottom sediment samples from Stations #215 and #216 in the Main Cooling Reservoir and one of two shoreline sediment samples taken at station # 227. The highest measurement in 2011 was 119 pCi/kg at Station # 215. The activity measured at station # 216 was 52 pCi/kg. Cesium-137 is often found in environmental media including soil and sediment from residual radioactive material from nuclear weapons testing fallout. Soil and sediment samples taken in 1986 and 1987 prior to operation of STP contained Cesium-137 from weapons testing fallout. The pre-operational average Cesium-137 concentration was 118 pCi/kg when it was detected in soil and sediment samples but the highest sample measured 383 pCi/kg. The 119 pCi/kg measured at Station # 215 and the 22 pCi/kg at Station # 227 are consistent with these pre-operational concentrations reduced by 25 years of radioactive decay.

Tritium has been monitored in the shallow aquifer since 1997 on the south side of the Main Cooling Reservoir. Models used when licensing the site predicted tritium in the shallow aquifer. These models were validated with additional studies for the proposed Units 3 & 4. A site conceptual model developed in 2008 to implement the Nuclear Energy Institute's Groundwater Protection Initiative also validated the original predictions of the site hydrology study.

Photo By: Steve Antonio

Historical Comparison of Cobalt-58 & Cobalt-60 in Main Cooling Reservoir Sediment 2001 - 2011

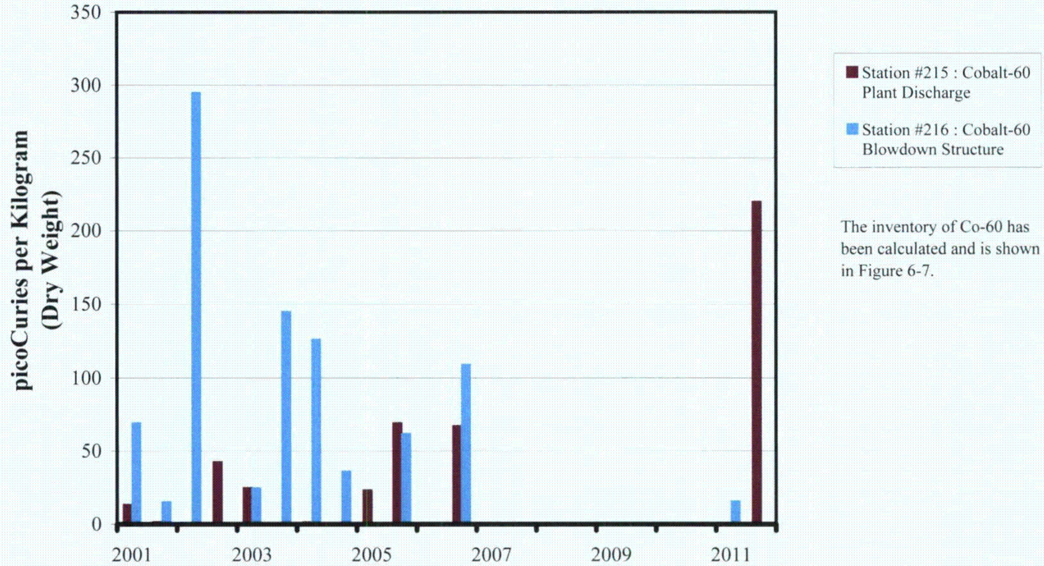
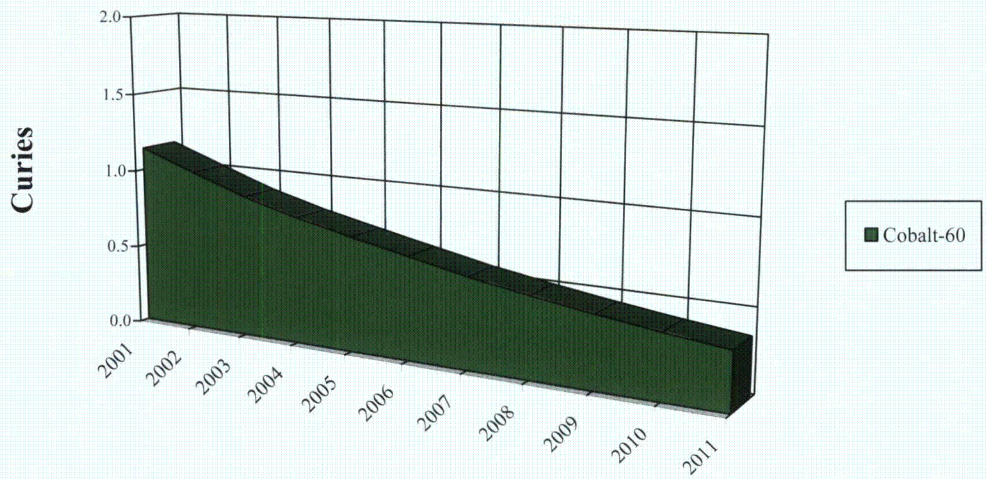


Figure 6-6

Calculated Cumulative Curies of Cobalt-60 in the Main Cooling Reservoir



ASSUMPTIONS:
1. Radioactive decay is the only mechanism for removal from the Main Cooling Reservoir.
2. The initial time for calculating the remaining radioactivity is July 1 of the year released.

Figure 6-7

Tritium is a radioactive isotope of hydrogen and is produced during plant operation. Tritium produced in the reactors is a part of the water molecule. Wastewater is treated to remove impurities before release, but tritium cannot be removed because it is chemically part of the water molecule. Some of the tritium is released into the atmosphere, and the remainder is released into the Main Cooling Reservoir. The tritium escapes from the Main Cooling Reservoir by evaporation, movement into the shallow aquifer, and by percolation from the relief wells which are a part of the reservoir embankment's stabilization system. Figure 6-8 shows the amount of tritium released to the Main Cooling Reservoir each year and the amount present during the last quarter of each year.

The concentration of tritium in the Main Cooling Reservoir was relatively stable in 2011. The amount of tritium measured in the Main Cooling Reservoir was consistent with the amount released. The amount of rainfall and river makeup normally influences the concentration of tritium in the Main Cooling Reservoir and the shallow aquifer surrounding it. The effect of reduced rainfall in the area due to drought conditions in 2011 resulted in higher concentrations of tritium in surface waters across the site. Tritium enters the sloughs and ditches of the site as runoff from the relief wells that surround the reservoir. In 2011, tritium levels remained low in the relief wells as shown in Figure 6-9.

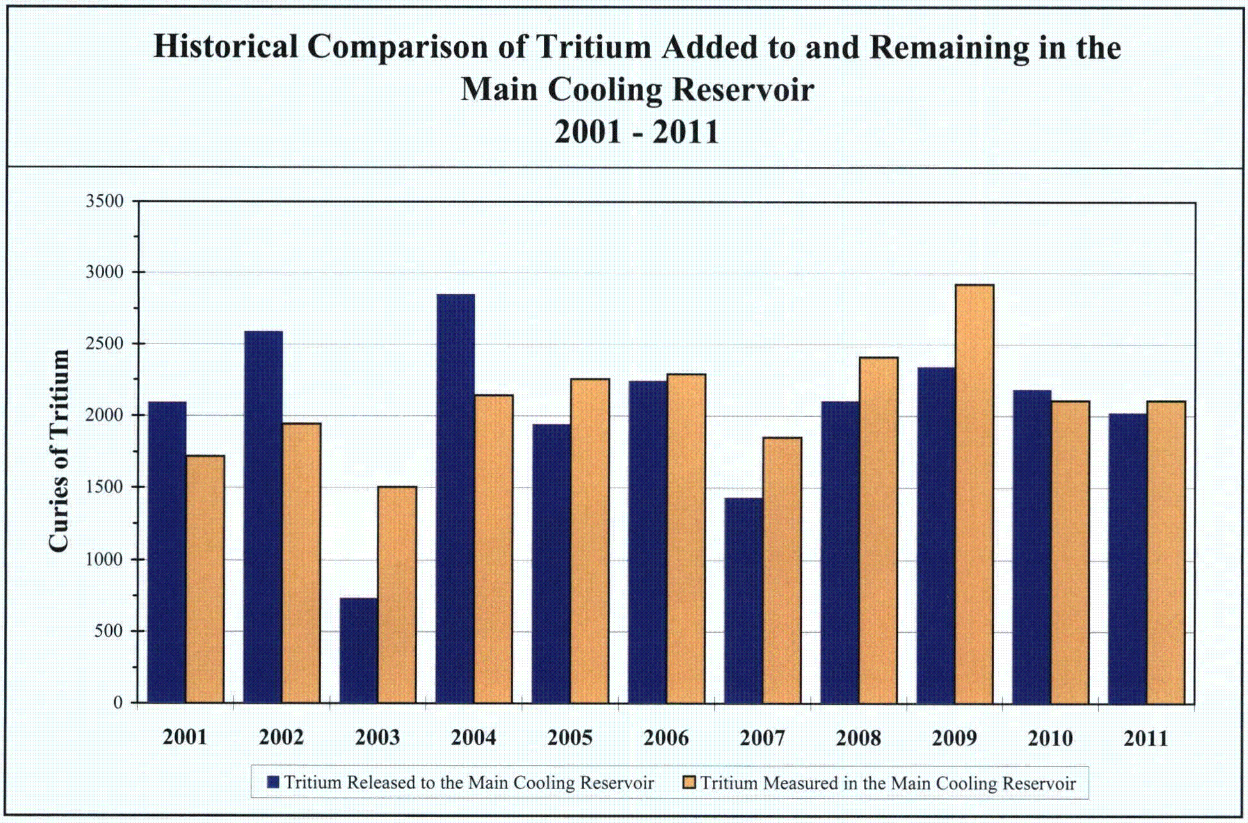


Figure 6-8

The tritium concentration in eight surface water sample points from 2001 through 2011 is shown in Figure 6-10. The specific sample point locations can be found in Table 2. Tritium levels in the onsite sloughs and ditches vary due to the concentration in the reservoir and the amount of rainfall received. The average tritium concentration in the relief wells, sloughs, and ditches is less than the reservoir because the water is diluted as it migrates through the reservoir relief well system. In 2011, four required and nine non-required surface water samples tested positive for tritium. Tritium activity was one and a half times higher than the nine month average for the surface water at station # 213 due to limited rainfall. All test results were below the United States Environmental Protection Agency drinking water limit of 20,000 pCi/kg. Rainwater was collected and analyzed during 2011 to determine if the tritium from the reservoir precipitated in the local area. Tritium was not measured in any of the rainwater samples.

Tritium was identified in the shallow (ten to thirty feet deep) aquifer test wells at Station #235, approximately seventy-five yards south of the reservoir embankment base during 1999. Starting in 2000, samples were collected from the shallow aquifer well at Station #251 southeast of the Main Cooling Reservoir. The tritium results from these two shallow aquifer wells are shown in Figure 6-11. In 2011, the concentration of the well at Station #235 was higher than average but consistent with values over the past three years. Tritium concentrations have remained near the

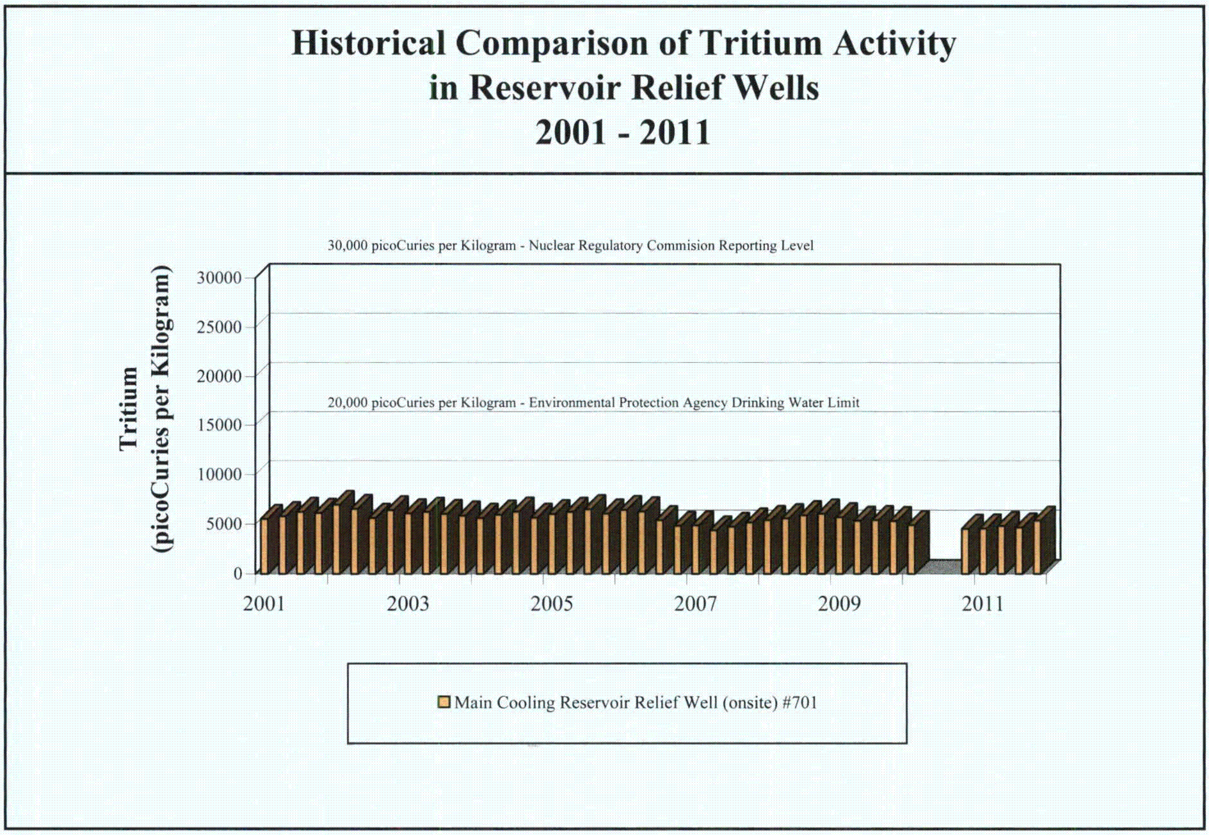


Figure 6-9

concentrations found in the relief wells. Wells at Stations #258 and #259 on the west side of the site boundary have been sampled since 2006. Wells at Stations #270 and #271 were installed during the last quarter of 2008. The sample results are shown in Figure 6-12. Tritium levels were generally stable in 2011 with a peak of 1,980 pCi/kg and remained below the United States Environmental Protection Agency drinking water limit (20,000 pCi/kg). The well at Station #271, located adjacent to site property on a county road easement directly west of the Main Cooling Reservoir, indicated a concentration in 2011 of 653 pCi/kg which is slightly above the detection limit. This is the second year that a positive measurement has been detected at this shallow monitoring well location. A windmill-powered ground water well, sample station # 267, first indicated tritium activity slightly above detection limits at 544 pCi/kg in 2011. This ground water sample station is the most distant location from the Main Cooling Reservoir that tritium has been detected.

The drinking water onsite is pumped from deep aquifer wells and is tested quarterly to verify tritium is not present. The South Texas Project uses no water from the reservoir, shallow aquifers or other surface water for drinking. If the water with the highest tritium concentration that leaves the site (Little Robbins Slough) was used for drinking, the maximum dose to an individual would be about one millirem in a year. This dose is insignificant compared to approximately 620 mrem the public receives a year from natural radioactivity in the environment and the radiation received from medical procedures (reference National Council on Radiation Protection Report No. 160).

Other samples are collected and analyzed in addition to those required by our licensing documents or internal procedures. These samples are collected to give additional assurance that the public and the environment are protected from any adverse effects from the plant. These samples include pasture grass, sediment samples, rain water, shallow aquifer well water, water from various ditches and sloughs onsite, and air samples near communities or other areas of interest. The results of these analyses indicate that plant related radioactive material released to the environment during plant operation has no health impact.

Photo By: Bernadette White

Historical Comparison of Tritium Activity in Surface Water 2001 - 2011

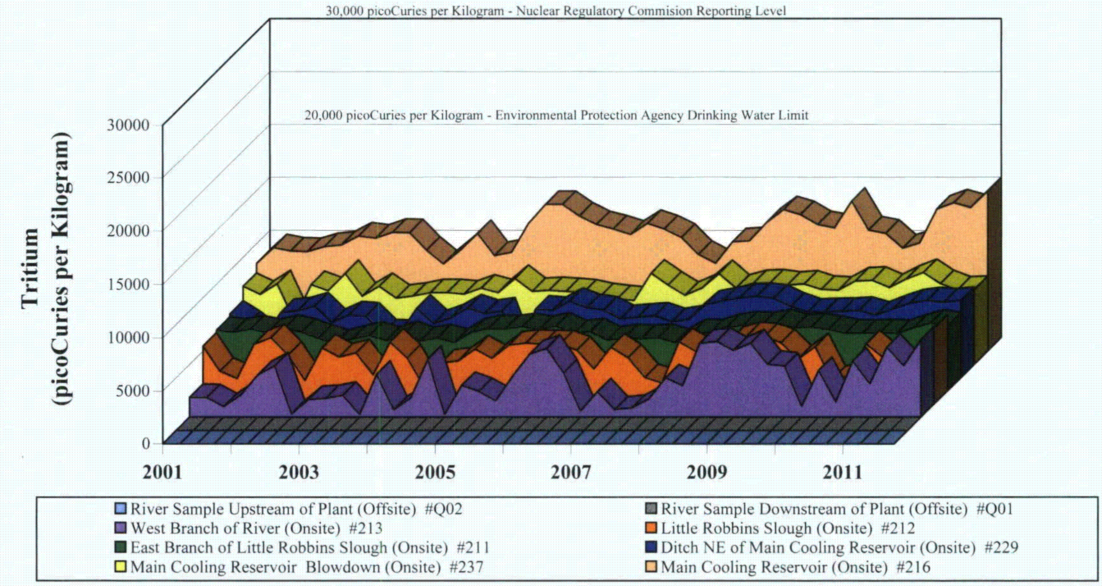


Figure 6-10

Historical Comparison of Tritium Activity in Shallow Aquifer Ground Water 2001 - 2011

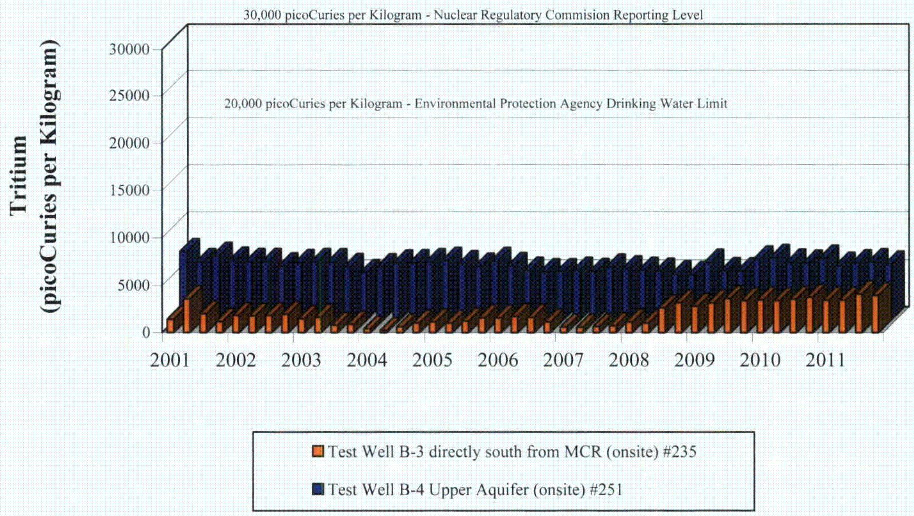


Figure 6-11

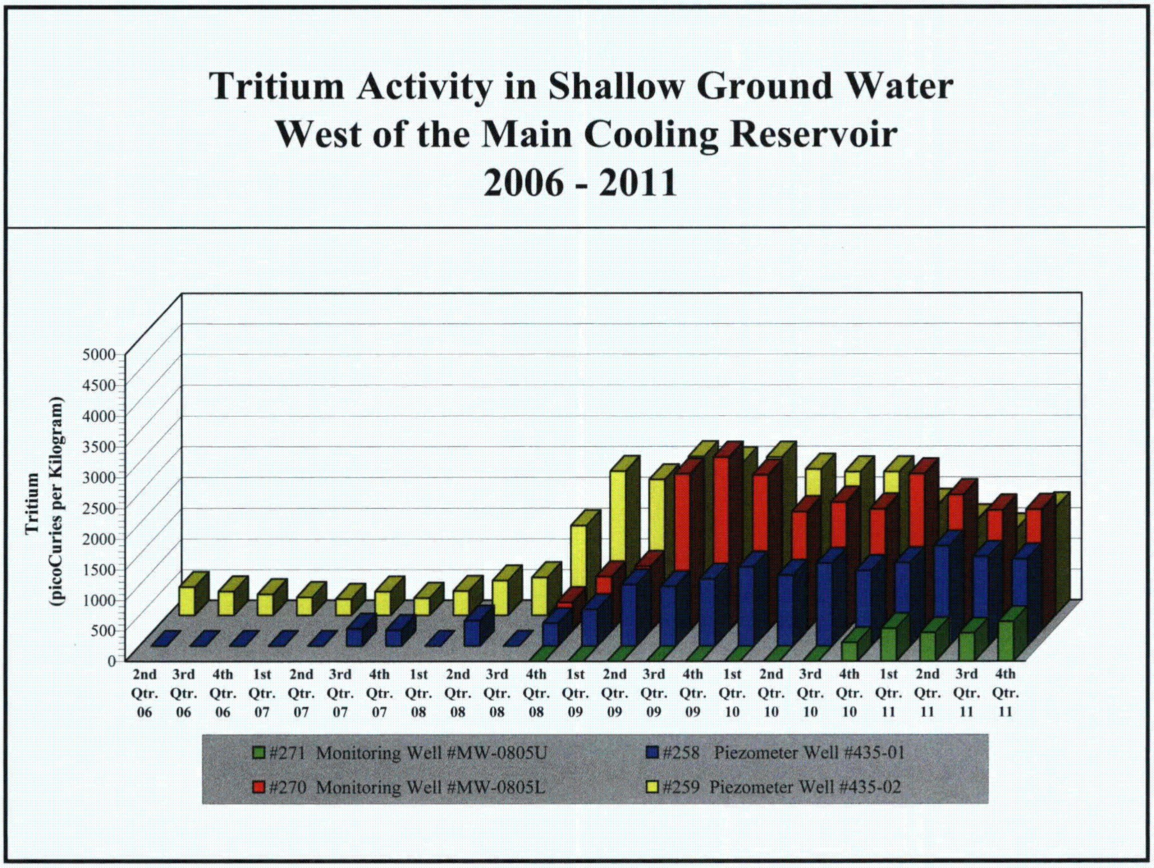


Figure 6-12

Photo By: Sherrie Deen

LAND USE CENSUS

The Annual Land Use Census is performed to determine if any changes have occurred in the location of residents and the use of the land within five miles of the South Texas Project generating units. The information is used to determine whether any changes are needed in the Radiological Environmental Monitoring Program. The census is performed by contacting area residents and local government agencies that provide the information. In addition, a survey is performed to verify the nearest residents within five miles of the South Texas Project generating units in each of 16 sectors. The results of the survey indicated no changes for 2011. The eleven sectors that have residents within five miles and the distance to the nearest residence in each sector are listed below.

SECTOR	DISTANCE (MILES)	LOCATION
ENE	4.5	CR 232 (Ryman Rd)
ESE	3.5	Selkirk Island
SE	3.5	Selkirk Island
SW	4.5	CR 386 (Corporon Rd)
SSW	4.5	CR 391 (Robbins Slough Rd.)
WSW	2.5	FM 521
W	4.5	FM 1095
WNW	4.5	CR 356 (Ashby-Buckeye Road)
NW	4.5	CR 354 (Mondrik Road)
NNW	3.0	Runnells Ranch – FM 1468
N	3.0	Runnells Ranch – FM 1468

The following items of interest were noted during the census:

- Colorado River water from below the Bay City Dam has not been used to irrigate crops.

- There were no identified commercial vegetable farms located within the five mile zone.

- No commercial dairy operates within Matagorda County and there is no source of milk within the five mile zone.

- Two commercial fish farms continue to operate. One is two miles west of the plant near FM 521, and the second is between four to five miles southwest of the plant located in the area north of Robbins Slough Road and east of South Citrus Road. The water supply, deep aquifer wells and Lower Colorado River Authority irrigation water, for the ponds is not affected by the operations of the South Texas Project generating units.

- Broadleaf vegetation sampling is performed at the site boundary in the three most frequent downwind sectors and at a control location in lieu of a garden census. The broadleaf vegetation samples taken satisfy the milk collection requirement when milk samples are not available.

QUALITY ASSURANCE

Quality assurance encompasses planned and systematic actions to ensure that an item or facility will perform satisfactorily. Reviews, surveillance, and audits have determined that the programs, procedures and personnel are adequate and perform satisfactorily.

Quality audits and independent technical reviews help to determine areas that need attention and re-evaluation. Areas that need attention are addressed in accordance with the station's Corrective Action Program.

The measurement capabilities of the Radiological Laboratory are demonstrated by participating in an inter-laboratory measurement assurance program as well as duplicate and split sample analyses. A total of approximately 10% of the analyses performed are quality control samples consisting of inter-laboratory measurement assurance program samples, duplicate samples, and split samples.

The inter-laboratory measurement assurance program provides samples that are similar in matrix and size to those measured by the Radiological Environmental Monitoring Program. This

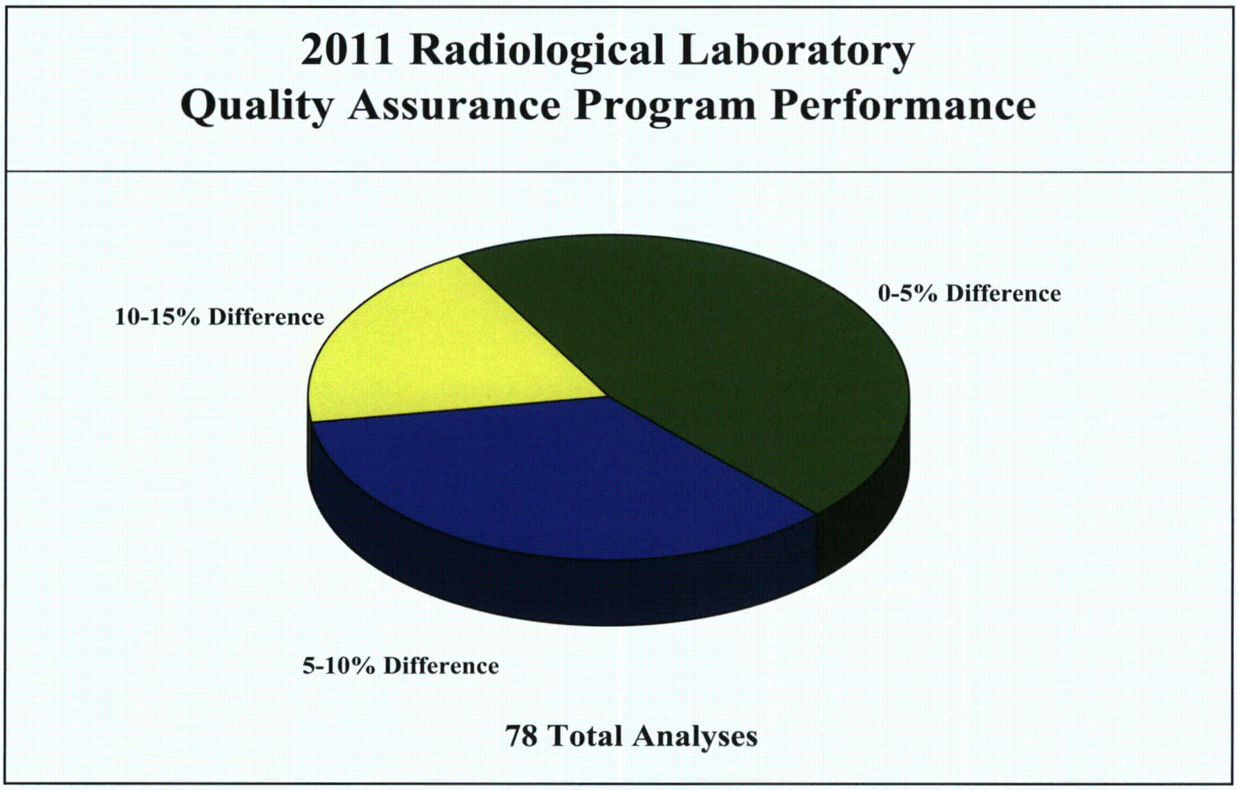


Figure 6-13

program assures that equipment calibrations and sample preparation methods accurately measure radioactive material in samples. Figure 6-13 summarizes the results of the inter-laboratory comparison programs.

Duplicate sampling of the environment allows the STP Nuclear Operating Company to estimate the repeatability of the sample collection, preparation, and analysis process. Splitting samples allows estimation of the precision and bias trends of the method of analysis without the added variables introduced by sampling. Generally, two samples split from the same original sample material should agree better than two separate samples collected in the same area and time period. Figure 6-14 shows the fraction of duplicate and split sample pairs that agreed with less than a 0.5% chance that any disagreement was due to chance alone.

Figure 6-14 depicts how results agreed for the 114 samples with detected radioactive material found in 258 duplicate or split samples collected from the same location in 2011. Historically, duplicate/split samples agreed 95% of the time. In 2011, 91.5% of the samples were in agreement at the 99.5% confidence interval. New-style air monitoring equipment tested in 2011 may have reduced air alpha measurement agreement from the historical average.

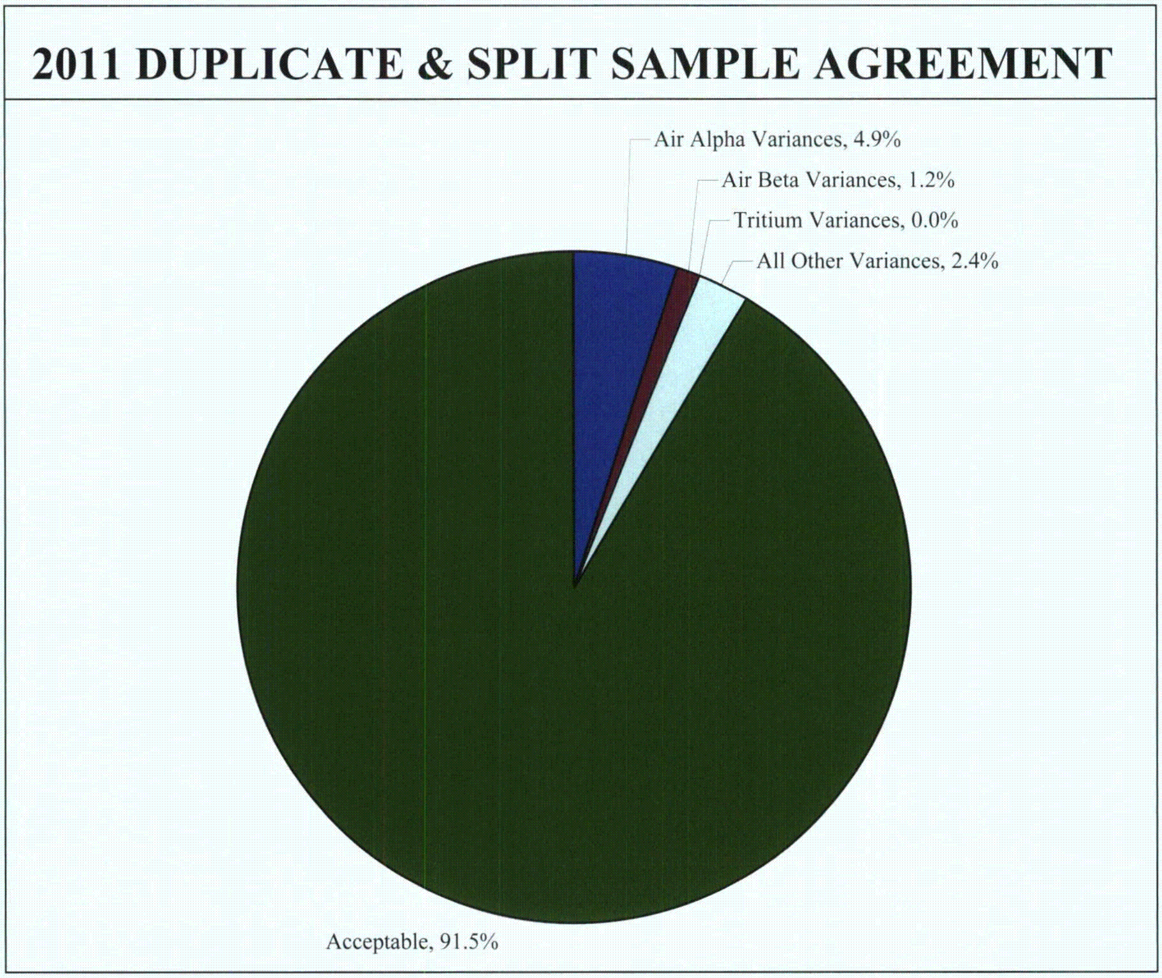


Figure 6-14

PROGRAM DEVIATIONS

In addition to measurement accuracy, radiochemical measurements must meet sensitivity requirements at the Lower Level of Detection for environmental samples. Deviations from the sampling program or sensitivity requirements must be acknowledged and explained in this report. During 2011 the following samples were not collected or were unacceptable for analysis:

- Twenty six out of thirty-six required broadleaf vegetation samples were not collected from January through December due to seasonal unavailability, extreme drought conditions, and destruction from wild hogs. Electric fencing has been installed to help prevent future destruction from wild hogs.

- One (Station # 266) out of twenty ground water samples was not collected due to drought conditions.

The minimum Radiological Environmental Monitoring Program is presented in Table 1. The table is organized by exposure pathway. Specific requirements such as location, sampling method, collection frequency, and analyses are given for each pathway.

NEI GROUNDWATER PROTECTION INITIATIVE

Nuclear industry events involving tritium prompted the station to sample groundwater in the shallow aquifer near the nuclear plants in 2005. Some samples indicated the presence of tritium, but all were at concentrations below the Environmental Protection Agency drinking water limit of 20,000 pCi/kg.

In 2007, the Nuclear Energy Institute established a standard for monitoring and reporting radioactive isotopes in groundwater titled "NEI Groundwater Protection Initiative", NEI 07-07. The station implemented the recommendations of this industry standard and has broadened the groundwater monitoring program to include samples collected near the nuclear plants. Some of the positive results of this broadened monitoring program likely reflect tritium associated with the Main Cooling Reservoir.

Wells near the nuclear plants are sampled semiannually, annually or once every five years depending on the concentration of tritium anticipated and the location of the wells. The following table contains the 2011 results along with the historical high prior to 2011 for each station since sampling began in 2006 and their locations are shown in Figure 6-15.

Sample Station	2011 Measurements (pCi/liter)	Historical High (pCi/liter)
801	780	1152
807	1300	15300
808	990	2858
809	315	less than 300
811	995	274
815	275	321
816	378	971
821	549	386
836	991	3324

Two wells sampled quarterly (807 and 808) are adjacent to where a pipe was broken and repaired several years ago. The tritium concentration at these two wells continued to decrease in 2011 as it has for the last four years. Well 809 became positive recently and the source of that tritium is also likely to be related to the previously referenced pipe break and subsequent repair. Well #836 has always been positive but has been decreasing from its peak concentration several years ago. All the other wells sampled in 2011 that had detectable tritium are influenced by groundwater originating in the Main Cooling Reservoir. Their concentrations remain in the range of groundwater tritium concentrations associated with the Main Cooling Reservoir. All the 2011 measurements of tritium in groundwater are a small fraction of the United States Environmental Protection Agency drinking water limit (20,000 pCi/liter).

Following the transport of a reactor head package to a temporary radiologically controlled area in 2011, a heavy rain storm soaked the package. Following the storm, water was noticed leaking from the head packaging to the ground. The soil and gravel were removed to remediate the areas affected. No ground water remediation was required. Information regarding the leaking rainwater and subsequent response was documented in the station's Correction Action Program. The evaluation identified no release via a credible pathway, no radioactive material was released offsite, and there was no impact to the drinking water or the health and safety of the public.

STP PROTECTED AREA GROUND WATER MONITORING WELLS

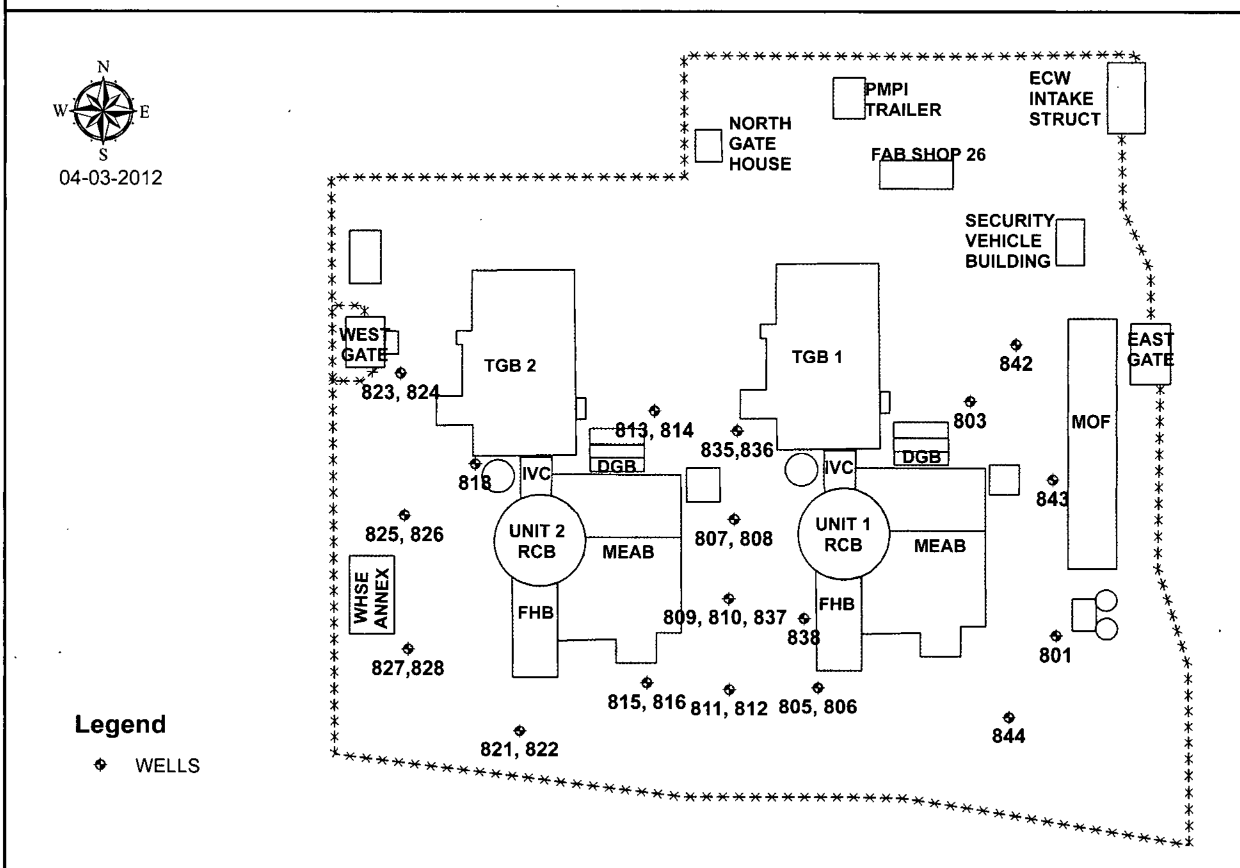


Figure 6-15

FUKUSHIMA DAIICHI

On March 11, 2011, a large earthquake followed by a tsunami inundated the Fukushima Daiichi nuclear power station in Japan. This radiological event released radioactive material into the atmosphere. During March and April of 2011 airborne radioactive material was detected at South Texas Project air sample stations, including the control station located greater than 10 miles from the South Texas Project. Numerous other North American nuclear power stations also measured similar concentrations of radioactive material during these two months following the incident at Fukushima Daiichi.

Air particulate and air iodine samples were obtained as part of our normal continuous air samples which are collected and counted on a weekly routine. The air sample stations measured low levels of Iodine-131 and Cesium-137 from March 22 to April 19, 2011. The highest Iodine-131 weekly air sample concentration was 0.1 pCi/m^3 and was measured at three different locations (#15, #18, and #35) on March 29, 2011. All air sample stations measured Iodine-131 during this period of time.

Additional daily air samples were also measured for informational purposes as part of a United States Environmental Protection Agency study in response to the Japanese nuclear event at Fukushima. The highest daily measurement at STP for Iodine-131 was 0.27 pCi/m^3 detected on March 24, 2011.

Air samples that indicated Iodine-131 or Cesium-137 are attributed to the Fukushima Daiichi event and not to operations at the South Texas Project. The low levels of airborne radioactive material posed no health risk to the residents near the South Texas Project, but the Fukushima Daiichi event did allow the station to demonstrate the capability to detect ultra-low concentrations of airborne radioactive material originating as far away as Japan.

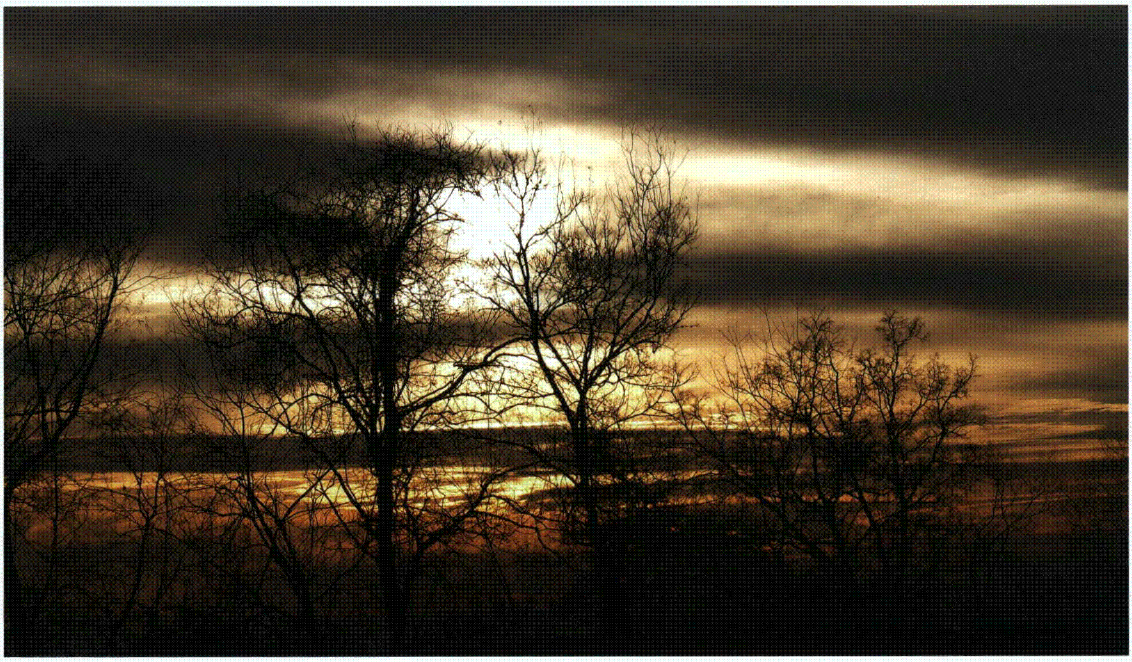


Photo By: Jodie Jankauskas

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE: **DIRECT RADIATION** 40 TOTAL SAMPLING STATIONS

Sample Media, Number, Approximate Location and Distance of Sample Stations from Containment.	Routine Sampling Mode	Sampling and Collection Frequency	Analysis Type	Minimum Analysis Frequency
Exposure Media: TLD 16- Located in all 16 meteorological sectors, 0.2* to 4 miles. 16- Located in all 16 meteorological sectors, 2 to 7 miles. 6- Located in special interest areas (e.g. school, population centers), within 14 miles. 2- Control stations located in areas of minimal wind direction (WSW,ENE), 10-16 miles.	Continuously	Quarterly	Gamma dose	Quarterly

* The inner ring of stations in the southern sectors are located within 1 mile because of the main cooling reservoir

EXPOSURE: **AIRBORNE** 5 TOTAL SAMPLING STATIONS

Sample Media, Number, Approximate Location, and Distance of Sample Stations from Containment.	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Charcoal and Particulate Filters 3- Located at the exclusion zone, N, NNW, NW Sectors, 1 mile. 1- Located in Bay City, 14 miles. 1- Control Station, located in a minimal wind direction (WSW), 10 miles.	Continuous sampler operations	Weekly or more frequently if required by dust loading	Radioiodine Canister: I-131 Particulate Sampler: Gross Beta Activity Gamma-Isotopic of composite (by location)	Weekly Following filter change Quarterly

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continue)

EXPOSURE: **WATERBORNE** 13 TOTAL SAMPLING STATIONS

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Surface				
1- Located in MCR at the MCR blowdown structure. 1- Located above the site on the Colorado River not influenced by plant discharge (control). 1- Located downstream from blow down entrance into the Colorado River.	Composite sample over a 1 month period (grab if not available)	Monthly	Gamma-Isotopic Tritium	Monthly Quarterly Composite
Ground				
5- Located in wells used to monitor tritium migration in the shallow aquifer.	Grab	Quarterly	Gamma-Isotopic & Tritium	Quarterly

EXPOSURE: **WATERBORNE** (CONTINUED)

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Drinking Water				
1- Located on site. * 1- Located at a control station.	Grab	Monthly	Gross Beta & Gamma-Isotopic	Monthly
			Tritium	Quarterly Composites
Sediment	Grab	Semiannually	Gamma-Isotopic	Semiannually
1- Located above the site on the Colorado River, not influenced by plant discharge. 1- Located downstream from blowdown entrance into the Colorado River. 1- Located in MCR.				

* No municipal water systems are affected by STP. This sample taken from deep aquifer supplying drinking water to employees while at work.

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continue)

EXPOSURE: **INGESTION** 7 TOTAL SAMPLING STATIONS

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Milk *	Grab	Semi-monthly when animals are on pasture; monthly at other times.	Gamma-Isotopic And Low Level I-131	Semi-monthly when animals are on pasture; monthly at other times.
Broadleaf Vegetation** 2- Located at the exclusion zone, N, NW, or NNW sectors. 1- Located in a minimal wind direction.	Grab	Monthly during growing season (When available)	Gamma-Isotopic	As collected

* Limited source of sample in vicinity of the South Texas Project. (Attempts will be made to obtain samples when available.)

** Three different kinds of broadleaf vegetation are to be collected over the growing season, not each collection period.

EXPOSURE: **INGESTION** (continued)

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Fish and Invertebrates (edible portions) 1- Representing commercially or recreational important species in vicinity of STP that maybe influenced by plant operation. 1- Same or analogous species in area not influenced by STP. 1- Same or analogous species in the MCR.	Grab	Sample semi-annually	Gamma-Isotopic on edible portions	As collected
Agricultural Products *	Grab	At time of harvest	Gamma-Isotopic Analysis in edible portion	As collected
Domestic Meat 1- Represents domestic stock fed on crops grown exclusively within 10 miles of the plant.	Grab	Annually	Gamma-Isotopic	As collected

* No sample stations have been identified in the vicinity of the site. Presently no agricultural land is irrigated by water into which liquid plant wastes will be discharged. Agricultural products will be considered if these conditions change.

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

AI	AIRBORNE RADIOIODINE	L6	COLLARD GREENS
AP	AIRBORNE PARTICULATE	L7	MUSTARD GREENS
B1	RESIDENT DABBLER DUCK	M1	BEEF MEAT
B2	RESIDENT DIVER DUCK	M2	POULTRY MEAT
B3	MIGRATORY DABBLER DUCK	M3	WILD SWINE
B4	MIGRATORY DIVER DUCK	M4	DOMESTIC SWINE
B5	GOOSE	M5	EGGS
B6	DOVE	M6	GAME DEER
B7	QUAIL	M7	ALLIGATOR
B8	PIGEON	M8	RABBIT
CC	CRUSTACEAN CRAB	OY	OYSTER
CS	CRUSTACEAN SHRIMP	SO	SOIL
DR	DIRECT RADIATION	S1	SEDIMENT - SHORELINE
F1	FISH - PISCIVOROUS	S2	SEDIMENT - BOTTOM
F2	FISH - CRUSTACEAN & INSECT FEEDERS	VB	ANY COMBINATION OF BROADLEAF SAMPLES (L1 thru L7)
F3	FISH - PLANKTIVORES & DETRITUS FEEDERS	VP	PASTURE GRASS
L1	BANANA LEAVES	WD	DRINKING WATER
L2	CANA LEAVES	WG	GROUND WATER
L4	TURNIP GREENS	WR	RAIN WATER
L5	CABBAGE	WS	SURFACE WATER
		WW	RELIEF WELL WATER

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR AI AP VB VP SO	001	1 mile N	FM 521
DR	002	1 mile NNE	FM 521
DR	003	1 mile NE	FM 521
DR	004	1 mile ENE	FM 521
DR	005	1 mile E	FM 521
DR AI AP SO	006	3.5 miles ESE	Site near Reservoir Makeup Pumping Facility
DR	007	3.5 miles SE	MCR Dike
DR	008	0.25 mile SSE	MCR Dike
DR	009	0.25 mile S	MCR Dike
DR	010	0.25 mile SSW	MCR Dike
DR	011	0.5 mile SW	MCR Dike
DR	012	1.5 mile WSW	MCR Dike
DR	013	1.5 mile W	FM 521
DR	014	1.5 mile WNW	FM 521
DR AI AP VB SO VP	015	1 mile NW	FM 521
DR AI AP VB SO VP	016	1 mile NNW	FM 521
DR	017	6.5 miles N	Buckeye - FM 1468
DR AI AP SO	018	5.5 miles NNE	OXEA Corp. - FM 3057
DR	019	5.5 miles NE	FM 2668

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.

* - Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR	020	5 miles ENE	FM 2668 & FM 2078
DR	021	5 miles E	FM 521 & FM 2668
DR	022	7 miles E	Lyondell Chemical Plant
DR	023 *	16 miles ENE	Intersection of FM 521 and FM 2540
DR	024	4 miles SSE	MCR Dike
DR	025	4 miles S	MCR Dike
DR	026	4 miles SSW	MCR Dike
DR	027	2.5 miles SW	MCR Dike
DR	028	5 miles WSW	FM 1095 & Ellis Road
DR SO	029	4.5 miles W	FM 1095
DR	030	6 miles WNW	Tres Palacios Oaks, FM 2853
DR	031	5.5 miles NW	Wilson Creek Road
DR	032	3.5 miles NNW	FM 1468
DR AI AP SO	033	14 miles NNE	Microwave Tower at end of Kilowatt Road in Bay City
DR	034	7.5 miles ENE	Wadsworth Water Supply Pump Station
DR AI AP SO	035	8.5 miles SSE	Matagorda
DR	036	9 miles WSW	College Port
DR AI AP VB VP SO	037*	10 miles WSW	Palacios AEP Substation
DR	038	10.5 miles NW	AEP Substation on TX 71 near Blessing

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.

* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR AI AP SO	039	9 miles NW	TX 35 under High Voltage Power lines near Tidehaven High School
DR	040	4.5 miles SW	Citrus Grove
DR	041	2.0 miles ESE	MCR Dike
DR	042	8.5 miles NW	FM 459 at Tidehaven Intermediate School
DR	043	4.5 miles SE	Site boundary at blowdown outlet
WG	205	4.0 miles SE	Piezometer Well #446A, 40' deep
WG	206	4.0 miles SE	Piezometer Well #446, 78' deep
WS	209	2 miles ESE	Kelly Lake
WD	210	On Site	Approved drinking water supply from STP
WS S1	211	3.5 miles S	Site, E. Branch Little Robbins Slough
WS S1	212	4 miles S	Little Robbins Slough
WS S1	213	4 miles SE	West Branch Colorado River
F (1,2, or 3) CC	214	2.5 miles SE	MCR at Makeup Water Discharge
S2	215	0.5 mile SW	MCR at Circulating Water Discharge
WS S2	216	3.5 miles SSE	MCR at blowdown structure
WS S(1 or 2) F(1,2 OR 3)	217	7-9 miles SSE	Region 1 (mouth of the Colorado River to marker 1)
F (1, 2, or 3) CC CS OY	222	>10 miles	West Matagorda Bay
WS S(1 or 2)	227	5-6 miles SE	West bank of Colorado River downstream of STP across from channel marker #22
WD	228*	14 miles NNE	Le Tulle Park public water supply
WS S1	229	2.3 miles ESE	Drainage ditch north of the reservoir that empties into Colorado River upstream of the reservoir makeup pumping facility
S(1 or 2)	230	3.5 miles ESE	Colorado River at point where drainage ditch (#229) empties into it

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.

* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
S(1 or 2) WS	233	4.5 miles SE	Colorado River where MCR blowdown discharge channel empties into it.
WG	235	3.8 miles S	Well B-3 directly south from MCR
B8	236	N/A	STP Protected Area
WS	237	3.7 miles SSE	Blowdown discharge channel from MCR
S(1 or 2) WS	242*	>10 miles N	Colorado River where it intersects Highway 35
WS	243*	>10 miles N	Colorado River upstream of Bay City Dam at the Lower Colorado River Authority pumping station
WG	245	4.5 miles SSE	Water well approximately 60' deep located on private property about 0.5 miles south of MCR
WS	247	<1 mile E	Essential Cooling Pond
F(1,2, or 3)	249*	N/A	Control sample purchased from a local retailer
SO	250	0.75 miles NW	Sewage sludge land farming area
WG	251	4.0 miles SSE	Test Well B-4, upper aquifer
WG	255	4.2 miles SE	Piezometer Well # 415 110' deep
WG	256	2.8 miles ESE	Piezometer Well # 417 100' deep
WG	257	3.9 miles SSW	Piezometer Well # 421-02, 80' deep 1.1 miles down STP Road from Well # 258 approximately 20' inside east fence (site boundary)
WG	258	2.9 miles SW	Piezometer Well # 435-01, 1.5 miles down STP Road from HWY 521 along east fence (site boundary)
WG	259	2.9 miles SW	Piezometer Well # 435-02, 1.5 miles down STP Road from HWY 521 20' east of fence (site boundary)
WG	260	3.7 miles S	Piezometer Well # 437, 74' deep
WG	263	3.2 miles ESE	Piezometer Well # 447, 104' deep

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
WG	264	3.2 miles ESE	Piezometer Well # 447A , 46' deep
WG	266	0.68 miles NW	Piezometer Well # 602A, 40' deep
WG	267	2.7 miles ESE	Windmill north of Heavy Haul Road
WG	268	3.0 miles SE	Windmill west of MCR
WG	269	4.2 miles SSE	Windmill south of STP owner contolled area on private land
WG	270	2.9 miles SW	Monitoring Well # MW-0805L, depth 49'
WG	271	2.9 miles SW	Monitoring Well # MW-0805U, depth 33'
F(1, 2, or 3) CC S2	301-356	S	STP Main Cooling Reservoir
WW	701	4 miles S	MCR Relief Well # 440
WS	Q01	N/A	Quarterly composite of station #227 and/or alternate #233
WS	Q02	N/A	Quarterly composite of station #243 and/or alternate #242

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

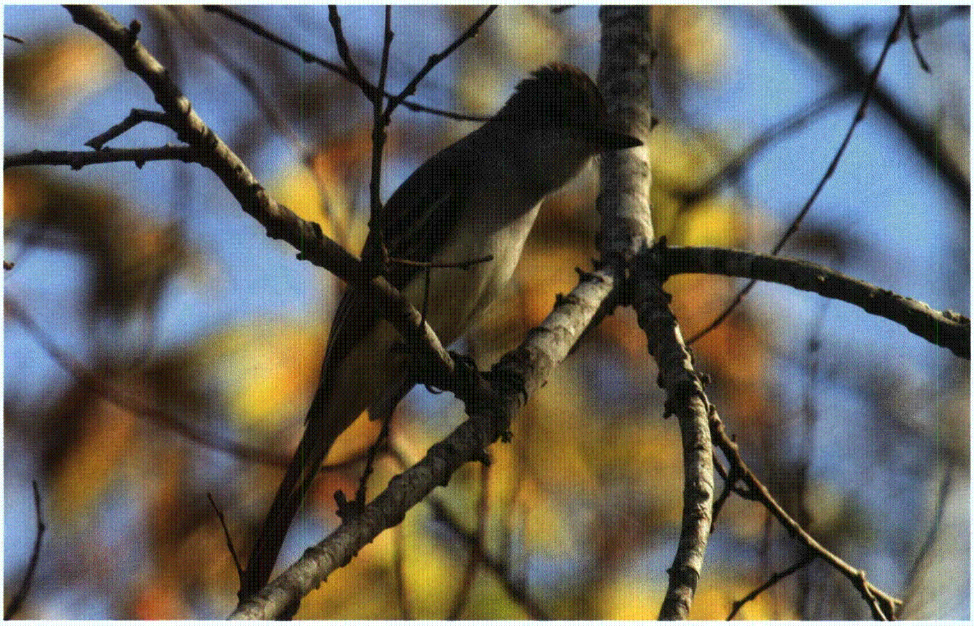


Photo By: Mark Scheuerman

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

A summary of all required samples is given in Table 3. The table has been formatted to resemble a United States Nuclear Regulatory Commission industry standard. Modifications have been made for the sole purpose of reading ease. Only positive values are given in this table.

Media type is printed at the top left of each table, and the units of measurement are printed at the top right. The first column lists the type of radioactivity or specific radionuclide for which each sample was analyzed. The second column gives the total number of analyses performed and the total number of non-routine analyses for each indicated nuclide. A non-routine measurement is a sample whose measured activity is greater than the reporting levels for Radioactivity Concentrations in Environmental Samples. The "LOWER LIMIT OF DETECTION" column lists the normal measurement sensitivities achieved. The sensitivities were better than required by the Nuclear Regulatory Commission.

A set of statistical parameters is listed for each radionuclide in the remaining columns. The parameters contain information from the indicator locations, the location having the highest annual mean, and information from the control stations. Some sample types do not have control stations. When this is the case, "no samples" is listed in the control location column. For each of these groups of data, the following is calculated:

- The mean positive values.
- The number of positive measurements / the total number of analyses.
- The lowest and highest values for the analysis.

The data placed in the table are from the samples listed in Table 1. Additional thermoluminescent dosimeters were utilized each quarter for quality control purposes. The minimum samples required by Table 1 were supplemented in 2011 by 15 direct radiation measurements, eight surface water samples for gamma analysis, one additional ground water samples, two drinking water samples, four rain water samples, and four sediment shoreline samples. Fish and crustacean samples vary in number according to availability but also exceeded the minimum number required by Table 1.

Photo By: Kim Danielski

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Direct Radiation | Units: MilliRoentgen/Standard Quarter

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gamma	175/ 0	---	1.4E+01 (167/ 167) (1.1E+01 - 2.9E+01)	0.25 miles S (#009)	2.0E+01 (4 / 4) (1.4E+01 - 2.9E+01)	1.5E+01 (8 / 8) (1.3E+01 - 1.8E+01)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Airborne Particulate & Radioiodine | Units: PicoCuries per Cubic Meter

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gross Beta	260/ 0	1.4E-03	2.2E-02 (208 / 208) (7.5E-03 - 4.1E-02)	1 mile NNW (#016)	2.2E-02 (52 / 52) (8.7E-03 - 4.0E-02)	2.2E-02 (52 / 52) (9.2E-03 - 4.0E-02)
Iodine-131	260/ 0	1.4E-02	4.5E-02 (15 / 208) (4.7E-03 - 1.1E-01)	1 mile NNW (#016)	5.1E-02 (4 / 52) (8.2E-03 - 9.9E-02)	4.2E-02 (4 / 52) (5.6E-03 - 9.3E-02)
Cesium-134	20/ 0	5.3E-04	--- (0 / 16)	---	---	--- (0 / 4)
Cesium-137	20/ 0	5.1E-04	1.6E-04 (1 / 16) (1.6E-04 - 1.6E-04)	14 miles NNE (#033)	1.6E-04 (1 / 4) (1.6E-04 - 1.6E-04)	--- (0 / 4)
Manganese-54	20/ 0	5.7E-04	--- (0 / 16)	---	---	--- (0 / 4)
Iron-59	20/ 0	2.5E-03	--- (0 / 16)	---	---	--- (0 / 4)
Cobalt-58	20/ 0	8.6E-04	--- (0 / 16)	---	---	--- (0 / 4)
Cobalt-60	20/ 0	5.5E-04	--- (0 / 16)	---	---	--- (0 / 4)
Zinc-65	20/ 0	1.4E-03	--- (0 / 16)	---	---	--- (0 / 4)
Zirconium-95	20/ 0	1.6E-03	--- (0 / 16)	---	---	--- (0 / 4)
Niobium-95	20/ 0	9.3E-04	--- (0 / 16)	---	---	--- (0 / 4)
Lanthanum-140 Barium-140	20/ 0	1.2E-02	--- (0 / 16)	---	---	--- (0 / 4)

† Number of positive measurements / total measurements at specified locations.

Photo By: Kristy Moss

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Surface Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	12/ 0	1.9E+02	+1.4E+04 (4/ 8) (+1.3E+04 - +1.5E+04)	3 miles SSE (#216)	+1.4E+04 (4/ 4) (+1.3E+04 - +1.5E+04)	--- (0/ 4)
Iodine-131	44/ 0	5.6E+00	--- (0/ 30)	---	---	--- (0/ 14)
Cesium-134	44/ 0	1.9E+00	--- (0/ 30)	---	---	--- (0/ 14)
Cesium-137	44/ 0	2.1E+00	--- (0/ 30)	---	---	--- (0/ 14)
Manganese-54	44/ 0	2.0E+00	--- (0/ 30)	---	---	--- (0/ 14)
Iron-59	44/ 0	4.9E+00	--- (0/ 30)	---	---	--- (0/ 14)
Cobalt-58	44/ 0	2.1E+00	--- (0/ 30)	---	---	--- (0/ 14)
Cobalt-60	44/ 0	2.1E+00	--- (0/ 30)	---	---	--- (0/ 14)
Zinc-65	44/ 0	4.5E+00	--- (0/ 30)	---	---	--- (0/ 14)
Zirconium-95	44/ 0	3.8E+00	--- (0/ 30)	---	---	--- (0/ 14)
Niobium-95	44/ 0	2.2E+00	--- (0/ 30)	---	---	--- (0/ 14)
Lanthanum-140 Barium-140	44/ 0	5.1E+00	--- (0/ 30)	---	---	--- (0/ 14)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Ground Water *(On site test well)* — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	21/ 0	1.7E+02	3.9E+03 (14 / 21) (1.4E+03 - 6.2E+03)	4.0 miles SSE (#251)	6.0E+03 (5/ 5) (5.7E+03 - 6.2E+03)	no samples
Iodine-131	21/ 0	3.3E+00	--- (0/ 21)	---	---	no samples
Cesium-134	21/ 0	2.8E+00	--- (0/ 21)	---	---	no samples
Cesium-137	21/ 0	2.8E+00	--- (0/ 21)	---	---	no samples
Manganese-54	21/ 0	2.6E+00	--- (0/ 21)	---	---	no samples
Iron-59	21/ 0	5.3E+00	--- (0/ 21)	---	---	no samples
Cobalt-58	21/ 0	2.6E+00	--- (0/ 21)	---	---	no samples
Cobalt-60	21/ 0	2.7E+00	--- (0/ 21)	---	---	no samples
Zinc-65	21/ 0	7.0E+00	--- (0/ 21)	---	---	no samples
Zirconium-95	21/ 0	4.5E+00	--- (0/ 21)	---	---	no samples
Niobium-95	21/ 0	2.8E+00	--- (0/ 21)	---	---	no samples
Lanthanum-140 Barium-140	21/ 0	3.9E+00	--- (0/ 21)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Drinking Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN: LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN: MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gross Beta	26/ 0	9.5E-01	2.0E+00 (13 / 13) (1.7E-03 - 4.0E+00)	14 miles NNE (#228)	6.2E+00 (13 / 13) (5.9E-03 - 1.0E+01)	6.2E+00 (13 / 13) (5.9E-03 - 1.0E+01)
Hydrogen-3	8/ 0	2.8E+02	--- (0/ 4)	---	---	--- (0/ 4)
Iodine-131	26/ 0	3.9E+00	--- (0/ 13)	---	---	--- (0/ 13)
Cesium-134	26/ 0	2.7E+00	--- (0/ 13)	---	---	--- (0/ 13)
Cesium-137	26/ 0	2.7E+00	--- (0/ 13)	---	---	--- (0/ 13)
Manganese-54	26/ 0	2.5E+00	--- (0/ 13)	---	---	--- (0/ 13)
Iron-59	26/ 0	5.5E+00	--- (0/ 13)	---	---	--- (0/ 13)
Cobalt-58	26/ 0	2.7E+00	--- (0/ 13)	---	---	--- (0/ 13)
Cobalt-60	26/ 0	2.7E+00	--- (0/ 13)	---	---	--- (0/ 13)
Zinc-65	26/ 0	6.7E+00	--- (0/ 13)	---	---	--- (0/ 13)
Zirconium-95	26/ 0	4.5E+00	--- (0/ 13)	---	---	--- (0/ 13)
Niobium-95	26/ 0	2.8E+00	--- (0/ 13)	---	---	--- (0/ 13)
Lanthanum-140 Barium-140	26/ 0	4.4E+00	--- (0/ 13)	---	---	--- (0/ 13)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Rain Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN: LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN: MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	4/ 0	2.9E+02	--- (0/ 4)	---	---	no samples
Iodine-131	4/ 0	6.8E+00	--- (0/ 4)	---	---	no samples
Cesium-134	4/ 0	2.3E+00	--- (0/ 4)	---	---	no samples
Cesium-137	4/ 0	2.3E+00	--- (0/ 4)	---	---	no samples
Manganese-54	4/ 0	2.2E+00	--- (0/ 4)	---	---	no samples
Iron-59	4/ 0	5.5E+00	--- (0/ 4)	---	---	no samples
Cobalt-58	4/ 0	2.4E+00	--- (0/ 4)	---	---	no samples
Cobalt-60	4/ 0	2.4E+00	--- (0/ 4)	---	---	no samples
Zinc-65	4/ 0	5.1E+00	--- (0/ 4)	---	---	no samples
Zirconium-95	4/ 0	4.3E+00	--- (0/ 4)	---	---	no samples
Niobium-95	4/ 0	2.4E+00	--- (0/ 4)	---	---	no samples
Lanthanum-140 Barium-140	4/ 0	6.0E+00	--- (0/ 4)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Sediment-Shoreline — Units: PicoCuries per Kilogram dry weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	4/ 0	2.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cesium-137	4/ 0	1.8E+01	2.2E+01 (1/ 2) (2.2E+01 - 2.2E+01)	6 miles SE (#227)	2.2E+01 (1/ 2) (2.2E+01 - 2.2E+01)	--- (0/ 2)
Manganese-54	4/ 0	2.2E+01	--- (0/ 2)	---	---	--- (0/ 2)
Iron-59	4/ 0	8.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-58	4/ 0	3.0E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-60	4/ 0	2.2E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zinc-65	4/ 0	6.7E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zirconium-95	4/ 0	5.9E+01	--- (0/ 2)	---	---	--- (0/ 2)
Niobium-95	4/ 0	3.6E+01	--- (0/ 2)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	4/ 0	3.2E+02	--- (0/ 2)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Sediment-Bottom — Units: PicoCuries per Kilogram dry weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	6/ 0	2.9E+01	--- (0/ 6)	---	---	no samples
Cesium-137	6/ 0	4.7E+00	8.3E+01 (5/ 6) (2.9E+01 - 1.5E+02)	1 mile SW (#215)	1.1E+02 (3/ 3) (6.5E+01 - 1.5E+02)	no samples
Manganese-54	6/ 0	2.6E+01	--- (0/ 6)	---	---	no samples
Iron-59	6/ 0	9.0E+01	--- (0/ 6)	---	---	no samples
Cobalt-58	6/ 0	3.2E+01	--- (0/ 6)	---	---	no samples
Cobalt-60	6/ 0	8.1E+00	1.2E+02 (4/ 6) (1.4E+01 - 2.3E+02)	1 mile SW (#215)	2.2E+02 (2/ 3) (2.1E+02 - 2.3E+02)	no samples
Zinc-65	6/ 0	8.4E+01	--- (0/ 6)	---	---	no samples
Zirconium-95	6/ 0	6.4E+01	--- (0/ 6)	---	---	no samples
Niobium-95	6/ 0	4.0E+01	--- (0/ 6)	---	---	no samples
Lanthanum-140 Barium-140	6/ 0	2.3E+02	--- (0/ 6)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Banana Leaves — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN † RANGE
				LOCATION INFORMATION	MEAN † RANGE	
Iodine-131	8/ 0	2.0E+01	--- (0/ 4)	---	---	--- (0/ 4)
Cesium-134	8/ 0	3.1E+00	--- (0/ 4)	---	---	--- (0/ 4)
Cesium-137	8/ 0	3.5E+00	--- (0/ 4)	---	---	--- (0/ 4)
Manganese-54	8/ 0	3.8E+00	--- (0/ 4)	---	---	--- (0/ 4)
Iron-59	8/ 0	1.5E+01	--- (0/ 4)	---	---	--- (0/ 4)
Cobalt-58	8/ 0	4.4E+00	--- (0/ 4)	---	---	--- (0/ 4)
Cobalt-60	8/ 0	4.8E+00	--- (0/ 4)	---	---	--- (0/ 4)
Zinc-65	8/ 0	1.3E+01	--- (0/ 4)	---	---	--- (0/ 4)
Zirconium-95	8/ 0	7.8E+00	--- (0/ 4)	---	---	--- (0/ 4)
Niobium-95	8/ 0	4.4E+00	--- (0/ 4)	---	---	--- (0/ 4)
Lanthanum-140 Barium-140	8/ 0	9.9E+00	--- (0/ 4)	---	---	--- (0/ 4)

† Number of positive measurements / total measurements at specified locations.

Photo By: Nancy Kubecka

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Collard Greens — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN † RANGE
				LOCATION INFORMATION	MEAN † RANGE	
Iodine-131	2/0	2.0E+01	--- (0/ 2)	---	---	no samples
Cesium-134	2/0	1.9E+00	--- (0/ 2)	---	---	no samples
Cesium-137	2/0	2.4E+00	--- (0/ 2)	---	---	no samples
Manganese-54	2/0	2.5E+00	--- (0/ 2)	---	---	no samples
Iron-59	2/0	1.1E+01	--- (0/ 2)	---	---	no samples
Cobalt-58	2/0	3.1E+00	--- (0/ 2)	---	---	no samples
Cobalt-60	2/0	3.2E+00	--- (0/ 2)	---	---	no samples
Zinc-65	2/0	8.4E+00	--- (0/ 2)	---	---	no samples
Zirconium-95	2/0	5.5E+00	--- (0/ 2)	---	---	no samples
Niobium-95	2/0	3.1E+00	--- (0/ 2)	---	---	no samples
Lanthanum-140 Barium-140	2/0	7.8E+00	--- (0/ 2)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Fish - Piscivorous — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN † RANGE
				LOCATION INFORMATION	MEAN † RANGE	
Cesium-134	4/0	3.6E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cesium-137	4/0	3.8E+01	--- (0/ 2)	---	---	--- (0/ 2)
Manganese-54	4/0	3.7E+01	--- (0/ 2)	---	---	--- (0/ 2)
Iron-59	4/0	9.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-58	4/0	3.8E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-60	4/0	4.0E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zinc-65	4/0	8.9E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zirconium-95	4/0	7.0E+01	--- (0/ 2)	---	---	--- (0/ 2)
Niobium-95	4/0	4.0E+01	--- (0/ 2)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	4/0	1.1E+02	--- (0/ 2)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Fish - Crustacean & Insect Feeders | Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN † RANGE
				LOCATION INFORMATION	MEAN † RANGE	
Cesium-134	7/ 0	3.6E+01	--- (0/ 7)	---	---	no samples
Cesium-137	7/ 0	3.7E+01	--- (0/ 7)	---	---	no samples
Manganese-54	7/ 0	3.4E+01	--- (0/ 7)	---	---	no samples
Iron-59	7/ 0	8.3E+01	--- (0/ 7)	---	---	no samples
Cobalt-58	7/ 0	3.5E+01	--- (0/ 7)	---	---	no samples
Cobalt-60	7/ 0	4.0E+01	--- (0/ 7)	---	---	no samples
Zinc-65	7/ 0	8.5E+01	--- (0/ 7)	---	---	no samples
Zirconium-95	7/ 0	6.3E+01	--- (0/ 7)	---	---	no samples
Niobium-95	7/ 0	3.6E+01	--- (0/ 7)	---	---	no samples
Lanthanum-140 Barium-140	7/ 0	8.1E+01	--- (0/ 7)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

Photo By: Kristy Moss

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Crustacean Shrimp — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	4/0	3.4E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cesium-137	4/0	3.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Manganese-54	4/0	3.2E+01	--- (0/ 2)	---	---	--- (0/ 2)
Iron-59	4/0	7.7E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-58	4/0	3.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-60	4/0	3.4E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zinc-65	4/0	7.6E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zirconium-95	4/0	6.1E+01	--- (0/ 2)	---	---	--- (0/ 2)
Niobium-95	4/0	3.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	4/0	1.0E+02	--- (0/ 2)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2011 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Beef Meat — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	2/0	3.1E+01	--- (0/ 2)	---	---	no samples
Cesium-137	2/0	3.3E+01	--- (0/ 2)	---	---	no samples
Manganese-54	2/0	3.1E+01	--- (0/ 2)	---	---	no samples
Iron-59	2/0	9.1E+01	--- (0/ 2)	---	---	no samples
Cobalt-58	2/0	3.9E+01	--- (0/ 2)	---	---	no samples
Cobalt-60	2/0	3.4E+01	--- (0/ 2)	---	---	no samples
Zinc-65	2/0	7.8E+01	--- (0/ 2)	---	---	no samples
Zirconium-95	2/0	7.0E+01	--- (0/ 2)	---	---	no samples
Niobium-95	2/0	3.9E+01	--- (0/ 2)	---	---	no samples
Lanthanum-140 Barium-140	2/0	1.7E+02	--- (0/ 2)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

Photo By: Kristy Moss

Photo By: Russell Kiesling

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