Enclosure B
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2014 Annual Environmental Operating Report (Non-Radiological)
(Report follows)

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FIRSTENERGY NUCLEAR OPERATING COMPANY

BEAVER VALLEY POWER STATION

2014 ANNUAL ENVIRONMENTAL OPERATING REPORT

NON-RADIOLOGICAL

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

BEAVER VALLEY POWER STATION
ENVIRONMENTAL & CHEMISTRY SECTION

Technical Report Approval

2014 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

(Non-Radiological)

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

Prepared by: **Cameron L. Lange** *(Via E-mail)* **Date: 2-26-15**

Prepared by: **William Cress** W M Cress **Date:** 4/16/15

Reviewed by: **Rebecca E. Novak** Rebecca Novak **Date:** 4/16/15

Approved by: **Donald J. Salera** Donald J Salera **Date:** 4-16-15

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This report is submitted in accordance with Section 5.4.1 of Appendix B: To Facility Operating License No. NPF-73, Beaver Valley Power Station Unit 2, Environmental Protection Plan (Non-Radiological). Beaver Valley Power Station (BVPS) is operated by FirstEnergy Nuclear Operating Company (FENOC). The Objectives of the Environmental Protection Plan (EPP) are to:

- Verify that the facility is operated in an environmentally acceptable manner, as established by the Final Environmental Statement-Operating License Stage (FES-OL) and other Nuclear Regulatory Commission (NRC) environmental impact assessments,
- Keep plant operations personnel appraised of changes in environmental conditions that may affect the facility,
- Coordinate NRC requirements and maintain consistency with other Federal, State, and local requirements for environmental protection, and
- Keep the NRC informed of the environmental effects of facility construction and operation and of actions taken to control those effects.

To achieve the objectives of the EPP, both FENOC and BVPS have written programs and procedures to comply with the EPP, protect the environment, and comply with governmental requirements primarily including the US Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP) requirements. Water quality matters identified in the Final Environmental Statements-Operating License Stage (FES-OL) are regulated under the National Pollutants Discharge Elimination System (NPDES) Permit No. PA0025615. Waste is regulated under EPA Identification No. PAR000040485. Attachment 10.1 contains a listing of permits and certificates for environmental compliance.

The BVPS programs and procedures include pre-work and pre-project environmental evaluations, operating procedures, pollution prevention and response programs procedures and plans, process improvement and corrective action programs, and human performance programs. Technical and managerial monitoring of tasks, operations, and other activities are performed. Any identified challenges, concerns, or questions are captured in the FENOC Problem Identification and Resolution Program with a Condition Report. Condition Reports include investigations, cause determinations, and corrective actions.

During 2014 BVPS continued an Aquatic Monitoring Program to evaluate its potential impact on the New Cumberland Pool of the Ohio River, and to provide information on potential impacts to BVPS operation from macrofoulers such as Asian clams and zebra mussels.

1.2 SUMMARY AND CONCLUSIONS

There were no significant environmental events during 2014. During 2014 no significant changes to operations that could affect the environment were made at Beaver Valley Power Station. ***As in previous years, results of the BVPS environmental programs did not indicate any adverse environmental impacts from station operation.***

1.3 ANALYSIS OF SIGNIFICANT ENVIRONMENTAL CHANGE

During 2014, no significant changes were made at BVPS to cause significant negative affect on the environment.

1.4 AQUATIC MONITORING PROGRAM

The 2014 Beaver Valley Power Station (BVPS) Units 1 and 2 Non-Radiological Monitoring Program consisted of an Aquatic Program that included surveillance and field sampling of the Ohio River's aquatic life in the vicinity of the station. The Aquatic Program is an annual program conducted to provide baseline aquatic resources data, to assess the impact of the operation of BVPS on the aquatic ecosystem of the Ohio River, and to monitor for potential impacts of biofouling organisms (*Corbicula* and zebra mussels) on BVPS operations. This is the 39th year of operational environmental monitoring for Unit 1 and the 28th year for Unit 2. As in previous years, the results of the program did not indicate any adverse environmental impact to the aquatic life in the Ohio River associated with the operation of BVPS.

The results of the 2014 benthic macroinvertebrate survey conducted in May and September indicated a normal community structure exists in the Ohio River both upstream and downstream of the BVPS. These benthic surveys are a continuation of a Fate and Effects Study conducted from 1990 through 1992 for the PADEP to assess the ecosystem impacts of the molluscicides Betz Clamtrol CT-1, CT-2, and Nalco H130M that have been used to control biofouling organisms at BVPS. To date the results of the benthic studies have not indicated any impacts of operation at the BVPS including the use these biocides on the benthic community below the BVPS discharge.

Substrate was probably the most important factor influencing the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. The generally soft muck-type substrate along the shoreline found in 2014 and previous years was conducive to segmented worm (oligochaete) and midge fly larvae (chironomid) proliferation. Increased water clarity due at least in part to the establishment of zebra mussels was noted during 2014. This has increased the amount of submerged aquatic vegetation at Stations 1, 2B and 3. The presence of submerged aquatic vegetation can increase the number of species of macroinvertebrates, especially chironomids (midge flies) that use them as a primary food source. Sixty (60) macroinvertebrate taxa were identified during the 2014 monitoring program. In 2014 one new taxon was added to the cumulative list of macroinvertebrates collected near BVPS (Table 5.2). This was the chironomid (midge fly) *Cryptotendipes* sp. No state or Federal threatened or endangered macroinvertebrate species were collected during 2014.

In May and in September oligochaetes were the most frequently collected group of

macroinvertebrates. ***There were no major differences in the community structure between control and non-control stations that could be attributed to operation of BVPS. The overall community structure has changed little since pre-operational years, and program results did not indicate that BVPS operations were affecting the benthic community of the Ohio River.***

The fish community of the Ohio River near the BVPS was sampled in May (spring), July (summer), September (fall) and November (winter) of 2014 with electrofishing and seining. Since monitoring began in the early 1970's, the number of identified fish taxa has increased from 43 to 78 for the New Cumberland Pool.

In 2014, 186 fish representing 20 taxa were collected (i.e., handled) during BVPS surveys by electrofishing and seining. This was three fewer taxa but 62 more fish than collected in 2013. All taxa collected in 2014 were previously encountered at BVPS. A total of 138 fish, representing 15 taxa, was collected by electrofishing in 2014 compared to 85 fish representing 19 species in 2012. The number of fish collected in 2014 compares favorably with the total number collected in 2011 (151 fish), the last time electrofishing was collected at night. The number of species collected was, however, fewer than in 2011 when 22 species were encountered. A total of 48 fish representing eight (8) taxa was collected by seines in 2014 (Table 5.10) compared to 39 fish representing seven (7) taxa in 2013.

Benthivores (bottom feeders including suckers and buffalo) and forage species (e.g. gizzard shad and emerald shiners) were generally collected in the highest numbers in 2014. The numbers of forage fish were greater than those present in 2013, due largely to the large number of gizzard shad collected. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad and emerald shiner with high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size. This, in turn, influences their appearance in the sample populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community.

In 2014, the annual catch rate was 0.86 fish per minute. In 2014, the greatest seasonal catch rate occurred in spring (May) when the catch rate was 1.09 fish per minute. Gizzard shad and walleye contributed to the majority of this total. The lowest catch rate occurred in summer (July) with a rate of 0.64 fish per electrofishing minute. The annual catch rate in 2014 (0.86 fish per minute) was higher than 2013 (0.53) and 2012 (0.59) when electrofishing was also conducted during the day and comparable to 2011 (0.93) the last year electrofishing was conducted exclusively at night. The greater electrofishing rate in 2014 was due to the relatively large number of gizzard shad that were collected.

Little difference in the species composition of the catch was observed between the control (Station 1) and non-control (Stations 2A, 2B and 3) stations. Habitat preference and availability were probably the most important factors affecting where and when fish were collected. ***Results from the 2014 fish surveys indicated that a normal community structure for the Ohio River exists near BVPS based on species composition and relative abundance. In 2014, there was no indication of negative impact to the fish community in the Ohio River from the operation of***

BVPS.

The monthly reservoir Ponar samples collected in Units 1 and 2 cooling towers and the four samples collected at the intake during 2014 indicated that *Corbicula* were present in the Ohio River and entering the station. In 2014, six (6) settled live *Corbicula* were collected from the Unit 1 cooling tower basin during monthly reservoir sampling. In 2014, five (5) live settled *Corbicula* was collected from the Unit 2 cooling tower reservoir; three during March and two in July. ***Overall, the numbers of Corbicula collected in the samples were comparatively low, which continued the trend over the past few years of fewer Corbicula and reflected a water-body-wide trend observed in the Ohio River.***

In 1995, live zebra mussels were collected for the first time by divers in the BVPS main intake and auxiliary intake structures during scheduled cleanings. They have been found in the BVPS every year since. Overall, both the number of observations and densities of settled mussels in 2014 were consistent to those recorded in 2008-2012, and much higher than the preceding five years. Although densities of settled mussels are low compared to other populations such as the Lower Great Lakes, densities comparable to those in the Ohio River are more than sufficient to cause problems in the operation of untreated cooling water intake systems. ***Whether the population of zebra mussels in this reach of the Ohio River will remain the same or increase cannot be determined. In any case, the densities of mussels that presently exist are more than sufficient to impact the BVPS, if continued prudent monitoring and control activities are not conducted.***

2.0 ENVIRONMENTAL PROTECTION PLAN NON-COMPLIANCES

There were no Environmental Protection Plan non-compliances identified in 2014.

3.0 CHANGES INVOLVING UNREVIEWED ENVIRONMENTAL QUESTIONS

No Unreviewed Environmental Questions were identified in 2014. Therefore, there were no changes involving an Unreviewed Environmental Question.

4.0 NON-ROUTINE ENVIRONMENTAL REPORT

There were no non-routine environmental reports in 2014.

5.0 AQUATIC MONITORING PROGRAM

This section of the report summarizes the Non-Radiological Environmental Program conducted for the BVPS Units 1 and 2; Operating License Numbers DPR-66 and NPF-73. This is a non-mandatory program, because on February 26, 1980, the NRC granted BVPS's request to delete all of the Aquatic Monitoring Program, with the exception of the fish impingement program (Amendment No. 25), from the Environmental Technical Specifications (ETS). In 1983, BVPS was permitted to also delete the fish impingement studies from the ETS program of required sampling along with non-radiological water quality requirements. However, in the interest of providing an uninterrupted database, BVPS has continued the Aquatic Monitoring Program.

The objectives of the 2014 environmental program were:

- To monitor for any possible environmental impact of BVPS operation on the benthic macroinvertebrate and fish communities in the Ohio River;

- To evaluate the presence, growth, and reproduction of macrofouling *Corbicula* (Asiatic clam) and zebra mussels (*Dreissena* spp.) at BVPS.

- To provide a low level sampling program to continue an uninterrupted environmental database for the Ohio River near BVPS, pre-operational to present; and

- Keep plant operations appraised of any of changes in environmental conditions that may affect the facility.

These objectives have assisted facility personnel in the past. For instance, in the facility's Significant Operating Experience Report (SOER 07-2, October 2008) relative to "Intake Cooling Water Blockage" this Aquatic Monitoring Program was credited as a means of addressing "Changing Environmental Conditions" by looking "for changes in quantity of clam and mussel activity by monitoring the veliger (commonly known as larvae) density in the river and mussel settlement density."

5.1 SITE DESCRIPTION

BVPS is located on an approximately 453-acre tract of land on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania. The Shippingport Atomic Power Station once shared the site with BVPS before being decommissioned. Figure 5.1 is a plan view of BVPS. The site is approximately 1 mile (1.6 km) from Midland, Pennsylvania; 5 miles (8 km) from East Liverpool, Ohio; and 25 miles (40 km) from Pittsburgh, Pennsylvania. The population within a 5-mile (8 km) radius of the plant is approximately 18,000. The Borough of Midland, Pennsylvania has a population of approximately 3,500.

The station is situated at Ohio River Mile 34.8 (Latitude: 40° 36' 18"; Longitude: 80° 26' 02") at a location on the New Cumberland Pool that is 3.1 river miles (5.3 km) downstream from Montgomery Lock and Dam and 19.6 miles (31.2 km) upstream from New Cumberland Lock and

Dam. The Pennsylvania-Ohio-West Virginia border is 5.2 river miles (8.4 km) downstream from the site. The river flow is regulated by a series of dams and reservoirs on the Beaver, Allegheny, Monongahela, and Ohio Rivers and their tributaries.

The study site lies along the Ohio River in a valley, which has a gradual slope that extends from the river at an elevation of 665 ft. (203 m) above mean sea level; to an elevation of 1,160 ft. (354 m) along a ridge south of BVPS. The plant entrance elevation at the station is approximately 735 ft. (224 m) above mean sea level.

BVPS Units 1 and 2 have a thermal rating of 2,900 megawatts (MW). Units 1 & 2 have a design electrical rating of 974 MW and 1,009 MW, respectively. The circulating water systems for each unit are considered a closed cycle system with continuous overflow, using a cooling tower to minimize heat released to the Ohio River. Commercial operation of BVPS Unit 1 began in 1976 and Unit 2 began operation in 1987.

5.2 STUDY AREA

The environmental study area was established to assess potential impacts and consists of four sampling stations, each having a north and south shore (Figure 5.1). Station 1 is located at River Mile (RM) 34.5, approximately 0.3 miles (0.5 km) upstream of BVPS and is the control station. Station 2A is located approximately 0.5 miles (0.8 km) downstream of the BVPS discharge structure in the main channel. Station 2B is located in the back channel of Phillis Island; also 0.5 miles downstream of the BVPS discharge structure. Station 2B is the principal non-control station because the majority of discharges from BVPS Units 1 and 2 are released to this back channel. Station 3 is located approximately two miles (3.2 km) downstream of BVPS and only rarely is influenced by the BVPS discharge.

5.3 METHODS

CB&I Environmental & Infrastructure, Incorporated (CB&I), formally known as Shaw, was contracted to perform the 2014 Aquatic Monitoring Program as specified in BVBP-ENV-001-Aquatic Monitoring (procedural guide). This procedural guide references and describes in detail the field and laboratory procedures used in the various monitoring programs, as well as the data analysis and reporting requirements. These procedures are summarized according to task in the following subsections. Sampling was conducted according to the schedule presented in Table 5.1.

5.3.1 Benthic Macroinvertebrate Monitoring

The benthic macroinvertebrate monitoring program consisted of river bottom sampling using a Ponar grab sampler at four stations on the Ohio River. Prior to 1996, duplicate sampling occurred at Stations 1, 2A, and 3, while triplicate sampling occurred at Station 2B (i.e., one sample at each shoreline and mid-channel) (Figures 5.1 and 5.2). In 1996, a review of the sampling design indicated that sampling should be performed in triplicate at each station to conform to standardized

EPA procedures. Therefore, starting in 1996, triplicate samples were taken at Stations 1, 2A, and 3, as in 1995, with triplicate samples also collected at each shore and mid-channel location at Station 2B. A petite Ponar dredge was used to collect these samples, replacing the standard Ponar dredge used in prior studies.

In 2014, benthic macroinvertebrate sampling was conducted as scheduled in May and September. For each 2014 field effort, 18 benthic samples were collected and processed in the laboratory. All field procedures and data analyses were conducted in accordance with the procedural guide. The contents of each Ponar grab sample were gently washed through a U.S. Standard No. 30 sieve and the retained contents were placed in a labeled bottle and preserved in ethanol. In the laboratory, rose bengal stain was added to aid in sorting and identifying the benthic organisms. Macroinvertebrates were sorted from each sample, identified to the lowest taxon practical and counted. Mean density (number/m^2) for each taxon was calculated for each replicate. Four indices used to describe the benthic community were calculated: Shannon-Weiner diversity index, evenness (Pielou, 1969), species richness, and the number of taxa. These estimates provide an indication of the relative quality of the macroinvertebrate community.

5.3.2 Fish Monitoring

Fish sampling was conducted in 2014 to provide a continuous baseline of data and to detect possible changes that may have occurred in the fish populations in the Ohio River near BVPS. Fish population surveys have been conducted in the Ohio River near BVPS annually from 1970 through 2014. These surveys have resulted in the collection of 73 fish species and five different hybrids.

Adult fish surveys were successfully conducted as scheduled in May, July, September, and November 2014. During each survey, fish were scheduled to be sampled at four stations (Stations 1, 2A, 2B and 3) (Figure 5.3). Prior to 2011, all electrofishing was conducted at night. From 2011 to present, due to damage to the onsite boat launch, the crew was required to launch the boat from the Lock 57 Community Park Boat Launch located near Glasgow Pennsylvania. The launch was only open until one hour after dark, so it was necessary to conduct electrofishing efforts during the day. Electrofishing was completed at all stations and months. On September 11, a problem with the electrofisher required CB&I to return to site on September 18 to complete sampling. Seining was scheduled to be performed at Station 1 (north shore) and Station 2B (south shore of Phillis Island) to sample species that are generally under-represented in electrofishing catches (e.g., young-of-the-year fish and small cyprinids). Severe erosion to the shoreline at Station 2B required relocating the seining location about 200 meters west. This habitat at the new location was comparable to the former site, prior to the erosion. The new location is also influenced by the BVPS discharge, so is a comparable non-control site. All seining efforts were successfully completed.

Electrofishing was conducted using a boat-mounted electroshocker. A Smith-Root Type VI A variable voltage, pulsed-DC electrofishing unit powered by a 5-kW generator was used. The voltage selected depended on water conductivity and was adjusted to provide constant amperage

(4-6 amps) of the current through the water. The north and south shoreline areas at each station were shocked for at least 10 minutes of unit "on" time (approximately five minutes along each shore) during each survey.

When large schools of fish of a single non-game species such as gizzard shad and shiners were encountered during electrofishing efforts, all of the stunned fish were not netted and retrieved onboard the boat. A few fish were netted for verification of identity, and the number of observed stunned fish remaining in the water was estimated. The size range of the individual fish in the school was also estimated and recorded. This was done in an effort to expedite sample processing and cover a larger area during the timed electrofishing run. Regardless of the number of individuals, all game fish were boated when observed.

Fish seining was performed during the day at Station 1 (control) and Station 2B (non-control) (Figure 5.3) during each of the four 2014 BVPS fishery surveys. A 30-ft long bag seine made of 1/4-inch nylon mesh netting was used to collect fish located close to shore in 1 to 4 ft. of water. Three seine hauls were performed at both Station 1 (north shore) and Station 2B (south shore of Phillis Island) during each survey.

Fish collected during electrofishing and seining efforts were processed according to standardized procedures. All captured game fishes were identified to species, counted, measured for total length (nearest 1 mm), and weighed (nearest 1 g for fish less than or equal to 1000 g and the nearest 5 g for all other fish). Non-game fishes were counted, and a random subsample of lengths was taken. Live fish were returned to the river immediately after processing was completed. All fish that were unidentifiable or of questionable identification and were obviously not on the endangered or threatened species list were placed in plastic sample bottles, preserved, labeled and returned to the laboratory for identification. Any species of fish that had not previously been collected at BVPS was retained for the voucher collection. Any threatened or endangered species (if collected) would be photographed and released.

5.3.3 *Corbicula* Density Determinations for Cooling Tower Reservoirs

The *Corbicula* Monitoring Program at BVPS includes sampling the circulating river water and the service water systems of the BVPS (intake structure and cooling towers). The objectives of the ongoing Monitoring Program are to evaluate the presence of *Corbicula* at BVPS, and to evaluate the potential for and timing of infestation of the BVPS. This program is conducted in conjunction with a program to monitor for the presence of macrofouling zebra mussels (see Section 5.3.5).

Corbicula enter the BVPS from the Ohio River by passing through the water intakes, and eventually settle in low flow areas including the lower reservoirs of the Units 1 and 2 cooling towers. The density and growth of these *Corbicula* were monitored by collecting monthly samples from the lower reservoir sidewalls and sediments. The sampler used on the sidewalls consisted of a D-frame net attached behind a 24-inch long metal scraping edge. This device was connected to a pole long enough to allow the sampler to extend down into the reservoir area from the outside wall of the cooling tower. Sediments were sampled with a petite Ponar dredge.

Cooling tower reservoir sampling was historically conducted once per month. Beginning in December 1997, it was decided to forego sampling in cold water months since buildup of *Corbicula* does not occur then. Monthly sampling has been maintained throughout the warmer water months of the year. In 2014 sampling began in March and ended in mid-November.

In 2014, once each month (March through November), a single petite Ponar grab sample was scheduled to be taken in the reservoir of each cooling tower to obtain density and growth information on *Corbicula* present in the bottom sediment. The samples collected from each cooling tower were returned to the laboratory and processed. Samples were individually washed, and any *Corbicula* removed and rinsed through a series of stacked U.S. Standard sieves that ranged in mesh size from 1.00 mm to 9.49 mm. Live and dead clams retained in each sieve were counted and the numbers were recorded. The size distribution data obtained using the sieves reflected clam width, rather than length. Samples containing a small number of *Corbicula* were not sieved; individuals were measured and placed in their respective size categories. A scraping sample of about 12 square feet was also collected at each cooling tower during each monthly sampling effort. This sample was processed in a manner consistent with the petit Ponar samples. All samples were successfully collected except in November when equipment issues precluded ponar sampling in both cooling towers and in Cooling Tower 2 in April due to a unit outage.

5.3.4 *Corbicula* Juvenile Monitoring

The *Corbicula* juvenile study was designed to collect data on *Corbicula* spawning activities and growth of individuals entering the intake from the Ohio River. From 1988 through 1998, clam cages were deployed in the intake forebay to monitor for *Corbicula* that entered the BVPS.

Observational-based concerns that the clam cages would quickly clog with sediment during high sediment periods and, as a result, would not effectively sample for *Corbicula*, led to an evaluation of an alternate sampling technique. From April through June 1997, a study was conducted to compare the results of the clam cage samplers to a petite Ponar dredge technique to determine *Corbicula* presence and density in the BVPS intake bays. It was hypothesized that using a Ponar sampler to collect bottom sediments and analysis of those sediments would provide a more representative sample of *Corbicula* settlement and growth rates, and had the added benefit of not requiring confined space entry to conduct the sampling. Results of the study confirmed this hypothesis.

During the 1998 sampling season, at the request of BVPS personnel, all clam cages were removed

after the May collection. Monthly petite Ponar grabs from the forebay in the intake building continued thereafter. Samples were processed in the same manner as Cooling Tower Samples (Section 5.3.3).

From 2002 to present, because of site access restrictions, sampling with the petite Ponar has been moved to the Ohio River directly in front of the Intake Structure Building. Collections are presently scheduled to be made in conjunction with the fisheries sampling (May, July, September, and November). During each sampling month two Ponar grabs are taken approximately 20 feet offshore of the intake building. These grab samples are processed in the same manner as when they were collected from within the Intake Structure Building.

5.3.5 Zebra Mussel Monitoring

The Zebra Mussel Monitoring Program includes sampling the Ohio River and the circulating river water system of the BVPS.

The objectives of the Monitoring Program were:

(1) To identify if zebra mussels were in the Ohio River adjacent to BVPS and provide early warning to operations personnel as to their possible infestation;

(2) To provide data as to when the larvae were mobile in the Ohio River and insights as to their vulnerability to potential treatments; and

(3) To provide data on their overall density and growth rates under different water temperatures and provide estimates on the time it requires these mussels to reach the size and density that could impact the plant.

The zebra mussel sampling for settled adults was historically conducted once per month, yearlong. Beginning in December 1997, it was decided to forego sampling in the colder water months of each year, since buildup of zebra mussels and growth of the individuals that are present, does not occur then. Monthly sampling has been maintained throughout the balance of the year. In 2014 sampling occurred from March through November.

A pump sample for zebra mussel veligers was collected at the barge slip location monthly from April through October in 1996 and 1997. The scope of the sampling was expanded in 1998 to also include the intake structure. In June 1998, the Emergency Outfall and Emergency Outfall Impact Basin locations were also added. Additional pump samples were collected from the cooling towers of Unit 1 and Unit 2 in October 1998. In 2014 veliger sampling began in April and was conducted monthly through October.

At the Intake Structure and Barge Slip the following surveillance techniques were used:

- Wall scraper sample collections on a monthly basis (March through November) from the barge slip and the riprap near the intake structure to detect attached adults; and

- Pump sample collections from the barge slip and outside the intake structure, to detect the planktonic early life forms (April through October).

At each of the cooling towers the following techniques were used:

- Monthly reservoir scraper sample collections in each cooling tower (March through November); and
- Pump samples in April through October to detect planktonic life forms.

At the Emergency Outfall and the Splash Pool the following techniques were used:

- Monthly scraper sample collections in each (March through November); and
- Pump samples in each from April through October to detect planktonic life forms.

5.3.6 Reports

Each month, activity reports that summarized the activities that took place the previous month were prepared and submitted. These reports included the results of the monthly *Corbicula*/zebra mussel monitoring including any trends observed and any preliminary results available from the benthic and fisheries programs. The reports addressed progress made on each task, and reported any observed biological activity of interest.

5.4 RESULTS OF THE AQUATIC MONITORING PROGRAM

The following sections summarize the findings for each of the program elements. Sampling dates for each of the program elements are presented in Table 5.1.

5.4.1 Benthic Macroinvertebrate Monitoring Program

Benthic surveys were performed in May and in September 2014. Benthic samples were successfully collected using a petite ponar grab sampler at Stations 1, 2A, 2B, and 3 (Figure 5.2). Triplicate samples were taken off the south shore at Stations 1, 2A, and 3. Sampling at Station 2B, in the back channel of Phillis Island, consisted of triplicate petite Ponar grabs at the south side, middle, and north side of the channel (i.e., Sample Stations 2B1, 2B2, and 2B3, respectively).

Substrate type is an important factor in determining the composition of the benthic community. The habitats in the vicinity of BVPS are the result of damming, channelization, and river traffic.

Shoreline habitats at the majority of sampling locations were generally in depositional areas that consisted of soft muck substrates composed of mixes of sand, silt, and detritus. One exception was along the north shoreline of Phillis Island at Station 2A where hard-pan clay overlain with a thin layer of fine sand dominated. The other distinct habitat, hard substrate (gravel and cobble), was located in mid-channel in the back channel of Phillis Island. The hard substrate was probably the result of channelization and ongoing scouring by river currents. In general, the substrates found at each sampling location have been consistent from year to year.

Increased water clarity due at least in part to the establishment of zebra mussels was noted during 2014. This has increased the amount of submerged aquatic vegetation at Stations 1, 2B and 3. The presence of submerged aquatic vegetation can increase the number of species of macroinvertebrates, especially chironomids (midge flies) that use them as a primary food source. Also zebra mussel filtering moves much of the available nutrients from the water column to the bottom, which also can affect the type and density of macroinvertebrates present in the project area.

Sixty (60) macroinvertebrate taxa were identified during the 2014 monitoring program (Tables 5.2 and 5.3), which was the same number that was identified in 2013. A mean density of 2,055 macroinvertebrates/m^2 was collected in May and 5,696/m^2 in September (Table 5.4). As in previous years, the macroinvertebrate assemblage during 2014 was dominated by burrowing organisms typical of soft unconsolidated substrates. Oligochaetes (segmented worms), mollusks (clams and snails) and chironomid (midge fly) larvae were abundant (Table 5.4). Seventeen (17) taxa of chironomids and 24 taxa of oligochaetes were collected. This is the one more chironomid taxa and three (3) more oligochaete taxa than collected in 2013. Nine (9) taxa of mollusks were also collected in 2014. As was the case in 2013, the total mean density of organism was higher in September than in May.

Thirty-six (36) taxa were present in the May 2014 samples. Forty-five (45) taxa were present in the September samples (Table 5.3.1 and 5.3.2). Twenty-three (23) of the 60 taxa were present in both May and September. As in 2013, immature tubificid worms were numerically the most abundant organism in both May and September 2014.

The macrofouling Asiatic clam (*Corbicula*) has been observed in the Ohio River near BVPS from 1974 to present. Macrofouling zebra mussels were first collected in the BVPS benthic samples in 1998. Adult zebra mussels, however, were detected in 1995 and 1996 by divers in the BVPS main and auxiliary intake structures during scheduled cleaning operations. Zebra mussel veligers, adults and juveniles were collected during the 1997-2014 sampling programs (see Sections 5.4.5 Zebra Mussel Monitoring Program). Both live adult *Corbicula* and adult zebra mussels were collected in benthic macroinvertebrate samples in 2014. *Corbicula* and zebra mussels were abundant species in September samples, but not collected in May.

In 2014 one new taxon was added to the cumulative list of macroinvertebrates collected near BVPS (Table 5.2). This was the chironomid (midge fly) *Cryptotendipes* sp. No state or Federal threatened or endangered macroinvertebrate species were collected during 2014.

In the May 2014 samples, oligochaetes accounted for the highest mean density of

macroinvertebrates (1,892/m^2 or 92 percent of the total density) (Table 5.4). Oligochaetes also were the dominant taxon in May 2013. Chironomids and organisms other than oligochaetes, chironomids and mollusks ("others") were both present at a density of 84/m^2 and contributed to four percent of the May total, each. No mollusks were collected in May.

In September 2014 samples, oligochaetes also accounted for the highest mean density of macroinvertebrates (3,218/m^2 or 56 percent of the total density) (Table 5.4). Chironomids had the next highest mean density in September 2014 (1,787/m^2 or 31 percent of the total density) followed by mollusks (540/m^2 or nine percent) and the "others" category (151/m^2 or three percent).

In May 2014, the highest density of macroinvertebrates (4,458/m^2) occurred at Station 2B2. Oligochaetes contributed to 91 percent of the total. In September, the highest density of macroinvertebrates occurred at Station 2B3 (14,979/m^2). This was also due to a high density of oligochaetes that contributed to 95 percent of this total. In May the lowest mean density of organisms was 487/m^2. In September, the lowest mean density of organisms occurred at Station 3 (2,379/m^2).

For a comparison of the control to non-control stations, Station 1 was designated the control station, because it is always out of the influence of the BVPS discharge and Station 2B (mean density of Station 2B1, 2B2, and 2B3) was designated as the non-control station, since it is the station most regularly subjected to BVPS's discharge. Stations 3 and 2A may be under the influence of the plume under certain conditions, but it is unlikely that they are regularly influenced by BVPS.

The mean density of macroinvertebrates in the non-control station was just more than two times higher (3,149/m^2) than that of the control station (1,634/m^2) in May (Table 5.5). The relatively higher densities of oligochaetes, at the non-control station contributed to the majority of this difference. This was the reverse of the previous year, when the density of macroinvertebrates was greater at the control station.

Similarly, in September the density of macroinvertebrates present at the non-control station (7,310/m^2) was just over two times more than at the control station (3,526/m^2). Differences were within the expected range of variation for natural populations of macroinvertebrates.

Indices that describe the relative diversity, evenness, and richness of the macroinvertebrate population structure among stations and between control and non-control sites were calculated. A higher Shannon-Weiner diversity index indicates a relatively better structured assemblage of organisms, while a lower index generally indicates a low quality or stressed community. Evenness is an index that estimates the relative contribution of each taxon to the community assemblage, the closer to 1.00, the healthier the community. The community richness is another estimate of the quality of the macroinvertebrate community with a higher richness number indicating a healthier community.

The Shannon-Weiner diversity indices in May 2014 collections ranged from 0.27 at Station 1 to 0.87 at Station 2B1 (Table 5.6). In May evenness ranged from 0.28 at Station 1 to 0.73 at Station 2A. Richness was greatest at Station 2B1 (3.82) and lowest at Station 1 (1.69). The generally low

indices at all locations (control and non-control) except Station 2B1 are attributed to the relatively few species collected at all locations and the dominance in off the immature tubificids that contributed to 65 percent of the individual macroinvertebrates collected. The low numbers species and the dominance of one species likely is due to natural variation in the Ohio River rather than due to BVPS operations, since they were present at both control and non-control stations.

The Shannon-Weiner diversity of the macroinvertebrate community (0.41 to 1.14), evenness (0.31 to 0.81) and richness (2.71 to 4.36) in September 2014 were higher than in May. Except at Station2B2 where the same number of taxa were present, there was also an increase in the number of taxa present at each station in September compared to that station in May. Relatively high numbers of taxa are frequently present in early fall due to the increased numbers of aquatic stages of insects, especially chironomids, as well as the ability to identify many of the tubificids that are lumped together when immature to lower taxonomic levels. A comparable increase in indices values in September compared to May was also observed in each year from 2010 through 2013.

In May 2014, the number of taxa was lower in the control station (Station 1) than in the non-control stations (2B1, 2B2, 2B3) (9 versus 19, 15 and 13). The diversity, evenness and richness indices were also lower at the control station than the non-control (Table 5.6). In September 2014 the indices at the control stations were, in general, comparable to the non-control stations. Similar trends were apparent in the previous five study years and were likely due to natural variations in the local populations at these locations. No impacts of the BVPS on the benthic community, as measured by differences between control and non-control zones, were evident in either May or September.

Substrate was probably the most important factor controlling the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. Soft, mucky substrates that generally existed along the shoreline are conducive to oligochaete, chironomid, and mollusk habitation and limit species of macroinvertebrates that require a more stable bottom.

The density of macroinvertebrates in May and September 2014 fell within the range of densities of macroinvertebrates collected at BVPS in previous years (Table 5.7). ***The community structure has changed little since pre-operational years, and the available evidence does not indicate that BVPS operations have affected the benthic community of the Ohio River.***

5.4.2 Fish Sampling Program

In 2014, 186 fish representing 20 taxa were collected (i.e., handled) during BVPS surveys by electrofishing and seining (Table 5.8). This was three fewer taxa but 62 more fish than collected in 2013. All taxa collected in 2014 were previously encountered at BVPS. The most common species in the 2014 BVPS surveys that were collected by electrofishing and seining combined were gizzard shad (35.0% of the total catch), emerald shiner (21.0%), smallmouth buffalo (7.0%), carp (7.0%), shorthead redhorse sucker (5.9%) and golden redhorse sucker (5.4%). None of the remaining 15 species contributed to more than 5 percent of the total handled catch. The most frequently observed but not handled fish in 2014 were unidentified black bass (Table 5.15). Game

fish collected in 2014 included channel catfish, bluegill, largemouth bass, smallmouth bass, walleye, spotted bass, and yellow perch. Game fish represented 28.2% of the total handled catch.

A total of 138 fish, representing 15 taxa, was collected by electrofishing in 2014 (Table 5.9) compared to 85 fish representing 19 species in 2012. The number of fish collected in 2014 compares favorably with the total number collected in 2011 (151 fish), the last time electrofishing was collected at night. The number of species collected was, however, fewer than in 2011 when 22 species were encountered. In general electrofishing at night has been demonstrated to be more productive than during the day in riverine systems. Movements of many species of fish into shallower water at night to feed, makes them more susceptible to the electrofishing technique. This may have contributed to the fewer number of species collected in 2014. Gizzard shad, smallmouth buffalo, carp, and shorthead redhorse sucker accounted for the greatest portion of the 2014 electrofishing catch (47.1%, 9.4%, 9.4% and 7.3%, respectively). No other species collected contributed to greater than seven percent of the total catch. Fish observed and not collected in the 2014 electrofishing study are presented in Table 5.15.

A total of 48 fish representing eight (8) taxa was collected by seines in 2014 (Table 5.10) compared to 39 fish representing seven (7) taxa in 2013. The most abundant taxa collected in 2014 were emerald shiner and juvenile redhorse sucker (representing 81.3% and 6.3% of the total catch, respectively). The other six species were each represented by single individual. Bluegill was the only game species collected and were only collected as juveniles.

A total of 72 fish representing 14 species was captured during the May (spring) 2014 sampling event (Table 5.11). A total of 44 fish representing 12 species were collected during electrofishing. Gizzard shad was the most abundant species and represented 27.3 % of the electrofishing catch, followed in abundance by walleye (representing 11.4% of the total catch), smallmouth bass (9.1%), longnose gar (9.1%) and shorthead redhorse sucker (9.1%). No other species contributed to more than seven (7) percent of the May electrofishing catch. A total of 28 fish representing two species were collected by seines in May. Emerald shiner (representing 96.4% of the seine catch) and mimic shiner (3.6%) were only species collected. Channel catfish, smallmouth bass, spotted bass and walleye were the game species collected in May

A total of 38 fish representing nine (9) species was captured during the July (summer) 2014 sampling event (Table 5.12). A total of 26 fish representing six (6) species was collected during electrofishing efforts. Gizzard shad smallmouth buffalo were the most abundant species and represented 53.9% and 23.1% of the catch, respectively. Shorthead redhorse sucker (11.5% of the total catch) was the nest most abundant species. No other species contributed to more than seven percent of the electrofishing catch. Twelve fish representing three species were collected in the seines. Emerald shiner was the most abundant species and represented two thirds of the seine catch. Juvenile golden redhorse sucker (25.0% of the total catch) and spotfin shiner (8.3%) were the other species collected. Smallmouth bass was the only game species collected in July.

During the September (fall) 2014 sampling event, 37 fish representing 7 taxa were collected. A total of 34 fish representing five (5) species was collected during electrofishing efforts (Table 5.13). Gizzard shad were the most abundant species and contributed to 76.5 percent on the total. Carp (11.8%) was the only other species that contributed to more than 7% of the total. Three fish

representing three species were collected in the seines. One bluntnose minnow, one northern hog sucker and one juvenile shorthead redhorse sucker were the only fish collected in seine samples. Emerald shiner was the most abundant species and represented two thirds of the seine catch. Largemouth bass and yellow perch were the game species collected.

During the November (winter) 2014 sampling event, 39 fish representing nine (9) taxa were collected. A total of 34 fish representing eight (8) species was collected during electrofishing efforts (Table 5.13). Gizzard shad and carp were the most abundant species collected by electrofishing and contributed to 38.2% and 17.7% of the total catch, respectively. Longnose gar, smallmouth buffalo, and golden redhorse sucker each, contributing to 11.8% of the catch were the next most abundant species. A total of five fish (four emerald shiners and one juvenile bluegill) were the only fish collected by seining. Game species collected in November included bluegill, and smallmouth bass.

Electrofishing catch rates are presented in Tables 5.16, 5.17, 5.18, and 5.19 for fish that were boated and handled during the 2011 through 2014 surveys by season (FENOC 2012, 2013 and 2014). In 2014, the annual catch rate was 0.86 fish per minute. In 2014, the greatest seasonal catch rate occurred in spring (May) when the catch rate was 1.09 fish per minute. Gizzard shad and walleye contributed to the majority of this total. The lowest catch rate occurred in summer (July) with a rate of 0.64 fish per electrofishing minute.

The annual catch rate in 2014 (0.86 fish per minute) was higher than 2013 (0.53) and 2012 (0.59) when electrofishing was also conducted during the day and comparable to 2011 (0.93) the last year electrofishing was conducted exclusively at night. The greater electrofishing rate in 2014 was due to the relatively large number of gizzard shad that were collected. Gizzard shad are schooling fish so multiple individuals are generally collected when present. They are display high year to year fluctuations in abundance due to spawning success and over winter mortality. The 2014 catch rates in spring and summer were the highest of the four years and the second highest (to catch rates in 2011) in winter. Over the four years, the highest seasonal catch rates occurred in fall 2011 (1.42 fish per minute).

The results of the electrofishing sampling effort in 2014 (Table 5.9) did not indicate any major differences in species composition between the control station (1) and the non-control Stations 2A, 2B, and 3. In both gizzard shad was the most abundant species. A greater number of fish representing more species was captured at non-control stations than control station. This was most likely due to the extra effort expended at non-control stations versus control station. There are three non-control stations and only one control station so there was three times the effort at the non-control stations. In 2014, there was 3.6 times as many fish collected at the non-control stations with three times the effort. In 2014, similar numbers of individuals and species were collected by seines at the control station compared to the non-control station, where sampling effort is equal (Table 5.10).

In 2014, species composition remained comparable among stations. Common taxa collected in the 2014 surveys by all methods included gizzard shad, redhorse sucker species, emerald shiner, and smallmouth bass. Little difference in the species composition of the catch and relative composition was observed between the control (1) and non-control stations (2A, 2B and 3). Habitat

preference and availability were probably the most important factors affecting where and when different species of fish are collected.

The results of the 2014 fish surveys indicated that there is a normal community structure in the Ohio River in the vicinity of BVPS based on species composition and relative abundance of fish observed during the surveys. Benthivores (bottom feeders including suckers and buffalo) and forage species (e.g. gizzard shad and emerald shiners) were generally collected in the highest numbers. The numbers of forage fish were greater than those present in 2013, due largely to the large number of gizzard shad collected. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad, minnow species and shiner species that have high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size. This, in turn, influences their appearance in the sampled populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community.

In addition, differences in electrofishing catch rate can be attributed to environmental conditions that prevail during sampling efforts. High water, increased turbidity, and swift currents that occur during electrofishing efforts in some years can affect the collection efficiency in any given month. In 2014, as in 2012 and 2013, increased water clarity was apparent during all months sampled. A direct result of the increased clarity was the abundance of rooted submerged aquatic vegetation throughout the study reach. The amount of rooted vegetation was much more than in any other year sampled. The increase in vegetation is likely the result of an increased photic zone due to zebra mussels filtering organic and inorganic particulates from the water and redistributes them to the benthic layer. The presence of rooted vegetation and increased water clarity can change the distribution of many of the fish species present in the study reach.

Even though the number of individuals collected were comparable to the last time electrofishing was conducted at night, the impact of needing to electrofish during the day in 2014 is also a factor that contributed to the 2014 catch. As previously discussed, shoreward fish movements of many species at night can increase catch rates as well as the number and types of species available for capture. The avoidance of the majority of fish species from bright light conditions during the day was likely as acerbated by the increased water clarity. Gizzard shad generally do not avoid bright light conditions, which made them available for capture in 2014.

5.4.3 *Corbicula* Monitoring Program

In 2014, six (6) settled live *Corbicula* were collected from the Unit 1 cooling tower basin during monthly reservoir ponar sampling (Table 5.20 and Figure 5.5). They ranged in size from 2.00 mm to 4.74 mm. Five dead *Corbicula* that were between 1.00 mm and 4.74 mm were also collected. The season average density of settled live *Corbicula* was 32/ m^2. Settled live *Corbicula* were collected in March, April, May, June and August. The highest density occurred in June when a

density of 86 *Corbicula*/m^2 was present. No *Corbicula* were collected in the scraping samples. *Corbicula* juveniles were also collected in monthly pump samples collected in the Unit 1 cooling tower reservoir in March, and August through October.

In 2014, five (5) live settled *Corbicula* was collected from the Unit 2 cooling tower reservoir; three during March and two in July (Table 5.21 and Figure 5.6). They were all less than 3.34mm in size that indicates that they were spawned late in 2013. Three dead *Corbicula* were also collected during 2014. These were between 2.00mm and 6.29 likely represented a number of year classes. The season average density of settled live *Corbicula* was 31/ m^2. The highest density of settled *Corbicula* occurred in March when a density of 129 *Corbicula*/m^2 was present. No *Corbicula* were collected in the scraping samples. *Corbicula* juveniles were also collected in monthly pump samples collected in the Unit 2 cooling tower reservoir in May and July through October.

In 2014, BVPS continued its *Corbicula* control program, which included the use of a molluscicide to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the PADEP to use a molluscicide to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications focused on reducing the *Corbicula* population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 and 1995, the applications targeted the internal water systems; therefore, the molluscicide concentrations in the cooling towers were reduced during applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the applications. Reservoir sediment samples taken after molluscicide applications represent mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems.

The monthly reservoir sediment samples and pump samples collected in Units 1 and 2 Cooling Towers in recent years demonstrated that *Corbicula* were entering and colonizing the reservoirs. Only 11 live and eight dead settled *Corbicula* were collected in the cooling towers in 2014; however, their presence in the cooling tower pump samples indicates that they still are available for establishment in the cooling towers. The recent decrease of *Corbicula* at the BVPS returns densities to levels more consistent with densities in the Ohio River in the mid-1990's, but well below those present during the 1980's. Whether the low density of *Corbicula* in 2014 is indicative of permanent lower levels in the environment or due to natural variability is uncertain, however, continued monitoring of *Corbicula* densities is recommended.

5.4.4 *Corbicula* Juvenile Monitoring Program

Figure 5.7 presents the abundance and size distribution data for samples collected in the Ohio River near the intake structure by petite ponar dredge in 2014. Seventeen (17) live individuals were collected 2014; all in May. They ranged in size from the 0.01-0.99 mm size range that were spawned in late 2013 to greater than 9.50 mm that were spawned in prior years. The number of individuals collected in 2014 was somewhat less than in 2013 (24 individuals) and 2012 (19 individuals) but more than in 2011 (12). A spring/early-summer spawning period typically occurs in the Ohio River near BVPS each year when preferred spawning temperatures (60-65° F) are reached (Figure 5.8). The offspring from this spawning event generally begin appearing in the

sample collections in June. The settled clams generally increase in size throughout the year. ***The overall low numbers of live <u>Corbicula</u> collected in the sample collected outside the intake and cooling towers in 2014, compared to levels in the 1980's, likely reflects a natural decrease in the density of <u>Corbicula</u> in the Ohio River near BVPS, although an increased density of live settled individuals and juveniles collected in the cooling towers may indicate that the population is beginning to increase again. Continued monitoring of <u>Corbicula</u> densities is recommended.***

5.4.5 Zebra Mussel Monitoring Program

Zebra mussels (*Dreissena polymorpha*) are exotic freshwater mollusks that have ventrally flattened shells generally marked with alternating dark and lighter bands. They are believed to have been introduced into North America through the ballast water of ocean-going cargo vessels probably from Eastern Europe. They were first identified in Lake St. Clair in 1988 and rapidly spread to other Great Lakes and the Mississippi River drainage system, and have become increasingly abundant in the lower, middle, and upper Ohio River. They use strong adhesive byssal threads, collectively referred to as their byssus, to attach themselves to any hard surfaces (e.g., intake pipes, cooling water intake systems, and other mussels). Responding to NRC Notice No. 89-76 (Biofouling Agent-Zebra Mussel, November 21, 1989), BVPS instituted a Zebra Mussel Monitoring Program in January 1990. Studies have been conducted each year since then.

Zebra mussels were detected in both the pump samples (Figures 5.9 and 5.10) and the substrate samples (Figure 5.11 and 5.12) in 2014. Zebra mussel veliger pump samples were collected from April through October 2014 (Figures 5.9 and 5.10). Veligers were collected at all of the six sites that were sampled in 2014. At most sample sites, there were generally two peaks in density. Densities in April through June were low. The first peak occurred in July. Then monthly densities were lower until a second somewhat smaller peak occurred in September. This seasonal pattern also occurred in 2013 and is typical for zebra mussels in the northeastern United States. Spawning begins as water temperature reach approximately 14^{O} C and peaks at water temperatures of 21^{O} C. Veliger densities usually peak about two weeks after the optimum water temperature for spawning is reached. Veliger densities then fall off as veligers mature and settle, although female mussels broadcast mature eggs throughout the season. The greatest density of veligers was present in the sample collected from the Intake sample in July (78,960/m^3). This was much higher than the peak density of veligers collected in 2013 (17,808/m^3) at the Barge slip in June and 2012 (34,628/m^3) at the Emergency Outfall Building in August. The 2014 density is high for the Ohio River. In April, veligers were collected only in the Cooling Tower 1 reservoir. This was probably due to the thermal enhancement of the cooling tower reservoirs, since the ambient Ohio River water temperatures did not reach the minimum spawning temperature for zebra mussels until May. Thereafter, veligers were present in every sample collected at all locations, except at the Barge Slip in May. Overall, veliger densities in 2014 were somewhat higher than those found in 2013 or 2012.

In 2014, settled zebra mussels were collected only in scrape samples at the barge slip and the intake structure (Figures 5.11 and 5.12). The highest density of settled mussels in any sample collected was at the barge slip (14 mussels/m^2) in April. The mussels collected at each of the sites included

individuals that were capable of reproducing. The density of collected adult zebra mussels in 2014 was comparable to the densities that occurred in 2013

Overall, both the number of observations and densities of settled mussels in 2014 were consistent to those recorded in 2008-2013, and much higher than the preceding five years. Although densities of settled mussels are low compared to other populations such as the Lower Great Lakes, densities comparable to those in the Ohio River are sufficient to cause problems in the operation of untreated cooling water intake systems. ***Whether the population of zebra mussels in this reach of the Ohio River will remain the same or increase cannot be determined. In any case, the densities of mussels that presently exist are more than sufficient to impact the BVPS, if continued prudent monitoring and control activities are not conducted.***

6.0 ZEBRA MUSSEL AND *CORBICULA* CONTROL ACTIVITIES

In 2014, BVPS continued its *Corbicula* and zebra mussel control program (25th year), which included the use of a molluscicide to prevent the proliferation of *Corbicula* and zebra mussels within BVPS. BVPS was granted permission by the PADEP to use a molluscicide to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (CT-1) focused on reducing the *Corbicula* population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 through 2006, the CT-1 or CT-2 (reformulated CT-1) applications targeted zebra mussels and *Corbicula* in the internal water systems; therefore the molluscicide concentrations in the cooling towers were reduced during CT-1 or CT-2 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the applications. Reservoir sediment samples taken after CT-1 or CT-2 applications represented mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems. In 2007 BVPS began using Nalco H150M as the molluscicide. This product, which has the same active ingredients as the CT-2 and CT-2, was applied in the same manner.

In addition to clamicide treatments, preventive measures were taken that included quarterly cleaning of the Intake Bays. The bay cleanings are intended to minimize the accumulation and growth of mussels within the bays. This practice prevents creating an uncontrolled internal colonization habitat.

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8.0

TABLES

TABLE 5.1
BEAVER VALLEY POWER STATION (BVPS)
SAMPLING DATES FOR 2014

Study	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Macroinvertebrate					28				11			
Fish					28		24		11,18		7	
Corbicula and Zebra Mussel			18	22	28	12	24	21	11	16	7	
Zebra Mussel Veliger				22	28	12	24	21	11	16		

Table 5.2
Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2014	New in 2014
Porifera						
			Spongilla fragilis	X		
Cnidaria						
	Hydrozoa					
		Clavidae				
			Cordylophora lacustris	X		
		Hydridae				
			Craspedacusta sowerbii	X		
			Hydra sp.	X		
Platyhelminthes						
	Tricladida			X		
	Rhabdocoela			X		
Nemertea				X		
Nematoda				X	X	
Entoprocta						
			Urnatella gracilis	X		
Ectoprocta						
			Fredericella sp.	X		
			Paludicella articulata	X		
			Pectinatella sp.	X		
			Plumatella sp.	X		
Annelida						
	Oligochaeta			X	X	
		Aeolosomatidae		X		
		Enchytraeidae		X	X	
		Naididae		X	X	
			Allonais pectinata	X		
			Amphichaeta leydigi	X		
			Amphichaeta sp.	X		
			Arcteonais lomondi	X	X	
			Aulophorus sp.	X		
			Chaetogaster diaphanus	X	X	
			C. diastrophus	X		
			Dero digitata	X		
			Dero flabelliger	X		
			D. nivea	X		
			Dero sp.	X		
			Nais barbata	X		
			N. behningi	X		
			N. bretscheri	X		
			N. communis	X	X	
			N. elinguis	X	X	
			N. pardalis	X	X	
			N. pseudobtusa	X		
			N. simplex	X		
			N. variabilis	X	X	
			Nais sp.	X		
			Ophidonais serpentina	X		
			Paranais frici	X		
			Paranais litoralis	X		
			Paranais sp.	X	X	
			Piguetiella michiganensis	X		
			Pristina idrensis	X		
			Pristina longisoma	X		
			Pristina longiseta	X		
			P. osborni	X		
			P. sima	X		
			Pristina sp.	X		
			Pristinella sp.	X		

Table 5.2 (continued) Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS						
Phylum	**Class**	**Family / Sub-Family**	**Genus and Species**	**Previous Collections**	**Collected in 2014**	**New in 2014**
Annelida	**Oligochaeta**	Naididae	*Pristinella jenkinae*	X	X	
			Pristinella idrensis	X		
			Pristina osborni	X	X	
			Ripistes parasita	X		
			Slavina appendiculata	X		
			Specaria josinae	X	X	
			Stephensoniana trivandrana	X	X	
			Stylaria fossularis	X		
			S. lacustris	X	X	
			Uncinais uncinata	X		
			Vejdovskyella comata	X		
			Vejdovskyella intermedia	X		
			Vejdovskyella sp.	X		
	Tubificida			X		
		Tubificidae		X	X	
			Aulodrilus limnobius	X		
			A. pigueti	X		
			A. pluriseta	X		
			Aulodrilus sp.	X	X	
			Bothrioneurum vejdovskyanum	X		
			Branchiura sowerbyi	X	X	
			Ilyodrilus templetoni	X		
			Limnodrilus cervix	X		
			L. cervix (variant)	X		
			L. claparedianus	X		
			L. hoffmeisteri	X	X	
			L. maumeensis	X	X	
			L. profundicla	X		
			L. spiralis	X		
			L. udekemianus	X	X	
			Limnodrilus sp.	X		
			Peloscolex multisetosus longidentus	X		
			P. m. multisetosus	X		
			Potamothrix moldaviensis	X		
			Potamothrix sp.	X		
			P. vejdovskyi	X		
			Psammoryctides curvisetosus	X		
			Tubifex tubifex	X		
			Unidentified immature forms:			
			with hair chaetae	X		
			without hair chaetae	X	X	
		Lumbriculidae		X		
		Hirudinae		X	X	
		Glossiphoniidae		X		
			Helobdella elongata	X		
			H. stagnalis	X		
			Helobdella sp.	X		
		Erpobdellidae				
			Erpobdella sp.	X		
			Mooreobdella microstoma	X		
		Haplotaxidae				
			Stylodrilus sp.	X		
	Lumbricina			X	X	
		Lumbricidae		X	X	

Table 5.2 (continued) Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS						
Phylum	**Class**	**Family / Sub-Family**	**Genus and Species**	**Previous Collections**	**Collected in 2014**	**New in 2014**
Arthropoda						
	Acarina			X		
			Oxus sp.	X		
	Ostracoda			X		
	Isopoda					
			Asellus sp.	X		
Arthropoda						
	Amphipoda					
		Talitridae				
			Hyalella azteca	X		
		Gammaridae				
			Crangonyx pseudogracilis	X		
			Crangonyx sp.	X		
			Gammarus fasciatus	X		
			Gammarus sp.	X	X	
		Pontoporeiidae				
			Monoporeia affinis	X		
		Corophididae		X	X	
Decapoda				X		
Collembola				X		
Ephemeroptera				X		
		Heptageniidae		X		
			Stenacron sp.	X		
			Stenonema sp.	X		
		Ephemeridae				
			Ephemera sp.	X		
			Hexagenia sp.	X	X	
			Ephron sp.	X		
		Baetidae				
			Baetis sp.	X		
		Caenidae				
			Caenis sp.	X		
			Serattella sp.	X		
		Tricorythidae				
			Tricorythodes sp.	X		
Megaloptera						
			Sialis sp.	X		
Odonata						
		Gomphidae				
			Argia sp.	X		
			Dromogomphus spoliatus	X		
			Dromogomphus sp.	X		
			Gomphus sp.	X	X	
		Lestidae				
			Lestes sp.	X		
		Libellulidae				
			Libellula sp.	X		
Plecoptera				X		
Trichoptera				X		
		Hydropsychidae				
			Cheumatopsyche sp.	X		
			Hydropsyche sp.	X		
			Parapsyche sp.	X		
		Hydroptilidae				
			Hydroptila sp.	X		
			Orthotrichia sp.	X		
			Oxyethira sp.	X		
		Leptoceridae				
			Ceraclea sp.	X		
			Oecetis sp.	X	X	
		Polycentropodidae				
			Cyrnellus sp	X		
		Polycentropodidae	*Polycentropus* sp.	X		

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2014	New in 2014
Coleoptera						
		Hydrophilidae		X		
Coleoptera		Elmidae	*Ancyronyx variegatus*	X		
			Dubiraphia sp.	X		
			Helichus sp.	X		
			Optioserus sp.	X		
			Stenelmis sp.	X		
		Psephenidae		X		
Diptera						
			Unidentified Diptera	X		
		Psychodidae		X		
			Pericoma sp.	X		
			Psychoda sp.	X		
			Telmatoscopus sp.	X		
			Unidentified Psychodidae pupae	X		
		Chaoboridae				
			Chaoborus sp.	X		
		Simuliidae				
			Similium sp.	X		
		Chironomidae		X		
		Chironominae		X	X	
			Tanytarsini pupa	X		
			Chironominae pupa	X	X	
			Axarus sp.	X	X	
			Chironomus sp.	X	X	
			Cladopelma sp.	X		
			Cladotanytarsus sp.	X		
			Cryptochironomus sp.	X	X	
			Cryptotendipes sp.		X	X
			Dicrotendipes nervosus	X	X	
			Dicrotendipes sp.	X		
			Glyptotendipes sp.	X		
			Harnischia sp.	X		
			Microchironomus sp.	X		
			Micropsectra sp.	X		
			Microtendipes sp.	X		
			Parachironomus sp.	X	X	
			Paracladopelma sp.	X		
			Paratanytarsus sp.	X		
			Paratendipes sp.	X		
			Phaenopsectra sp.	X	X	
			Polypedilum (s.s.) convictum type	X	X	
			P. (s.s.) simulans type	X		
			Polypedilum sp.	X		
			Pseudochironomis sp.	X	X	
			Rheotanytarsus sp.	X	X	
			Stempellina sp.	X		
			Stenochironomus sp.	X		
			Stictochironomus sp.	X		
			Tanytarsus coffmani	X		
			Tanytarsus sp.	X	X	
			Tribelos sp.	X		
			Xenochironomus sp.	X		
		Tanypodinae		X		
			***Tanypodinae* pupae**	X		
			Ablabesmyia sp.	X	X	
			Clinotanypus sp.	X	X	
			Coelotanypus scapularis	X		
			Coelotanypus sp.	X		
			Djalmabatista pulcher	X		
			Djalmabatista sp.	X		
			Procladius sp.	X	X	
			Tanypus sp.	X	X	

Table 5.2 (continued)

Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS

Phylum	Class	Family / Sub-Family	Genus and Species	Previous Collections	Collected in 2014	New in 2014
Diptera		Tanypodinae	*Thienemannimyia* group	X		
			Zavrelimyia sp.	X		
		Orthocladiinae		X		
			***Orthocladiinae* pupae**	X		
			Cricotopus bicinctus	X		
			C. (s.s.) trifascia	X		
			Cricotopus (Isocladius)-sylvestris Group	X		
			C. (Isocladius) sp.	X		
			Cricotopus (s.s.) sp.	X	X	
			Eukiefferiella sp.	X		
			Hydrobaenus sp.	X		
			Limnophyes sp.	X		
			Nanocladius (s.s.) distinctus	X		
			Nanocladius sp.	X		
			Orthocladius sp.	X		
			Parametriocnemus sp.	X		
			Paraphaenocladius sp.	X		
			Psectrocladius sp.	X		
			Pseudorthocladius sp.	X		
			Pseudosmittia sp.	X		
			Smittia sp.	X		
			Theinemannimyia sp.	X		
		Diamesinae				
			Diamesa sp.	X		
			Potthastia sp.	X		
		Ceratopogonidae		X		
			Probezzia sp.	X	X	
			Bezzia sp.	X		
			Culicoides sp.	X		
		Dolichopodidae		X		
		Empididae		X	X	
			Clinocera sp.	X		
			Wiedemannia sp.	X		
		Ephydridae		X		
		Muscidae		X		
		Rhagionidae		X		
		Tipulidae		X		
		Stratiomyidae		X		
		Syrphidae		X		
Lepidoptera				X		
Hydracarinidia				X		
			Oxus sp.	X		
Mollusca						
	Gastropoda			X		
		Hydrobiidae		X		
		Amnicolinae				
			Amnicola sp.	X	X	
			Aminicola binneyana	X		
			Amnicola limosa	X		
			Stagnicola elodes	X		
		Bithynidae				
			Bithynia sp.	X		
	Physacea			X		
		Pleuroceridae				
			Pleurocera acuta	X		
			Goniobasis sp.	X		
		Physidae		X		
			Physa sp.	X	X	
			Physa ancillaria	X		
			Physa integm	X	X	

Table 5.2 (continued) Systematic List of Macroinvertebrates Collected From 1973 Through 2014 in The Ohio River Near BVPS						
Phylum	**Class**	**Family Sub-Family**	**Genus and Species**	**Previous Collections**	**Collected in 2014**	**New in 2014**
Mollusca	**Physacea**	Ancylidae		X		
			Ferrissia sp.	X	X	
		Planorbidae				
			Gillia atilis	X	X	
			Gyraulus sp.	X	X	
		Valvatidae		X		
			Valvata perdepressa	X		
			Valvata piscinalis	X		
			Valvata sincera	X		
			Valvata sp.	X		
Pelecypoda				X		
	Sphaeriacea			X		
		Corbiculidae				
			Corbicula fluminea	X		
			Corbicula sp.	X	X	
		Sphaeriidae		X		
			Pisidium ventricosum	X		
			Pisidium sp.	X	X	
			Sphaerium sp.	X		
			Unidentified immature Sphaeriidae	X		
		Dreissenidae				
			Dreissena polymorpha	X	X	
		Unionidae		X		
			Anodonta grandis	X		
			Anodonta (immature)	X		
			Elliptio sp.	X		
			Quadrula pustulosa	X		
			Unidentified immature Unionidae	X		

TABLE 5.3

BENTHIC MACROINVERTEBRATE COUNTS FOR TRIPLICATE SAMPLES TAKEN AT EACH SAMPLE STATION FOR MAY AND SEPTEMBER 2014

Scientific name	May							Sept							
	Location						May	Location						Sept	2014
	1	2A	2B1	2B2	2B3	3	Total	1	2A	2B1	2B2	2B3	3	Total	Total
Ablabesmyia sp.	0	0	0	0	0	0	0	2	4	0	0	0	0	6	6
Amnicola limosa	0	0	0	0	0	0	0	8	6	20	0	1	7	42	42
Arcteonais lomondi	0	0	0	0	0	1	1	0	0	0	0	0	1	1	2
Aulodrilus sp	0	0	0	7	3	0	10	0	0	0	0	1	0	1	11
Axarus sp.	0	0	0	0	0	0	0	0	10	1	1	0	0	12	12
Branchiura sowerbyi	1	0	0	0	0	0	1	0	1	0	1	10	1	13	14
Chaetogaster sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Chironomid pupae	0	0	2	0	0	0	2	3	3	6	0	3	0	15	17
Chironomidae	0	0	1	0	0	0	1	1	0	0	0	0	0	1	2
Chironomus sp.	2	0	3	4	5	0	14	11	19	20	1	19	1	71	85
Clinotanypus sp.	0	0	0	0	0	0	0	0	0	1	3	3	4	11	11
Corbicula sp.	0	0	0	0	0	0	0	3	1	2	6	1	0	13	13
Corophididae (Amphipod)	0	0	0	0	0	0	0	0	27	0	0	0	0	27	27
Cricotopus (s.s.) sp.	0	0	0	0	0	0	0	23	1	1	0	0	0	25	25
Cryptochironomus sp.	1	0	2	2	1	0	6	9	7	16	2	0	1	35	41
Cryptotendipes sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Dicrotentipides sp	0	0	0	0	0	0	0	12	290	27	0	0	0	329	329
Dreissena polymorpha	0	0	0	0	0	0	0	5	32	7	1	0	3	48	48
Emphrididae	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Enchytraeidae	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Ferrissia sp.	0	0	0	0	0	0	0	24	6	10	0	0	45	85	85
Gammarus sp.	0	0	1	0	0	0	1	7	3	2	0	0	0	12	13
Gillia atilis	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Gyraulus sp	0	0	0	0	0	0	0	0	0	4	0	0	1	5	5
Gomphus sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Hexagenia sp.	0	0	0	5	0	0	5	0	0	0	9	1	1	11	16
Hirudinea	0	1	0	0	0	0	1	0	0	1	0	1	0	2	3
Immature tubificid without	100	17	50	203	152	40	562	39	2	52	129	822	50	1094	1656
Limnodrilus hoffmeisteri	3	5	3	53	10	1	75	2	0	12	3	80	6	103	178
Limnodrilus maumeensis	0	5	3	12	53	0	73	0	0	0	0	60	0	60	133
Limnodrilus udemekianus	0	1	0	0	3	0	4	0	0	0	0	0	0	0	4
Lumbricina	0	0	2	0	0	1	3	0	0	0	0	0	0	0	3
Lumbriculidae	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1
Naididae	1	1	1	0	0	0	3	1	0	0	0	0	0	1	4
Nais communis	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2
Nais elinguis	0	2	0	0	0	0	2	0	0	0	0	0	0	0	2
Nais pardalis	0	1	3	0	0	0	4	6	5	1	1	2	0	15	19
Nais variabilis	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Nematoda	0	0	2	4	3	0	9	10	0	1	0	3	16	30	39
Ocetis sp.	0	0	0	0	0	0	0	0	0	1	0	2	0	3	3
Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Parachironomus sp.	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6
Paranais sp	2	0	22	0	0	2	26	0	0	0	0	0	0	0	26
Phaenopsectra sp.	0	0	6	0	0	0	6	0	0	0	0	0	0	0	6
Physa sp	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Physa integm	0	0	0	0	0	0	0	1	0	0	0	0	1	2	2
Pisidium sp.	0	0	0	0	0	1	1	0	8	8	4	3	5	28	29
Polypedilum sp.	0	0	0	0	1	0	1	50	2	50	0	8	6	116	117
Pristina osborni	3	0	2	3	0	0	8	1	0	0	4	15	6	26	34
Pristinella jenkinae	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Probezzia sp.	0	0	4	10	1	0	15	0	0	0	0	4	0	4	19
Procladius sp.	0	0	0	2	1	0	3	7	5	25	8	5	1	51	54
Pseudochironomis sp.	0	0	0	0	0	0	0	0	5	0	0	0	0	5	5
Rheotanytarsus sp.	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
Specaria josinae	0	1	0	0	0	6	7	0	0	0	0	0	0	0	7
Stephensoniana	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2
Stylaria lacustris	1	0	2	0	0	0	3	0	0	0	0	0	0	0	3
Tanypus sp	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Tanytarsus sp.	0	0	1	0	0	0	1	18	5	38	0	0	1	62	63
Tubificidae	0	0	1	0	3	0	4	0	0	0	0	0	1	1	5
Monthly Total	114	34	111	311	237	53	860	246	442	310	175	1045	166	2384	3244

TABLE 5.4

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETES, CHIRONOMIDS, MOLLUSKS, AND OTHER ORGANISMS, 2014 BVPS

May	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaetes	1591	97	473	97	1276	80	4042	91	3225	95	745	98	1892	92
Chironomids	43	3	0	0	215	14	129	3	115	3	0	0	84	4
Mollusks	0	0	0	0	0	0	0	0	0	0	15	2	3	0
Others	0	0	14	3	100	6	287	6	57	2	0	0	76	4
Total	1634	100	487	100	1591	100	4458	100	3397	100	760	100	2055	100

September	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaetes	717	20	502	8	946	21	2007	80	14204	95	946	40	3218	56
Chironomids	1964	56	5031	79	2680	60	215	9	545	4	272	11	1787	31
Mollusks	602	17	760	12	731	16	158	6	72	0	917	39	540	9
Others	243	7	43	1	86	2	129	5	158	1	244	10	151	3
Total	3526	100	6336	100	4443	100	2509	100	14979	100	2379	100	5696	100

TABLE 5.5

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS FOR THE CONTROL STATION (1) AND THE AVERAGE FOR NON-CONTROL STATIONS (2B1, 2B2, AND 2B3), 2014 BVPS

May	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	1591	97	2848	90
Chironomidae	43	3	153	5
Mollusca	0	0	0	0
Others	0	0	148	5
TOTAL	1634	100	3149	100

September	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	717	20	5719	78
Chironomidae	1964	56	1147	16
Mollusca	602	17	320	4
Others	243	7	124	2
TOTAL	3526	100	7310	100

TABLE 5.6

SHANNON-WEINER DIVERSITY, EVENNESS AND RICHNESS INDICES
FOR BENTHIC MACROINVERTEBRATES COLLECTED IN THE OHIO RIVER, 2014

	Station					
May	1	2A	2B1	2B2	2B3	3
No. of Taxa	9	9	19	15	13	8
Shannon-Weiner Index	0.27	0.69	0.87	0.56	0.51	0.42
Evenness	0.28	0.73	0.68	0.48	0.46	0.46
Richness	1.69	2.27	3.82	2.44	2.19	1.76

	Station					
September	1	2A	2B1	2B2	2B3	3
No. of Taxa	25	21	26	15	21	22
Shannon-Weiner Index	1.14	0.66	1.12	0.52	0.41	0.95
Evenness	0.81	0.50	0.79	0.44	0.31	0.71
Richness	4.36	3.28	4.36	2.71	2.88	4.11

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2014.

	Preoperational					
	1973		1974		1975	
	1	2B	1	2B	1	2B
May	248	508	1116	2197		
August	99	244	143	541	1017	1124
Mean	**173**	**376**	**630**	**1369**	**1017**	**1124**

	Operational					
	1976		1977		1978	
	1	2B	1	2B	1	2B
May	927	3660	674	848	351	126
August	851	785	591	3474	601	1896
Mean	**889**	**2223**	**633**	**2161**	**476**	**1011**

	Operational					
	1979		1980		1981	
	1	2B	1	2B	1	2B
May	1004	840	1041	747	209	456
Aug/Sept	1185	588	1523	448	2185	912
Mean	**1095**	**714**	**1282**	**598**	**1197**	**684**

	Operational					
	1982		1983		1984	
	1	2B	1	2B	1	2B
May	3490	3026	3590	1314	2741	621
September	2958	3364	4172	4213	1341	828
Mean	**3223**	**3195**	**3881**	**2764**	**2041**	**725**

	Operational					
	1985		1986		1987	
	1	2B	1	2B	1	2B
May	2256	867	601	969	1971	2649
September	1024	913	849	943	2910	2780
Mean	**1640**	**890**	**725**	**956**	**2440**	**2714**

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2014 (Continued).

	Operational					
	1988		1989		1990	
	1	2B	1	2B	1	2B
May	1804	1775	3459	2335	15135	5796
September	1420	1514	1560	4707	5550	1118
Mean	**1612**	**1645**	**2510**	**3274**	**10343**	**3457**

	Operational					
	1991		1992		1993	
	1	2B	1	2B	1	2B
May	7760	6355	7314	10560	8435	2152
September	3588	2605	2723	4707	4693	2143
Mean	**5808**	**4480**	**5019**	**7634**	**6564**	**2148**

	Operational					
	1994		1995		1996	
	1	2B	1	2B	1	2B
May	6980	2349	8083	9283	1987	1333
September	1371	2930	1669	3873	1649	2413
Mean	**4176**	**2640**	**4876**	**6578**	**1814**	**1873**

	Operational					
	1997		1998		1999	
	1	2B	1	2B	1	2B
May	1411	2520	6980	2349	879	1002
September	1944	2774	1371	2930	302	402
Mean	**1678**	**2647**	**4176**	**2640**	**591**	**702**

	Operational					
	2000		2001		2002	
	1	2B	1	2B	1	2B
May	2987	2881	3139	5232	1548	2795
September	3092	2742			8632	14663
Mean	**3040**	**2812**	**3139**	**5232**	**5090**	**8729**

Table 5.7. Benthic Macroinvertebrate Densities for Stations 1 (Control) and 2B (Noncontrol), BVPS, 1973-2014 (Continued).

	Operational					
	2003		2004		2005	
	1	2B	1	2B	1	2B
May	7095	10750	2752	4558	516	1146
September	2193	6464	10062	7604	4773	6435
Mean	**4644**	**8607**	**6407**	**6181**	**2645**	**3791**

	Operational					
	2006		2007		2008	
	1	2B	1	2B	1	2B
May	143	1242	559	912	158	1252
September	229	2199	560	3794	1161	2150
Mean	**186**	**1721**	**560**	**2353**	**660**	**1701**

	Operational					
	2009		2010		2011	
	1	2B	1	2B	1	2B
May	71	1462	1763	2527	115	1700
September	903	1902	1720	1256	874	1233
Mean	**487**	**1682**	**1742**	**1892**	**495**	**1467**

	Operational					
	2012		2013		2014	
	1	2B	1	2B	1	2B
May	71	1462	2107	903	1634	3149
September	903	1902	373	1731	3526	7310
Mean	**487**	**1682**	**1240**	**1317**	**2580**	**5230**

TABLE 5.8

TOTAL FISH CATCH; ELECTROFISHING AND SEINE NET COMBINED DURING THE BVPS 2014 FISHERIES SURVEY

Common Name	Scientific Name	Number	Percent
Smallmouth buffalo	*Ictiobus bubalus*	13	**6.99**
Bluntnose minnow	*Pimephales notatus*	1	**0.54**
Bluegill	*Lepomis macrochirus*	2	**1.08**
Carp	*Cyprinis carpio*	13	**6.99**
Channel catfish	*Ictalurus punctatus*	2	**1.08**
Emerald shiner	*Notropis atherinoides*	39	**20.97**
Freshwater drum	*Aplodinotus grunniens*	2	**1.08**
Gizzard shad	*Dorosoma cepedianum*	65	**34.95**
Golden redhorse sucker	*Moxostoma erythrurum*	10	**5.38**
Largemouth bass	*Micropterus salmoides*	1	**0.54**
Longnose gar	*Lepisosteus osseus*	9	**4.84**
Mimic shiner	*Notropis volucellus*	1	**0.54**
Northern hogsucker	*Hypentelian nigricans*	1	**0.54**
River carpsucker	*Carpiodes carpio*	1	**0.54**
Shorthead redhorse sucker	*Moxostoma macrolepidotum*	11	**5.91**
Smallmouth bass	*Micropterus dolomieu*	6	**3.23**
Spotfin shiner	*Notropis spilopterus*	1	**0.54**
Spotted bass	*Micropterus punctulatus*	2	**1.08**
Walleye	*Sander vitreum*	5	**2.69**
Yellow perch	*Perca flavescens*	1	**0.54**
Total Fish Collected in 2014		**186**	**100.00**

TABLE 5.9

COMPARISON OF CONTROL VS. NON-CONTROL ELECTROFISHING CATCHES DURING THE BVPS 2014 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Smallmouth buffalo	3	10.00	10	9.3	13	9.42
Bluegill			1	0.9	1	0.72
Carp	3	10.00	10	9.3	13	9.42
Channel catfish			2	1.9	2	1.45
Freshwater drum	2	6.67			2	1.45
Gizzard shad	8	26.67	57	52.8	65	47.10
Golden redhorse sucker	2	6.67	5	4.6	7	5.07
Largemouth bass			1	0.9	1	0.72
Longnose gar	6	20.00	3	2.8	9	6.52
River carpsucker	1	3.33			1	0.72
Shorthead redhorse sucker	2	6.67	8	7.4	10	7.25
Smallmouth bass	2	6.67	4	3.7	6	4.35
Spotted bass			2	1.9	2	1.45
Walleye	1	3.33	4	3.7	5	3.62
Yellow perch			1	0.9	1	0.72
Total	**30**	**100.00**	**108**	**100.0**	**138**	**100.00**

TABLE 5.10

COMPARISON OF CONTROL VS. NON-CONTROL SEINE CATCHES DURING THE BVPS 2014 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Bluntnose minnow	1	4.35	0	0.00	1	2.08
Bluegill	1	4.35	0	0.00	1	2.08
Emerald shiner	19	82.61	20	80.00	39	81.25
Golden redhorse sucker	0	0.00	3	12.00	3	6.25
Mimic shiner	1	4.35	0	0.00	1	2.08
Northern hogsucker	0	0.00	1	4.00	1	2.08
Shorthead redhorse sucker	1	4.35	0	0.00	1	2.08
Spotfin shiner	0	0.00	1	4.00	1	2.08
Total	**23**	**100.00**	**25**	**100.00**	**48**	**100.00**

TABLE 5.11

FISH SPECIES COLLECTED DURING THE MAY 2014 (SPRING) SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Smallmouth buffalo			1		2		0	0.00	3	6.82
Bluntnose minnow							0	0.00	0	0.00
Bluegill							0	0.00	0	0.00
Carp				2			0	0.00	2	4.55
Channel catfish						2	0	0.00	2	4.55
Emerald shiner	15	12					27	96.43	0	0.00
Freshwater drum			2				0	0.00	2	4.55
Gizzard shad			4	1		7	0	0.00	12	27.27
Golden redhorse sucker			1	2			0	0.00	3	6.82
Largemouth bass							0	0.00	0	0.00
Longnose gar			3		1		0	0.00	4	9.09
Mimic shiner	1						1	3.57	0	0.00
Northern hogsucker							0	0.00	0	0.00
River carpsucker			1				0	0.00	1	2.27
Shorthead redhorse sucker			1	1		2	0	0.00	4	9.09
Smallmouth bass			1		2	1	0	0.00	4	9.09
Spotfin shiner							0	0.00	0	0.00
Spotted bass						2	0	0.00	2	4.55
Walleye			1	1	3		0	0.00	5	11.36
Yellow perch							0	0.00	0	0.00
Total	16	12	15	7	8	14	28	100.00	44	100.00

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.12

FISH SPECIES COLLECTED DURING THE JULY (SUMMER) 2014 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

	Sample locations *						Seine		Electrofishing	
Common Name	**S-1**	**S-2**	**E-1**	**E-2A**	**E-2B**	**E-3**	**Total**	**%**	**Total**	**%**
Smallmouth buffalo			1		3	2	0	0.00	6	23.08
Bluntnose minnow							0	0.00	0	0.00
Bluegill							0	0.00	0	0.00
Carp			1				0	0.00	1	3.85
Channel catfish							0	0.00	0	0.00
Emerald shiner		8					8	66.67	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad				14			0	0.00	14	53.85
Golden redhorse sucker		3					3	25.00	0	0.00
Largemouth bass							0	0.00	0	0.00
Longnose gar			1				0	0.00	1	3.85
Mimic shiner							0	0.00	0	0.00
Northern hogsucker							0	0.00	0	0.00
River carpsucker							0	0.00	0	0.00
Shorthead redhorse sucker				1	2		0	0.00	3	11.54
Smallmouth bass			1				0	0.00	1	3.85
Spotfin shiner		1					1	8.33	0	0.00
Spotted bass							0	0.00	0	0.00
Walleye							0	0.00	0	0.00
Yellow perch							0	0.00	0	0.00
Total	**0**	**12**	**4**	**15**	**5**	**2**	**12**	**100.00**	**26**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.13

FISH SPECIES COLLECTED DURING THE SEPTEMBER (FALL) 2014 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

	Sample locations *						Seine		Electrofishing	
Common Name	**S-1**	**S-2**	**E-1**	**E-2A**	**E-2B**	**E-3**	**Total**	**%**	**Total**	**%**
Smallmouth buffalo							0	0.00	0	0.00
Bluntnose minnow	1						1	33.33	0	0.00
Bluegill							0	0.00	0	0.00
Carp				2	1	1	0	0.00	4	11.76
Channel catfish							0	0.00	0	0.00
Emerald shiner							0	0.00	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad				6	5	15	0	0.00	26	76.47
Golden redhorse sucker							0	0.00	0	0.00
Largemouth bass					1		0	0.00	1	2.94
Longnose gar							0	0.00	0	0.00
Mimic shiner							0	0.00	0	0.00
Northern hogsucker		1					1	33.33	0	0.00
River carpsucker							0	0.00	0	0.00
Shorthead redhorse sucker	1			2			1	33.33	2	5.88
Smallmouth bass							0	0.00	0	0.00
Spotfin shiner							0	0.00	0	0.00
Spotted bass							0	0.00	0	0.00
Walleye							0	0.00	0	0.00
Yellow perch						1	0	0.00	1	2.94
Total	**2**	**1**	**0**	**10**	**7**	**17**	**3**	**100.00**	**34**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.14

FISH SPECIES COLLECTED DURING THE NOVEMBER (WINTER) 2014 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

	Sample locations *						Seine		Electrofishing	
Common Name	**S-1**	**S-2**	**E-1**	**E-2A**	**E-2B**	**E-3**	**Total**	**%**	**Total**	**%**
Smallmouth buffalo			1	2	1		0	0.00	4	11.76
Bluntnose minnow							0	0.00	0	0.00
Bluegill	1				1		1	20.00	1	2.94
Carp			2	4			0	0.00	6	17.65
Channel catfish							0	0.00	0	0.00
Emerald shiner	4						4	80.00	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad			4		9		0	0.00	13	38.24
Golden redhorse sucker			1	2	1		0	0.00	4	11.76
Largemouth bass							0	0.00	0	0.00
Longnose gar			2	2			0	0.00	4	11.76
Mimic shiner							0	0.00	0	0.00
Northern hogsucker							0	0.00	0	0.00
River carpsucker							0	0.00	0	0.00
Shorthead redhorse sucker			1				0	0.00	1	2.94
Smallmouth bass				1			0	0.00	1	2.94
Spotfin shiner							0	0.00	0	0.00
Spotted bass							0	0.00	0	0.00
Walleye							0	0.00	0	0.00
Yellow perch							0	0.00	0	0.00
Total	**5**	**0**	**5**	**11**	**12**	**0**	**5**	**100.00**	**34**	**100.00**

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.15

ESTIMATED NUMBER OF FISH OBSERVED * DURING ELECTROFISHING OPERATIONS, 2014

Common Name	May	July	Sept	Nov	Total
Walleye	2				**2**
Smallmouth buffalo	1	2			**3**
Longnose gar					**0**
Unidentified suckers	3				**3**
Unidentified black bass	2		1	1	**4**
Gizzard shad	1	1			**2**
Total	**9**	**3**	**1**	**1**	**14**

* = Not boated or handled

Table 5.16

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2011 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	40.5	Smallmouth buffalo	2	0.0494
		Channel catfish	1	0.0247
		Gizzard shad	1	0.0247
		Golden redhorse sucker	2	0.0494
		Longnose gar	1	0.0247
		Quillback	5	0.1235
		Shorthead redhorse sucker	12	0.2963
		Smallmouth bass	5	0.1235
		White bass	2	0.0494
		Season Total	**31**	**0.7654**
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Summer	40.3	Bluegill	2	0.0496
		Freshwater drum	1	0.0248
		Gizzard shad	3	0.0744
		Golden redhorse sucker	1	0.0248
		Longnose gar	1	0.0248
		Quillback	3	0.0744
		Shorthead redhorse sucker	3	0.0744
		Smallmouth bass	2	0.0496
		Spotted bass	3	0.0744
		Season Total	**19**	**0.4715**

Table 5.16 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2011 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40.2	Smallmouth buffalo	1	0.0249
		Black crappie	1	0.0249
		Bluegill	1	0.0249
		Channel catfish	1	0.0249
		Common carp	1	0.0249
		Flathead catfish	2	0.0498
		Freshwater drum	1	0.0249
		Gizzard shad	3	0.0746
		Golden redhorse sucker	5	0.1244
		Longnose gar	3	0.0746
		Mooneye	2	0.0498
		Sauger	5	0.1244
		Shorthead redhorse sucker	10	0.2488
		Silver redhorse	2	0.0498
		Smallmouth bass	8	0.1990
		Spotted bass	5	0.1244
		Walleye	3	0.0746
		White bass	3	0.0746
		Season Total	**57**	**1.4179**
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Winter	40.5	Smallmouth buffalo	4	0.0988
		Bluegill	3	0.0741
		Common carp	1	0.0247
		Freshwater drum	2	0.0494
		Gizzard shad	1	0.0247
		Largemouth bass	1	0.0247
		Pumpkinseed	1	0.0247
		Sauger	11	0.2716
		Shorthead redhorse sucker	9	0.2222
		Smallmouth bass	7	0.1728
		Spotted bass	2	0.0494
		White bass	1	0.0247
		Yellow perch	1	0.0247
		Season Total	**44**	**1.0864**
2011	**161.5**		**151**	**0.93498**

Table 5.17

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2012 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	40.1	Smallmouth buffalo	1	0.0249
		Channel catfish	1	0.0249
		Common carp	1	0.0249
		Gizzard shad	5	0.1247
		Golden redhorse sucker	5	0.1247
		Longnose gar	1	0.0249
		Rock bass	1	0.0249
		Shorthead redhorse sucker	5	0.1247
		Smallmouth bass	3	0.0748
		Season Total	**23**	0.5736
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Summer	40.1	Smallmouth buffalo	5	0.1247
		Common carp	1	0.0249
		Gizzard shad	8	0.1995
		Largemouth bass	1	0.0249
		Smallmouth bass	3	0.0748
		Season Total	**18**	0.4489

Table 5.17 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2012 FISHERIES SURVEY

Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Fall	40.1	Smallmouth buffalo	4	0.0998
		Black crappie	1	0.0249
		Common carp	2	0.0499
		Freshwater drum	1	0.0249
		Gizzard shad	10	0.2494
		Golden redhorse sucker	3	0.0748
		Largemouth bass	1	0.0249
		Quillback	1	0.0249
		Rock bass	1	0.0249
		Sauger	1	0.0249
		Shorthead redhorse sucker	3	0.0748
		Smallmouth bass	2	0.0499
		Spotted bass	1	0.0249
		White bass	6	0.1496
		Season Total	**37**	0.9227
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Winter	30	Smallmouth buffalo	1	0.0333
		Freshwater drum	1	0.0333
		Golden shiner	1	0.0333
		Shorthead redhorse sucker	3	0.1000
		Smallmouth bass	2	0.0667
		Walleye	1	0.0333
		White bass	1	0.0333
		Season Total	**10**	0.3333
2012	**150.3**		**88**	**0.58550**

Table 5.18

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2013 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	40.4	Smallmouth buffalo	1	0.0248
		Black crappie	1	0.0248
		Bluegill	1	0.0248
		Gizzard shad	1	0.0248
		Golden redhorse sucker	8	0.1980
		Longnose gar	2	0.0495
		Pumpkinseed	1	0.0248
		Quillback	2	0.0495
		River carpsucker	2	0.0495
		Rock bass	1	0.0248
		Shorthead redhorse sucker	10	0.2475
		Smallmouth bass	7	0.1733
		Spotted bass	2	0.0495
		Season Total	**39**	0.9653
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Summer	40.0	Smallmouth buffalo	3	0.0750
		Black crappie	1	0.0250
		Gizzard shad	1	0.0250
		Golden redhorse sucker	3	0.0750
		Sauger	1	0.0250
		Smallmouth bass	2	0.0500
		Season Total	**11**	0.2750

Table 5.18 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2013 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40.4	Bluegill	2	0.0495
		Channel catfish	1	0.0248
		Flathead catfish	1	0.0248
		Freshwater drum	1	0.0248
		Gizzard shad	1	0.0248
		Golden redhorse sucker	2	0.0495
		Longnose gar	1	0.0248
		River carpsucker	1	0.0248
		Smallmouth bass	1	0.0248
		Spotted bass	1	0.0248
		Walleye	1	0.0248
		Season Total	**13**	0.3218
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Winter	40.1	Bluegill	1	0.0249
		Channel catfish	1	0.0249
		Freshwater drum	1	0.0249
		Golden redhorse sucker	6	0.1496
		Rock bass	3	0.0748
		Shorthead redhorse sucker	7	0.1746
		Smallmouth bass	2	0.0499
		Yellow perch	1	0.0249
		Season Total	**22**	0.5486
2013	**160.9**		**85**	**0.52828**

Table 5.19

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2014 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	40.4	Smallmouth buffalo	3	0.0743
		Carp	2	0.0495
		Channel catfish	2	0.0495
		Freshwater drum	2	0.0495
		Gizzard shad	12	0.2970
		Golden redhorse sucker	3	0.0743
		Longnose gar	4	0.0990
		River carpsucker	1	0.0248
		Shorthead redhorse sucker	4	0.0990
		Smallmouth bass	4	0.0990
		Spotted bass	2	0.0495
		Walleye	5	0.1238
		Season Total	**44**	1.0891
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Summer	40.1	Smallmouth buffalo	6	0.1496
		Carp	1	0.0249
		Gizzard shad	14	0.3491
		Longnose gar	1	0.0249
		Shorthead redhorse sucker	3	0.0748
		Smallmouth bass	1	0.0249
		Season Total	**26**	0.6484

Table 5.19 (continued)

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2014 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40.0	Carp	4	0.1000
		Gizzard shad	26	0.6500
		Largemouth bass	1	0.0250
		Shorthead redhorse sucker	2	0.0500
		Yellow perch	1	0.0250
		Season Total	**34**	0.8500
Season	**Effort (min)**	**Common Name**	**Number Collected**	**CPUE (fish/min)**
Winter	40.0	Smallmouth buffalo	4	0.1000
		Bluegill	1	0.0250
		Carp	6	0.1500
		Gizzard shad	13	0.3250
		Golden redhorse sucker	4	0.1000
		Longnose gar	4	0.1000
		Shorthead redhorse sucker	1	0.0250
		Smallmouth bass	1	0.0250
		Season Total	**34**	0.8500
2014	**160.5**		**138**	**0.85981**

TABLE 5.20

UNIT 1 COOLING RESERVOIR MONTHLY SAMPLING <u>CORBICULA</u> DENSITY DATA FOR 2014 FROM BVPS

Collection Date	Area Sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum Length Range(mm)	Estimated Number (per sq m)
3/18/2014	0.25	Dead	1	1.00-1.99	1.00-1.99	43
		Live	1	2.00-3.34	2.00-3.34	43
4/22/2014	0.25	Dead	2	2.00-3.34	2.00-3.34	86
		Live	1	2.00-3.34	2.00-3.34	43
5/28/2014	0.25	Dead	0	---	---	0
		Live	1	2.00-3.34	2.00-3.34	43
6/12/2014	0.25	Dead	0	---		0
		Live	2	3.35-4.74	2.00-3.34	86
7/24/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
8/21/2014	0.25	Dead	2	3.35-4.74	1.00-1.99	86
		Live	1	2.00-3.34	2.00-3.34	43
9/11/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
10/16/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
11/7/2014*	---	Dead	---	---	---	---
		Live	---	---	---	---
Unit summary		Dead	5	3.35-4.74	1.00-1.99	27
		Live	6	3.35-4.74	2.00-3.34	32

*Not sampled due to equipment issue

TABLE 5.21

UNIT 2 COOLING RESERVOIR MONTHLY SAMPLING <u>CORBICULA</u> DENSITY DATA FOR 2014 FROM BVPS

Collection Date	Area Sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum Length Range(mm)	Estimated Number (per sq m)
3/18/2014	0.25	Dead	1	2.00-3.34	2.00-3.34	43
		Live	3	2.00-3.34	1.00-1.99	129
4/2/2014*	---	Dead	---	---	---	---
		Live	---	---	---	---
5/28/2014	0.25	Dead	1	4.75-6.29	4.75-6.29	43
		Live	0	---	---	0
6/12/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
7/24/2014	0.25	Dead	1	2.00-3.34	2.00-3.34	43
		Live	2	2.00-3.34	1.00-1.99	86
8/21/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
9/11/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
10/16/2014	0.25	Dead	0	---	---	0
		Live	0	---	---	0
11/7/2014**	---	Dead	---	---	---	---
		Live	---	---	---	---
Unit summary		Dead	3	4.75-6.29	2.00-3.34	18
		Live	5	2.00-3.34	1.00-1.99	31

*Not sampled due to outage

**Not sampled due to equipment issue

9.0

FIGURES

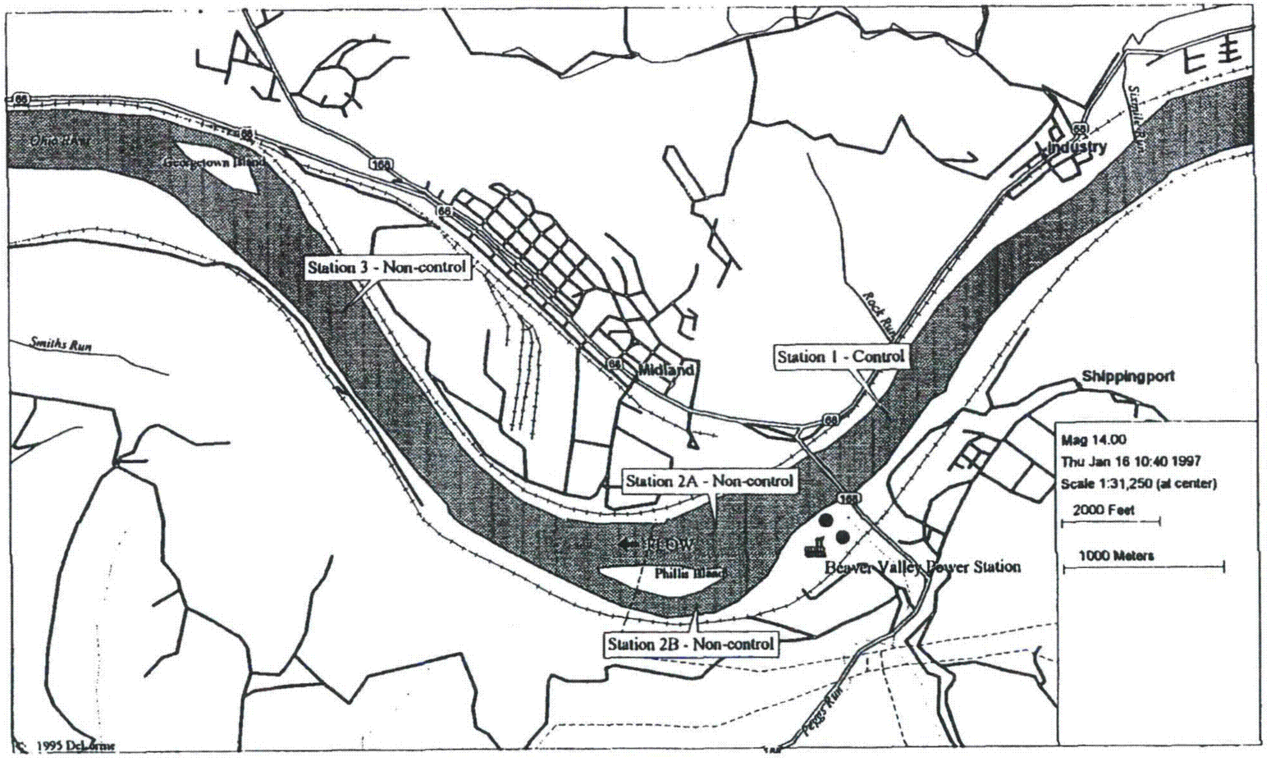


Figure 5.1 2014 Beaver Valley Power Station Aquatic Monitoring Program Sampling Control and Non-Control Sampling Stations

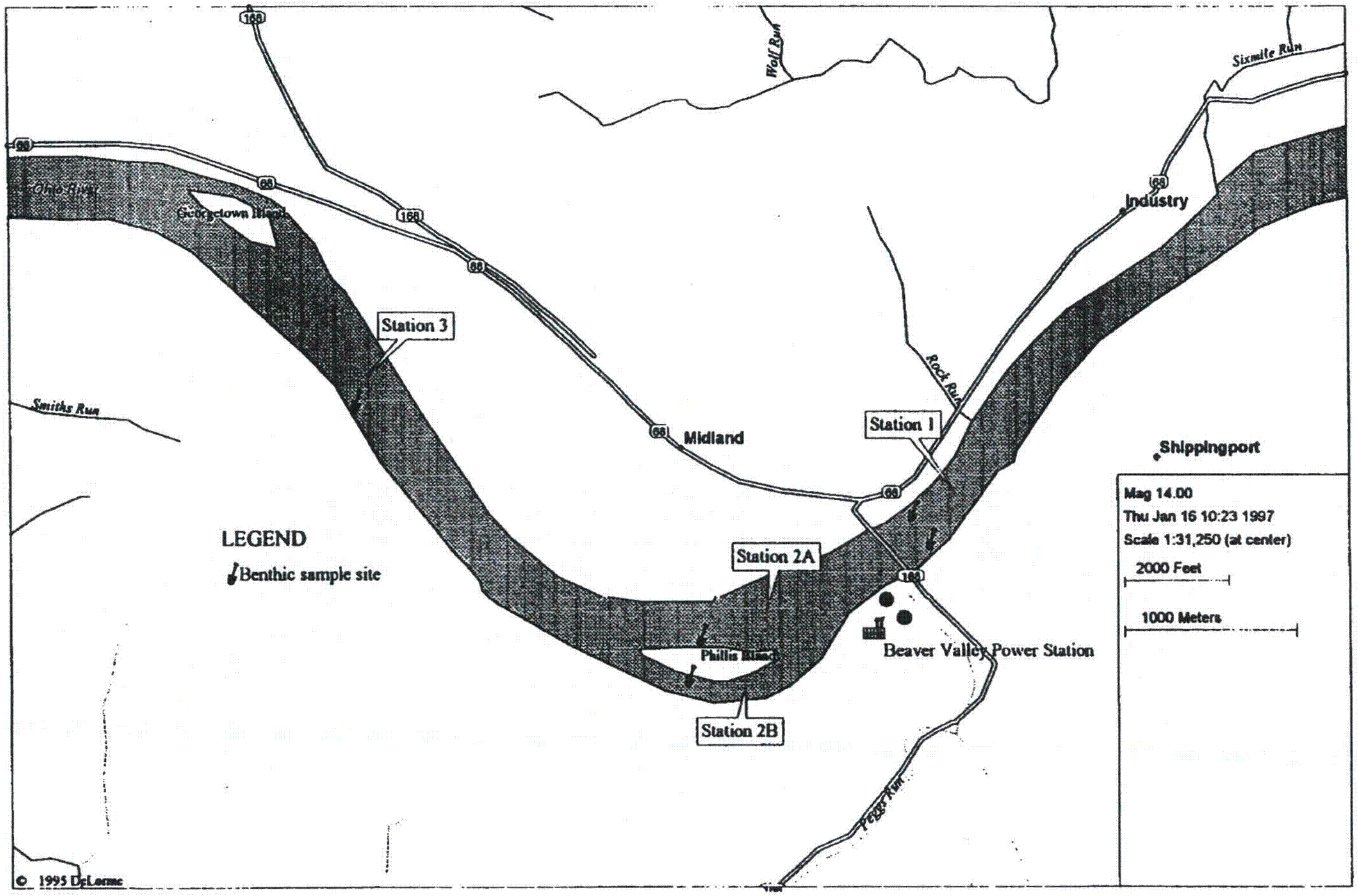


Figure 5.2 Location Map for Beaver Valley Power Station Benthic Organism Survey Sampling Sites for the 2014 Study

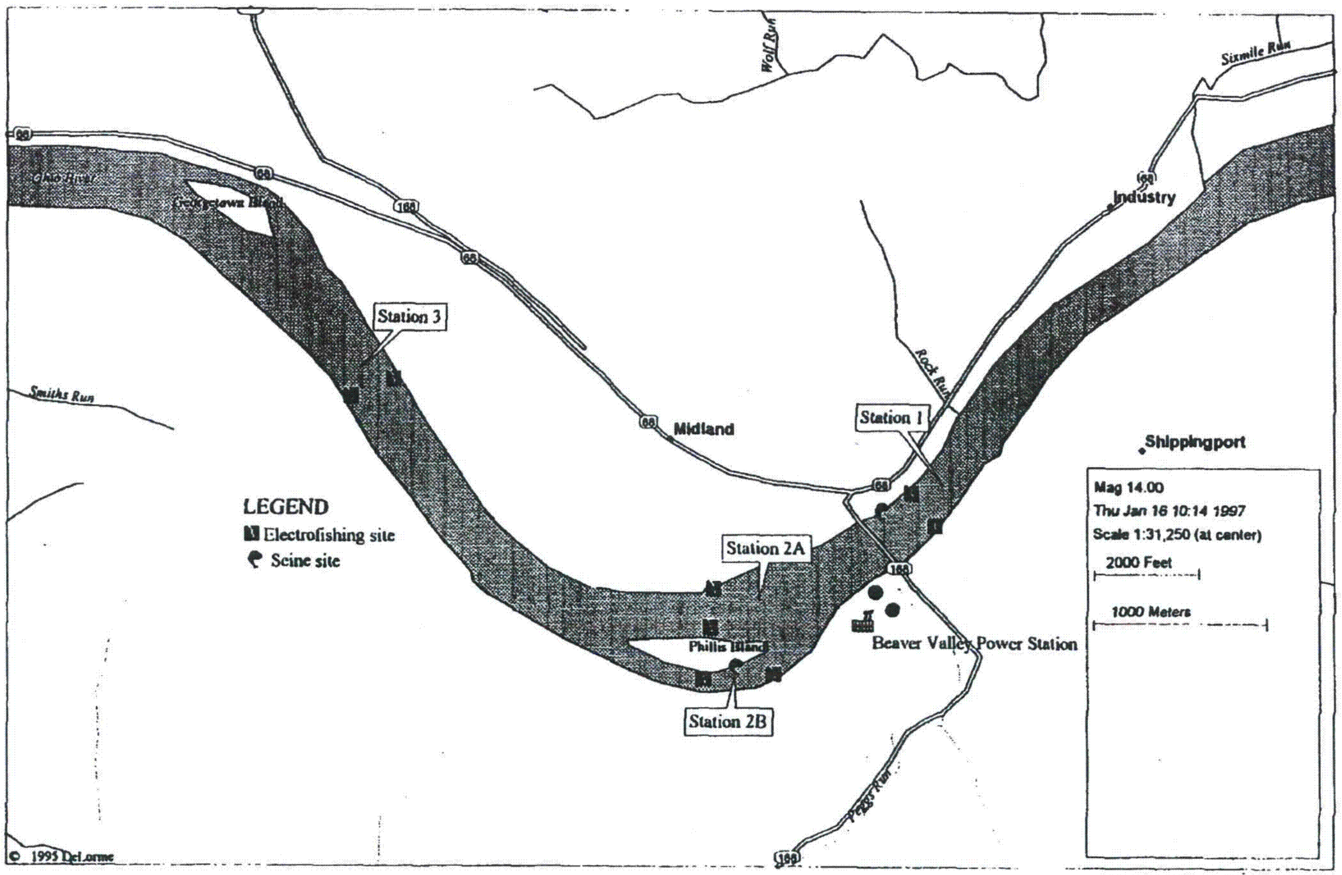


Figure 5.3 Location Map for Beaver Valley Power Station Fish Population Survey Fish Sampling Sites for the 2014 Study

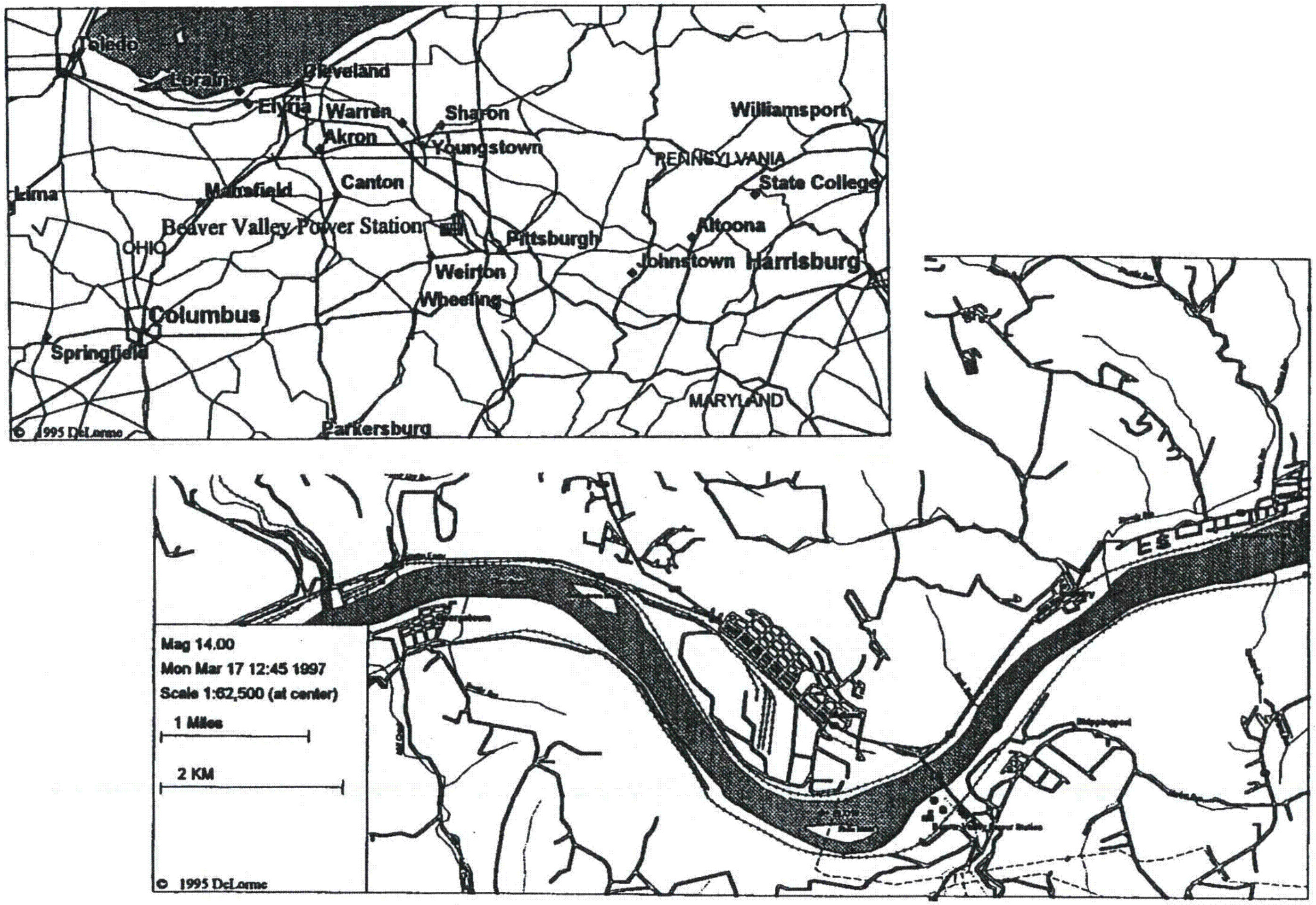
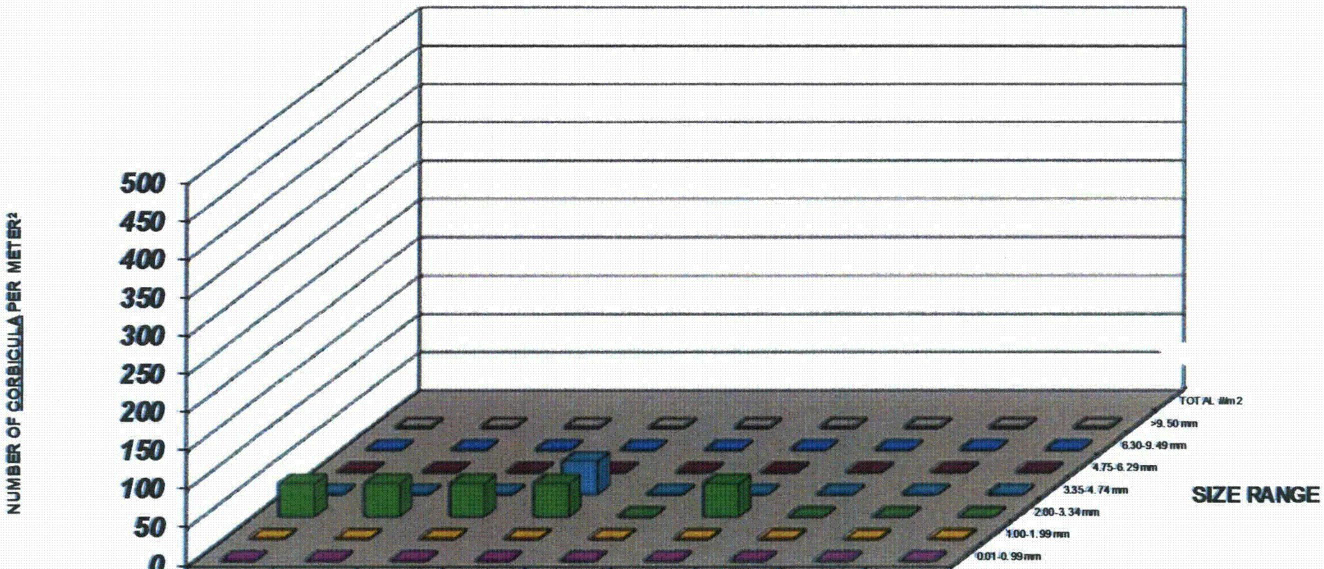


Figure 5.4 Location of Study Area, Beaver Valley Power Station Shippingport, Pennsylvania BVPS

Comparison of live Corbicula clam density estimates among 2014 BVPS Unit 1 cooling tower reservoir events, for various clam shell groups.

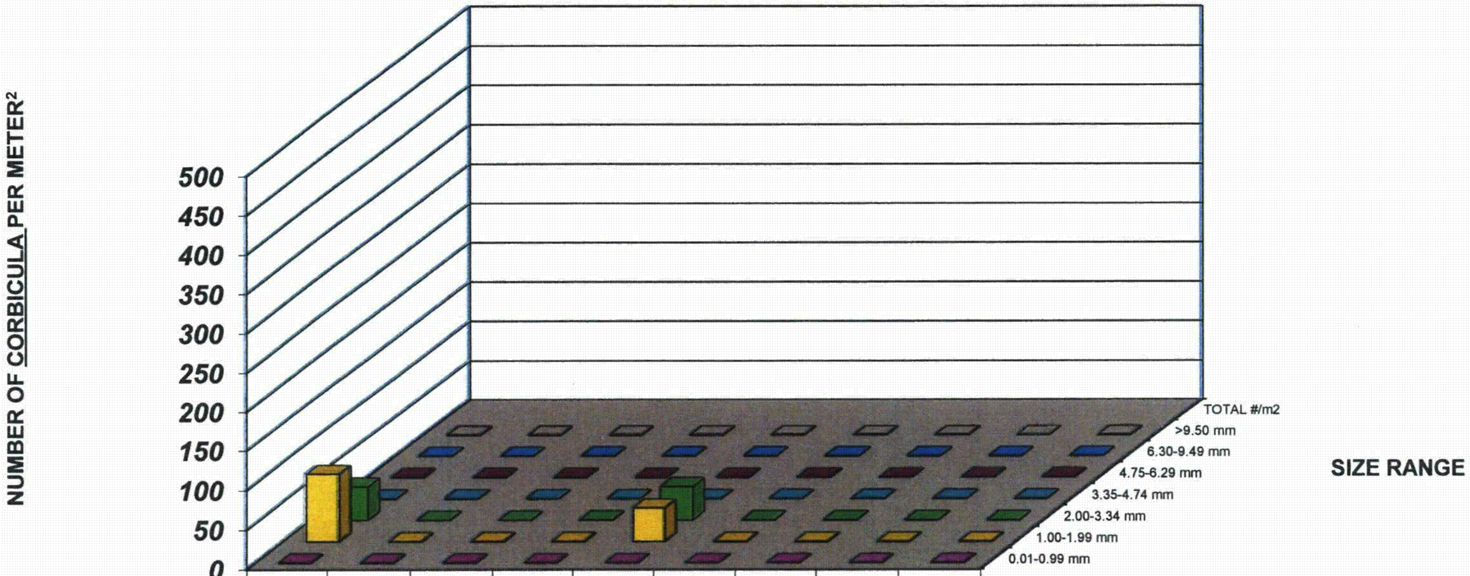


	3/18	4/22	5/28	6/12	7/24	8/21	9/11	10/16	11/7*
0.01-0.99 mm	0	0	0	0	0	0	0	0	0
1.00-1.99 mm	0	0	0	0	0	0	0	0	0
2.00-3.34 mm	43	43	43	43	0	43	0	0	0
3.35-4.74 mm	0	0	0	43	0	0	0	0	0
4.75-6.29 mm	0	0	0	0	0	0	0	0	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	0	0	0	0	0	0	0
TOTAL #/m2	43	43	43	86	0	43	0	0	0

Figure 5.5

*Not sampled in November due to equipment issues

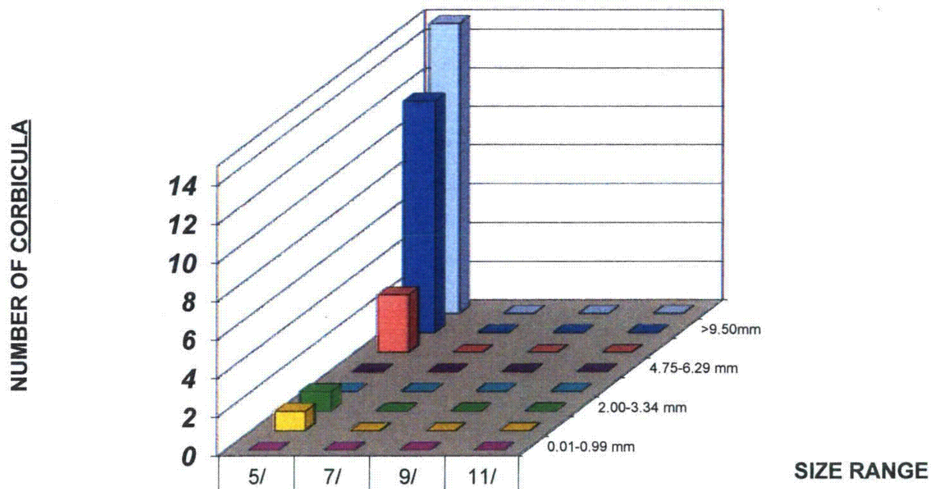
Comparison of live Corbicula clam density estimates among 2014 BVPS Unit 2 cooling tower reservoir events, for various clam shell groups.



	3/18	4/22*	5/28	6/12	7/24	8/21	9/11	10/16	11/7**
0.01-0.99 mm	0	0	0	0	0	0	0	0	0
1.00-1.99 mm	86	0	0	0	43	0	0	0	0
2.00-3.34 mm	43	0	0	0	43	0	0	0	0
3.35-4.74 mm	0	0	0	0	0	0	0	0	0
4.75-6.29 mm	0	0	0	0	0	0	0	0	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	0	0	0	0	0	0	0
TOTAL #/m2	129	0	0	0	86	0	0	0	0

Figure 5.6

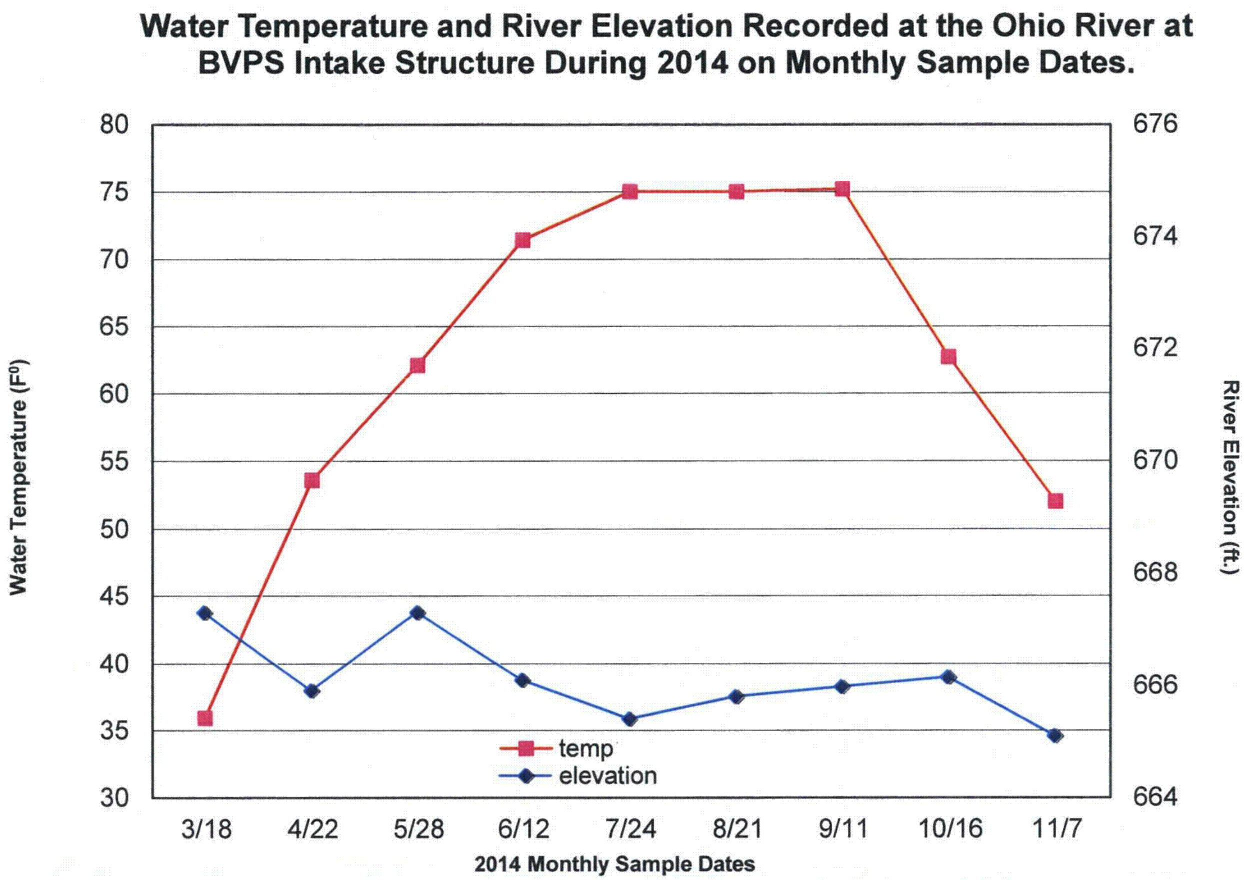
Comparison of live Corbicula clam density estimates among 2014 BVPS Intake Structure sample events, for various clam shell groups.



	5/28	7/24	9/11	11/7
0.01-0.99 mm	0	0	0	0
1.00-1.99 mm	1	0	0	0
2.00-3.34 mm	1	0	0	0
3.35-4.74 mm	0	0	0	0
4.75-6.29 mm	0	0	0	0
6.30-9.49 mm	3	0	0	0
>9.50mm	12	0	0	0
TOTAL	17	0	0	0

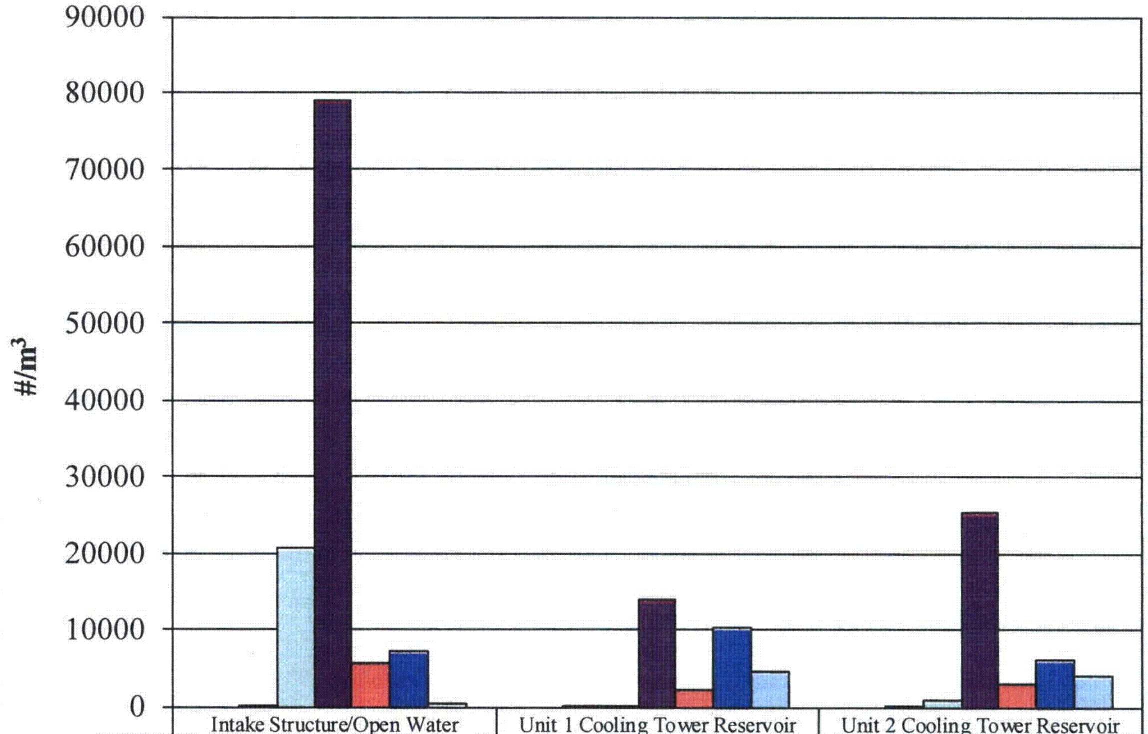
Intake structure bottom samples are collected from the Ohio River at the Intake Building.

Figure 5.7



Water Temperature and River Elevation Recorded at the Ohio River at BVPS Intake Structure During 2014 on Monthly Sample Dates.
80
75
70
65
60
55
50
45
40
35
30
Water Temperature (F⁰)
676
674
672
670
668
666
664
River Elevation (ft.)
temp
elevation
3/18
4/22
5/28
6/12
7/24
8/21
9/11
10/16
11/7
2014 Monthly Sample Dates

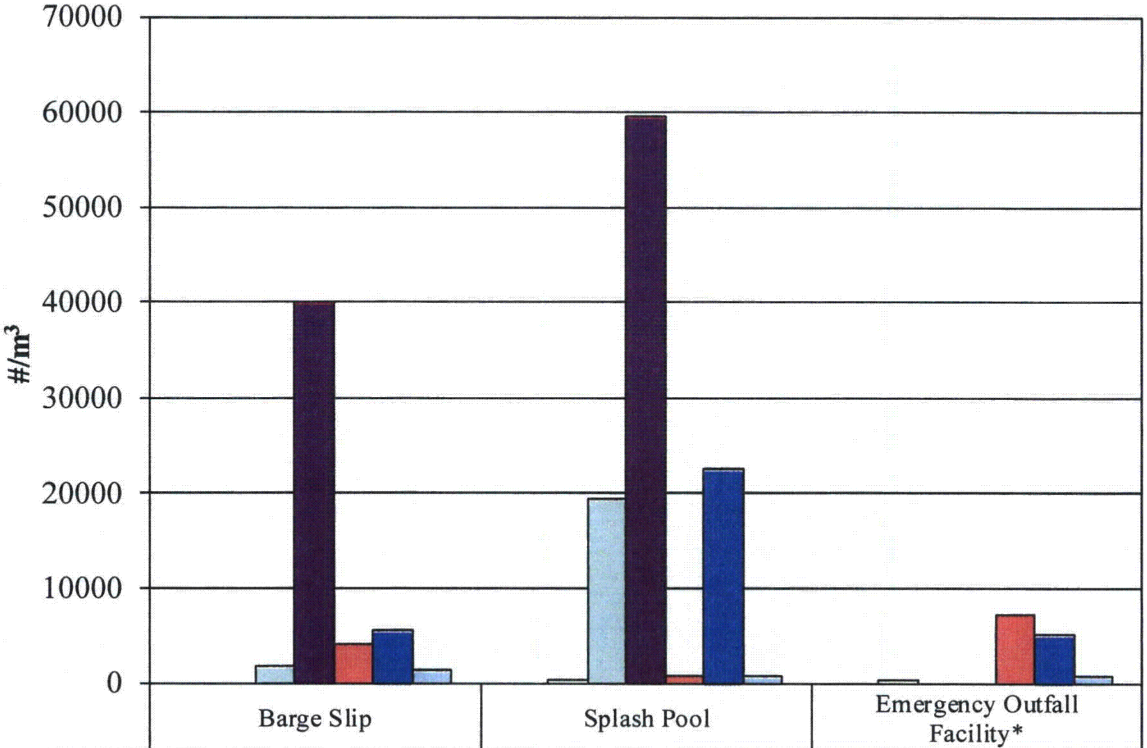
Figure 5.8



	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
4/22*	0	13	0
5/28	195	21	99
6/12	20550	60	1030
7/24	78960	13898	25380
8/21	5540	2140	3070
9/11	7275	10150	6188
10/16	380	4460	4064

Sample location

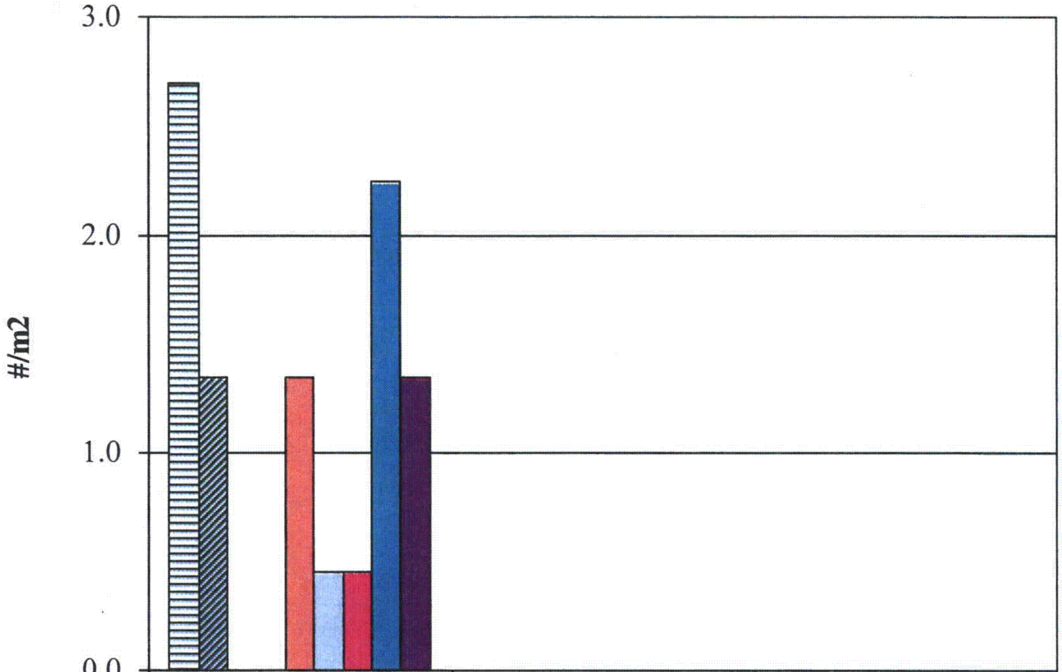
Figure 5.9. Density of zebra mussel veligers collected at Beaver Valley Power Station, 2014.
*Cooling Tower 2 not sampled in April due to outage



	Barge Slip	Splash Pool	Emergency Outfall Facility*
4/22	0	0	0
5/28	0	242	336
6/12	1790	19350	0
7/24	40150	59640	0
8/21	4140	700	7260
9/11	5467	22550	5134
10/16	1270	740	810

Sample location

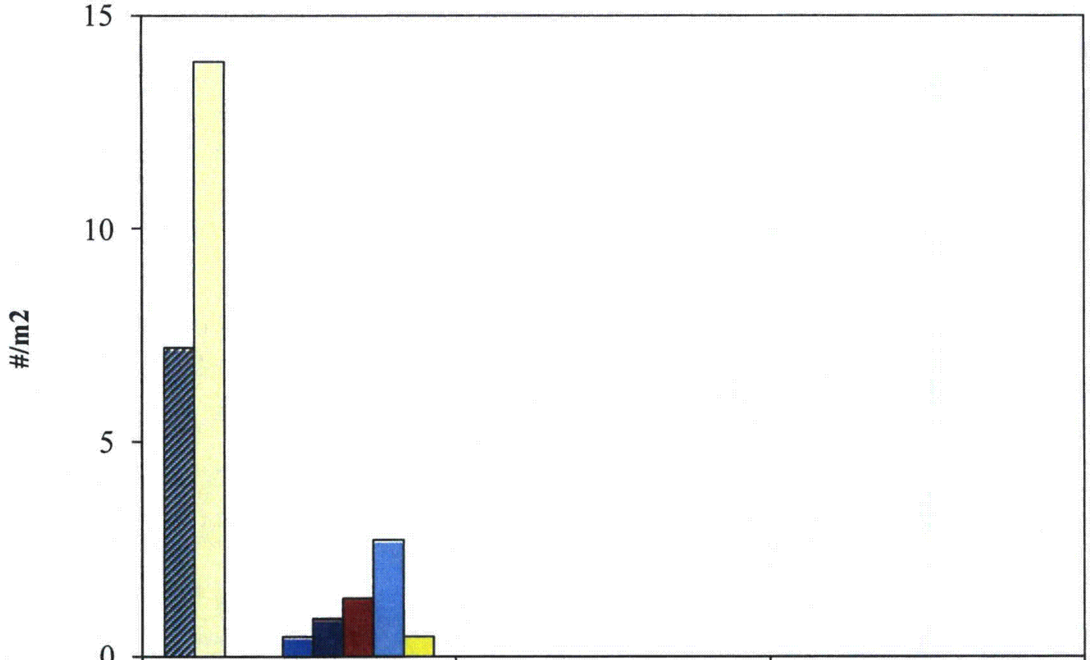
Figure 5.10. Density of zebra mussel veligers collected at Beaver Valley Power Station, 2014.
*No sample at EOF in June or July . Construction precluded access.



	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
6/18	2.7	0.0	0.0
4/22*	1.3	0.0	0.0
5/28	0.0	0.0	0.0
6/12	0.0	0.0	0.0
7/24	1.3	0.0	0.0
8/21	0.4	0.0	0.0
9/11	0.4	0.0	0.0
10/16	2.2	0.0	0.0
11/7	1.3	0.0	0.0

Figure 5.11. Density of settled zebra mussels at Beaver Valley Power Station, 2014.

*Unit 2 Cooling tower not sampled in April due to outage



	Barge Slip	Splash Pool	Emergency Outfall Facility*
3/18	7	0	0
4/22	14	0	0
5/28	0	0	0
6/12	0	0	0
7/24	0	0	0
8/21	1	0	0
9/11	1	0	0
10/16	3	0	0
11/7	0	0	0

Figure 5.12. Density of settled zebra mussels at Beaver Valley Power Station, 2014.

*The EOF was not sampled in June or July due to Access Restrictions

10.0

PERMITS

Attachment 10.1: PERMITS & CERTIFICATES FOR ENVIRONMENTAL COMPLIANCE

Registration Number	Regulator/Description	Expiration
PAR000040485	BVPS EPA generator identification Resource Conservation & Recovery Act (RCRA) Identification number for regulated waste activity. Also used by PA DEP to monitor regulated waste activity under the Pennsylvania Solid Waste Management Act (SWMA).	Indefinite
04-02474	BVPS EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
04-02475	FE Long Term Distribution Center/Warehouse (22) EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
PA0025615	BVPS NPDES Permit number under US EPA and PA DEP.	12/27/2006 *Continued pending approval of renewal application.*
04-13281	BVPS Unit 1 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
04-13361	BVPS Unit 2 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
OP-04-00086	PA DEP State Only Synthetic Minor Permit for emergency auxiliary boilers, emergency diesel generators, paint shop and other miscellaneous sources.	10/12/2012 *Continued pending approval of renewal application.*
N/A	PA DEP Open Burning Permit for operation of the BVPS Fire School- annual application and renewal	01/01/2016
042009 450 002RT	US Department of Transportation Hazardous Materials Registration	06/30/2015
200100242	US Army Permit for maintenance dredging (With Encroachment/Submerged Lands Agreement #0477705, this allows maintenance dredging.).	12/31/2021
0477705	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of current barge slip. (With US Army Permit #200100242, this allows maintenance dredging.)	Indefinite
06786A	Encroachment Permit/Submerged Lands Agreement for transmission line over Ohio River @ Mile 34.5	Indefinite
18737	Encroachment Permit/Submerged Lands Agreement for Unit 1 intake and discharge (main combined intake and outfall structures)	Indefinite
0475711	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of Unit 2 auxiliary intake	Indefinite
GP020409201	For construction and maintenance of boat ramp near barge slip.	Indefinite
	- End Table -	

APPENDIX A

SCIENTIFIC AND COMMON NAME[1]
OF FISH COLLECTED IN THE NEW CUMBERLAND
POOL OF THE OHIO RIVER, 1970 THROUGH 2014
BVPS

[1]Nomenclature follows Robins, et al. (1991)

Appendix A

SCIENTIFIC AND COMMON NAME[1] OF FISH COLLECTED IN THE NEW CUMBERLAND POOL OF THE OHIO RIVER, 1970 THROUGH 2014 BVPS

Family and Scientific Name	Common Name
Lepisosteidae (gars)	
Lepisosteus osseus	Longnose gar
Hiodontidae (mooneyes)	
Hiodon alosoides	Goldeye
H. tergisus	Mooneye
Clupeidae (herrings)	
Alosa chrysochloris	Skipjack herring
A. pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Cyprinidae (carps and minnows)	
Campostoma anomalum	Central stoneroller
Carassius auratus	Goldfish
Ctenopharyngodon idella	Grass carp
Notropis spilopterus	Spotfin shiner
Cyprinus carpio	Common carp
C. carpio x C. auratus	Carp-goldfish hybrid
Luxilus chrysocephalus	Striped shiner
Macrhybopsis storeriana	Silver chub
Nocomis micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
N. buccatus	Silverjaw minnow
N. hudsonius	Spottail shiner
N. rubellus	Rosyface shiner
N. stramineus	Sand shiner
N. volucellus	Mimic shiner
Pimephales notatus	Bluntnose minnow
P. promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Semotilus atromaculatus	Creek chub
Catostomidae (suckers)	
Carpiodes carpio	River carpsucker
C. cyprinus	Quillback
C. velifer	Highfin carpsucker
Catostomus commersonii	White sucker
Hypentelium nigricans	Northern hogsucker
Ictiobus bubalus	Smallmouth buffalo
I. niger	Black buffalo
Minytrema melanops	Spotted sucker

Appendix A
(Continued)

Family and Scientific Name	Common Name
Moxostoma anisurum	Silver redhorse
M. carinatum	River redhorse
M. duquesnei	Black redhorse
M. erythrurum	Golden redhorse
M. macrolepidotum	Shorthead redhorse
Ictaluridae (bullhead catfishes)	
Ameiurus catus	White catfish
A. furcatus	Blue catfish
A. melas	Black bullhead
A. natalis	Yellow bullhead
A. nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Pylodictis olivaris	Flathead catfish
Esocidae (pikes)	
Esox lucius	Northern pike
E. masquinongy	Muskellunge
E. lucius x E. masquinongy	Tiger muskellunge
Salmonidae (trouts)	
Oncorhynchus mykiss	Rainbow trout
Percopsidae (trout-perches)	
Percopsis omiscomaycus	Trout-perch
Cyprinodontidae (killifishes)	
Fundulus diaphanus	Banded killifish
Atherinidae (silversides)	
Labidesthes sicculus	Brook silverside
Percichthyidae (temperate basses)	
Morone chrysops	White bass
M. saxatilis	Striped bass
M. saxatilis x M. chrysops	Striped bass hybrid
Centrarchidae (sunfishes)	
Ambloplites rupestris	Rock bass
Lepomis cyanellus	Green sunfish
L. gibbosus	Pumpkinseed
L. macrochirus	Bluegill
L. microlophus	Redear sunfish
L. gibbosus x L. microlophus	Pumpkinseed-redear sunfish hybrid

Family and Scientific Name	Common Name
Micropterus dolomieu	Smallmouth bass
M. punctulatus	Spotted bass
M. salmoides	Largemouth bass
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappie
Percidae (perches)	
Etheostoma blennioides	Greenside darter
E. nigrum	Johnny darter
E. zonale	Banded darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
P. copelandi	Channel darter
Sander canadense	Sauger
S. vitreum	Walleye
S. canadense x S. vitreum	Saugeye
Sciaenidae (drums)	
Aplodinotus grunniens	Freshwater drum

[1]Nomenclature follows Robins, et al. (1991)

RTL #A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-1.01

ODCM: Index, Matrix and History of ODCM Changes

Document Owner
Manager, Chemistry

Revision Number	20
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	10/07/14

TABLE OF CONTENTS

TABLE OF CONTENTS

3-28-14

1.0 PURPOSE

1.1 This procedure provides an index for the entire Offsite Dose Calculation Manual (ODCM).

1.2 This procedure also provides an historical description of all changes to the ODCM.

1.3 This procedure also contains a matrix of plant procedure references for Radiological Effluent Technical Specifications (RETS), Radiological Environmental Monitoring Program (REMP) surveillances that were transferred from the Technical Specification Procedure Matrix to the ODCM via Change (8) and Change (16).

1.3.1 Prior to issuance of this procedure, these items were located in the Index and Appendix F of the old ODCM.

1.3.2 The numbering of each specific ODCM Controls, ODCM Surveillance Requirements and ODCM Controls Tables contained in this procedure does not appear to be sequential. This is intentional, as all ODCM Controls, ODCM Surveillance Requirements and ODCM Controls Tables numbers remained the same when they were transferred from the Technical Specifications Procedure Matrix. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

2.0 SCOPE

2.1 This procedure is applicable to all station personnel that are qualified to perform activities as described and referenced in this procedure.

3.0 REFERENCES AND COMMITMENTS

3.1 References Used in This Procedure

3.1.1 NUREG-0472, Draft 7 for Rev. 3, Standard Radiological Effluent Technical Specifications For PWRs September, 1982.

3.1.2 NUREG-0133, Preparation Of Radiological Effluent Technical Specifications For Nuclear Power Plants, October, 1978.

3.1.3 Generic Letter 89-01, Implementation Of Programmatic Controls For Radiological Effluent Technical Specifications In The Administrative Controls Section Of The Technical Specifications And The Relocation Of Procedural Details Of RETS To The ODCM Or To The PCP, January 31, 1989.

3.1.4 NUREG-1301, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls For Pressurized Water Reactors, Generic Letter 89-01, Supplement No. 1, April, 1991.

3.1.5 1/2-ODC-3.03, ODCM: Controls for RETS and REMP Programs

3.1.6 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.7 1/2-ADM-0100, Procedure Writer's Guide

3.1.8 NOP-SS-3001, Procedure Review and Approval

3.1.9 CR 04-09895, Missed ODCM Channel Functional Test (Gas Effluent Sampler Flowrate). CA-04, Revise ODCM procedure 1/2-ODC-1.01, Attachment C, Table F:3a to show that the Channel Functional Test requirements for the Unit 1 Sampler Flowrate Measuring Devices delineated in ODCM procedure 1/2-ODC-3.03, Attachment F, Table 4.3-13 are being met by Form 1/2-ENV-01.04.F01 instead of 1MSP-43.71-I

3.1.10 CR 05-01169 Chemistry Action Plan For Transition of RETS, REMP and ODCM, CA-14 thru CA-21, Revise ODCM procedures to change document owner from "Manager, Radiation Protection" to Manager Nuclear Environmental & Chemistry".

3.1.11 CR06-04908, Radiation Monitor Alarm Setpoint Discrepancies. CA-03; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [RM-1RM-100] and [RM-1DA-100] for incorporation of the Extended Power Uprate per Unit 1 TS Amendment No. 275. Also, CA-04; revised ODCM procedure 1/2-ODC-2.02 to add a"$\leq$" designation to all alarm setpoints for Unit 1 and Unit 2 low range noble gas effluent monitors.

3.1.12 CR06-6476, Procedure 1/2-ODC-2.01 Needs Revised for Plant Uprate. CA-01; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [2SWS-RQ101] for incorporation of the Extended Power Uprate per Unit 2 TS Amendment No. 156.

3.2 <u>Summary of References Used Throughout Other Procedures of the ODCM</u>

3.2.1 <u>BVPS-1 and 2 UFSAR</u>:

3.2.1.1 BVPS-1 UFSAR Section 11.2.3; Gaseous Waste Disposal System

3.2.1.2 BVPS-1 UFSAR Section 11.2.4; Liquid Waste Disposal System

3.2.1.3 BVPS-2 UFSAR Section 11.2; Liquid Waste Management Systems

3.2.1.4 BVPS-2 UFSAR Section 11.3; Gaseous Waste Management Systems

3.2.2 <u>Condition Reports and SAP Orders</u>:

3.2.2.1 CR 971578, MEMBERS OF THE PUBLIC Discrepancies. CA-01, Revise Section 4 of the ODCM to clarify how doses due to effluents for members of the public (conducting activities inside the site boundary) are derived and reported.

3.2.2.2 CR 980129, ODCM Procedure Matrix Discrepancies. CA-01, Revise Appendix F of the ODCM to correct discrepancies with 1/2-OM L5 Surveillance Logs.

3.2.2.3 CR 980353, EPMP 2.01 Discrepancies for Environmental Sampling Locations. CA-01, Revise Section 3 of the ODCM to correct REMP sample site distances and sectors.

3.2.2.4 CR 981488, Chemistry Related ODCM Procedures and ODCM Appendix F References. CA-01, Revise ODCM Appendix F to add Chemistry procedure references.

3.2.2.5 CR 981489, ODCM Table 4.11-2 Row A (Waste Gas Storage Tank Discharge Tritium). CA-01, Revise Appendix C of the ODCM (Table 4.11-2) to add clarification as to where and when tritium samples are to be obtained for GWST discharges.

3.2.2.6 CR 981490, ODCM Table 4.11-2 Note e, and Related Chemistry Department Procedures. CA-01, Revise Appendix C of the ODCM (Table 4.11-2, Note e) to specify the proper tritium sample point.

3.2.2.7 CR 982097, Liquid Discharge Post Release Review Methodology. CA-01, Revise Section 1 of the ODCM to add clarification for calculation of radionuclide concentration when the Post Dose Correction Factor is >1.

3.2.2.8 CR 990025, Unnecessary Radiation Monitor Setpoint Change After Waste Discharges. No ODCM changes are required for this CR.

3.2.2.9 CR 992652, Discrepancies Concerning ODCM Surveillances of Unit 1 Gaseous Effluent Instrumentation. CA-02, Revise Appendix F of the ODCM to make proper reference to the HP Shift logs.

3.2.2.10 CR 993021, Apparent Failure to Test RM-DA-100 Trip Function as Required by ODCM. No ODCM changes are required for this CR.

3.2.2.11 CR 001682, ODCM Action 28 Guidance. CA-02, Revise Appendix C of the ODCM (Table 3.3-13, Action 28) to differentiate actions associated with Inoperable Process Flow Rate Monitors vs. Sample Flow Rate Monitors.

3.2.2.12 CR 02-05533, Procedure 1/2-ODC-3.03, ATTACHMENT E Missing Information. CA-01, Revise ODCM procedure 1/2-ODC-3.03 (Table 3.3-12) to include minimum channels operable and associated actions when Flow Rate Measurement Device [FR-1LW-103] is inoperable.

3.2.2.13 CR 02-05711, TS and ODCM changes not reflected in 1OM-54.3.L5 Surveillance Log. CA-01, Revise 1/2-ODC-3.03 to add a requirement for applicable station groups notification of pending ODCM changes.

3.2.2.14 CR 02-06174, Tracking of Activities for Unit 1 RCS Zinc Addition Implementation. CA-13, Revise ODCM procedure 1/2-ODC-1.01 to include a discussion as to why Zn-65 is being added to the ODCM. CA-14, Revise ODCM procedure 1/2-ODC-2.01 (Tables 1.1-1a and 1b) to include the addition of Zn-65 to ODCM liquid source term.

3.2.2.15 CR 03-02466, RFA-Radiation Protection Effluent Control Provide Recommendation on Processing when Performing Weekly Sample of [1LW-TK-7A/7B]. CA-02, Revise ODCM Procedure 1/2-ODC-2.01, (Attachment D) to show the liquid waste flow path cross-connect between Unit 1 and Unit 2.

3.2.2.16 CR 03-04830, Containment Vacuum Pump Replacement Increases ODCM Source Term. CA-03, Revise Unit 1 Containment Vacuum Pump Source-Term in ODCM procedure 1/2-ODC-2.02, Attachment A, Table 2.1-1a.

3.2.2.17 CR 03-06123, Enhance Table 3.3-6 of 1/2-ODC-3.03 to Add More Preplanned Method of Monitoring. CA-01, Revise Table 3.3-6 and Table 4.3-3 to allow use of Eberline SPING Channel 5 as an additional 2nd PMM when the Unit 1 Mid or High Range Noble Gas Effluent Monitors are Inoperable.

3.2.2.18 CR 03-06281, Gaseous Tritium Sampling Required by ODCM (1/2-ODC-3.03) Unclear for Chemistry. CA-01, Revise procedure Attachment K Table 4.11-2 for RP & Chemistry sampling of Gaseous Effluent Pathways to show which effluent pathways need sampled for compliance to ODCM Control 3.11.2.1 requirements.

3.2.2.19 CR 03-07487, Results of NQA Assessment of the Radiological Effluents Program. CA-01, Revise Calculation Package No. ERS-ATL-95-007 to clarify the term "Surface Water Supply" per guidance presented in NUREG-0800 SRP 15.7.3. CA-05, Revise 1/2-ODC3.03 Control 3.11.1.4 to update the activity limits for the outside storage tanks.

3.2.2.20 CR 03-07668, Benchmark Effluent & Environmental Programs VS Papers Presented at 13th REMP/RETS Workshop. CA-01, Evaluate procedure Attachment K Table 4.11-2 to reduce the amount of Effluent Samples obtained during a power transient.

3.2.2.21 CR 03-09288, LAR 1A-321 & 2A-193, Increased Flexibility in Mode Restraints. CA-19, Review LAR 1A-321/2A-193 to identify the affected Rad Effluent procedures, programs, manuals, and applicable plant modification documents that will need to be revised to support implementing the LAR.

3.2.2.22 CR 03-09959, RFA-Rad Protection Provide Clarification to ODCM 1/Day Air Tritium Sample. CA-01, Revise ODCM procedure 1/2-ODC-3.03 Attachment K (Table 4.11-2 note c & note e) to allow sampling of the appropriate building atmosphere.

3.2.2.23 CR 03-11726, Typographical Error Found in ODCM 3.11.2.5. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment O, Control 3.11.2.5 to correct a typographical error. Specifically, the final word in Action (a) needs changed from "nad" to "and".

3.2.2.24 CR 04-00149, Radiation Protection Performance Review Committee Action Items. CA-12. Incorporate the Global Positioning System [GPS] in the Radiological Environmental Monitoring Program.

3.2.2.25 CR 04-01643, Procedure Correction – Typographical Error in the ODCM. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment F, (Table 3.3-13 and 4.3-13) to correct a typographical error. Specifically, the Asset Number for the Vacuum Gauge used for measurement of sample flow (from the Alternate Sampling Device) needs changed from [PI-1GW-13] to [PI-1GW-135].

3.2.2.26 CR 04-02275, Discrepancies in Table 3.3-13 of the ODCM. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment F, (Table 3.3-13 and 4.3-13) to add clarification that the "Sampler Flow Rate Monitors are the devices used for "Particulate and Iodine Sampling".

3.2.2.27 CR 05-01169, Chemistry Action Plan For Transition of RETS, REMP and ODCM, CA-14 thru CA-21, Revise ODCM procedures to change document owner from "Manager, Radiation Protection" to Manager Nuclear Environmental & Chemistry".

3.2.2.28 CR 05-01390, Include GPS data in 2004 REMP Report and related 1/2-ODC and 1/2-ENV procedures. CA-02, revise ODCM procedure 1/2-ODC-2.03 to include an update of REMP sample locations (using the GPS Satellite data).

3.2.2.29 CR 05-03306, Incorporated Improved Technical Specifications (ITS). This includes transfer of programmatic controls for BV-2 Noble Gas Effluent Steam Monitors [2MSS-RQ101A], [2MSS-RQ101B] and [2MSS-RQ101C] from the Technical Specifications to ODCM procedure 1/2-ODC-3.03 (Attachment D Tables 3.3-6 and 4.3-3). This was permitted via Unit 1/2 Technical Specification Amendments No. 278/161.

3.2.2.30 CR 05-03854, ODCM Figure for Liquid Effluent Release Points Needs Updated. CA-01, revise ODCM procedure 1/2-ODC-2.01 (ODCM: Liquid Effluents) Attachment D, Figure 1.4-3 to incorporate a modified version of Plant Drawing No. 8700-RM-27F.

3.2.2.31 CR 06-04908, Radiation Monitor Alarm Setpoint Discrepancies. CA-03; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [RM-1RM-100] and [RM-1DA-100] for incorporation of the Extended Power Uprate per Unit 1 TS Amendment No. 275. Also, CA-04; revised ODCM procedure 1/2-ODC-2.02 to add a"$\leq$" designation to all alarm setpoints for Unit 1 and Unit 2 low range noble gas effluent monitors.

3.2.2.32 CR 06-6476, Procedure 1/2-ODC-2.01 Needs Revised for Plant Uprate. CA-01; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [2SWS-RQ101] for incorporation of the Extended Power Uprate per Unit 2 TS Amendment No. 156.

3.2.2.33 SAP Order 200197646-0110: Revise ODCM procedure 1/2ODC-3.03, 1/2-HPP-3.06.001, 1/2-ENV-05-01, Form 1/2-HPP-3.06.001.F05 and Form 1/2-ENV-05.1.F05 to incorporate revised outside liquid storage tank activity limits via Calculation Package No. ERS-ATL-95-007, R2.

3.2.2.34 SAP Order 200240681: Revise ODCM procedure 1/2-ODC-3.03 (Attachment E Table 3.3-12) to add an alternate Action when the primary Flow Rate Measurement Device [FT-1CW-101-1] is not OPERABLE. The alternate Action (25A) uses local measurements (as described in 1MSP-31.06-I) to determine a total dilution flow rate during liquid effluent releases.

3.2.2.35 CR 06-04944: ODCM 3.03 Attachment E conflict between Applicability and Action Statement. CA-01; revise ODCM procedure 1/2-ODC-3.03, Attachment E to clarify Applicability for tank level indicating devices is during addition to the tank.

3.2.2.36 CR 07-12924 and SAP Order 200247228-0410: Revise ODCM procedure 1/2-ODC-3.03 (Attachment F Tables 3.3-13 and 4.3-13) to clarify the Functional Location of the Sampler Flow Rate Monitors for the BV-2 gaseous effluent release pathways. Specifically, the procedure was changed to refer to Functional Location [2HVS-FIT101-1] instead of [2HVS-FIT101], [2RMQ-FIT301-1] instead of [2RMQ-FIT301], [2HVL-FIT112-1] instead of [2HVL-FIT112], and [2RMQ-FIT303-1] instead of [2RMQ-FIT303].

3.2.2.37 CR 09-53803-10: Revise ODCM procedure 1/2-ODC-3.03 to add EAL related area and process monitors to Attachment D Tables 3.3-6 and 4.3-3

3.2.2.38 CR 09-53803-13: Revise ODCM procedure 1/2-ODC-1.01 to add appropriate MSP and OST references for EAL related area and process monitors to the procedure matrix.

3.2.2.39 SAP Order 200257692-0360 and 0390: Revise the procedure matrix of 1/2-ODC-1.01 to remove obsolete forms and procedures used for ODCM Channel Checks. Specifically, Form 1/2-ADM-0606.F01, Form 1/2-ADM-0606.F02, Form 1/2-HPP-3.07.003.F01 and procedures 1/2-HPP-3.06.005, 1/2-HPP-3.06.006 and 1/2-HPP-3.06.012 were removed from the Attachment C Tables of the procedure matrix.

3.2.2.40 SAP Order 200197646-0300 and CR 07-31083: Revise ODCM procedure 1/2-ODC-3.03 to add a definition for Channel Functional Test, and revise the definition for Channel Operational Test to indicate that these definitions have the same requirements and, therefore, are considered equal.

3.2.2.41 SAP Order 200247228-0450: Revise 1/2-ODC-3.03 Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications, as follows: (1) add the word "or" where it is missing from Attachment F, Table 3.3-13 and 4.3-13, (2) remove grab samples from the list of alternates in Table 3.3-13 and 4.3-13, because a grab sample is an “action”, not an “alternate”, (3) add notations in Table 3.3-12 and 3.3-13 to indicate that Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b and 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days, and (4) remove surveillances for Preplanned Method of Monitoring (PMM) from Table 4.3-3, because surveillances only apply to instruments, not methods.

3.2.2.42 SAP Order 200240681-0020 and 0040: Revise 1/2-ODC-3.03 Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line.

3.2.2.43 CR 05-00004-15, CR 05-00004-17 and SAP Order 200197646-0010 to revise 1/2-ODC-2.01. Add the Coolant Recovery Tanks [1BR-TK-4A/4B] as Liquid Waste Tanks to Section 8.4 description and Attachment D Figures 1.4-1 and 1.4-2. Add a default 2-tank volume recirculation time of 45.7 hrs for the Coolant Recovery Tanks [1BR-TK-4A/4B] to Attachment B Table 1.2-1a. Add the Cesium Removal Ion Exchangers [1BR-I-1A/1B and 2BRS-IOE21A/21B] to Section 8.4 description and Attachment B Figures 1.4-1 and 1.4-2. Revise the recirculation times in Attachment B Table 1.2-1a and 1.2-1b to indicate the times for nominal tank volume and maximum tank volume.

3.2.2.44 SAP Order 200197646-0660. Revise 1/2-ODC-2.01 Attachment D Figure 1.4-3 to remove STP Outfalls 113 and 203 due to retirement of the Sewage Treatment Plants and to remove Outfall 501. Water is no longer discharged via these outfalls.

3.2.2.45 SAP Order 200197646-0810. Revise 1/2-ODC-2.01 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100]. Specifically, due to obsolescence of the original Model 843-30 and 843-32 detectors that were previously installed in [RM-1DA-100], the vendor has upgraded them to Model 843-30R and 843-32R detectors, which include upgraded efficiency data as well.

3.2.2.46 CR 10-77489, Procedure 1/2-ODC-2.03 needs revised for labeling discrepancies. Corrected sampling location descriptions for REMP TLD #94 and #95; Changed sample designation from #49 to #49A; Clarified program requirements for garden sampling.

3.2.2.47 CR 10-86844 revises 1/2-ODC-2.01 to remove description that batch releases of liquid waste are processed by recirculation through eductors. Deleted Attachment B which referenced minimum liquid waste batch release recirculation times and added description that liquid waste recirculation times to achieve two tank volumes are calculated based upon actual tank volume and pump capacity.

3.2.2.48 CR 10-85877, Selenium-75 (Se-75) discharge via U1/U2 Process Vent. CA-02 revises ODCM procedure 1/2-ODC-2.02 to include dose factors for Se-75 (documented in RFCA Packages # BV20100284, BV20100285, and BV20110013).

3.2.2.49 CA G203-2011-97516-001, Retire TLD Station #88 and add Station #88A.

3.2.2.50 CR G203-2011-02332, Inability to meet ODCM requirements for REMP milk sampling in 2011 and CA G203-2011-02332-1, Make changes to the ODCM.

3.2.2.51 ECP 11-0049 and CR 2012-02583 implement changes to the design of the liquid waste system for Phase 2 of Coolant Recovery Project.

3.2.2.52 SAP Notification 600747531, Update 1/2-ODC-2.01 for RM-1RW-100.

3.2.2.53 CR-2012-05875, Antimony-126 identified in the liquid waste system.

3.2.2.54 SAP Notification 600765150, Request from Operations to allow discharge of water in high level drains tanks [LW-TK-2A/B] through low level waste tanks [LW-TK-3A/B] via RM-LW-104.

3.2.2.55 CA 2012-15547-7, To address the extent of condition with potential gaps in Radiological Effluent Program, evaluate the need to place appropriate ODCM controls on various non-radiological tanks and sumps throughout the site.

3.2.3 Calculation Packages:

3.2.3.1 ERS-ATL-83-027; Liquid Waste Dose Factor Calculation for HPM-RP 6.5, Issue 3 and Later

3.2.3.2 ERS-SFL-85-031; Gaseous Effluent Monitor Efficiency Data

3.2.3.3 ERS-ATL-86-008; ODCM Alarm Setpoint Revisions for Gaseous Monitors

3.2.3.4 ERS-HHM-87-014; Unit 1/2 ODCM Gaseous Effluent Monitor Alarm Setpoint Determinations

3.2.3.5 ERS-ATL-87-026; BVPS-1 and BVPS-2 ODCM T Factor Justification

3.2.3.6 ERS-ATL-89-014; Verification/Validation of ODCM R Values

3.2.3.7 ERS-ATL-90-021; Justification for Removal of Technical Specification Process Flowrate Measurement Requirements for 2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112

3.2.3.8 ERS-ATL-95-006; Re-evaluation of TS/ODCM SR's 4.11.1.1.3, 4.11.1.1.4 and Notes e and g of TS/ODCM Table 4.11-1

3.2.3.9 ERS-ATL-95-007; Verification of Outside Storage Tank Activity Limit of TS 3.11.1.4

3.2.3.10 Stone and Webster UR(B)-160; BVPS Liquid Radwaste Releases and Concentrations - Expected and Design Cases (Per Unit and Site)

3.2.3.11 Vendor Calculation Package No. 8700-UR(B)-223, Impact of Atmospheric Containment Conversion, Power Uprate, and Alternate Source Terms on the Alarm Setpoints for the Radiation Monitors at Unit 1

3.2.3.12 Engineering Change Package No. ECP-04-0440, Extended Power Uprate (Unit 1)

3.2.3.13 Vendor Calculation Package No. 8700-UR(B)-508, Impact of Atmospheric Containment Conversion, Power Uprate, and Alternate Source Terms on the Alarm Setpoints for the Radiation Monitors at Unit 2

3.2.3.14 Engineering Change Package No. ECP-04-0440, Extended Power Uprate (Unit 2)

3.2.3.15 ERS-MPD-93-007, BVPS-1 Gaseous Radioactivity Monitor Emergency Action Levels

3.2.3.16 ERS-ATL-93-021, Process Alarm Setpoints for Liquid Effluent Monitors

3.2.3.17 ERS-LMR-12-001, ODCM P and R Values for Carbon-14

3.2.3.18 Engineering Change Package No. ECP-12-0478 Liquid Waste Demin Project: Installation of new Demineralizers in Solid Waste Building

3-7-14

3.2.4 <u>Internal Letters:</u>

3.2.4.1 DLC Response to NRC Unresolved Item 50-334/83-30-05, Radiation Monitor Study- Particle Distribution Evaluation, November 26, 1986.

3.2.4.2 ND1SHP:776, BVPS-1 ODCM Table 2.2-2, Appendix B, February 12, 1988

3.2.4.3 ND3NSM:3431; Technical Specification Verification Effort, August 11, 1988

3.2.4.4 NDLNSM:3522; Technical Specification Verification Effort Checklist, September 14, 1988

3.2.4.5 ND1NSM:3652; Technical Specification Verification Effort, November 21, 1988

3.2.4.6 NPD3SHP:2466; Self Assessment of the Liquid and Gaseous Effluent Processes at BVPS - Final Report, July 16, 1997

3.2.4.7 NPD3SHP:2257; ODCM Liquid Waste Recirculation Rates, February 11, 1998

3.2.4.8 NPD3SHP:2643; Action 28 of ODCM Appendix C Table 3.3-13, January 14, 1999

3.2.4.9 ND3MNO:4309; Response to Request for Technical Specification Interpretation, April 20, 1999.

3.2.5 Contractor Technical Evaluation Reports:

3.2.5.1 EGG-PHY-8194; Technical Evaluation Report for the Evaluation of ODCM Updated through Issue 2, Revision 1, Beaver Valley Power Station, Unit 1, September 1988

3.2.5.2 EGG-PHY-8217; Technical Evaluation Report for the Evaluation of ODCM updated through Issue 1, Revision 2, Beaver Valley Power Station, Unit 2, September 1988

3.2.5.3 NUS-2173; Development of Terrain Adjustment Factors For Use at the Beaver Valley Power Station for the Straight-Line Atmospheric Dispersion Model, June 1978

3.2.5.4 UCRL-50564; Concentration Factors of Chemical Elements in Edible Aquatic Organisms, Revision 1, 1972

3.2.6 NRC Letters:

3.2.6.1 Unit 1 Technical Specification Amendment 66, March 28, 1983

3.2.6.2 Beaver Valley Unit 2 - Offsite Dose Calculation Manual, ODCM (TAC 63996), July 14, 1987

3.2.6.3 Beaver Valley Units 1 and 2 - Acceptance of the Offsite Dose Calculation Manuals (TAC 93996 and 67421), March 2, 1989

3.2.6.4 Unit 1/2 Technical Specification 6.8.6, including Amendments 1A-188/2A-70 (LAR 1A-175/2A-37), Implemented August 7, 1995

3.2.6.5 Unit 1/2 Technical Specification 6.8.6, including Amendments 1A-194/2A-77 (LAR's 1A-231/2A-101), Implemented December 1, 1995

3.2.6.6 Unit 1/2 Technical Specification Figure 5.1-2, including Amendments 1A-202/2A-83 (LAR 1A-234/2A-107, Implemented June 9, 1997

3.2.6.7 Unit 1/2 Technical Specifications 6.9.1.10 and 6.9.2, including Amendments 1A-220/2A-97 (LAR 1A-246/2A-116), Implemented May 20, 1999

3.2.6.8 Unit 1/2 Technical Specification 3.3.3.1, including Amendments 1A-246/2A-124 (LAR 1A-287/2A-159), Implemented April 11, 2002

3.2.6.9 Unit 1/2 Technical Specifications 3.11.1.4, 3.11.2.5, 6.8.6, and 6.9.2 including Amendments 1A-250/2A-130 (LAR 1A-291/2A-163), Implemented August 7, 2002

3.2.7 NUREG's:

3.2.7.1 NUREG-0017, Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors, (PWR- Gale Code), Revision 1, April 1985

3.2.7.2 NUREG 0133; Preparation of Radiological Effluent Technical Specification for Nuclear Power Plants, October 1978

3.2.7.3 NUREG-0172; Age-Specific Radiation Dose Commitment Factors for a One-Year Chronic Intake, November 1977

3.2.7.4 NUREG-0324, XOQDOQ, Program for the Meteorological Evaluation of Routine Releases at Nuclear Power Stations, September 1977

3.2.7.5 NUREG-0472; Radiological Effluent Technical Specifications for PWR's.

3.2.7.6 NUREG-0800, Standard Review Plan, Postulated Radioactive Releases Due to Liquid-Containing Tank Failures, July 1981

3.2.7.7 NUREG-1301; Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1), April 1991

3.2.7.8 NUREG-1431; Standard Technical Specification - Westinghouse Plants Specifications

3.2.7.9 NUREG/CR-2919; Meteorological Evaluation of Routine Effluent Releases At Nuclear Power Stations, September 1982

3.2.8 Regulatory Guides:

3.2.8.1 RG-1.23; Meteorological Measurement Program For Nuclear Power Plants

3.2.8.2 RG-1.109; Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, April 1977

3.2.8.3 RG-1.111; Methods For Estimating Atmospheric Transport And Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors, Revision 1, July 1977

3.2.8.4 RG-1.113; Estimating Aquatic Dispersion of Effluents From Accidental and Routine Reactor Releases For The Purpose of Implementing Appendix I, April 1977

3.3 Commitments

3.3.1 10 CFR Part 20, Standards for Protection Against Radiation

3.3.2 10CFR20.1302, Compliance with Dose Limits for Individual Members of the Public.

3.3.3 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities

3.3.4 10CFR50.36a, Technical Specifications on Effluents from Nuclear Power Reactors

3.3.5 Appendix I to 10 CFR Part 50, Numerical Guides For Design Objectives and Limiting Conditions For Operation to Meet The Criterion "As Low As Reasonably Achievable" For Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents

3.3.6 40 CFR Part 141

3.3.7 40 CFR Part 190, Environmental Radiation Protection Standards For Nuclear Power Operations

3.3.8 Licensee Response to NRC Unresolved Item 50-334/83-30-05. The Radiation Monitor Particle Distribution Evaluation showed that the Licensee must continue to use correction factors to determine particulate activity in samples obtained from the effluent release pathways.

3.3.9 CR 05-03854, ODCM Figure for Liquid Effluent Release Points Need Updated. CA-01, revise ODCM procedure 1/2-ODC-2.01 (ODCM: Liquid Effluents) Attachment D, Figure 1.4-3 to incorporate a modified version of Plant Drawing No. 8700-RM-27F.

3.3.10 10 CFR 72.104, Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS. 10-7-14

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.1.2 Changes to the ODCM shall be documented and records of reviews shall be retained in accordance with the applicable record retention provisions of the quality assurance program description included in the Updated Final Safety Analysis Report.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 This OFFSITE DOSE CALCULATION MANUAL (ODCM) provides the information and methodologies to be used by Beaver Valley Power Station Unit 1 and Unit 2 (BV-1) and (BV-2) to assure compliance with the Administrative Controls Section of the operating Technical Specifications. They are intended to show compliance with 10 CFR 20.1302,[3.2.1] 10 CFR 50.36a,[3.2.2] Appendix I of 10 CFR Part 50,[3.2.3] and 40 CFR Part 190.[3.2.4]

5.2 This ODCM is based on the NUREG's and Generic Letter documents from the United States Nuclear Regulatory Commission.[3.1.1, 3.1.2, 3.1.3, 3.1.4] Specific plant procedures for implementation of the ODCM are included in various site procedures and documents, and are utilized by the operating staff to assure compliance with Technical Specifications and the CONTROLS Procedure of the ODCM:[3.1.5]

5.3 The ODCM has been prepared as generically as possible in order to minimize the need for future versions. However, some changes to the ODCM may be necessary in the future. Any such changes will be properly prepared, reviewed, and approved as indicated in the Administrative Control Section of the Technical Specifications.

5.3.1 An implementation procedure for control of the ODCM is included in 1/2-ADM-1640.[3.1.6]

5.4 This procedure also contains information that was previously contained in Appendix F of the previous BV-1 and 2 Offsite Dose Calculation Manual.

5.4.1 In regards to this, the Tables that were transferred from Appendix F to the appropriate ATTACHMENTS of this procedure will still contain a prefix denoting an "F".

6.0 ACCEPTANCE CRITERIA

6.1 All changes to this procedure shall contain sufficient justification that the change will maintain the level of radioactive Effluent Control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculation.[3.1.7]

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6.1.1 All changes to this procedure shall be prepared in accordance with 1/2-ADM-0100[3.1.7] and 1/2-ADM-1640.[3.1.6]

6.1.2 All changes to this procedure shall be reviewed and approved in accordance with NOP-SS-3001[3.1.8] and 1/2-ADM-1640.[3.1.6]

7.0 PREREQUISITES

7.1 The user of this procedure shall be familiar with ODCM structure and content.

8.0 PROCEDURE

8.1 Description of ODCM Structure

8.1.1 1/2-ODC-1.01, ODCM: Index, Matrix and History of ODCM changes
(formerly: ODCM Index and Appendix F)

8.1.1.1 History of ODCM Changes

8.1.1.2 Summary of ODCM References

8.1.1.3 List of Tables (ATTACHMENT A)

8.1.1.4 List of Figures (ATTACHMENT B)

8.1.1.5 Matrix of Procedures Used to Meet ODCM Controls (ATTACHMENT C)

8.1.1.5.1 BV-1 Radiation Monitor Surveillances

8.1.1.5.2 BV-1 Liquid Effluent Monitor Surveillances

8.1.1.5.3 BV-2 Liquid Effluent Monitor Surveillances

8.1.1.5.4 BV-1 Gaseous Effluent Monitor Surveillances

8.1.1.5.5 BV-2 Gaseous Effluent Monitor Surveillances

8.1.1.5.6 BV-1 and 2 Liquid Effluent Concentration Surveillances

8.1.1.5.7 BV-1 and 2 Liquid Effluent Dose Surveillances

8.1.1.5.8 BV-1 and 2 Liquid Effluent Treatment Surveillances

8.1.1.5.9 BV-1 and 2 Gaseous Effluent Air Dose Surveillances

8.1.1.5.10 BV-1 and 2 Gaseous Effluent Particulate and Iodine Surveillances

8.1.1.5.11 BV-1 and 2 Gaseous Effluent Treatment Surveillances

8.1.1.5.12 BV-1 and 2 Gaseous Effluent Total Dose Surveillances

8.1.1.5.13 BV-1 and 2 Gaseous Effluent REMP Surveillances

8.1.1.5.14 BV-1 and 2 Gaseous Effluent Land Use Census Surveillances

8.1.1.5.15 BV-1 and 2 Gaseous Effluent Interlaboratory Comparison Program Surveillances

8.1.8.3 Control 3.3.3.1: Radiation Monitoring Instrumentation

8.1.8.4 Control 3.3.3.9: Radioactive Liquid Effluent Monitoring Instrumentation

8.1.8.5 Control 3.3.3.10: Radioactive Gaseous Monitoring Instrumentation

8.1.8.6 Control 3.11.1.1: Liquid Effluent Concentration

8.1.8.7 Control 3.11.1.2: Liquid Effluent Dose

8.1.8.8 Control 3.11.1.3: Liquid Radwaste Treatment System

8.1.8.9 Control 3.11.1.4: Liquid Holdup Tanks

8.1.8.10 Control 3.11.2.1: Gaseous Effluent Dose Rate

8.1.8.11 Control 3.11.2.2: Dose- Noble Gases

8.1.8.12 Control 3.11.2.3: Dose - Radioiodines, Radioactive Material in Particulate Form, and Radionuclides Other Than Noble Gases

8.1.8.13 Control 3.11.2.4: Gaseous Radwaste Treatment System

8.1.8.14 Control 3.11.2.5: Gas Storage Tanks

8.1.8.15 Control 3.11.4.1: Total Dose

8.1.8.16 Control 3.12.1: REMP Program Requirements

8.1.8.17 Control 3.12.2: REMP - Land Use Census

8.1.8.18 Control 3.12.3: REMP - Interlaboratory Comparison Program

8.1.8.19 Control 6.9.2: Annual REMP Report

8.1.8.20 Control 6.9.3: Annual RETS Report

8.2 <u>History Of ODCM Changes</u>

8.2.1 <u>Change (1) of BV-1 ODCM (Issue 1), Effective January, 1984</u>

8.2.1.1 This is the initial issue of the BV-1 ODCM, as prepared for implementation of the Radiological Effluent Technical Specifications (RETS). Implementation of this manual was commensurate with Amendment No. 66 to the Unit 1 Technical Specifications as approved by the NRC on March 28, 1983.

8.2.2 Change (2) of BV-1 ODCM (Issue 1, Rev 1), Effective October, 1984

8.2.2.1 A description of the changes implemented with this revision are as follows:

8.2.2.1.1 Section 1.0: Table 1.3-1 was revised to include liquid dose factors for nuclides presently identified at BVPS and not included in the original table.

8.2.2.1.2 Section 2.0: Equations 2.1-19 and 2.1-22 were revised as approved at RSC Meeting No. BVPS-RSC-1-84 on January 31, 1984. The equations were revised to clarify flow rate terminology.

8.2.2.1.3 Section 2.0: Section 2.2.2 was revised to delete the food and ground pathways for gaseous dose rate calculations of I-131, tritium, and radionuclides in particulate form with half lives greater than 8 days.

8.2.2.1.4 Section 2.0: Table 2.2-13 was revised to include 7 organs rather than only the maximum organ. Also, the receptor was changed from infant to child, and addition/deletion of nuclides to be consistent with the Technical Specifications and nuclides identified at BV-1.

8.2.3 Change (3) of BV-1 ODCM (Issue 1, Rev 2), Effective July, 1986

8.2.3.1 A description of the changes that were implemented with this revision are as follows:

8.2.3.1.1 Section 1.0: Provide a flow based monitor setpoint adjustment factor in Section 1.1.2. This change makes Section 1.1.2 consistent with Section 1.1.1 and current procedures.

8.2.3.1.2 Section 1.0 and 2.0: Revise the 31-day dose projection limits and methodology in Sections 1.3.2, 2.3.1.2, and 2.3.2.2. This change corrected the 31-day dose projection limits and changed the dose projection methodology to be consistent with proposed software.

8.2.3.1.3 Section 2.0: Revise the Gaseous Effluent Monitor Setpoints in Sections 2.1.1 and 2.1.2. They were revised due to pressure corrections determined for the detectors, changes in isotopic literature, and the addition of SPING Channel 5 alternate monitor data. The calculations supporting this item are contained in Calculation Packages ERS-SFL-85-031 and ERS-ATL-86-008.

8.2.4 Change (4) of BV-1 ODCM (Issue 2), and BV-2 ODCM (Issue 1, Rev 1), Effective July, 1987

8.2.4.1 With the start-up of BV-2 in the second half of 1987, the BV-1 ODCM required revision and the BV-2 ODCM required initial implementation. A description of the changes are as follows:

8.2.4.1.1 Produce functionally compatible BV-1 and BV-2 ODCMs which address site dose rate limits and meet regulatory requirements. Note that due to the scope of the revisions to the Unit 1 ODCM, it was re-issued as Issue 2. Also, for clarity, the draft BV-2 ODCM previously submitted to the NRC was regarded as Issue 1 (historical) and operation of BV-2 began with Issue 1, Revision 1 of the BV-2 ODCM.

8.2.4.1.2 Section 1.0: A shared liquid radwaste system, permitting mixing of waste for processing, the sharing of dilution water, and the apportionment of dose according to NUREG-0133 was incorporated into both ODCMs.

8.2.4.1.3 Section 2.0: A shared elevated gaseous radwaste system, permitting the mixing of gaseous radwaste and the apportionment of dose, according to NUREG-0133 was incorporated into both ODCMs.

8.2.4.1.4 Section 2.0: Separate ground level gaseous releases were maintained. The BV-1 ODCM was updated to incorporate the BV-2 five year meteorology base. Gaseous source terms were revised to that calculated for BV-1 in the BV-2 FSAR, and terms were added for calculation of a turbine building release.

8.2.4.1.5 Section 2.0: The gaseous effluent monitor alarm setpoints of both ODCMs were revised as required by revisions to meteorology, source terms, monitor efficiencies, and revised percentages of site dose rate limits.

8.2.4.1.6 Section 2.0: Formal justification was provided for use of the "T" factor as described in the Containment Purge Dose Rate calculations. Whereas, the dose rate for a Containment Purge may be averaged over a time period not to exceed 960 minutes. Since the Containment air volume change time period is 60 minutes, then the maximum value for "T" is 16 (i.e., 960 minutes/60 minutes = 16).

8.2.5 Change (5) of BV-1 ODCM (Issue 2, Rev 1), and BV-2 ODCM (Issue 1, Revision 2), Effective December, 1987

8.2.5.1 Section 2.0: Sections 2.1.3 and 2.1.4 of both ODCMs were changed to delete a note concerning noble gas nuclides as requested by a NRC letter dated July 14, 1987 titled Beaver Valley Unit 2 - Offsite Dose Calculation Manual, ODCM (TAC 63996).

8.2.6 Change (6) of BV-1 ODCM (Issue 2, Rev 2), and BV-2 ODCM (Issue 1, Rev 3), Effective June, 1989

8.2.6.1 A description of the changes implemented with this revision are as follows:

8.2.6.1.1 Section 1.0 and 2.0: Both ODCMs were revised for addition of Sections 1.4 and 2.4. This addition gives a description of and includes flow diagrams of the Liquid Radwaste System and the Gaseous Radwaste System. (See justification 1)

8.2.6.1.2 Section 1.0: Corrected typos to BV-1 ODCM Equation 1.1-8 to show differentiation between the two f's, and add the division sign. (See Justification 1)

8.2.6.1.3 Section 1.0: Re-define F_k in equation 1.3-1 of both ODCMs, as allowed by the NRC. (See Justification 1)

8.2.6.1.4 Section 1.0 and 2.0: Typos were corrected to the following: (1) BV-1 ODCM equation 1.3-7; add a division sign between the brackets. (2) BV-1 ODCM equation 1.3-8; add a division sign between the brackets. (3) Equation 2.1-20 of both ODCMs; change the HHSP to HSP multiplier from 0.70 to 0.33. (4) Equation 2.1-24 of both ODCMs, change the HHSP to HSP multiplier from 0.70 to 0.33. (See Justification 1)

8.2.6.1.5 Section 1.0 and 2.0: Typos were also corrected as follows: (1) Add the words "from each reactor unit" to five places (Sections 1.3.1, 1.3.2, 2.3.1.1, 2.3.1.2, and 2.3.2.2) of both ODCMs. This ensures compliance with the current requirements of the Technical Specifications. (2) Correct punctuation in Section 2.3.2.1 of the BV-1 ODCM. (3) Correct typos in Table 3.0-1 of both ODCMs. (4) Correct typos in Figure 3.0-3 of both ODCMs.

8.2.6.1.6 Section 2.0: Add a Reference to Section 2 of the BV-1 ODCM. (See Justification 3)

8.2.6.1.7 Section 2.0: Add the words "from the site" to Section 2.2.2 of both ODCMs. This ensures compliance with the current requirements of the Technical Specifications. (See Justification 2)

8.2.6.1.8 Section 2.0: Revise BV-1 ODCM Table 2.2-2 to change the particulate and iodine radionuclide mix for the Unit 1 Ventilation Vent and to correct a typo for Xe-135m in the Containment Vacuum Pumps. (See Justification 3)

8.2.6.1.9 Section 2.0: Provide re-verified $P_{i\tau}$ values for the Beaver Valley site in Table 2.2-13 of both ODCMs. (See Justification 1)

8.2.6.1.10 Section 2.0: Correct the definition for the t_f value in the cow-meat pathway in Section 2.3.2.1 of both ODCMs. (See Justification 1)

8.2.6.1.11 Section 2.0: Provide re-verified R values for the Beaver Valley site in Tables 2.3-2 through 2.3-20 of both ODCMs. (See Justification 1)

8.2.6.1.12 Appendix B: Change the particulate and iodine release fractions in Appendix B of the BV-1 ODCM. (See Justification 3)

8.2.6.2 The justification used for Change (6) to the ODCMs are as follows:

8.2.6.2.1 A letter dated March 2, 1989 (from the NRC) was received by Duquesne Light regarding acceptance of the Offsite Dose Calculation Manuals. The NRC acceptance of the BV-1 and BV-2 ODCMs was based on Technical Evaluation Reports (TER No. EGG-PHY-8194 and EGG-PHY-8217) provided by the Idaho National Engineering Laboratory.

As stated in the letter, minor concerns are delineated in Section 4 of the TER. In general, these concerns are considered typos or additions and in one way impact any of the calculations currently being performed for dose contributions. However, one of these concerns is regarding the inability to reproduce the ODCM R values for the cow-meat, cow-milk and goat-milk pathways when using the ODCM/NUREG-0133 methodology. These R values (along with all other ODCM R values) were re-validated VIA Calculation Package No. ERS-ATL-89-014. The results of this package showed that the R values for the three aforementioned pathways were in error. SINCE the R values in error do not involve the controlling receptor for gaseous release (i.e.; the controlling receptor is VIA the Inhalation, Ground, and Vegetation pathways, not the pathways subject to error), THEN the changes will not adversely impact the accuracy or reliability of effluent dose calculations.

8.2.6.2.2 As requested by DLC letters ND3NSM:3431, ND1NSM:3522, and ND1NSM:3652, Technical Specifications were required to be verified in all plant implementing procedures. As part of this effort, wording errors/typos were identified in various sections of the ODCM. This revision corrects the anomalies identified during the verification effort.

8.2.6.2.3 As delineated in letter ND1SHP:776, dated February 12, 1988 (BVPS-1 ODCM Table 2.2-2, Appendix B) a series of apparent discrepancies were identified between ODCM Table 2.2-2 and similar tables of the BVPS-2 FSAR. Evaluation showed that apparent credit was given for continuous filtration of SLCRS releases which is invalid at Unit 1. However, the calculation package on which the BVPS-2 FSAR expected release tables are based, is correct (i.e.; no credit was taken for routine filtration for Unit 1 releases). Except for revising the ODCM, no further corrective action is necessary because the particulates and iodines in the ODCM were not used for gaseous effluent alarm setpoint. Therefore, this change does not adversely impact the accuracy or reliability of setpoint calculations.

8.2.7 Change (7) of BV-1 and 2 ODCM (Issue 3), Effective August, 1995

8.2.7.1 The combined ODCM contains the following changes:

8.2.7.1.1 Prior to ISSUE 3, BV-1 and BV-2 had individual ODCMs that were generically equal. In an effort to simplify the implementing documents, the ODCMs have been combined. This merger of the individual ODCMs will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50. Also, this merger will not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

8.2.7.1.2 Section 1.0: Revised Section 1.0 (Liquid Effluents) to show compliance with 10 CFR 20 Appendix B (20.1001 - 20.2401), Table 2, Col. 2 EC's. This includes the following: (1) Revising the alarm setpoints for monitors [RM-1LW-104, RM-1LW-116, and 2SGC-RQ100]. (2) Updating the BV-1 monitor detection efficiencies. (3) Updating discharge rate and dilution rate parameters for BV-1 and BV-2. (4) Adding the alarm setpoints for monitors [RM-1RW-100, RM-1DA-100, 2SWS-RQ101, and 2SWS-RQ102].

8.2.7.1.3 Section 1.0: Revised Section 1.0 (Liquid Effluents) and Section 2.0 (Gaseous Effluents) to merge the BV-1 alarm setpoint calculations with the BV-2 alarm setpoint calculations. For all practical purposes, when Tables, Figures, and Equations were transferred to the combined ODCM, the numbering was kept generically equal. The two exceptions to this are as follows: (1) If a table was contained in both ODCMs, but each had data specific to BV-1 or BV-2, then an a or b was added to the table. For example, Table 1.1-1 was previously included in the BV-1 ODCM and the BV-2 ODCM. These tables are now numbered 1.1-1a and 1.1-1b denoting BV-1 and BV-2 respectively. A cross reference for ODCM tables is provided in the Table Of Contents. (2) If an equation was contained in both ODCMs, but each had data specific to BV-1 or BV-2, then a (1) or (2) was added to the equation. For example, Equation 1.1-1 was previously included in the BV-1 ODCM and the BV-2 ODCM. These equations are now numbered 1.1(1)-1 and 1.1(2)-1, denoting BV-1 and BV-2 respectively. A cross reference for ODCM equations is provided in the Table Of Contents.

8.2.7.1.4 Section 3.0: Revised Section 3.0 (Radiological Environmental Monitoring Program) to list the program requirements from the Radiological Assessment Branch Technical Position (Revision 1, 1979).

8.2.7.1.5 Section 4.0: Revised Section 4.0 (Information Related To 40 CFR 190) to provide clarified reporting requirements for the Special Report. The clarifications were taken from Generic Letter 89-01, Supplement No. 1 (NUREG-1301).

8.2.7.1.6 Appendix A: Revised Appendix A to transfer the Batch Release dispersion parameters from Appendix A (Tables A-2 through A-5) to Section 2.3 (Tables 2.3-35 through 2.3-38). This revision was done for clarification. For example, all dispersion parameters are now included in one area of the ODCM.

8.2.7.1.7 Appendix C: This is a new Appendix to the ODCM. Procedural details for the Radiological Effluent Technical Specifications (RETS) were transferred from the Technical Specifications to Appendix C of the ODCM per Generic Letter 89-01 and Generic Letter 89-01, Supplement No. 1 (NUREG 1301). This Appendix also includes selected Definitions and Tables as delineated in the Technical Specifications (Section 1) and selected Applicability and Surveillance Requirement statements as delineated in the Technical Specifications (Section 3/4). These were added to Appendix C for reference purposes, even though they are currently described in the Technical Specification.

8.2.7.1.8 Appendix D: This is a new Appendix to the ODCM. The bases for ODCM Controls were transferred from the Bases Section of the Technical Specifications to Appendix D of the ODCM per Generic Letter 89-01.

8.2.7.1.9 Appendix E: This is a new Appendix to the ODCM. The Annual Radioactive Effluent Release Report and the Annual Radiological Environmental Report reporting requirements are listed in this appendix to the ODCM.

8.2.7.1.10 There are three differences (i.e., non-editorial changes) in this ODCM revision when compared to the previous BV-1 and BV-2 Technical Specifications. These are the only changes that are identified by revision bars. These differences are as follows:

8.2.7.1.10.1 First Difference - LLD Definition Clarification is described as follows: (1) There was a sentence removed in the LLD Standard Deviation Definitions delineated in Appendix C Tables 4.11-1 and 4.11-2. This sentence stated: "In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium in milk samples)." (2) This sentence was removed by justification of NUREG-0472, Rev. 2 (i.e., this revision to the NUREG removed the sentence from Tables 4.11-1 and 4.11-2). At BV-1 and 2, there are no other radionuclides normally present in effluent samples. However, there is applicability to environmental LLD calculations due to the existence of other radionuclides in environmental samples. This sentence, therefore, will not be removed from Appendix C, Table 4.12-1. (3) Removal of the sentence from Appendix C, Tables 4.11-1 and 4.11-2 does not adversely impact the accuracy or reliability of current or past effluent LLD calculations. This change

maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations. (4) This change brings ODCM Appendix C, Tables 4.11-1 and 4.11-2 in generic agreement with NRC guidance (i.e., NUREG-0472) and industry standard.

8.2.7.1.10.2 Second Difference - Change From Semi-Annual Report To Annual Report as follows: (1) The frequency of the Radioactive Effluent Release Report was changed from Semi-Annual to Annual. This change is justified by Federal Register, Rules And Regulations (Vol. 57, No. 169, Monday, August 31, 1992), where as; 10 CFR Part 50.36a(a)(2) states, in part. "Each licensee shall submit a report to the Commission annually that specifies the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in gaseous effluents during the previous 12 months of operation...the time between submission of the reports must be no longer than 12 months..." (2) This change maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

8.2.7.1.10.3 Third Difference - Implementation Of New 10 CFR 20 is described as follows: (1) The definition for MEMBER(S) OF THE PUBLIC was revised to agree with the definition in 10 CFR 20.1003. (2) The definition for UNRESTRICTED AREA was modified from the definition that was in the Technical Specifications prior to transferring to the ODCM. This modification was necessary to ensure that the ODCM dose model for gaseous releases is not affected. The modification involved adding the following sentence: "For gaseous release dose calculations, the UNRESTRICTED AREA should exclude any public road, railway, or waterway adjacent to or crossing the site that is not occupied continuously by MEMBER(S) OF THE PUBLIC". (3) The limits for liquid effluent concentration were changed from 1 times 10 CFR 20 Appendix B (20.1 - 20.601), Table II, Col. 2 MPC's to 10 times 10 CFR 20 Appendix B (20.1001 - 20.2401), Table 2, Col. 2 EC's. This limit will now be referred to as the ODCM Effluent Concentration Limit (OEC). (4) For gaseous effluents, no changes were made to implement the New 10 CFR 20. As justification, when the utility adopted the RETS (1/1/84), compliance to 10 CFR 20 shifted from the MPC concept to the Unrestricted Area Dose Rate concept. The Dose Rate concept is the preferred method of controlling gaseous effluent release rate, and will continue to be used in-lieu of the MPC or EC concept. (5) Changing to the OEC limit for liquid effluents accommodates needed operational

flexibility to facilitate implementation of the New 10 CFR 20 requirements. (6) For information, the general intent of the New Part 20 is that radiation doses to members of the public not exceed 100 mrems per year, which is more restrictive than the 500 mrems per year limit in the Old Part 20, and that fuel cycle licensees also comply with 40 CFR 190. The New Part 20 does not include a requirement on limiting radioactivity concentrations in effluents, which is less restrictive than the Old Part 20. (7) The basic requirements for RETS (i.e.; ODCM Appendix C Controls) are stated in 10 CFR 50.36a. These requirements indicate that compliance with the RETS will keep average annual releases of radioactive material in effluents to small percentages of the limits specified in the 10 CFR 20.106 (10 CFR 20.1302). These requirements also indicate that operational flexibility is allowed (with considerations for public health and safety) which may temporarily result in releases higher than such small percentages, but still within the MPC limits specified in the 10 CFR 20.106. The MPC's relate to an annual dose of 500 mrem. Also, 10 CFR 50.36a indicates that when using operational flexibility, best efforts shall be exerted to keep levels of radioactive materials in effluents to ALARA as set forth in 10 CFR 50 Appendix I. (8) As stated in the Introduction to Appendix B of the New 10 CFR 20, the liquid EC's are based on an annual dose of 50 mrem. Since a release concentration corresponding to a limiting dose rate of 500 mrem/year has been acceptable as a RETS limit for liquid effluents, it should not be necessary to reduce this limit by a factor of ten. (9) BV-1 and BV-2 has demonstrated that the use of the MPC's associated with the 10 CFR 20.106 has resulted in calculated maximum individual doses to a member of the public that are small percentages of the limits of 10 CFR 50 Appendix I. Therefore, the use of the OEC's, which correspond to an annual dose of 500 mrem (i.e.; 10 times the 10 CFR 20 EC's) should not have a negative impact on the ability to continue to operate within the limits of 10 CFR 50 Appendix I, and 40 CFR 190. (10) Operational flexibility is also necessary in establishing a basis for effluent monitor setpoint calculations. As previously discussed, the EC's stated in 10 CFR 20 relate to a dose of 50 mrem in a year. This is too restrictive to base effluent monitor setpoint calculations. For many liquid effluent release situations, the monitor background is high, which could result in a monitor setpoint that is approximately equal to the monitor background. (11) In summary, to accommodate operational flexibility needed for effluent releases, the limits associated with the liquid release concentration (i.e.; the OEC) are based on 10 times the EC's stated in the 10 CFR 20. The multiplier of 10 is used because the annual dose of 500 mrem (10 CFR 20 MPC bases) is a factor of 10 higher than the annual dose of 50 mrem (10 CFR 20 EC bases). Compliance with the 100 mrem dose limit of the 10 CFR 20.1302 will be demonstrated by operating

within the dose limits of 10 CFR 50 Appendix I, and 40 CFR 190 (which are also ODCM Controls for liquid and gaseous effluents). Implementation of the 10 CFR 20 for liquid effluents maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

8.2.7.2 In summary, Per Generic Letter 89-01, the transfer of RETS procedural details fulfills the goal of the USNRC Policy Statement for Technical Specification improvements. It is not the USNRC's (or DLC's) intent to reduce the level of radioactive effluent control. Rather, the intent is to provide programmatic controls for RETS (as delineated in Technical Specification 6.8.6) and allow for relocation of the procedural details of the RETS to the ODCM.

8.2.8 <u>Change (8) of BV-1 and 2 ODCM (Issue 3, Rev 1), Effective October, 1995</u>

8.2.8.1 A description of the changes implemented with this revision are as follows:

8.2.8.1.1 <u>Index</u>: Editorial changes were made for clarity. (See justification 1)

8.2.8.1.2 <u>Section 1.0</u>: Revised Nb-95 and Nb-97 dose factors in Table 1.3-1 due to changing the niobium bioaccumulation factor. (see justification 2)

8.2.8.1.3 <u>Appendix A</u>: A change was made to Table 1.1 so that the letter A would proceed the table number. (See justification 1)

8.2.8.1.4 <u>Appendix B</u>: A descriptive paragraph was added at the front of this Appendix. Also, changes were made to the tables so that the letter B would proceed the table numbers. (See justification 1)

8.2.8.1.5 <u>Appendix C</u>: Descriptive paragraphs were added at the front of the Appendix (See justification 1). Removed the process flow rate operability and surveillance requirements for gaseous effluent radiation monitors [2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112] from Tables 3.3-13 and 4.3-13 (See justification 3). Added alternate system effluent flow rate measuring devices for the three gaseous effluent pathways to Tables 3.3-13 and 4.3-13 (See justification 4). Revised Surveillance Requirements 4.11.1.1.3 and 4.11.1.1.4 and notes e and g of Table 4.11-1 to clarify Turbine Building sump sampling requirements (See justification 5).

8.2.8.1.6 <u>Appendix D</u>: Descriptive paragraphs were added at the front of the Appendix. (See justification 1)

8.2.8.1.7 <u>Appendix E</u>: Descriptive paragraphs were added at the front of the Appendix. (See justification 1)

8.2.8.1.8 Appendix F: This is a new Appendix to the ODCM. It contains plant procedure references for Radiological Effluent Technical Specification (RETS) that were transferred from the Technical Specification Procedure Matrix. (See justification 1)

8.2.8.2 The justification used for change (8) to the ODCM are as follows:

8.2.8.2.1 These changes are considered editorial in nature. Therefore, these editorial changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.

8.2.8.2.2 This change resulted from revising the bioaccumulation factor (BF) for niobium from the value posted in Table A-1 of Regulatory Guide 1.109, Revision 1, 1977 (30,000 pCi/kg per pCi/l). Since this change in niobium BF (as documented and justified in Appendix A to Calculation Package No. ERS-ATL-83-027) merely removes the conservatism associated with organism uptake, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, removing the conservatism will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.

8.2.8.2.3 This change removes the process flow rate operability and surveillance requirements for BV-2 Gaseous Effluent Radiation Monitors [2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112] from Appendix C Tables 3.3-13 and 4.3-13. These items were removed from the ODCM by justification provided in Calculation Package No. ERS-ATL-90-021. A safety analysis and a no significant hazards evaluation were prepared and approved prior to submitted it to the NRC via TSCR No. 2A-61 in 1992. However, it was withdrawn in 1993 in an effort to alleviate any further delays associated with approval of TSCR No. 1A-175/2A-37 (Generic Letter 89-01 implementation). Removal of these requirements from the ODCM will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also removal of these items will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation. The following is a summary of the justification. (1) BVPS-1 and BVPS-2 is currently using, and will continue to use design (maximum) system flow rates in ODCM Dose & Dose Rate Calculations, rather than those flow rates observed during normal plant operation. (2) BVPS-2 UFSAR Section 11.3.3 indicates that the source term for these three pathways are not significant. These pathways are not included in UFSAR Tables 11.3-1 through 11.3-4 that list the expected and design releases for each potentially radioactive pathway. (3) The DLC commitment to Regulatory Guide 1.97, Rev. 2 (Section 1.8-1 of the BVPS-2 UFSAR) is not affected. This RG

applies to instrumentation used during and after postulated accident conditions. These three process flow rate instruments were not used in any accident analysis, nor are they used to assess plant conditions during and following an accident. (4) The DLC commitment to Regulatory Guide 1.21, Rev. 1 (Section 1.8-1 of the BVPS-2 UFSAR) is not affected. RG 1.21, Section C.2 (Location of Monitoring) states in part: "All major and potentially significant paths for release of radioactive material during normal reactor operation, including anticipated operational occurrences, should be monitored. Measurements of effluent volume, rates of release, and specific radionuclides should be made insofar as practical . . " As previously stated, the three process flow rate instruments are located on effluent pathways that do not have a significant source term. (5) BVPS-2 UFSAR Sections 9.4.13 and 9.4.16 indicate that the building ventilation system for these three pathways are non-safety related and are not required to perform any safety-related function. (6) There is no effect to the Noble Gas Monitors located on these three pathways. The Noble Gas Monitors are still capable of performing their intended functions as described in BVPS-2 UFSAR Section 11.5.2.4.

8.2.8.2.4 This change adds alternate system effluent flowrate measuring devices for the three BV-1 gaseous effluent pathways to Appendix C Tables 3.3-13 and 4.3-13. A 10 CFR 50.59 safety evaluation has concluded that no unreviewed safety question is involved by adding the alternate measuring devices to Appendix C Tables 3.3-13 and 4.3-13. This conclusion is based on the following: (1) There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety. (2) There is no creation of a possibility for an accident or malfunction of a different type than any evaluated previously. (3) There is no reduction in the margin of safety. (4) Also, since this change merely adds alternate measuring devices that meet the same surveillance requirements of the primary channel, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, addition of the alternate flow rate measuring devices will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

8.2.8.2.5 This change to the ODCM clarifies Turbine Building sump sampling requirements and clarifies effluent related actions associated with detection of radioactivity in the secondary system. These clarifications are documented and justified in Calculation Package No. ERS-ATL-95-006. Also, since these clarifications were shown to meet the intent of NUREG-1301 (superseding NUREG-0472) and the BVPS-1 and 2 UFSAR's, then the clarification will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the clarifications will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation. Also, a 10 CFR 50.59 safety evaluation has concluded that no

unreviewed safety question is involved by clarifying these actions. This conclusion is based on the following: (1) There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety. (2) There is no creation of a possibility for an accident or malfunction of a different type than any evaluated previously. (3) There is no reduction in the margin of safety.

8.2.9 Change (9) of BV-1 and 2 ODCM (Issue 3, Rev 2), Effective May 1997

8.2.9.1 A description of the changes implemented with this revision are as follows:

8.2.9.1.1 Index: Editorial changes were made for clarity. (See Justification 1)

8.2.9.1.2 Section 1.0: Clarifying statements were added to Tables 1.2-1a and 1.2-1b to show that the recirculation times listed are based on historical recirculation rates. Figure 1.4-3 was added to show BV-1 and 2 liquid Effluent Release Points. (See Justification 1)

8.2.9.1.3 Section 3.0: Removed the option to perform broad leaf vegetation sampling at the site boundary in a sector with the highest D/Q. (See Justification 2)

8.2.9.1.4 Appendix C: Added plant specific Mark Numbers to Tables 3.3-12, 4.3-12, 3.3-13 and 4.3-13 (See Justification 1). Corrected typographical errors on Surveillance Requirement 4.11.4.1.1 (See Justification 1). Added clarifying statements from NUREG-1301 and the Radiological Assessment Branch Technical Position to Tables 3.12-2 and 4.12-1 (See Justification 1). Removed the option to perform broad leaf vegetation sampling at the site boundary in a sector with the highest D/Q (See Justification 2).

8.2.9.1.5 Appendix E: Corrected typographical error on Table 6.9-1. (See Justification 1)

8.2.9.1.6 Appendix F: Added procedure details to Tables 11, 12 and 13. (See Justification 1)

8.2.9.2 The justification used for Change (9) to the ODCM are as follows:

8.2.9.2.1 These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

8.2.9.2.2 This change removes the option to perform broad leaf vegetation sampling at the site boundary (in a sector with the highest D/Q) in lieu of the garden census. Per NUREG-1301 and the Radiological Branch Technical Position, this option does not apply to plants with elevated releases. Since BV-1 and 2 have elevated releases, the option should not be exercised. A review of past garden census showed that the option was never exercised at BV-1 and 2. Since this change removes an option that should not be exercised, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, removal of the option will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

8.2.10 <u>Change (10) of BV-1 and 2 ODCM (Issue 3, Rev 3), Effective June 1997</u>

8.2.10.1 A description of the changes implemented with this revision are as follows:

8.2.10.1.1 <u>Section 2.0</u>: A release point for the BV-2 Turbine Building Vent was added (for editorial purposes) to Figure 2.4-2.

8.2.10.2 The justification used for Change (10) to the ODCM is as follows:

8.2.10.2.1 This change is considered editorial in nature. The change adds an equivalent item that was previously located on BV-2 Technical Specification Figure 5.1-2. Since BV-2 Technical Specification Amendment 83 removed this figure, then the gaseous release point for the BV-2 Turbine Building Vent needed transferred to the ODCM. Therefore, since this change is considered editorial, the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial change will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

8.2.11 <u>Change (11) of BV-1 and 2 ODCM (Issue 3, Rev 4), Effective March 1998</u>

8.2.11.1 A description of the changes implemented with this revision are as follows:

8.2.11.1.1 <u>Index</u>: Editorial changes were made for clarity.

8.2.11.1.2 <u>Section 3.0</u>: The distances for the environmental monitoring sample points were revised to show a more accurate measurement from the center of the Unit 1 Containment Building. The actual sample locations and descriptions remain unchanged. Also, the 4 individual quadrant maps showing TLD locations were consolidated into 1 map. This is a Corrective Action to Condition Report CR 980353.

8.2.11.1.3 Section 4.0: Added clarifying statements as to how doses due to radioactive effluents for MEMBERS OF THE PUBLIC conducting activities inside the site boundary are derived and reported. This is a Corrective Action to Condition Report CR 971578.

8.2.11.1.4 Appendix C: Added statements to Action 23 of Table 3.3-12 to clarify that batch liquid releases may also be initiated with the same Action needed for resuming the release. This is a recommendation from the 1997 RETS Self-Assessment. A note was also added to this table to clarify that independent signatures on the discharge permit satisfy the requirement for "two technically qualified members of the Facility Staff independently verify the release rate calculation..." Added Action 29 to RM-1GW-108B on Table 3.3-13. This addition ensures consistency with the other 7 continuous gaseous effluent pathway Actions for Noble Gas Monitor inoperability. Added plant specific Mark Numbers for primary and alternate instrumentation to Tables 3.3-13 and 4.3-13 as follows: (1) For Noble Gas Activity Monitors, [RM-1VS-109 Channel 5] was added as an alternate to [RM-1VS-101B] and [RM-1V1S-110 Channel 5] was added as an alternate to [RM-1VS-107B]. [RM-1GW-109 Channel 5] was not added as an alternate to [RM-1GW-108B] at this time, because it does not perform on auto-isolation of gaseous waste decay tank release upon upper activity alarm. (2) For Particulate Activity Monitors, [RM-1VS-109 Channel 1] was added as an alternate to [RM-1VS-101A], [RM-1VS-1110 Channel 1] was added as an alternate to [RM-VS-1107A], and [RM-1GW-109 Channel 1] was added as an alternate to RM-1GW-108A.

8.2.11.1.5 Appendix E: Corrected typographical errors on Table E:6.9-1

8.2.11.1.6 Appendix F: Updated the procedure details for primary and alternate instrumentation included in Appendix C Tables 3.3-13 and 4.3-13. Reduced the amount of detail contained in reference to the Operating Manual L-5 logs so that the position of the surveillance on the logs can be changed without having a need to change the Tables in this Appendix. This is a Corrective Action to Condition Report CR 980129.

8.2.11.2 The justification used for Change (11) to the ODCM is as follows:

8.2.11.2.1 These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

8.2.12 Change (12) of BV-1 and 2 ODCM (Issue 3, Rev 5), Effective November 1998

8.2.12.1 A description of the changes implemented with this revision are as follows.

8.2.12.1.1 Index: Editorial changes were made for clarity. (See Justification 1.)

8.2.12.1.2 Section 1.0: Added clarification for calculation of radionuclide concentration when the Post Dose Correction Factor is >1. (See Justification 1).

8.2.12.1.3 Section 3.0: Added an additional site location for the upstream environmental surface water sample. Added additional method after collecting and compositing this sample. (See Justification 2.)

8.2.12.1.4 Appendix C: Revised the definitions for MEMBER(S) OF THE PUBLIC and UNRESTRICTED AREA to ensure compliance with 10 CFR 20.1003. (See Justification 1.) Added a definition for MEMBER(S) OF THE PUBLIC to ensure compliance with 40 CFR 190.02(k). (See Justification 1.) Added plant specific Mark Numbers for primary and alternate instrumentation to Table 3.3-13 that were inadvertently omitted from change (11) to the ODCM. (See Justification 1.) Added clarification to Table 4.11-2 as to where and when H-3 samples of Waste Gas Storage Tanks are to be obtained. This is a Corrective Action to Condition Report CR 981489. (See Justification 1.) Added clarification to note "e" of Table 4.11-2 as to the appropriate ventilation release path. This is a Corrective Action to CR 981490. (See Justification 1.). Corrected an obvious omission on Table 3.12-1 to ensure that 2 TLD's are used for determination of Direct Radiation. (See Justification 1.) Incorporated the appropriate changes to Table 3.12-1 that are described above for Section 3.0. (See Justification 2.)

8.2.12.1.5 Appendix F: Added procedure details from the Chemistry Manual to Table 6. This is a Corrective Action to Condition Report CR 981488. (See Justification 1.)

8.2.12.2 The justifications used for Change (12) to the ODCM are as follows:

8.2.12.2.1 These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

8.2.12.2.2 These changes involve the upstream environmental surface water sample method and sample site. Since these changes were shown to meet the intent of NUREG-1301, and BVPS-1 and 2 UFSAR's, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the change will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations. Also, a 10 CFR 10.50 safety evaluation has concluded that no unreviewed safety question is involved by adding an additional sample site and sample method. This evaluation is based on the following: (1) There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety. (2) There is no creation of a possibility for an accident or malfunction of a different type than any evaluated previously. (3) There is no reduction in the margin of safety.

8.2.13 Change (13) of BV-1 and 2 ODCM (Issue 3, Rev 6), Effective May 1999

8.2.13.1 A description of the changes implemented with this revision are as follows:

8.2.13.1.1 Index: Editorial changes were made for clarity.

8.2.13.1.2 Section 3.0: Updated figure number and table reference. Removed a redundant upstream environmental surface water sampling location.

8.2.13.1.3 Appendix C: Made editorial changes for clarity. Added definitions for SHUTDOWN and STARTUP. Changed definition for ODCM to ensure agreement with definition provided in Unit 1/2 Technical Specification Amendments 220/97. Changed designations for primary and alternate instruments on Tables 3.3-12, 4.3-12, 3.3-13 and 4.3-13 from "P" and "A" to "Pri" and "Alt". Clarified use of the Flow Rate Measurement Devices for the Cooling Tower Blowdown Line on Tables 3.3-12 and 4.3-12 to show that the Unit 1/2 combined instrument [FT-1CW-101-1] is the primary and both of the individual Unit 1 and Unit 2 instruments [FT-1CW-101] and [2CWS-FT101] are the alternates. Updated Actions 24, 25 and 26 of Table 3.3-12 to describe use of comparable alternate monitoring channels when the primary channels are INOPERABLE. Clarified Table 3.3-13 Action 28 applicability for Unit 2 gaseous effluent monitors. Clarified Table 3.3-13 Action 30 to show that applicability is for batch purges of the reactor containments. Changed reference of Special Report compliance requirement from Technical Specification 6.9.2f to 10 CFR 20.2203 and 10 CFR 50.4 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Clarified note b of Table 4.11-2 regarding sampling and surveillances frequencies. Clarified Controls 3.12.1 and 3.12.2 to ensure compliance with NUREG-1301.

8.2.13.1.4 Appendix E: Made editorial changes for clarity. Changed reference of Special Report compliance requirement from Technical Specification 6.9.2f to 10 CFR 20.2203 and 10 CFR 50.4 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Changed submittal date of annual REMP report from May 1 to May 15 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Changed column heading in Table E: 6.9-1 to ensure consistency with NUREG-1301.

8.2.13.2 The justification used for change (13) to the ODCM is as follows:

8.2.13.2.1 All changes are considered editorial in nature. The changes either clarify the intent of the original specification or add equivalent items form the standard guidance document (NUREG-1301) or recent Technical Specification Amendments. Therefore, since these changes are considered editorial, the changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

8.2.14 Change (14) of BV-1 and 2 ODCM (Rev 14), Effective March 2000

8.2.14.1 Prior to this ODCM change, the change numbers did not match the Issue and Revision numbers. For example, the last implemented ODCM change was (13), but carried an Issue 3, Revision 6 designation. Therefore, as of this ODCM change (14), consecutive Revision numbers will begin with Revision 14.

8.2.14.2 A description of the changes implemented with this revision are as follows:

8.2.14.2.1 Index: Editorial changes were made for clarity. References to condition reports CR 982097, CR 992652 and CR 993021 were added.

8.2.14.2.2 Appendix C: Editorial changes were made for clarity. Corrected a typographical error on Table 3.3-12 in regards to FT-CW-101-1. Changed the grab sampling requirement from 8 hours to 12 hours for Table 3.3-12 Action 24 (NUREG-1301, Table 3.3-12, Action 36 and 37 allow this change). Enhanced the Channel Functional Test requirements on Table 4.3-12 from Q(6) to Q(1) for RM-1DA-100 (Corrective Action to Condition Report CR 993021). Add clarification to Table 3.3-13 and 4.3-13 to show the plant specific Mark Numbers for the primary and alternate BV-1 Sample Flow Rate Measuring Devices. Corrected a typographical error on Table 3.3-13 Action 27. Separated Action 28 of Table 3.3-13 into individual Action 28 requirements for System Effluent Flow Rate Measuring Devices/Process Flowrate Monitors and individual Action 28 requirements for Sample Flow Rate Measuring Devices/Sample Flowrate Monitors. Added clarification to Table 3.3-13 to show that Action 29 and Action 32 are applicable for continuous releases. Added an alternate method in lieu of grab sample collection (i.e., local monitor readings can be obtained when

communication is lost to the Control Room) to show compliance to Table 3.3-13 Action 29. Changed the grab sampling requirement from 8 hours to 12 hours for Table 3.3-13 Action 29 and Action 32 (NUREG-1301, Table 3.3-013, Action 47 allows this change). Corrected typographical errors on Table 4.11-1 in regards to liquid composite analysis frequency and table notation.

8.2.14.2.3 Appendix F: Made editorial changes for clarity. Updated the procedure details for primary and alternate instrumentation included in Appendix C Tables 3.3-13 and 4.3-13. Added appropriate references to the HP Shift Logs (i.e., HPM Appendix 1) when these logs are used satisfy ODCM Appendix C Surveillances and Actions (Corrective Action to Condition Report CR 992652).

8.2.14.3 The justification used for change (14) to the ODCM is as follows:

8.2.14.3.1 Most of these changes are considered editorial in nature. All changes were screened for 10CFR50.59 applicability. In summary, the BVPS-1 and 2 UFSAR's are not impacted, because the changes either clarify the intent of the original specification, add plant specific Mark Numbers, or add equivalent items from the standard guidance document (NUREG-1301). Therefore, these changes will maintain the level of radioactive effluent control required by 10CFR20.1302, 40CFR Part 190, 10 CFR50.36a, and Appendix I to 10CFR50. Also, these changes will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

8.2.15 Change (15) of BV-1 and 2 ODCM (Rev 15), Effective August 2000

8.2.15.1 A description of the changes implemented with this revision are as follows:

8.2.15.1.1 Index: Editorial changes were made for clarity. Reference to Condition Report CR 001682 was added. Reference to NRC unresolved Item 83-30-05 was added.

8.2.15.1.2 Appendix C: Editorial changes were made for clarity. Annotated Actions 28 of Table 3.3-13 into Action 28A and 28B to show differentiation between Action 28A requirements for system/process flow rate measurement and Action 28B requirements for sampler flow rate measurement. Added an alternate method in lieu of 4 hour flow rate estimations (i.e.; assume ODCM design values for system/process flow rate) to show compliance with Table 3.3-13 Action 28A when the system/process flow rate monitor is inoperable. Annotated Actions 30 of Table 3.3-13 into Action 30A and 30B to show differentiation between Action 30A requirements for BV-1 reactor containment purges and Action 30B requirements for BV-2 reactor containment purges.

8.2.15.2 The justification used for change (15) to the ODCM is as follows:

8.2.15.2.1 Some of these changes are considered editorial in nature. These changes were screened for 10CFR50.59 applicability and determined not to impact the BVPS-1 and 2 UFSAR's. Since the editorial changes clarify the intent of the original specification, then these changes will maintain the level of radioactive effluent control required by 10CFR20.1302, 40CFR Part 190, 10CFR50.36a, and Appendix I to 10CFR50. Also, these changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.15.2.2 The change to allow use of design (maximum) system flow rates in lieu of 4 hour flow rate estimations (for five of the eight gaseous effluent release pathways) was screened for 10CFR50.59 applicability and determined not to impact the BVPS-1 and 2 UFSAR's. The 4 hour flow rate estimations for these effluent release pathways have never been used in ODCM Dose and Dose Rate Calculations. The method for use of process flow rates in ODCM Dose and Dose Rate Calculations remains unchanged. For example, BVPS-1 and BVPS-2 is currently using, and will continue to use design (maximum) system flow rates in ODCM Dose and Dose Rate Calculations for all eight gaseous effluent release pathways. This is necessary to ensure that DLC response to NRC Unresolved Item 50-334/83-30-05 is not compromised. Also this change is considered similar and within the justification provided for ODCM change (8) that removed all of the process flow rate operability and surveillance requirements for the other three gaseous effluent release pathways. Based on the above, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, these changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.16 Change (16) of BV-1 and 2 ODCM (Effective April 2002)

8.2.16.1 A description of the changes implemented with this revision are as follows:

8.2.16.1.1 The entire BV-1 and 2 ODCM was converted to the ODC format as delineated in 1/2-ADM-0100. As part of this process, the ODCM was separated into eight procedures as follows:

8.2.16.1.1.1 1/2-ODC-1.01, Rev 0; ODCM: Index, Matrix and History of ODCM Changes (formerly; ODCM Index and Appendix F)

8.2.16.1.1.2 1/2-ODC-2.01, Rev 0; ODCM: Liquid Effluents (formerly; ODCM Section 1 and 5)

8.2.16.1.1.3 1/2-ODC-2.02, Rev 0; ODCM: Gaseous Effluents (formerly; ODCM Section 2 and 5)

8.2.16.1.1.4 1/2-ODC-2.03, Rev 0; ODCM: Radiological Environmental Monitoring Program (formerly; ODCM Section 3)

8.2.16.1.1.5 1/2-ODC-2.04, Rev 0; ODCM: Information Related to 40 CFR 190 (formerly; ODCM Section 4)

8.2.16.1.1.6 1/2-ODC-3.01, Rev 0; ODCM: Dispersion Calculational Procedure and Source Term Inputs (formerly; ODCM Appendix A & B)

8.2.16.1.1.7 1/2-ODC-3.02, Rev 0; ODCM: Bases for ODCM Controls (formerly; ODCM Appendix D)

8.2.16.1.1.8 1/2-ODC-3.03, Rev 0; ODCM: Controls for RETS and REMP Programs (formerly; ODCM Appendix C and E)

8.2.16.1.2 Procedure 1/2-ODC-3.02, Rev 0: Technical Specification Bases 3/4.3.3.1 was duplicated in the Bases for ODCM Controls as permitted by Unit 1/2 Technical Specification Amendments 1A-246/2A-124.[3.2.6.8]

8.2.16.1.3 Procedure 1/2-ODC-3.03, Rev 0: Portions of Technical Specification LCO 3.3.3.1 (including portions of Tables 3.3-6 and 4.3-3) were transferred to the ODCM Controls as permitted by Unit 1/2 Technical Specification Amendments 1A-246/2A-124.[3.2.6.8] Specifically, this includes the Mid and High Range Channels of Noble Gas Effluent Monitors [RM-1VS-109 (7 and 9), RM-1VS-110 (7 and 9), RM-1GW-109 (7 and 9), and 2HVS-RQ109C and 109D], the Atmospheric Steam Dump Valve/Code Safety Relief Valve Discharge Monitors [RM-1MS-100A, B and C] and Auxiliary Feedwater Pump Turbine Exhaust Monitor [RM-1MS-101]. The Preplanned Method of Monitoring (PMM) was also added for clarification of necessary actions when the primary instrument is inoperable. Addition of the PMM's are considered an editorial change because it merely specifies the asset number (or appropriate form number), which were included as PMM's in previously approved station documents.

8.2.16.1.4 Procedure 1/2-ODC-3.03, Rev 0: Added clarifications to ODCM Control 3.3.3.9 Table 3.3-13 to show that Action 30A and Action 3B are applicable to the initial batch purge of the reactor containment atmosphere. All other releases of reactor containment atmosphere (i.e.; after the initial batch purge) are considered continuous releases.

8.2.16.1.5 Procedure 1/2-ODC-3.03, Rev 0: Added specific plant asset numbers to ODCM Control 3.3.3.10 Table 3.3-13 and Table 4.3-13 to show that Sample Flow Rate Monitor flow transmitters [2HVS-FIT101-1, 2RMQ-FIT301-1, 2HVL-FIT112-1 and 2RMQFIT303-1] may be used as comparable alternates when the primary instruments [RM-11 Monitor Item 28 for 2HVS-RQ101, 2RMQ-RQ301, 2HVL-RQ112 and 2RMQ-RQ303], respectively, are INOPERABLE. This is considered an editorial change because the primary monitoring channel (i.e.; RM-11 Monitor Item 28) display already receives its input from these same flow transmitters.

8.2.16.1.6 Procedure 1/2-ODC-3.03, Rev 0: Added notation to ODCM Control 3.3.3.10 Table 3.3-13 and Table 4.3-13 to show that [RM-1GW-109 Channel 5] may be used as a comparable alternate to [RM-1GW-108B] for continuous releases. However, since [RM-1GW-109 Channel 5] cannot perform an automatic isolation of gaseous waste decay or storage tank releases, then notation was also added to prevent using this monitor as a comparable alternate for batch releases. This is considered an editorial change because it merely specifies the asset number of a redundant alternate monitoring channel that was included in previously approved station documents.

8.2.16.1.7 Procedure 1/2-ODC-3.03, Rev 0: Replaced the requirements for "Particulate Activity Monitors" in ODCM Control 3.3.3.10 Tables 3.3-13 and Table 4.3-13 with requirements for "Particulate and Iodine Samplers". This is considered an editorial change because the NRC guidance document used for preparation of ODCM Controls (NUREG-1301) contains the clarification that the requirements listed in these Tables are for the "Particulate and Iodine Samplers", and not for the "Particulate Activity Monitors".

8.2.16.2 The justification used for change (16) to the ODCM is as follows:

8.2.16.2.1 The specific radiation monitoring channels transferred to the ODCM provide alarms and indications to alert plant personnel of high radiation conditions and to assist in evaluating and trending plant effluents. The Actions applicable if the monitors are inoperable require only that area surveys be performed on a daily basis, or that explanations of inoperability be provided in an annual effluent report. The Actions do not impact or reference the operability of other systems nor do the Actions require that plant operation be terminated at any time.

8.2.16.2.2 Some of the radiation monitoring effluent monitors transferred to the ODCM provide indications used to assess selected plant parameters following an accident consistent with the recommendations of NUREG-0737. However, the monitors do not provide indication for post accident variables that have been identified as Regulatory Guide 1.97 Type A or Category I.

8.2.16.2.3 The Safety Analysis performed for the License Amendments conclude that the radiating monitoring channels transferred to the ODCM do not reduce the effectiveness of the requirements being relocated. Rather, the transferred results in a change in the regulatory control required for future changes made to the requirements. The requirements will continue to be implemented by the appropriate plant procedures in the same manner as before. However, future changes to the transferred requirements will be controlled in accordance with 10 CFR 50.59 instead of requiring a license amendment per 10 CFR 50.90.

8.2.16.2.4 Based on the above, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, these changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.17 Change (17) of BV-1 and 2 OCDM (Effective August 2002)

8.2.17.1 A description of the changes implemented with this revision are as follows:

8.2.17.1.1 Procedure 1/2-ODC-3.03, Rev 1: Technical Specification LCO 3.11.1.4 for Liquid Storage Tank Activity Limits, and LCO 3.11.2.5, for Gas Storage Tank Activity Limits were transferred to ODCM Controls 3.11.1.4 and 3.11.2.5 respectively as permitted by Unit 1/2 Technical Specification Amendments 1A- 250/2A-130.[3.2.6.9]

8.2.17.1.1.1 As part of the preparation work for transfer of the Liquid Storage Tank Activity Limits to the ODCM, the 10 Curie Limit for these tanks was re-verified and documented in Calculation Package ERS-ATL-95-007.[3.2.3.9] The results of this calculation provide tank specific activity limits to ensure that the 10 CFR 20 Appendix B Table 2, Col. 2 EC Limits will be maintained should an accidental release of the tank(s) contents occur. Previously, LCO 3.11.1.4 used a generic limit of 10 Curies for each of the four tanks listed. However, formal documentation for derivation of the 10 Curie value could not be located in the records storage system.

8.2.17.1.1.2 In addition, individual tank Activity limits were developed for the Unit 1 and 2 Refueling Water Storage Tanks (RWST's), which were also added to this ODCM Control. The Surveillance Requirements for determination of RWST Activity will not be performed once per 7 days like the other Liquid Storage Tanks, because radioactive material is not added to the RWST's on a weekly basis. Therefore, the surveillance for determination of (RWST's) Activity will be performed within 7 days of returning reactor cavity water (radioactive material) back to the RWST (i.e.; during a refueling outage).

8.2.17.1.2 Procedure 1/2-ODC-3.03, Rev 1: Changed the due date of the Annual Radioactive Effluent Release Report from April 1 to May 1 as permitted by Unit 1/2 Technical Specification Amendments 1A-250/2A-130.[3.2.6.9]

8.2.17.1.3 Procedure 1/2-ODC-3.03, Rev 1: Changed Table 3.3-12 of Control 3.3.3.9 to correct an obvious omission of Channel Operability and Action Statement Requirements for Flow Rate Measurement Device [FR-1LW-103] on the Liquid Waste Containment Drain Line. This obvious omission is detailed in CR 02-05533.[3.2.2.12]

8.2.17.1.4 Procedure 1/2-ODC-3.03, Rev 1: Made editorial changes to correct the primary asset numbers of the BVPS-2 Sample Flowrate Monitors as shown on Tables 3.3-13 and 4.3-13 of Control 3.3.3.10. These changes clarify that the primary Sampler Flowrate Monitor is the device that is used for monitoring sample flowrate through the Particulate and Iodine Sampler Flowpath, not the Particulate and Iodine Monitoring Flowpath.

8.2.17.2 The justification used for change (17) of the ODCM is as follows:

8.2.17.2.1 These changes merely transfers existing storage tank activity limits from the Technical Specification to the ODCM and changes the due date for the Annual Radioactive Effluent Release Report as permitted by Unit 1/2 Technical Specification Amendments 1A-250/2A-130. As part of this change, the ODCM Control for Liquid Storage Tank Activity Limits was enhanced to add ODCM Controls and Surveillance Requirements for the Unit 1 and Unit 2 RWST's. Therefore, these changes (as delineated in the Technical Specification Amendments) will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, these changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.18 Change (18) of the BV-1 and 2 ODCM (Effective October 2002)

8.2.18.1 A description of the changes implemented with this revision are as follows:

8.2.18.1.1 Procedure 1/2-ODC-3.03, Rev 2: Added requirement for applicable station groups notification of pending ODCM changes as described in CR 09-05711.[3.2.2.13]

8.2.18.2 The justification used for change (18) of the ODCM is as follows:

8.2.18.2.1 This change is considered editorial in nature, which exempts the change from Regulatory Applicability Determination. Therefore, this change will not impact the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.19 Change (19) of BV-1 and 2 ODCM (Effective November 2002)

8.2.19.1 A description of the changes implemented with this revision are as follows:

8.2.19.1.1 Procedure 1/2-ODC-2.01, Rev 1: Changed Table 1.1-1a and 1.1-1b to add Zn-65 to the respective BV-1 and 2 Liquid Source Term as described in CR 02-06174 (CA-01, CA-13 and CA-14). For information, zinc may be added to the reactor coolant system in an effort to reduce general corrosion of primary system materials and mitigation of stress corrosion cracking. Added benefits to zinc addition involve preferential release of nickel and cobalt which, in-turn, reduces plant dose rates. Development of the specific Zn-65 Annual Release Activity is delineated in Calculation Package No. ERS-ATL-83-027.[3.2.3.1] Addition of Zn-65 to the source terms also caused changes in the Liquid Effluent Monitor Alarm Setpoints, and appropriate monitor conversion factors.

8.2.19.1.2 Procedure 1/2-ODC-2.01, Rev 1: Table 1.1-1a was changed to update the remainder of the source term with annual release values derived in Stone and Webster Calculation Package No. UR(B)-160.[3.2.3.10]

8.2.19.1.3 Procedure 1/2-ODC-2.01, Rev 1: Editorial changes were made to this procedure for update of ODCM references and to add discussion of why Liquid Waste Evaporators are no longer used at BV-1 and 2 to process liquid waste.

8.2.19.2 The justification used for change (19) of the ODCM is as follows:

8.2.19.2.1 Addition of Zn-65 to the BV-1 and 2 Liquid Source Terms, along with update of the BV-1 and 2 Liquid Source Term is considered a procedure correction, and is enveloped by the Regulatory Applicability Determination performed for BV-1 ECP-02-0410. Based on the above, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, these changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.20 Change (20) of BV-1 and 2 ODCM (Effective October 2003)

8.2.20.1 A description of the changes implemented with this revision are as follows:

8.2.20.1.1 Procedure 1/2-ODC-2.01, Rev 2: Changed LW System diagrams (Attachment D) to indicate the flow path for cross connect of LW between Unit 1 and Unit 2.

8.2.20.1.2 Procedure 1/2-ODC-2.02, Rev 1: Changed Table 2.1-1 to revise the source term for the Unit 1 Containment Vacuum Pumps as described in CR03-04830 (CA-03).

8.2.20.1.3 Procedure 1/2-ODC-3.03, Rev 3: Changed the Preplanned Method of Monitoring (PMM) in Attachment D Table 3.3-6 and Table 4.3-3. Specifically, the 2nd PMM for the Reactor Building/SLCRS Mid & High Range Noble Gas Monitors (RM-1VS-110 Ch 7 & Ch 9) was changed FROM "(RM-1VS-107B)" TO "(RM-1VS-107B, or RM-1VS-110 Ch 5)". Also, the 2nd PMM for the Auxiliary Building Ventilation System Mid & High Range Noble Gas Monitors (RM-1VS-109 Ch 7 & Ch 9) was changed FROM "(RM-1VS-101B)" TO "(RM-1VS-101B, or RM-1VS-109 Ch 5)". Similarly, the 2nd PMM for the Gaseous Waste/ Process Vent System Mid & High Range Noble Gas Monitors (RM-1GW-109 Ch 7 & Ch 9) was changed FROM "(RM-1GW-108B)" TO "(RM-1GW-108B, or RM-1GW-109 Ch 5)".

8.2.20.1.4 Procedure 1/2-ODC-3.03, Rev 3: Changed Attachment J Control 3.11.1.4 to update the activity limits for the liquid storage tanks to the values specified in Calculation Package No. ERS-ATL-95-007.

8.2.20.1.5 Procedure 1/2-ODC-3.03, Rev 3: Changed Attachment K Table 4.11-2 to add more specific guidance for sampling of Gaseous Effluent Pathways. Specifically, this table is generic for Unit 1 & Unit 2 Gaseous Effluent Pathways, but sampling may only need required at some of the Gaseous Effluent Pathways rather than all of the Gaseous Effluent Pathways (as could be inferred from the wording in the Table Notation). Therefore to prevent unnecessary sampling, applicability statements were added to this table to delineate which ventilation systems are affected by the note(s). Also, note (f) includes a clarification of how compliance to this requirement is achieved per response to NRC Unresolved Item 50-334/83-30-05.

8.2.20.2 The justifications used for change (20) of the ODCM are as follows:

8.2.20.2.1 Procedure 1/2-ODC-2.01, Rev 2: Changing the diagram to show the LW cross connect between Unit 1 and Unit 2 is not a change to plant configuration, and is considered a procedure correction. Specifically, this procedure of the ODCM already describes the shared radwaste treatments system. Also, the UFSAR's describe the cross connect. Based on the above, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.20.2.2 Procedure 1/2-ODC-2.02, Rev 1: The original source-term calculation for the GW System was based on an operating flow rate of 5 scfm for the Unit 1 containment vacuum pumps. The flow rate for the new pumps is 70 scfm. Consequently, the source-term was revised per Calculation Package ERS-HHM-87-014 and then transcribed to this procedure. Although the new pumps represent a factor of 15 increase in flow rate, the gaseous effluent monitor alarm setpoints are unchanged. Specifically, the previous setpoints were based on a percentage of Offsite Dose Rate Limits, and those values were actually above the range of the instruments, so an on-scale value was substituted. This is also true for the re-calculated setpoints, so the same on-scale values are used. In summary, changing the source term is considered a procedure correction, and is enveloped by the Regulatory Applicability Determination performed for BV-1 ECP-02-0079. Based on the above, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.. This procedure change implements a Corrective Action per CR03-04830-03.

8.2.20.2.3 Procedure 1/2-ODC-3.03, Rev 3: Changing the Preplanned Method of Monitoring (PMM) will prevent unnecessary grab sampling (i.e.; the 3rd PMM) when the primary channel for the Mid or High Range Noble Gas Monitor is inoperable. Specifically, **IF** other Noble Gas Monitoring channels are available on that effluent pathway, **THEN** monitoring should be assumed with those channels as the 2nd PMM. In summary, the 3rd PMM (i.e.; obtaining grab gas samples every 12 hours) should only be performed as a last resort to a complete lack of continuous noble gas monitoring channels being available on that effluent pathway. Based on the above, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.. This procedure change implements a Corrective Action per CR03-06123-01.

8.2.20.2.4 Procedure 1/2-ODC-3.03, Rev 3: Changing the activity limits for liquid storage tanks does not affect original plant accident analyses. Specifically, the original analyses were performed in accordance with NUREG-0800 SRP 15.7.3 using the best available data at that time. The updated analyses were also performed in accordance the same NUREG, but current (more accurate) data was used to determine allowable activity content in each tank. Based on the above, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR 03-07487-05.

8.2.20.2.5 Procedure 1/2-ODC-3.03, Rev 3: Changing Attachment K Table 4.11-2 to add more specific guidance for sampling of Gaseous Effluent Pathways is considered a simple change. Specifically, this change merely prevents unnecessary sampling of unaffected ventilation pathways. Based on the above, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR 03-06281-01.

8.2.21 Change (21) of BV-1 and 2 ODCM (Effective November 2004)

8.2.21.1 A description of the changes implemented with this revision are as follows:

8.2.21.1.1 Procedure 1/2-ODC-1.01, Rev 4, Procedure 1/2-ODC-2.01, Rev 3 and Procedure 1/2-ODC-3.03, Rev 4: Changed ownership of procedures from the Radiation Protection Section to the Nuclear Environmental & Chemistry Section per CR 05-01169-14, CR 05-01169-15 and CR 05-01169-21.

8.2.21.1.2 Procedure 1/2-ODC-2.01, Rev 3: Changed Attachment D to correct the volume of Liquid Waste Drain Tanks (2LWS-TK21A/21B) from 7,500 gal/tank to 10,000 gal/tank.

8.2.21.1.3 Procedure 1/2-ODC-3.03, Rev 4: Changed Attachment C to implement the increased flexibility in Mode restraints that is described in LAR 1A-321/2A 193 and CR 03-09288-19.

8.2.21.1.4 Procedure 1/2-ODC-3.03, Rev 4: Corrected a typographical error in Attachment O, Control 3.11.2.5 per CR03-11726-01. Specifically, the final word in Action (a) was changed from “nad” to “and”.

8.2.21.1.5 Procedure 1/2-ODC-3.03, Rev 4: Revised Attachment F, (Table 3.3-13 and 4.3-13) to correct a typographical error per CR04-01643-01. Specifically, the Asset Number for the Vacuum Gauge used for measurement of sample flow (from the Alternate Sampling Device) was changed from [PI-1GW-13] to [PI-1GW-135].

8.2.21.1.6 Procedure 1/2-ODC-3.03, Rev 4: Revised Attachment F, (Table 3.3-13 and 4.3-13) per CR04-02275-01. Specifically, clarification was provided to indicate that the “Sampler Flow Rate Monitors are the devices used for “Particulate and Iodine Sampling”.

8.2.21.1.7 Procedure 1/2-ODC-3.03, Rev 4: Revised Attachment J, Control 3.11.1.4, ACTION a, to add clarification that requires specific calculation of 10 CFR Part 20 EC’s when the individual tank limits are exceeded.

8.2.21.2 The justifications used for change (21) of the ODCM are as follows:

8.2.21.2.1 Procedure 1/2-ODC-1.01, Rev 4, Procedure 1/2-ODC-2.01, Rev 3 and Procedure 1/2-ODC-3.03, Rev 4: Changing ownership of these procedures from Radiation Protection to Nuclear Environmental & Chemistry is considered a procedure correction. SINCE the changes merely transfers RETS, REMP and ODCM responsibilities to a different manager, THEN the changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the changes will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. The procedure changes implement Corrective Actions per CR 05-01169-14, CR 05-01169-15, and CR 05-01169-21.

8.2.21.2.2 Procedure 1/2-ODC-2.01, Rev 3: Changing the volume of the Unit 2 Liquid Waste Tank is considered a procedure correction. SINCE this was a typographical error on the Attachment, THEN it does not impact the actual tank volume that is used in effluent release calculations and offsite dose determinations. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.21.2.3 Procedure 1/2-ODC-3.03, Rev 4: Changing Attachment C to implement the increased flexibility in Mode restraints (described in LAR 1A-321/2A-193) is considered a simple change. SINCE the change implements guidance provided in the Technical Specifications, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR 03-09288-19.

8.2.21.2.4 Procedure 1/2-ODC-3.03, Rev 4: The typographical error in Attachment O, Control 3.11.2.5 is considered a procedure correction. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR 03-11726-01.

8.2.21.2.5 Procedure 1/2-ODC-3.03, Rev 4: Correcting the typographical error in Attachment F, (Table 3.3-13 and 4.3-13) is considered a procedure correction. SINCE this change merely corrects an obvious error, THEN this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR04-01643-01.

8.2.21.2.6 Procedure 1/2-ODC-3.03, Rev 4: Providing clarification for the Sampler Flow Rate Monitors is considered a simple change, because it was possible to misinterpret which filter paper sampler (e.g.; moving filter or fixed filter) the specification was referring to. SINCE no changes were made to actual samplers used for effluent release calculations or offsite dose determinations, THEN this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This procedure change implements a Corrective Action per CR04-02275-01.

8.2.21.2.7 Procedure 1/2-ODC-3.03, Rev 4: Providing clarification that requires calculation of 10 CFR Part 20 EC's (when the individual tank limits are exceeded) is considered a simple change. Specifically, the individual tank limits were derived from an assumed source-term and may not be representative of the actual source term at time of sample. This clarification also ensures that a "Special Report" is submitted only when the 10 CFR Part 20 EC limits are actually exceeded (i.e.; when calculated using actual sample analysis) at the nearest surface water supply and the nearest potable water supply in the unrestricted area. Per Calculation Package No. ERS-ATL-95-007 [3.2.3.9], the nearest surface water supply and the nearest potable water supply are considered to be the entrance to the Midland Water Treatment Facility. SINCE no changes were made to the bases for the tank activity limits, THEN this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, this change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation.

8.2.22 Change (22) of BV-1 and 2 ODCM (Effective August 2006)

8.2.22.1 A description of the changes implemented with this revision are as follows:

8.2.22.1.1 Procedure 1/2-ODC-2.01, Rev 4: Incorporated Improved Technical Specification Reference changes from T.S. 6.8.6 to T.S. 5.5.2, per CR 05-03306. Revised the alarm setpoints of [RM-1RM-100] and [RM-1DA-100] via vendor calculation Package No. 8700-UR(B)-223. These changes reflect the Extended Power Uprate (EPU) at Unit 1 per ECP-04-0440, Unit 1 TS Amendment No. 275 and CR 06-04908-03. Updated the figure of Liquid Effluent Release Points (Attachment D, Figure 1.4-3) to incorporate a modified version of Plant Drawing No. 8700-RM-27F per CR 05-03854-01.

8.2.22.1.2 Procedure 1/2-ODC-2.02, Rev 2: Changed ownership of procedure from the Radiation Protection Section to the Nuclear Environmental & Chemistry Section per CR 05-01169-16. Incorporated a "≤" designation for all low range noble gas effluent monitor alarm setpoints to meet the provisions of vendor calculation Package No. 8700-UR(B)-223. These changes reflect the Extended Power Uprate (EPU) at Unit 1 per ECP-04-0440, Unit 1 TS Amendment No. 275 and CR 06-04908-04.

8.2.22.1.3 Procedure 1/2-ODC-3.03, Rev 5: Revised the alarm setpoints of the mid range and high range noble gas effluent monitors via vendor calculation Package No. 8700-UR(B)-223. These changes reflect the Extended Power Uprate (EPU) at Unit 1 per ECP-04-0440, Unit 1 TS Amendment No. 275 and CR 06-04908-03.

8.2.22.2 The justifications used for change (22) of the ODCM are as follows:

8.2.22.2.1 Procedure 1/2-ODC-2.01, Rev 4: Updating the alarm setpoints and the figure of liquid effluent release points are considered procedure corrections, because they merely update the ODCM to agree with previously approved documents that were implemented with TS Amendments. SINCE the change merely updates the ODCM, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. SINCE PORC review & acceptance is required per TS 6.14 and 1/2-ADM-1640, THEN the review is considered complete per Regulatory Applicability Determination RAD-06-03831, RAD-06-01658 and RAD-06-05070. As previously noted, these procedure changes implement Corrective Actions per CR 06-04908-03, and CR 05-03854-01.

8.2.22.2.2 Procedure 1/2-ODC-2.02, Rev 2: Changing the ownership of the procedure and updating the alarm setpoints with a "≤"designation are considered procedure corrections, because they merely update the ODCM to agree with previously approved documents that were implemented with TS Amendments. SINCE the change merely updates the ODCM, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. SINCE PORC review & acceptance is required per TS 6.14 & 1/2-ADM-1640, THEN the review is considered complete per Regulatory Applicability Determination RAD-06-03831 and RAD-06-01658. As previously noted, these procedure changes implement Corrective Actions per CR 05-01169-16 and CR 06-04908-04.

8.2.22.2.3 Procedure 1/2-ODC-3.03, Rev 5: Updating the alarm setpoints is considered a procedure correction, because this merely updates the ODCM to agree with previously approved documents that were implemented with TS Amendments. SINCE the change merely updates the ODCM, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. SINCE PORC review & acceptance is required per TS 6.14 & 1/2-ADM-1640, THEN the review is considered complete per Regulatory Applicability Determination RAD-06-03831 and RAD-06-01658. As previously noted, these procedure changes implement Corrective Actions per CR 06-04908-03.

8.2.23 Change (23) of BV-1 and 2 ODCM (Effective December 2006)

8.2.23.1 A description of the changes implemented with this revision are as follows:

8.2.23.1.1 Procedure 1/2-ODC-1.01, Rev 5: Changed Attachment C, Table F: 3a of the procedure matrix to add Form 1/2-ENV-01.04.F01 as documentation for performing a Channel Functional Test of the Unit 1 Primary and Alternate Gaseous Effluent Sampler Flowrate Measuring Devices per CR 04-09895. Attachment C Tables were also changed to denote transition of ODCM Channel Checks from Operations (L5 Logs) to Nuclear Environmental & Chemistry (Form 1/2-ADM-0606.F01 & F02) per CR 05-01422. Also, per Improved Technical Specifications (ITS), changed Attachment C Tables to reflect change in term from CHANNEL FUNCTIONAL TEST to CHANNEL OPERATIONAL TEST (COT), and added step 4.1.2 to identify requirements for ODCM changes record review and retention requirements. Revised step 5.3 to require ODCM changes be reviewed and accepted by PORC per CR 05-03306.

8.2.23.1.2 Procedure 1/2-ODC-2.01, Rev 5: Revised the alarm setpoints of [2SWS-RQ101] via vendor calculation Package No. 10080-UR(B)-508. These changes reflect the Extended Power Uprate (EPU) at Unit 2 per ECP-04-0441, Unit 2 TS Amendment No. 156 and CR 06-6476-01.

8.2.23.1.3 Procedure 1/2-ODC-2.03, Rev 1: Updated the existing REMP sampling locations with the most recent survey results that were performed using a Global Positioning System per CR 05-01390-02.

8.2.23.1.4 Procedure 1/2-ODC-3.02, Rev 2: Changed ownership of procedure from the Radiation Protection Section to the Nuclear Environmental & Chemistry Section per CR 05-01169-20.

8.2.23.1.5 Procedure 1/2-ODC-2.03, Rev 1, Procedure 1/2-ODC-2.04, Rev 1 and Procedure 1/2-ODC-3.01, Rev 1: Changed ownership of procedures from the Radiation Protection Section to the Nuclear Environmental & Chemistry Section per CR 05-01169-17, CR 05-01169-18 and CR 06-01169-19.

8.2.23.2 The justifications used for change (23) of the ODCM are as follows:

8.2.23.2.1 Procedure 1/2-ODC-1.01, Rev 5: Changing Attachment C, Table F: 3a of the procedure matrix to add Form 1/2-ENV-01.04.F01 as documentation for performing the Channel Functional Test of the Unit 1 Primary and Alternate Gaseous Effluent Sampler Flowrate Measuring Devices is considered a procedure correction, because no Acceptance Criteria was altered. Transition of ODCM Channel Checks from Operations (L5 Logs) to Nuclear Environmental & Chemistry (Form 1/2-ADM-0606.F01 & F02) is also considered a procedure correction, because the no Acceptance Criteria was altered. SINCE these changes merely correct the procedure matrix, THEN the changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. As previously noted, these procedure changes implement Corrective Actions per CR 04-09895, CR 05-01422 and CR 05-03306.

8.2.23.2.2 Procedure 1/2-ODC-2.01, Rev 5: Updating the alarm setpoints is considered a procedure correction, because this merely updates the ODCM to agree with previously approved documents that were implemented with TS Amendments. SINCE the change merely updates the ODCM, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. SINCE PORC review & acceptance is required per TS 6.14 & 1/2-ADM-1640, THEN the review is considered complete per Regulatory Applicability Determination RAD-06-04585. As previously noted, these procedure changes implement Corrective Actions per CR 06-6476-01.

8.2.23.2.3 Procedure 1/2-ODC-2.03, Rev 1: Updating the existing REMP sampling locations with the most recent survey results that were performed using a Global Positioning System is considered a procedure correction. SINCE the change provides more accurate distances to existing REMP sampling locations, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. The procedure change implements Corrective Actions per CR 04-00149-12 and CR 05-01390-02.

8.2.23.2.4 Procedure 1/2-ODC-2.03, Rev 1, Procedure 1/2-ODC-2.04, Rev 1 and Procedure 1/2-ODC-3.01, Rev 1: Changing ownership of these procedures from Radiation Protection to Nuclear Environmental & Chemistry is considered a procedure correction. SINCE the changes merely transfers RETS, REMP and ODCM responsibilities to a different manager, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. These procedure changes implement Corrective Actions per CR 05-01169-17, CR 05-01169-18 and CR 06-01169-19.

8.2.24 Change (24) of BV-1 and 2 ODCM (Effective May 2007)

8.2.24.1 A description of the changes implemented with this revision are as follows:

8.2.24.1.1 Procedure 1/2-ODC-3.03, Rev 6: Incorporated Improved Technical Specifications (ITS). This includes transfer of programmatic controls for BV-2 Noble Gas Effluent Steam Monitors [2MSS-RQ101A], [2MSS-RQ101B] and [2MSS-RQ101C] from the Technical Specifications to ODCM procedure 1/2-ODC-3.03 (Attachment D Tables 3.3-6 and 4.3-3). Reference CR 05-03306.

8.2.24.1.2 Procedure 1/2-ODC-3.03, Rev 6: Revised Attachment J to update the outside liquid storage tank activity limits via Calculation Package No. ERS-ATL-95-007, R2. Reference SAP Order 200197646-0110.

8.2.24.1.3 Procedure 1/2-ODC-3.03, Rev 6: Revised Attachment E to clarify that the Applicability for tank level indicating devices is during additions to the tank. Reference CR 06-04944.

8.2.24.1.4 Procedure 1/2-ODC-3.03, Rev 6: Revised Attachment E Table 3.3-12 to add an alternate Action when the primary Flow Rate Measurement Device [FT-1CW-101-1] is not OPERABLE. The alternate Action (25) uses local measurements (as described in 1MSP-31.06-I) to determine a total dilution flow rate during liquid effluent releases. Reference SAP Order 200240681.

8.2.24.1.5 Procedure 1/2-ODC-3.03, Rev 6: Revised Attachment F Tables 3.3-13 and 4.3-13 to clarify the Functional Location of the Sampler Flow Rate Monitors for the BV-2 gaseous effluent release pathways. Specifically, the procedure was changed to refer to Functional Location [2HVS-FIT101-1] instead of [2HVS-FIT101], [2RMQ-FIT301-1] instead of [2RMQ-FIT301], [2HVL-FIT112-1] instead of [2HVL-FIT112], and [2RMQ-FIT303-1] instead of [2RMQ-FIT303]. Reference CR07-12924 and SAP Order 200247228-0410.

8.2.24.2 The justifications used for change (24) of the ODCM are as follows:

8.2.24.2.1 Procedure 1/2-ODC-3.03, Rev 6: Incorporating the Improved Technical Specifications (ITS) is considered a simple change, because this was performed in accordance with the guidance provided in Unit 1/2 Technical Specification Amendments No. 278/161. The ITS upgrade includes transfer of programmatic controls for BV-2 Noble Gas Effluent Steam Monitors [2MSS-RQ101A], [2MSS-RQ101B] and [2MSS-RQ101C] from the Technical Specifications to ODCM procedure 1/2-ODC-3.03 (Attachment D Tables 3.3-6 and 4.3-3. SINCE the change was performed in accordance with the TS Amendments, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. The procedure change implements Corrective Actions per CR 05-03306.

8.2.24.2.2 Procedure 1/2-ODC-3.03, Rev 6: Revising Attachment J to update the outside liquid storage tank activity limits via Calculation Package No. ERS-ATL-95-007, R2 is considered a simple change, because this change merely implements updated release volumes and source-terms from other station documents. SINCE the change was performed in accordance with the guidance provided in Standard Review Plan 15.7.3 of NUREG-0800, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. The procedure change implements Corrective Actions per SAP Order 200197646-0110.

8.2.24.2.3 Procedure 1/2-ODC-3.03, Rev 6: Revising Attachment E to indicate that the Applicability for tank level indicating devices is during additions to the tank is considered a simple change, because this merely clarifies the existing Applicability of the instrument. SINCE this change merely provides clarification of existing Applicability, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. The procedure change implements Corrective Actions per CR 06-04944-01.

8.2.24.2.4 Procedure 1/2-ODC-3.03, Rev 6: Revising Attachment E Table 3.3-12 to add an alternate Action when the primary Flow Rate Measurement Device [FT-1CW-101-1] is not OPERABLE is considered a simple change, because use of an alternate Action does not modify the intent of estimating flow rate when the primary and alternate flow rate instruments are not OPERABLE. SINCE this change merely provides an alternate means of estimating dilution flow rate during liquid releases, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. The procedure change implements Corrective Actions per SAP Order 200240681.

8.2.24.2.5 Procedure 1/2-ODC-3.03, Rev 6: Revising Attachment F Tables 3.3-13 and 4.3-13 to clarify the Functional Location of the Sampler Flow Rate Monitors for the BV-2 gaseous effluent release pathways is considered a simple change, because this merely clarifies the actual Functional Location in use. SINCE this change merely updates a location title, THEN the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. The procedure change implements Corrective Actions per CR 07-12924 and SAP Order 200247228-0410.

8.2.25 Change (25) of BV-1 and 2 ODCM (Effective May 2009)

8.2.25.1 A description of the changes implemented with this revision are as follows:

8.2.25.1.1 Procedure 1/2-ODC-1.01 Rev 7: Removed the requirement for PORC review and acceptance of changes made to the ODCM.

8.2.25.1.2 Procedure 1/2-ODC-1.01, Rev 7: Added MSP and OST references for EPP-EAL area and process monitors to Attachment C, Table F: 1a and 1b. Specifically, this includes area monitors RM-1RM-201, RM-1RM-202, RM-1RM-203, RM-1RM-210, RM-1RM-212, 2RMP-RQ204, 2RMP-RQ210, 2RMR-RQ201, 2RMR-RQ202B, 2RMR-RQ203, 2RMS-RQ223, and process monitors RM-1CH-101A, RM-1CH-101B, RM-1RW-100A, RM-1RW-100B, RM-1RW-100C, RM-1RW-100D, RM-1VS-103A, RM-1VS-103B, 2CHS-RQ101A, 2CHS-RQ101B, 2SWS-RQ100A, 2SWS-RQ100B, 2SWS-RQ100C, 2SWS-RQ100D, 2SWS-RQ101, 2SWS-RQ102, 2RMF-RQ301A, 2RMF-RQ301B. Reference CR09-53803-13.

8.2.25.1.3 Procedure 1/2-ODC-1.01, Rev 7: Revised Attachment C Tables of the procedure matrix to remove obsolete forms and procedures used for ODCM Channel Checks. Specifically, Form 1/2-ADM-0606.F01, Form 1/2-ADM-0606.F02, Form 1/2-HPP-3.07.003.F01 and procedures 1/2-HPP-3.06.005, 1/2-HPP-3.06.006 & 1/2-HPP-3.06.012 were removed from the procedure matrix. Reference SAP Order 200257692-0360 and 0390.

8.2.25.1.4 Procedure 1/2-ODC-2.01, Rev 6: Added the Coolant Recovery Tanks [1BR-TK-4A/4B] as Liquid Waste Tanks to Section 8.4 description and Attachment D Figures 1.4-1 and 1.4-2. Added a default 2-tank volume recirculation time of 45.7 hrs for the Coolant Recovery Tanks [1BR-TK-4A/4B] to Attachment B Table 1.2-1a. Added the Cesium Removal Ion Exchangers [1BR-I-1A/1B and 2BRS-IOE21A/21B] to Section 8.4 description and Attachment B Figures 1.4-1 and 1.4-2. Revised the recirculation times in Attachment B Table 1.2-1a and 1.2-1b to indicate the times for nominal tank volume and maximum tank volume. Reference CR 05-00004-15, CR 05-00004-17 and SAP Order 200197646-0010.

8.2.25.1.5 Procedure 1/2-ODC-2.01, Rev 6: Revised Attachment D Figure 1.4-3 to remove Sewage Treatment Plants (STP) Outfalls 113 and 203 due to retirement of the STP and to remove Outfall 501. Water is no longer discharged via these outfalls. Reference SAP Order 200197646-0660.

8.2.25.1.6 Procedure 1/2-ODC-2.01, Rev 6: Revised section 8.1.1.1 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100]. Specifically, due to obsolescence of the original Model 843-30 and 843-32 detectors that were previously installed in [RM-1DA-100], the vendor has upgraded them to Model 843-30R and 843-32R detectors, which include upgraded efficiency data as well. Reference SAP Order 200197646-0810.

8.2.25.1.7 Procedure 1/2-ODC-3.03, Rev 7: Added EPP-EAL area and process monitors to Attachment D, Tables 3.3-6 and 4.3-3. Specifically, this includes area monitors RM-1RM-201, RM-1RM-202, RM-1RM-203, RM-1RM-210, RM-1RM-212, 2RMP-RQ204, 2RMP-RQ210, 2RMR-RQ201, 2RMR-RQ202B, 2RMR-RQ203, 2RMS-RQ223, and process monitors RM-1CH-101A, RM-1CH-101B, RM-1RW-100A, RM-1RW-100B, RM-1RW-100C, RM-1RW-100D, RM-1VS-103A, RM-1VS-103B, 2CHS-RQ101A, 2CHS-RQ101B, 2SWS-RQ100A, 2SWS-RQ100B, 2SWS-RQ100C, 2SWS-RQ100D, 2SWS-RQ101, 2SWS-RQ102, 2RMF-RQ301A, 2RMF-RQ301B. Other editorial changes included adding EAL references to existing liquid and gaseous radiation monitors provided in Attachment E and Attachment F, respectively. Reference CR 09-53803-10.

8.2.25.1.8 Procedure 1/2-ODC-3.03, Rev 7: Added a definition for Channel Functional Test and revised the definition for Channel Operational Test to indicate that these definitions have the same requirements and, therefore, are considered equal. Reference SAP Order 200197646-0300 and CR 07-31083.

8.2.25.1.9 Procedure 1/2-ODC-3.03, Rev 7: Revised Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications and to remove unnecessary information, as follows: (1) added the word "or" where it is missing from Attachment F, Table 3.3-13 & 4.3-13, (2) removed grab samples from the list of alternates in Table 3.3-13 and 4.3-13, because a grab sample is an "action", not an "alternate", (3) added notations in Table 3.3-12 and 3.3-13 to indicate that Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b and 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days, and (4) removed surveillances for Preplanned Method of Monitoring (PMM) from Table 4.3-3, because surveillances only apply to instruments, not methods. Reference SAP Order 200247228-0450.

8.2.25.1.10 Procedure 1/2-ODC-3.03, Rev 7: Revised Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line. Specifically, 1st alternate will use local measurements via 1MSP-31.06-I, and the 2nd alternate will use the individual Units' devices. Reference SAP Order 200240681-0020.

8.2.25.2 The justifications used for change (25) of the ODCM are as follows:

8.2.25.2.1 Procedure 1/2-ODC-1.01 Rev 7: Removed the requirement for PORC review and acceptance of changes made to the ODCM as it is no longer a requirement of ITS 5.5.1.

8.2.25.2.2 Procedure 1/2-ODC-1.01, Rev 7: Adding MSP and OST references for EPP-EAL area and process monitors to Attachment C, Table F: 1a and 1b does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per CR 09-53803-13.

8.2.25.2.3 Procedure 1/2-ODC-1.01, Rev 7: Revising Attachment C Tables of the procedure matrix to remove obsolete forms and procedures used for ODCM Channel Checks does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200257692-0360 and 0390.

8.2.25.2.4 Procedure 1/2-ODC-2.01, Rev 6: Adding; (1) the Coolant Recovery Tanks as Liquid Waste Tanks, (2) adding a default 2-tank volume recirculation time for the Coolant Recovery Tanks, (3) adding the Cesium Removal Ion Exchangers, and (4) revising the recirculation times to indicate the times for nominal tank volume and maximum tank volume does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per CR05-00004-15, CR05-00004-17 and SAP Order 200197646-0010.

8.2.25.2.5 Procedure 1/2-ODC-2.01, Rev 6: Revising Attachment D Figure 1.4-3 to remove Sewage Treatment Plants (STP) Outfalls 113 and 203 does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200197646-0660.

8.2.25.2.6 Procedure 1/2-ODC-2.01, Rev 6: Revising Section 8.1.1.1 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100] does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200197646-0810.

8.2.25.2.7 Procedure 1/2-ODC-3.03, Rev 7: Adding EPP-EAL area and process monitors to Attachment D, Tables 3.3-6 and 4.3-3 (and adding EAL references to existing liquid and gaseous radiation monitors Attachment E and Attachment F) does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per CR 09-53803-10.

8.2.25.2.8 Procedure 1/2-ODC-3.03, Rev 7: Adding a definition for Channel Functional Test and revising the definition for Channel Operational Test to indicate that these definitions have the same requirements (i.e., considered equal) does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200197646-0300 and CR 07-31083.

8.2.25.2.9 Procedure 1/2-ODC-3.03, Rev 7: Revising Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications and to remove unnecessary information does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200247228-0450.

8.2.25.2.10 Procedure 1/2-ODC-3.03, Rev 7: Revising Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in May 2007. This change implements Corrective Actions per SAP Order 200240681-0020.

8.2.26 Change (26) of BV-1 and 2 ODCM (Effective May 2009)

8.2.26.1 A description of the changes implemented with this revision are as follows:

8.2.26.1.1 Procedure 1/2-ODC-1.01 Rev 8: Reverted procedure back to the contents of Revision 6.

8.2.26.1.2 Procedure 1/2-ODC-2.01, Rev 7: Reverted procedure back to the contents of Revision 5.

8.2.26.1.3 Procedure 1/2-ODC-3.03, Rev 8: Reverted procedure back to the contents of Revision 6.

8.2.26.2 The justifications used for change (26) of the ODCM are as follows:

8.2.26.2.1 Procedure 1/2-ODC-1.01 Rev 8: It was determined that the implementation of Revision 7 was premature because supporting procedure changes were not completed and surveillances required by these changes were not in place. This procedure was reverted back to the contents of the previous revision. This change implements Corrective Actions initiated by and described in CR 09-59875.

8.2.26.2.2 Procedure 1/2-ODC-2.01, Rev 7: It was determined that the implementation of Revision 6 was premature because supporting procedure changes were not completed and surveillances required by these changes were not in place. This procedure was reverted back to the contents of the previous revision. This change implements Corrective Actions initiated by and described in CR 09-59875.

8.2.26.2.3 Procedure 1/2-ODC-3.03, Rev 8: It was determined that the implementation of Revision 7 was premature because supporting procedure changes were not completed and surveillances required by these changes were not in place. This procedure was reverted back to the contents of the previous revision. This change implements Corrective Actions initiated by and described in CR 09-59875.

8.2.27 Change (27) of BV-1 and 2 ODCM (Effective August 2010)

8.2.27.1 A description of the changes implemented with this revision are as follows:

8.2.27.1.1 Procedure 1/2-ODC-1.01, Rev 9: Added revision history to capture Changes 25 and 26.

8.2.27.1.2 Procedure 1/2-ODC-1.01, Rev 9: Removed the requirement for PORC review and acceptance of changes made to the ODCM.

8.2.27.1.3 Procedure 1/2-ODC-1.01, Rev 9: Revised Attachment C Tables of the procedure matrix to remove obsolete forms and procedures used for ODCM Channel Checks. Specifically, Form 1/2-ADM-0606.F01, Form 1/2-ADM-0606.F02, Form 1/2-HPP-3.07.003.F01 and procedures 1/2-HPP-3.06.005, 1/2-HPP-3.06.006 were removed from the procedure matrix (superseded by 1/2-ADM-1611.F03, 1/2-ADM-1611.F04, NOP-OP-4702-01, 1/2-ENV-05.04, and 1/2-ENV-05.05, respectively). Reference SAP Order 200257692-0360 and 0390. References were updated for Operational Surveillance Tests (OSTs) for Channel Functional Tests that have since been split from one large OST into specific OSTs for each radiation monitor and obsolete Chemistry and Environmental procedures.

8.2.27.1.4 Procedure 1/2-ODC-2.01, Rev 8: Revised Attachment D Figure 1.4-3 to remove Sewage Treatment Plants (STP) Outfalls 113 and 203 due to retirement of the STP and to remove U1 Steam Generator Blowdown Filter Backwash Outfall 501. Water is no longer discharged via these outfalls. Reference SAP Order 200197646-0660.

8.2.27.1.5 Procedure 1/2-ODC-2.01, Rev 8: Revised section 8.1.1.1 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100]. Specifically, due to obsolescence of the original Model 843-30 and 843-32 detectors that were previously installed in [RM-1DA-100], the vendor has upgraded them to Model 843-30R and 843-32R detectors, which include upgraded efficiency data as well. Reference SAP Order 200197646-0810.

8.2.27.1.6 Procedure 1/2-ODC-2.01, Rev 8: Added the Coolant Recovery Tanks [1BR-TK-4A/4B] as Liquid Waste Tanks to Section 8.4 description and Attachment D Figures 1.4-1 and 1.4-2. Added a default 2-tank volume recirculation time of 45.7 hrs for the Coolant Recovery Tanks [1BR-TK-4A/4B] to Attachment B Table 1.2-1a. Added the Cesium Removal Ion Exchangers [1BR-I-1A/1B and 2BRS-IOE21A/21B] to Section 8.4 description and Attachment B Figures 1.4-1 and 1.4-2. Revised the recirculation times in Attachment B Table 1.2-1a and 1.2-1b to indicate the times for nominal tank volume and maximum tank volume. Reference CR 05-00004-15, CR 05-00004-17 and SAP Order 200197646-0010.

8.2.27.1.7 Procedure 1/2-ODC-2.03, Rev 2: Corrected sampling location descriptions for TLD #94 and #95; Changed sample designation from #49 to #49A; Clarified program requirements for garden sampling. These changes implement Corrective Actions for CA #10-77489-1.

8.2.27.1.8 Procedure 1/2-ODC-3.03, Rev 9: Added a definition for Channel Functional Test and revised the definition for Channel Operational Test to indicate that these definitions have the same requirements and, therefore, are considered equal. Reference SAP Order 200197646-0300 and CR07-31083.

8.2.27.1.9 Procedure 1/2-ODC-3.03, Rev 9: Revised Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications and to remove unnecessary information, as follows: (1) added the word "or" where it is missing from Attachment F, Table 3.3-13 & 4.3-13, (2) removed grab samples from the list of alternates in Table 3.3-13 and 4.3-13, because a grab sample is an "action", not an "alternate", (3) added notations in Table 3.3-12 and 3.3-13 to indicate that Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b and 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days, and (4) removed surveillances for Preplanned Method of Monitoring (PMM) from Table 4.3-3, because surveillances only apply to instruments, not methods. Reference SAP Order 200247228-0450.

8.2.27.1.10 Procedure 1/2-ODC-3.03, Rev 9: Revised Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line. Specifically, 1st alternate will use the individual Units' devices, and the 2nd alternate will use local measurements via 1MSP-31.06-I. The alternates were chosen in this particular order to support practicality of plant operations, rather than the way they were initially proposed in the SAP order. Reference SAP Order 200240681-0020.

8.2.27.1.11 Procedure 1/2-ODC-3.03, Rev 9: Revised Attachment D Tables 3.3-6 and 4.3-3 to remove obsolete forms and procedures Specifically, Form 1/2-ENV-05.14.F01 was removed.

8.2.27.2 The justifications used for change (27) of the ODCM are as follows:

8.2.27.2.1 Procedure 1/2-ODC-1.01 Rev 9 : Because it was determined that the implementation of Revision 7 was premature and this procedure was reverted back to the exact contents of the previous revision, the revision history was not captured. PORC review and acceptance of this change was completed in August 2010.

8.2.27.2.2 Procedure 1/2-ODC-1.01, Rev 9: Removed the requirement for PORC review and acceptance of changes made to the ODCM as it is no longer a requirement of ITS 5.5.1. PORC review and acceptance of this change was completed in August 2010.

8.2.27.2.3 Procedure 1/2-ODC-1.01, Rev 9: Revising Attachment C Tables of the procedure matrix to remove obsolete forms and procedures does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. This change implements some of the corrective actions per SAP Order 200257692-0360 and 0390. PORC review and acceptance of this change was completed in August 2010.

8.2.27.2.4 Procedure 1/2-ODC-2.01, Rev 8: Revising Attachment D Figure 1.4-3 to remove Sewage Treatment Plants (STP) Outfalls 113 and 203 and U1 Steam Generator Blowdown Filter Backwash Outfall 501 does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per SAP Order 200197646-0660.

8.2.27.2.5 Procedure 1/2-ODC-2.01, Rev 8: Revising Section 8.1.1.1 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100] does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per SAP Order 200197646-0810.

8.2.27.2.6 Procedure 1/2-ODC-2.01, Rev 8: Adding; (1) the Coolant Recovery Tanks as Liquid Waste Tanks, (2) adding a default 2-tank volume recirculation time for the Coolant Recovery Tanks, (3) adding the Cesium Removal Ion Exchangers, and (4) revising the recirculation times to indicate the times for nominal tank volume and maximum tank volume does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per CR 05-00004-15, CR 05-00004-17 and SAP Order 200197646-0010.

8.2.27.2.7 Procedure 1/2-ODC-2.03, Rev 2: All changes in this revision were to correct labeling deficiencies. They did not change program requirements or the implementation of program sampling. There is no impact to the accuracy or reliability of the Radiological Environmental Monitoring Program. This change implements Corrective Action 10-77489-1. PORC review of these changes was completed on August 2010.

8.2.27.2.8 Procedure 1/2-ODC-3.03, Rev 9: Adding a definition for Channel Functional Test and revising the definition for Channel Operational Test to indicate that these definitions have the same requirements (i.e., considered equal) does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per SAP Order 200197646-0300 and CR 07-31083.

8.2.27.2.9 Procedure 1/2-ODC-3.03, Rev 9: Revising Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications and to remove unnecessary information does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per SAP Order 200247228-0450.

8.2.27.2.10 Procedure 1/2-ODC-3.03, Rev 9: Revising Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010. This change implements Corrective Actions per SAP Order 200240681-0020.

8.2.27.2.11 Procedure 1/2-ODC-3.03, Rev 9: Revising Attachment D Tables to remove obsolete forms and procedures does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the change will not impact the accuracy or reliability of effluent dose or alarm setpoint calculation. PORC review and acceptance of this change was completed in August 2010.

8.2.28 Change (28) of BV-1 and 2 ODCM (Effective December 2010)

8.2.28.1 A description of the changes implemented with this revision are as follows:

8.2.28.1.1 Procedure 1/2-ODC-1.01, Rev 10: Revision history was updated and references to CTS and ITS conversion project were removed.

8.2.28.1.2 Procedure 1/2-ODC-2.01, Rev 9: Removed description that batch releases of liquid waste are processed by recirculation through eductors. Deleted Attachment B which referenced minimum liquid waste batch release recirculation times and added description that liquid waste recirculation times to achieve two tank volumes are calculated based upon actual tank volume and pump capacity.

8.2.28.2 The justifications used for change (28) of the ODCM are as follows:

8.2.28.2.1 Procedure 1/2-ODC-1.01 Rev 10: Changes are administrative only because ITS conversion project has been completed. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.28.2.2 Procedure 1/2-ODC-2.01 Rev 9: Change removes description that batch releases of liquid waste be recirculated through tanks with eductors. Eductors are not currently installed on liquid waste tanks. Per BVPS-1 UFSAR Section 1.3.3.21, the recommendations contained in Regulatory Guide 1.21 (1974) are followed. The RG states that (prior to sampling) "large volumes of liquid waste should be mixed in as short a time interval as practicable to assure that any sediments or particulate solids are distributed uniformly in the waste mixture." BVPS-2 UFSAR Table 1.8-1 contains a similar statement. As such, current licensing bases does not require eductors for processing batch releases of liquid waste. Attachment B was removed. This attachment provided information on minimum recirculation times of liquid waste tanks for batch liquid releases. Recirculation times are calculated based upon actual tank volume and pump capacity and this description was added. The change does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.29 Change (29) of BV-1 and 2 ODCM (Effective January 2011)

8.2.29.1 A description of the changes implemented with this revision are as follows:

8.2.29.1.1 Procedure 1/2-ODC-2.02, Rev 3: This revision corrected a spelling error in the title of Attachment C. A typo was corrected in equation 2.2-13. Calculated values of the organ dose parameters, $P_{i\tau}$, listed in Table 2.2-13 were verified to have been accurately calculated using the breathing rate of 3.7E9 in Calculation Package No. ERS-HHM-84-20, ODCM Update of Table 2.2-1S and Calculation Package No. ERS-ATL-89-014, Verification/Validation of ODCM R Values. Dose factors for Selenium-75 (Se-75) were provided by ABS Consulting. Attachment H (Table 2.2-13) and Attachment J (Tables 2.3-2 through 2.3-20) were copied into excel/word format and updated to include Se-75.

8.2.29.1.2 Procedure 1/2-ODC-3.03 Rev 10: The previous revisions to the procedure (Change 25, Revision 7 and then again in Change 27, Revision 9) added notations in Table 3.3-12 and 3.3-13 to indicate that Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b and 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days. However, Control 3.3.3.9 Action b and 3.3.3.10 Action b provided conflicting guidance because the footnote was not included on these pages. Therefore, the footnote was added to Control 3.3.3.9 Action b and 3.3.3.10 Action b in this revision.

8.2.29.2 The justifications used for change (29) of the ODCM are as follows:

8.2.29.2.1 Procedure 1/2-ODC-2.02, Rev 3: This change corrects a minor typo and adds an isotope to the program. The change does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.29.2.2 Procedure 1/2-ODC-3.03 Rev 10: Revising the Controls for Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 to provide added clarification does not remove or modify any standard ODCM Controls currently in place. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.30 Change (30) of BV-1 and 2 ODCM (Effective September 2011)

8.2.30.1 A description of the changes implemented with this revision are as follows:

8.2.30.1.1 Procedure 1/2-ODC-2.03, Rev 3: This change retired TLD Station #88 and added Station #88A according to CA G203-2011-97516-001 due to repeated vandalism of the sample point.

8.2.30.2 The justifications used for change (29) of the ODCM are as follows:

8.2.30.2.1 Procedure 1/2-ODC-2.03, Rev 3: This revision exchanges two sample locations within the same sector, therefore maintaining the same total number of monitoring points located around BVPS. The change does not remove or modify any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.31 Change (31) of BV-1 and 2 ODCM (Effective December 2011)

8.2.31.1 A description of the changes implemented with this revision are as follows:

8.2.31.1.1 Procedure 1/2-ODC-2.03, Rev 4: This revision increases vegetation sampling requirements when milk sampling requirements cannot be met due to milk sampling locations being unavailable.

8.2.31.1.2 Procedure 1/2-ODC-3.03, Rev 11: This revision increases vegetation sampling requirements when milk sampling requirements cannot be met due to milk sampling locations being unavailable.

8.2.31.2 The justifications used for change (31) of the ODCM are as follows:

8.2.31.2.1 Procedure 1/2-ODC-2.03, Rev 4: Because of decreasing milk locations in the vicinity of BVPS, the REMP needed to be revised to provide instructions for sampling when we do not have enough milk locations to meet ODCM requirements. The vegetation sampling program is in accordance with NUREG-1301. The change does not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.31.2.2 Procedure 1/2-ODC-3.03, Rev 11: Because of decreasing milk locations in the vicinity of BVPS, the REMP needed to be revised to provide instructions for sampling when we do not have enough milk locations to meet ODCM requirements. The vegetation sampling program is in accordance with NUREG-1301. The change does not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.32 Change (32) of BV-1 and 2 ODCM (Effective February 2012)

8.2.32.1 A description of the changes implemented with this revision are as follows:

8.2.32.1.1 Procedure 1/2-ODC-2.01, Rev 10: This revision implements changes to the Liquid Rad Waste System per ECP 11-0049 in order to continue improvements to the system after the site added the Coolant Recovery Tanks [BR-TK-4A/B] to the liquid waste system in revision 8 (ODCM Change 27). Other descriptions to the liquid waste system components were revised to better reflect actual plant conditions (for example, normal rate of discharge through the radiation monitor for BR-TK-4A/B or the resin selection/sequence for LW-I-2).

8.2.32.2 The justifications used for change (32) of the ODCM are as follows:

8.2.32.2.1 Procedure 1/2-ODC-2.01, Rev 10: This change provides a description of the Rad Waste System. It does not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.33 Change (33) of BV-1 and 2 ODCM (Effective June 2012)

8.2.33.1 A description of the changes implemented with this revision are as follows:

8.2.33.1.1 Procedure 1/2-ODC-2.01, Rev 11: This revision adds Antimony-126 (Sb-126) to Attachment B Table 1.3-1, Ingestion Dose Commitment Factors, after the isotope was identified during 1R21. After revising ERS-ATL-83-027, the calculation package for liquid Ingestion Dose Commitment Factors, it was noticed that other isotopes previously calculated in the package were not included in Attachment B. These were also added to the ODCM at this time. The revision also reduces the HHSP and HSP for Unit 1 Radiation Monitor RM-RW-100 per Calculation Package ERS-ATL-93-021 Rev. 4.

8.2.33.2 The justifications used for change (33) of the ODCM are as follows:

8.2.33.2.1 Procedure 1/2-ODC-2.01, Rev 11: This change added the ability to calculate dose for additional isotopes and lowered the alarm setpoints for a radiation monitor. It did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.34 Change (34) of BV-1 and 2 ODCM (Effective July 2012)

8.2.34.1 A description of the changes implemented with this revision are as follows:

8.2.34.1.1 Procedure 1/2-ODC-1.01, Rev 16: Removed reference to analytical procedure 1/2-ENV-05.25. This procedure is slated for deletion in the near future.

8.2.34.1.2 Procedure 1/2-ODC-2.01, Rev 12: This revision adds the ability to discharge processed and unprocessed liquid wastes from the low level drains tanks [LW-TK-3A/B]. These tanks were originally designed with the ability to discharge to the Ohio River. They are not generally used due to their small volume capacity. A request was made by Operations to allow discharge of these tanks to prevent unnecessary damage/depletion of the liquid waste ion exchanger(s) from non-radioactive water containing high chemical contaminants.

8.2.34.2 The justifications used for change (34) of the ODCM are as follows:

8.2.34.2.1 Procedure 1/2-ODC-1.01, Rev 16: This change removed a reference throughout the document. It did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.34.2.2 Procedure 1/2-ODC-2.01, Rev 12: This change added the ability to discharge processed and unprocessed liquid wastes from the low level drains tanks [LW-TK-3A/B]. It did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.35 Change (35) of BV-1 and 2 ODCM (Effective March 2013)

8.2.35.1 A description of the changes implemented with this revision are as follows:

8.2.35.1.1 Procedure 1/2-ODC-1.01, Rev 17: Removed reference Tables 1.2-1a and 1.2-1b that were deleted from 1/2-ODC-2.01 (previous Attachment B) in revision 9.

8.2.35.1.2 Procedure 1/2-ODC-2.01, Rev 13: This change added descriptions of the U1 Chemical Waste Sump and U2 Cable Vault Sump discharge points. ODCM controls are now officially established for these sumps, including two volume recirculation and batch sampling requirements.

8.2.35.2 The justifications used for change (35) of the ODCM are as follows:

8.2.35.2.1 Procedure 1/2-ODC-1.01, Rev 17: This change removed a reference from the document that was overlooked in a previous revision. It did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.35.2.2 Procedure 1/2-ODC-2.01, Rev 13: This change added descriptions of discharge points and employed ODCM controls where not previously implemented. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.36 Change (36) of BV-1 and 2 ODCM (Effective February 2014)

8.2.36.1 A description of the changes implemented with this revision are as follows:

8.2.36.1.1 Procedure 1/2-ODC-2.01, Rev 14: This change added descriptions of the new Unit 1 Liquid Radwaste System components that were installed via ECP 12-0478. New components that were installed include Liquid Waste Pre-Conditioning Filter, Liquid Waste Demineralizer, Rad Waste Reverse Osmosis (RWRO) Pre-filter, RWRO Skid, Polishing Vessel, Antimony Vessel and Sample Sinks.

3-7-14

8.2.36.1.2 Procedure 1/2-ODC-2.02, Rev 4: This change added dose equations and dose factors for carbon-14 per notification 600737534 and dose factors for antimonty-126 per notification 600727275 (from CR#2012-17177).

8.2.36.1.3 Procedure ½-ODC-2.03, Rev 5: This change removed Searight's Dairy farm from milk sample locations (Notification 6008201182 and CR#2013-03554)

8.2.36.2 The justifications used for change (36) of the ODCM are as follows:

8.2.36.2.1 Procedure 1/2-ODC-2.01, Rev 14: The current Unit 1 Liquid Waste system has been removed and replaced with new components. This change documents and describes the new liquid waste components. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

3-7-14

8.2.36.2.2 Procedure 1/2-ODC-2.02, Rev 4: This change added the ability to perform dose calculations for more isotopes. Carbon-14 does not currently have a regulatory limit for discharge, but is required to be reported. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.36.2.3 Procedure ½-ODC-2.03, Rev 5: This change removed Searight's Dairy farm from milk sample locations. The local farmer notified Beaver Valley that the dairy would be closing permanently, the dairy cattle would be sold and the property will be utilized for hay bailing and possibly beef cattle. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50.

8.2.37 Change (37) of BV-1 and 2 ODCM (Effective September 2014)

8.2.37.1 A description of the changes implemented with this revision are as follows:

8.2.37.1.1 Procedure 1/2-ODC-1.01, Rev 20: This change added 10 CFR 72.104 to the reference and acceptance criteria per ECP 12-0250. The change also documents changes to ½-ODC-2.02 R5, ½-ODC-2.03 R6, ½-ODC-2.04 R2, and ½-ODC-3.03 R12.

10-7-14

8.2.37.1.2 Procedure 1/2-ODC-2.02, Rev 5: This change added the definition for "1.1" in equation 2.1(2)-18 per notification 600877226 and added 10 CFR 72.104 to the reference and acceptance criteria per ECP 12-0250.

8.2.37.1.3 Procedure 1/2-ODC-2.03, Rev 6: This change added 10 CFR 72.104 to the reference and acceptance criteria per ECP 12-0250.

8.2.37.1.4 Procedure 1/2-ODC-2.04, Rev 2: This change added 10 CFR 72.104 to the reference and acceptance criteria per ECP 12-0250.

8.2.37.1.5 Procedure 1/2-ODC-3.03, Rev 12: This change added 10 CFR 72.104 to the reference and acceptance criteria and noted ISFSI dose considerations are included in dose calculations per ECP 12-0250.

8.2.37.2 The justifications used for change (37) of the ODCM are as follows:

8.2.37.2.1 Procedure 1/2-ODC-1.01, Rev 20: This change added 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, to the reference and acceptance criteria per ECP 12-0250, Independent Spent Fuel Storage Installation (ISFSI) Spent Fuel Storage System (SFSS) System Incorporation. With the installation of the SFSS additional consideration must be given when updating the ODCM. 10 CFR 72.104 document the requirements. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50.

8.2.37.2.2 Procedure 1/2-ODC-2.02, Rev 5: This change added a definition for equation 2.1(2)-18 to provide user clarification and ensure equation formatting is consistent throughout the procedure. This change also added 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, to the reference and acceptance criteria per ECP 12-0250, Independent Spent Fuel Storage Installation (ISFSI) Spent Fuel Storage System (SFSS) System Incorporation. With the installation of the SFSS additional consideration must be given when updating the ODCM. 10 CFR 72.104 document the requirements. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50.

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8.2.37.2.3 Procedure 1/2-ODC-2.03, Rev 6: This change added 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, to the reference and acceptance criteria per ECP 12-0250, Independent Spent Fuel Storage Installation (ISFSI) Spent Fuel Storage System (SFSS) System Incorporation. With the installation of the SFSS additional consideration must be given when updating the ODCM. 10 CFR 72.104 document the requirements. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50.

8.2.37.2.4 Procedure 1/2-ODC-2.04, Rev 2: This change added 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, to the reference and acceptance criteria per ECP 12-0250, Independent Spent Fuel Storage Installation (ISFSI) Spent Fuel Storage System (SFSS) System Incorporation. With the installation of the SFSS additional consideration must be given when updating the ODCM. 10 CFR 72.104 document the requirements. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50.

10-7-14

8.2.37.2.5 Procedure 1/2-ODC-3.03, Rev 12: This change added 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, to the reference and acceptance criteria per ECP 12-0250, Independent Spent Fuel Storage Installation (ISFSI) Spent Fuel Storage System (SFSS) System Incorporation. With the installation of the SFSS additional consideration must be given when updating the ODCM. 10 CFR 72.104 document the requirements. This revision did not remove any standard ODCM Controls specified in NUREG-1301. Therefore, this change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50.

-END-

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 RADIATION MONITORING INSTRUMENTION SURVEILLANCES

TABLE F: 1a

1/2-ODC-3.03, Attachment D Control 3.3.3.1: Maintain Radiation Monitoring Channels in Table 3.3-6 OPERABLE
APPLICABILITY: MODES 1 thru 4

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.1	Test Monitors at Table 4.3-3 Frequency	
4.3.3.1.1	**Noble Gas Effluent Monitors - SPINGS**	**NOTE: Actions for INOPERABLE Monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.1.1.a	Supplementary Leak Collection and Release System (RM-1VS-110 CH7 & CH9)	1MSP-43.59-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check 1OST-43.7: Channel Operational Test
4.3.3.1.1.b	Auxiliary Building Ventilation System (RM-1VS-109 CH7 & CH9)	1MSP-43.60-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check 1OST-43.07: Channel Operational Test
4.3.3.1.1.c	Process Vent System (RM-1GW-109 CH7 & 9)	1MSP-43.58-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check 1OST-43.7: Channel Operational Test
4.3.3.1.2	**Noble Gas Steam Effluent Monitors**	**NOTE: Actions for INOPERABLE Monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.1.2.civ.1.2a	Atmospheric Steam Dump Valve and Code Safety Valve Discharge (RM-1MS-100A, B, C)	1MSP-43.62-I: RM-1MS-100A Channel Calibration 1MSP-43.63-I: RM-1MS-100B Channel Calibration 1MSP-43.64-I: RM-1MS-100C Channel Calibration Form 1/2-ADM-1611.F03: Channel Check 1OST-43.5: Channel Operational Test
4.3.3.1.2.b	Auxiliary Feedwater Pump Turbine Exhaust (RM-1MS-101)	1MSP-43.65-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check 1OST-43.5: Channel Operational Test

ATTACHMENT C

ODCM CONTROLS PROCEDURE MATRIX

BV-2 RADIATION MONITORING INSTRUMENTION SURVEILLANCES

TABLE F: 1b
1/2-ODC-3.03, Attachment D Control 3.3.3.1: Maintain Radiation Monitoring Channels in Table 3.3-6 OPERABLE
APPLICABILITY: MODES 1 thru 4

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.1	Test Monitors at Table 4.3-3 Frequency	
4.3.3.1.1	**Noble Gas Effluent Monitors**	**NOTE: Actions for INOPERABLE Monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.1.2.c.i.1.1.a	Supplementary Leak Collection and Release System (2HVS-RQ109C & D)	2MSP-43.33-I: Channel Calibration Form 1/2-ADM-1611.F04: Channel Check 2OST-43.8: Channel Operational Test

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BV-1 LIQUID EFFLUENT MONITOR SURVEILLANCES

TABLE F: 2a
1/2-ODC-3.03, Attachment E Control 3.3.3.9: Maintain Liquid Effluent Monitors in Table 3.3-12 OPERABLE
APPLICABILITY: During Releases Through The Flow Path

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.9	Test Monitors at Table 4.3-12 Frequency	
4.3.3.9.1	**Monitors Providing Alarm and Automatic Termination**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.9.1.a	Liquid Radwaste Effluent Line (RM-1LW-104)	1MSP-43.18-I: Channel Calibration Form 1/2-ENV-05.04.F01: Source Check 1/2OM-17.4A.D: Source Check 1OM-17.4.AK Source Check 1OST-43.9F: Channel Functional Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.9.1.b	Liquid Waste Contaminated Drain Line (RM-1LW-116)	1MSP-43.23-I: Channel Calibration Form 1/2-ENV-05.04.F01: Source Check 1/2OM-17.4A.D: Source Check 1OST-43.9G: Channel Functional Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.9.1.c	Auxiliary Feed Pump Bay Drain Monitor (RM-1DA-100)	1MSP-43.70-I: Channel Calibration 1OM-54.3 L5 Log: Source Check 1OST-43.9B: Channel Functional Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.9.2	**Monitors Providing Alarm, but Not Providing Auto Termination**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.9.2.a	Component Cooling - Recirculation Spray Hx River Water Monitor (RM-1RW-100)	1MSP-43.10-I: Channel Calibration 1OST-43.9H: Channel Functional Test 1OST-43.9A: Source Check Form 1/2-ADM-1611.F03: Channel Check
4.3.3.9.3	**Flow Rate Measurement Devices**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.04**
4.3.3.9.3a,b	Liquid Radwaste Effluent Lines 3a: (FR-1LW-104 for RM-1LW-104) 3b: (FR-1LW-103 for RM-1LW-116)	1MSP-17.05-I: Channel Calibration (3b) 1MSP-17.06-I: F-LW-104-1 Channel Calibration (3a) 1MSP-17.07-I: F-LW-104-2 Channel Calibration (3a) 1MSP-17.08-I: F-LW-104-1 Channel Operational Test (3a) 1MSP-17.09-I: F-LW-104-2 Channel Operational Test (3a) 1MSP-17.10-I: F-LW-103 Channel Operational Test (3b) Form 1/2-ADM-1611.F03: Channel Check 1OM-54.3 L5 Log: FR-1LW-104 & FR-1LW-103 Channel Checks
4.3.3.9.3.c	Cooling Tower Blowdown Line Pri: [FT-1CW-101-1] Alt: [FT-1CW-101] and [2CWS-FT101]	1MSP-31.04-I: FT-CW-101 Channel Calibration 1MSP-31.05-I: FT-CW-101 Channel Operational Test 1MSP-31.06-I: FT-CW-101-1 Channel Calibration 1MSP-31.07-I: FT-CW-101-1 Channel Operational Test 2MSP-31.04-I: 2CWS-FT101 Channel Calibration 2MSP-31.05-I: 2CWS-FT101 Channel Operational Test 1OM-54.3 L5 Log: FT-CW-101-1 & FT-CW-101 Channel Checks 2OM-54.3 L5 Log: 2CWS-FT101 Channel Check
4.3.3.9.4	**Tank Level Indicating Devices**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations Shift Logs**
4.3.3.9.4.a	Primary Water Storage Tank (LI-1PG-115A for 1BR-TK-6A)	1MSP-8.01-I: L-PG115A Channel Operational Test 1MSP-8.03-I: L-PG115A Channel Calibration 1OM-54.3 L5 Log: Channel Check (When Adding to Tank)
4.3.3.9.4.b	Primary Water Storage Tank (LI-1PG-115B for 1BR-TK-6B)	1MSP-8.02-I: L-PG-115B Channel Operational Test 1MSP-8.04-I: L-PG-115B Channel Calibration 1OM-54.3 L5 Log: Channel Check (When Adding to Tank)
4.3.3.9.4.c	Steam Generator Drain Tank (LI-1LW-110 for 1LW-TK-7A)	1MSP-17.01-I: L-LW110 Channel Operational Test 1MSP-17.03-I: L-LW110 Channel Calibration 1OM-54.3 L5 Log: Channel Check (When Adding to Tank)
4.3.3.9.4.d	Steam Generator Drain Tank (LI-1LW-111 for 1LW-TK-7B)	1MSP-17.02-I: L-LW111 Channel Operational Test 1MSP-17.04-I: L-LW111 Channel Calibration 1OM-54.3 L5 Log: Channel Check (When Adding to Tank)

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ODCM CONTROLS PROCEDURE MATRIX

BV-2 LIQUID EFFLUENT MONITOR SURVEILLANCES

TABLE F: 2b
1/2-ODC-3.03, Attachment E Control 3.3.3.9: Maintain Liquid Effluent Monitors in Table 3.3-12 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.9	Test Monitors at Table 4.3-12 Frequency	
4.3.3.9.1	**Monitors Providing Alarm and Automatic Termination**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs.**
4.3.3.9.1.a	Liquid Waste Process Effluent Monitor (2SGC-RQ100)	Form 1/2-ADM-1611.F04: Channel Check Form 1/2-ENV-05.04.F01: Source Check 2MSP-43.39-I: Channel Calibration 1/2OM-17.4A.C: Source Check 2OM-25.4.L: Source Check 2OM-25.4.N: Source Check 2OST-43.3: Channel Functional Test
4.3.3.9.2	**Flow Rate Measurement Devices**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.04**
4.3.3.9.2.a	Liquid Radwaste Effluent (2SGC-FIS100)	2MSP-25.01-I: 2SGC-P26A,B Channel Calibration 2MSP-25.01-I: 2SGC-P26A,B Channel Operational Test 2MSP-43.39-I: Channel Calibration Form 1/2-ADM-1611.F04: Channel Check 2OM-54.3 L5 Log: Channel Check
4.3.3.9.2.b	Cooling Tower Blowdown Line Pri: [FT-1CW-101-1] Alt: [FT-1CW-101] and [2CWS-FT101]	1MSP-31.04-I: FT-CW-101 Channel Calibration 1MSP-31.05-I: FT-CW-101 Channel Operational Test 1MSP-31.06-I: FT-CW-101-1 Channel Calibration 1MSP-31.07-I: FT-CW-101-1 Channel Operational Test 2MSP-31.04-I: 2CWS-FT101 Channel Calibration 2MSP-31.05-I: 2CWS-FT101 Channel Operational Test 1OM-54.3 L5 Log: FT-CW-101-1 & FT-CW-101 Channel Checks 2OM-54.3 L5 Log: 2CWS-FT101 Channel Check

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 GASEOUS EFFLUENT MONITOR SURVEILLANCES

TABLE F: 3a
1/2-ODC-3.03, Attachment F Control 3.3.3.10: Maintain Gaseous Effluent Monitors in Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.10	Test Monitors at Table 4.3-13 Frequency	
4.3.3.10.1	**Gaseous Waste / Process Vent System**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.1.a	Noble Gas Activity Monitor Pri: (RM-1GW-108B) Alt: (RM-1GW-109 Ch 5): for continuous releases only, not an alternate for batch releases	1MSP-43.22-I: Channel Calibration 1OM-19.4.E, H: Channel Check (Batch Release) 1OM-19.4.E, H: Source Check 1/2-OM-19.4A.D: Source Check 1/2-OM-19.4A.D: Channel Check (Batch Release) 1OST-43.9D: Channel Functional Test 1OST-43.7A: RM-1GW-109 Channel Functional Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.1.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (RM-1GW-109) Alt: Filter Paper and Charcoal Cartridge for (RM-1GW-110)	Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.1.c	System Effluent Flow Rate Measuring Device Pri: (FR-1GW-108) Alt: (RM-1GW-109 Ch 10)	1MSP-19.05-I: Channel Operational Test 1MSP-19.06-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.1.d	Sampler Flow Rate Measuring Device Pri: (RM-1GW-109 Ch 15) Alt: (Rotometer: FM-1GW-101 and Vacuum Gauge: PI-1GW-135 for RM-1GW-110)	1MSP-43.21-I: Channel Calibration Form 1/2-ENV-01.04.F01: Channel Operational Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.2	**Auxiliary Building Ventilation System (Ventilation Vent)**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.2.a	Noble Gas Activity Monitor Pri: (RM-1VS-101B) Alt: (RM-1VS-109 Ch 5)	1MSP-43.13-I: Channel Calibration 1OST-43.7A: RM-1VS-109 Channel Functional Test 1OST-43.9J: Channel Functional Test 1OST-43.9A: Source Check Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.2.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (RM-1VS-109) Alt: Filter Paper and Charcoal Cartridge for (RM-1VS-111)	Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.2.c	System Effluent Flow Rate Measuring Device Pri: (FR-1VS-101) Alt: (RM-1VS-109 Ch 10)	1MSP-44.07-I: Channel Operational Test 1MSP-44.08-I: Channel Calibration Form 1/2-ADM-1611.F03: Channel Check

BV-1 GASEOUS EFFLUENT MONITOR SURVEILLANCES
Continued

TABLE F: 3a
1/2-ODC-3.03, Attachment F Control 3.3.3.10: Maintain Gaseous Effluent Monitors in Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.10.2.d	Sampler Flow Rate Measuring Device Pri: (RM-1VS-109 Ch 15) Alt: (Rotometer: FM-1VS-102 and Vacuum Gauge: PI-1VS-659 for RM-1VS-111)	1MSP-44.07-I: Channel Functional Test 1MSP-44.08-I: Channel Calibration Form 1/2-ENV-01.04.F01 Channel Operational Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.3	**Rx Containment / SLCRS (Elevated Release)**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.3.a	Noble Gas Activity Monitor Pri: (RM-1VS-107B) Alt: (RM-1VS-110 Ch 5)	1MSP-43.20-I: Channel Calibration 1OM-54.3 L5 Log: RM-1VS-107B Channel Check 1OST-43.7A: RM-1VS-110 Channel Functional Test 1OST-43.9L: Channel Functional Test 1OST-43.9A: Source Check Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.3.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (RM-1VS-110) Alt: Filter Paper and Charcoal Cartridge for (RM-1VS-112)	Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.3.c	System Effluent Flow Rate Measuring Device Pri: (FR-1VS-112) Alt: (RM-1VS-110 Ch 10)	1MSP-44.09-I: Channel Calibration 1MSP-44.10-I: Channel Operational Test Form 1/2-ADM-1611.F03: Channel Check
4.3.3.10.3.d	Sampler Flow Rate Measuring Device Pri: (RM-1VS-110 Ch 15) Alt: (Rotometer: FM-1VS-103 and Vacuum Gauge: PI-1VS-660 for RM-1VS-112)	1MSP-43.19-I: Channel Calibration Form 1/2-ENV-01.04.F01: Channel Operational Test Form 1/2-ADM-1611.F03: Channel Check

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ODCM CONTROLS PROCEDURE MATRIX

BV-2 GASEOUS EFFLUENT MONITOR SURVEILLANCES
Continued

TABLE F: 3b
1/2-ODC-3.03, Attachment F Control 3.3.3.10: Maintain Gaseous Effluent Monitors in Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.10	Test Monitors at Table 4.3-13 Frequency	
4.3.3.10.1	**SLCRS Unfiltered Pathway (Ventilation Vent)**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.1.a	Noble Gas Activity Monitor Pri: (2HVS-RQ101B)	2MSP-43.36-I: Channel Calibration 2OST-43.9A: Channel Functional Test Form 1/2-ADM-1611.F04: Channel Check 2-HPP-4.02.018 Source Check (DRMS Auto Function)
4.3.3.10.1.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (2HVS-RQ101A)	Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.1.c	Process Flow Rate Monitor Pri: (Monitor Item 29 for 2HVS-VP101)	2MSP-43.36-I: Channel Calibration 2MSP-43.36A-I: Channel Operational Test Work Request: Channel Calibration (Velocity Probe) Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.1.d	Sampler Flow Rate Monitor Pri: (2HVS-FIT101-1)	2MSP-43.36-I: Channel Calibration 2MSP-43.36A-I: Channel Operational Test Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.2	**SLCRS Filtered Pathway (Elevated Release)**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.2.a	Noble Gas Activity Monitor Pri: (2HVS-RQ109B)	2MSP-43.32-I: 2HVS-RQ109A Channel Calibration 2MSP-43.33-I: 2HVS-RQ109B,C,D Channel Calibration 2OST-43.8: Channel Functional Test Form 1/2-ADM-1611.F04: Channel Check 2-HPP-4.02.018 Source Check (DRMS Auto Function)
4.3.3.10.2.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (2HVS-RQ109A)	Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.2.c	Process Flow Rate Monitor Pri: (Monitor Item 29 for 2HVS-FR22) 1st Alt: (2HVS-FI22A and FI22C) 2nd Alt: (2HVS-FI22B and FI22D)	2MSP-43.32A-I: Channel Operational Test 2MSP-43.33-I: 2HVS-RQ109B,C,D, Channel Calibration Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.2.d	Sampler Flow Rate Monitor Pri: (Monitor Items 28 & 72 for 2HVS-DAU109A)	2MSP-43.32-I: 2HVS-RQ109A Channel Calibration 2MSP-43.32A-I: Channel Operational Test 2MSP-43.33-I: 2HVS-RQ109B,C,D, Channel Calibration Form 1/2-ADM-1611.F04: Channel Check

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ODCM CONTROLS PROCEDURE MATRIX

BV-2 GASEOUS EFFLUENT MONITOR SURVEILLANCES
Continued

TABLE F: 3b
1/2-ODC-3.03, Attachment F Control 3.3.3.10: Maintain Gaseous Effluent Monitors in Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE
4.3.3.10.3	**Decontamination Building Vent**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.3.a	Noble Gas Activity Monitor Pri: (2RMQ-RQ301B)	2MSP-43.35-I: Channel Calibration 2OST-43.9B: Channel Functional Test 2-HPP-4.02.018 Source Check (DRMS Auto Function) Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.3.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (2RMQ-RQ301A)	Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.3.d	Sampler Flow Rate Monitor Pri: (2RMQ-FIT301-1)	2MSP-43.35-I: Channel Calibration 2MSP-43.35A-I: Channel Operational Test Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.4	**Condensate Polishing Building Vent**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.4.a	Noble Gas Activity Monitor Pri: (2HVL-RQ112B)	2MSP-43.38-I: Channel Calibration 2OST-43.9C: Channel Functional Test Form 1/2-ADM-1611.F04: Channel Check 2-HPP-4.02.018 Source Check (DRMS Auto Function)
4.3.3.10.4.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (2HVL-RQ112A)	Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.4.d	Sampler Flow Rate Monitor Pri: (2HVL-FIT112-1)	2MSP-43.38-I: Channel Calibration 2MSP-43.38A-I: Channel Operational Test Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.5	**Waste Gas Storage Vault Vent**	**NOTE: Actions for INOPERABLE monitors are documented in the Operations & Rad Effluent Shift Logs and 1/2-ENV-05.05**
4.3.3.10.5.a	Noble Gas Activity Monitor Pri: (2RMQ-RQ303B)	2MSP-43.37-I: Channel Calibration 2OST-43.9D: Channel Functional Test Form 1/2-ADM-1611.F04: Channel Check 2-HPP-4.02.018 Source Check (DRMS Auto Function)
4.3.3.10.5.b	Particulate & Iodine Sampler Pri: Filter Paper and Charcoal Cartridge for (2RMQ-RQ303A)	Form 1/2-ADM-1611.F04: Channel Check
4.3.3.10.5.d	Sampler Flow Rate Monitor Pri: (2RMQ-FIT303-1)	2MSP-43.37-I: Channel Calibration 2MSP-43.37A-I Channel Operational Test Form 1/2-ADM-1611.F04: Channel Check

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 LIQUID EFFLUENT CONCENTRATION SURVEILLANCES

TABLE F: 4
1/2-ODC-3.03, Attachment G Control 3.11.1.1: Maintain Effluent Concentration within 10 Times 10CFR20 EC's
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.1.1.1.A	Batch Waste Release Tanks: Sample and Analyze Radioactive Liquid Wastes per Table 4.11-1	1/2-CHM-ANA-5.3: LW Compositing Form 1/2-ADM-1611.F03 & F04: LW Tank Sampling, Form 1/2-HPP-3.06.001.F01: Activity Check Record Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.1.1.1.B	Continuous Releases: Sample and Analyze Radioactive Liquid Wastes per Table 4.11-1	Form 1/2-ADM-1611.F03 & F04: LW Tank Sampling, Form 1/2-HPP-3.06.001.F01: Activity Check Record Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.1.1.2	Use ODCM Methodology to Assure Compliance	Form 1/2-ENV-05.04.F01: RWDA-L 1/2OM-17.4A.D: RWDA-L
4.11.1.1.3	Take Turbine Building Grab Sample When BV-1 Primary to Secondary Leakage Exceeds 0.1 gpm (142 gpd)	Form 1/2-ADM-1611.F03 & F04: Sump Sampling, Form 1/2-HPP-3.06.001.F01: Activity Check Record Form 1/2-ENV-05.04.F01: RWDA-L Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.1.1.4	Obtain Turbine Building Grab Sample When BV-2 Primary to Secondary Leakage Exceeds 0.1 gpm (142 gpd)	Form 1/2-ADM-1611.F03 & F04: Sump Sampling, Form 1/2-HPP-3.06.001.F01: Activity Check Record Form 1/2-ENV-05.04.F01: RWDA-L Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.1.1.5	Obtain Grab Samples Prior to BV-2 Recirculation Drain Pump Discharge to Catch Basin No. 16	Form 1/2-ADM-1611.F03 & F04: Sump Sampling, Form 1/2-HPP-3.06.001.F01: Activity Check Record 2OM-9.2: Rx Plant Vents and Drains (CB-16) 2OM-9.4F: Drain RSS Pump Casing / Pit 2OM 51: OM Clearance 51-86 (2DAS-P215A/B)

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 LIQUID EFFLUENT DOSE SURVEILLANCES

TABLE F: 5
1/2-ODC-3.03, Attachment H Control 3.11.1.2: Liquid Effluent Dose
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.1.2.1	Using the ODCM - Determine Cumulative Dose From Liquid Effluents Every 31 Days	Form 1/2-ENV-05.04.F01: RWDA-L SAP Order (Issue NPD3NRE Letter: Monthly Dose Projection) 1/2OM-17.4A.D: RWDA-L

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 LIQUID EFFLUENT TREATMENT SURVEILLANCES

TABLE F: 6
1/2-ODC-3.03, Attachment I Control 3.11.1.3: Liquid Effluent Treatment System
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.1.3.1	Using the ODCM - Project the Liquid Release Dose Every 31 Days	Form 1/2-ENV-05.04.F01: RWDA-L SAP Order (Issue NPD3NRE Letter: Monthly Dose Projection) 1/2OM-17.4A.D: RWDA-L

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 LIQUID STORAGE TANK ACTIVITY LIMIT SURVEILLANCES

TABLE F: 7
1/2-ODC-3.03, Attachment J Control 3.11.1.4: Maintain Liquid Tank Activity within the following limits:

≤18 Curies in Unit 1 Primary Grade Water Storage Tank [1BR-TK-6A]
≤18 Curies in Unit 1 Primary Grade Water Storage Tank [1BR-TK-6B]
≤7 Curies in Unit 1 Steam Generator Drain Tank [1LW-TK-7A]
≤7 Curies in Unit 1 Steam Generator Drain Tank [1LW-TK-7B]
≤6 Curies in Unit 1 Refueling Water Storage Tank [1QS-TK-1]
≤62 Curies in Unit 2 Refueling Water Storage Tank [2QSS-TK21]
≤10 Curies in Unit 1 and Unit 2 miscellaneous temporary outside radioactive liquid storage tanks.

APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.1.4.1	Every 7 days Analyze a tank sample when radioactive material is added to tanks except the RWST's. For RWST's, analyze sample within 7 days of reactor cavity drain down back to the RWST.	Form 1/2-HPP-3.06.001.F01: Activity Check Record Form 1/2-ENV-05.04.F01: RWDA-L 1OM-8.4.Z: Recirculate Test Tanks Thru Ion Exchanger 1OM-17.4.AJ: LW Transfer to 1LW-TK-7A&B 1OM-54.3 L5 Log Item 197: 1OM-54.3 L5 Log Item 132: 1OM-54.3 L5 Log Item 134: 1OM-54.3 L5 Log Item 200: 2OM-17.4B: LW to SG Blowdown Tank

ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 GASEOUS EFFLUENT DOSE SURVEILLANCES

TABLE F: 8
1/2-ODC-3.03, Attachment K Control 3.11.2.1: Gaseous Effluent Dose Rates
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.1.1	Using the ODCM - Determine the Noble Gas Effluent Dose Rate	Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-3.06.012.F01: Abnormal Gaseous Releases 1OM-19.4E, H: RWDA-G for Unit 1 GWDT's 1/2OM-19.4A.B: RWDA-G for Unit 2 GWST's
4.11.2.1.2	**Sample and Analyze per Table 4.11-2 to Determine Inhalation Pathway Dose**	
4.11.2.1.2.A	Waste Gas Storage Tank - Grab Sample Each Tank	Form 1/2-ADM-1611.F03 & F04: GW Tank Sampling Form 1/2-HPP-3.06.003.F01: GW Tank Sampling Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.2.1.2.B	Containment Purge - Grab Sample Each Purge	Form 1/2-ADM-1611.F03 & F04: GW Tank Sampling Form 1/2-ENV-05.05.F01: RWDA-G Form NOP-OP-4702-01: Air Sample Record Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling
4.11.2.1.2.C	Ventilation Systems	
4.11.2.1.2.C.1 thru 4.11.2.1.C.3 and 4.11.2.1.2.D.1 thru 4.11.2.1.2.D.3	BV-1 Grab and Continuous Samples	Form 1/2-ADM-1611.F03 & F04: GW Tank Sampling Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling Form 1/2-HPP-4.02.017.F01-90: RMS & DRMS Valve Verification 1-HPP-5.01.001: SA-9/10 Emergency Operation 1-HPP-5.01.002: SPING-4 Emergency Operation
4.11.2.1.2.C.4 thru 4.11.2.1.2.C.8 and 4.11.2.1.2.D.4 thru 4.11.2.1.2.D.8	BV-2 Grab and Continuous Samples	Form 1/2-ADM-1611.F03 & F04: GW Tank Sampling Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling Form 1/2-HPP-4.02.017.F01-90: RMS & DRMS Valve Verification 2-HPP-5.04.001: Emergency Operation of WRGM Assembly

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 GASEOUS EFFLUENT AIR DOSE SURVEILLANCES

TABLE F: 9
1/2-ODC-3.03, Attachment L Control 3.11.2.2: Gaseous Effluent Air Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.2.1	Using the ODCM - Determine the Noble Gas Cumulative Dose Contributions Every 31 Days	Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-3.06.012.F01: Abnormal Gaseous Releases Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling SAP Order (Issue NPD3NRE Letter: Monthly Dose Projection)

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 GASEOUS EFFLUENT PARTICULATE AND IODINE DOSE SURVEILLANCES

TABLE F: 10
1/2-ODC-3.03, Attachment M Control 3.11.2.3: Gaseous Effluent Particulate And Iodine Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.3.1	Using the ODCM - Determine the Particulate & Radioiodine Cumulative Dose Contributions Every 31 Days	Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-3.06.012.F01: Abnormal Gaseous Releases Form 1/2-HPP-4.02.002.F02: Rad Monitor Sampling SAP Order (Issue NPD3NRE Letter: Monthly Dose Projection)

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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 GASEOUS EFFLUENT TREATMENT SURVEILLANCES

TABLE F: 11
1/2-ODC-3.03, Attachment N Control 3.11.2.4: Gaseous Effluent Treatment System
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.4.1	Using the ODCM - Project the Gas Release Dose from the Site Every 31 Days	Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-3.06.012.F01: Abnormal Gaseous Releases SAP Order (Issue NPD3NRE Letter: Monthly Dose Projection)

ODCM CONTROLS PROCEDURE MATRIX

BV-1 GASEOUS STORAGE TANK ACTIVITY LIMIT SURVEILLANCES

TABLE F: 12a
1/2-ODC-3.03, Attachment O Control 3.11.2.5: Maintain Gas Storage Tank Activity within the following limits:

1GW-TK-1A: ≤52000 Curies Noble Gas (Considered Xe-133)
1GW-TK-1B: ≤52000 Curies Noble Gas (Considered Xe-133)
1GW-TK-1B: ≤52000 Curies Noble Gas (Considered Xe-133)

APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.5.1	Determine Tank Gas Contents when Adding Rad Material & (RCS Activity >100uCi/ml)	Form 1/2-HPP-3.06.003.F01: GW Tank Sampling 1OM-19.4.G: GW Disposal System

BV-2 GASEOUS STORAGE TANK ACTIVITY LIMIT SURVEILLANCES

TABLE F: 12b
1/2-ODC-3.03, Attachment O Control 3.11.2.5: Maintain Gas Storage Tank Activity with the following limit:

2GWS-TK25A thru 25G: ≤19000 Curies Noble Gas (Considered Xe-133) in any connected group of Gas Storage Tanks

APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.2.5.1	Determine Gaseous Waste Tank Rad Material When Adding Rad Material to the Tank.	Form 1/2-HPP-3.06.003.F01: GW Tank Sampling 2OM-19.2: GW Precautions & Limitations 2OM-19.4G: GW transfer from Unit 2 2OM-54.3 L5 Log Item 133

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BV-1 AND 2 TOTAL DOSE SURVEILLANCES

TABLE F: 13
1/2-ODC-3.03, Attachment P Control 3.11.4.1: Liquid And Gaseous Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.11.4.1.1	Using the ODCM - Determine Cumulative Gas & Liquid Dose per Control 3.11.1.2, 3.11.2.2, 3.11.2.3	Form 1/2-ENV-01.05.F01: Annual RETS Report (40CFR190) Form 1/2-ENV-05.04.F01: RWDA-L Form 1/2-ENV-05.05.F01: RWDA-G Form 1/2-ENV-01.03.F01: Continuous Release Permit Form 1/2-HPP-3.06.012.F01: Abnormal Gaseous Releases 1/2-ENV-01.04: Effluent Data Logs (40CFR190)

ATTACHMENT C
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ODCM CONTROLS PROCEDURE MATRIX

BV-1 AND 2 REMP PROGRAM SURVEILLANCES

TABLE F: 14
1/2-ODC-3.03, Attachment Q Control 3.12.1: Radiological Environmental Monitoring Program (REMP)
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.12.1.1	Using Locations in the ODCM -Collect and Analyze Samples per Tables 3.12-1, 3.12-2 & 4.12-1	1/2-ENV-02.01: Radiological Environmental Monitoring Program 1/2-ENV-03.01: Environmental Sampling

TABLE F: 15
1/2-ODC-3.03, Attachment R Control 3.12.2: Land Use Census
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.12.2.1	Using the Best Available Method - Conduct a Land Use Census Yearly Between 6/1 & 10/1	1/2-ENV-02.01: Radiological Environmental Monitoring Program 1/2-ENV-04.02: REMP Calculations

TABLE F: 16
1/2-ODC-3.03, Attachment S Control 3.12.3: Interlaboratory Comparison Program
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE
4.12.3.1	Include Analysis Results of the Interlaboratory Comparison Program in the Annual Radiological Environmental Report	1/2-ENV-02.01: Radiological Environmental Monitoring Program Split Sample Program with PA-DEP Spike Sample Program with Independent Laboratory 1/2-ENV-01.05: Section 4 of AREOR Template

RTL #A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-2.01

ODCM: LIQUID EFFLUENTS

Document Owner
Manager, Nuclear Environmental and Chemistry

Revision Number	14
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	03/07/14

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure provides the methodology to calculate dose, release concentrations, and alarm setpoints from liquid effluents in accordance with the requirements of in Beaver Valley Technical Specifications [TS] 5.5.2.(3.2.1)

1.1.1 Liquid effluent monitor alarm setpoints [TS] 5.5.2.a

1.1.2 Liquid effluent release concentration calculations [TS] 5.5.2.b)

1.1.3 Liquid effluent dose projection and cumulative dose calculations [TS] 5.5.2.d and [TS] 5.5.2.e

1.1.4 Liquid Radwaste Treatment System [TS] 5.5.2.f

1.1.5 Site Boundary used for liquid effluents

2.0 SCOPE

2.1 This procedure is applicable to liquid effluents at Beaver Valley Power Station.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 References For BV-1 Liquid Effluent Monitor Setpoints

3.1.1.1 Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412; Table 2.1-3

3.1.1.2 Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412; Table 2.1-2

3.1.1.3 10 CFR 20, Appendix B, (20.1001-20.2402) Table 2, Column 2 EC's

3.1.1.4 Calculation Package No. ERS-SFL-92-039, Isotopic Efficiencies For Unit 1 Liquid Process Monitors

3.1.1.5 Calculation Package No. ERS-ATL-93-021, Process Alarm Setpoints For Liquid Effluent Monitors

3.1.1.6 Stone and Webster Calculation Package No. UR(B)-160, BVPS Liquid Radwaste Releases and Concentrations - Expect and Design Cases (per Unit and Site)

3.1.2 References for BV-2 Liquid Effluent Monitor Setpoints

3.1.2.1 10 CFR 20, Appendix B, (20.1001-20.2402) Table 2, Column 2 EC's

3.1.2.2 Calculation Package No. ERS-SFL-86-026, Unit 2 DRMS Isotopic Efficiencies

3.1.2.3 Stone and Webster Computer Code LIQ1BB; "Normal Liquid Releases From A Pressurized Water Reactor"

3.1.2.4 Calculation Package No. ERS-JWW-87-015, Isotopic Efficiencies For 2SGC-RQ100

3.1.2.4.1 The Isotopic Efficiencies for 2SGC-RQ100 are superseded by the values presented in Calculation Package No. ERS-SFL-86-026.

3.1.2.5 Calculation Package No. ERS-WFW-87-021, Conversion Factor for 2SGC-RQ100

3.1.2.5.1 The Monitor Conversion Factor (CF_{11}) for 2SGC-RQ100 is superseded by the value presented in Calculation Package No. ERS-ATL-93-021.

3.1.2.6 Calculation Package No. ERS-ATL-93-021, Process Alarm Setpoints For Liquid Effluent Monitors

3.1.2.7 Stone and Webster Calculation Package No. UR(B)-160, BVPS Liquid Radwaste Releases and Concentrations - Expect and Design Cases (per Unit and Site)

3.1.3 References used in other sections of this procedure

3.1.3.1 NUREG-0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants

3.1.3.2 NUREG-1301, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

3.1.3.3 NUREG-0017; Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from PWRs, Revision 0

3.1.3.4 Regulatory Guide 1.113; Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I, April 1977

3.1.3.5 Regulatory Guide 1.109; Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance to 10 CFR Part 50, Appendix I

3.1.3.6 Calculation Package No. ERS-ATL-83-027; Liquid Waste Dose Factor Calculation for HPM-RP 6.5, Issue 3 and Later

3.1.3.7 NUREG-0172; Age-Specific Radiation Dose Commitment Factors for a One-Year Chronic Intake

3.1.3.8 UCRL-50564; Concentration Factors of Chemical Elements in Edible Aquatic Organisms, Revision 1, 1972

3.1.3.9 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.3.10 1/2-ADM-0100, Procedure Writers Guide

3.1.3.11 NOP-SS-3001, Procedure Review and Approval

3.1.3.12 1/2-ODC-3.03, ODCM: Controls for RETS and REMP Programs

3.1.3.13 CR 02-06174, Tracking of Activities for Unit 1 RCS Zinc Addition Implementation. CA-014, Revise ODCM Procedure 1/2-ODC-2.01 (Tables 1.1-1a and 1b) to include the addition of Zn-65 to the ODCM liquid source term.

3.1.3.14 CR 03-02466, RFA-Radiation Protection Effluent Control Provide Recommendation on Processing when Performing Weekly Sample of [1LW-TK-7A/7B]. CA-02, Revise ODCM Procedure 1/2-ODC-2.01, (Attachment D) to show the liquid waste flow path cross-connect between Unit 1 and Unit 2.

3.1.3.15 CR 05-03306, Incorporated Improved Technical Specifications (ITS).

3.1.3.16 CR 05-03854, ODCM Figure for Liquid Effluent Release Points Need Updated. CA-01, revise ODCM procedure 1/2-ODC-2.01 (ODCM: Liquid Effluents) Attachment D, Figure 1.4-3 to incorporate a modified version of Plant Drawing No. 8700-RM-27F.

3.1.3.17 Unit 1 Technical Specification Amendment No. 275 (LAR 1A-302) to License No. DPR-66. This amendment to the Unit 1 license was approved by the NRC on July 19, 2006.

3.1.3.18 Vendor Calculation Package No. 8700-UR(B)-223, Impact of Atmospheric Containment Conversion, Power Uprate, and Alternative Source Terms on the Alarm Setpoints for the Radiation Monitors at Unit 1.

3.1.3.19 Engineering Change Package No. ECP-04-0440, Extended Power Uprate.

3.1.3.20 CR 06-04908, Radiation Monitor Alarm Setpoint Discrepancies. CA-03; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [RM-1RW-100] and [RM-1DA-100] for incorporation of the Extended Power Uprate per Unit 1 TS Amendment No. 275.

3.1.3.21 CR 06-6476, Procedure 1/2-ODC-2.01 needs revised for Plant Uprate. CA-01; revise ODCM procedure 1/2-ODC-2.01 to update the alarm setpoints of [2SWS-RQ101] for incorporation of the Extended Power Update at Unit 2 (ECP-04-0441) per Unit 2 TS Amendment No. 156.

3.1.3.22 CR 05-00004-15, CR05-00004-17 and SAP Order 200197646-0010 to revise 1/2-ODC-2.01. Add the Coolant Recovery Tanks [1BR-TK-4A/4B] as Liquid Waste Tanks to Section 8.4 description and Attachment D Figures 1.4-1 and 1.4-2. Add a default 2-tank volume recirculation time of 45.7 hrs for the Coolant Recovery Tanks [1BR-TK-4A/4B] to Attachment B Table 1.2-1a. Add the Cesium Removal Ion Exchangers [1BR-I-1A/1B and 2BRS-IOE21A/21B] to Section 8.4 description and Attachment B Figures 1.4-1 and 1.4-2. Revise the recirculation times in Attachment B Table 1.2-1a and 1.2-1b to indicate the times for nominal tank volume and maximum tank volume.

3.1.3.23 SAP Order 200197646-0660. Revise 1/2-ODC-2.01 Attachment D Figure 1.4-3 to remove STP Outfalls 113 and 203 due to retirement of the Sewage Treatment Plants and to remove U1 Steam Generator Blowdown Filter Backwash Outfall 501. Water is no longer discharged via these outfalls.

3.1.3.24 SAP Order 200197646-0810. Revise 1/2-ODC-2.01 to incorporate alarm setpoints for all possible detector combinations for [RM-1DA-100]. Specifically, due to obsolescence of the original Model 843-30 and 843-32 detectors that were previously installed in [RM-1DA-100], the vendor has upgraded them to Model 843-30R and 843-32R detectors, which include upgraded efficiency data as well.

3.1.3.25 CR 10-86844 revises 1/2-ODC-2.01 to remove description that batch releases of liquid waste are processed by recirculation through eductors. Deleted Attachment B which referenced minimum liquid waste batch release recirculation times and added description that liquid waste recirculation times to achieve two tank volumes are calculated based upon actual tank volume and pump capacity.

3.1.3.26 ECP 11-0049 and CR 2012-02583 implement changes to the design of the liquid waste system for Phase 2 of Coolant Recovery Project.

3.1.3.27 SAP Notification 600747531, Update 1/2-ODC-2.01 for RM-1RW-100.

3.1.3.28 CR-2012-05875, Antimony-126 identified in the liquid waste system.

3.1.3.29 SAP Notification 600765150, Request from Operations to allow discharge of water in high level drains tanks [LW-TK-2A/B] through low level waste tanks [LW-TK-3A/B] via RM-LW-104.

3.1.3.30 CA 2012-15547-7, To address the extent of condition with potential gaps in Radiological Effluent Program, evaluate the need to place appropriate ODCM controls on various non-radiological tanks and sumps throughout the site.

3.1.3.31 Engineering Change Package (ECP) 12-0478, Liquid Waste Demin Project: Installation of new Demineralizers in Solid Waste Building. 3-7-14

3.2 Commitments

3.2.1 Beaver Valley Technical Specifications: **[TS]** 5.5.2, Radioactive Effluent Controls Program.

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

5.1.1 None

5.2 Limitations

5.2.1 In Section 8.1, Alarm Setpoints, of this procedure effluent monitor setpoints for a conservative mix are based on the individual units specific parameters, but effluent monitor setpoints for analysis prior to release permit use the total dilution flow available at the site.

5.2.2 BV-1 and BV-2 utilize the concept of a shared liquid radioactive waste system according to NUREG-0133.[3.1.3.1] This permits the mixing of liquid radwaste for processing and allocating of dose due to release as defined in Section 8.4, Liquid Radwaste System.

5.2.3 A difference in alarm setpoint terminology for the radiation monitoring systems of BV-1 and BV-2 is described as follows:

5.2.3.1 HIGH and HIGH-HIGH terminology are used for BV-1 monitors and ALERT and HIGH terminology is used for BV-2 monitors.

5.2.3.2 BV-1 alarm setpoint units are expressed as counts per minute (cpm) and BV-2 alarm setpoints units are expressed as microcurie per milliliter (uCi/mL). The difference is due to BV-2 software which applies a conversion factor to the raw data (cpm) to convert units to uCi/ml. Note that the uCi/ml presentation is technically correct only for the specific isotopic mix used in the determination of the conversion factors. Therefore, BV-2 setpoints determined on analysis prior to release will be correct for properly controlling dose rate, but the indicated uCi/ml value may differ from the actual value.

5.2.4 This procedure also contains information that was previously contained in Section 5 of the previous BV-1 and 2 Offsite Dose Calculation Manual.

5.2.4.1 In regards to this, the site boundary for liquid effluents was included in this procedure.

5.2.4.2 The Site Boundary for Liquid Effluents is shown in ATTACHMENT D Figure 5-1.

6.0 <u>ACCEPTANCE CRITERIA</u>

6.1 Changes to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculation.[3.1.3.2]

6.1.1 Changes to this procedure shall be prepared in accordance with 1/2-ADM-0100, PROCEDURE WRITER'S GUIDE[3.1.3.10] and 1/2-ADM-1640, CONTROL OF THE OFFSITE DOSE CALCULATION MANUAL.[3.1.3.9]

6.1.2 Changes to this procedure shall be reviewed and approved in accordance with NOP-SS-3001, PROCEDURE REVIEW AND APPROVAL[3.1.3.11] and 1/2-ADM-1640.[3.1.3.9]

7.0 <u>PREREQUISITES</u>

7.1 None

8.0 <u>PROCEDURE</u>

8.1 **<u>Alarm Setpoints</u>**

8.1.1 **<u>BV-1 Monitor Alarm Setpoint Determination</u>**

This procedure determines the monitor HIGH-HIGH Alarm Setpoint (HHSP) to provide indication if the concentration of radionuclides in the liquid effluent released from the site to unrestricted areas exceeds 10 times the Effluent Concentrations (ECs) specified in 10 CFR 20, Appendix B (20.1001-20.2402), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases or exceeds a concentration of 2E-4 uCi/ml for dissolved or entrained noble gases. [3.1.1.5]

The methodology described in Section 8.1.1.2 is an alternative method to be used to determine the [RM-1LW-104], LIQUID WASTE EFFLUENT RADIATION MONITOR or [RM-1LW-116], LIQUID WASTE CONTAMINATED DRAINS RADIATION MONITOR

monitor HHSP. The methodology in Section 8.1.1.2 may be used for any batch release and shall be used when the respective total gamma activity concentration of the liquid effluent prior to dilution exceeds 3.14E-3 uCi/ml and 7.33E-3 uCi/ml. This concentration is equivalent to the respective HHSPs derived in Section 8.1.1.1 and allows for respective tritium concentrations up to 4.26E+0 uCi/ml and 9.94E+0 uCi/ml.(3.1.1.5)

8.1.1.1 **BV-1 Setpoint Determination Based On A Conservative Mix**

The Alarm Setpoints shall be set at the values listed in the following table:

BV-1 LIQUID MONITOR SETPOINTS				
		cpm Above Background		
	Monitor	CR	HHSP	HSP
Liquid Waste Effluent Monitor	RM-1LW-104	3.53E+5	≤ 3.53E+5	≤ 2.47E+5
Laundry And Contaminated Shower Drains Monitor	RM-1LW-116	8.24E+5	≤ 8.24E+5	≤ 5.77E+5
Component Cooling/ Recirculation Spray Hx River Water Monitor	RM-1RW-100	2.57E+4	≤ 1.90E+4 (3)	≤ 1.33E+4 (3)
Component Cooling Hx River Water Monitor	RM-1RW-101	9.02E+3	≤ 9.02E+3	≤ 6.32E+3
Aux Feed Pump Bay Drain Monitor	RM-1DA-100 with Detector Model 843-30 or 843-32	(1) 1.22E+4 (2) 1.05E+4	(1) ≤ 1.20E+4 (2) ≤ 1.05E+4	(1) ≤ 8.43E+3 (2) ≤ 7.33E+3
	RM-1DA-100 with Detector Model 843-30R or 843-32R	(1) 1.22E+4 (2) 1.22E+4	(1) ≤ 1.20E+4 (2) ≤ 1.22E+4	(1) ≤ 8.43E+3 (2) ≤ 8.52E+3

(1) Use these values for a monitor with an analog drawer/meter face. These values are from Calculation No. 8700-UR(B)-223, and are justified for use in Attachment 6 of Calculation Package ERS-ATL-93-021.(3.1.1.5)(3.1.3.18)

(2) Use these values when the monitor is upgraded to a digital drawer/meter face. These values are justified for use in Attachment 6 of Calculation Package ERS-ATL-93-021(3.1.1.5)

(3) Calculation Package ERS-ATL-93-021 Revision 4(3.1.1.5)

The setpoint bases for all monitors can be found in Calculation Package ERS-ATL-93-021 and/or Calculation No. 8700-UR(B)-223.(3.1.3.18) The setpoints for RM-1LW-104 and RM-1LW-116 are based on the following conditions:

- Source terms given in ATTACHMENT A Table 1.1-1a. These source terms (without Zn-65) have been generated from the GALE Computer Code, as described in NUREG-0017.(3.1.3.3) The inputs to GALE are given in 1/2-ODC-3.01 Appendix B. The Zn-65 source term was generated via Calculation Package No. ERS-ATL-93-021.(3.1.1.5, 3.1.3.13)

- Dilution water flow rate of 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).
- Discharge flow rate prior to dilution of 35 gpm for the Liquid Waste Effluent Monitor (RM-1LW-104).
- Discharge flow rate prior to dilution of 15 gpm for the Laundry and Contaminated Shower Drains Monitor [RM-1LW-116].

The above setpoints for [RM-1LW-104] and [RM-1LW-116] can be varied based on actual operating conditions resulting in changes in the discharge and dilution flow rates as follows:

$$HHSP = \frac{542F}{f} \qquad [1.1(1)\text{-}1]$$

3-7-14

where:

HHSP = Monitor HIGH-HIGH Alarm Setpoint above background (ncpm).

542 = Most restrictive proportionality constant based on nominal flow conditions:
542 = 3.53E+5 ncpm x 35 gpm ÷ 22,800 gpm [RM-1LW-104]
542 = 8.24E+5 ncpm x 15 gpm ÷ 22,800 gpm [RM-1LW-116]

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release through the Emergency Outfall Structure).

f = Discharge flow rate prior to dilution (gpm).

8.1.1.1.1 BV-1 Mix Radionuclides

The "mix" (radionuclides and composition) of the liquid effluent was determined as follows:

- The liquid source terms that are representative of the "mix" of the liquid effluent were determined. Liquid source terms are the radioactivity levels of the radionuclides in the effluent from ATTACMENT A Table 1.1-1a.

- The fraction of the total radioactivity in the liquid effluent comprised by radionuclide "i" (S_i) for each individual radionuclide in the liquid effluent was determined as follows:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [1.1(1)\text{-}2]$$

where:

A_i = Annual release of radionuclide "i" (Ci/yr) in the liquid effluent from ATTACHMENT A Table 1.1-1a.

8.1.1.1.2 BV-1 Maximum Acceptable Concentration (All Radionuclides)

The maximum acceptable total radioactivity concentration (uCi/ml) of all radionuclides in the liquid effluent prior to dilution (C_t) was determined by:

$$C_t = \frac{F}{f \sum_i \frac{S_i}{OEC_i}} \qquad [1.1(1)\text{-}3]$$

where:

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release through the Emergency Outfall Structure).

= 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2)

f = Maximum acceptable discharge flow rate prior to dilution (gpm).

= 35 gpm for Liquid Waste Effluent Monitor [RM-1LW-104].

= 15 gpm for Laundry and Contaminated Shower Drains Monitor [RM-1LW-116].

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from ATTACHMENT A Table 1.1-1a. The OEC is set at 10 times the 10 CFR 20, Appendix B (20.1001-20.2402) Table 2, Col. 2 EC values.

S_i = The fraction of total radioactivity attributed to radionuclide "i", from Equation [1.1(1)-2].

8.1.1.1.3 BV-1 Maximum Acceptable Concentration (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/ml) of radionuclide "i" in the liquid effluent prior to dilution (C_i) was determined by:

$$C_i = S_i\, C_t \qquad [1.1(1)\text{-}4]$$

8.1.1.1.4 BV-1 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the radionuclides; (CR) was determined by:

$$CR = \sum_i C_i\, E_i \qquad [1.1(1)\text{-}5]$$

where:

E_i = Detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from ATTACHMENT A Table 1.1-1a. If not listed in Attachment A, then obtained from Calculation Package ERS-SFL-92-039. (3.1.1.4)

8.1.1.1.5 BV-1 Monitor HHSP

The monitor HHSP above background (ncpm) should be set at the CR value. Since only one tank can be released at a time, adjustment of this value is not necessary to compensate for release from more than one source.

8.1.1.2 **<u>BV-1 Setpoint Determination Based On Analysis Prior To Release</u>**

The following method applies to liquid releases when determining the setpoint for the maximum acceptable discharge flow rate prior to dilution and the associated HHSP Alarm Setpoint based on this flow rate for the [RM-1LW-104], LIQUID WASTE EFFLUENT MONITOR and the [RM-1LW-116], LAUNDRY AND CONTAMINATED SHOWER DRAINS MONITOR during all operational conditions.

The monitor alarm setpoint is set slightly above (a factor of 1.25) the count rate that results from the concentration of gamma emitting radionuclides in order to avoid spurious alarms. To compensate for this increase in the monitor alarm setpoint, the allowable discharge flow rate is reduced by the same factor.

When the discharge flow rate is limited by the radwaste discharge pump rate capacity or by administrative selection rather than the allowable flow rate determined from activity concentration, the alarm setpoint will be proportionally adjusted based upon the excess dilution factor provided.

8.1.1.2.1 BV-1 Maximum Acceptable Discharge Flow Rate

The maximum acceptable discharge flow rate (f) prior to dilution (gpm) is determined by:

$$f = \frac{F}{1.25 \sum_i \frac{C_i}{OEC_i}} \qquad [1.1(1)\text{-}6]$$

where:

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown (gpm).

The dilution water flow rate may include the combined cooling tower blowdown flow from both units exiting the discharge structure (but excluding emergency outfall structure flow) when simultaneous liquid discharges are administratively prohibited.

C_i = Radioactivity concentration of radionuclide "i" in the liquid effluent prior to dilution (uCi/ml) from analysis of the liquid effluent to be released.

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from ATTACHMENT A Table 1.1-1a. The OEC is set at 10 times the 10 CFR 20, Appendix B (20.1001-20.2402) Table 2, Col. 2 EC values.

8.1.1.2.2 BV-1 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the radionuclides, (CR) is determined by:

$$CR = 1.25 \sum_i C_i E_i \qquad [1.1(1)\text{-}7]$$

where:

E_i = The detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from ATTACHMENT A Table 1.1-1a. If not listed in Attachment A, then obtained from Calculation Package ERS-SFL-92-039.[3.1.1.4]

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

8.1.1.2.3 BV-1 Monitor HHSP

The liquid effluent monitor HHSP above background (ncpm) should be set at the CR value adjusted by any excess dilution factor provided as defined in the following equation:

$$HHSP = CR \frac{f}{f'} \qquad [1.1(1)\text{-}8]$$

where:

HHSP = Monitor HHSP above background.

CR = Calculated monitor count rate (ncpm) from equation [1.1(1)-7].

f = Maximum acceptable discharge flow rate prior to dilution determined by equation [1.1(1)-6].

f' = Actual maximum discharge flow rate to be maintained for the discharge. The reduced value of f' may be due to pump limitations or administrative selection.

8.1.2 **BV-2 Monitor Alarm Setpoint Determination**

This procedure determines the monitor HIGH Alarm Setpoint (HSP) that indicates if the concentration of radionuclides in the liquid effluent released from the site to unrestricted areas exceeds 10 times the ECs specified in 10 CFR 20, Appendix B (20.1001-20.2402), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases or exceeds a concentration of 2E-4 uCi/ml for dissolved or entrained noble gases.[3.1.2.6]

The methodology described in Section 8.1.2.2 is an alternative method to be used to determine the [2SGC-RQ100], LIQUID WASTE EFFLUENT RADIATION MONITOR HSP. The methodology in Section 8.1.2.2 may be used for any batch release and shall be used when the total gamma radioactivity concentration of the liquid effluent prior to dilution exceeds 1.14E-3 uCi/ml. This concentration is equivalent to a monitor response and HSP derived in Section 8.1.2.1 and allows for a tritium concentration of up to 2.16E+0 uCi/ml. The setpoint was obtained by use of a conversion factor of 5.61E-9 uCi/ml/cpm determined for the nuclide mix.[3.1.2.6]

8.1.2.1 **BV-2 Setpoint Determination Based On A Conservative Mix**

The Alarm Setpoints shall be set at the values listed in the following Table:

BV-2 LIQUID MONITOR SETPOINTS				
		µCi/ml Above Background		
	Monitor	DV	HSP	ASP
Liquid Waste Effluent Monitor	2SGC-RQ100	1.14E-3	≤ 1.14E-3	≤ 7.99E-4
Service Water Monitor	2SWS-RQ101	4.30E-5	≤ 4.30E-5	≤ 3.01E-5
Service Water Monitor	2SWS-RQ102	4.30E-5	≤ 4.30E-5	≤ 3.01E-5

The setpoint for [2SGC-RQ100] is based on the following conditions, however, the setpoint bases for [2SWS-RQ101] and [2SWS-RQ102] can be found in Calculation Package ERS-ATL-93-021.(3.1.2.6)

- Source terms given in ATTACHMENT A Table 1.1-1b. These source terms (without Zn-65) have been generated by using models and input similar to NUREG-0017. The inputs are given in 1/2-ODC-3.01. The Zn-65 source term was generated via Calculation Package No. ERS-ATL-93-021.(3.1.2.6, 3.1.3.13)
- Dilution water flow rate of 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).
- Discharge flow rate prior to dilution of 80 gpm for the Liquid Waste Effluent Monitor [2SGC-RQ100].
- A software conversion factor of 5.61E-9 uCi/ml/cpm associated with Liquid Waste Effluent Monitor [2SGC-RQ100].(3.1.2.6)

The above setpoint for [2SGC-RQ100] can be varied based on actual operating conditions resulting in the discharge and dilution flow rates as follows:

$$HSP = \frac{4.00E\text{-}6\ F}{f} \qquad [1.1(2)\text{-}1]$$

where:

HSP = HSP (uCi/ml) above background.

4.00E-6 = Proportionality constant based on nominal flow conditions:
4.00E-6 = 1.14E-3 net uCi/ml x 80 gpm ÷ 22,800 gpm

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown Rate (gpm).

f = Discharge flow rate prior to dilution (gpm).

8.1.2.1.1 BV-2 Mix Radionuclides

The "mix" (radionuclides and composition) of the liquid effluent was determined as follows:

- The liquid source terms that are representative of the "mix" of the liquid effluent were determined. Liquid source terms are the radioactivity levels of the radionuclides in the effluent from ATTACHMENT A Table 1.1-1b.
- The fraction of the total radioactivity in the liquid effluent comprised by radionuclide "i" (Si) for each individual radionuclide in the liquid effluent was determined as follows:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [1.1(2)\text{-}2]$$

where:

Ai =Annual release of radionuclide "i" (Ci/yr) in the liquid effluent from ATTACHMENT A Table 1.1-1b.

8.1.2.1.2 BV-2 Maximum Acceptable Concentration (All Radionuclides)

The maximum acceptable total radioactivity concentration (uCi/ml) of all radionuclides in the liquid effluent prior to dilution (C_t) was determined by:

$$C_t = \frac{F}{f \sum_i \frac{S_i}{OEC_i}} \qquad [1.1(2)\text{-}3]$$

where:

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release out through the Emergency Outfall Structure).

= 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).

f = Maximum acceptable discharge flow rate prior to dilution (gpm).

= 80 gpm for Liquid Waste Process Effluent Monitor [2SGC-RQ100].

OECi = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from ATTACHMENT A Table 1.1-1b. The OEC is set at 10 times the 10 CFR 20, Appendix B (20.1001-20.2402) Table 2, Col. 2 EC values.

S_i = The fraction of total radioactivity attributed to radionuclide "i", from Equation [1.1(2)-2].

8.1.2.1.3 BV-2 Maximum Acceptable Concentration (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/ml) of radionuclide "i" in the liquid effluent prior to dilution (C_i) was determined by:

$C_i = S_i\, C_t$ [1.1(2)-4]

8.1.2.1.4 BV-2 Monitor Display Value

The calculated monitor Display Value (uCi/ml) above background attributed to the radionuclides; (DV), was determined by:

$DV = 5.61E\text{-}9\ \Sigma_i\, C_i\, E_i$ [1.1(2)-5]

where:

5.61E-9 = Conversion factor (uCi/ml/cpm), an average determined for the source term mix.

E_i = Detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from ATTACHMENT A Table 1.1-1b. If not listed there, from Calculation Package ERS-SFL-86-026.[3.1.2.2]

8.1.2.1.5 BV-2 Monitor HSP

The monitor HIGH Alarm Setpoint above background (uCi/ml) should be set at the DV value.

8.1.2.2 **BV-2 Setpoint Determination Based On Analysis Prior To Release**

The following method applies to liquid releases when determining the setpoint for the maximum acceptable discharge flow rate prior to dilution and the associated HIGH Alarm Setpoint based on this flow rate for the Liquid Waste Effluent Monitor (2SGC-RQ100) during all operational conditions.

The monitor alarm setpoint is set slightly above (a factor of 1.25) the concentration reading that results from the concentration of gamma emitting radionuclides in order to avoid spurious alarms. To compensate for this increase in the monitor alarm setpoint, the allowable discharge flow rate is reduced by the same factor.

When the discharge flow rate is limited by the radwaste discharge pump rate capacity or by administrative selection rather than the allowable flow rate determined from activity concentration, the alarm setpoint will be proportionally adjusted based upon the excess dilution factor provided.

8.1.2.2.1 BV-2 Maximum Acceptable Discharge Flow Rate

The maximum acceptable discharge flow rate (f) prior to dilution (gpm) is determined by:

$$f = \frac{F}{1.25\ \Sigma_i \frac{C_i}{OEC_i}} \qquad [1.1(2)\text{-}6]$$

where:

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown (gpm).

The dilution water flow rate may include the combined cooling tower blowdown flow from both units exiting the discharge structure (but excluding emergency outfall structure flow) when simultaneous liquid discharges from both plants are administratively prohibited.

C_i = Radioactivity concentration of radionuclide "i" in the liquid effluent prior to dilution (uCi/ml) from analysis of the liquid effluent to be released.

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from Table 1.1-1b. The OEC is set at 10 times the 10 CFR 20, Appendix B (20.1001-20.2402) ATTACHMENT A Table 2, Col. 2 EC values.

8.1.2.2.2 BV-2 Monitor Display Value

The calculated monitor Display Value (uCi/ml) above background attributed to the radionuclides; (DV) is determined by:

$$DV = (1.25)\,(5.61E\text{-}9)\,\Sigma_i\, C_i\, E_i \qquad [1.1(2)\text{-}7]$$

where:

E_i = The detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from ATTACHMENT A Table 1.1-1b. If not listed there, from Calculation Package ERS-SFL-86-026.(3.1.2.2)

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

5.61E-9 = Conversion factor (uCi/ml/cpm), an average determined for the source term mix.

8.1.2.2.3 BV-2 Monitor HSP

The liquid effluent monitor HSP above background (uCi/ml) should be set at the DV value adjusted by any excess dilution factor provided as defined in the following equation:

$$HSP = DV \frac{f}{f'} \qquad [1.1(2)\text{-}8]$$

where:

HSP = HSP above background.

DV = Calculated monitor concentration reading (uCi/ml) from equation [1.1(2)-7].

F = Maximum acceptable discharge flow rate prior to dilution determined by equation [1.1(2)-6].

f' = Actual maximum discharge flow rate to be maintained for the discharge. The reduced value of f' may be due to pump limitations or administrative selection.

8.2 Compliance With 10 CFR 20 EC Limits (ODCM CONTROL 3.11.1.1)

8.2.1 Batch Releases

8.2.1.1 Pre-Release

The radioactivity content of each batch release will be determined prior to release in accordance with 1/2-ODC-3.03, Table 4.11-1. In order to assure representative samples, at least two (2) tank volumes of entrained fluid from each tank to be discharged shall be recirculated. To meet this requirement tank recirculation time is calculated using actual tank volumes and recirculation pump capacity. BV-1 and BV-2 will show compliance with ODCM Control 3.11.1.1 in the following manner:

The activity of the various radionuclides in the batch release, determined in accordance with 1/2-ODC-3.03, Table 4.11-1, is divided by the minimum dilution flow to obtain the concentration at the unrestricted area. This calculation is shown in the following equation:

$$Conc_i = \frac{C_i R}{MDF} \quad [1.2\text{-}1]$$

where:

$Conc_i$ = Concentration of radionuclide "i" at the unrestricted area (uCi/ml).

C_i = Concentration of radionuclide "i" in the potential batch release (uCi/ml).

R = Release rate of the batch (gpm).

MDF = Minimum dilution flow (gpm). (May be combined BV-1/BV-2 flow when simultaneous liquid discharges are administratively prohibited).

The projected concentrations in the unrestricted area are compared to the OECs. Before a release is authorized, Equation [1.2-2] must be satisfied.

$$\Sigma_i (Conc_i/OEC_i) < 1 \quad [1.2\text{-}2]$$

where:

OEC_i = The ODCM effluent concentration limit of radionuclide "i" (uCi/ml) from ATTACHMENT A Table 1.1-1a and 1.1-1b. The OEC is set at 10 times the 10 CFR 20, Appendix B, (20.1001-20.2402) Table 2, Col. 2 EC values.[3.1.1.3, 3.1.2.1]

8.2.1.2 Post-Release

Following release from the batch tank, the Post Dose Correction Factor will be calculated in the following manner:

$$PDCF = \frac{(VA_t)/(DFA)}{(VI_t)/(DFI)} \quad [1.2\text{-}3]$$

where:

PCDF = Post Dose Correction Factor.

VA_t = Actual Volume of tank released (gal).

DFA = Actual Dilution Flow during release (gpm).

VI_t = Initial Volume authorized for release (gal).

DFI = Initial Dilution Flow authorized for release (gpm).

The concentration of each radionuclide following release from the batch tank will be calculated in the unrestricted area in the following manner when the Post Dose Correction Factor shown in equation [1.2-3] is >1:

The average activity of radionuclide "i" during the time period of release is divided by the actual dilution flow during the period of release to obtain the concentration in the unrestricted area. This calculation is shown in the following equation:

$$Conc_{ik} = \frac{C_{ik}\, V_{tk}}{ADF_k} \quad [1.2\text{-}4]$$

where:

$Conc_{ik}$ = The concentration of radionuclide "i" (uCi/ml) at the unrestricted area, during the release period of time k.

NOTE:	Since discharge is from an isolated well-mixed tank at essentially a uniform rate, the difference between average and peak concentration within any discharge period is minimal.

C_{ik} = Concentration of radionuclide "i" (uCi/ml) in batch release during time period k.

V_{tk} = Volume of Tank released during time period k (gal).

ADF_k = Actual volume of Dilution Flow during the time period of release k (gal).

To show compliance with ODCM CONTROL 3.11.1.1, the following relationship must be satisfied:

$$\Sigma_i(Conc_{ik}/OEC_i) \leq 1 \qquad [1.2\text{-}5]$$

8.2.2 **Continuous Releases**

Continuous releases of liquid effluents do not normally occur at BV-1 or BV-2. When they do occur, the concentration of various radionuclides in the unrestricted area would be calculated using Equation [1.2-1] with C_{ik}, the concentration of isotope i in the continuous release. To show compliance with ODCM CONTROL 3.11.1.1, Equation [1.2-5] must again be satisfied.

8.3 **Compliance With 10 CFR 50 Dose Limits (ODCM CONTROLS 3.11.1.2 And 3.11.1.3)**

BV-1 and 2 utilize the concept of a shared liquid radioactive waste system according to NUREG-0133.(3.1.3.1) This permits mixing of the liquid radwaste for processing. Since the resulting effluent release cannot accurately be attributed to a specific reactor unit, the treated effluent releases are allocated as defined below.

8.3.1 **Cumulation Of Doses (ODCM CONTROL 3.11.1.2)**

The dose contribution from the release of liquid effluents will be calculated monthly for each batch release during the month and a cumulative summation of the total body and organ doses will be maintained for each calendar month, current calendar quarter, and the calendar year to date. The dose contribution will be calculated using the following equation:

$$D_\tau = UAF \sum_{i} A_{i\tau} \sum_{k=1}^{m} \Delta t_k \, C_{ik} \, F_k \qquad [1.3\text{-}1]$$

where:

D_τ = The cumulative dose commitment to the total body or any organ, τ, from the liquid effluents for the total time period $\sum_{k=1}^{m} \Delta t_k$ (mrem)

Δt_k = The length of the kth release over which C_{ik} and F_k are averaged for all liquid releases (hours).

C_{ik} = The average concentration of radionuclide, "i" (uCi/ml), in undiluted liquid effluent during time period Δt_k from any liquid release.

$A_{i\tau}$ = The site related ingestion dose commitment factor to the total body or any organ τ for each identified principal gamma and beta emitter (mrem-ml per hr-uCi) from ATTACHMENT B Table 1.3-1.

m = Number of releases contributing to the cumulative dose, D_t.

UAF = Unit allocation factor. Provides apportionment of dose between BV-1 and BV-2. Normally set at 0.5 for each unit. (Must total to $\leq$ 1.0).

F_k = The near field average dilution factor for Cik during any liquid effluent release. Defined as the ratio of the average undiluted liquid waste flow to the product of the average flow from the site discharge structure during the report period to unrestricted receiving waters, times 3. (3 is the site specific applicable factor for the mixing effect of the BV-1 and BV-2 discharge structure).

$$= \frac{\text{Waste Flow}}{(3)(\text{Dilution Water Flow})}$$

The site specific applicable factor of 3 results in a conservative estimate of the near field dilution factor based upon Regulatory Guide 1.113[3.1.3.4] methodology and is a factor of 10 below the limit specified in NUREG-0133, Section 4.3.[3.1.3.1]

The dose factor $A_{i\tau}$ was calculated for an adult for each isotope using the following equation from NUREG-0133.[3.1.3.1]

$$A_{i\tau} = 1.14E5\ (730/D_w + 21BF_i)DF_{i\tau} \qquad [1.3\text{-}2]$$

where:

$$1.14E5 = \left[\frac{1E6\ pCi}{uCi}\right] x \left[\frac{1E3\ ml}{liter}\right] x \left[\frac{1yr}{8760\ hr}\right]$$

730 = Adult water consumption rate (liters/yr).

D_w = Far field dilution factor from the near field area within 1/4 mile of the release point to the potable water intake for adult water consumption.

21 = Adult fish consumption (kg/yr).

BF_i = Bioaccumulation factor for radionuclide "i" in fish from Table A-1 of Regulatory Guide 1.109[3.1.3.5] (pCi/kg per pCi/l). However, if data was not available from that reference, it was obtained from Table 6 of UCRL-50564.[3.1.3.8]

The bioaccumulation factor for niobium (300 pCi/kg per pCi/l) was not obtained from either of the above references noted. It was obtained from IAEA Safety Series No. 57. Justification for use of this value is documented in Appendix A to Calculation Package No. ERS-ATL-83-027.[3.1.3.6]

$DF_{i\tau}$ = Dose conversion factor for radionuclide "i" for adults for a particular organ τ (mrem/pCi) from Table E-11 of Regulatory Guide 1.109,(3.1.3.5) or NUREG-0172.(3.1.3.7)

A table of $A_{i\tau}$ values for an adult at BV-1 and BV-2 are presented in ATTACHMENT B Table 1.3-1.

The far field dilution factor (Dw) for BV-1 and BV-2 is 200. This value is based on a total dilution factor of 600 applicable to the Midland water intake located 1.3 miles downstream and on the opposite bank from BV-1 and BV-2 (i.e., 200 = 600 ÷ 3). The total dilution factor of 600 represents a conservative fully mixed annual average condition. Since the Midland intake is located on the opposite bank and is below the water surface, essentially fully mixed conditions would have to exist for the radioactive effluent to be transported to the intake.

The cumulative doses (from each reactor unit) for a calendar quarter and a calendar year are compared to ODCM CONTROL 3.11.1.2 as follows:

For the calendar quarter,

$D_\tau < 1.5$ mrem total body [1.3-3]

$D_\tau < 5$ mrem any organ [1.3-4]

For the calendar year,

$D_\tau < 3$ mrem total body [1.3-5]

$D_\tau < 10$ mrem any organ [1.3-6]

If any of the limits in Equation [1.3-3] through [1.3-6] are exceeded, a Special Report pursuant to ODCM Control 3.11.1.2 of 1/2-ODC-3.03 is required.(3.1.3.12)

8.3.2 **Projection Of Doses (ODCM CONTROL 3.11.1.3)**

Doses due to liquid releases shall be projected at least once per 31 days in accordance with ODCM CONTROL 3.11.1.3 and this section. The Liquid Radwaste Treatment System shall be used to reduce the radioactive materials in each liquid waste batch prior to its discharge, when the projected doses due to liquid effluent releases from each reactor unit, when averaged over 31 days would exceed 0.06 mrem to the total body or 0.2 mrem to any organ. Doses used in the projection are obtained according to equation [1.3-1]. The 31-day dose projection shall be performed according to the following equations:

When including pre-release data,

$$D_{31} = \left[\frac{A+B}{T}\right] 31 + C \qquad [13\text{-}7]$$

When not including pre-release data,

$$D_{31} = \left[\frac{A}{T}\right] 31 + C \qquad [13\text{-}8]$$

where:

D_{31} = Projected 31 day dose (mrem).
A = Cumulative dose for quarter (mrem).
B = Projected dose from this release (mrem).
T = Current days into quarter.
C = Value which may be used to anticipate plant trends (mrem).

8.4 Liquid Radwaste System

The liquid radwaste system has the capability to control, collect, process, store, recycle, and dispose of liquid radioactive waste generated as a result of plant operations, including anticipated operational occurrences. This system also uses some of the components of the steam generator blowdown system for processing.

Simplified flow diagrams of the liquid radwaste systems for BV-1 and BV-2 are provided as ATTACHMENT C Figures 1.4-1 and 1.4-2 respectively. A diagram showing the liquid effluent release points is provided as ATTACHMENT C Figure 1.4-3. A diagram of the site boundary for liquid effluents is provided as ATTACHMENT D Figure 5-1.

Since the concept of a shared liquid radwaste system is used, then any liquid waste generated can be stored, processed and discharged from either BV-1 or BV-2.

8.4.1 BV-1 Liquid Radwaste System Components

8.4.1.1 [1BR-I-1A, (1B)], CESIUM REMOVAL ION EXCHANGERS

There are two (2) of these ion exchangers, each has a capacity of thirty-five (35) cubic feet. They are located on the east side of the Auxiliary Building (elevation 735'). They receive process fluid (liquid waste) from the reactor coolant system when letdown flow is diverted from the volume control tank.

8.4.1.2 [1BR-TK-4A, (4B)_], COOLANT RECOVERY TANKS

There are two (2) of these tanks, each tank has a nominal capacity of 195,000 gallons (maximum capacity = 205,578 gallons). They are located in the Solid Waste Building. They receive diverted letdown flow from the volume control tank and various reactor plant non-aerated drains that were processed through the [1BR-I-1A,

(1B)], CESIUM REMOVAL ION EXCHANGERS from both Unit 1 and Unit 2. These tanks can also receive unprocessed liquid wastes from either Unit 1 or Unit 2 liquid waste systems. Normally, one (1) tank receives liquid waste while the other tank is placed on recirculation through the demineralizer until the radioactivity concentration is acceptable for discharge. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.1.3 [1LW-TK-2A, (2B)], HIGH LEVEL WASTE DRAIN TANKS

There are two (2) of these tanks, each tank has a nominal capacity of 5,000 gallons (maximum capacity = 4,899 gallons). They are located on the northwest wall of the Auxiliary Building (elevation 735'). They receive liquid wastes from the vent and drain system.

8.4.1.4 [1LW-TK-3A, (3B)], LOW LEVEL WASTE DRAIN TANKS

There are two (2) of these tanks, each tank has a nominal capacity of 2,000 gallons (maximum capacity = 1,998 gallons). They are located in the northwest corner of the Auxiliary Building (elevation 735'). They receive liquid wastes from the vent and drain system and can be transferred directly to [1BR-TK-4A, (4B)], COOLANT RECOVERY TANKS. Although not normally used, these tanks can also be utilized to discharge processed or unprocessed liquid wastes. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.1.5 [1LW-FL-7], LIQUID WASTE PRE-CONDITIONING FILTER

3-7-14

A pre-conditioning filter with a fifty (50) is designed to clean liquid waste water of particulate and dissolved radioactive contaminants that is stored in [1LW-TK-2A, (2B)], HIGH LEVEL WASTE DRAIN TANKS; [1LW-TK-3A, (3B)], LOW LEVEL WASTE DRAIN TANKS; and [1BR-TK-4A, (4B)], COOLANT RECOVERY TANKS. The pre-conditioning filter can be charged with varying grades of activated charcoal (carbon) intended for removal of radionuclides in a colloidal state. The charcoal may consist of course mesh high activated coco carbon, medium mesh high activated coco carbon, fine mesh high activated coco carbon and cobalt selective media. This filter is located in the Solid Waste Building (elevation 735'-6").

8.4.1.6 [1LW-I-3], LIQUID WASTE DEMINERALIZER

3-7-14

There are two (2) demineralizer 36" diameter vessels [1LW-I-3-1, 1LW-I-3-2] each with a capacity of thirty (30) cubic feet and two (2) demineralizer 24" diameter vessels [1LW-I-3-3, 1LW-I-3-4] each with a capacity of fifteen (15) cubic feet. The demineralizers are designed to clean liquid waste water of particulate and dissolved radioactive contaminants and pre-conditioned by [1LW-FL-7]. The primary ion exchange occurs in [1LW-3-3, 1LW-I-3-4] exchange vessels. These vessels are located at the end of the process train to maximize the cleaning effect of the media. [1LW-I-3-1, 1LW-I-3-2] "accumulator" vessels are placed at the front of the influent liquid waste demineralizer line. These vessels are used as ion exchange process

vessels, however they are normally used for holding partially depleted resin sluiced in from the primary ion exchangers [1LW-I-3-3, 1LW-I-3-4]. Each of the demineralizer vessels may be charged with different resins for effective removal of chemical and radioactive contaminants. Resin selection and sequence may be changed dependant upon site liquid waste processing needs. This demineralizer is located in the Solid Waste Building (elevation 735'-6"). 3-7-14 3-7-14

8.4.1.7 Liquid Waste Evaporator

An evaporator was originally designed to process liquid waste at Unit 1 with a capacity of six (6) gpm. However, this evaporator was retired prior to initial issue of the ODCM, because of concerns for creating a mixed-waste. <u>SINCE</u> the evaporator is no longer in-use, <u>THEN</u> it is not shown on Figure 1.4-1 in ATTACHMENT C.

8.4.1.8 [1LW-TK-7A/7B], STEAM GENERATOR DRAIN TANKS

There are two (2) of these tanks, each tank has a nominal capacity of 34,500 gallons (maximum capacity = 35,800 gallons). They are located in the Fuel Pool Leakage Monitoring Room (elevation 735'). They normally receive liquid waste that has been processed through the liquid waste demineralizer. These tanks can also receive liquid waste from Unit 2. Upon completion of filling operation, the tank is placed on recirculation through the demineralizer until the radioactivity concentration is acceptable for discharge. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.1.9 [RM-1LW-104], LIQUID WASTE DISCHARGE RADIATION MONITOR

A off-line gamma scintillator radiation monitor continuously analyzes liquid waste as it is being discharged. The normal rate of discharge through this radiation monitor from [1LW-TK-3A, (3B)], LOW LEVEL WASTE TANK DRAIN TANKS and [1LW-TK-7A, (7B)] is less than thirty-five (35) gpm. The normal rate of discharge through this radiation monitor from [1BR-TK-4A,(4B)], COOLANT RECOVERY TANKS is less than 50 gpm. The high alarm on this radiation monitor has a setpoint that would indicate liquid waste discharges that are approaching OEC limits.. If an high high alarm is received, liquid waste discharge is automatically terminated by closing the discharge line isolation valve.

8.4.1.10 [1LW-FL-8], RAD WASTE REVERSE OSMOSIS (RWRO) PRE-FILTER

A pleated paper mechanical pre-filter upstream of [1LW-RWRO-1], RAD WASTE REVERSE OSMOSIS (RWRO) SKID is designed to prevent fouling of the system by buildup of suspended solids in the reverse osmosis membranes. The shielded pleated-paper filter is sized to filter particulate down to 0.3 microns. The filter is contained within a lockable, shielded cover that allows access for filter replacement. This filter is located in the Solid Waste Building (elevation 735'-6"). 3-7-14

8.4.1.11 [1LW-RWRO-1], RAD WASTE REVERSE OSMOSIS (RWRO) SKID adds a physical membrane barrier to the chemical ion exchange system used in the current liquid waste demineralizer system. This replaceable membrane barrier prevents radwaste particles that were not captured during the ion exchange process. [1LW-RWRO-1] does not capture the particles, but instead produces a reject stream separate from the permeate stream. The [1LW-RWRO-1] accepts the effluent stream of the demineralizer system [1LW-I-3], LIQUID WASTE DEMINERALIZER and is designed to allow boron and silica particles to pass through while rejecting others such as antimony. If antimony is present in the effluent stream it is separated and is sent to [1LW-I-3-5], Antimony Vessel charged with antimony selective resin. The antimony vessel removes the isotope from the reject stream prior to discharge back to the [1BR-TK-4A, (4B)], COOLANT RECOVERY TANK being processed from. This skid is located in the Solid Waste Building (elevation 735'-6").

8.4.1.12 [1LW-I-3-5], ANTIMONY VESSEL

[1LW-I-3-5], ANTIMONY VESSEL is a two (2) cubic foot ion exchange vessel placed downstream of the [1LW-RWRO-1], RAD WASTE REVERSE OSMOSIS (RWRO) SKID. This vessel removes antimony isotopes from the reject stream of the [1LW-I-3-5] prior to discharge back to the [1BR-TK-4A, (4B)], COOLANT RECOVERY TANK being processed from. This skid is located in the Solid Waste Building (elevation 735'-6").

3-7-14

8.4.1.13 [1LW-I-3-6], POLISHING VESSEL

[1LW-I-3-6], POLISHING VESSEL is a fifteen (15) cubic foot ion exchange vessel placed downstream of the [1LW-RWRO-1], RAD WASTE REVERSE OSMOSIS (RWRO) SKID. This skid is located in the Solid Waste Building (elevation 735'-6").

8.4.1.14 Sample Sinks

The sample sinks allow sampling at both influent and effluent vessel streams. In addition, the sinks include gauges that indicate the pressure at each sample point. One sample sink is located locally (Solid Waste Building - elevation 735'-6") to the system and allows for sampling from eight (8) individual points within the system. A second sample sink is remotely located and contains four (4) sampling points (Primary Auxiliary Building - elevation 768'-7" along the east wall). A sample sink is also included on the [1LW-RWRO-1], RAD WASTE REVERSE OSMOSIS (RWRO) SKID to provide sample points from within the skid itself.

8.4.2 **BV-1 Laundry and Contaminated Shower Drain System Components**

8.4.2.1 [1LW-TK-6A, (6B)], LAUNDRY AND CONTAMINATED SHOWER DRAIN TANKS

There are two (2) of these tanks, each has a nominal capacity of 1,200 gallons (maximum capacity = 1,303 gallons). They are located in the northwest corner of the Auxiliary Building (elevation 722'). They receive laundry and contaminated shower drains waste from the Service Building. These tanks can also receive mop water waste and other low-level contaminated waste from Unit 2. The waste in these tanks is not sent to the liquid waste demineralizer for cleanup because this waste may contain organic compounds that will deplete a resin bed. Upon completion of filling operation, the tank must be recirculated a minimum of two (2) tank volumes prior to sampling for discharge permit preparation.

8.4.2.2 [RM-1LW-116], LAUNDRY AND CONTAMINATED SHOWER DRAINS TANK DISCHARGE RADIATION MONITOR

An off-line gamma scintillator radiation monitor continuously analyzes laundry and contaminated shower drains waste as it is being discharged. The normal rate of discharge through this radiation monitor from [1LW-TK-6A, (6B)], LAUNDRY AND CONTAMINATED SHOWER DRAIN is less than fifteen (15) gpm. The high alarm on this radiation monitor has a setpoint that would indicate liquid waste discharges are approaching OEC limits.. If an high high alarm is received, liquid waste discharge is automatically terminated by closing the discharge line isolation valve.

8.4.3 **BV-2 Liquid Radwaste System Components**

8.4.3.1 [2BRS-IOE21A, (21B)], CESIUM REMOVAL ION EXCHANGERS

There are two (2) of these ion exchangers, each has a capacity of thirty-five (35) cubic feet. They are located on the east side of the Auxiliary Building (elevation 718'). They receive and process liquid wastes from the reactor coolant system during dilution or letdown operations.

8.4.3.2 [2LWS-TK21A, (21B)], WASTE DRAIN TANKS

There are two (2) of these tanks, each tank has a nominal capacity of 10,000 gallons (maximum capacity = 10,184 gallons). They are located in the northeast corner of the Auxiliary Building (elevation 710'). They receive liquid wastes from the vent and drain system. These tanks can also receive liquid wastes from Unit 1. If further processing is not necessary, then it may be placed on recirculation. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.3.3 [2SGC-IOE21A, (21B)], STEAM GENERATOR BLOWDOWN CLEANUP ION EXCHANGERS

The main purpose of the ion exchangers is to clean liquid waste water of particulate and dissolved radioactive contaminants through an ion exchange process. There is a resin bed, outlets strainer, and cleanup filter associated with each of these ion exchangers. They are located in the Waste Handling Building (elevation 722').

8.4.3.4 Liquid Waste Evaporator

Two (2) evaporators were originally designed to process liquid waste at Unit 2 with a capacity of twenty (20) gpm each. However, these evaporators were retired prior to initial issue of the ODCM, because of concerns for creating a mixed-waste. Since the evaporators are no longer in-use then they are not shown on Figure 1.4-2 in ATTACHMENT C.

8.4.3.5 [2SGC-TK23A(23B)], STEAM GENERATOR BLOWDOWN TEST TANKS

There are two (2) of these tanks, each has a nominal capacity of 18,000 gallons (maximum capacity = 17,955 gallons). They are located in the Auxiliary Building (elevation 755'). They receive liquid waste that has been processed through the cleanup ion exchangers. Upon completion of filling operation, the tank is placed on recirculation through the demineralizer until the radioactivity concentration is acceptable for discharge. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.3.6 [2SGC-TK21A, (21B)], STEAM GENERATOR BLOWDOWN HOLD TANKS

There are two (2) of these tanks, each has a nominal capacity of 50,000 gallons (maximum capacity = 51,460 gallons). They are located in the Waste Handling Building (elevation 722'). These tanks are used to store liquid waste when the radioactive concentration of the steam generator blowdown test tank is not acceptable for discharge. These tanks can also receive liquid wastes from Unit 1. The contents of this tank may be drained or processed through the Unit 1 or Unit 2 Liquid Radwaste Treatment System until the radioactivity concentration is acceptable for discharge. A minimum of two (2) tank volumes must be recirculated prior to sampling for discharge permit preparation.

8.4.3.7 [2SGC-RQ100], LIQUID WASTE EFFLUENT MONITOR

A off-line gamma scintillator radiation monitor continuously analyzes liquid waste as it is being discharged. The normal rate of discharge through this radiation monitor is less than eighty-five (85) gpm. The alert alarm on this radiation monitor has a setpoint that would indicate liquid waste discharges are approaching OEC limits. If a high alarm is received, liquid waste discharge is automatically terminated by closing the discharge line isolation valve.

8.4.4 **BV-1/2 Miscellaneous Sumps**

8.4.4.1 Unit 1 Chemical Waste Sump

This sump has an approximate capacity of 16,755 gallons and the associated trenches add an additional volume of approximately 5,140 gallons. The waste in this sump is not processed through any liquid waste demineralizer for cleanup. This sump cannot be completely isolated and does not have any radiation monitors. The sump discharges to Unit 1 Liquid Waste Line that discharges to the Unit 1 Cooling Tower Blowdown Line.

The Chemical Waste Sump typically does not receive radiological liquid waste. When primary to secondary leakage is greater than 0.1 gpm (142 gpd) releases of radioactive material from this sump are considered to be continuous liquid effluent discharge as specified in ODCM Control 3.11.1.1. When the Turbine Building Sump concentration exceeds 1 OEC, the Chemical Waste Sump accepts flow from the Turbine Building Sump(s).

Prior to discharge the Chemical Waste Sump is sampled. Individual liquid effluent batch discharge permits are not required if no Licensed Radioactive Material (LRM) is present and the discharge of tritium is accounted for with a monthly secondary diffusion permit. If LRM is detected in the Chemical Waste Sump, then a special permit is required. Upon completion of filling operation, the sump must be recirculated a minimum of two (2) volumes prior to sampling for batch discharge permit preparation.

During normal plant operation, this sump may be used for the treatment and disposal of radiological materials for various projects at the discretion of site management. When Licensed Radioactive Material from a source other than a Turbine Building drain of secondary water is added to the sump, the sump may be discharged using batch release methods if concentration and dose limits are maintained.

8.4.4.2 Unit 2 Cable Vault Sump

This sump has a capacity of 2,424 gallons, however the high level alarm will actuate at 1,500 gallons. This sump cannot be completely isolated and does not have any radiation monitors. The waste in this sump is not normally processed through a liquid waste demineralizer for cleanup because the sump may contain contaminants that would deplete the resin bed. The sump normally receives non-radiological liquid waste. It is used for the collection and release of non-contaminated water. The open pit design provides the potential for radiological materials to enter the sump due to its location in the Radiological Controlled Area thus requiring Offsite Dose Calculation Manual (ODCM) controls prior to discharge.

Prior to discharge the Cable Vault Sump is sampled. Licensed Radioactive Material entering the sump may be discharged using batch release methods if concentration and dose limits are maintained. Typically, tritium is accounted for in monthly pre-release batch liquid effluent discharge permit. This sump discharges into the Unit 2 Catch Basin System at 2CB-4. Upon completion of filling operation, the sump must be recirculated a minimum of two (2) volumes prior to sampling for discharge permit preparation.

- END -

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LIQUID SOURCE TERMS

TABLE 1.1-1a
BV-1 LIQUID SOURCE TERM

NUCLIDE	(2) A_i ANNUAL RELEASE (Ci)	(3) OEC_i (uCi/ml)	(4) E_i DETECTION EFFICIENCY (cpm/uCi/ml)
Cr-51	1.3E-3	5E-3	1.18E+7
Mn-54	3.1E-4	3E-4	8.59E+7
Fe-55	1.6E-3	1E-3	(5)
Fe-59	8.3E-4	1E-4	9.17E+7
Co-58	1.4E-2	2E-4	1.16E+8
Co-60	2.0E-3	3E-5	1.73E+8
Zn-65 (3.1.3.13)	2.69E-2	5E-5	4.67E+7
Np-239	1.4E-4	2E-4	8.49E+7
Br-83	2.5E-5	9E-3	1.36E+6
Br-84	2.5E-5	4E-3	9.75E+7
Br-85	2.7E-6	(5)	6.19E+6
Rb-86	7.5E-5	7E-5	(5)
Sr-89	2.9E-4	8E-5	(5)
Sr-90	1.1E-5	5E-6	(5)
Y-90	9.4E-6	7E-5	(5)
Y-91m	8.7E-6	2E-2	8.98E+7
Y-91	5.7E-5	8E-5	2.60E+5
Y-93	7.4E-7	2E-4	(5)
Zr-95	5.1E-5	2E-4	8.60E+7
Nb-95	5.2E-5	3E-4	8.64E+7
Sr-91	1.3E-5	2E-4	6.97E+7
Mo-99	1.1E-2	2E-4	2.84E+7
Tc-99m	1.1E-2	1E-2	8.96E+7
Ru-103	3.4E-5	3E-4	9.5E+7
Ru-106	1.0E-5	3E-5	(5)
Rh-103m	3.4E-5	6E-2	(5)
Rh-106	1.0E-5	(5)	(5)
Te-125m	2.5E-5	2E-4	1.83E+5
Te-127m	2.6E-4	9E-5	4.09E+4
Te-127	2.7E-4	1E-3	1.38E+6
Te-129m	1.1E-3	7E-5	4.02E+6
Te-129	6.7E-4	4E-3	1.12E+7
I-130	1.2E-4	2E-4	3.08E+8
Te-131m	1.6E-4	8E-5	1.82E+8
Te-131	3E-5	8E-4	1.20E+8
I-131	1.6E-1	1E-5	1.11E+8
Te-132	4.3E-3	9E-5	1.17E+8
I-132	4.9E-3	1E-3	2.66E+8
I-133	4.0E-2	7E-5	9.90E+7
I-134	8.0E-5	4E-3	2.70E+8
Cs-134	4.6E-2	9E-6	1.99E+8

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LIQUID SOURCE TERMS

I-135	4.3E-3	3E-4	1.19E+8
Cs-136	8.9E-3	6E-5	2.80E+8
Cs-137	3.3E-2	1E-5	8.01E+7
Ba-137m	3.1E-2	1E-5	8.01E+7
Ba-140	1.1E-4	8E-5	4.37E+7
La-140	1.1E-4	9E-5	2.00E+8
Ce-141	5.1E-5	3E-4	5.07E+7
Ce-143	2.8E-6	2E-4	7.27E+7
Ce-144	3.2E-5	3E-5	1.06E+7
Pr-143	2.7E-5	2E-4	1.04E+0
Pr-144	3.2E-5	6E-3	2.25E+6
H-3	5.50E+2	1E-2	(5)
TOTAL[1]	4.05E-1		

(1) Excluding Tritium and Entrained Noble Gases
(2) Source Term for (RM-1LW-104 and RM-1LW-116) from Stone and Webster Calculation Package UR(B)-160 [3.1.1.6]
(3) ODCM Effluent Concentration Limit = 10 times the EC values of 10 CFR 20 [3.1.1.3]
(4) Detection Efficiency for (RM-1LW-104 and RM-1LW-116) from Calculation Package ERS-SFL-92-039 [3.1.1.4]
(5) Insignificant

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LIQUID SOURCE TERMS

TABLE 1.1-1b
BV-2 LIQUID SOURCE TERM

NUCLIDE	(2) A_i ANNUAL RELEASE (Ci)	(3) OEC_i (uCi/ml)	(4) DETECTION EFFICIENCY (cpm/uCi/ml)
Cr-51	1.00E-4	5E-3	2.01E+7
Mn-54	2.50E-5	3E-4	1.27E+8
Fe-55	1.30E-4	1E-3	(5)
Fe-59	6.50E-5	1E-4	1.26E+8
Co-58	1.10E-3	2E-4	1.82E+8
Co-60	1.60E-4	3E-5	2.38E+8
Zn-65 (3.1.3.13)	5.10E-2	5E-5	6.50E+7
Np-239	3.20E-5	2E-4	1.65E+8
Br-83	2.90E-5	9E-3	2.42E+6
Br-84	5.90E-9	4E-3	1.38E+8
Rb-86	3.70E-5	7E-5	1.04E+7
Sr-89	2.20E-5	8E-5	1.83E+4
Sr-90	8.50E-7	5E-6	(5)
Sr-91	5.30E-6	2E-4	1.04E+8
Mo-99	2.30E-3	2E-4	4.47E+7
Tc-99m	2.10E-3	1E-2	1.40E+8
Te-125m	1.90E-6	2E-4	3.94E+5
Te-127m	2.10E-5	9E-5	1.26E+5
Te-127	2.50E-5	1E-3	2.43E+6
Te-129m	8.20E-5	7E-5	6.53E+6
Te-129	5.30E-5	4E-3	1.96E+7
I-130	2.30E-4	2E-4	5.18E+8
Te-131m	5.20E-5	8E-5	2.85E+8
Te-131	9.40E-6	8E-4	1.88E+8
I-131	1.00E-1	1E-5	1.96E+8
Te-132	7.80E-4	9E-5	1.76E+8
I-132	2.30E-3	1E-3	4.22E+8
I-133	6.50E-2	7E-5	1.73E+8
I-134	4.60E-6	4E-3	4.06E+8
Cs-134	3.00E-2	9E-6	3.25E+8
I-135	9.20E-3	3E-4	1.71E+8
Cs-136	3.90E-3	6E-5	4.28E+8
Cs-137	2.20E-2	1E-5	1.28E+8
Ba-137m	2.10E-2	1E-5	1.33E+8
Ba-140	9.30E-6	8E-5	7.50E+7
La-140	8.40E-6	9E-5	3.08E+8

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LIQUID SOURCE TERMS

TABLE 1.1-1b (continued)
BV-2 LIQUID SOURCE TERM

NUCLIDE	(2) A_i ANNUAL RELEASE (Ci)	(3) OEC_i (uCi/ml)	(4) E_i DETECTION EFFICIENCY (cpm/uCi/ml)
Y-90	6.00E-7	7E-5	
Y-91m	3.60E-6	2E-2	1.59E+8
Y-91	4.40E-6	8E-5	3.55E+5
Y-93	3.00E-7	2E-4	2.03E+7
Zr-95	4.00E-6	2E-4	1.35E+8
Nb-95	4.00E-6	3E-4	1.33E+8
Ru-103	2.70E-6	3E-4	1.71E+8
Ru-106	8.20E-7	3E-5	(5)
Rh-103m	2.70E-6	6E-2	(5)
Rh-106	8.20E-7	--	5.65E+7
Ce-141	4.00E-6	3E-4	7.75E+7
Ce-143	8.60E-7	2E-4	1.20E+8
Ce-144	2.60E-6	3E-5	1.87E+7
Pr-143	2.30E-6	2E-4	1.63E+0
Pr-144	2.60E-6	6E-3	3.40E+6
H-3	5.50E+2	1E-2	(5)
TOTAL(1)	2.40E-1		

(1) Excluding Tritium and Entrained Noble Gases
(2) Source Term for (2SGC-RQ100) from Computer Code LIQ1BB (3.1.2.3)
(3) ODCM Effluent Concentration Limit = 10 times the EC values of 10 CFR 20 (3.1.2.1)
(4) Detection Efficiency for (2SGC-RQ100) from Calculation Package ERS-SFL-86-026 (3.1.2.2)
(5) Insignificant

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INGESTION DOSE COMMITMENT FACTORS

TABLE 1.3-1

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01
C-14	3.13E 04	6.26E 03	6.26E 03	6.26E 03	6.26E 03	6.26E 03	6.26E 03
Na-24	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02
P-32	4.62E 07	2.87E 06	1.79E 06	0.00E-01	0.00E-01	0.00E-01	5.19E 06
Cr-51	0.00E-01	0.00E-01	1.27E 00	7.62E-01	2.81E-01	1.69E 00	3.21E 02
Mn-54	0.00E-01	4.38E 03	8.35E 02	0.00E-01	1.30E 03	0.00E-01	1.34E 04
Mn-56	0.00E-01	1.10E 02	1.95E 01	0.00E-01	1.40E 02	0.00E-01	3.52E 03
Fe-55	6.59E 02	4.56E 02	1.06E 02	0.00E-01	0.00E-01	2.54E 02	2.61E 02
Fe-59	1.04E 03	2.45E 03	9.38E 02	0.00E-01	0.00E-01	6.83E 02	8.15E 03
Co-57	0.00E-01	2.10E 01	3.50E 01	0.00E-01	0.00E-01	0.00E-01	5.33E 02
Co-58	0.00E-01	8.95E 01	2.01E 02	0.00E-01	0.00E-01	0.00E-01	1.81E 03
Co-60	0.00E-01	2.57E 02	5.67E 02	0.00E-01	0.00E-01	0.00E-01	4.83E 03
Ni-63	3.12E 04	2.16E 03	1.05E 03	0.00E-01	0.00E-01	0.00E-01	4.51E 02
Ni-65	1.27E 02	1.65E 01	7.51E 00	0.00E-01	0.00E-01	0.00E-01	4.17E 02
Cu-64	0.00E-01	1.00E 01	4.70E 00	0.00E-01	2.52E 01	0.00E-01	8.53E 02
Zn-65	2.32E 04	7.37E 04	3.33E 04	0.00E-01	4.93E 04	0.00E-01	4.64E 04
Zn-69	4.93E 01	9.43E 01	6.56E 00	0.00E-01	6.13E 01	0.00E-01	1.42E 01
Br-83	0.00E-01	0.00E-01	4.04E 01	0.00E-01	0.00E-01	0.00E-01	5.82E 01
Br-84	0.00E-01	0.00E-01	5.24E 01	0.00E-01	0.00E-01	0.00E-01	4.11E-04
Br-85	0.00E-01	0.00E-01	2.15E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Rb-86	0.00E-01	1.01E 05	4.71E 04	0.00E-01	0.00E-01	0.00E-01	1.99E 04
Rb-88	0.00E-01	2.90E 02	1.54E 02	0.00E-01	0.00E-01	0.00E-01	4.00E-09
Rb-89	0.00E-01	1.92E 02	1.35E 02	0.00E-01	0.00E-01	0.00E-01	1.12E-11
Sr-89	2.22E 04	0.00E-01	6.39E 02	0.00E-01	0.00E-01	0.00E-01	3.57E 03
Sr-90	5.48E 05	0.00E-01	1.34E 05	0.00E-01	0.00E-01	0.00E-01	1.58E 04
Sr-91	4.10E 02	0.00E-01	1.65E 01	0.00E-01	0.00E-01	0.00E-01	1.95E 03
Sr-92	1.55E 02	0.00E-01	6.72E 00	0.00E-01	0.00E-01	0.00E-01	3.08E 03
Y-90	5.80E-01	0.00E-01	1.55E-02	0.00E-01	0.00E-01	0.00E-01	6.15E 03
Y-91m	5.48E-03	0.00E-01	2.12E-04	0.00E-01	0.00E-01	0.00E-01	1.61E-02
Y-91	8.50E 00	0.00E-01	2.27E-01	0.00E-01	0.00E-01	0.00E-01	4.68E 03
Y-92	5.09E-02	0.00E-01	1.49E-03	0.00E-01	0.00E-01	0.00E-01	8.92E 02
Y-93	1.62E-01	0.00E-01	4.46E-03	0.00E-01	0.00E-01	0.00E-01	5.12E 03
Zr-95	2.53E-01	8.11E-02	5.49E-02	0.00E-01	1.27E-01	0.00E-01	2.57E 02
Zr-97	1.40E-02	2.82E-03	1.29E-03	0.00E-01	4.26E-03	0.00E-01	8.73E 02
Nb-95	4.47E 00	2.49E 00	1.34E 00	0.00E-01	2.46E 00	0.00E-01	1.51E 04
Nb-97	3.75E 02	9.49E-03	3.46E-03	0.00E-01	1.11E-02	0.00E-01	3.50E 01

ATTACHMENT B
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INGESTION DOSE COMMITMENT FACTORS

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
Mo-99	0.00E-01	1.05E 02	2.00E 01	0.00E-01	2.38E 02	0.00E-01	2.43E 02
Tc-99m	8.97E-03	2.54E-02	3.23E-01	0.00E-01	3.85E-01	1.24E-02	1.50E 01
Tc-101	9.23E-03	1.33E-02	1.30E-01	0.00E-01	2.39E-01	6.79E-03	4.00E-14
Ru-103	4.51E 00	0.00E-01	1.94E 00	0.00E-01	1.72E 01	0.00E-01	5.26E 02
Ru-105	3.75E-01	0.00E-01	1.48E-01	0.00E-01	4.85E 00	0.00E-01	2.29E 02
Ru-106	6.70E 01	0.00E-01	8.48E 00	0.00E-01	1.29E 02	0.00E-01	4.34E 03
Rh-103m	4.51E 00	0.00E-01	1.94E 00	0.00E-01	1.72E 01	0.00E-01	5.26E 02
Rh-105	2.95E 00	2.16E 00	1.42E 00	0.00E-01	9.16E 00	0.00E-01	3.43E 02
Rh-106	6.70E 01	0.00E-01	8.48E 00	0.00E-01	1.29E 02	0.00E-01	4.34E 03
Ag-110m	9.48E-01	8.77E-01	5.21E-01	0.00E-01	1.72E 00	0.00E-01	3.58E 02
Sb-124	7.87E 00	1.49E-01	3.12E 00	1.91E-02	0.00E-01	6.13E 00	2.23E 02
Sb-125	5.03E 00	5.62E-02	1.20E 00	5.11E-03	0.00E-01	3.88E 00	5.54E 01
Sb-126	3.23E 00	6.58E-02	1.17E 00	1.98E-02	0.00E-01	1.98E 00	2.64E 02
Sb-127	7.25E-01	1.59E-02	2.78E-01	8.71E-03	0.00E-01	4.30E-01	1.66E 02
Te-125m	2.57E 03	9.30E 02	3.44E 02	7.72E 02	1.04E 04	0.00E-01	1.03E 04
Te-127m	6.49E 03	2.32E 03	7.90E 02	1.66E 03	2.63E 04	0.00E-01	2.17E 04
Te-127	1.05E 02	3.78E 01	2.28E 01	7.81E 01	4.29E 02	0.00E-01	8.32E 03
Te-129m	1.10E 04	4.11E 03	1.74E 03	3.78E 03	4.60E 04	0.00E-01	5.55E 04
Te-129	3.01E 01	1.13E 01	7.33E 00	2.31E 01	1.26E 02	0.00E-01	2.27E 01
Te-131m	1.66E 03	8.10E 02	6.75E 02	1.28E 03	8.21E 03	0.00E-01	8.05E 04
Te-131	1.89E 01	7.88E 00	5.96E 00	1.55E 01	8.27E 01	0.00E-01	2.67E 00
Te-132	2.41E 03	1.56E 03	1.47E 03	1.72E 03	1.50E 04	0.00E-01	7.39E 04
Te-134	3.10E 01	2.03E 01	1.25E 01	2.71E 01	1.96E 02	0.00E-01	3.44E-02
I-129	1.19E 02	1.02E 02	3.35E 02	2.63E 05	2.19E 02	0.00E-01	1.61E 01
I-130	2.75E 01	8.10E 01	3.20E 01	6.87E 03	1.26E 02	0.00E-01	6.97E 01
I-131	1.51E 02	2.16E 02	1.24E 02	7.08E 04	3.71E 02	0.00E-01	5.70E 01
I-132	7.37E 00	1.97E 01	6.90E 00	6.90E 02	3.14E 01	0.00E-01	3.71E 00
I-133	5.16E 01	8.97E 01	2.74E 01	1.32E 04	1.57E 02	0.00E-01	8.06E 01
I-134	3.85E 00	1.05E 01	3.74E 00	1.81E 02	1.66E 01	0.00E-01	9.12E-03
I-135	1.61E 01	4.21E 01	1.55E 01	2.78E 03	6.76E 01	0.00E-01	4.76E 01
Cs-134	2.98E 05	7.09E 05	5.79E 05	0.00E-01	2.29E 05	7.61E 04	1.24E 04
Cs-136	3.12E 04	1.23E 05	8.86E 04	0.00E-01	6.85E 04	9.39E 03	1.40E 04
Cs-137	3.82E 05	5.22E 05	3.42E 05	0.00E-01	1.77E 05	5.89E 04	1.01E 04
Cs-138	2.64E 02	5.22E 02	2.59E 02	0.00E-01	3.84E 02	3.79E 01	2.23E-03
Ba-139	9.69E-01	6.90E-04	2.84E-02	0.00E-01	6.45E-04	3.92E-04	1.72E 00
Ba-140	2.03E 02	2.55E-01	1.33E 01	0.00E-01	8.66E-02	1.46E-01	4.18E 02

ATTACHMENT B
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INGESTION DOSE COMMITMENT FACTORS

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
Ba-141	4.71E-01	3.56E-04	1.59E-02	0.00E-01	3.31E-04	2.02E-04	2.22E-10
Ba-142	2.13E-01	2.19E-04	1.34E-02	0.00E-01	1.85E-04	1.24E-04	3.00E-19
La-140	1.51E-01	7.59E-02	2.01E-02	0.00E-01	0.00E-01	0.00E-01	5.57E 03
La-142	7.71E-03	3.51E-03	8.74E-04	0.00E-01	0.00E-01	0.00E-01	2.56E 01
Ce-141	2.63E-02	1.78E-02	2.02E-03	0.00E-01	8.26E-03	0.00E-01	6.80E 01
Ce-143	4.64E-03	3.43E 00	3.79E-04	0.00E-01	1.51E-03	0.00E-01	1.28E 02
Ce-144	1.37E 00	5.73E-01	7.36E-02	0.00E-01	3.40E-01	0.00E-01	4.64E 02
Pr-143	5.54E-01	2.22E-01	2.75E-02	0.00E-01	1.28E-01	0.00E-01	2.43E 03
Pr-144	1.81E-03	7.53E-04	9.22E-05	0.00E-01	4.25E-04	0.00E-01	2.61E-10
Nd-147	3.79E-01	4.38E-01	2.62E-02	0.00E-01	2.56E-01	0.00E-01	2.10E 03
Pm-147	4.54E 00	4.27E-01	1.73E-01	0.00E-01	8.08E-01	0.00E-01	5.38E 02
Pm-149	9.16E-02	1.30E-02	5.29E-03	0.00E-01	2.45E-02	0.00E-01	2.43E 03
Sm-151	4.16E 00	7.17E-01	1.72E-01	0.00E-01	8.02E-01	0.00E-01	3.17E 02
Sm-153	5.16E-02	4.31E-02	3.15E-03	0.00E-01	1.39E-02	0.00E-01	1.54E 03
W-187	2.96E 02	2.47E 02	8.65E 01	0.00E-01	0.00E-01	0.00E-01	8.10E 04
Np-239	2.90E-02	2.85E-03	1.57E-03	0.00E-01	8.89E-03	0.00E-01	5.85E 02

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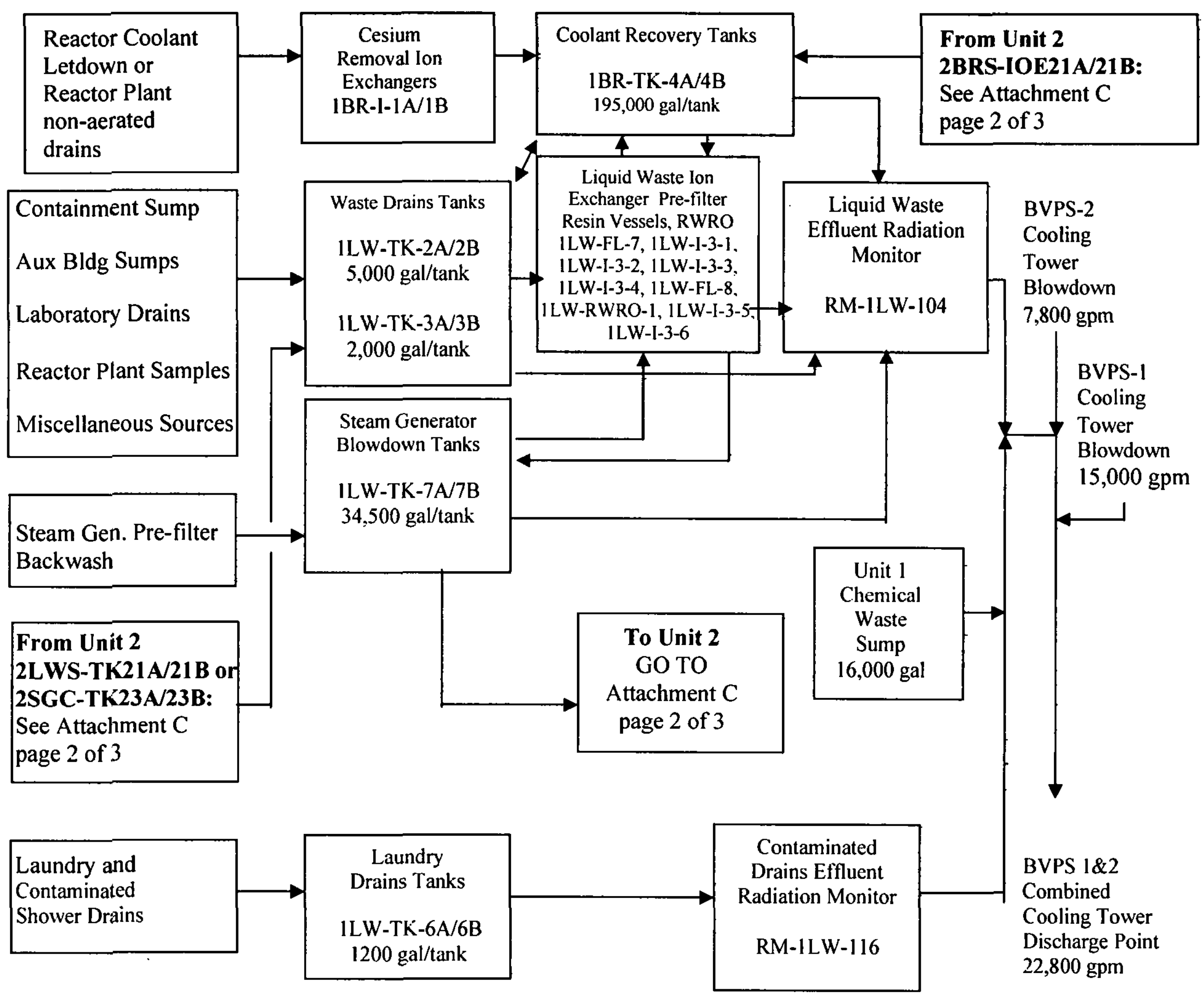
LIQUID RADWASTE SYSTEM

FIGURE 1.4-1
BV-1 LIQUID RADWASTE SYSTEM

STREAM **UNIT 1: COLLECTION, TREATMENT, & DISCHARGE**



3-7-14

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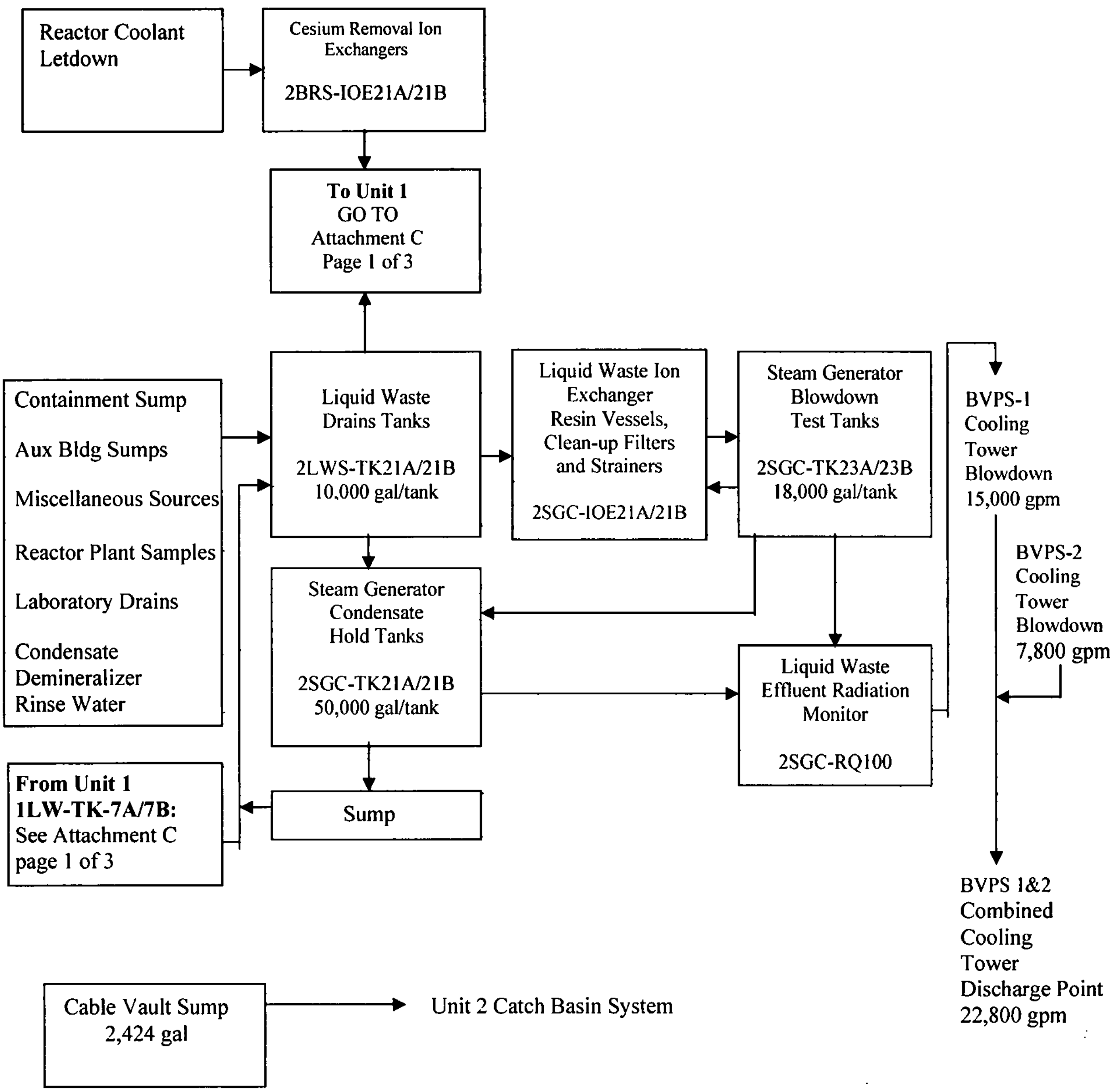
LIQUID RADWASTE SYSTEM

FIGURE 1.4-2
BV-2 LIQUID RADWASTE SYSTEM

STREAM **UNIT 2: COLLECTION, TREATMENT, & DISCHARGE**



ATTACHMENT C
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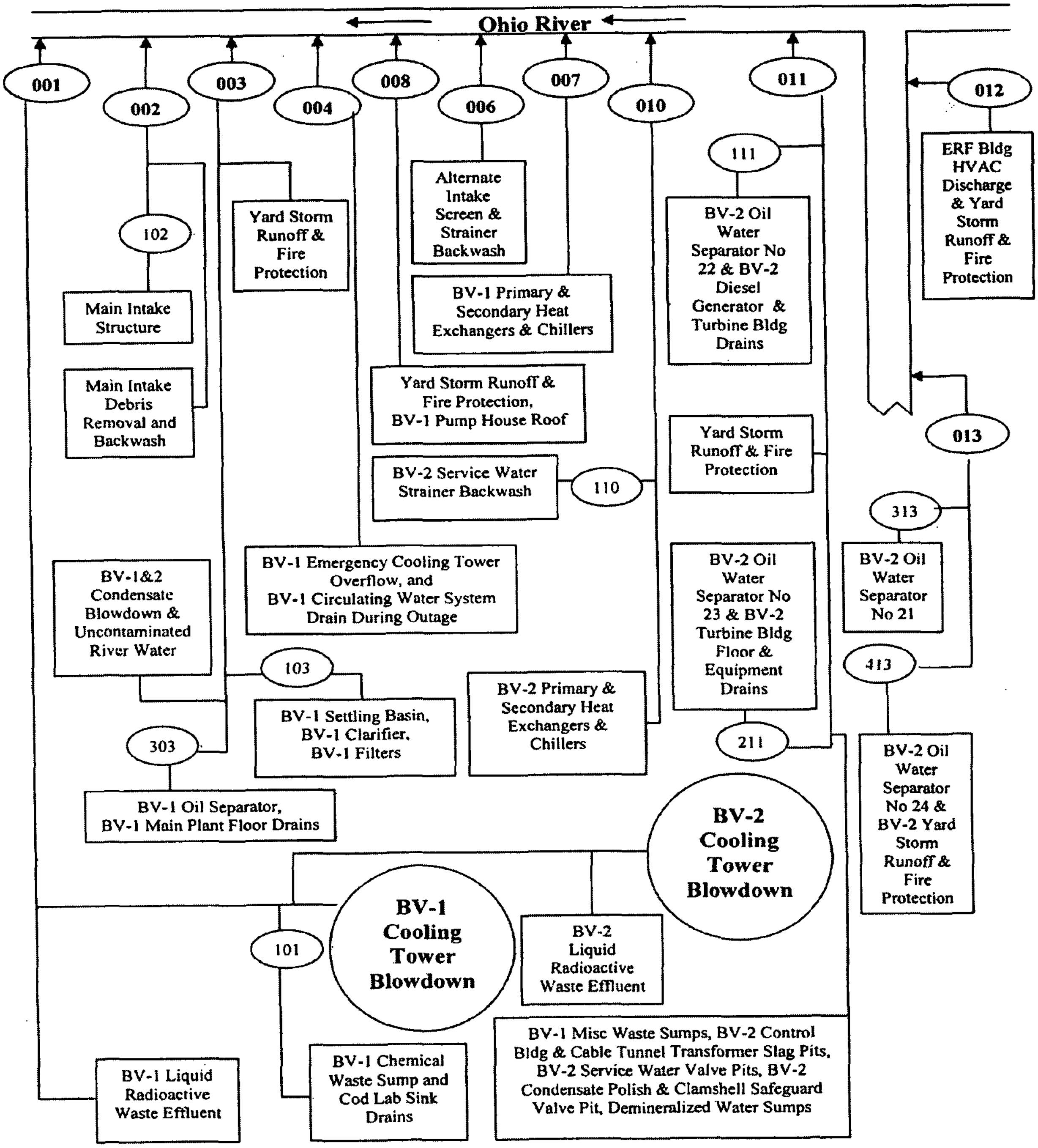
LIQUID RADWASTE SYSTEM

FIGURE 1.4-3
BV-1 AND 2 LIQUID EFFLUENT RELEASE POINTS



ATTACHMENT D

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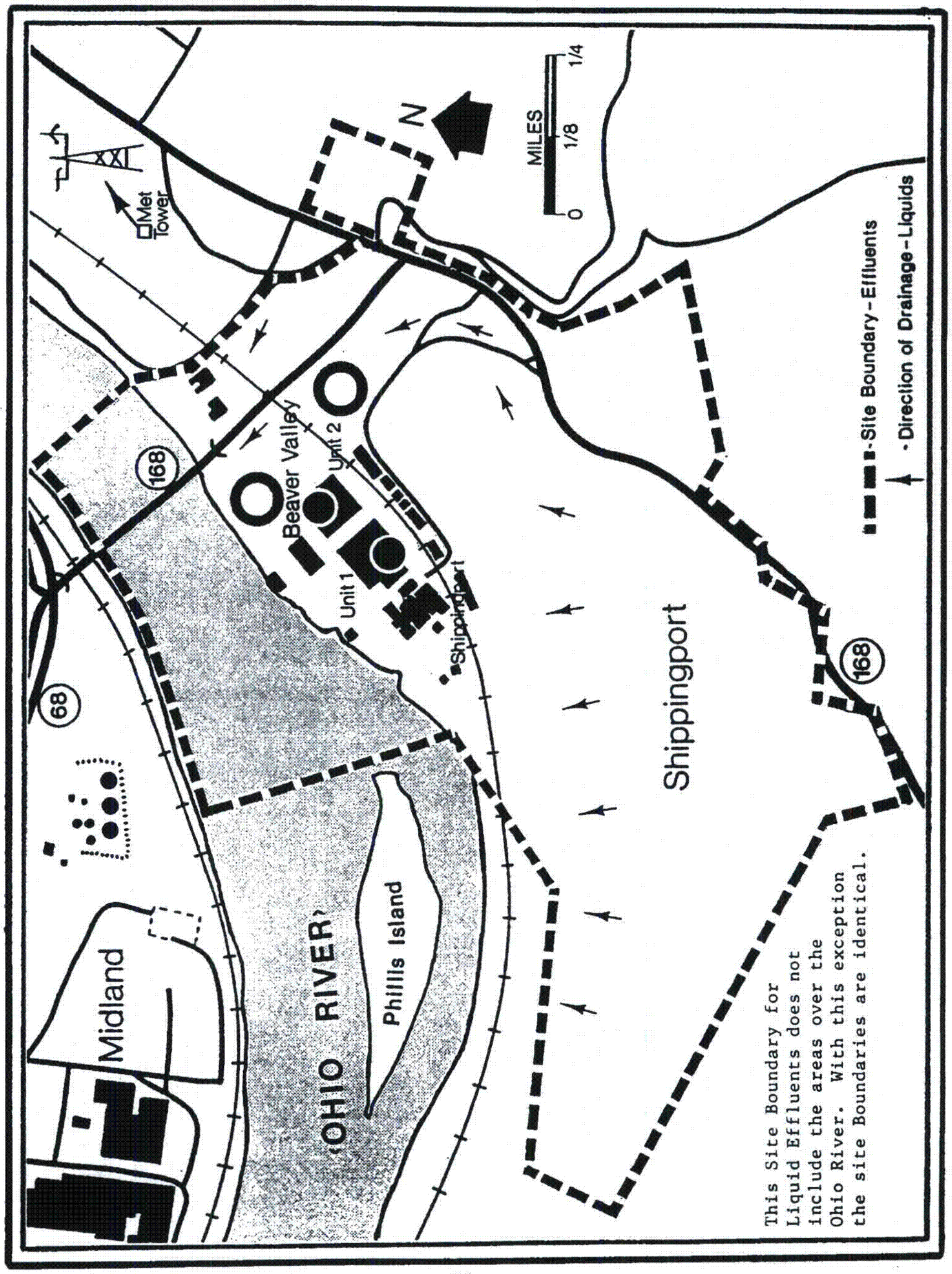
SITE BOUNDARY FOR LIQUID EFFLUENTS

FIGURE 5-1

SITE BOUNDARY FOR LIQUID EFFLUENTS



Beaver Valley Power Station

Unit 1/2

1/2-ODC-2.02

ODCM: GASEOUS EFFLUENTS

Document Owner
Manager, Nuclear Environmental & Chemistry

Revision Number	5
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	10/07/14

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1.0 PURPOSE

1.1 This procedure provides the methodology to calculate dose, dose rates, and alarm setpoints from gaseous effluents in accordance with the requirements of Beaver Valley Technical Specifications [TS] 5.5.2.

1.1.1 Gaseous effluent monitor alarm setpoints [TS] 5.5.2.a

1.1.2 Gaseous effluent dose rate calculations [TS] 5.5.2.g

1.1.3 Gaseous effluent dose calculations [TS] 5.5.2.g, [TS] 5.5.2.h, [TS] 5.5.2.i

1.1.4 Gaseous Radwaste Treatment System [TS] 5.5.2.f

1.1.5 Site Boundary used for gaseous effluents

2.0 SCOPE

2.1 This procedure is applicable to gaseous effluents at Beaver Valley Power Station.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 References for BV-1 Gaseous Effluent Monitor Setpoints

3.1.1.1 Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412; Table 2.1-3

3.1.1.2 Beaver Valley Power Station, Unit 2 UFSAR; Table 11.3-1

3.1.1.3 BVPS Specification No. BVS 414, Table V Nuclide Data,; Table 1 and Figure 1, Table 3, and Figure 2, May 30, 1974

3.1.1.4 Calculation Package No. ERS-SFL-85-031, Unit 1 Gaseous Effluent Monitor Efficiency Data

3.1.1.5 Calculation Package No. ERS-HHM-87-014, Unit 1/Unit 2 ODCM Gaseous Alarm Setpoint Determinations

3.1.1.6 Calculation Package No. ERS-ATL-87-026, BVPS-1 and BVPS-2 ODCM T Factor Justification

3.1.1.7 Letter ND1SHP:776, dated February 12, 1988, BVPS-1 ODCM Table 2.2-2, Appendix B

3.1.1.8 Stone and Webster Calculation No. UR(B)-262, Gaseous Releases From Containment Vacuum Pumps

3.1.2 References for BV-2 Gaseous Effluent Monitor Setpoints

3.1.2.1 Calculation Package No. ERS-SFL-86-026, Unit 2 DRMS Isotopic Efficiencies

3.1.2.2 Calculation Package No. ERS-HHM-87-014, Unit 1/Unit 2 ODCM Gaseous Alarm Setpoint Determinations

3.1.2.3 Beaver Valley Power Station, Unit 2 UFSAR; Table 11.3-2

3.1.2.4 Calculation Package No. ERS-ATL-87-026, BVPS-1 and BVPS-2 ODCM T Factor Justification

3.1.2.5 Stone and Webster Calculation No. UR(B)-262, Gaseous Releases From Containment Vacuum Pumps

3.1.3 References used in other sections of this procedure

3.1.3.1 NUREG-0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants

3.1.3.2 NUREG-1301, Offsite Dose Calculation Manual Guidance; Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

3.1.3.3 NUREG-0324; XOQDOQ Program for the Meteorological Evaluation of Routine Releases at Nuclear Power Stations, September 1977

3.1.3.4 NUREG-0017; Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents form PWR's Revision 0.

3.1.3.5 Regulatory Guide 1.109, Calculation of Annual Dose to Man from Routine Releases of Reactor Effluents for the Purpose of Implementing Appendix I, April 1977

3.1.3.6 NUREG-0172, Age - Specific Radiation Dose Commitment Factors for a one-year Chronic Intake

3.1.3.7 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.3.8 1/2-ADM-0100, Procedure Writers Guide

3.1.3.9 NOP-SS-3001, Procedure Review and Approval

3.1.3.10 CR03-04830, Containment Vacuum Pump Replacement Increases ODCM Source Term. CA-03, Revise Unit 1 Containment Vacuum Pump Source-Term in ODCM procedure 1/2-ODC-2.02, Attachment A, Table 2.1-1a.

3.1.3.11 CR 05-01169, Chemistry Action Plan for Transition of RETS, REMP and ODCM. CA-16, Revise procedure 1/2-ODC-2.02 to change document owner from Manager, Radiation Protection to Manager, Nuclear Environmental & Chemistry.

3.1.3.12 Unit 1 Technical Specification Amendment No. 275 (LAR 1A-302) to License No. DPR-66. This amendment to the Unit 1 license was approved by the NRC on July 19, 2006.

3.1.3.13 Vendor Calculation Package No. 8700-UR(B)-223, Impact of Atmospheric Containment Conversion, Power Uprate, and Alternative Source Terms on the Alarm Setpoints for the Radiation Monitors at Unit 1.

3.1.3.14 Engineering Change Package No. ECP-04-0440, Extended Power Uprate.

3.1.3.15 CR 06-04908, Radiation Monitor Alarm Setpoint Discrepancies. CA-03; revise ODCM procedure 1/2-ODC-2.02 to update the alarm setpoints of gaseous effluent radiation monitor for incorporation of the Extended Power Uprate per Unit 1 TS Amendment No. 275.

3.1.3.16 MELCOR Accident Consequence Code System for the Calculation of the Health and Economic Consequences of accidental Atmospheric Radiological Releases (MACCS2 V.1.12), Oak Ridge National Laboratory.

3.1.3.17 Federal Guidance Report No. 11: Limiting Values of Radionuclide Intake And Air Concentration and Dose Conversion Factors For Inhalation, Submersion, and Ingestion, September 1988.

3.1.3.18 Federal Guidance Report No. 12: External Exposure to Radionuclides in Air, Water, and Soil, September 1993.

3.1.3.19 L. R. McKay (Ed.), A Methodology for Calculating Radiation Doses from Radioactivity Released to the Environment (ORNL-4992), Oak Ridge National Laboratory, 1975.

3.1.3.20 CR 10-85877, Selenium-75 (Se-75) discharge via U1/U2 Process Vent. CA-02 revises ODCM procedure 1/2-ODC-2.02 to include dose factors for Se-75.

3.1.3.21 Technical Evaluation Package ERS-LMR-12-001, ODCM Piτ and R values for Carbon-14.

3.1.3.22 Notification 600727275 and CR #2012-17177, Revise 1/2-ODC-2.02, Gaseous Effluents, with the R values for Sb-126.

3.1.3.23 Notification 600737534 Item #4, Revise ODCM for Carbon-14.

3.1.3.24 10 CFR 72.104, Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS.

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3.2 **Commitments**

3.2.1 Beaver Valley Technical Specifications: [TS] 5.5.2, Radioactive Effluent Controls Program.

4.0 RECORDS AND FORMS

4.1 **Records**

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.2 **Forms**

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 **Precautions**

5.1.1 None.

5.2 **Limitations**

5.2.1 Offsite Dose Calculation Manual (ODCM) controls applicable to dose rate apply to the site. The site dose rate is calculated by summing the releases from both units.

5.2.2 ODCM controls applicable to accumulated dose apply individually to each unit.

5.2.3 Releases at the Beaver Valley site are characterized as Ground Level or Elevated in nature.

5.2.3.1 Ground Level releases are attributed to the specific unit for which the release occurs. Determination of site dose rate and dose is assigned to the specific unit.

5.2.3.2 Elevated releases are attributed to both units because they originate, by design from a shared radwaste system. Elevated releases are discharged from a common release point, the Process Vent, at the top of the BV-1 cooling tower.

5.2.4 Dose from continuous and batch (Gas Waste Storage Tanks) releases at BV-1 and BV-2 via the shared radwaste system (Process Vent) are normally attributed equally to the units. Containment purge through the Process Vent is attributed to the specific unit for which it originates. Continuous and batch releases via non-shared radwaste systems shall be attributed to the specific unit for which it originates.

5.2.5 A difference in alarm setpoint terminology presentations for the radiation monitoring systems of BV-1 and BV-2 is described as follows:

5.2.5.1 HIGH and HIGH-HIGH terminology are used for the BV-1 Victoreen monitors, ALERT and HIGH terminology are used for the BV-1 Eberline SPING monitors and the BV-2 monitors.

5.2.5.2 BV-1 alarm setpoints are expressed in counts per minute (cpm) and BV-2 alarm setpoints are expressed in microcurie per cubic centimeters (uCi/cc). The difference is due to BV-2 software which applies a conversion factor to the raw data (cpm) to convert units to uCi/cc. Note that the uCi/cc presentation is technically correct only for the specific isotopic mix used in the determination of the conversion factors. Therefore, BV-2 setpoints determined on analysis prior to release will be correct for properly controlling dose rate, but the indicated uCi/cc value may differ from the actual value.

5.2.5.3 BV-1 and BV-2 effluent monitors specified in this procedure have Upper Alarm Setpoints established at sixty (60) percent of the site limit and Lower Alarm Setpoints established at thirty (30) percent of the site limit.

5.2.6 Releases are characterized as batch or continuous in nature.

5.2.6.1 Batch refers to releases that are intermittent in radionuclide concentrations or flow, such as releases from gas storage tanks, containment purges, and venting of systems or components with infrequent use.

5.2.6.2 Batch releases may occur due to operational variations which result in radioactive releases greater than fifty (50) % of the releases normally considered as continuous. Batch releases from these sources during normal operation, including anticipated operational occurrences, are defined as those which occur for a total of five-hundred (500) hours or less in a calendar year, but not more than one-hundred (150) hours in any quarter.

5.2.6.3 The batch relative concentration value has been calculated in accordance with the guidelines provided in NUREG-0324[3.1.3.3] for short-term release.

5.2.6.4 If a batch and continuous release occur simultaneously from the same vent path, then use the lowest setpoint obtained as determined in Sections 8.1.1.1 through 8.1.3.2.

5.2.7 This procedure also contains information that was previously contained in Section 5 of the previous BV-1 and BV-2 Offsite Dose Calculation Manual.

5.2.7.1 In regards to this, the site boundary for gaseous effluents was included in this procedure.

5.2.7.2 The Site Boundary for Gaseous Effluents is shown in ATTACHMENT P Figure 5-1.

6.0 ACCEPTANCE CRITERIA

6.1 Changes to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104, and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculation.(3.1.3.2)

6.1.1 Changes to this procedure shall be prepared in accordance with 1/2-ADM-0100, PROCEDURE WRITER'S GUIDE (3.1.3.8) and 1/2-ADM-1640, CONTROL OF THE OFFSITE DOSE CALCULATION MANUAL.(3.1.3.7)

6.1.2 Changes to this procedure shall be reviewed and approved in accordance with NOP-SS-3001, PROCEDURE REVIEW AND APPROVAL (3.1.3.9) and 1/2-ADM-1640. (3.1.3.7)

7.0 PREREQUISITES

7.1 None.

8.0 PROCEDURE

8.1 Alarm Setpoints

8.1.1 BV-1 Monitor Alarm Setpoint Determination

ODCM CONTROL 3.11.2.1 require that the dose rate in unrestricted areas due to noble gas radionuclides in the gaseous effluent released from the site shall be limited to $\leq$ 500 mrem/yr to the total body and to $\leq$ 3000 mrem/yr to the skin.

This section describes the methodology used to maintain the release of noble gas radionuclides within ODCM CONTROL 3.11.2.1 for the site, and determines monitor setpoints for BV-1.

The methodologies described in Section 8.1.1.2, 8.1.2.2, and 8.1.3.2 provide an alternate means of determining monitor alarm setpoints that may be used when an analysis is performed prior to release.

Control of the site dose rate limit due to noble gases is shown in the following Table. Dose rate control is exercised through a total of eight (8) effluent stream monitors, of which three (3) are located at BV-1 (alternates exists for these monitors), and five (5) are located at BV-2. As previously noted, BV-1 and BV-2 elevated releases are via the PV-1/2 Process Vent.

Monitor Setpoint Specifications Based On Fraction Of Site Limit

UNIT RELEASE POINT MONITOR NO.	FRACTION OF SITE LIMITING DOSE RATE	
	Upper Alarm	Lower Alarm
(VV-1) Unit 1, Auxiliary Building Vent		
Pri.: RM-1VS-101B or	60% (HIGH-HIGH)	30% (HIGH)
Alt.: RM-1VS-109 (5)	60% (HIGH)	30% (ALERT)
(CV-1) Unit 1, Rχ Containment/SLCRS Vent		
Pri.: RM-1VS-107B or	60% (HIGH-HIGH)	30% (HIGH)
Alt.: RM-1VS-110 (5)	60% (HIGH)	30% (ALERT)
(PV-1/2), Unit 1/2, Gaseous Waste/Process Vent		
Pri.: RM-1GW-108B or	60% (HIGH-HIGH)	30% (HIGH)
Alt.: RM-1GW-109 (5)	60% (HIGH)	30% (ALERT)
(CV-2), Unit 2, SLCRS Filtered Pathway		
2HVS-RQ109E	60% (HIGH)	30% (ALERT)
(VV-2), Unit 2, SLCRS Unfiltered Pathway		
2HVS-RQ101B	60% (HIGH)	30% (ALERT)
(WV-2), Unit 2, Waste Gas Storage Vault Vent		
2RMQ-RQ303B	60% (HIGH)	30% (ALERT)
(DV-2), Unit 2, Decontamination Building Vent		
2RMQ-RQ301B	60% (HIGH)	30% (ALERT)
(CB-2), Condensate Polishing Building Vent		
2HVL-RQ112B	60% (HIGH)	30% (ALERT)

With the monitor setpoints based on fractions of the site limit as defined above, the following criteria may be applied to determine that the dose rate due to noble gas released from the site complies with ODCM CONTROL 3.11.2.1:

- The site dose rate is thirty (30) % of the site dose rate limit when any monitor is indicating a Lower Alarm.
- The site dose rate is sixty (60) % of the site dose rate limit when any two monitors are indicating Lower Alarms.
- The site dose rate is sixty (60) % of the site dose rate limit when any monitor is indicating an Upper Alarm.
- The site dose rate is ninety (90) % of the site dose rate limit when any monitor is indicating an Upper Alarm and any other monitor is indicating a Lower Alarm.

8.1.1.1 **BV-1 Setpoint Determination Based On A Calculated Mix For VV-1 and CV-1 Ground Releases**

The table below gives the calculated monitor count rate above background (CR), in ncpm, and provides the equivalent monitor indication associated with the most limiting site dose rate limit (i.e.; 500 mrem/yr Total Border or 3000 mrem/yr skin). The monitor HIGH-HIGH alarm setpoint above background (HHSP), and the monitor HIGH alarm setpoint above background (HSP) for each vent and operational condition shall be as follows:

BV-1 ALARM SETPOINTS FOR GROUND RELEASES

cpm ABOVE BACKGROUND

	(P) PRIMARY* MONITOR (A) ALTERNATE MONITOR	CR	60% SITE LIMIT UPPER ALARM	30% SITE LIMIT UPPER ALARM
• Continuous Release Via The BV-1 Auxiliary Building Vent (VV-1)	(P)RM-1VS-101B	3000	≤ 1800	≤ 900
	(A)RM-1VS-109(5)	1470	≤ 879	≤ 440
• Batch Release Of Containment Purge Via The BV-1 Auxiliary Building Vent (VV-1)	(P)RM-1VS-101B	1200	≤ 718	≤ 359
	(A)RM-1VS-109(5)	1430	≤ 860	≤ 430
• Continuous Release Via The BV-1 Rx Containment/SLCRS Vent (CV-1)	(P)RM-1VS-107B	6440	≤ 3870	≤ 1930
	(A)RM-1VS-110(5)	3380	≤ 2030	≤ 1010
• Batch Release Of Containment Purge Via The BV-1 Rx Containment/SLCRS Vent (CV-1)	(P)RM-1VS-107B	12,700	≤ 7630	≤ 3810
	(A)RM-1VS-110(5)	6660	≤ 4000	≤ 2000

*IF the primary monitor is out of service, THEN ODCM CONTROL 3.3.3.10 is met for the respective alternate monitor. The alternate setpoints shall be utilized.

The setpoints were determined using the following conditions and information:

- Source terms given in ATTACHMENT A Table 2.1-1a. The gaseous source terms were derived from Stone & Webster computer code GAS1BB (similar to NUREG-0017),[3.1.3.4] and computer code DRAGON 4 (for the containment vacuum pump sources). ATTACHMENT A Table 2.1-1a does not include particulates and iodines, which are not used in site noble gas dose rate calculations.
- Onsite meteorological data for the period January 1, 1976 through December 31, 1980.
- Discharge flow rate of 62,000 cfm for a VV-1 Continuous Release.

- Discharge flow rate of 92,000 cfm for a VV-1 Batch Release of Containment Purge. This is comprised of 30,000 cfm from the containment purge plus 62,000 cfm for VV-1.
- Discharge flow rate of 49,300 cfm for a CV-1 Continuous Release.
- Discharge flow rate of 56,800 cfm for a CV-1 Batch Release of Containment Purge. This is comprised of 7,500 cfm from the containment purge plus 49,300 cfm for CV-1.
- Information listed under References for BV-1 Gaseous Effluent Monitor Setpoints.

The calculation method given in Sections 8.1.1.1.1 through 8.1.1.1.7 was used to derive the monitor setpoints for the following operational conditions:

- Continuous release via VV-1.
- Continuous release via CV-1.
- Batch release of BV-1 Containment Purge via VV-1.
- Batch release of BV-1 Containment Purge via CV-2.

8.1.1.1.1 **BV-1 Mix Radionuclides**

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

- The gaseous source terms that are representative of the "mix" of the gaseous effluent were selected. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. Gaseous source terms can be obtained from ATTACHMENT A Table 2.1-1a.
- The fraction of the total radioactivity in the gaseous effluent comprised of noble gas radionuclide "i" (Si) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1(1)\text{-}1]$$

where:

A_i = The total radioactivity or radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent from ATTACHMENT A Table 2.1-1a.

8.1.1.1.2 **BV-1 Maximum Acceptable Release Rate (Whole Body Exposure)**

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was calculated by:

$$Q_t = \frac{500}{(X/Q) \sum_i K_i \; S_i} \qquad [2.1(1)\text{-}2]$$

where:

$(X/Q)_{vv}$ = The highest calculated annual average relative concentration of effluents released via VV-1 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-5.

= 1.03E-4 sec/m^3 for continuous releases.

$(X/q)_{vv}$ = The highest calculated short term relative concentration of effluents released via VV-1 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-36.

= 3.32E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cv}$ = The highest calculated annual average relative concentration of effluents released via CV-1 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-4.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/q)_{cv}$ = The highest calculated short term relative concentration of effluents released via CV-1 for any area at or beyond the unrestricted area boundary for any sectors (sec/m^3) from ATTACHMENT M Table 2.3-35.

= 3.08E-4 sec/m^3 for batch release of containment purge.

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

S_i = From equation [2.1(1)-1] above.

8.1.1.1.3 **BV-1 Maximum Acceptable Release Rate (Skin Exposure)**

Q_t was also determined based upon the skin exposure limit by:

$$Q_t = \frac{3000}{(X/Q)\sum_i (L_i + 1.1M_i)\, S_i}$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i"(mrad/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photons of interest, (mrem/mrad).

(X/Q) = Same as in Section 8.1.1.1.2.

8.1.1.1.4 **BV-1 Maximum Acceptable Release Rate (Individual Radionuclide)**

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i\, Q_t \qquad [2.1(1)\text{-}4]$$

NOTE: Use the lower of the Q_t values obtained in Section 8.1.1.1.2 and 8.1.1.1.3.

8.1.1.1.5 **BV-1 Maximum Acceptable Concentrations (Individual Radionuclide)**

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (C_i) for each individual noble gas radionuclide "i" in the gaseous effluent was determined by:

$$C_i = \frac{2.12\text{E-}3\ Q_i}{F} \qquad [2.1(1)\text{-}5]$$

where:

F = The maximum acceptable effluent flow rate at the point of release (cfm) as listed in Section 8.1.1.1.

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

8.1.1.1.6 **BV-1 Monitor Count Rate**

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide. CR was determined by:

$$CR = \sum_i C_i E_i \qquad [2.1(1)\text{-}6)]$$

where:

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2a.

8.1.1.1.7 **BV-1 Monitor Setpoints**

The monitor alarm setpoints above background were determined as follows:

- The monitor HIGH-HIGH Alarm Setpoint above background (ncpm) was determined by:

  $$HHSP = 0.60 \times CR \qquad [2.1(1)\text{-}7]$$

- The monitor HIGH Alarm Setpoint above background (ncpm) was determined by:

  $$HSP = 0.30 \times CR \qquad [2.1(1)\text{-}8]$$

NOTE: The values 0.60 for the HHSP and 0.30 for the HSP are fractions of the total radioactivity concentration that may be released via the monitored pathway to ensure that the site boundary limit is not exceeded due to simultaneous releases from both units.

8.1.1.2 **BV-1 Setpoint Determination Based On Analysis Prior To Release For VV-1 and CV-1 Ground Releases**

When the setpoints established using "the calculated mix" for ground releases do not provide adequate flexibility for operational needs, the method described below may be used in lieu of that set forth in Step 8.1.1.1. In this case, the results of sample analysis are used to determine the source term "mix." This calculational method applies to gaseous releases via VV-1 and CV-1 when determining the setpoint for the maximum acceptable discharge flow rate and the associated HIGH-HIGH Alarm Setpoint based on this flow rate during the following operational conditions:

- Batch release of Containment Purge via VV-1.
- Batch release of Containment Purge via CV-1.

8.1.1.2.1 **BV-1 Maximum Acceptable Release Rate**

The maximum acceptable discharge flow rate from VV-1 and CV-1 during purging is determined as follows:

- The maximum acceptable gaseous discharge flow rate (f) from VV-1 and CV-1 (cfm) during purging based upon the whole body exposure limit is calculated by:

$$f = \frac{1.06\ S\ T}{(X/q) \sum_i K_i\ C_i} \qquad [2.1(1)\text{-}17]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm set point rules of Section 8.1.1.

T = Maximum valve for T is 16 based on the limiting restriction in ODCM CONTROL 3.11.2.1 where the dose rate for a containment purge may be averaged over a time period not to exceed 960 minutes. (As containment air volume change time period is 60 minutes; T = 960/60 = 16).(3.1.1.6)

$(X/q)_{vv}$ = The highest calculated short term relative concentration of effluents released via VV-1 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-36.

= 3.32E-4 sec/m^3

$(X/q)_{cv}$ = The highest calculated short term relative concentration of effluents released via CV-1 for areas at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-37.

= 3.08E-4 sec/m^3

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" ($mrem/year/uCi/m^3$) from ATTACHMENT G Table 2.2-11.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

- The flow rate (f) is also determined based upon the skin exposure limit as follows:

$$f = \frac{6.36\ S\ T}{(X/q) \sum_i (L_i + 1.1 M_i)\ C_i} \qquad [2.1(1)\text{-}18]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i" (mrad/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

(X/q) = Same as above.

- The flow rate (f) is determined by selecting the smaller of the calculated (f) values based on the whole body exposure limit, or the skin exposure limit shown above. The actual purge flow rate (cfm) must be maintained at or below this calculated (f) value or the discharge cannot be made from the vent.

8.1.1.2.2 **BV-1 Monitor Setpoints**

The monitor alarm setpoints above background are determined as follows:

- The calculated monitor HIGH-HIGH Alarm Setpoint above background (ncpm) attributed to noble gas radionuclides is determined by:

$$HHSP = \frac{f \sum_i C_i E_i}{F'} \qquad [2.1(1)\text{-}19]$$

where:

f = The maximum acceptable gaseous discharge flow rate (cfm) determined in Section 8.1.1.2.1.

F′ = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 92,000 cfm for VV-1

= 56,800 cfm for CV-1

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2a.

- When a HIGH-HIGH set point has been calculated according to this section, the monitor HIGH Alarm Setpoint above background (ncpm) is determined as follows:

HSP = HHSP x 0.5 [2.1(1)-20]

8.1.2 **<u>BV-2 Monitor Alarm Setpoint Determination</u>**

See Section 8.1.1 for a description of Monitor Alarm Setpoint Determinations.

8.1.2.1 **<u>BV-2 Setpoint Determination Based On A Calculated Mix For VV-2, CV-2, DV-2, WV-2 and CB-2 Ground Releases.</u>**

The table below gives the calculated monitor count rate above background (CR) in ncpm, and provides the equivalent monitor indication (DV) in net uCi/cc associated with the most limiting site dose rate limit (i.e., 500 mrem/yr Total Body or 3000 mrem/yr Skin). The HIGH alarm setpoint (HSP) in uCi/cc above background, and the ALERT alarm setpoint (ASP) in uCi/cc above background for each vent and operational condition shall be as follows:

BV2 ALARM SETPOINTS FOR GROUND RELEASES
uCi/cc ABOVE BACKGROUND
(unless otherwise specified)

	MONITOR	CR ncpm	DV	60% SITE LIMIT UPPER ALARM	30% SITE LIMIT LOWER ALARM
• Continuous Release Via The BV-2 SLCRS Unfiltered Pathway (VV-2)	2HVS-RQ101B	8260	3.01E-4	≤ 1.81E-4	≤ 9.04E-5
• Batch Release Of Containment Purge Via The BV-2 SLCRS Unfiltered Pathway (VV-2)	2HVS-RQ101B	2020	7.39E-5	≤ 4.43E-5	≤ 2.22E-5
• Continuous Release Via The BV-2 SLCRS Filtered Pathway (CV-2)	2HVS-RQ109E	4320	2940 µCi/sec	≤ 1770 µCi/sec	≤ 883 µCi/sec
• Batch Release Of Containment Purge Via The BV-2 SLCRS Filtered Pathway (CV-2)	2HVS-RQ109E	16,400	1130 µCi/sec	≤ 676 µCi/sec	≤ 338 µCi/sec
• Continuous Release Via The BV-2 Condensate Polishing Building Vent (CB-2)	2HVL-RQ112B	28,900	1.61E-3	≤ 9.63E-4	≤ 4.82E-4
• Continuous Release Via The BV-2 Decontamination Building Vent (DV-2)	2RMQ-RQ301B	56,600	3.15E-3	≤ 1.89E-3	≤ 9.44E-4
• Continuous Release Via The BV-2 Waste Gas Storage Vault Vent (WV-2)	2RMQ-RQ303B	912,000	2.58E-2	≤ 1.55E-2	≤ 7.74E-3

The setpoints were determined using the following conditions and information:

- Source terms given in ATTACHMENT A Table 2.1-1b. These gaseous source terms were derived from Stone & Webster computer code GAS1BB (similar to NUREG-0017)[3.1.3.4] and computer code DRAGON 4 (for the containment vacuum pump sources). ATTACHMENT A Table 2.1-1b does not include particulates and iodines, which are not used in site noble gas dose rate calculations.

- The Containment Building Purge radionuclide mix was utilized for the purposes of determining an alarm setpoint for the SLCRS Unfiltered Pathway on the basis of the proximity of the contiguous areas.

- The Decontamination Building and Condensate Polishing Building ventilation exhaust are not expected to be radioactive. However, for purposes of determining an alarm setpoint, it is conservatively assumed that Xe-133 is in the ventilation exhaust at concentrations that would result in the appropriate dose rate limits.

- The Waste Gas Storage Vault ventilation exhaust is also not normally radioactive. However, the monitor alarm setpoint is based on the assumption that the ventilation exhaust radionuclide spectrum is similar to the gaseous inventory in the system housed by the waste gas storage vault. This spectrum is listed in ATTACHMENT A Table 2.1-1b under Gaseous Waste System.

- Onsite meteorological data for the period January 1, 1976 through December 31, 1980.

- Discharge flow rate of 23,700 cfm for a VV-2 Continuous Release.

- Discharge flow rate of 53,700 cfm for a VV-2 Batch Release of Containment Purge. This is comprised of 30,000 cfm from the containment purge plus 23,700 cfm from the CV-2.

- Discharge flow rate of 59,000 cfm for a CV-2 Continuous Release.

- Discharge flow rate of 59,000 cfm for a CV-2 Batch Release of Containment Purge. This is comprised of 7,500 cfm from the containment purge plus 51,500 cfm from CV-2.

- Discharge flow rate of 30,556 cfm for a CB-2 Continuous Release.

- Discharge flow rate of 12,400 cfm for DV-2 Continuous Release.

- Discharge flow rate of 2,000 cfm for WV-2 Continuous Release.

- Information listed under References for BV-2 Gaseous Effluent Monitor Setpoints.

The calculation method given in Sections 8.1.2.1.1 through 8.1.2.1.7 was used to derive the alarm setpoints for the following operational conditions:

- Continuous release via VV-2.
- Continuous release via CV-2.
- Batch release of BV-2 Containment Purge via VV-2.
- Batch release of BV-2 Containment Purge via CV-2.
- Continuous release via CB-2.
- Continuous release via DV-2.
- Continuous release via WV-2.

8.1.2.1.1 **BV-2 Mix Radionuclides**

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

- The gaseous source terms that are representative of the "mix" of the gaseous effluent were selected based on the relative stream composition and volumetric flowrate. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. Gaseous source terms can be obtained from ATTACHMENT A Table 2.1-1b.
- The fraction of the total radioactivity in the gaseous effluent comprised of noble gas radionuclide "i" (Si) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1(2)\text{-}1]$$

where:

A_i = The radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent (for VV-2, CV-2 and WV-2) is from ATTACHMENT A Table 2.1-1b. However, SINCE releases via CB-2 and DV-2 do not have a valid source term mix, THEN the noble gas radioactivity concentration is assumed to be Xe-133.

8.1.2.1.2 **BV-2 Maximum Acceptable Release Rate (Whole Body Exposure)**

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was calculated by:

$$Q_t = \frac{500}{(X/Q)\sum_i K_i\ S_i} \qquad [2.1(2)\text{-}2]$$

where:

$(X/Q)_{vv}$ = The highest calculated annual average relative concentration of effluents released via VV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-5.

= 1.03E-4 sec/m^3 for continuous releases.

$(X/q)_{vv}$ = The short term relative concentration of effluents released via VV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-36.

= 3.32E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cv}$ = The highest calculated annual average relative concentration of effluents released via CV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-4.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/q)_{cv}$ = The short term relative concentration of effluents released via CV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-35.

= 3.08E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cp}$ = The highest calculated annual average relative concentration of effluents released via CB-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-10.

= 7.35E-5 sec/m^3 for continuous releases.

$(X/Q)_{dv}$ = The highest calculated annual average relative concentration of effluents released via DV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-8.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/Q)_{wv}$ = The highest calculated annual average relative concentration of effluents released via WV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-9.

= 9.24E-5 sec/m^3 for continuous releases.

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3)from ATTACHMENT G Table 2.2-11.

S_i = From equation [2.1(2)-1].

8.1.2.1.3 **BV-2 Maximum Acceptable Release Rate (Skin Exposure)**

Q_t was also determined based upon the skin exposure limit by:

$$Q_t = \frac{3000}{(X/Q) \sum_i (L_i + 1.1M_i)\, S_i} \qquad [2.1(2)\text{-}3]$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i"(mrad/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photons of interest, (mrem/mrad).

(X/Q) = Same as in Section 8.1.2.1.2.

8.1.2.1.4 **BV-2 Maximum Acceptable Release Rate (Individual Radionuclide)**

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i\, Q_t \qquad [2.1(2)\text{-}4]$$

NOTE: Use the lower of the Q_t values obtained in Section 8.1.2.1.2 and 8.1.2.1.3.

8.1.2.1.5 **BV-2 Maximum Acceptable Concentrations (Individual Radionuclide)**

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (Ci) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$C_i = \frac{2.12E-3\ Q_i}{F} \qquad [2.1(2)\text{-}5]$$

where:

F = The maximum acceptable effluent flow rate at the point of release (cfm) as listed in Section 8.1.2.1.

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

8.1.2.1.6 **BV-2 Monitor Count Rate**

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide (CR) was determined by:

$$CR = \sum_i C_i\ E_i \qquad [2.1(2)\text{-}6)]$$

where:

Ei = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2b.

8.1.2.1.7 **BV-2 Monitor Setpoints**

The monitor alarm setpoints above background were determined as follows:

- The monitor HIGH Alarm Setpoint above background (uCi/cc) was determined by:

$$HSP = \frac{0.60 \text{ x } CR}{E_{i\ ave}} \qquad [2.1(2)\text{-}7]$$

where;

$E_{i\ ave}$ = The CR of equation [2.1(2)-6] divided by the sum of the C_i for the respective mix.

- The monitor ALERT Alarm Setpoint above background (uCi/cc) was determined by:

$$ASP = \frac{0.30 \times CR}{E_{i\ ave}} \qquad [2.1(2)\text{-}8]$$

8.1.2.2 **BV-2 Setpoint Determination Based On Analysis Prior To Release for VV-2 and CV-2 Ground Releases**

When the setpoints established using "the calculated mix" do not provide adequate flexibility for operational needs, the method described below may be used in lieu of that set forth in Section 8.1.2.1. In this case, the results of sample analysis are used to determine the appropriate nuclide mix. This calculational method applies when determining the setpoint for the maximum acceptable discharge flow rate and the associated HIGH Alarm Setpoint based on respective vent flow rate during the following operational conditions:

- Batch release of Containment Purge via VV-2.
- Batch release of Containment Purge via CV-2.

8.1.2.2.1 **BV-2 Maximum Acceptable Release Rate**

The maximum acceptable discharge flow rate from VV-2 or CV-2 during purging is determined as follows:

- The maximum acceptable gaseous discharge flow rate (f) from VV-2 or CV-2 (cfm) during purging based upon the whole body exposure limit is calculated by:

$$f = \frac{1.06\ S\ T}{(X/q) \sum_i K_i\ C_i} \qquad [2.1(2)\text{-}17]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit, whole body exposure

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm setpoint rules of Section 8.1.2.

T = Maximum value for T is 16 based on the limiting restriction in ODCM CONTROL 3.11.2.1 where the dose rate for a containment purge may be averaged over a time period not to

exceed 960 minutes. (As containment air volume change time period is 60 minutes; T = 960/60 = 16).[3.1.2.4]

$(X/q)_{vv}$ = The highest calculated short term relative concentration of effluents released via VV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-36.

= 3.32E-4 sec/m^3

$(X/q)_{cv}$ = The highest calculated short term relative concentration of effluents released via CV-2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT M Table 2.3-37.

= 3.08E-4 sec/m^3

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

- The flow rate (f) is also determined based upon the skin exposure limit as follows:

$$f = \frac{6.36\ S\ T}{(X/q) \sum_i (L_i + 1.1 M_i)\ C_i} \qquad [2.1(2)\text{-}18]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit, skin exposure

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i" (mrad/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

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1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photons of interest, (mrem/mrad).

(X/q) = Same as above.

- The flow rate (f) is determined by selecting the smaller of the calculated (f) values based on the whole body exposure limit, or the skin exposure limit shown above. The actual purge flow rate (cfm) must be maintained at or below this calculated (f) value or the discharge cannot be made from the vent.

8.1.2.2.2 **BV-2 Monitor Setpoints**

The monitor alarm setpoints above background are determined as follows:

- The calculated monitor HIGH Alarm Setpoint above background (net uCi/cc) attributed to the noble gas radionuclides is determined by:

$$HSP = \frac{f \sum_i C_i E_i}{F' E_{i\,ave}} \qquad [2.1(2)\text{-}19]$$

where:

f = The maximum acceptable containment purge flow rate (cfm) determined in Section 8.1.2.2.1.

F′ = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 53,700 cfm for VV-2

= 59,000 cfm for CV-2

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2b.

$E_{i\,ave}$ = The CR of equation [2.1(2)-6] divided by the sum of the Ci for the respective mix.

NOTE: To enable maintaining a constant conversion factor from cpm to uCi/cc in the Digital Radiation Monitoring System software, the "calculated mix" is used rather than the analysis mix to calculate $E_{i\,ave}$ above. This does not cause any change in the function of the monitor setpoint to properly control dose rate. However, the monitor indicated uCi/cc value may differ from the actual value.

- When a HIGH Alarm Setpoint has been calculated according to this section, the monitor ALERT Alarm Setpoint above background (net uCi/cc) is determined as follows:

  ASP = HSP x 0.5 [2.1(2)-20]

8.1.3 **BV-1/2 Monitor Alarm Setpoint Determination**

See Section 8.1.1 for a description of Monitor Alarm Setpoint Determination.

8.1.3.1 **BV-1/2 Setpoint Determination Based On A Calculated Mix For PV-1/2 Elevated Releases**

The calculated monitor count rate above background (CR), in ncpm, the monitor HIGH-HIGH alarm setpoint above background (HHSP), and the monitor HIGH alarm setpoint above background (HSP) for each operational condition are shown in the following Table:

BV-1/2 ALARM SETPOINTS FOR ELEVATED RELEASES
cpm ABOVE BACKGROUND

	(P)PRIMARY* MONITOR (A)ALTERNATE MONITOR	CR	60% SITE LIMIT UPPER ALARM	30% SITE LIMIT LOWER ALARM
• Continuous Release	(P)RM-1GW-108B	3.49E7	≤ 3.60E5	≤ 1.20E5
	(A)RM-1GW-109(5)	2.61E7	≤ 3.60E5	≤ 1.20E5
• Batch Release Of BV-1 Decay Tanks or BV-2 Storage Tanks	(P)RM-1GW-108B	3.93E5	≤ 2.36E5	≤ 1.18E5
	(A)RM-1GW-109(5)	7.87E6	≤ 3.60E5	≤ 1.20E5

*IF the primary monitor is out of service, THEN ODCM CONTROL 3.3.3.10 is met for the respective alternate monitor. The alternate setpoints shall be utilized:

The setpoints were determined using a calculated mix from the UFSAR and discharge flow rate of 1450 cfm for PV-1/2.

The calculational method below was used to derive the monitor setpoints for the following operational conditions:

- Continuous release via PV-1/2.
- Batch release of BV-1 or BV-2 Waste Gas Decay Tank via PV-1/2.
- Batch release of BV-1 or BV-2 Containment Purge via PV-1/2 is not shown in the above table. However, if it is necessary to perform a BV-1 or BV-2 Containment Purge via this release point, the alarm setpoint shall be calculated in accordance with Section 8.1.3.2.

8.1.3.1.1 **BV-1/2 Mix Radionuclides**

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

- The gaseous source terms that are representative of the "mix" of the gaseous effluent were evaluated. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. The gaseous source terms can be obtained from ATTACHMENT A Tables 2.1-1a. and 2.1-1b.
- The fraction of the total radioactivity in the gaseous effluent comprised by noble gas radionuclide "i" (Si) for each individual noble gas radionuclide in the gaseous effluent was calculated by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1\text{-}9]$$

where:

A_i = The total radioactivity or radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent from ATTACHMENT A Table 2.1-1a and 2.1.1b.

8.1.3.1.2 **BV-1/2 Maximum Acceptable Release Rate (Whole Body Exposure)**

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was determined by:

$$Q_t = \frac{500}{\sum_i V_i\, S_i} \qquad [2.1.10]$$

where:

V_i = The constant for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrem/year/uCi/sec) from ATTACHMENT G Table 2.2-12.

S_i = From equation [2.1-9]

8.1.3.1.3 **BV-1/2 Maximum Acceptable Release Rate (Skin Exposure)**

Q_t was also determined based upon the skin exposure limit as follows:

$$Q_t = \frac{3000}{\sum_i [L_i (X/Q)_{pv} + 1.1 B_i] S_i} \quad [2.1\text{-}11]$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

$(X/Q)_{pv}$ = The highest calculated annual average relative concentration of effluents releases via PV-1/2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-6.

= 2.31E-6 sec/m^3 (0.5 – 1.0 miles)

$(X/q)_{pv}$ = The highest calculated short term relative concentration of effluents released via PV-1/2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT N Table 2.3-38.

= 1.07E-5 sec/m^3 (0.5 – 1.0 miles)

B_i = The constant for long term releases (greater than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation dose from the elevated finite plume (mrad/year/uCi/sec) from ATTACHMENT G Table 2.2-12.

8.1.3.1.4 **BV-1/2 Maximum Acceptable Release Rate (Individual Radionuclide)**

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i Q_t \quad [2.1\text{-}12]$$

NOTE: Use the lower of the Q_t values obtained in Section 8.1.3.1.2 and 8.1.3.1.3.

8.1.3.1.5 **BV-1/2 Maximum Acceptable Concentrations (Individual Radionuclide)**

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (C_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$C_i = \frac{2.12E-3\ Q_i}{F} \qquad [2.1\text{-}13]$$

where:

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

F = The maximum acceptable effluent flow rate at the point of release (cfm) as listed in Section 8.1.3.1.

8.1.3.1.6 **BV-1/2 Monitor Count Rate**

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide. (CR) was determined by:

$$CR = \sum_i C_i E_i \qquad [2.1\text{-}14]$$

where:

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2a and 2.1-2b.

8.1.3.1.7 **BV-1/2 Monitor Setpoints**

The monitor alarm setpoints above background were determined as follows:

- The monitor HIGH-HIGH Alarm Setpoint above background (ncpm) was determined by:

  HHSP = 0.60 x CR [2.1-15]

- The monitor HIGH Alarm Setpoint above background (ncpm) was determined by:

  HSP = 0.30 x CR [2.1-16]

8.1.3.2 **BV-1/2 Setpoint Determination Based On Analysis Prior To Release For PV-1/2 Elevated Releases**

The following calculation method applies to gaseous releases via the PV-1/2 Gaseous Waste/Process Vent when the "calculated mix" does not provide adequate operational flexibility. This method is used to determine the setpoint for the maximum acceptable discharge flow rate and the associated HIGH-HIGH Alarm Setpoint based on this flow rate for the BV-1/2 Gaseous Waste Gas Monitor (RM-GW-108B) or alternate (RM-1GW-109 CH 5) during the following operational conditions:

- Continuous release via PV-1/2.
- Batch release of BV-1 or BV-2 Waste Gas Decay Tank via PV-1/2.
- Batch release of BV-1 or BV-2 Containment Purge via PV-1/2.

8.1.3.2.1 **BV-1/2 Maximum Acceptable Release Rate**

Determine the maximum acceptable discharge flow rate for the release from the Process Vent for the analyzed mix.

- The maximum acceptable gaseous discharge flow rate (f) from the Process Vent (cfm) based upon the whole body exposure limit is determined by:

$$f = \frac{1.06\ S}{\sum_i V_i\ C_i} \qquad [2.1\text{-}21]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit, whole body exposure

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm setpoint rules of Section 8.1.3.

V_i = The constant for noble gas radionuclide "i" accounting for the gamma radiation from the elevated plume (mrem/year/uCi/sec) from ATTACHMENT G Table 2.2-12.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

- Based upon the skin exposure limit, (f) is calculated by:

$$f = \frac{6.36\ S}{\sum_i [L_i\ (X/Q)_{pv} + 1.1 B_i]\ C_i} \qquad [2.1\text{-}22]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit, skin exposure

2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from ATTACHMENT G Table 2.2-11.

$(X/Q)_{pv}$ = The highest calculated annual average relative concentration of effluents released via PV-1/2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT F Table 2.2-6.

= 2.31E-6 sec/m^3

$(X/q)_{pv}$ = The highest calculated short term relative concentration of effluents released via PV-1/2 for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from ATTACHMENT N Table 2.3-38.

= 1.07E-5 sec/m^3

B_i = The constant for long-term releases (greater than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/year/uCi/sec) from ATTACHMENT G Table 2.2-12.

- Select the smaller of the calculated f values based on the whole body exposure limit and based on the skin exposure limit shown above. The actual discharge flow rate (cfm) must be maintained at or below this (f) value.

8.1.3.2.2 **BV-1/2 Monitor Setpoints**

The monitor alarm setpoints above background are determined as follows:

- The calculated monitor HIGH-HIGH Alarm Setpoint above background (ncpm) attributed to the noble gas radionuclides is determined by:

$$HHSP = \frac{f \sum_i C_i \, E_i}{F'} \qquad [2.1\text{-}23]$$

where:

f = The maximum acceptable gaseous discharge flow rate (cfm) determined in Section 8.1.3.2.1.

F′ = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 1450 cfm for PV-1/2

C_i = The undiluted radioactivity of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the respective monitor (RM-1GW-108B) or (RM-1GW-109 CH 5) for noble gas radionuclide "i" (cpm/uCi/cc) from ATTACHMENT B Table 2.1-2a and 2.1-2b.

When a HIGH-HIGH Alarm Setpoint has been calculated according to this section the monitor HIGH Alarm setpoint above background (ncpm) is determined by:

$$HSP = HHSP \times 0.5 \qquad [2.1\text{-}24]$$

8.2 Compliance With 10 CFR 20 Dose Rate Limits (ODCM CONTROL 3.11.2.1)

8.2.1 Dose Rate Due To Noble Gases

The dose rate in unrestricted areas resulting from noble gas effluents from the site is limited to 500 mrem/yr to the total body and 3,000 mrem/yr to the skin. Site gaseous effluents are the total of BV-1 and BV-2 specific ground releases and a shared elevated

release, the PV-1/2 Gaseous Waste/Process Vent. Based upon NUREG-0133 (3.1.3.1) the following equations are used to show compliance with ODCM CONTROL 3.11.2.1.a.

$$\sum_i \left[V_i Q_{is} + K_i (\overline{X/Q})_v \, Q_{iv} \right] < 500 \text{ mrem/yr} \qquad [2.2\text{-}1]$$

$$\sum_i \left[[L_i (\overline{X/Q})_s + 1.1 B_i] \, Q_{is} + [L_i + 1.1 M_i] \, (\overline{X/Q})_v \, Q_{iv} \right] \leq 3000 \text{ mrem/yr} \qquad [2.2\text{-}2]$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide "i", mrem/year/uCi/m^3.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide "i", mrem/year/uCi/m^3.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide "i", mrad/year/uCi/m^3.

V_i = The constant for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume, mrem/year/uCi/sec.

B_i = The constant for long-term releases (greater than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume, mrad/year/uCi/sec.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photon of interest, mrem/mrad.

Q_{is} = The release rate of noble gas radionuclide "i" in gaseous effluents from free-standing stack, uCi/sec.

Q_{iv} = The release rate of noble gas radionuclide "i" in gaseous effluents from all vent releases, uCi/sec.

$(\overline{X/Q})_s$ = The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary for elevated releases (sec/m^3).

$(\overline{X/Q})_v$ = The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary for elevated releases (sec/m^3).

At the Beaver Valley site gaseous releases may occur from the following Release Points (RP's) as shown in ATTACHMENT P Figure 2.4.2:

RP 1 & 4. The BV-1 Auxiliary Building Vent and the BV-2 SLCRS Unfiltered Pathway atop the Auxiliary Buildings (VV-1 and VV-2)

RP 2 & 5. The BV-1 Rx Containment/SLCRS Vent and the BV-2 SLCRS Filtered Pathway atop the Containment Domes (CV-1 and CV-2)

RP 3. The BV-1/2 Gaseous Waste/Process Vent atop the BV-1 Cooling Tower (PV-1/2)

RP 6. The BV-2 Condensate Polishing Building Vent (CB-2)

RP 7. The BV-2 Waste Gas Storage Vault Vent (WV-2)

RP 8. The BV-2 Decontamination Building Vent (DV-2)

RP 9. The BV-2 Turbine Building Vent (TV-2)

- The effluents from Release Point 1 & 4 are ground level in nature. At BV-1 the sources of these releases are Containment Purges and normal Auxiliary Building Ventilation. At BV-2 the sources of these releases are Containment Purges and Contiguous Area ventilation.

- Effluent from the Release Point 2 & 5 are assumed ground level in nature. At BV-1 the source of these releases is the Supplementary Leak Collection and Release System (SLCRS). At BV-2 the source of these releases is normal Auxiliary Building Ventilation. It is also possible to release Containment Purges from these vents.

- Release Points 6, 7, 8 and 9 are not normally radioactive release points.

- The effluent from Release Point 3 are elevated, and the sources of these releases are the Main Condenser Air Ejectors, the Waste Gas Decay Tanks and the Containment Vacuum Pumps.

Noble gas releases may normally occur from Release Points 1 through 5 above. To show compliance with the site limits of ODCM CONTROL 3.11.2.1.a, Equations [2.2-1] and [2.2-2] are expressed in terms of the actual release points for the site. Note that the expressions for release points 6, 7, 8 and 9 are included for use if radioactive releases via these release points are identified in the future.

8.2.1.1 **Total Body Dose Rate (All Release Points)**

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i \,[\overline{(X/Q)}_{cv}\, Q_{i_{cv1}} + \overline{(X/Q)}_{vv}\, Q_{i_{vv1}} + \overline{(X/Q)}_{cv}\, Q_{i_{cv2}} + \overline{(X/Q)}_{vv}$$

$$Q_{i_{vv2}} + \overline{(X/Q)}_{tv}\, Q_{i_{tv2}} + \overline{(X/Q)}_{cb}\, Q_{i_{cb2}} + \overline{(X/Q)}_{dv}\, Q_{i_{dv2}} + \overline{(X/Q)}_{wv}\, Q_{i_{wv2}}\,]$$

$$\leq 500 \text{ mrem/yr} \qquad [2.2\text{-}3]$$

8.2.1.2 **Skin Dose Rate (All Release Points)**

$$\sum_i \left[L_i \overline{(X/Q)}_{pv} + 1.1B_i\right] Q_{i_{pv}} + \sum_i \left[L_i + 1.1M_i\right][\overline{(X/Q)}_{cv}\, Q_{i_{cv2}} + \overline{(X/Q)}_{vv}\, Q_{i_{vv1}} +$$

$$\overline{(X/Q)}_{cv}\, Q_{i_{cv2}} + (X/Q)_{vv}\, Q_{i_{vv2}} + \overline{(X/Q)}_{tv}\, Q_{i_{tv2}} + \overline{(X/Q)}_{cb}\, Q_{i_{cb2}} + \overline{(X/Q)}_{dv}$$

$$Q_{i_{dv2}} + \overline{(X/Q)}_{wv}\, Q_{i_{wv2}}\,] \leq 3000 \text{ mrem/yr} \qquad [2.2\text{-}4]$$

where:

$Q_{i_{pv}}$ = Release rate of radionuclide "i" from the PV-1/2, uCi/sec.

$Q_{i_{cv1}}$ = Release rate of radionuclide "i" from CV-1, uCi/sec.

$Q_{i_{cv2}}$ = Release rate of radionuclide "i" from CV-2, uCi/sec.

$Q_{i_{vv1}}$ = Release rate of radionuclide "i" from VV-1 Auxiliary Building, uCi/sec.

$Q_{i_{vv2}}$ = Release rate of radionuclide "i" from VV-2, uCi/sec.

$Q_{i_{tv2}}$ = Release rate of radionuclide "i" from TV-2, uCi/sec.

$Q_{i_{cb}}$ = Release rate of radionuclide "i" from CB-2, uCi/sec.

$Q_{i_{dv2}}$ = Release rate of radionuclide "i" from DV-2, uCi/sec.

$Q_{i_{wv2}}$ = Release rate of radionuclide "i" from WV-2, uCi/sec.

$(\overline{X/Q})_{pv}$ = Highest calculated annual average relative concentration for releases from the PV-1/2, sec/m^3.

$(\overline{X/Q})_{cv}$ = Highest calculated annual average relative concentration for releases from CV-1 and CV-2, sec/m^3.

$(\overline{X/Q})_{vv}$ = Highest calculated annual average relative concentration for releases from VV-1 and VV-2, sec/m^3.

$(\overline{X/Q})_{tv}$ = Highest calculated annual average relative concentration for releases for TV-2, sec/m^3.

$(\overline{X/Q})_{cb}$ = Highest calculated annual average relative concentration for releases for CB-2, sec/m^3.

$(\overline{X/Q})_{dv}$ = Highest calculated annual average relative concentration for releases for DV-2, sec/m^3.

$(\overline{X/Q})_{wv}$ = Highest calculated annual average relative concentration for releases for WV-2, sec/m^3.

The release rate for a containment purge is based on an averaged release rate in uCi/sec for the entire purge (not to exceed 960 min in accordance with ODCM CONTROL 3.11.2.1).

All other terms remain the same as those defined previously.

For the site, 4 potential modes of release are possible. The release modes identify the various combinations of sources of radioactivity and their release points which are used to determine the controlling locations. They are presented in ATTACHMENT C Table 2.2-1. For Release Modes 1, 2, and 3, the controlling location for implementation of ODCM CONTROL 3.11.2.1.a is 0.35 miles NW. Inserting the appropriate X/Q's from ATTACHMENT F Tables 2.2-4 through 2.2-10 for this location, Equations [2.2-3] and [2.2-4] become:

8.2.1.3 **Total Body Dose Rate (at 0.35 Miles NW)**

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i [9.24E-5\,Q_{i_{cv^1}} + 1.03E-4\,Q_{i_{vv^1}} + 9.24E-5\,Q_{i_{cv^2}} +$$

$$1.03E-4\,Q_{i_{vv^2}} + 7.35E-5\,Q_{i_{tv^2}} + 9.24E-5\,Q_{i_{dv^2}} + 9.24E-5\,Q_{1_{wv^2}} +$$

$$7.35E-5\,Q_{i_{cb^2}}] \leq 500\text{mrem/yr} \qquad [2.2\text{-}5]$$

8.2.1.4 **Skin Dose Rate (at 0.35 Miles NW)**

$$\sum_i [7.0E-10\,L_i + 1.1B_i]Q_{i_{pv}} \sum_i [L_i + 1.1M_i] + 9.24E-5\,Q_{i_{cv^1}} + 1.03E-4$$

$$Q_{i_{vv^1}} + 9.24E-5\,Q_{i_{cv^2}} + 1.03E-4\,Q_{i_{vv^2}} + 7.35E-5\,Q_{i_{tv^2}} + 9.24E-5\,Q_{i_{dv^2}} +$$

$$9.24E-5\,Q_{i_{wv^2}} + 7.35E-5\,Q_{i_{cb^2}}] \leq 3000\text{ mrem/yr} \qquad [2.2\text{-}6]$$

For Release Mode 4, the controlling location is 0.75 miles N. Inserting the appropriate X/Q's from ATTACHMENT F Tables 2.2-4 through 2.2-10 for this location, Equations [2.2-3 and 2.2-4] become:

8.2.1.5 **Total Body Dose Rate (at 0.75 Miles N)**

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i [3.95E-6\,Q_{i_{cv^1}} + 4.99E-6\,Q_{i_{vv^1}} + 3.95E-6\,Q_{i_{cv^2}} + 4.99E-$$

$$6\,Q_{i_{vv^2}} + 4.26E-6\,Q_{i_{tv^2}} + 3.95E-6\,Q_{i_{dv^2}} + 3.95E-6\,Q_{i_{wv^2}} + 4.26E-6\,Q_{i_{cb^2}}]$$

$$\leq 500\text{ mrem/yr} \qquad [2.2\text{-}7]$$

8.2.1.6 **Skin Dose Rate (at 0.75 Miles N)**

$$\sum_i [2.31E-6\,L_i + 1.1B_i]Q_{i_{pv}} + \sum_i [L_i + 1.1M_i][3.95E-6\,Q_{i_{cv^1}} + 4.99E-6\,Q_{i_{vv^1}} +$$

$$3.95E-6\,Q_{i_{cv^2}} + 4.99E-6\,Q_{i_{vv^2}} + 4.26E-6\,Q_{i_{tv^2}} + 3.95E-6\,Q_{i_{dv}} + 3.95E-$$

$$6\,Q_{i_{wv}} + 4.26E-6\,Q_{i_{cb}}] \leq 3000\text{ mrem/yr} \qquad [2.2\text{-}8]$$

8.2.1.7 **Determination of Controlling Location**

The determination of controlling location for implementation of ODCM CONTROL 3.11.2.1.a for noble gases is a function of the following parameters:

- Radionuclide mix and their isotopic release rate
- Release Mode
- Meteorology

The incorporation of these 3 parameters into Equations [2.2-3] and [2.2-4] resulted in the equations for the controlling locations as presented in Equations [2.2-5 through 2.2-8].

The radionuclide mix used to determine controlling locations was based on source terms calculated with the Stone and Webster Engineering Corporation computer code GAS1BB (similar to NUREG-0017.[3.1.3.4]) Inputs were based on operating modes of the respective plants. The code inputs utilized are presented in 1/2-ODC-3.01. The source term is presented in ATTACHMENT D Tables 2.2-2a and 2.2-2b as a function of release type and Release Point.

The X/Q values utilized in the equations for implementation of ODCM CONTROL 3.11.2.1.a are based upon the maximum long-term annual average X/Q in the unrestricted area. ATTACHMENT E Table 2.2-3 presents the distances from the Release Points to the nearest unrestricted area for each of the 16 sectors as well as to the nearest vegetable garden, cow, goat, and beef animal. ATTACHMENT F Tables 2.2-4 through 2.2-10 present the long-term annual average (X/Q) values for all Release Points to the special locations presented in ATTACHMENT E Table 2.2-3. A description of their derivation is provided in 1/2-ODC-3.01.

For Release Modes 1, 2, and 3, dose calculations were performed using the highest calculated site boundary X/Q values applicable to the release points involved and the projected radionuclide mix applicable to the release source. In that a simultaneous, continuous elevated release could contribute to the dose at a given location, the selection of the two highest sector X/Q values at the site boundary considered this contribution. From these results, the distance and sector associated with the highest calculated site boundary dose were selected as the controlling location.

For Release Modes 1, 2, and 3 the controlling location is 0.35 miles NW. In Release Mode 1, the dominant release is via VV-1 and CV-2. In Release Modes 2 and 3, the dominant release is a Containment Purge from the VV-1 or VV-2.

For Release Mode 4, a similar evaluation was performed. Long-term annual average X/Q values were calculated at the mid-point of the 10 standard distances listed in ATTACHMENT F Table 2.2-4 through 2.2-10. In that a simultaneous, ground level release could contribute to the dose at a given location, the selection of the two highest X/Q values at the controlling distance considered this contribution. Since the two maximum X/Q values occurred in the 0.5 - 1.0 mile radial band, the controlling distance was selected at 0.75 miles. From the calculated dose results, the controlling sector was shown to be North. In this Release Mode, the dominant release is a Containment Purge via the PV-1/2 Gaseous Waste/Process Vent. Neither of the controlling receptor locations are presently inhabited.

Values for K_i, L_i, and M_i, which were used in the determination of the controlling receptor location and which are to be used in Equations [2.2-5] through [2.2-8] to show compliance with ODCM CONTROL 3.11.2.1.2, are presented in Table 2.2-11. Values taken from Table B-1 of NRC Regulatory Guide 1.109, Revision 1,[3.1.3.5] were multiplied by 1E6 to convert picocuries to microcuries for use in ATTACHMENT G Table 2.2-11.

Values for V_i and B_i for the finite plume model can be expressed as shown in Equation [2.2-9] and [2.2-10]. Values were calculated using the NRC code RABFIN at the site boundary location which would receive the highest total dose from all Release Points. These values are presented in ATTACHMENT G Table 2.2-12 and calculated from the following equation:

$$B_i = \frac{K}{r_d} \sum_j \sum_k \sum_l \frac{f_{jk}\ A_{li}\ u_a\ E_l\ I}{u_j} \qquad [2.2\text{-}9]$$

where:

I = The results of numerical integration over the plume spatial distribution of the airborne activity as defined by the meteorological condition of wind speed (u_j) and atmospheric stability class "k" for a particular wind direction.

K = A numerical constant representing unit conversions.

$$= \frac{(260\ \text{mrad})(\text{radians})\ (\text{m}^3)\ (\text{transformation})}{(\text{sec})(\text{Mev})(\text{Ci})}\left[\frac{16\ \text{sectors}}{2\pi\ \ \text{radians}}\right]$$

$$\left[1\text{E}-6\,\frac{\text{Ci}}{\text{uCi}}\right]\left[3.15\text{E}7\,\frac{\text{sec}}{\text{yr}}\right]$$

= 2.1E4 mrad (m^3) (transformation)/yr(Mev)(uCi).

r_d = The distance from the release point to the receptor location, meters.

u_j = The mean wind speed assigned to the "j" th wind speed class, meters/sec.

f_{jk} = The joint frequency of occurrence of the "j" th wind speed class and kth stability class (dimensionless).

A_{li} = The number of photons of energy corresponding to the "l" th energy group emitted per transformation of the "i" th radionuclide, number/transformation.

E_l = The energy assigned to the "l" th energy group, Mev.

u_a = The energy absorption coefficient in air for photon energy H_l, meters $^{-1}$.

The V_i factor is computed with conversion from air dose to tissue depth dose, thus:

$$V_i = 1.1 \frac{K}{r_d} \sum_j \sum_k \sum_l \frac{f_{jk} A_{li} u_a E_l I_e - u_T T_d}{u_j} \qquad [2.2\text{-}10]$$

where:

u_T = The tissue energy absorption coefficient for photons of energy E_l, cm^2/gm.

T_d = The tissue density thickness taken to represent the total body dose ($5gm/cm^2$).

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of photons of interest, mrem/mrad.

8.2.2 **<u>Dose Rate Due To Radioiodines And Particulates</u>**

The dose rate in unrestricted areas resulting from the of inhalation of I-131, tritium, and all radionuclides in particulate form (excluding C-14) with half lives greater than 8 days released in gaseous effluents from the site shall be limited to 1,500 mrem/yr to any organ. Based upon NUREG-0133,[3.1.3.1] the following basic equation is used to show compliance with ODCM CONTROL 3.11.2.1.b:

$$\sum_i P_{i\tau} \left[(\overline{X/Q})_s Q_{is} + (\overline{X/Q})_v Q_{iv} \right] \leq 1{,}500 \text{ mrem/yr} \qquad [2.2\text{-}11]$$

where:

$P_{i\tau}$ = Dose parameter for any organ τ for each identified radionuclide "i", mrem/yr per uCi/m3.

Q_{is} = The release rate of radionuclide "i", in gaseous effluents from elevated releases, uCi/sec.

Q_{iv} = The release rate of radionuclide "i", in gaseous effluents from ground level releases, uCi/sec.

$\overline{(X/Q)}_s$ = The highest calculated annual average relative concentration at the unrestricted area boundary for elevated releases, sec/m^3.

$\overline{(X/Q)}_v$ = The highest calculated annual average relative concentration at the unrestricted area boundary for ground level releases, sec/m^3.

NOTE: The dispersion parameters specified in Section 8.2.2 are limited to the site boundary as defined above.

Releases may occur from any Release Point in the Release Modes listed in ATTACHMENT C Table 2.2-1. To show compliance with ODCM CONTROL 3.11.2.1.b, Equation [2.2-11] is now expressed in terms of the actual Release Points for the site.

$$\sum_i P_{i\tau} [\overline{(X/Q)}_{pv} Q_{i_{pv}} + \overline{(X/Q)}_{cv} Q_{i_{cv^1}} + \overline{(X/Q)}_{vv} Q_{i_{vv^1}} + \overline{(X/Q)}_{cv} Q_{i_{cv^2}} + \overline{(X/Q)}_{vv}$$

$$\overline{(X/Q)}_{tv} Q_{i_{tv^2}} + \overline{(X/Q)}_{cb} Q_{i_{cb^2}} + \overline{(X/Q)}_{dv} Q_{i_{dv^2}} + \overline{(X/Q)}_{wv} Q_{i_{wv^2}}] \leq 1500 \text{ mrem/yr}$$

[2.2-12]

where:

$\overline{(X/Q)}_{pv}$ = Highest calculated annual average relative concentration for releases from PV-1/2, sec/m^3.

$\overline{(X/Q)}_{cv}$ = Highest calculated annual average relative concentration for releases from CV-1 and CV-2, sec/m^3.

$\overline{(X/Q)}_{vv}$ = Highest calculated annual average relative concentration for releases from VV-1 and VV-2, sec/m^3.

$\overline{(X/Q)}_{tv}$ = Highest calculated annual average relative concentration for releases from TV-2, sec/m^3.

$\overline{(X/Q)}_{cb}$ = Highest calculated annual average relative concentration for releases from CB-2, sec/m^3.

$\overline{(X/Q)}_{dv}$ = Highest calculated annual average relative concentration for releases from DV-2, sec/m^3.

$\overline{(X/Q)}_{wv}$ = Highest calculated annual average relative concentration for release from WV-2, sec/m^3.

$Q_{i_{pv}}$ = Long-term release rate of radionuclide "i" from PV-1/2, uCi/sec.

$Q_{i_{cv1}}$ = Long-term release rate of radionuclide "i" from CV-1, uCi/sec.

$Q_{i_{cv2}}$ = Long-term release rate of radionuclide "i" from CV-2, uCi/sec.

$Q_{i_{vv1}}$ = Long-term release rate of radionuclide "i" from VV-1, uCi/sec.

$Q_{i_{vv2}}$ = Long-term release rate of radionuclide "i" from VV-2, uCi/sec.

$Q_{i_{tv2}}$ = Long-term release rate of radionuclide "i" from TV-2, uCi/sec.

$Q_{i_{cb2}}$ = Long-term release rate of radionuclide "i" from CB-2, uCi/sec.

$Q_{i_{dv2}}$ = Long-term release rate of radionuclide "i" from DV-2, uCi/sec.

$Q_{i_{wv2}}$ = Long-term release rate of radionuclide "i" from WV-2, uCi/sec.

All other terms are the same as those defined previously.

TV-2, CB-2, DV-2 and WV-2 are not normal radioactive Release Points. These Release Points are included only for use if radioactive releases via these vents are identified in the future. In the calculation to show compliance with ODCM CONTROL 3.11.2.1.b only the inhalation pathway is considered.

Values of the organ dose parameters, $P_{i\tau}$, were calculated using methodology given in NUREG-0133.[3.1.3.1] For the child age group, the following equation was used for all nuclides. The $P_{i\tau}$, values are presented in ATTACHMENT H Table 2.2-13.

$$P_{i\tau} = 3.7E9\ DFA_{i\tau} \qquad [2.2\text{-}13]$$

where:

3.7E9 = Breathing rate of child (3,700 m^3/yr) x unit conversion factor (1E6 pCi/uCi).

$DFA_{i\tau}$ = The organ inhalation dose factor for a child from Table 6 of NUREG-0172,(3.1.3.6) for organ τ, nuclide "i", in units of mrem/pCi.

For Release Modes 1 through 4, the controlling location is the site boundary, 0.35 miles NW.

Equation [2.2-12] becomes:

$$\sum_i P_{i\tau}\,[7.00E-10\,Q_{i_{pv}} + 9.24E-5\,Q_{i_{cv1}} + 1.03E-4\,Q_{i_{vv1}} + 7.35E-5\,Q_{i_{tv1}} + 9.24E-5\,Q_{i_{cv2}} + 1.03E-4\,Q_{i_{vv2}} + 7.35E-5\,Q_{i_{tv2}} + 7.35E-5\,Q_{i_{cb2}} + 9.24E-5\,Q_{i_{dv2}} + 9.24E-5\,Q_{i_{wv2}}] \le 1500 \text{ mrem/yr} \quad [2.2\text{-}14]$$

8.2.2.1 **Determination of Controlling Location**

The determination of the controlling location for implementation of ODCM CONTROL 3.11.2.1.b for radioiodines and particulates is a function of the same 3 parameters as for noble gases plus a fourth, the actual receptor pathways. The incorporation of these parameters into Equation [2.2-12] results in the respective equations for each Release Mode at the site boundary controlling locations. The radionuclide mix was again based upon the source terms presented in ATTACHMENT D Tables 2.2-2a and 2.2-2b as a function of release type and Release Point.

In the determination of the controlling site boundary for each Release Mode, the highest 2 site boundary X/Q values for each Release Point were utilized in conjunction with the radionuclide mix and the release rate for each Release Point to determine the controlling location.

The $P_{i\tau}$ values are presented in ATTACHMENT H Table 2.2-13.

The X/Q values in Equation [2.2-14] were obtained from ATTACHMENT F Tables 2.2-4 through 2.2-10.

A description of the derivation of the X/Q values is provided in 1/2-ODC-3.01.

8.3 Compliance With 10 CFR 50 Dose Limits (ODCM CONTROLS 3.11.2.2 And 3.11.2.3) (Gaseous)

At the Beaver Valley site all elevated gaseous releases are considered to originate from a shared radwaste system. The effluent from both units are mixed and discharged from a common Release Point, the PV-1/2 Gaseous Waste/Process Vent, at the top of the Unit 1 Cooling Tower. The resulting dose for the purpose of implementing 10 CFR 50 is normally apportioned equally to each unit. The only exception would be a Containment Purge via the Process Vent. The resulting dose shall be attributed to the contributing reactor unit. Since this operation is expected to be rare, equations are shown throughout this section with the apportionment set at 0.5.

8.3.1 Dose Due To Noble Gases

8.3.1.1 Cumulation Of Doses

Section II.B.1 of Appendix I of 10 CFR 50 (ODCM CONTROL 3.11.2.2) limits the releases of gaseous effluents from each reactor such that the estimated annual gamma air dose is limited to 10 millirad and the beta air dose is limited to 20 millirad. In addition, ODCM CONTROL 3.11.2.4 requires use of radwaste system if air doses when averaged over 31 days exceed 0.2 mrad for gamma and 0.4 mrad for beta. Based upon NUREG-0133,[3.1.3.1] the air dose limits in the unrestricted area due to noble gases released in gaseous effluents are defined by the following equations:

8.3.1.1.1 Gamma Radiation Quarter Limit

$$3.17E-8\sum_i \left[M_i\left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv}\right] + \left[B_i Q_{is} + b_i q_{is}\right]\right] \leq 5 \text{ mrad} \qquad [2.3\text{-}1]$$

8.3.1.1.2 Beta Radiation Quarter Limit

$$3.17E-8\sum_i N_i\left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv} + (\overline{X/Q})_s Q_{is} + (\overline{X/q})_s q_i s\right] \leq 10 \text{ mrad} \qquad [2.3\text{-}2]$$

8.3.1.1.3 Gamma Radiation Year Limit

$$3.17E-8\sum_i \left[M_i\left[(\overline{X/Q})_V Q_{iv} + (\overline{X/q})_V q_{iv}\right] + \left[B_i Q_{is} + b_i q_{is}\right]\right] \leq 10 \text{ mrad}$$

8.3.1.1.4 Beta Radiation Year Limit

$$3.17E-8\sum_i N_i\left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv} + (\overline{X/Q})_s Q_{is} + (\overline{X/q})_s q_i s\right] \leq 20 \text{ mrad}$$

[2.3-4]

8.3.1.1.5 **Gamma Radiation Projection Averaged Over 31 Days**

$$3.17E-8\sum_i \left[M_i\left[\overline{(X/Q)}_v Q_{iv} + \overline{(X/q)}_v q_{iv}\right] + \left[B_i Q_{is} + b_i q_{is}\right]\right] \leq 0.2\text{ mrad} \qquad [2.3\text{-}5]$$

8.3.1.1.6 **Beta Radiation Projection Averaged Over 31 Days**

$$3.17E-8\sum_i N_i\left[\overline{(X/Q)}_v Q_{iv} + \overline{(X/q)}_v q_{iv} + \overline{(X/Q)}_s Q_{is} + \overline{(X/q)}_s q_i s\right] \leq 0.4\text{ mrad} \qquad [2.3\text{-}6]$$

where:

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide "i" (mrad/yr per uCi/m^3).

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide "i" (mrad/yr per uCi/m^3).

$\overline{(X/Q)}_v$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term vent releases greater than 500 hrs/year (sec/m^3).

$\overline{(X/q)}_v$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term vent releases equal to or less than 500 hrs/year (sec/m^3).

$\overline{(X/Q)}_s$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term free standing stack releases greater than 500 hrs/year (sec/m^3).

$\overline{(X/q)}_s$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term free standing stack releases equal to or less than 500 hrs/year (sec/m^3).

q_{is} = Release of noble gas radionuclide "i" in gaseous effluents for short-term stack releases equal to or less than 500 hrs/year (uCi).

q_{iv} = Release of noble gas radionuclide "i" in gaseous effluents for short-term vent releases equal to or less than 500 hrs/year (uCi).

Q_{is} = Release of noble gas radionuclide "i" in gaseous effluents for long-term free standing stack releases greater than 500 hrs/year (uCi).

Q_{iv} = Release of noble gas radionuclide "i" in gaseous effluents for long-term vent releases greater than 500 hrs/year (uCi).

B_i = The constant for long-term releases (greater than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/yr per uCi/sec).

b_i = The constant for short-term releases (equal to or less than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/yr per uCi/sec).

3.17E-8 = The inverse of the number of seconds in a year.

NUREG 0133[3.1.3.1] permits eliminating the short-term release term and short-term meteorological terms in the determination of doses when short-term releases are sufficiently random in both time of day and duration to be represented by annual average dispersion conditions. This special consideration is applied in Equations [2.3-1] through [2.3-6], however, a summary of the "real time" meteorological data coupled with the corresponding releases shall be included in the Annual Radioactive Effluent Release Report.

Short-term releases are also evaluated annually in computer codes technically consistent with XOQDOQ and GASPAR for inclusion in the Annual Radiological Environmental Report.

The incorporation of this option and the Release Modes of ATTACHMENT I Table 2.3-1 results in the following equations to show compliance with 10 CFR 50 for the calendar quarter or year.

8.3.1.1.7 **Gamma Radiation Dose Equation**

$$3.17E-8 \sum_i [M_i [\overline{(X/Q)}_{cv} Q_{i_{cv}} + \overline{(X/Q)}_{vv} Q_{i_{vv}} + \overline{(X/Q)}_{cb} Q_{i_{cb}} + \overline{(X/Q)}_{dv} Q_{i_{dv}} + \overline{(X/Q)}_{wv} Q_{i_{wv}}] + 0.5\, B_i Q_{i_{pv}}] \quad [2.3\text{-}7]$$

$\leq$ 0.2 mrad (per 31 days), or
$\leq$ 5.0 mrad (per quarter), or
$\leq$ 10.0 mrad (per year)

8.3.1.1.8 **Beta Radiation Dose Equation**

$$3.17E-8 \sum_i N_i \, [(\overline{X/Q})_{cv} Q_{i_{cv}} + (\overline{X/Q})_{vv} Q_{i_{vv}} + (\overline{X/Q})_{cb} Q_{i_{cb}} + (\overline{X/Q})_{dv} Q_{i_{dv}} +$$

$$(\overline{X/Q})_{wv} Q_{i_{wv}} + 0.5\,(\overline{X/Q})_{pv} Q_{i_{pv}}] \qquad [2.3\text{-}8]$$

$\leq$ 0.4 mrad (per 31 days), or
$\leq$ 10.0 mrad (per quarter), or
$\leq$ 20.0 mrad (per year)

where:

$(\overline{X/Q})_{cv}$ = Annual average relative concentration for releases from CV-1 and CV-2 (sec/m^3).

$(\overline{X/Q})_{vv}$ = Annual average relative concentration for releases from VV-1 and VV-2 (sec/m^3).

$(\overline{X/Q})_{pv}$ = Annual average relative concentration for releases from PV-1/2 (sec/m^3).

$(\overline{X/Q})_{tv}$ = Annual average relative concentration for releases from TV-2 (sec/m^3).

$Q_{i_{cv}}$ = Release of radionuclide "i" from CV-1 and CV-2 (uCi).

$Q_{i_{vv}}$ = Release or radionuclide "i" from VV-1 and VV-2 (uCi).

$Q_{i_{pv}}$ = Release of radionuclide "i" from PV-1/2 (uCi).

$Q_{i_{tv}}$ = Release of radionuclide "i" from TV-2 (uCi).

$Q_{i_{cb}}$ = Release of radionuclide "i" from the CB-2 (uCi).

$Q_{i_{dv}}$ = Release of radionuclide "i" from DV-2 (uCi).

$Q_{i_{wv}}$ = Release of radionuclide "i" from WV-2 (uCi).

For Release Modes 1, 2, 3, and 4 the controlling location is 0.35 miles NW. Substitution of the appropriate X/Q values into Equations [2.3-7] and [2.3-8] results in the following:

8.3.1.1.9 **Gamma Radiation Dose Determination**

$$3.17E-8 \sum_i [M_i [9.24E-5\, Q_{i_{cv}} + 1.03E-4\, Q_{i_{vv}} + 7.35E-5\, Q_{i_{tv}} + 7.35E-5\, Q_{i_{cb}} + 9.24E-5\, Q_{i_{dv}} + 9.24E-5\, Q_{i_{wv}}] + 0.5\, B_i Q_{i_{pv}} \quad [2.3\text{-}9]$$

$\leq$ 0.2 mrad (per 31 days), or
$\leq$ 5.0 mrad (per quarter), or
$\leq$ 10.0 mrad (per year)

8.3.1.1.10 **Beta Radiation Dose Determination**

$$3.17E-8 \sum_i N_i [9.24E-5\, Q_{i_{cv}} + 1.03E-4\, Q_{i_{vv}} + 7.35E-5\, Q_{i_{tv}} + 7.35E-5\, Q_{i_{cb}} + 9.24E-5\, Q_{i_{dv}} + 9.24E-5\, Q_{i_{wv}} + (0.5)\, 7.0E-10\, Q_{i_{pv}}] \quad [2.3\text{-}10]$$

$\leq$ 0.4 mrad (per 31 days), or
$\leq$ 10.0 mrad (per quarter), or
$\leq$ 20.0 mrad (per year)

8.3.1.1.11 **Determination of Controlling Location**

The determination of the controlling locations for implementation of 10 CFR 50 is a function of the following parameters:

- Radionuclide mix and their isotopic release
- Release Mode
- Meteorology

The incorporation of these parameters into Equations [2.3-7] and [2.3-8] resulted in the equations for the controlling locations as presented in Equations [2.3-9] and [2.3-10]. The radionuclide mix was based upon source terms calculated using the NRC GALE Code (see 1/2-ODC-3.01 for inputs) and are shown in ATTACHMENT D Tables 2.2-2a and 2.2-2b as a function of release type and Release Point.

As in Section 8.2.1, for each Release Mode, the two highest boundary X/Q values for each release point and release duration were utilized in conjunction with the radionuclide mix and release for each release point to determine the controlling site boundary location. Since elevated releases occur from the BVPS site and their maximum X/Q values may not decrease with distance (i.e., the site boundary may not have highest X/Q values), the two highest X/Q values for those distances, greater than the site boundary, were also considered in conjunction with the radionuclide mix to determine the controlling location. These values of X/Q were obtained for the midpoint of the 10 standard distance intervals previously presented in ATTACHMENT F Tables 2.2-4 through 2.2-10.

For each Release Mode, a particular combination of Release Point mix and meteorology dominates in the determination of the controlling location. For Release Modes 1, 2, 3, and 4 the controlling release is VV-1 and VV-2. For Release Mode 3, the controlling release is CV-1 and CV-2.

Values for M_i and N_i, which were used in the determination of the controlling location and which are to be used by BV-1 and BV-2 in Equations [2.3-9] and [2.3-10] to show compliance with 10 CFR 50 were presented in ATTACHMENT G Table 2.2-11. Values taken from Table B-1 of Regulatory Guide 1.109, Revision 1[3.1.3.5] were multiplied by 1E6 to convert from picocuries to microcuries for use in ATTACHMENT G Table 2.2-11.

In determination of the controlling location for Release Modes 1, 2, 3, and 4, ATTACHMENT F Tables 2.2-4 through 2.2-7 are utilized for X/Q values. The B_i values to be utilized are the same values which were presented in ATTACHMENT G Table 2.2-12. A description of the derivation of the various X/Q values is presented in 1/2-ODC-3.01.

The following relationship must hold for BV-1 or BV-2 to show compliance with ODCM CONTROL 3.11.2.2:

<u>For The Calendar Quarter</u>

$D_\gamma \leq 5.0$ mrad [2.3-11]

$D_\beta \leq 10$ mrad [2.3-12]

<u>For The Calendar Year</u>

$D_\gamma \leq 10$ mrad [2.3-13]

$D_\beta \leq 20$ mrad [2.3-14]

where:

D_γ = The air dose from gamma radiation (mrad).

D_β = The air dose from beta radiation (mrad).

The quarterly limits given above represent one-half the annual design objective of Section II.B.1 of Appendix I of 10 CFR 50. If any of the limits of Equations [2.3-11] through [2.3-14] are exceeded, a special report pursuant to both Section IV.A of Appendix I of 10 CFR 50 and ODCM CONTROL 3.11.2.2.a must be filed with the NRC at the identified locations.

In addition, ODCM CONTROL 3.1.2.4 requires that the gaseous radwaste system must be used to reduce radioactive materials in that waste when projected doses from each reactor unit when averaged over 31 days exceed any of the following:

$D_\gamma \leq 0.2$ mrad [2.3-15]

$D_\beta \leq 0.4$ mrad [2.3-16]

8.3.1.2 **<u>Projection Of Doses (Noble Gas)</u>**

Doses due to gaseous releases from BV-1 and BV-2 shall be projected at least once per 31 days in accordance with ODCM CONTROL 4.11.2.4 and this section. (Also see Section 8.3.2.2 <u>Projection Of Doses</u> for additional specifications). The Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge in accordance with ODCM CONTROL 3.11.2.4 when the projected gaseous effluent air dose due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. (Also see Section 8.3.2.2 <u>Projection Of Doses</u> for additional specifications). The doses used in the 31-day dose projection will be calculated using Equations [2.3-9] and [2.3-10] as appropriate. The 31-day dose projection shall be performed according to the following equations:

8.3.1.2.1 **<u>When Including Pre-Release Data</u>,**

$$D_{31} = \left[\frac{A+B}{T}\right](31) + C \qquad [2.3\text{-}17]$$

8.3.1.2.2 **<u>When Not Including Pre-Release Data</u>,**

$$D_{31} = \left[\frac{A}{T}\right](31) + C \qquad [2.3\text{-}18]$$

where:

D_{31} = Projected 31 day dose (mrad).

A = Cumulative dose for quarter (mrad).

B = Projected dose from this release (mrad).

T = Current days into quarter.

C = Value which may be used to anticipate plant trends (mrad).

8.3.2 **Dose Due To Radioiodines And Particulates**

8.3.2.1 **Cumulation Of Doses**

Section II.C of Appendix I of 10 CFR 50 (ODCM CONTROLS 3.11.2.3 and 3.11.2.4) limits the release of radioiodines and radioactive material in particulate form from each reactor unit such that estimated dose or dose commitment to an individual in an unrestricted area from all pathways of exposure is not in excess of 15 mrem to any organ. In addition, ODCM CONTROL 3.11.2.4 requires the use of gaseous radwaste treatment system when the projected dose due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.3 mrem to any organ. Based upon NUREG-0133,[3.1.3.1] the dose to an organ of an individual from radioiodines and particulates, and radionuclides other than noble gases with half-lives greater than 8 days in gaseous effluents released to unrestricted areas, can be determined by the following equation:

8.3.2.1.1 **Radioiodines and Particulates Month, Quarter, and Year Limits**

$$3.17E-8 \sum_{i} R_{i\tau} \left[W_s Q_{is} + w_s q_{is} + W_v Q_{iv} + w_v q_{iv}\right]$$

$\leq$ 0.3 mrem (per 31 days), or [2.3-19]
$\leq$ 7.5 mrem (per quarter), or
$\leq$ 15.0 mrem (per calendar year)

where:

Q_{is} = Release of radionuclide "i" for long-term free standing stack releases greater than 500 hrs/yr (uCi).

Q_{iv} = Release of radionuclide "i" for long-term vent releases greater than 500 hrs/yr (uCi).

q_{is} = Release of radionuclide "i" for short-term free standing stack releases equal to or less than 500 hrs/yr (uCi).

q_{iv} = Release of radionuclide "i" for short-term vent releases equal to or less than 500 hrs/yr (uCi).

w_s = Dispersion parameter for estimating dose to an individual at the controlling location for long-term free standing stack releases greater than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, ($\overline{W/Q}$)s.

= meters^{-2} for the food and ground plane pathway, ($\overline{D/Q}$)s.

W_v = The dispersion parameter for estimating the dose to an individual at the controlling location for long-term vent releases greater than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, ($\overline{X/Q}$)$_v$.

= meters^{-2} for the food and ground plane pathway, ($\overline{D/Q}$)$_v$.

w_s = Dispersion parameter for estimating the dose to an individual at the controlling location for short-term stack releases equal to or less than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, ($\overline{W/q}$)$_s$.

= meters^{-2} for the food and ground plane pathway, ($\overline{D/q}$)$_s$.

w_v = The dispersion parameter for estimating the dose to an individual at the controlling location for short-term vent releases equal to or less than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, ($\overline{X/q}$)$_v$.

= meters^{-2} for the food and ground plane pathway, ($\overline{D/q}$)$_v$.

3.17E-8 = The inverse of the number of seconds in a year.

$R_{i\tau}$ = The dose factor for each identified radionuclide "i" for the organ "τ" of interest (mrem/yr per uCi/sec per m^{-2} or mrem/yr per uCi/m^3).

Radionuclides and particulates may be released from any of the BV-1 and BV-2 Release Points in the Release Modes identified in ATTACHMENT I Table 2.3-1. As described previously in Section 8.3.1.1, NUREG 0133[3.1.3.1] permits use of long-term annual average dispersion calculations (which with the release modes of Table 2.3-1 results in the following equations) to show compliance with ODCM CONTROLS 3.11.2.3 and 3.11.2.4. For a particular organ, Equation [2.3-19] becomes:

8.3.2.1.2 **Radioiodines and Particulates Dose Equation**

$$3.17E-8\sum_i R_{i\tau}\,[0.5\,W_{pv}Q_{i_{pv}} + W_{cv}Q_{i_{cv}} + W_{vv}Q_{i_{vv}} + W_{tv}Q_{i_{tv}} + W_{cb}Q_{i_{cb}} + W_{dv}Q_{i_{dv}} + W_{wv}\,Q_{i_{wv}}] \qquad [2.3\text{-}20]$$

≤ 0.3 mrem (per 31 days), or
≤ 7.5 mrem (per quarter), or
≤ 15.0 mrem (per calendar year)

where:

$0.5\ W_{pv}$ = Dispersion parameter for releases from PV-1/2. The value of 0.5 represents the portion of dose assigned to each Unit due to this being a shared Release Point

W_{cv} = Dispersion parameter for releases from CV-1 and CV-2.

W_{vv} = Dispersion parameter for releases from VV-1 and VV-2.

W_{tv} = Dispersion parameter for releases from TV-2.

W_{cb} = Dispersion parameter for releases from CB-2.

W_{dv} = Dispersion parameter for releases from DV-2.

W_{wv} = Dispersion parameter for releases from WV-2.

$Q_{i_{pv}}$ = Release of radionuclide "i" from PV-1/2 (uCi).

$Q_{i_{cv}}$ = Release of radionuclide "i" from CV-1 and CV-2 (uCi).

$Q_{i_{vv}}$ = Release of radionuclide "i" from VV-1 and VV-2 (uCi).

$Q_{i_{tv}}$ = Release of radionuclide "i" from TV-2 (uCi).

$Q_{i_{cb}}$ = Release of radionuclide "i" from CB-2 (uCi).

$Q_{i_{dv}}$ = Release of radionuclide "i" from DV-2 (uCi).

$Q_{i_{wv}}$ = Release of radionuclide "i" from WV-2 (uCi).

TV-2, CB-2, DV-2 and WV-2 are not normally radioactive Release Points. These are included only for use if a radioactive release is identified in the future.

In determining the dose at a particular location, dispersion parameter W is a function of the pathway. For the food and ground plane pathway, W is in terms of D/Q. If the inhalation pathway is considered, W is in terms of X/Q. Incorporation of the various pathways into Equation [2.3-20] results in the following equation for a particular organ:

8.3.2.1.2.1 **Radioiodines and Particulates Dose Determination**

$$3.17E-8\sum_i [[R_{i\tau_G} + R_{i\tau_M} + R_{i\tau_V} + R_{i\tau_B}][0.5\,W_{pv}Q_{i_{pv}} + W_{cv}Q_{i_{cv}} + W_{vv}Q_{i_{vv}} + W_{tv}Q_{i_{tv}} + W_{cb}Q_{i_{cb}} + W_{dv}Q_{i_{dv}} + W_{wv}Q_{i_{wv}}] + R_{i\tau_I}[0.5\,(X/Q)_{pv}Q_{i_{pv}} + (X/Q)_{cv}Q_{i_{cv}} + (X/Q)_{vv}Q_{i_{vv}} + (X/Q)_{tv}Q_{i_{tv}} + (X/Q)_{cb}Q_{i_{cb}} + (X/Q)_{dv}Q_{i_{dv}} + (X/Q)_{wv}Q_{i_{wv}}]] \quad [2.3\text{-}21]$$

3-7-14

$\leq$ 0.3 mrem (per 31 days), or
$\leq$ 7.5 mrem (per quarter), or
$\leq$ 15.0 mrem (per year)

where:

$R_{i\tau_G}$ = Dose factor for an organ "τ" for radionuclide "i" for the ground plane exposure pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_M}$ = Dose factor for an organ "τ" for radionuclide "i" for either the cow milk or goat milk pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_V}$ = Dose factor for an organ "τ" for radionuclide "i" for the vegetable pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_B}$ = Dose factor for an organ "τ" for radionuclide "i" for the meat pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_I}$ = Dose factor for an organ "τ" for radionuclide "i" for the inhalation pathway (mrem/yr per uCi/m^3).

It should be noted that W_{pv}, W_{cv}, W_{vv}, W_{tv}, W_{cp}, W_{dv}, and W_{wv} in Equation [2.3-21] are in terms of $D/Q(m^{-2})$.

Values of the dose factor, $R_{i\tau}$, were calculated using the methodology of NUREG-0133.(3.1.3.1) The following equations are used for all nuclides, unless specifically listed for tritium or carbon-14: 3-7-14

8.3.2.1.2.2 **Dose Factors For Inhalation Pathway**

$$R_{i\tau_I} = K'(BR)_a(DFA_{i\tau})_a$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}22]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

$(BR)_a$ = The breathing rate of the receptor of age group "a" (m^3/yr).

$(DFA_{i\tau})_a$ = Each organ inhalation dose factor for the receptor of age group "a" for the "i" th radionuclide (mrem/pCi). Inhalation dose factors (DFA_{it}) by organ for the various age groups are given in Table E-7 through E-10 of Regulatory Guide 1.109, Rev. 1(3.1.3.5) or Tables 5 through 8 of NUREG-0172 for all nuclides except Se-75.(3.1.3.6) Se-75 DFA_{it} were provided by ABS Consulting and were derived from MACCS2(3.1.3.16), FGR 11/12(3.1.3.17 and 18) and ORNL-4992(3.1.3.19) using conversion factors for the adult pathway only.

The breathing rates $(BR)_a$ used for the various age groups are tabulated below, as given in Table E-5 of the Regulatory Guide 1.109.(3.1.3.5)

Age Group(a)	Breathing Rate (m^3/yr)
Infant	1400
Child	3700
Teen	8000
Adult	8000

8.3.2.1.2.3 **Dose Factors For Ground Plane Pathway**

$$R_{i\tau_G} = K'K''(SF)DFG_{i\tau}[(1 - e^{-\lambda_i t})/\lambda_i]$$

$$= m^2\text{-mrem/yr per uCi/sec} \qquad [2.3\text{-}23]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

K'' = A constant of unit conversion (8760 hr/year).

λi = The decay constant for the "i" th radionuclide (sec^{-1}).

t = The exposure time (4.73E8 sec or 15 years).

$DFG_{i\tau}$ = The groundplane dose conversion factor for organ "τ" for the "i" th radionuclide (mrem/hr per pCi/m^2). A tabulation of $DFG_{i\tau}$ values is presented in Table E-6 of Regulatory Guide 1.109.(3.1.3.5) for all nuclides except Se-75.(3.1.3.6) Se-75 DFG_{it} were provided by ABS Consulting and were derived from MACCS2(3.1.3.16), FGR 11/12(3.1.3.17 and 18) and ORNL-4992(3.1.3.19) using conversion factors for the adult pathway only.

SF = The shielding factor (dimensionless). A shielding factor of 0.7 as suggested in Table E-15 of Regulatory Guide 1.109 is used.(3.1.3.5)

8.3.2.1.2.4 **Dose Factors For Cow Milk or Goat Milk Pathway**

$$R_{i\tau_M} = K' \frac{Q_F (U_{ap})}{\lambda_i + \lambda_w} F_m (r)(DFL_{i\tau})_a \left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s) e^{-\lambda_i t_h}}{Y_S} \right] e^{-\lambda_i t_f}$$

$= m^2$ -mrem/yr per uCi/sec [2.3-24]

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

QF = The animal's consumption rate, wet weight (kg/day).

U_{ap} = The receptor's milk consumption rate, for age "a" (liters/yr).

Y_p = The agricultural productivity by unit area of pasture feed grass (kg/m2).

Y_S = The agricultural productivity by unit area of stored feed (kg/m2).

F_m = The stable element transfer coefficients (days/liter).

r = Fraction of deposited activity retained on animals feed grass.

$(DFL_{i\tau})_a$ = The maximum organ ingestion dose factor for the "i" th radionuclide for the receptor in age group "a" (mrem/pCi). Ingestion dose factors $(DFL_{i\tau})_a$ for the various age groups are given in Table E-11 through E-14 of Regulatory Guide 1.109[3.1.3.5] or Tables 1 through 4 of NUREG-0172.[3.1.3.6] for all nuclides except Se-75.[3.1.3.6] Se-75 DFL_{it} were provided by ABS Consulting and were derived from MACCS2[3.1.3.16], FGR 11/12[3.1.3.17 and 18] and ORNL-4992[3.1.3.19] using conversion factors for the adult pathway only.

λ_i = The decay constant for the "i" th radionuclide (sec-1).

λ_w = The decay constant for removal of activity on leaf and plant surfaces by weathering 5.73E-7 sec^{-1} (corresponding to a 14 day half-life).

t_f = The transport time from pasture, to animal, to milk, to receptor (sec).

t_h = The transport time from pasture, to harvest, to animal, to milk, to receptor (sec).

f_p = Fraction of the year that the animal is on pasture (dimensionless).

f_s = Fraction of the animal feed that is pasture grass while the animal is on pasture (dimensionless).

Tabulated below are the parameter values used for cow's milk and their reference to Regulatory Guide 1.109.[3.1.3.5]

Parameter	Value	RG. 1.109 Table
r (dimensionless)	1.0 for radioiodine	E-15
	0.2 for particulates	E-15
F_m (days/liter)	each stable element	E-1 (cow milk)
		E-2 (goat milk)
U_{ap} (liters/yr) - infant	330	E-5
child	330	E-5
teen	400	E-5
adult	310	E-5
$(DLF_{i\tau})_a$ (mrem/pCi)	each radionuclide	E-11 to E-14
Y_p (kg/m^2)	0.7	E-15
Y_s (kg/m^2)	2.0	E-15
t_f (seconds)	1.73E5 (2 days)	E-15
t_h (seconds)	7.78E6 (90 days)	E-15
Q_F (kg/day)	50	E-3
f_p	0.5	--
f_s	1.0	--

For goat's milk, all values remain the same except for Q_F, which is 6 kg/day.

8.3.2.1.2.5 **Dose Factors For Meat Pathway**

$$R_{i\tau_B} = K' \frac{Q_F(U_{ap})}{\lambda_i + \lambda_w} F_f(r)(DFL_{i\tau})_a \left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s) e^{-\lambda_i t_h}}{Y_s} \right] e^{-\lambda_i t_f}$$

$= m^2$ -mrem/yr per uCi/sec [2.3-25]

where:

F_f = The stable element transfer coefficients (days/kg).

U_{ap} = The receptor's meat consumption rate for age "a" (kg/yr).

t_f = The average time from slaughter of meat animal to consumption (sec).

t_h = The transport time from crop field to receptor (sec).

All parameter values are the same as the milk pathway parameter values except F_f which is obtained from Table E-1. Parameter t_f is obtained from Table E-15, and U_{ap} is obtained from Table E-5. These values, as obtained from Regulatory Guide 1.109,[3.1.3.5] are as follows:

Parameter	Value	RG-1.109 Table
F (days/kg)	each stable element	E-1
t_f (seconds)	1.73E6 (20 days)	E-15
U_{ap} (kg/yr) - infant	0	E-5
Child	41	E-5
Teen	65	E-5
Adult	110	E-5

Man is considered to consume 2 types of vegetation (fresh and stored) that differ only in the time period between harvest and consumption; therefore:

8.3.2.1.2.6 **Dose Factors For Vegetation Pathway**

$$R_{i\tau_V} = K'\left[\frac{(r)}{Y_V(\lambda_i + \lambda_W)}\right](DFL_{i\tau})_a\left[U_a^L f_L e^{-\lambda_i t_L} + U_a^S f_g e^{-\lambda_i t_h}\right]$$

$= m^2$-mrem/yr per uCi/sec [2.3-26]

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

U_a^L = The consumption rate of fresh leafy vegetation by the receptor in age group "a" (kg/yr).

U_a^S = The consumption rate of stored vegetation by the receptor in age group "a" (kg/yr).

f_L = The fraction of the annual intake of fresh leafy vegetation grown locally.

f_g = The fraction of the annual intake of stored vegetation grown locally.

t_L = The average time between harvest of leafy vegetation and its consumption (seconds).

t_h = The average time between harvest of stored vegetation and its consumption (seconds).

Y_v = The vegetation area density (kg/m^2).

all other factors are defined previously.

Tabulated below are the appropriate parameter values and their reference to Regulatory Guide 1.109.(3.1.3.5)

Parameter	Value	RG-1.109 Table
r (dimensionless)	1.0 for radioiodines	E-15
	0.2 for particulates	E-15
$(DFL_{i\tau})_a$ (mrem/pCi)	each stable element	E-11 to E-14
U_a^L (kg/yr) - infant	0	E-5
Child	26	E-5
teen	42	E-5
adult	64	E-5
U_a^S (kg/yr) - infant	0	E-5
child	520	E-5
teen	630	E-5
adult	520	E-5
f_L (dimensionless)	1.0	E-15
F_g (dimensionless)	0.76	E-15
t_L (seconds)	8.6E4 (1 day)	E-15
t_h (seconds)	5.18E6 (60 days)	E-15
Y_v (kg/m^2)	2.0	E-15

As discussed in Section 8.2.2 for tritium, the parameter W for the food pathway is based upon X/Q. The ground plane pathway is not appropriate for tritium. Therefore, the

left-hand portion of Equation [2.3-20] may be expressed for purposes of implementation of 40 CFR 190, discussed in 1/2-ODC-2.04, as follows:

8.3.2.1.2.7 **Tritium Dose Equation**

$$3.17E-8\,(R_{T\tau_M} + R_{T\tau_V} + R_{T\tau_B} + R_{T\tau_I})\ [0.5\,(X/Q)_{pv} Q_{T_{pv}} + (X/Q)_{cv} Q_{T_{cv}} + (X/Q)_{vv} Q_{T_{vv}} + (X/Q)_{tv} Q_{T_{tv}} + (X/Q)_{cb} Q_{\tau_{cb}} + (X/Q)_{dv} Q_{\tau_{dv}} + (X/Q)_{wv} Q_{\tau_{wv}}\ ]$$

[2.3-27]

where:

$R_{T\tau M}$ = Dose factor for organ "τ" for tritium for the milk pathway (mrem/yr per uCi/m^3).

$R_{T\tau V}$ = Dose factor for organ "τ" for tritium for the vegetable pathway (mrem/yr per uCi/m^3).

$R_{T\tau B}$ = Dose factor for organ "τ" for tritium for the beef pathway (mrem/yr per uCi/m^3).

$R_{T\tau I}$ = Dose factor for organ "τ" for tritium for the inhalation pathway (mrem/yr per uCi/m^3).

Equation [2.3-27] is used to show compliance with 40 CFR 190, as discussed in 1/2-ODC-2.04.

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. Therefore, the $R_{T\tau M}$ is based on [X/Q]:

8.3.2.1.2.8 **Tritium Dose Factors For Milk Pathway**

$$R_{T\tau M} = K'K''\, F_m Q_F U_{ap} (DLF_{i\tau})_a [0.75(0.5/H)]$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}28]$$

where:

K" = A constant of unit conversion (1000 gm/kg).

H = Absolute humidity of the atmosphere (8 gm/m^3).

0.75 = The fraction of total feed that is water.

0.5 = The ratio of the specific activity of the feed grass water to the atmospheric water.

and other parameters and values are the same as for $R_{i\tau M}$.

The concentration of tritium in vegetation is based on the airborne concentration rather than the deposition. Therefore, the $R_{t\tau_V}$ is based on [X/Q]:

8.3.2.1.2.9 **Tritium Dose Factors For Vegetation Pathway**

$$R_{T\tau_V} = K'K''\left[U_a^L f_L + U_a^S f_g\right]\left(DFL_{i\tau}\right)_a \left[0.75(0.5/H)\right]$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}29]$$

where all terms have been defined above.

The concentration of tritium in meat is based on its airborne concentration rather than the deposition. Therefore, the $R_{T\tau B}$ is based on [X/Q]:

8.3.2.1.2.10 **Tritium Dose Factors For Beef Pathway**

$$R_{T\tau_B} = K'K''F_f Q_F U_{ap}\left(DFL_{i\tau}\right)_a \left[0.75(0.5/H)\right]$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}30]$$

where all terms have been defined above.

In determining the dose for carbon-14, the plume and ground pathways are not applicable. The concentration of carbon-14 is based on the airborne concentration rather than the deposition in all pathways. Therefore, the $R_{c\tau}$ is based on [X/Q]. Incorporation of the various pathways into Equation [2.3-20] results in the following equation for a particular organ:

8.3.2.1.2.11 **Carbon-14 Dose Determination**

$$3.17E-8\,(pR_{c\tau_M} + pR_{c\tau_V} + pR_{c\tau_B} + R_{c\tau_I})\,[0.5\,(X/Q)_{pv}Q_{c_{pv}} + (X/Q)_{cv}Q_{c_{cv}} + (X/Q)_{vv}Q_{c_{vv}} + (X/Q)_{tv}Q_{c_{tv}} + (X/Q)_{cb}Q_{c_{cb}} + (X/Q)_{dv}Q_{c_{dv}} + (X/Q)_{wv}Q_{c_{wv}}\,]$$

[2.3-31]

where:

$R_{c\tau_M}$ = Dose factor for an organ "τ" for carbon-14 for either the cow milk or goat milk pathway mrem/yr per uCi/m^3).

$R_{c\tau_V}$ = Dose factor for an organ "τ" for carbon-14 for the vegetable pathway (mrem/yr per uCi/m^3).

$R_{c\tau_B}$ = Dose factor for an organ "τ" for carbon-14 for the meat pathway (mrem/yr per uCi/m^3).

$R_{c\tau_I}$ = Dose factor for an organ "τ" for carbon-14 for the inhalation pathway (mrem/yr per uCi/m^3).

p = The fractional equilibrium ratio, dimensionless. For batch releases, the parameter p is defined as the ratio of the total annual atmospheric release time to the total annual time during which photosynthesis occurs (assumed to be 4400 hours). Under this condition, p should never exceed 1. For continuous releases, p = 1.

NOTE:	Because photosynthesis only occurs during daylight hours, it may be acceptable to take this into further consideration.

3-7-14

Values of the dose factor, $R_{c\tau}$, were calculated using the methodology of NUREG-0133.[3.1.3.1] Carbon-14 inhalation dose factors were calculated according to Equation [2.3-22] and are therefore not repeated in this section. The following equations were used for other pathways to determine carbon-14 dose factors:

8.3.2.1.2.12 **Carbon-14 Dose Factors For Cow Milk or Goat Milk Pathway**

$$R_{c\tau_M} = K'K''F_m Q_F U_{ap} (DFL_{i\tau})_a (0.11/0.16)$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}32]$$

where:

0.11 = The fraction of total plant mass that is natural carbon, dimensionless.

0.16 = The concentration of natural carbon in the atmosphere (g/m^3).

and other parameters as defined above.

8.3.2.1.2.13 **Carbon-14 Dose Factors For Meat Pathway**

$$R_{i\tau_B} = K'K''F_f Q_F U_{ap} (DFL_{i\tau})_a (0.11/0.16)$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}33]$$

where all terms have been defined above.

8.3.2.1.2.14 **Carbon-14 Dose Factors For Vegetation Pathway**

$$R_{c\tau_V} = K'K''\left[U_a^L f_L + U_a^S f_g\right](DFL_{i\tau})_a (0.11/0.16)$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}34]$$

where all other terms have been defined above.

3-7-14

The following sections explain the determination of the controlling locations and limits for dose of radioiodines and particulates. While carbon-14 was used to determine controlling locations, there are currently no regulatory limits on carbon-14 effluents from the plant. Equations [2.3-31] though [2.3-34] should be used to calculate dose at the controlling location (0.89 miles NW) for the Annual Radioactive Effluent Release Report. 3-7-14

To show compliance with ODCM CONTROLS 3.11.2.3 and 3.11.2.4, Equation [2.3-21] is evaluated at the controlling pathway location. For Release Modes 1 through 4, the controlling location is a residence 0.89 miles in the NW sector. Inserting appropriate X/Q values from ATTACHMENT F Tables 2.2-4 to 2.2-10 and D/Q values from ATTACHMENT L Tables 2.3-28 to 2.3-34, Equation [2.3-21] becomes:

8.3.2.1.3 **<u>Radioiodines and Particulates (excluding C-14) Dose Determination</u>** 3-7-14

$$Q_{i_{vv}} + 1.55E-8\,Q_{i_{tv}} + 1.55E-8\,Q_{i_{cb}} + 1.56E-8\,Q_{i_{dv}} + 1.56E-8$$

$$Q_{i_{wv}}] + R_{i\tau_I}\,[(0.5)\,7.30E-9\,Q_{i_{pv}} + 2.00E-5\,Q_{i_{cv}} + 2.71E-5\,Q_{i_{vv}}$$

$$+\ 2.22E-5\,Q_{i_{tv}} + 2.22E-5\,Q_{i_{cb}} + 2.00E-5\,Q_{i_{dv}} + 2.00E-5\,Q_{i_{wv}}]$$

$\leq$ 0.3 mrem (per 31 days), or [2.3-35] 3-7-14
$\leq$ 7.5 mrem (per quarter), or
$\leq$15.0 mrem (per year)

For tritium, for purposes of implementation of 40 CFR 190, as discussed in 1/2-ODC-2.04, Equation [2.3-28] reduces to:

$$3.17E-8\,[R_{T\tau_V} + R_{T\tau_I}]\,[(0.5)7.30E-9\,Q_{i_{pv}} + 2.00E-5\,Q_{i_{cv}} + 2.71E-$$

$$5Q_{i_{vv}} +\ 2.22E-5\,Q_{i_{tv}} + 2.22E-5\,Q_{i_{cb}} + 2.00E-5Q_{i_{dv}} +$$

$$2.00E-5\,Q_{i_{wv}}] \qquad [2.3\text{-}36]$$

3-7-14

8.3.2.1.4 **Determination of Controlling Location**

The determination of a controlling locating for implementation of ODCM CONTROLS 3.11.2.3 and 3.11.2.4 for radioiodines and particulates is a function of:

- Radionuclide mix and their isotopic release
- Release Mode
- Meteorology
- Exposure pathway
- Receptor's age

The incorporation of these parameters into Equation [2.3-19] results in the respective equations for each Release Mode at the controlling location.

In determination of the controlling location for each Release Mode, the radionuclide mix of radioiodines and particulates was based upon the source terms calculated using the GALE code. This mix was presented in ATTACHMENT D Tables 2.2-2a and 2.2-2b as a function of Release Mode and Release Point. For the ground plane exposure pathway, all radionuclides (excluding H-3 and C-14) were considered in determination of the controlling location. For the inhalation and food pathways H-3 and C-14 were also considered in determination of the controlling location.

In determination of the controlling location for each Release Mode, all of the exposure pathways, as presented in ATTACHMENT E Table 2.2-3, were evaluated. These include cow milk, goat milk, beef and vegetable ingestion and inhalation and ground plane exposure. An infant was assumed to be present at all milk pathway locations. A child was assumed to be present at all vegetable garden and beef animal locations. The ground plane and inhalation exposure pathways were considered to be present at all locations.

For determination of the controlling location, the highest D/Q and X/Q values for each Release Point and Release Mode for the vegetable garden, cow milk, and goat milk pathways were selected. The organ dose was calculated at each of these locations using the radionuclide mix and Release Points of ATTACHMENT D Tables 2.2-2a and 2.2-2b Based upon these calculations, it was determined that the controlling location for Release Modes 1 through 4 is the residence (vegetable garden)/child pathway.

For Release Modes 1 through 4, the controlling Release Point and mix is VV-1 and VV-2.

ATTACHMENT J Tables 2.3-2 through 2.3-20 present Ri values for the total body, GI-LLI, bone, liver, kidney, thyroid, and lung organs for the ground plane, inhalation, cow milk, goat milk, vegetable, and meat ingestion pathways for the infant, child, teen, and adult age groups as appropriate to the pathways. These values were calculated using the methodology described in NUREG-0133[3.1.3.1] using a grazing period of 6 months.

In determination of the controlling location for Release Modes 1-4, ATTACHMENT F Tables 2.2-4 through 2.2-10 are utilized for X/Q's, and ATTACHMENT L Tables 2.3-28 through 2.3-34 are utilized for long term D/Q values. A description of the derivation of the various X/Q and D/Q values is presented in 1/2-ODC-3.01.

Long-term D/Q values for PV-1/2, CV-1, CV-2, VV-1, VV-2, TV-2, CB-2, DV-2 AND WV-2 are provided for the midpoints of the following distances:

0.0-0.5 mi., 0.5-1.0 mi., 1.0-1.5 mi., 1.5-2.0 mi., 2.0-2.5 mi.,
2.5-3.0 mi., 3.0-3.5 mi., 3.5-4.0 mi., 4.0-4.5 mi., 4.5-5.0 mi.

The values appear in ATTACHMENT K Tables 2.3-21 through 2.3-27. These values may be utilized if an additional special location arises different from those presented in the special locations of ATTACHMENT E Table 2.2-3.

The following relationship must hold for BV-1 or BV-2 to show compliance with ODCM CONTROL 3.11.2.3.

For The Calendar Quarter:

$D_\tau \leq 7.5$ mrem to any organ [2.3-37] 3-7-14

For The Calendar Year:

$D_\tau \leq 15$ mrem to any organ [2.3-38] 3-7-14

where:

D_τ = The dose to any organ from radioiodines and particulates (mrem).

The quarterly limits given above represent one-half the annual design objective of Section II.C of Appendix I of 10 CFR 50. If any of the limits of Equations [2.3-33] and [2.3-34] are exceeded, a Special Report pursuant to both Section IV.A of Appendix I of 10 CFR 50 and ODCM CONTROL 3.11.2.3.a must be filed with the NRC at the identified locations.

8.3.2.2 **Projection Of Doses (Radioiodines And Particulates)**

Doses due to gaseous releases from BV-1 or BV-2 shall be projected at least once per 31 days in accordance with ODCM CONTROL 4.11.2.4 and this section. (Also see Section 8.3.1.2, Projection Of Doses for additional specifications). The appropriate portions of the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge in accordance with ODCM CONTROL 3.11.2.4 when the projected doses due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.3 mrem to any organ. (Also see Section 8.3.1.2, Projection Of Doses for additional specifications). Doses resulting from the gaseous effluent release of radioiodines and particulates will be calculated for use in the 31-day dose projection using Equation [2.3-31]. The 31-day dose projection shall be performed according to the following equations:

8.3.2.2.1 **When Including Pre-Release Data,**

$$D_{31} = \left[\frac{A + B}{T}\right](31) + C \qquad [2.3\text{-}39]$$

3-7-14

8.3.2.2.2 **When Not Including Pre-Release Data,**

$$D_{31} = \left[\frac{A}{T}\right](31) + C \qquad [2.3\text{-}40]$$

3-7-14

where:

D_{31} = Projected 31 day dose (mrem).

A = Cumulative dose for quarter (mrem).

B = Projected dose for this release (mrem).

T = Current days into quarter.

C = Value which may be used to anticipate plant trends (mrem).

8.4 Gaseous Radwaste System

The gaseous radwaste system has the capability to control, collect, process, store, recycle, and dispose of gaseous radioactive waste generated as a result of plant operations, including anticipated operational occurrences.

A simplified flow diagram of the gaseous radwaste system for BV-1 and BV-2 is provided as ATTACHMENT N Figure 2.4-1. A diagram showing the gaseous effluent Release Points is provided as ATTACHMENT P Figure 2.4-2. Since the concept of a shared gaseous radwaste system is used, then gaseous waste generated can be stored, processed, and discharged from either BV-1 or BV-2.

8.4.1 BV-1 Gaseous Radwaste System Components

8.4.1.1 BR-1EV-2A/2B: Degasifiers

There are two Degasifiers. They are designed to continuously process reactor coolant letdown for reducing entrained noble gases in the liquid.

8.4.1.2 GW-1E-1A/1B: Waste Gas Chillers

There are two Chillers. Non-condensable gases from the degasifiers are directed by system pressure to the Waste Gas Chillers.

8.4.1.3 GW-1TK-3A thru 3D: Gaseous Waste Charcoal Delay Beds

There are four Charcoal Beds. The dry effluent from the Chillers is directed to the Waste Gas Charcoal Delay Beds for holdup of xenon and krypton and adsorption of radioiodines. When four beds are operated in series, they provide a holdup of xenon isotopes for about 30 days.

8.4.1.4 GW-1FL-5A/5B: Overhead Gas Compressor Prefilters

There are two Prefilters. The gaseous effluent (primarily hydrogen) is directed from the Gaseous Waste Charcoal Delay Beds to one of the Overhead Gas Compressor Prefilters. The filters remove carbon solids from the gas stream.

8.4.1.5 GW-1C-1A/1B: Gas Compressors

There are two Compressors. The waste gas enters one of the compressors after passing through the Prefilters.

8.4.1.6 GW-1TK-2: Gaseous Waste Surge Tank

There is one Surge Tank. It has a capacity of 52 cuft. After compression to about 65 psig, the waste gas is sent to the Surge Tank. This can be done automatically or manually.

8.4.1.7 **GW-1TK-1A thru 1C: Waste Gas Decay Tanks**

There are three Decay Tanks. Each has a capacity of 132 cuft. The contents of the Surge Tank is transferred to the Decay Tanks for storage and decay. After 30 days of storage, all xenon and iodine should have decayed, and the resulting predominant nuclide should be krypton 85.

8.4.1.8 **RM-1GW-108 And RM-1GW-109: Gaseous Effluent Radiation Monitors**

There are redundant Radiation Monitors on the combined PV-1/2 Gaseous Waste/Process Vent release path. These Radiation Monitors continuously analyze gaseous waste as it is being discharged. Gaseous Monitor RM-1GW-108B is an off-line gamma scintillator, while RM-1GW-109 Channel 5 is an off-line beta scintillator. The upper activity alarm on the gaseous Channels of these Radiation Monitors have setpoints that would indicate we are approaching the Total Body Dose Rate or Skin Dose Rate limits for radioactive gas leaving the site. If an upper activity alarm on RM-1GW-108B is received, it automatically terminates the discharge by closing an isolation valve downstream of the Decay Tanks.

8.4.2 **BV-2 Gaseous Radwaste System Components**

8.4.2.1 **2BRS-EV21A/21B: Degasifiers**

There are four Degasifiers (two at Unit 1 and two at Unit 2). They are designed to continuously process reactor coolant letdown for reducing entrained noble gases in the liquid.

8.4.2.2 **2GWS-E21A/21B: Waste Gas Chillers**

There are four Chillers (two at Unit 1 and two at Unit 2). Non-condensable gases from the degasifiers are directed by system pressure to the Waste Gas Chillers.

8.4.2.3 **2GWS-TK22A thru 22D: Waste Gas Charcoal Delay Beds**

There are four Charcoal Beds (four at Unit 1 and four at Unit 2). The dry effluent from the Chillers is directed to the Waste Gas Charcoal Delay Beds for holdup of xenon and krypton and adsorption of radioiodines. When four beds are operated in series, they provide a holdup of xenon isotopes for about 30 days.

8.4.2.4 **2GWS-FLT24A/24B: Overhead Gas Compressor Prefilters**

There are two Prefilters. The gaseous effluent (primarily hydrogen) is directed from the Waste Gas Charcoal Delay Beds to one of the Overhead Gas Compressor Prefilters. The filters remove carbon solids from the gas stream.

8.4.2.5 **2GWS-C21A/21B: Gas Compressors**

There are two Compressors. The waste gas enters one of the compressors after passing through the Prefilters.

8.4.2.6 **2GWS-TK21: Gaseous Waste Surge Tank**

There is one Surge Tank. It has a capacity of 52 cuft. After compression to about 65 psig, the waste gas is sent to the Surge Tank. This can be done automatically or manually.

8.4.2.7 **2GWS-TK25A thru 25G: Gaseous Waste Storage Tanks**

There are seven Storage Tanks. Each has a capacity of 132 cuft. The contents of the Surge Tank is transferred to the Storage Tanks for storage and decay. After 30 days of storage, all xenon and iodine should have decayed, and the resulting predominant nuclide should be krypton 85.

8.4.2.8 **RM-1GW-108 And RM-1GW-109: Gaseous Effluent Radiation Monitors**

Previously described in Section 8.4.1.

- END -

ATTACHMENT A
Page 1 of 2
GASEOUS SOURCE TERM

TABLE 2.1-1a

BV-1 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)

	RX CONTAINMENT/ SLCRS VENT	AUXILIARY BUILDING VENT	GASEOUS WASTE/PROCESS VENT		
NUCLIDE[2]	Long Term, And CONTAINMENT BUILDING[1] Short Term	AUXILIARY BUILDING VENTILATION Long Term	MAIN CONDENSER/ AIR EJECTOR Long Term	CONTAINMENT VACUUM PUMPS[3] Long Term	GASEOUS WASTE SYSTEM Short Term
Kr-83m	2.2E-02	4.2E-01	2.7E-01	5.2E-03	0.0
Kr-85m	1.5E-01	1.9E+00	1.2E+00	5.5E-02	7.3E-02
Kr-85	6.1E+01	2.5E+00	1.6E+00	1.0E+01	2.3E+02
Kr-87	5.4E-02	1.3E+00	8.2E-01	1.1E-02	0.0
Kr-88	2.4E-01	3.8E+00	2.4E+00	7.0E-02	0.0
Kr-89	4.7E-04	1.2E-01	7.7E-02	4.3E-05	0.0
Xe-131m	7.4E-01	1.3E-01	8.0E-02	1.8E-01	1.3E+00
Xe-133m	8.9E-01	8.9E-01	5.6E-01	3.1E-01	0.0
Xe-133	8.9E+01	3.6E+01	2.3E+01	2.7E+01	2.3E+01
Xe-135m	4.5E-03	3.2E-01	2.0E-01	6.2E-04	0.0
Xe-135	7.0E-01	4.5E+00	2.8E+00	2.7E-01	0.0
Xe-137	1.0E-03	2.1E-01	1.3E-01	8.8E-05	0.0
Xe-138	1.5E-02	1.1E+00	6.6E-01	1.7E-03	0.0
Ar-41	2.5E+01	0.0	0.0	0.0	0.0

(1) Containment can be purged via VV-1 (Auxiliary Building Vent), CV-1 (Rx Containment/SLCRS Vent), or PV-1/2 (Gaseous Waste/Process Vent)

(2) Source Term from BVPS-2 UFSAR Table 11.3.1[3.1.1.2]

(3) Original Source Term from Calculation No. UR(B)-262 was adjusted for a factor of 14 increase in pump flowrate due to installation of high capacity pumps during 1R15. This change in Source Term is documented in Condition Report CR03-04830 and Calculation No. ERS-HHM-87-014.[3.1.1.5] [3.1.1.8] [3.1.3.10]

ATTACHMENT A
Page 2 of 2
GASEOUS SOURCE TERM

TABLE 2.1-1b
BV-2 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)

	SLCRS UNFILTERED PATHWAY	SLCRS FILTERED PATHWAY	TURBINE BUILDING VENT	GASEOUS WASTE/PROCESS VENT		
NUCLIDE[2]	Long Term, And CONTAINMENT BUILDING[1]	AUXILIARY BUILDING VENTILATION	TURBINE BUILDING VENTILATION	MAIN CONDENSER/ AIR EJECTOR	CONTAINMENT VACUUM PUMPS[3]	GASEOUS WASTE SYSTEM
	Short Term	Long Term	Long Term	Long Term	Long Term	Short Term
Kr-83m	4.0E-05	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.4E-02	1.9E+00	1.7E-04	1.2E+00	3.9E-03	1.2E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.3E-06	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	4.1E-03	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	0.0	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.2E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	8.3E-01
Xe-133m	7.6E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.4E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	8.2E+00
Xe-135m	0.0	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	2.4E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	0.0	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	0.0	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

(1) Containment can be purged via VV-2 (SLCRS Unfiltered Pathway), CV-2 (SLCRS Filtered Pathway), or PV-1/2 (Gaseous Waste/Process Vent)
(2) Source Term from BVPS-2 UFSAR Table 11.3.2[3.1.2.3]
(3) Source Term from Calculation No. UR(B)-262[3.1.2.5]

ATTACHMENT B
Page 1 of 2
GASEOUS EFFLUENT MONITOR DETECTION EFFICIENCIES

TABLE 2.1-2a

BV-1 MONITOR DETECTOR EFFICIENCIES
(cpm/uCi/cc)

NUCLIDE	AUXILIARY BUILDING VENT		GASEOUS WASTE/ PROCESS VENT		Rx CONTAINMENT/ SLCRS VENT	
	PRIMARY MONITOR(1)	ALTERNATE MONITOR(2)	PRIMARY MONITOR(1)	ALTERNATE MONITOR(2)	PRIMARY MONITOR(1)	ALTERNATE MONITOR(2)
	RM-VS-101B	RM-VS-109 Channel 5	RM-GW-108B	RM-GW-109 Channel 5	RM-VS-107B	RM-VS-110 Channel 5
Kr-83m	--	--	--	--	--	--
Kr-85m	9.80 E7	2.39 E7	9.00 E7	2.43 E7	5.16 E7	2.57 E7
Kr-85	3.88 E5	2.47 E7	3.56 E5	2.51 E7	5.04 E7	2.67 E7
Kr-87	7.38 E7	2.95 E7	6.78 E7	3.00 E7	9.60 E7	3.19 E7
Kr-88	1.14 E8	2.11 E7	1.05 E8	2.14 E7	5.16 E7	2.28 E7
Kr-89	1.39 E8	2.93 E7	1.28 E8	2.98 E7	9.59 E7	3.16 E7
Kr-90	1.34 E8	3.05 E7	1.23 E8	3.10 E7	9.87 E7	3.29 E7
Xe-131m	2.25 E6	1.56 E7	2.07 E6	1.59 E7	2.94 E7	1.68 E7
Xe-133m	1.26 E7	1.94 E7	1.16 E7	1.97 E7	4.17 E7	2.09 E7
Xe-133	1.01 E7	1.24 E7	9.24 E6	1.26 E7	2.28 E7	1.33 E7
Xe-135m	7.15 E7	5.70 E6	6.58 E7	5.80 E6	1.51 E7	6.15 E6
Xe-135	1.12 E8	2.91 E7	1.03 E8	2.96 E7	6.42 E7	3.14 E7
Xe-137	3.16 E7	2.96 E7	2.91 E7	3.01 E7	1.05 E8	3.19 E7
Xe-138	1.15 E8	2.66 E7	1.06 E8	2.70 E7	7.35 E7	2.87 E7
Ar-41	7.17 E7	3.00 E7	6.59 E7	3.05 E7	7.19 E7	3.23 E7

(1) The listed detector efficiencies for the respective primary monitors (Victoreen) are corrected for the reduced pressures observed and documented during operation.

(2) The alternate monitors (Eberline SPING Channel 5) efficiencies are corrected for detector unique installation factors. (Pressure corrections are not required for the SPING Monitors.) See Calculation Package ERS-SFL-85-031 for additional information.[3.1.1.4]

ATTACHMENT B
Page 2 of 2
GASEOUS EFFLUENT MONITOR DETECTION EFFICIENCIES

TABLE 2.1-2b
BV-2 MONITOR DETECTOR EFFICIENCIES
(cpm/uCi/cc)

NUCLIDE[1]	SLCRS UNFILTERED PATHWAY 2HVS-RQ101B	SLCRS FILTERED PATHWAY 2HVS-RQ109B	WASTE GAS STORAGE VAULT VENT 2RMQ-RQ303B	DECON BUILDING VENT 2RMQ-RQ301B	CONDENSATE POLISHING BUILDING VENT 2HVL-RQ112B
Kr-83m	--	--	--	--	--
Kr-85m	3.20E7	5.83E7	3.20E7	3.20E7	3.20E7
Kr-85	3.60E7	7.19E7	3.60E7	3.60E7	3.60E7
Kr-87	3.73E7	8.85E7	3.73E7	3.73E7	3.73E7
Kr-88	3.05E7	6.80E7	3.05E7	3.05E7	3.05E7
Kr-89	3.72E7	8.73E7	3.72E7	3.72E7	3.72E7
Kr-90	3.86E7	8.80E7	3.86E7	3.86E7	3.86E7
Xe-131m	2.44E7	4.61E4	2.44E7	2.44E7	2.44E7
Xe-133m	2.86E7	6.06E4	2.86E7	2.86E7	2.86E7
Xe-133	1.80E7	2.94E7	1.80E7	1.80E7	1.80E7
Xe-135m	7.22E6	1.55E4	7.22E6	7.22E6	7.22E6
Xe-135	3.86E7	7.48E7	3.86E7	3.86E7	3.86E7
Xe-137	3.78E7	9.07E7	3.78E7	3.78E7	3.78E7
Xe-138	3.52E7	7.74E7	3.52E7	3.52E7	3.52E7
Ar-41	3.79E7	7.90E7	3.79E7	3.79E7	3.79E7

(1) Efficiencies from Calculation Package ERS-SFL-86-026.[3.1.2.1]

ATTACHMENT C
Page 1 of 1
MODES OF GASEOUS RELEASE

Table 2.2-1
MODES OF GASEOUS RELEASE FROM BEAVER VALLEY SITE VENTS FOR IMPLEMENTATION OF 10 CFR 20 AND 10 CFR 50

RELEASE POINT	RELEASE MODE 1	RELEASE MODE 2	RELEASE MODE 3	RELEASE MODE 4
RP 1; VV-1, Auxiliary Building Vent(1)	Aux. Bldg. Ventilation	Containment Purge(3)	Same As Mode 1	Same As Mode 1
RP 2; CV-1, Rx Containment/SLCRS Vent(1)	Leakage Collection Exhaust	Same As Mode 1	Same As Mode 1 and Containment Purge(3)	Same As Mode 1
RP 3; PV-1/2, Gaseous Waste/Process Vent(2)	Main Cond. Air Ejector, Waste Gas, Containment Vacuum	Same As Mode 1	Same As Mode 1	Same As Mode 1 and Containment Purge
RP 4; VV-2 SLCRS Unfiltered Pathway(1)	Contiguous Areas	Containment Purge(3)	Same As Mode 1	Same As Mode 1
RP 5; CV-2, SLCRS Filtered Pathway Vent(1)	Aux. Bldg. Ventilation	Same As Mode 1	Same As Mode 1 and Containment Purge(3)	Same As Mode 1
RP 6; CB-2, Condensate Polishing Bldg Vent(1)	(4)	(4)	(4)	(4)
RP 7; WV-2, Waste Gas Storage Vault Vent(1)	(4)	(4)	(4)	(4)
RP 8; DV-2, Decontamination Bldg Vent(1)	(4)	(4)	(4)	(4)
RP 9; TV-2, Turbine Bldg Vent(1)	(4)	(4)	(4)	(4)

NOTE: For the purpose of implementing 10 CFR 50, batch discharges may use continuous meteorology since short term meteorology is used at the time of the annual report.

(1) Continuous ground level meteorology is applicable
(2) Continuous elevated meteorology is applicable
(3) Mode established by purge from one unit, all other release points remain same as Mode 1
(4) Not normally a radioactive release point

ATTACHMENT D
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RADIONUCLIDE MIX

TABLE 2.2-2a
BV-1 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)

	RX CONTAINMENT/ SLCRS VENT	AUXILIARY BUILDING VENT	GASEOUS WASTE/PROCESS VENT		
	Long Term, And				
NUCLIDE[2]	CONTAINMENT BUILDING[1]	AUXILIARY BUILDING VENTILATION	MAIN CONDENSER/ AIR EJECTOR	CONTAINMENT VACUUMM PUMPS[3]	GASEOUS WASTE SYSTEM
	Short Term	Long Term	Long Term	Long Term	Short Term
Kr-83m	2.2E-02	4.2E-01	2.7E-01	5.2E-03	0.0
Kr-85m	1.5E-01	1.9E+00	1.2E+00	5.5E-02	1.2E-02
Kr-85	6.1E+01	2.5E+00	1.6E+00	1.0E+01	2.3E+02
Kr-87	5.4E-02	1.3E+00	8.2E-01	1.1E-02	0.0
Kr-88	2.4E-01	3.8E+00	2.4E+00	7.0E-02	0.0
Kr-89	4.7E-04	1.2E-01	7.7E-02	4.3E-05	0.0
Xe-131m	7.4E-01	1.3E-01	8.0E-02	1.8E-01	8.3E-01
Xe-133m	8.9E-01	8.9E-01	5.6E-01	3.1E-01	0.0
Xe-133	8.9E+01	3.6E+01	2.3E+01	2.7E+01	8.2E+00
Xe-135m	4.5E-03	3.2E-01	2.0E-01	6.2E-04	0.0
Xe-135	7.0E-01	4.5E+00	2.8E+00	2.7E-01	0.0
Xe-137	1.0E-03	2.1E-01	1.3E-01	8.8E-05	0.0
Xe-138	1.5E-02	1.1E+00	6.6E-01	1.7E-03	0.0
I-131	1.2E-03	4.6E-02	2.1E-02	6.6E-03	0.0
I-132	0.0	0.0	0.0	3.5E-05	0.0
I-133	2.0E-04	6.7E-02	3.0E-02	1.2E-03	0.0
I-134	0.0	0.0	0.0	6.6E-06	0.0
I-135	0.0	0.0	0.0	2.0E-04	0.0
Co-58	7.5E-04	6.0E-02	0.0	2.2E-04	0.0
Co-60	3.4E-04	2.7E-02	0.0	1.0E-04	0.0
Mn-54	2.2E-04	1.8E-02	0.0	6.9E-05	0.0
Fe-59	7.5E-05	6.0E-03	0.0	2.2E-05	0.0
Sr-89	1.7E-05	1.3E-03	0.0	5.2E-06	0.0
Sr-90	3.0E-06	2.0E-04	0.0	9.2E-07	0.0
Cs-134	2.2E-04	1.8E-02	0.0	6.9E-05	0.0
Cs-137	3.8E-04	3.0E-02	0.0	1.2E-04	0.0
C-14	1.0E+00	0.0	0.0	0.0	7.0E+00
Ar-41	2.5E+01	0.0	0.0	0.0	0.0

(1) Containment can be purged via VV-1 (Auxiliary Building Vent), CV-1 (Rx Containment/SLCRS Vent), or PV-1/2 (Gaseous Waste/Process Vent)

(2) Source Term from BVPS-2UFSAR Table 11.3-1[(3.1.1.2)]

(3) See Note [(3)] from ATTACHMENT A Table 2.1-1a [(3.1.1.5) (3.1.1.8) (3.1.3.10)]

ATTACHMENT D
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RADIONUCLIDE MIX

TABLE 2.2-2b
BV-2 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)

	SLCRS UNFILTERED PATHWAY Long Term, And	SLCRS FILTERED PATHWAY	TURBINE BUILDING VENT	GASEOUS WASTE/PROCESS VENT		
NUCLIDE[2]	CONTAINMENT BUILDING[1] Short Term	AUXILIARY BUILDING VENTILATION Long Term	TURBINE BUILDING VENTILATION Long Term	MAIN CONDENSER/ AIR EJECTOR Long Term	CONTAINMENT VACUUM PUMPS[3] Long Term	GASEOUS WASTE SYSTEM Short Term
Kr-83m	4.0E-05	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.4E-02	1.9E+00	1.7E-04	1.2E+00	3.9E-03	1.2E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.3E-06	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	4.1E-03	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	0.0	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.2E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	8.3E-01
Xe-133m	7.6E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.4E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	8.2E+00
Xe-135m	0.0	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	2.4E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	0.0	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	0.0	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
I-131	2.7E-05	4.6E-03	6.5E-04	2.1E-02	4.7E-04	0.0
I-132	0.0	0.0	0.0	0.0	2.5E-06	0.0
I-133	2.6E-06	6.7E-03	8.7E-04	3.0E-02	8.4E-05	0.0
I-134	0.0	0.0	0.0	0.0	4.7E-07	0.0
I-135	0.0	0.0	0.0	0.0	1.4E-05	0.0
Co-58	7.5E-02	6.0E-04	0.0	0.0	1.6E-05	0.0
Co-60	3.4E-02	2.7E-04	0.0	0.0	7.4E-06	0.0
Mn-54	2.2E-02	1.8E-04	0.0	0.0	4.9E-06	0.0
Fe-59	7.5E-03	6.0E-05	0.0	0.0	1.6E-06	0.0
Sr-89	1.7E-03	1.3E-05	0.0	0.0	3.7E-07	0.0
Sr-90	3.0E-04	2.0E-06	0.0	0.0	6.6E-08	0.0
Cs-134	2.2E-02	1.8E-04	0.0	0.0	4.9E-06	0.0
Cs-137	3.8E-02	3.0E-04	0.0	0.0	8.4E-06	0.0
C-14	1.0E+00	0.0	0.0	0.0	0.0	7.0E+00
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

(1) Containment can be purged via VV-2 (SLCRS Unfiltered Pathway), CV-2 (SLCRS Filtered Pathway), or PV-1/2 (Gaseous Waste/Process Vent)

(2) Source Term from BVPS-2UFSAR Table 11.3-2[3.1.1.3]

(3) See Section 8.1.1.1

ATTACHMENT E
Page 1 of 1
DISTANCES TO RELEASE POINTS

TABLE 2.2-3
DISTANCES OF LIMITING MAXIMUM INDIVIDUAL RECEPTORS TO RELEASE POINTS
FOR ANNUAL X/Q VALUES
(meters)

DOWNWIND SECTOR	SITE BOUNDARY* GROUND (1)	SITE BOUNDARY* GROUND (2)	SITE BOUNDARY* ELEV	VEGETABLE GARDEN GROUND	VEGETABLE GARDEN ELEV	MILK COW GROUND	MILK COW ELEV	MILK GOAT GROUND	MILK GOAT ELEV	MEAT ANIMAL GROUND	MEAT ANIMAL ELEV	RESIDENT GROUND	RESIDENT ELEV
N	670	579	413	2,623	2,423	---	---	4,651	4,418	4,152	3,919	2,527	2,295
NNE	535	792	632	2,740	2,461	---	---	6,276	6,033	2,848	2,605	2,639	2,461
NE	490	442	327	724	901	7,741	7,526	20,760	20,545	7,741	7,526	708	790
ENE	490	448	394	1,674	1,658	---	---	6,824	6,671	---	---	708	1,562
E	545	546	551	1,979	1,922	7,065	6,998	4,265	4,200	4,265	4,200	756	1,922
ESE	575	607	672	1,577	1,619	---	---	2,865	2,899	1,577	1,619	1,577	1,650
SE	575	701	815	1,835	1,961	5,729	5,848	5,729	5,848	3,299	3,420	1,835	1,961
SSE	655	762	912	1,738	1,933	5,053	5,244	9,977	10,166	1,770	1,964	1,432	1,628
S	850	887	1,054	3,138	3,372	3,347	3,539	---	---	2,253	2,487	2,189	2,423
SSW	975	1,064	1,226	2,317	2,560	3,347	3,590	5,616	5,859	2,317	2,560	1,223	1,466
SW	1,435	1,439	1,574	2,221	2,439	---	---	2,993	3,210	2,414	2,632	2,221	2,439
WSW	595	561	660	2,301	2,463	5,182	5,341	---	---	2,446	2,608	2,301	2,463
W	685	640	681	3,556	3,635	5,118	5,195	---	---	4,088	4,166	3,556	3,635
WNW	810	701	676	3,605	3,590	4,538	4,521	22,529	22,507	3,605	3,590	3,605	3,590
NW	655	567	482	1,464	1,415	---	---	10,944	10,832	4,570	4,461	1,432	1,383
NNW	645	558	420	1,464	1,285	---	---	15,450	15,262	3,959	3,774	1,143	1,253

*Distances for ground releases are measured from the center point between the BV-1 and BV-2 Containment Buildings. Distances for elevated release are measured from the BV-1 Cooling Tower. Elevated release is applicable to PV-1/2. Ground release is applicable to all other release points.

(1) TV-2 and CB-2
(2) VV-1, CV-1, VV-2, CV-2, DV-2, WV-2

ATTACHMENT F
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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-4
CV-1 AND CV-2 ANNUAL AVERAGE, GROUND LEVEL,
X/Q VALUES FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
DOWN-WIND SECTOR	SITE BOUND-ARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	125.0	12.80	--	5.360	6.27	13.50	233.0	39.5	18.70	11.80	7.68	5.82	4.240	3.480	2.660	2.280
NNE	50.2	6.92	--	2.040	6.42	7.16	148.0	26.8	10.80	6.62	4.60	3.44	2.690	2.190	1.830	1.560
NE	102.0	47.40	1.200	0.265	1.20	49.10	120.0	21.6	11.60	6.99	4.81	3.55	2.370	1.910	1.450	1.230
ENE	85.8	12.50	--	0.124	--	42.20	103.0	18.4	9.55	5.70	4.14	3.04	2.340	1.880	1.260	1.060
E	54.5	6.16	0.807	1.910	1.91	32.60	89.5	15.7	6.08	3.65	2.49	1.83	1.300	1.040	0.859	0.726
ESE	31.1	6.92	--	3.010	6.92	6.92	59.1	10.5	5.16	3.10	1.95	1.43	1.020	0.815	0.612	0.517
SE	27.8	6.70	0.994	0.994	2.74	6.70	65.9	12.0	5.89	3.54	2.41	1.77	1.160	0.931	0.768	0.649
SSE	24.1	6.68	1.030	0.372	6.50	9.01	67.2	12.0	5.46	3.30	1.91	1.41	0.997	0.803	0.665	0.563
S	27.5	3.40	3.090	--	5.57	5.81	99.9	17.5	6.77	4.11	2.84	2.10	1.490	1.200	0.999	0.848
SSW	23.8	6.31	3.700	1.740	6.31	19.30	110.0	19.9	7.83	4.80	3.33	2.48	1.940	1.580	1.190	1.020
SW	22.3	13.90	--	9.050	12.30	13.90	160.0	29.2	16.10	9.94	5.85	4.37	3.430	2.790	2.110	1.800
WSW	163.0	19.30	5.720	--	17.70	19.30	283.0	49.8	23.50	14.60	10.30	7.72	5.690	4.650	3.620	3.090
W	278.0	15.70	9.540	--	13.00	15.70	615.0	103.0	49.00	31.00	15.40	11.70	9.320	7.660	6.460	5.550
WNW	487.0	40.70	30.100	1.810	40.70	40.70	1290.0	203.0	92.10	59.20	40.60	31.20	25.000	20.700	14.200	12.200
NW	924.0	194.00	--	8.660	40.50	200.00	1710.0	262.0	123.00	79.80	55.00	42.30	34.000	28.200	19.400	16.700
NNW	302.0	63.00	--	1.720	15.40	92.30	547.0	86.4	40.80	26.20	17.60	13.50	10.100	8.350	6.560	5.660

ATTACHMENT F
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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-5
VV-1 AND VV-2 ANNUAL AVERAGE, GROUND LEVEL,
X/Q VALUES FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES										
DOWN-WIND SECTOR	SITE BOUND -ARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	152.0	15.00	--	5.980	7.06	15.90	276.0	49.9	22.70	13.70	8.75	6.52	4.69	3.810	2.900	2.470
NNE	62.3	7.66	--	2.150	7.08	7.95	189.0	32.0	12.20	7.31	4.99	3.69	2.87	2.320	1.920	1.630
NE	132.0	57.90	1.240	0.269	1.24	60.20	156.0	24.8	12.70	7.51	5.09	3.73	2.47	1.980	1.500	1.270
ENE	110.0	13.60	--	1.270	--	50.40	135.0	20.6	10.20	6.01	4.31	3.14	2.41	1.930	1.290	1.080
E	67.8	6.66	0.828	1.990	1.99	38.80	116.0	17.7	6.57	3.86	2.61	1.90	1.34	1.070	0.883	0.774
ESE	38.0	7.64	--	3.200	7.64	7.64	76.7	11.9	5.59	3.29	2.05	1.49	1.05	0.842	0.630	0.531
SE	33.3	7.27	1.030	1.030	2.88	7.27	86.2	13.5	6.37	3.75	2.53	1.84	1.20	0.960	0.790	0.666
SSE	29.1	7.41	1.080	0.382	7.19	10.10	87.0	13.7	5.98	3.53	2.02	1.48	1.04	0.833	0.688	0.531
S	32.8	3.65	3.300	--	6.10	6.38	127.0	20.3	7.56	4.48	3.04	2.23	1.57	1.260	1.050	0.885
SSW	28.7	7.08	4.040	1.850	7.08	22.90	140.0	23.6	8.87	5.28	3.60	2.66	2.07	1.670	1.260	1.070
SW	26.2	15.70	--	9.980	13.80	15.70	204.0	34.8	18.40	11.40	6.38	4.71	3.66	2.960	2.230	1.900
WSW	201.0	22.40	6.230	--	20.40	22.40	347.0	61.3	27.70	16.60	11.40	8.49	6.19	5.020	3.880	3.300
W	345.0	18.00	10.600	--	14.70	18.00	715.0	132.0	60.30	36.50	17.70	13.20	10.40	8.440	7.060	6.040
WNW	598.0	48.60	35.000	1.920	48.60	48.60	1410.0	269.0	120.00	73.00	48.50	36.40	28.70	23.400	15.900	13.600
NW	1030.0	262.00	---	9.520	47.80	271.00	1820.0	350.0	164.00	100.00	66.60	50.10	39.50	32.300	21.900	18.800
NNW	345.0	83.40	--	1.840	18.10	121.00	601.0	114.0	52.80	32.20	21.00	15.80	11.60	9.460	7.360	6.310

ATTACHMENT F

0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-6
PV-1/2 ANNUAL AVERAGE, ELEVATED LEVEL, X/Q VALUES
FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES										
DOWN-WIND SECTOR	SITE BOUND-ARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	0.0082	6.720	--	1.910	2.27	6.790	0.0289	23.1000	8.2700	5.32	2.56	1.91	1.480	1.200	0.996	0.846
NNE	0.0280	6.690	--	1.430	6.14	6.890	0.0175	14.5000	6.9800	5.47	3.27	2.69	1.770	1.430	1.290	1.100
NE	0.0110	.074	1.610	0.350	1.61	0.055	0.0069	0.1160	.2300	7.10	5.38	3.68	2.880	2.090	1.880	1.570
ENE	0.0110	9.090	--	1.770	--	0.525	0.0135	0.3310	7.2800	6.02	4.75	3.22	2.620	2.030	1.710	1.100
E	0.0360	8.300	1.240	2.870	2.87	8.300	0.0124	17.1000	7.8600	6.20	3.67	2.83	2.190	1.730	1.280	1.200
ESE	0.0420	11.600	--	4.570	11.60	11.200	0.0208	12.7000	8.1400	4.78	3.00	2.20	1.360	1.160	0.830	0.737
SE	0.0750	7.890	1.230	1.230	3.05	7.890	0.4770	7.4000	7.5700	4.45	2.79	2.05	1.460	1.180	0.811	0.686
SSE	0.2060	7.390	1.160	0.357	7.20	9.770	0.3030	9.4400	6.9300	4.06	2.58	1.89	1.170	0.937	0.646	0.546
S	5.740	3.760	3.490	--	6.06	6.310	0.7960	8.5100	8.4900	4.98	3.37	2.47	1.380	1.110	0.774	0.655
SSW	7.640	3.610	2.140	0.872	3.61	5.820	26.1000	9.1000	4.0300	3.11	2.11	1.56	1.030	0.834	0.807	0.684
SW	6.500	3.900	--	2.560	3.47	3.900	36.1000	15.9000	4.9300	3.12	1.77	1.57	1.201	1.060	1.150	0.977
WSW	0.126	4.350	1.420	--	3.98	4.350	0.3870	17.8000	4.9000	3.53	2.36	1.64	1.460	1.210	0.920	0.781
W	0.029	2.490	0.764	--	2.02	2.490	0.0147	8.7200	6.2300	3.68	2.50	1.84	0.741	1.120	0.851	0.795
WNW	0.033	2.530	1.780	0.163	2.53	2.530	0.0202	0.0549	0.0809	3.07	2.50	1.84	1.110	0.686	0.791	0.731
NW	0.007	0.074	--	0.305	1.67	0.073	0.0084	0.0650	0.1170	3.66	2.30	1.69	1.210	0.903	0.804	0.683
NNW	0.008	6.460	--	0.224	1.81	6.590	0.0135	6.7800	5.0200	2.96	1.93	1.49	1.050	0.849	0.705	0.599

*Elevated release X/Q value at site boundary location where ground level release X/Qs maximize.

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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-7
TV-2 ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES										
DOWN-WIND SECTOR	SITE BOUND-ARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	105.0	14.00	--	5.740	6.74	14.80	244.0	42.6	20.50	12.70	8.18	6.15	4.45	3.640	2.770	2.380
NNE	102.0	7.37	--	2.130	6.83	7.64	161.0	28.8	11.40	6.94	4.79	3.56	2.78	2.250	1.870	1.590
NE	96.6	51.90	1.230	0.268	1.23	53.80	132.0	23.0	12.10	7.24	4.95	3.64	2.42	1.950	1.480	1.250
ENE	84.1	13.20	--	1.280	--	46.30	115.0	19.4	9.89	5.85	4.23	3.09	2.38	1.900	1.270	1.070
E	60.7	6.49	.829	1.980	1.98	35.70	99.2	16.6	6.32	3.75	2.55	1.87	1.32	1.060	0.871	0.735
ESE	37.1	7.25	--	3.100	7.25	7.25	65.8	11.1	5.36	3.19	2.00	1.46	1.03	0.829	0.621	0.524
SE	41.8	7.06	1.020	1.020	2.85	7.06	73.5	12.6	6.12	3.64	2.47	1.81	1.18	0.945	0.779	0.658
SSE	34.0	7.16	1.070	0.384	6.96	9.69	74.2	12.7	5.71	3.41	1.97	1.45	1.02	0.818	0.676	0.572
S	32.7	3.64	3.310	--	6.00	6.27	109.0	18.6	7.13	4.29	2.94	2.17	1.53	1.230	1.020	0.866
SSW	29.7	6.73	3.890	1.800	6.73	20.90	120.0	21.3	8.31	5.03	3.46	2.57	2.00	1.620	1.230	1.040
SW	24.1	14.80	--	9.550	13.10	14.80	174.0	31.2	17.20	10.40	6.10	4.54	3.54	2.870	2.170	1.850
WSW	159.0	20.80	6.010	--	19.10	20.80	301.0	53.6	25.30	15.60	10.80	8.09	5.93	4.830	3.750	3.200
W	264.0	16.90	10.100	--	13.90	16.90	636.0	111.0	53.90	33.50	16.50	12.40	9.82	8.040	6.760	5.790
WNW	404.0	44.50	32.500	1.870	44.50	44.50	1310.0	218.0	104.00	65.40	44.20	33.60	26.70	22.000	15.000	12.900
NW	735.0	216.00	--	9.100	43.90	222.00	1720.0	279.0	140.00	88.80	60.30	45.90	36.60	30.100	20.600	17.700
NNW	247.0	71.00	--	1.820	17.00	99.40	557.0	924.0	45.90	28.90	19.20	14.60	10.80	8.880	6.950	5.980

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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-8

DV-2 ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

Same as Table 2.2-4

ATTACHMENT F
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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-9

WV-2 ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

Same as Table 2.2-4

ATTACHMENT F
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0-5 MILE DISPERSION PARAMETERS

TABLE 2.2-10

CB-2 ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS RELEASES, SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E, TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

Same as Table 2.2-7

ATTACHMENT G
Page 1 of 2
NOBLE GAS DOSE FACTORS AND DOSE PARAMETERS

TABLE 2.2-11

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS

NUCLIDE[1]	K_i TOTAL BODY DOSE FACTOR mrem/yr Per uCi/m^3	L_i SKIN DOSE FACTOR mrem/yr Per uCi/m^3	M_i GAMMA AIR DOSE FACTOR mrad/yr Per uCi/m^3	N_i BETA AIR DOSE FACTOR mrad/yr Per uCi/m^3
Kr-83m	7.56E-02	--	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

(1) The listed dose factors are for radionuclides that may be detected in gaseous effluents.

ATTACHMENT G
Page 2 of 2
NOBLE GAS DOSE FACTORS AND DOSE PARAMETERS

TABLE 2.2-12

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES

NUCLIDE(4)	V_i(1) TOTAL BODY DOSE FACTOR mrem/yr Per uCi/sec	B_i(1), (2) GAMMA AIR DOSE FACTOR mrad/yr Per uCi/sec	M_i(3) TOTAL BODY DOSE FACTOR mrem/yr Per uCi/sec	B_i(3) GAMMA AIR DOSE FACTOR mrad/yr Per uCi/sec
Kr-83m	3.19E-10	1.75E-8	4.58E-8	3.96E-5
Kr-85m	7.81E-5	1.16E-4	4.70E-4	7.06E-4
Kr-85	1.55E-6	2.35E-6	5.54E-6	8.40E-6
Kr-87	5.13E-4	7.74E-4	1.45E-3	2.19E-3
Kr-88	1.39E-3	2.09E-3	4.09E-3	6.16E-3
Kr-89	7.99E-4	1.20E-3	1.25E-3	1.88E-3
Xe-131m	1.64E-5	2.47E-5	1.67E-4	3.09E-4
Xe-133m	1.38E-5	2.11E-5	1.32E-4	2.61E-4
Xe-133	1.05E-5	1.56E-4	1.54E-4	2.76E-4
Xe-135m	2.41E-4	3.66E-4	6.21E-4	9.50E-4
Xe-135	1.41E-4	2.12E-4	6.96E-4	1.05E-3
Xe-137	6.00E-5	9.05E-5	9.66E-5	1.46E-4
Xe-138	8.11E-4	1.22E-3	2.22E-3	3.34E-3
Ar-41	1.02E-3	1.53E-3	2.68E-3	4.02E-3

(1) V_i and B_i values used to implement Modes 1, 2, and 3 of Section 2.2.1 (10CFR20)

(2) B_i values used to implement Modes 1, 2, 3, and 4 of Section 2.3.1 (10CFR50)

(3) V_i and B_i values to implement Mode 4 of Section 2.2.1 (10CFR20) and to implement monitor setpoint determinations of Section 2.1.2 and 2.1.4

(4) The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

ATTACHMENT H
Page 1 of 1
ORGAN DOSE PARAMETERS

Table 2.2-13

P_{iT} VALUES FOR A CHILD FOR THE BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
2	C-14	3.59E+04	6.73E+03	6.73E+03	6.73E+03	6.73E+03	6.73E+03	6.73E+03
3	P-32	2.60E+06	1.14E+05	9.88E+04	0.00E+00	0.00E+00	0.00E+00	4.22E+04
4	Cr-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
5	Mn-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
6	Fe-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
7	Co-57	0.00E+00	9.03E+02	1.07E+03	0.00E+00	0.00E+00	5.07E+05	1.32E+04
8	Co-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
9	Co-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
10	Zn-65	4.26E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
11	Se-75	2.05E+04	1.50E+04	3.14E+04	1.15E+04	1.97E+04	7.45E+04	1.58E+04
12	Rb-86	0.00E+00	1.98E+05	1.14E+05	0.00E+00	0.00E+00	0.00E+00	7.99E+03
13	Sr-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
14	Sr-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
15	Y-91	9.14E+05	0.00E+00	2.44E+04	0.00E+00	0.00E+00	2.63E+06	1.84E+05
16	Zr-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
17	Nb-95	2.35E+04	9.18E+03	6.55E+03	0.00E+00	8.62E+03	6.14E+05	3.70E+04
18	Nb-97	4.29E-01	7.70E-02	3.60E-02	0.00E+00	8.55E-02	3.42E+03	2.78E+04
19	Mo-99	0.00E+00	1.72E+02	4.26E+01	0.00E+00	3.92E+02	1.35E+05	1.27E+05
20	Tc-99m	1.78E-03	3.48E-03	5.77E-02	0.00E+00	5.07E-02	9.51E+02	4.81E+03
21	Ru-103	2.79E+03	0.00E+00	1.07E+03	0.00E+00	7.03E+03	6.62E+05	4.48E+04
22	Ru-106	1.36E+05	0.00E+00	1.69E+04	0.00E+00	1.84E+05	1.43E+07	4.29E+05
23	Ag-110m	1.69E+04	1.14E+04	9.14E+03	0.00E+00	2.12E+04	5.48E+06	1.00E+05
24	Sb-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
25	Sb-125	9.84E+04	7.59E+02	2.07E+04	9.10E+01	0.00E+00	2.32E+06	4.03E+04
26	Sb-126	6.36E+03	9.69E+01	2.28E+03	3.70E+01	0.00E+00	1.06E+06	2.10E+05
27	Te-127m	2.49E+04	8.55E+03	3.02E+03	6.07E+03	6.36E+04	1.48E+06	7.14E+04
28	Te-129m	1.92E+04	6.85E+03	3.04E+03	6.33E+03	5.03E+04	1.76E+06	1.82E+05
29	I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
30	I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
31	Cs-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
32	Cs-136	6.51E+04	1.71E+05	1.16E+05	0.00E+00	9.55E+04	1.45E+04	4.18E+03
33	Cs-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
34	Ba-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
35	La-140	6.44E+02	2.25E+02	7.55E+01	0.00E+00	0.00E+00	1.83E+05	2.26E+05
36	Ce-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
37	Ce-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

Calculated per ODCM equation 2.2-13

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MODES OF GASEOUS RELEASE

TABLE 2.3-1

MODES OF GASEOUS RELEASE FROM BEAVER VALLEY SITE VENTS FOR IMPLEMENTATION OF 10 CFR 20 AND 10 CFR 50

RELEASE POINT	RELEASE MODE 1	RELEASE MODE 2	RELEASE MODE 3	RELEASE MODE 4
RP 1; VV-1, Auxiliary Building Vent(1)	Aux. Bldg. Ventilation	Containment Purge(3)	Same As Mode 1	Same As Mode 1
RP 2; CV-1, Rx Containment/SLCRS Vent(1)	Leakage Collection Exhaust	Same As Mode 1	Same As Mode 1 and Containment Purge(3)	Same As Mode 1
RP 3; PV-1/2, Gaseous Waste/Process Vent(2)	Main Cond. Air Ejector, Waste Gas, Containment Vacuum	Same As Mode 1	Same As Mode 1	Same As Mode 1 and Containment Purge
RP 4; VV-2 SLCRS Unfiltered Pathway(1)	Contiguous Areas	Containment Purge(3)	Same As Mode 1	Same As Mode 1
RP 5; CV-2, SLCRS Filtered Pathway(1)	Aux. Bldg. Ventilation	Same As Mode 1	Same As Mode 1 and Containment Purge(3)	Same As Mode 1
RP 6; CB-2, Condensate Polishing Bldg Vent(1)	(4)	(4)	(4)	(4)
RP 7; WV-2, Waste Gas Storage Vault Vent(1)	(4)	(4)	(4)	(4)
RP 8; DV-2, Decontamination Bldg Vent(1)	(4)	(4)	(4)	(4)
RP 9; TV-2, Turbine Bldg Vent(1)	(4)	(4)	(4)	(4)

NOTE: For the purpose of implementing 10 CFR 50, batch discharges may use continuous meteorology since short term meteorology is used at the time of the annual report.

(1) Continuous ground level meteorology is applicable
(2) Continuous elevated meteorology is applicable
(3) Mode established by purge from one unit, all other release points remain same as Mode 1
(4) Not normally a radioactive release point

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P&I ORGAN DOSE FACTORS

Table 2.3-2

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Adult

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03
2	C-14	1.82E+04	3.41E+03	3.41E+03	3.41E+03	3.41E+03	3.41E+03	3.41E+03
3	P-32	1.32E+06	7.71E+04	5.01E+04	0.00E+00	0.00E+00	0.00E+00	8.64E+04
4	Cr-51	0.00E+00	0.00E+00	1.00E+02	5.95E+01	2.28E+01	1.44E+04	3.32E+03
5	Mn-54	0.00E+00	3.96E+04	6.30E+03	0.00E+00	9.84E+03	1.40E+06	7.74E+04
6	Fe-59	1.18E+04	2.78E+04	1.06E+04	0.00E+00	0.00E+00	1.02E+06	1.88E+05
7	Co-57	0.00E+00	6.92E+02	6.71E+02	0.00E+00	0.00E+00	3.70E+05	3.14E+04
8	Co-58	0.00E+00	1.58E+03	2.07E+03	0.00E+00	0.00E+00	9.28E+05	1.06E+05
9	Co-60	0.00E+00	1.15E+04	1.48E+04	0.00E+00	0.00E+00	5.97E+06	2.85E+05
10	Zn-65	3.24E+04	1.03E+05	4.66E+04	0.00E+00	6.90E+04	8.64E+05	5.34E+04
11	Se-75	4.44E+04	3.24E+04	6.78E+04	2.48E+04	4.26E+04	1.61E+05	3.42E+04
12	Rb-86	0.00E+00	1.35E+05	5.90E+04	0.00E+00	0.00E+00	0.00E+00	1.66E+04
13	Sr-89	3.04E+05	0.00E+00	8.72E+03	0.00E+00	0.00E+00	1.40E+06	3.50E+05
14	Sr-90	9.92E+07	0.00E+00	6.10E+06	0.00E+00	0.00E+00	9.60E+06	7.22E+05
15	Y-91	4.62E+05	0.00E+00	1.24E+04	0.00E+00	0.00E+00	1.70E+06	3.85E+05
16	Zr-95	1.07E+05	3.44E+04	2.33E+04	0.00E+00	5.42E+04	1.77E+06	1.50E+05
17	Nb-95	1.41E+04	7.82E+03	4.21E+03	0.00E+00	7.74E+03	5.05E+05	1.04E+05
18	Nb-97	2.22E-01	5.62E-02	2.05E-02	0.00E+00	6.54E-02	2.40E+03	2.42E+02
19	Mo-99	0.00E+00	1.21E+02	2.30E+01	0.00E+00	2.91E+02	9.12E+04	2.48E+05
20	Tc-99m	1.03E-03	2.91E-03	3.70E-02	0.00E+00	4.42E-02	7.64E+02	4.16E+03
21	Ru-103	1.53E+03	0.00E+00	6.58E+02	0.00E+00	5.83E+03	5.05E+05	1.10E+05
22	Ru-106	6.91E+04	0.00E+00	8.72E+03	0.00E+00	1.34E+05	9.36E+06	9.12E+05
23	Ag-110m	1.08E+04	1.00E+04	5.94E+03	0.00E+00	1.97E+04	4.63E+06	3.02E+05
24	Sb-124	3.12E+04	5.89E+02	1.24E+04	7.55E+01	0.00E+00	2.48E+06	4.06E+05
25	Sb-125	5.34E+04	5.95E+02	1.26E+04	5.40E+01	0.00E+00	1.74E+06	1.01E+05
26	Sb-126	3.60E+03	7.30E+01	1.30E+03	2.20E+01	0.00E+00	7.66E+05	4.81E+05
27	Te-127m	1.26E+04	5.77E+03	1.57E+03	3.29E+03	4.58E+04	9.60E+05	1.50E+05
28	Te-129m	9.76E+03	4.67E+03	1.58E+03	3.44E+03	3.66E+04	1.16E+06	3.83E+05
29	I-131	2.52E+04	3.58E+04	2.05E+04	1.19E+07	6.13E+04	0.00E+00	6.28E+03
30	I-133	8.64E+03	1.48E+04	4.52E+03	2.15E+06	2.58E+04	0.00E+00	8.88E+03
31	Cs-134	3.73E+05	8.48E+05	7.28E+05	0.00E+00	2.87E+05	9.76E+04	1.04E+04
32	Cs-136	3.90E+04	1.46E+05	1.10E+05	0.00E+00	8.56E+04	1.20E+04	1.17E+04
33	Cs-137	4.78E+05	6.21E+05	4.28E+05	0.00E+00	2.22E+05	7.52E+04	8.40E+03
34	Ba-140	3.90E+04	4.90E+01	2.57E+03	0.00E+00	1.67E+01	1.27E+06	2.18E+05
35	La-140	3.44E+02	1.74E+02	4.58E+01	0.00E+00	0.00E+00	1.36E+05	4.58E+05
36	Ce-141	1.99E+04	1.35E+04	1.53E+03	0.00E+00	6.26E+03	3.62E+05	1.20E+05
37	Ce-144	3.43E+06	1.43E+06	1.84E+05	0.00E+00	8.48E+05	7.78E+06	8.16E+05

Calculated per ODCM equation 2.3-22

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P&I ORGAN DOSE FACTORS

Table 2.3-3

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Teen

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03
2	C-14	2.60E+04	4.87E+03	4.87E+03	4.87E+03	4.87E+03	4.87E+03	4.87E+03
3	P-32	1.89E+06	1.10E+05	7.16E+04	0.00E+00	0.00E+00	0.00E+00	9.28E+04
4	Cr-51	0.00E+00	0.00E+00	1.35E+02	7.50E+01	3.07E+01	2.10E+04	3.00E+03
5	Mn-54	0.00E+00	5.11E+04	8.40E+03	0.00E+00	1.27E+04	1.98E+06	6.68E+04
6	Fe-59	1.59E+04	3.70E+04	1.43E+04	0.00E+00	0.00E+00	1.53E+06	1.78E+05
7	Co-57	0.00E+00	9.44E+02	9.20E+02	0.00E+00	0.00E+00	5.86E+05	3.14E+04
8	Co-58	0.00E+00	2.07E+03	2.78E+03	0.00E+00	0.00E+00	1.34E+06	9.52E+04
9	Co-60	0.00E+00	1.51E+04	1.98E+04	0.00E+00	0.00E+00	8.72E+06	2.59E+05
10	Zn-65	3.86E+04	1.34E+05	6.24E+04	0.00E+00	8.64E+04	1.24E+06	4.66E+04
11	Se-75	4.44E+04	3.24E+04	6.78E+04	2.48E+04	4.26E+04	1.61E+05	3.42E+04
12	Rb-86	0.00E+00	1.90E+05	8.40E+04	0.00E+00	0.00E+00	0.00E+00	1.77E+04
13	Sr-89	4.34E+05	0.00E+00	1.25E+04	0.00E+00	0.00E+00	2.42E+06	3.71E+05
14	Sr-90	1.08E+08	0.00E+00	6.68E+06	0.00E+00	0.00E+00	1.65E+07	7.65E+05
15	Y-91	6.61E+05	0.00E+00	1.77E+04	0.00E+00	0.00E+00	2.94E+06	4.09E+05
16	Zr-95	1.46E+05	4.58E+04	3.15E+04	0.00E+00	6.74E+04	2.69E+06	1.49E+05
17	Nb-95	1.86E+04	1.03E+04	5.66E+03	0.00E+00	1.00E+04	7.51E+05	9.68E+04
18	Nb-97	3.14E-01	7.78E-02	2.84E-02	0.00E+00	9.12E-02	3.93E+03	2.17E+03
19	Mo-99	0.00E+00	1.69E+02	3.22E+01	0.00E+00	4.11E+02	1.54E+05	2.69E+05
20	Tc-99m	1.38E-03	3.86E-03	4.99E-02	0.00E+00	5.76E-02	1.15E+03	6.13E+03
21	Ru-103	2.10E+03	0.00E+00	8.96E+02	0.00E+00	7.43E+03	7.83E+05	1.09E+05
22	Ru-106	9.84E+04	0.00E+00	1.24E+04	0.00E+00	1.90E+05	1.61E+07	9.60E+05
23	Ag-110m	1.38E+04	1.31E+04	7.99E+03	0.00E+00	2.50E+04	6.75E+06	2.73E+05
24	Sb-124	4.30E+04	7.94E+02	1.68E+04	9.76E+01	0.00E+00	3.34E+06	3.98E+05
25	Sb-125	7.38E+04	8.08E+02	1.72E+04	7.04E+01	0.00E+00	2.74E+06	9.92E+04
26	Sb-126	4.95E+03	1.02E+02	1.78E+03	2.80E+01	0.00E+00	1.24E+06	4.81E+05
27	Te-127m	1.80E+04	8.16E+03	2.18E+03	4.38E+03	6.54E+04	1.66E+06	1.59E+05
28	Te-129m	1.39E+04	6.58E+03	2.25E+03	4.58E+03	5.19E+04	1.98E+06	4.05E+05
29	I-131	3.54E+04	4.91E+04	2.64E+04	1.46E+07	8.40E+04	0.00E+00	6.49E+03
30	I-133	1.22E+04	2.05E+04	6.22E+03	2.92E+06	3.59E+04	0.00E+00	1.03E+04
31	Cs-134	5.02E+05	1.13E+06	5.49E+05	0.00E+00	3.75E+05	1.46E+05	9.76E+03
32	Cs-136	5.15E+04	1.94E+05	1.37E+05	0.00E+00	1.10E+05	1.78E+04	1.09E+04
33	Cs-137	6.70E+05	8.48E+05	3.11E+05	0.00E+00	3.04E+05	1.21E+05	8.48E+03
34	Ba-140	5.47E+04	6.70E+01	3.52E+03	0.00E+00	2.28E+01	2.03E+06	2.29E+05
35	La-140	4.79E+02	2.36E+02	6.26E+01	0.00E+00	0.00E+00	2.14E+05	4.87E+05
36	Ce-141	2.84E+04	1.90E+04	2.17E+03	0.00E+00	8.88E+03	6.14E+05	1.26E+05
37	Ce-144	4.89E+06	2.02E+06	2.62E+05	0.00E+00	1.21E+06	1.34E+07	8.64E+05

Calculated per ODCM equation 2.3-22

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P&I ORGAN DOSE FACTORS

Table 2.3-4

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Child

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
2	C-14	3.59E+04	6.73E+03	6.73E+03	6.73E+03	6.73E+03	6.73E+03	6.73E+03
3	P-32	2.60E+06	1.14E+05	9.88E+04	0.00E+00	0.00E+00	0.00E+00	4.22E+04
4	Cr-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
5	Mn-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
6	Fe-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
7	Co-57	0.00E+00	9.03E+02	1.07E+03	0.00E+00	0.00E+00	5.07E+05	1.32E+04
8	Co-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
9	Co-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
10	Zn-65	4.26E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
11	Se-75	2.05E+04	1.50E+04	3.14E+04	1.15E+04	1.97E+04	7.45E+04	1.58E+04
12	Rb-86	0.00E+00	1.98E+05	1.14E+05	0.00E+00	0.00E+00	0.00E+00	7.99E+03
13	Sr-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
14	Sr-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
15	Y-91	9.14E+05	0.00E+00	2.44E+04	0.00E+00	0.00E+00	2.63E+06	1.84E+05
16	Zr-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
17	Nb-95	2.35E+04	9.18E+03	6.55E+03	0.00E+00	8.62E+03	6.14E+05	3.70E+04
18	Nb-97	4.29E-01	7.70E-02	3.60E-02	0.00E+00	8.55E-02	3.42E+03	2.78E+04
19	Mo-99	0.00E+00	1.72E+02	4.26E+01	0.00E+00	3.92E+02	1.35E+05	1.27E+05
20	Tc-99m	1.78E-03	3.48E-03	5.77E-02	0.00E+00	5.07E-02	9.51E+02	4.81E+03
21	Ru-103	2.79E+03	0.00E+00	1.07E+03	0.00E+00	7.03E+03	6.62E+05	4.48E+04
22	Ru-106	1.36E+05	0.00E+00	1.69E+04	0.00E+00	1.84E+05	1.43E+07	4.29E+05
23	Ag-110m	1.69E+04	1.14E+04	9.14E+03	0.00E+00	2.12E+04	5.48E+06	1.00E+05
24	Sb-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
25	Sb-125	9.84E+04	7.59E+02	2.07E+04	9.10E+01	0.00E+00	2.32E+06	4.03E+04
26	Sb-126	6.36E+03	9.69E+01	2.28E+03	3.70E+01	0.00E+00	1.06E+06	2.10E+05
27	Te-127m	2.49E+04	8.55E+03	3.02E+03	6.07E+03	6.36E+04	1.48E+06	7.14E+04
28	Te-129m	1.92E+04	6.85E+03	3.04E+03	6.33E+03	5.03E+04	1.76E+06	1.82E+05
29	I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
30	I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
31	Cs-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
32	Cs-136	6.51E+04	1.71E+05	1.16E+05	0.00E+00	9.55E+04	1.45E+04	4.18E+03
33	Cs-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
34	Ba-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
35	La-140	6.44E+02	2.25E+02	7.55E+01	0.00E+00	0.00E+00	1.83E+05	2.26E+05
36	Ce-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
37	Ce-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

Calculated per ODCM equation 2.3-22

3-7-14

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P&I ORGAN DOSE FACTORS

Table 2.3-5

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Infant

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02
2	C-14	2.65E+04	5.31E+03	5.31E+03	5.31E+03	5.31E+03	5.31E+03	5.31E+03
3	P-32	2.03E+06	1.12E+05	7.74E+04	0.00E+00	0.00E+00	0.00E+00	1.61E+04
4	Cr-51	0.00E+00	0.00E+00	8.95E+01	5.75E+01	1.32E+01	1.28E+04	3.57E+02
5	Mn-54	0.00E+00	2.53E+04	4.98E+03	0.00E+00	4.98E+03	1.00E+06	7.06E+03
6	Fe-59	1.36E+04	2.35E+04	9.48E+03	0.00E+00	0.00E+00	1.02E+06	2.48E+04
7	Co-57	0.00E+00	6.51E+02	6.41E+02	0.00E+00	0.00E+00	3.79E+05	4.86E+03
8	Co-58	0.00E+00	1.22E+03	1.82E+03	0.00E+00	0.00E+00	7.77E+05	1.11E+04
9	Co-60	0.00E+00	8.02E+03	1.18E+04	0.00E+00	0.00E+00	4.51E+06	3.19E+04
10	Zn-65	1.93E+04	6.26E+04	3.11E+04	0.00E+00	3.25E+04	6.47E+05	5.14E+04
11	Se-75	7.77E+03	5.67E+03	1.19E+04	4.35E+03	7.46E+03	2.82E+04	5.98E+03
12	Rb-86	0.00E+00	1.90E+05	8.82E+04	0.00E+00	0.00E+00	0.00E+00	3.04E+03
13	Sr-89	3.98E+05	0.00E+00	1.14E+04	0.00E+00	0.00E+00	2.03E+06	6.40E+04
14	Sr-90	4.09E+07	0.00E+00	2.59E+06	0.00E+00	0.00E+00	1.12E+07	1.31E+05
15	Y-91	5.88E+05	0.00E+00	1.57E+04	0.00E+00	0.00E+00	2.45E+06	7.03E+04
16	Zr-95	1.15E+05	2.79E+04	2.03E+04	0.00E+00	3.11E+04	1.75E+06	2.17E+04
17	Nb-95	1.57E+04	6.43E+03	3.78E+03	0.00E+00	4.72E+03	4.79E+05	1.27E+04
18	Nb-97	3.42E-01	7.29E-02	2.63E-02	0.00E+00	5.70E-02	3.32E+03	2.69E+04
19	Mo-99	0.00E+00	1.65E+02	3.23E+01	0.00E+00	2.65E+02	1.35E+05	4.87E+04
20	Tc-99m	1.40E-03	2.88E-03	3.72E-02	0.00E+00	3.11E-02	8.11E+02	2.03E+03
21	Ru-103	2.02E+03	0.00E+00	6.79E+02	0.00E+00	4.24E+03	5.52E+05	1.61E+04
22	Ru-106	8.68E+04	0.00E+00	1.09E+04	0.00E+00	1.07E+05	1.16E+07	1.64E+05
23	Ag-110m	9.98E+03	7.22E+03	5.00E+03	0.00E+00	1.09E+04	3.67E+06	3.30E+04
24	Sb-124	3.79E+04	5.56E+02	1.20E+04	1.01E+02	0.00E+00	2.65E+06	5.91E+04
25	Sb-125	5.17E+04	4.77E+02	1.09E+04	6.23E+01	0.00E+00	1.64E+06	1.47E+04
26	Sb-126	4.31E+03	8.41E+01	1.55E+03	3.29E+01	0.00E+00	9.63E+05	7.46E+04
27	Te-127m	1.67E+04	6.90E+03	2.07E+03	4.87E+03	3.75E+04	1.31E+06	2.73E+04
28	Te-129m	1.41E+04	6.09E+03	2.23E+03	4.21E+03	3.18E+04	1.68E+06	6.90E+04
29	I-131	3.79E+04	4.44E+04	1.96E+04	1.48E+07	5.18E+04	0.00E+00	1.06E+03
30	I-133	1.32E+04	1.92E+04	5.60E+03	3.56E+06	2.24E+04	0.00E+00	2.16E+03
31	Cs-134	3.96E+05	7.03E+05	7.45E+04	0.00E+00	1.90E+05	7.97E+04	1.33E+03
32	Cs-136	4.83E+04	1.35E+05	5.29E+04	0.00E+00	5.64E+04	1.18E+04	1.43E+03
33	Cs-137	5.49E+05	6.12E+05	4.55E+04	0.00E+00	1.72E+05	7.13E+04	1.33E+03
34	Ba-140	5.60E+04	5.60E+01	2.90E+03	0.00E+00	1.34E+01	1.60E+06	3.84E+04
35	La-140	5.05E+02	2.00E+02	5.15E+01	0.00E+00	0.00E+00	1.68E+05	8.48E+04
36	Ce-141	2.77E+04	1.67E+04	1.99E+03	0.00E+00	5.25E+03	5.17E+05	2.16E+04
37	Ce-144	3.19E+06	1.21E+06	1.76E+05	0.00E+00	5.38E+05	9.84E+06	1.48E+05

Calculated per ODCM equation 2.3-22

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P&I ORGAN DOSE FACTORS

Table 2.3-6

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Ground

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3	P-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	Cr-51	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06
5	Mn-54	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09
6	Fe-59	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08
7	Co-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8	Co-58	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08
9	Co-60	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10
10	Zn-65	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08
11	Se-75	4.51E+08	4.51E+08	4.51E+08	4.51E+08	4.51E+08	4.51E+08	4.51E+08
12	Rb-86	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06
13	Sr-89	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04
14	Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
15	Y-91	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06
16	Zr-95	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08
17	Nb-95	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08
18	Nb-97	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19	Mo-99	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06
20	Tc-99m	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05
21	Ru-103	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08
22	Ru-106	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08
23	Ag-110m	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04
28	Te-129m	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07
29	I-131	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07
30	I-133	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06
31	Cs-134	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09
32	Cs-136	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08
33	Cs-137	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10
34	Ba-140	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07
35	La-140	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07
36	Ce-141	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07
37	Ce-144	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07

Calculated per ODCM equation 2.3-23

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P&I ORGAN DOSE FACTORS

Table 2.3-7

R VALUES FOR BEAVER VALLEY SITE
(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Adult

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.26E+03	2.26E+03	2.26E+03	2.26E+03	2.26E+03	2.26E+03
2	C-14	8.97E+05	1.79E+05	1.79E+05	1.79E+05	1.79E+05	1.79E+05	1.79E+05
3	P-32	1.40E+09	8.74E+07	5.43E+07	0.00E+00	0.00E+00	0.00E+00	1.58E+08
4	Cr-51	0.00E+00	0.00E+00	4.64E+04	2.78E+04	1.02E+04	6.16E+04	1.17E+07
5	Mn-54	0.00E+00	3.13E+08	5.97E+07	0.00E+00	9.31E+07	0.00E+00	9.59E+08
6	Fe-59	1.26E+08	2.96E+08	1.14E+08	0.00E+00	0.00E+00	8.28E+07	9.88E+08
7	Co-57	0.00E+00	1.17E+07	1.95E+07	0.00E+00	0.00E+00	0.00E+00	2.97E+08
8	Co-58	0.00E+00	3.07E+07	6.89E+07	0.00E+00	0.00E+00	0.00E+00	6.23E+08
9	Co-60	0.00E+00	1.67E+08	3.69E+08	0.00E+00	0.00E+00	0.00E+00	3.14E+09
10	Zn-65	3.17E+08	1.01E+09	4.56E+08	0.00E+00	6.75E+08	0.00E+00	6.36E+08
11	Se-75	4.91E+08	3.11E+08	6.16E+08	2.68E+08	4.55E+08	3.93E+08	4.14E+08
12	Rb-86	0.00E+00	2.19E+08	1.02E+08	0.00E+00	0.00E+00	0.00E+00	4.33E+07
13	Sr-89	9.97E+09	0.00E+00	2.86E+08	0.00E+00	0.00E+00	0.00E+00	1.60E+09
14	Sr-90	6.05E+11	0.00E+00	1.48E+11	0.00E+00	0.00E+00	0.00E+00	1.75E+10
15	Y-91	5.11E+06	0.00E+00	1.37E+05	0.00E+00	0.00E+00	0.00E+00	2.81E+09
16	Zr-95	1.17E+06	3.77E+05	2.55E+05	0.00E+00	5.91E+05	0.00E+00	1.19E+09
17	Nb-95	1.42E+05	7.92E+04	4.26E+04	0.00E+00	7.83E+04	0.00E+00	4.81E+08
18	Nb-97	2.16E-06	5.46E-07	1.99E-07	0.00E+00	6.37E-07	0.00E+00	2.02E-03
19	Mo-99	0.00E+00	6.15E+06	1.17E+06	0.00E+00	1.39E+07	0.00E+00	1.43E+07
20	Tc-99m	3.10E+00	8.77E+00	1.12E+02	0.00E+00	1.33E+02	4.30E+00	5.19E+03
21	Ru-103	4.77E+06	0.00E+00	2.06E+06	0.00E+00	1.82E+07	0.00E+00	5.57E+08
22	Ru-106	1.93E+08	0.00E+00	2.44E+07	0.00E+00	3.72E+08	0.00E+00	1.25E+10
23	Ag-110m	1.05E+07	9.75E+06	5.79E+06	0.00E+00	1.92E+07	0.00E+00	3.98E+09
24	Sb-124	1.04E+08	1.96E+06	4.11E+07	2.51E+05	0.00E+00	8.07E+07	2.94E+09
25	Sb-125	1.37E+08	1.53E+06	3.25E+07	1.39E+05	0.00E+00	1.05E+08	1.50E+09
26	Sb-126	7.01E+06	1.43E+05	2.53E+06	4.29E+04	0.00E+00	4.30E+06	5.73E+08
27	Te-127m	3.49E+08	1.25E+08	4.26E+07	8.92E+07	1.42E+09	0.00E+00	1.17E+09
28	Te-129m	2.51E+08	9.38E+07	3.98E+07	8.64E+07	1.05E+09	0.00E+00	1.27E+09
29	I-131	8.08E+07	1.16E+08	6.62E+07	3.79E+10	1.98E+08	0.00E+00	3.05E+07
30	I-133	2.09E+06	3.63E+06	1.11E+06	5.33E+08	6.33E+06	0.00E+00	3.26E+06
31	Cs-134	4.67E+09	1.11E+10	9.08E+09	0.00E+00	3.59E+09	1.19E+09	1.94E+08
32	Cs-136	4.27E+07	1.69E+08	1.21E+08	0.00E+00	9.38E+07	1.29E+07	1.91E+07
33	Cs-137	6.36E+09	8.70E+09	5.70E+09	0.00E+00	2.95E+09	9.81E+08	1.68E+08
34	Ba-140	1.29E+08	1.61E+05	8.42E+06	0.00E+00	5.49E+04	9.24E+04	2.65E+08
35	La-140	1.98E+03	9.97E+02	2.63E+02	0.00E+00	0.00E+00	0.00E+00	7.32E+07
36	Ce-141	1.97E+05	1.33E+05	1.51E+04	0.00E+00	6.19E+04	0.00E+00	5.10E+08
37	Ce-144	3.29E+07	1.38E+07	1.77E+06	0.00E+00	8.16E+06	0.00E+00	1.11E+10

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29
C-14 calculated per ODCM equation 2.3-34 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-8

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Teen

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.59E+03	2.59E+03	2.59E+03	2.59E+03	2.59E+03	2.59E+03
2	C-14	1.45E+06	2.91E+05	2.91E+05	2.91E+05	2.91E+05	2.91E+05	2.91E+05
3	P-32	1.61E+09	9.98E+07	6.24E+07	0.00E+00	0.00E+00	0.00E+00	1.35E+08
4	Cr-51	0.00E+00	0.00E+00	6.17E+04	3.43E+04	1.35E+04	8.81E+04	1.04E+07
5	Mn-54	0.00E+00	4.54E+08	9.01E+07	0.00E+00	1.36E+08	0.00E+00	9.32E+08
6	Fe-59	1.79E+08	4.19E+08	1.62E+08	0.00E+00	0.00E+00	1.32E+08	9.90E+08
7	Co-57	0.00E+00	1.79E+07	3.00E+07	0.00E+00	0.00E+00	0.00E+00	3.33E+08
8	Co-58	0.00E+00	4.36E+07	1.00E+08	0.00E+00	0.00E+00	0.00E+00	6.01E+08
9	Co-60	0.00E+00	2.49E+08	5.60E+08	0.00E+00	0.00E+00	0.00E+00	3.24E+09
10	Zn-65	4.24E+08	1.47E+09	6.87E+08	0.00E+00	9.42E+08	0.00E+00	6.23E+08
11	Se-75	5.94E+08	3.77E+08	7.47E+08	3.24E+08	5.51E+08	4.77E+08	5.02E+08
12	Rb-86	0.00E+00	2.74E+08	1.29E+08	0.00E+00	0.00E+00	0.00E+00	4.05E+07
13	Sr-89	1.51E+10	0.00E+00	4.34E+08	0.00E+00	0.00E+00	0.00E+00	1.80E+09
14	Sr-90	7.51E+11	0.00E+00	1.85E+11	0.00E+00	0.00E+00	0.00E+00	2.11E+10
15	Y-91	7.84E+06	0.00E+00	2.10E+05	0.00E+00	0.00E+00	0.00E+00	3.21E+09
16	Zr-95	1.72E+06	5.43E+05	3.74E+05	0.00E+00	7.98E+05	0.00E+00	1.25E+09
17	Nb-95	1.92E+05	1.07E+05	5.87E+04	0.00E+00	1.03E+05	0.00E+00	4.56E+08
18	Nb-97	2.00E-06	4.97E-07	1.81E-07	0.00E+00	5.81E-07	0.00E+00	1.19E-02
19	Mo-99	0.00E+00	5.65E+06	1.08E+06	0.00E+00	1.29E+07	0.00E+00	1.01E+07
20	Tc-99m	2.74E+00	7.64E+00	9.90E+01	0.00E+00	1.14E+02	4.24E+00	5.02E+03
21	Ru-103	6.82E+06	0.00E+00	2.92E+06	0.00E+00	2.41E+07	0.00E+00	5.70E+08
22	Ru-106	2.38E+08	0.00E+00	3.90E+07	0.00E+00	5.97E+08	0.00E+00	1.48E+10
23	Ag-110m	1.52E+07	1.43E+07	8.72E+06	0.00E+00	2.74E+07	0.00E+00	4.03E+09
24	Sb-124	1.54E+08	2.84E+06	6.02E+07	3.50E+05	0.00E+00	1.35E+08	3.11E+09
25	Sb-125	2.14E+08	2.34E+06	5.01E+07	2.05E+05	0.00E+00	1.88E+08	1.67E+09
26	Sb-126	7.37E+06	1.51E+05	2.65E+06	4.17E+04	0.00E+00	5.28E+06	4.36E+08
27	Te-127m	5.52E+08	1.96E+08	6.56E+07	1.31E+08	2.24E+09	0.00E+00	1.37E+09
28	Te-129m	3.62E+08	1.34E+08	5.73E+07	1.17E+08	1.51E+09	0.00E+00	1.36E+09
29	I-131	7.69E+07	1.08E+08	5.78E+07	3.14E+10	1.85E+08	0.00E+00	2.13E+07
30	I-133	1.94E+06	3.29E+06	1.00E+06	4.59E+08	5.77E+06	0.00E+00	2.49E+06
31	Cs-134	7.10E+09	1.67E+10	7.75E+09	0.00E+00	5.31E+09	2.03E+09	2.08E+08
32	Cs-136	4.38E+07	1.72E+08	1.16E+08	0.00E+00	9.37E+07	1.48E+07	1.39E+07
33	Cs-137	1.01E+10	1.35E+10	4.69E+09	0.00E+00	4.59E+09	1.78E+09	1.92E+08
34	Ba-140	1.38E+08	1.69E+05	8.90E+06	0.00E+00	5.74E+04	1.14E+05	2.13E+08
35	La-140	1.81E+03	8.88E+02	2.36E+02	0.00E+00	0.00E+00	0.00E+00	5.10E+07
36	Ce-141	2.83E+05	1.89E+05	2.17E+04	0.00E+00	8.90E+04	0.00E+00	5.41E+08
37	Ce-144	5.27E+07	2.18E+07	2.83E+06	0.00E+00	1.30E+07	0.00E+00	1.33E+10

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29
C-14 calculated per ODCM equation 2.3-34 (reference ERS-LMR-12-001)

3-7-14

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P&I ORGAN DOSE FACTORS

Table 2.3-9

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Child

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	4.01E+03	4.01E+03	4.01E+03	4.01E+03	4.01E+03	4.01E+03
2	C-14	3.50E+06	7.01E+05	7.01E+05	7.01E+05	7.01E+05	7.01E+05	7.01E+05
3	P-32	3.37E+09	1.58E+08	1.30E+08	0.00E+00	0.00E+00	0.00E+00	9.32E+07
4	Cr-51	0.00E+00	0.00E+00	1.17E+05	6.50E+04	1.78E+04	1.19E+05	6.21E+06
5	Mn-54	0.00E+00	6.65E+08	1.77E+08	0.00E+00	1.86E+08	0.00E+00	5.58E+08
6	Fe-59	3.98E+08	6.43E+08	3.20E+08	0.00E+00	0.00E+00	1.87E+08	6.70E+08
7	Co-57	0.00E+00	2.99E+07	6.04E+07	0.00E+00	0.00E+00	0.00E+00	2.45E+08
8	Co-58	0.00E+00	6.44E+07	1.97E+08	0.00E+00	0.00E+00	0.00E+00	3.76E+08
9	Co-60	0.00E+00	3.78E+08	1.12E+09	0.00E+00	0.00E+00	0.00E+00	2.10E+09
10	Zn-65	8.13E+08	2.17E+09	1.35E+09	0.00E+00	1.36E+09	0.00E+00	3.80E+08
11	Se-75	4.91E+08	3.11E+08	6.16E+08	2.68E+08	4.55E+08	3.93E+08	4.14E+08
12	Rb-86	0.00E+00	4.52E+08	2.78E+08	0.00E+00	0.00E+00	0.00E+00	2.91E+07
13	Sr-89	3.60E+10	0.00E+00	1.03E+09	0.00E+00	0.00E+00	0.00E+00	1.39E+09
14	Sr-90	1.24E+12	0.00E+00	3.15E+11	0.00E+00	0.00E+00	0.00E+00	1.67E+10
15	Y-91	1.86E+07	0.00E+00	4.99E+05	0.00E+00	0.00E+00	0.00E+00	2.48E+09
16	Zr-95	3.86E+06	8.48E+05	7.55E+05	0.00E+00	1.21E+06	0.00E+00	8.85E+08
17	Nb-95	4.11E+05	1.60E+05	1.14E+05	0.00E+00	1.50E+05	0.00E+00	2.96E+08
18	Nb-97	3.65E-06	6.59E-07	3.08E-07	0.00E+00	7.31E-07	0.00E+00	2.03E-01
19	Mo-99	0.00E+00	7.71E+06	1.91E+06	0.00E+00	1.65E+07	0.00E+00	6.38E+06
20	Tc-99m	4.71E+00	9.24E+00	1.53E+02	0.00E+00	1.34E+02	4.69E+00	5.26E+03
21	Ru-103	1.53E+07	0.00E+00	5.90E+06	0.00E+00	3.86E+07	0.00E+00	3.97E+08
22	Ru-106	7.45E+08	0.00E+00	9.30E+07	0.00E+00	1.01E+09	0.00E+00	1.16E+10
23	Ag-110m	3.21E+07	2.17E+07	1.73E+07	0.00E+00	4.04E+07	0.00E+00	2.58E+09
24	Sb-124	3.52E+08	4.57E+06	1.23E+08	7.77E+05	0.00E+00	1.95E+08	2.20E+09
25	Sb-125	4.99E+08	3.85E+06	1.05E+08	4.63E+05	0.00E+00	2.78E+08	1.19E+09
26	Sb-126	1.39E+07	2.12E+05	4.98E+06	8.13E+04	0.00E+00	6.62E+06	2.80E+08
27	Te-127m	1.32E+09	3.56E+08	1.57E+08	3.16E+08	3.77E+09	0.00E+00	1.07E+09
28	Te-129m	8.41E+08	2.35E+08	1.31E+08	2.71E+08	2.47E+09	0.00E+00	1.03E+09
29	I-131	1.43E+08	1.44E+08	8.17E+07	4.76E+10	2.36E+08	0.00E+00	1.28E+07
30	I-133	3.53E+06	4.37E+06	1.65E+06	8.12E+08	7.28E+06	0.00E+00	1.76E+06
31	Cs-134	1.60E+10	2.63E+10	5.55E+09	0.00E+00	8.15E+09	2.93E+09	1.42E+08
32	Cs-136	8.24E+07	2.27E+08	1.47E+08	0.00E+00	1.21E+08	1.80E+07	7.96E+06
33	Cs-137	2.39E+10	2.29E+10	3.38E+09	0.00E+00	7.46E+09	2.68E+09	1.43E+08
34	Ba-140	2.77E+08	2.42E+07	1.62E+07	0.00E+00	7.89E+04	1.45E+05	1.40E+08
35	La-140	3.25E+03	1.13E+03	3.83E+02	0.00E+00	0.00E+00	0.00E+00	3.16E+07
36	Ce-141	6.56E+05	3.27E+05	4.86E+05	0.00E+00	1.43E+05	0.00E+00	4.08E+08
37	Ce-144	1.27E+08	3.98E+07	6.78E+06	0.00E+00	2.21E+07	0.00E+00	1.04E+10

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29
C-14 calculated per ODCM equation 2.3-34 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-10

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Adult

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	3.25E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02
2	C-14	3.33E+05	6.66E+04	6.66E+04	6.66E+04	6.66E+04	6.66E+04	6.66E+04
3	P-32	3.95E+09	2.46E+08	1.53E+08	0.00E+00	0.00E+00	0.00E+00	4.44E+08
4	Cr-51	0.00E+00	0.00E+00	5.86E+03	3.50E+03	1.29E+03	7.78E+03	1.47E+06
5	Mn-54	0.00E+00	6.49E+06	1.24E+06	0.00E+00	1.93E+06	0.00E+00	1.99E+07
6	Fe-59	2.14E+08	5.04E+08	1.93E+08	0.00E+00	0.00E+00	1.41E+08	1.68E+09
7	Co-57	0.00E+00	4.01E+06	6.66E+06	0.00E+00	0.00E+00	0.00E+00	1.02E+08
8	Co-58	0.00E+00	1.42E+07	3.18E+07	0.00E+00	0.00E+00	0.00E+00	2.87E+08
9	Co-60	0.00E+00	5.12E+07	1.13E+08	0.00E+00	0.00E+00	0.00E+00	9.61E+08
10	Zn-65	2.54E+08	8.09E+08	3.66E+08	0.00E+00	5.41E+08	0.00E+00	5.10E+08
11	Se-75	1.15E+08	7.27E+07	1.44E+08	6.25E+07	1.06E+08	9.18E+07	9.67E+07
12	Rb-86	0.00E+00	4.11E+08	1.92E+08	0.00E+00	0.00E+00	0.00E+00	8.11E+07
13	Sr-89	2.41E+08	0.00E+00	6.92E+06	0.00E+00	0.00E+00	0.00E+00	3.87E+07
14	Sr-90	8.41E+09	0.00E+00	2.06E+09	0.00E+00	0.00E+00	0.00E+00	2.43E+08
15	Y-91	8.94E+05	0.00E+00	2.39E+04	0.00E+00	0.00E+00	0.00E+00	4.92E+08
16	Zr-95	1.47E+06	4.71E+05	3.19E+05	0.00E+00	7.39E+05	0.00E+00	1.49E+09
17	Nb-95	1.89E+06	1.05E+06	5.64E+05	0.00E+00	1.04E+06	0.00E+00	6.37E+09
18	Nb-97	5.32E-119	1.34E-119	4.91E-120	0.00E+00	1.57E-119	0.00E+00	4.96E-116
19	Mo-99	0.00E+00	8.51E+04	1.62E+04	0.00E+00	1.93E+05	0.00E+00	1.97E+05
20	Tc-99m	3.83E-21	1.08E-20	1.38E-19	0.00E+00	1.64E-19	5.30E-21	6.40E-18
21	Ru-103	8.57E+07	0.00E+00	3.69E+07	0.00E+00	3.27E+08	0.00E+00	1.00E+10
22	Ru-106	1.97E+09	0.00E+00	2.49E+08	0.00E+00	3.80E+09	0.00E+00	1.27E+11
23	Ag-110m	4.77E+06	4.41E+06	2.62E+06	0.00E+00	8.67E+06	0.00E+00	1.80E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	8.38E+08	3.00E+08	1.02E+08	2.14E+08	3.40E+09	0.00E+00	2.81E+09
28	Te-129m	9.33E+08	3.48E+08	1.48E+08	3.21E+08	3.89E+09	0.00E+00	4.70E+09
29	I-131	9.13E+06	1.31E+07	7.48E+06	4.28E+09	2.24E+07	0.00E+00	3.45E+06
30	I-133	3.12E-01	5.42E-01	1.65E-01	7.96E+01	9.46E-01	0.00E+00	4.87E-01
31	Cs-134	4.53E+08	1.08E+09	8.81E+08	0.00E+00	3.49E+08	1.16E+08	1.89E+07
32	Cs-136	1.02E+07	4.04E+07	2.91E+07	0.00E+00	2.25E+07	3.08E+06	4.59E+06
33	Cs-137	5.90E+08	8.06E+08	5.28E+08	0.00E+00	2.74E+08	9.10E+07	1.56E+07
34	Ba-140	2.44E+07	3.06E+04	1.60E+06	0.00E+00	1.04E+04	1.75E+04	5.02E+07
35	La-140	3.16E-02	1.59E-02	4.21E-03	0.00E+00	0.00E+00	0.00E+00	1.17E+03
36	Ce-141	1.16E+04	7.83E+03	8.88E+02	0.00E+00	3.64E+03	0.00E+00	2.99E+07
37	Ce-144	1.03E+06	4.32E+05	5.55E+04	0.00E+00	2.56E+05	0.00E+00	3.50E+08

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30
C-14 calculated per ODCM equation 2.3-33 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-11

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Teen

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02
2	C-14	2.81E+05	5.62E+04	5.62E+04	5.62E+04	5.62E+04	5.62E+04	5.62E+04
3	P-32	3.34E+09	2.07E+08	1.29E+08	0.00E+00	0.00E+00	0.00E+00	2.80E+08
4	Cr-51	0.00E+00	0.00E+00	4.69E+03	2.60E+03	1.03E+03	6.69E+03	7.88E+05
5	Mn-54	0.00E+00	4.95E+06	9.81E+05	0.00E+00	1.48E+06	0.00E+00	1.01E+07
6	Fe-59	1.71E+08	4.00E+08	1.54E+08	0.00E+00	0.00E+00	1.26E+08	9.45E+08
7	Co-57	0.00E+00	3.22E+06	5.40E+06	0.00E+00	0.00E+00	0.00E+00	6.01E+07
8	Co-58	0.00E+00	1.09E+07	2.52E+07	0.00E+00	0.00E+00	0.00E+00	1.51E+08
9	Co-60	0.00E+00	3.97E+07	8.95E+07	0.00E+00	0.00E+00	0.00E+00	5.17E+08
10	Zn-65	1.79E+08	6.21E+08	2.90E+08	0.00E+00	3.97E+08	0.00E+00	2.63E+08
11	Se-75	7.69E+07	4.89E+07	9.66E+07	4.20E+07	7.14E+07	6.17E+07	6.50E+07
12	Rb-86	0.00E+00	3.43E+08	1.61E+08	0.00E+00	0.00E+00	0.00E+00	5.08E+07
13	Sr-89	2.03E+08	0.00E+00	5.83E+06	0.00E+00	0.00E+00	0.00E+00	2.42E+07
14	Sr-90	5.44E+09	0.00E+00	1.34E+09	0.00E+00	0.00E+00	0.00E+00	1.53E+08
15	Y-91	7.53E+05	0.00E+00	2.02E+04	0.00E+00	0.00E+00	0.00E+00	3.09E+08
16	Zr-95	1.18E+06	3.71E+05	2.55E+05	0.00E+00	5.45E+05	0.00E+00	8.56E+08
17	Nb-95	1.47E+06	8.17E+05	4.50E+05	0.00E+00	7.92E+05	0.00E+00	3.49E+09
18	Nb-97	4.44E-119	1.10E-119	4.02E-120	0.00E+00	1.29E-119	0.00E+00	2.63E-115
19	Mo-99	0.00E+00	7.03E+04	1.34E+04	0.00E+00	1.61E+05	0.00E+00	1.26E+05
20	Tc-99m	3.04E-21	8.48E-21	1.10E-19	0.00E+00	1.26E-19	4.71E-21	5.57E-18
21	Ru-103	6.98E+07	0.00E+00	2.98E+07	0.00E+00	2.46E+08	0.00E+00	5.83E+09
22	Ru-106	1.28E+09	0.00E+00	2.09E+08	0.00E+00	3.19E+09	0.00E+00	7.94E+10
23	Ag-110m	3.61E+06	3.42E+06	2.08E+06	0.00E+00	6.52E+06	0.00E+00	9.60E+08
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	7.07E+08	2.51E+08	8.41E+07	1.68E+08	2.87E+09	0.00E+00	1.76E+09
28	Te-129m	7.82E+08	2.90E+08	1.24E+08	2.52E+08	3.27E+09	0.00E+00	2.93E+09
29	I-131	7.59E+06	1.06E+07	5.71E+06	3.10E+09	1.83E+07	0.00E+00	2.10E+06
30	I-133	2.61E-01	4.42E-01	1.35E-01	6.17E+01	7.75E-01	0.00E+00	3.34E-01
31	Cs-134	3.60E+08	8.48E+08	3.93E+08	0.00E+00	2.69E+08	1.03E+08	1.05E+07
32	Cs-136	7.98E+06	3.14E+07	2.11E+07	0.00E+00	1.71E+07	2.69E+06	2.53E+06
33	Cs-137	4.90E+08	6.51E+08	2.27E+08	0.00E+00	2.22E+08	8.61E+07	9.27E+06
34	Ba-140	2.02E+07	2.47E+04	1.30E+06	0.00E+00	8.38E+03	1.66E+04	3.11E+07
35	La-140	2.60E-02	1.28E-02	3.40E-03	0.00E+00	0.00E+00	0.00E+00	7.33E+02
36	Ce-141	9.72E+03	6.49E+03	7.46E+02	0.00E+00	3.06E+03	0.00E+00	1.86E+07
37	Ce-144	8.72E+05	3.61E+05	4.68E+04	0.00E+00	2.15E+05	0.00E+00	2.19E+08

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30
C-14 calculated per ODCM equation 2.3-33 (reference ERS-LMR-12-001)

3-7-14
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Table 2.3-12

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Child

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.34E+02	2.34E+02	2.34E+02	2.34E+02	2.34E+02	2.34E+02
2	C-14	5.29E+05	1.06E+05	1.06E+05	1.06E+05	1.06E+05	1.06E+05	1.06E+05
3	P-32	6.29E+09	2.94E+08	2.43E+08	0.00E+00	0.00E+00	0.00E+00	1.74E+08
4	Cr-51	0.00E+00	0.00E+00	7.31E+03	4.06E+03	1.11E+03	7.41E+03	3.88E+05
5	Mn-54	0.00E+00	5.66E+06	1.51E+06	0.00E+00	1.59E+06	0.00E+00	4.75E+06
6	Fe-59	3.04E+08	4.91E+08	2.45E+08	0.00E+00	0.00E+00	1.42E+08	5.12E+08
7	Co-57	0.00E+00	4.21E+06	8.52E+06	0.00E+00	0.00E+00	0.00E+00	3.45E+07
8	Co-58	0.00E+00	1.28E+07	3.91E+07	0.00E+00	0.00E+00	0.00E+00	7.45E+07
9	Co-60	0.00E+00	4.72E+07	1.39E+08	0.00E+00	0.00E+00	0.00E+00	2.61E+08
10	Zn-65	2.68E+08	7.15E+08	4.44E+08	0.00E+00	4.50E+08	0.00E+00	1.25E+08
11	Se-75	4.65E+07	2.95E+07	5.84E+07	2.54E+07	4.32E+07	3.73E+07	3.93E+07
12	Rb-86	0.00E+00	4.87E+08	2.99E+08	0.00E+00	0.00E+00	0.00E+00	3.13E+07
13	Sr-89	3.85E+08	0.00E+00	1.10E+07	0.00E+00	0.00E+00	0.00E+00	1.49E+07
14	Sr-90	7.03E+09	0.00E+00	1.78E+09	0.00E+00	0.00E+00	0.00E+00	9.47E+07
15	Y-91	1.42E+06	0.00E+00	3.81E+04	0.00E+00	0.00E+00	0.00E+00	1.90E+08
16	Zr-95	2.09E+06	4.59E+05	4.09E+05	0.00E+00	6.57E+05	0.00E+00	4.79E+08
17	Nb-95	2.54E+06	9.90E+05	7.07E+05	0.00E+00	9.30E+05	0.00E+00	1.83E+09
18	Nb-97	8.24E-119	1.49E-119	6.95E-120	0.00E+00	1.65E-119	0.00E+00	4.59E-114
19	Mo-99	0.00E+00	9.79E+04	2.42E+04	0.00E+00	2.09E+05	0.00E+00	8.09E+04
20	Tc-99m	5.33E-21	1.05E-20	1.73E-19	0.00E+00	1.52E-19	5.31E-21	5.95E-18
21	Ru-103	1.26E+08	0.00E+00	4.85E+07	0.00E+00	3.18E+08	0.00E+00	3.26E+09
22	Ru-106	3.12E+09	0.00E+00	3.89E+08	0.00E+00	4.21E+09	0.00E+00	4.85E+10
23	Ag-110m	5.99E+06	4.04E+06	3.23E+06	0.00E+00	7.53E+06	0.00E+00	4.81E+08
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	1.33E+09	3.59E+08	1.58E+08	3.19E+08	3.80E+09	0.00E+00	1.08E+09
28	Te-129m	1.47E+09	4.11E+08	2.29E+08	4.75E+08	4.33E+09	0.00E+00	1.80E+09
29	I-131	1.41E+07	1.42E+07	8.04E+06	4.68E+09	2.32E+07	0.00E+00	1.26E+06
30	I-133	4.84E-01	5.99E-01	2.27E-01	1.11E+02	9.98E-01	0.00E+00	2.41E-01
31	Cs-134	6.35E+08	1.04E+09	2.20E+08	0.00E+00	3.23E+08	1.16E+08	5.62E+06
32	Cs-136	1.38E+07	3.78E+07	2.45E+07	0.00E+00	2.01E+07	3.00E+06	1.33E+06
33	Cs-137	9.02E+08	8.63E+08	1.27E+08	0.00E+00	2.81E+08	1.01E+08	5.40E+06
34	Ba-140	3.72E+07	3.26E+06	2.17E+06	0.00E+00	1.06E+04	1.94E+04	1.89E+07
35	La-140	4.76E-02	1.66E-02	5.61E-03	0.00E+00	0.00E+00	0.00E+00	4.63E+02
36	Ce-141	1.83E+04	9.13E+03	1.36E+04	0.00E+00	4.00E+03	0.00E+00	1.14E+07
37	Ce-144	1.64E+06	5.15E+05	8.77E+04	0.00E+00	2.85E+05	0.00E+00	1.34E+08

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30
C-14 calculated per ODCM equation 2.3-33 (reference ERS-LMR-12-001)

3-7-14
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Table 2.3-13

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Adult

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	7.63E+02	7.63E+02	7.63E+02	7.63E+02	7.63E+02	7.63E+02
2	C-14	3.63E+05	7.26E+04	7.26E+04	7.26E+04	7.26E+04	7.26E+04	7.26E+04
3	P-32	1.45E+10	9.01E+08	5.60E+08	0.00E+00	0.00E+00	0.00E+00	1.63E+09
4	Cr-51	0.00E+00	0.00E+00	2.38E+04	1.42E+04	5.24E+03	3.15E+04	5.98E+06
5	Mn-54	0.00E+00	5.95E+06	1.13E+06	0.00E+00	1.77E+06	0.00E+00	1.82E+07
6	Fe-59	2.40E+07	5.63E+07	2.16E+07	0.00E+00	0.00E+00	1.57E+07	1.88E+08
7	Co-57	0.00E+00	9.10E+05	1.51E+06	0.00E+00	0.00E+00	0.00E+00	2.31E+07
8	Co-58	0.00E+00	3.67E+06	8.22E+06	0.00E+00	0.00E+00	0.00E+00	7.43E+07
9	Co-60	0.00E+00	1.12E+07	2.46E+07	0.00E+00	0.00E+00	0.00E+00	2.10E+08
10	Zn-65	9.80E+08	3.12E+09	1.41E+09	0.00E+00	2.09E+09	0.00E+00	1.96E+09
11	Se-75	1.85E+09	1.17E+09	2.32E+09	1.01E+09	1.71E+09	1.48E+09	1.56E+09
12	Rb-86	0.00E+00	2.19E+09	1.02E+09	0.00E+00	0.00E+00	0.00E+00	4.32E+08
13	Sr-89	1.16E+09	0.00E+00	3.33E+07	0.00E+00	0.00E+00	0.00E+00	1.86E+08
14	Sr-90	3.16E+10	0.00E+00	7.76E+09	0.00E+00	0.00E+00	0.00E+00	9.14E+08
15	Y-91	6.78E+03	0.00E+00	1.81E+02	0.00E+00	0.00E+00	0.00E+00	3.73E+06
16	Zr-95	7.40E+02	2.37E+02	1.61E+02	0.00E+00	3.72E+02	0.00E+00	7.52E+05
17	Nb-95	6.77E+04	3.77E+04	2.03E+04	0.00E+00	3.72E+04	0.00E+00	2.29E+08
18	Nb-97	2.81E-12	7.11E-13	2.60E-13	0.00E+00	8.30E-13	0.00E+00	2.62E-09
19	Mo-99	0.00E+00	2.11E+07	4.01E+06	0.00E+00	4.77E+07	0.00E+00	4.88E+07
20	Tc-99m	2.83E+00	7.99E+00	1.02E+02	0.00E+00	1.21E+02	3.91E+00	4.73E+03
21	Ru-103	8.29E+02	0.00E+00	3.57E+02	0.00E+00	3.16E+03	0.00E+00	9.68E+04
22	Ru-106	1.43E+04	0.00E+00	1.81E+03	0.00E+00	2.77E+04	0.00E+00	9.27E+05
23	Ag-110m	4.16E+07	3.84E+07	2.28E+07	0.00E+00	7.56E+07	0.00E+00	1.57E+10
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	3.44E+07	1.23E+07	4.19E+06	8.79E+06	1.40E+08	0.00E+00	1.15E+08
28	Te-129m	4.95E+07	1.85E+07	7.84E+06	1.70E+07	2.07E+08	0.00E+00	2.49E+08
29	I-131	2.52E+08	3.60E+08	2.06E+08	1.18E+11	6.17E+08	0.00E+00	9.50E+07
30	I-133	3.29E+06	5.72E+06	1.75E+06	8.41E+08	9.99E+06	0.00E+00	5.14E+06
31	Cs-134	3.89E+09	9.27E+09	7.58E+09	0.00E+00	3.00E+09	9.96E+08	1.62E+08
32	Cs-136	2.23E+08	8.82E+08	6.35E+08	0.00E+00	4.91E+08	6.73E+07	1.00E+08
33	Cs-137	4.99E+09	6.82E+09	4.47E+09	0.00E+00	2.32E+09	7.70E+08	1.32E+08
34	Ba-140	2.28E+07	2.87E+04	1.49E+06	0.00E+00	9.74E+03	1.64E+04	4.70E+07
35	La-140	3.84E+00	1.93E+00	5.11E-01	0.00E+00	0.00E+00	0.00E+00	1.42E+05
36	Ce-141	3.99E+03	2.70E+03	3.06E+02	0.00E+00	1.25E+03	0.00E+00	1.03E+07
37	Ce-144	2.54E+05	1.06E+05	1.36E+04	0.00E+00	6.29E+04	0.00E+00	8.58E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

3-7-14

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Table 2.3-14

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Teen

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	9.94E+02	9.94E+02	9.94E+02	9.94E+02	9.94E+02	9.94E+02
2	C-14	6.70E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05
3	P-32	2.67E+10	1.66E+09	1.04E+09	0.00E+00	0.00E+00	0.00E+00	2.25E+09
4	Cr-51	0.00E+00	0.00E+00	4.15E+04	2.31E+04	9.10E+03	5.93E+04	6.97E+06
5	Mn-54	0.00E+00	9.91E+06	1.96E+06	0.00E+00	2.95E+06	0.00E+00	2.03E+07
6	Fe-59	4.18E+07	9.76E+07	3.77E+07	0.00E+00	0.00E+00	3.08E+07	2.31E+08
7	Co-57	0.00E+00	1.60E+06	2.68E+06	0.00E+00	0.00E+00	0.00E+00	2.98E+07
8	Co-58	0.00E+00	6.17E+06	1.42E+07	0.00E+00	0.00E+00	0.00E+00	8.51E+07
9	Co-60	0.00E+00	1.89E+07	4.26E+07	0.00E+00	0.00E+00	0.00E+00	2.46E+08
10	Zn-65	1.51E+09	5.23E+09	2.44E+09	0.00E+00	3.34E+09	0.00E+00	2.21E+09
11	Se-75	2.38E+09	1.51E+09	2.99E+09	1.30E+09	2.21E+09	1.91E+09	2.01E+09
12	Rb-86	0.00E+00	3.99E+09	1.87E+09	0.00E+00	0.00E+00	0.00E+00	5.91E+08
13	Sr-89	2.14E+09	0.00E+00	6.12E+07	0.00E+00	0.00E+00	0.00E+00	2.55E+08
14	Sr-90	4.47E+10	0.00E+00	1.10E+10	0.00E+00	0.00E+00	0.00E+00	1.25E+09
15	Y-91	1.25E+04	0.00E+00	3.35E+02	0.00E+00	0.00E+00	0.00E+00	5.11E+06
16	Zr-95	1.29E+03	4.08E+02	2.81E+02	0.00E+00	6.00E+02	0.00E+00	9.42E+05
17	Nb-95	1.16E+05	6.41E+04	3.53E+04	0.00E+00	6.21E+04	0.00E+00	2.74E+08
18	Nb-97	5.13E-12	1.27E-12	4.65E-13	0.00E+00	1.49E-12	0.00E+00	3.04E-08
19	Mo-99	0.00E+00	3.80E+07	7.25E+06	0.00E+00	8.70E+07	0.00E+00	6.81E+07
20	Tc-99m	4.90E+00	1.37E+01	1.77E+02	0.00E+00	2.04E+02	7.59E+00	8.98E+03
21	Ru-103	1.47E+03	0.00E+00	6.30E+02	0.00E+00	5.20E+03	0.00E+00	1.23E+05
22	Ru-106	2.03E+04	0.00E+00	3.32E+03	0.00E+00	5.08E+04	0.00E+00	1.26E+06
23	Ag-110m	6.87E+07	6.50E+07	3.95E+07	0.00E+00	1.24E+08	0.00E+00	1.83E+10
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	6.34E+07	2.25E+07	7.54E+06	1.51E+07	2.57E+08	0.00E+00	1.58E+08
28	Te-129m	9.06E+07	3.36E+07	1.43E+07	2.92E+07	3.79E+08	0.00E+00	3.40E+08
29	I-131	4.57E+08	6.39E+08	3.43E+08	1.87E+11	1.10E+09	0.00E+00	1.26E+08
30	I-133	6.01E+06	1.02E+07	3.11E+06	1.42E+09	1.79E+07	0.00E+00	7.71E+06
31	Cs-134	6.76E+09	1.59E+10	7.38E+09	0.00E+00	5.06E+09	1.93E+09	1.98E+08
32	Cs-136	3.80E+08	1.50E+09	1.01E+09	0.00E+00	8.15E+08	1.28E+08	1.20E+08
33	Cs-137	9.05E+09	1.20E+10	4.19E+09	0.00E+00	4.10E+09	1.59E+09	1.71E+08
34	Ba-140	4.12E+07	5.05E+04	2.65E+06	0.00E+00	1.71E+04	3.39E+04	6.35E+07
35	La-140	6.89E+00	3.39E+00	9.01E-01	0.00E+00	0.00E+00	0.00E+00	1.94E+05
36	Ce-141	7.32E+03	4.89E+03	5.62E+02	0.00E+00	2.30E+03	0.00E+00	1.40E+07
37	Ce-144	4.67E+05	1.93E+05	2.51E+04	0.00E+00	1.15E+05	0.00E+00	1.17E+08

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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Table 2.3-15

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Child

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.57E+03	1.57E+03	1.57E+03	1.57E+03	1.57E+03	1.57E+03
2	C-14	1.65E+06	3.29E+05	3.29E+05	3.29E+05	3.29E+05	3.29E+05	3.29E+05
3	P-32	6.59E+10	3.09E+09	2.54E+09	0.00E+00	0.00E+00	0.00E+00	1.82E+09
4	Cr-51	0.00E+00	0.00E+00	8.46E+04	4.70E+04	1.28E+04	8.58E+04	4.49E+06
5	Mn-54	0.00E+00	1.48E+07	3.95E+06	0.00E+00	4.16E+06	0.00E+00	1.24E+07
6	Fe-59	9.70E+07	1.57E+08	7.82E+07	0.00E+00	0.00E+00	4.55E+07	1.63E+08
7	Co-57	0.00E+00	2.73E+06	5.52E+06	0.00E+00	0.00E+00	0.00E+00	2.24E+07
8	Co-58	0.00E+00	9.43E+06	2.89E+07	0.00E+00	0.00E+00	0.00E+00	5.50E+07
9	Co-60	0.00E+00	2.94E+07	8.67E+07	0.00E+00	0.00E+00	0.00E+00	1.63E+08
10	Zn-65	2.95E+09	7.87E+09	4.89E+09	0.00E+00	4.96E+09	0.00E+00	1.38E+09
11	Se-75	1.97E+09	1.25E+09	2.47E+09	1.07E+09	1.82E+09	1.58E+09	1.66E+09
12	Rb-86	0.00E+00	7.40E+09	4.55E+09	0.00E+00	0.00E+00	0.00E+00	4.76E+08
13	Sr-89	5.29E+09	0.00E+00	1.51E+08	0.00E+00	0.00E+00	0.00E+00	2.05E+08
14	Sr-90	7.55E+10	0.00E+00	1.91E+10	0.00E+00	0.00E+00	0.00E+00	1.02E+09
15	Y-91	3.08E+04	0.00E+00	8.24E+02	0.00E+00	0.00E+00	0.00E+00	4.11E+06
16	Zr-95	3.00E+03	6.60E+02	5.88E+02	0.00E+00	9.45E+02	0.00E+00	6.89E+05
17	Nb-95	2.61E+05	1.02E+05	7.26E+04	0.00E+00	9.54E+04	0.00E+00	1.88E+08
18	Nb-97	1.25E-11	2.25E-12	1.05E-12	0.00E+00	2.50E-12	0.00E+00	6.94E-07
19	Mo-99	0.00E+00	6.92E+07	1.71E+07	0.00E+00	1.48E+08	0.00E+00	5.72E+07
20	Tc-99m	1.12E+01	2.20E+01	3.65E+02	0.00E+00	3.20E+02	1.12E+01	1.25E+04
21	Ru-103	3.49E+03	0.00E+00	1.34E+03	0.00E+00	8.78E+03	0.00E+00	9.01E+04
22	Ru-106	6.49E+04	0.00E+00	8.10E+03	0.00E+00	8.76E+04	0.00E+00	1.01E+06
23	Ag-110m	1.49E+08	1.01E+08	8.05E+07	0.00E+00	1.87E+08	0.00E+00	1.20E+10
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	1.56E+08	4.21E+07	1.86E+07	3.74E+07	4.46E+08	0.00E+00	1.27E+08
28	Te-129m	2.23E+08	6.24E+07	3.47E+07	7.20E+07	6.56E+08	0.00E+00	2.72E+08
29	I-131	1.11E+09	1.11E+09	6.33E+08	3.68E+11	1.83E+09	0.00E+00	9.92E+07
30	I-133	1.46E+07	1.81E+07	6.83E+06	3.36E+09	3.01E+07	0.00E+00	7.28E+06
31	Cs-134	1.56E+10	2.56E+10	5.40E+09	0.00E+00	7.93E+09	2.85E+09	1.38E+08
32	Cs-136	8.58E+08	2.36E+09	1.53E+09	0.00E+00	1.26E+09	1.87E+08	8.29E+07
33	Cs-137	2.18E+10	2.09E+10	3.08E+09	0.00E+00	6.80E+09	2.45E+09	1.31E+08
34	Ba-140	9.94E+07	8.71E+06	5.80E+06	0.00E+00	2.84E+04	5.19E+04	5.04E+07
35	La-140	1.65E+01	5.77E+00	1.94E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+05
36	Ce-141	1.80E+04	8.99E+03	1.34E+04	0.00E+00	3.94E+03	0.00E+00	1.12E+07
37	Ce-144	1.15E+06	3.61E+05	6.15E+04	0.00E+00	2.00E+05	0.00E+00	9.41E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-16

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Infant

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.38E+03	2.38E+03	2.38E+03	2.38E+03	2.38E+03	2.38E+03
2	C-14	3.23E+06	6.89E+05	6.89E+05	6.89E+05	6.89E+05	6.89E+05	6.89E+05
3	P-32	1.36E+11	7.99E+09	5.27E+09	0.00E+00	0.00E+00	0.00E+00	1.84E+09
4	Cr-51	0.00E+00	0.00E+00	1.34E+05	8.75E+04	1.91E+04	1.70E+05	3.91E+06
5	Mn-54	0.00E+00	2.76E+07	6.25E+06	0.00E+00	6.11E+06	0.00E+00	1.01E+07
6	Fe-59	1.81E+08	3.16E+08	1.25E+08	0.00E+00	0.00E+00	9.35E+07	1.51E+08
7	Co-57	0.00E+00	6.36E+06	1.03E+07	0.00E+00	0.00E+00	0.00E+00	2.17E+07
8	Co-58	0.00E+00	1.89E+07	4.70E+07	0.00E+00	0.00E+00	0.00E+00	4.70E+07
9	Co-60	0.00E+00	6.00E+07	1.42E+08	0.00E+00	0.00E+00	0.00E+00	1.43E+08
10	Zn-65	3.97E+09	1.36E+10	6.27E+09	0.00E+00	6.60E+09	0.00E+00	1.15E+10
11	Se-75	1.97E+09	1.25E+09	2.47E+09	1.07E+09	1.82E+09	1.58E+09	1.66E+09
12	Rb-86	0.00E+00	1.88E+10	9.28E+09	0.00E+00	0.00E+00	0.00E+00	4.81E+08
13	Sr-89	1.01E+10	0.00E+00	2.89E+08	0.00E+00	0.00E+00	0.00E+00	2.07E+08
14	Sr-90	8.22E+10	0.00E+00	2.09E+10	0.00E+00	0.00E+00	0.00E+00	1.03E+09
15	Y-91	5.79E+04	0.00E+00	1.54E+03	0.00E+00	0.00E+00	0.00E+00	4.15E+06
16	Zr-95	5.33E+03	1.30E+03	9.22E+02	0.00E+00	1.40E+03	0.00E+00	6.47E+05
17	Nb-95	4.87E+05	2.01E+05	1.16E+05	0.00E+00	1.44E+05	0.00E+00	1.69E+08
18	Nb-97	2.63E-11	5.62E-12	2.03E-12	0.00E+00	4.39E-12	0.00E+00	1.77E-06
19	Mo-99	0.00E+00	1.77E+08	3.45E+07	0.00E+00	2.64E+08	0.00E+00	5.83E+07
20	Tc-99m	2.34E+01	4.82E+01	6.21E+02	0.00E+00	5.19E+02	2.52E+01	1.40E+04
21	Ru-103	7.06E+03	0.00E+00	2.36E+03	0.00E+00	1.47E+04	0.00E+00	8.59E+04
22	Ru-106	1.34E+05	0.00E+00	1.67E+04	0.00E+00	1.58E+05	0.00E+00	1.01E+06
23	Ag-110m	2.75E+08	2.01E+08	1.33E+08	0.00E+00	2.88E+08	0.00E+00	1.04E+10
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	3.16E+08	1.05E+08	3.83E+07	9.14E+07	7.79E+08	0.00E+00	1.28E+08
28	Te-129m	4.58E+08	1.57E+08	7.06E+07	1.76E+08	1.15E+09	0.00E+00	2.74E+08
29	I-131	2.31E+09	2.72E+09	1.20E+09	8.95E+11	3.18E+09	0.00E+00	9.72E+07
30	I-133	3.08E+07	4.49E+07	1.31E+07	8.17E+09	5.28E+07	0.00E+00	7.60E+06
31	Cs-134	2.51E+10	4.69E+10	4.73E+09	0.00E+00	1.21E+10	4.95E+09	1.27E+08
32	Cs-136	1.68E+09	4.93E+09	1.84E+09	0.00E+00	1.97E+09	4.02E+08	7.49E+07
33	Cs-137	3.48E+10	4.07E+10	2.89E+09	0.00E+00	1.09E+10	4.43E+09	1.27E+08
34	Ba-140	2.05E+08	2.05E+05	1.05E+07	0.00E+00	4.86E+04	1.26E+05	5.02E+07
35	La-140	3.45E+01	1.36E+01	3.50E+00	0.00E+00	0.00E+00	0.00E+00	1.60E+05
36	Ce-141	3.57E+04	2.18E+04	2.57E+03	0.00E+00	6.72E+03	0.00E+00	1.13E+07
37	Ce-144	1.65E+06	6.75E+05	9.25E+04	0.00E+00	2.73E+05	0.00E+00	9.47E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-17

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Adult

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.56E+03	1.56E+03	1.56E+03	1.56E+03	1.56E+03	1.56E+03
2	C-14	3.63E+05	7.26E+04	7.26E+04	7.26E+04	7.26E+04	7.26E+04	7.26E+04
3	P-32	1.74E+10	1.08E+09	6.72E+08	0.00E+00	0.00E+00	0.00E+00	1.96E+09
4	Cr-51	0.00E+00	0.00E+00	2.85E+03	1.70E+03	6.28E+02	3.78E+03	7.17E+05
5	Mn-54	0.00E+00	7.14E+05	1.36E+05	0.00E+00	2.12E+05	0.00E+00	2.19E+06
6	Fe-59	3.12E+05	7.32E+05	2.81E+05	0.00E+00	0.00E+00	2.05E+05	2.44E+06
7	Co-57	0.00E+00	1.09E+05	1.82E+05	0.00E+00	0.00E+00	0.00E+00	2.77E+06
8	Co-58	0.00E+00	4.40E+05	9.86E+05	0.00E+00	0.00E+00	0.00E+00	8.91E+06
9	Co-60	0.00E+00	1.34E+06	2.96E+06	0.00E+00	0.00E+00	0.00E+00	2.52E+07
10	Zn-65	1.18E+08	3.74E+08	1.69E+08	0.00E+00	2.50E+08	0.00E+00	2.36E+08
11	Se-75	2.22E+08	1.41E+08	2.78E+08	1.21E+08	2.06E+08	1.78E+08	1.87E+08
12	Rb-86	0.00E+00	2.63E+08	1.22E+08	0.00E+00	0.00E+00	0.00E+00	5.18E+07
13	Sr-89	2.43E+09	0.00E+00	6.99E+07	0.00E+00	0.00E+00	0.00E+00	3.91E+08
14	Sr-90	6.64E+10	0.00E+00	1.63E+10	0.00E+00	0.00E+00	0.00E+00	1.92E+09
15	Y-91	8.14E+02	0.00E+00	2.18E+01	0.00E+00	0.00E+00	0.00E+00	4.48E+05
16	Zr-95	8.87E+01	2.85E+01	1.93E+01	0.00E+00	4.47E+01	0.00E+00	9.02E+04
17	Nb-95	8.13E+03	4.52E+03	2.43E+03	0.00E+00	4.47E+03	0.00E+00	2.74E+07
18	Nb-97	3.38E-13	8.54E-14	3.12E-14	0.00E+00	9.96E-14	0.00E+00	3.15E-10
19	Mo-99	0.00E+00	2.53E+06	4.81E+05	0.00E+00	5.72E+06	0.00E+00	5.86E+06
20	Tc-99m	3.39E-01	9.59E-01	1.22E+01	0.00E+00	1.46E+01	4.70E-01	5.67E+02
21	Ru-103	9.95E+01	0.00E+00	4.29E+01	0.00E+00	3.80E+02	0.00E+00	1.16E+04
22	Ru-106	1.72E+03	0.00E+00	2.18E+02	0.00E+00	3.32E+03	0.00E+00	1.11E+05
23	Ag-110m	4.99E+06	4.61E+06	2.74E+06	0.00E+00	9.07E+06	0.00E+00	1.88E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	4.13E+06	1.48E+06	5.03E+05	1.05E+06	1.68E+07	0.00E+00	1.38E+07
28	Te-129m	5.94E+06	2.22E+06	9.41E+05	2.04E+06	2.48E+07	0.00E+00	2.99E+07
29	I-131	3.02E+08	4.32E+08	2.48E+08	1.42E+11	7.40E+08	0.00E+00	1.14E+08
30	I-133	3.95E+06	6.87E+06	2.09E+06	1.01E+09	1.20E+07	0.00E+00	6.17E+06
31	Cs-134	4.67E+08	1.11E+09	9.09E+08	0.00E+00	3.60E+08	1.19E+08	1.95E+07
32	Cs-136	6.70E+08	2.65E+09	1.90E+09	0.00E+00	1.47E+09	2.02E+08	3.01E+08
33	Cs-137	1.50E+10	2.05E+10	1.34E+10	0.00E+00	6.95E+09	2.31E+09	3.96E+08
34	Ba-140	2.74E+06	3.44E+03	1.79E+05	0.00E+00	1.17E+03	1.97E+03	5.64E+06
35	La-140	4.60E-01	2.32E-01	6.13E-02	0.00E+00	0.00E+00	0.00E+00	1.70E+04
36	Ce-141	4.79E+02	3.24E+02	3.68E+01	0.00E+00	1.51E+02	0.00E+00	1.24E+06
37	Ce-144	3.05E+04	1.27E+04	1.64E+03	0.00E+00	7.55E+03	0.00E+00	1.03E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-18

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Teen

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.03E+03	2.03E+03	2.03E+03	2.03E+03	2.03E+03	2.03E+03
2	C-14	6.70E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05	1.34E+05
3	P-32	3.21E+10	1.99E+09	1.24E+09	0.00E+00	0.00E+00	0.00E+00	2.70E+09
4	Cr-51	0.00E+00	0.00E+00	4.98E+03	2.77E+03	1.09E+03	7.11E+03	8.37E+05
5	Mn-54	0.00E+00	1.19E+06	2.36E+05	0.00E+00	3.55E+05	0.00E+00	2.44E+06
6	Fe-59	5.44E+05	1.27E+06	4.90E+05	0.00E+00	0.00E+00	4.00E+05	3.00E+06
7	Co-57	0.00E+00	1.92E+05	3.21E+05	0.00E+00	0.00E+00	0.00E+00	3.57E+06
8	Co-58	0.00E+00	7.40E+05	1.71E+06	0.00E+00	0.00E+00	0.00E+00	1.02E+07
9	Co-60	0.00E+00	2.27E+06	5.11E+06	0.00E+00	0.00E+00	0.00E+00	2.96E+07
10	Zn-65	1.81E+08	6.27E+08	2.93E+08	0.00E+00	4.01E+08	0.00E+00	2.66E+08
11	Se-75	2.86E+08	1.82E+08	3.59E+08	1.56E+08	2.65E+08	2.29E+08	2.41E+08
12	Rb-86	0.00E+00	4.79E+08	2.25E+08	0.00E+00	0.00E+00	0.00E+00	7.09E+07
13	Sr-89	4.49E+09	0.00E+00	1.29E+08	0.00E+00	0.00E+00	0.00E+00	5.35E+08
14	Sr-90	9.39E+10	0.00E+00	2.32E+10	0.00E+00	0.00E+00	0.00E+00	2.64E+09
15	Y-91	1.50E+03	0.00E+00	4.01E+01	0.00E+00	0.00E+00	0.00E+00	6.14E+05
16	Zr-95	1.55E+02	4.90E+01	3.37E+01	0.00E+00	7.19E+01	0.00E+00	1.13E+05
17	Nb-95	1.39E+04	7.69E+03	4.23E+03	0.00E+00	7.45E+03	0.00E+00	3.29E+07
18	Nb-97	6.15E-13	1.53E-13	5.57E-14	0.00E+00	1.79E-13	0.00E+00	3.65E-09
19	Mo-99	0.00E+00	4.56E+06	8.70E+05	0.00E+00	1.04E+07	0.00E+00	8.17E+06
20	Tc-99m	5.88E-01	1.64E+00	2.13E+01	0.00E+00	2.45E+01	9.11E-01	1.08E+03
21	Ru-103	1.77E+02	0.00E+00	7.56E+01	0.00E+00	6.24E+02	0.00E+00	1.48E+04
22	Ru-106	2.44E+03	0.00E+00	3.98E+02	0.00E+00	6.10E+03	0.00E+00	1.52E+05
23	Ag-110m	8.24E+06	7.80E+06	4.75E+06	0.00E+00	1.49E+07	0.00E+00	2.19E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	7.61E+06	2.70E+06	9.05E+05	1.81E+06	3.08E+07	0.00E+00	1.90E+07
28	Te-129m	1.09E+07	4.03E+06	1.72E+06	3.51E+06	4.55E+07	0.00E+00	4.08E+07
29	I-131	5.48E+08	7.67E+08	4.12E+08	2.24E+11	1.32E+09	0.00E+00	1.52E+08
30	I-133	7.21E+06	1.22E+07	3.73E+06	1.71E+09	2.15E+07	0.00E+00	9.26E+06
31	Cs-134	8.11E+08	1.91E+09	8.86E+08	0.00E+00	6.07E+08	2.32E+08	2.38E+07
32	Cs-136	1.14E+09	4.49E+09	3.02E+09	0.00E+00	2.44E+09	3.85E+08	3.61E+08
33	Cs-137	2.71E+10	3.61E+10	1.26E+10	0.00E+00	1.23E+10	4.77E+09	5.14E+08
34	Ba-140	4.94E+06	6.06E+03	3.18E+05	0.00E+00	2.05E+03	4.07E+03	7.62E+06
35	La-140	8.27E-01	4.06E-01	1.08E-01	0.00E+00	0.00E+00	0.00E+00	2.33E+04
36	Ce-141	8.79E+02	5.87E+02	6.74E+01	0.00E+00	2.76E+02	0.00E+00	1.68E+06
37	Ce-144	5.60E+04	2.32E+04	3.01E+03	0.00E+00	1.39E+04	0.00E+00	1.41E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-19

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Child

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	3.20E+03	3.20E+03	3.20E+03	3.20E+03	3.20E+03	3.20E+03
2	C-14	1.65E+06	3.29E+05	3.29E+05	3.29E+05	3.29E+05	3.29E+05	3.29E+05
3	P-32	7.91E+10	3.70E+09	3.05E+09	0.00E+00	0.00E+00	0.00E+00	2.19E+09
4	Cr-51	0.00E+00	0.00E+00	1.02E+04	5.64E+03	1.54E+03	1.03E+04	5.39E+05
5	Mn-54	0.00E+00	1.78E+06	4.74E+05	0.00E+00	4.99E+05	0.00E+00	1.49E+06
6	Fe-59	1.26E+06	2.04E+06	1.02E+06	0.00E+00	0.00E+00	5.91E+05	2.12E+06
7	Co-57	0.00E+00	3.27E+05	6.63E+05	0.00E+00	0.00E+00	0.00E+00	2.68E+06
8	Co-58	0.00E+00	1.13E+06	3.46E+06	0.00E+00	0.00E+00	0.00E+00	6.60E+06
9	Co-60	0.00E+00	3.53E+06	1.04E+07	0.00E+00	0.00E+00	0.00E+00	1.95E+07
10	Zn-65	3.54E+08	9.44E+08	5.87E+08	0.00E+00	5.95E+08	0.00E+00	1.66E+08
11	Se-75	2.36E+08	1.50E+08	2.96E+08	1.29E+08	2.19E+08	1.89E+08	1.99E+08
12	Rb-86	0.00E+00	8.88E+08	5.46E+08	0.00E+00	0.00E+00	0.00E+00	5.71E+07
13	Sr-89	1.11E+10	0.00E+00	3.17E+08	0.00E+00	0.00E+00	0.00E+00	4.30E+08
14	Sr-90	1.59E+11	0.00E+00	4.02E+10	0.00E+00	0.00E+00	0.00E+00	2.14E+09
15	Y-91	3.70E+03	0.00E+00	9.89E+01	0.00E+00	0.00E+00	0.00E+00	4.93E+05
16	Zr-95	3.60E+02	7.92E+01	7.05E+01	0.00E+00	1.13E+02	0.00E+00	8.27E+04
17	Nb-95	3.13E+04	1.22E+04	8.71E+03	0.00E+00	1.14E+04	0.00E+00	2.25E+07
18	Nb-97	1.49E-12	2.70E-13	1.26E-13	0.00E+00	2.99E-13	0.00E+00	8.33E-08
19	Mo-99	0.00E+00	8.30E+06	2.05E+06	0.00E+00	1.77E+07	0.00E+00	6.87E+06
20	Tc-99m	1.35E+00	2.65E+00	4.39E+01	0.00E+00	3.84E+01	1.34E+00	1.51E+03
21	Ru-103	4.18E+02	0.00E+00	1.61E+02	0.00E+00	1.05E+03	0.00E+00	1.08E+04
22	Ru-106	7.79E+03	0.00E+00	9.72E+02	0.00E+00	1.05E+04	0.00E+00	1.21E+05
23	Ag-110m	1.79E+07	1.21E+07	9.65E+06	0.00E+00	2.25E+07	0.00E+00	1.44E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	1.88E+07	5.05E+06	2.23E+06	4.48E+06	5.35E+07	0.00E+00	1.52E+07
28	Te-129m	2.68E+07	7.48E+06	4.16E+06	8.64E+06	7.87E+07	0.00E+00	3.27E+07
29	I-131	1.33E+09	1.34E+09	7.60E+08	4.42E+11	2.19E+09	0.00E+00	1.19E+08
30	I-133	1.75E+07	2.17E+07	8.20E+06	4.03E+09	3.61E+07	0.00E+00	8.73E+06
31	Cs-134	1.87E+09	3.07E+09	6.48E+08	0.00E+00	9.52E+08	3.42E+08	1.66E+07
32	Cs-136	2.58E+09	7.08E+09	4.58E+09	0.00E+00	3.77E+09	5.62E+08	2.49E+08
33	Cs-137	6.54E+10	6.26E+10	9.24E+09	0.00E+00	2.04E+10	7.34E+09	3.92E+08
34	Ba-140	1.19E+07	1.05E+06	6.96E+05	0.00E+00	3.40E+03	6.23E+03	6.04E+06
35	La-140	1.98E+00	6.92E-01	2.33E-01	0.00E+00	0.00E+00	0.00E+00	1.93E+04
36	Ce-141	2.16E+03	1.08E+03	1.60E+03	0.00E+00	4.73E+02	0.00E+00	1.35E+06
37	Ce-144	1.38E+05	4.33E+04	7.37E+03	0.00E+00	2.40E+04	0.00E+00	1.13E+07

All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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P&I ORGAN DOSE FACTORS

Table 2.3-20

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Infant

	Nuclide	Bone	Liver	T.Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	4.86E+03	4.86E+03	4.86E+03	4.86E+03	4.86E+03	4.86E+03
2	C-14	3.23E+06	6.89E+05	6.89E+05	6.89E+05	6.89E+05	6.89E+05	6.89E+05
3	P-32	1.63E+11	9.59E+09	6.32E+09	0.00E+00	0.00E+00	0.00E+00	2.21E+09
4	Cr-51	0.00E+00	0.00E+00	1.61E+04	1.05E+04	2.29E+03	2.04E+04	4.69E+05
5	Mn-54	0.00E+00	3.31E+06	7.50E+05	0.00E+00	7.33E+05	0.00E+00	1.21E+06
6	Fe-59	2.35E+06	4.11E+06	1.62E+06	0.00E+00	0.00E+00	1.21E+06	1.96E+06
7	Co-57	0.00E+00	7.64E+05	1.24E+06	0.00E+00	0.00E+00	0.00E+00	2.60E+06
8	Co-58	0.00E+00	2.26E+06	5.64E+06	0.00E+00	0.00E+00	0.00E+00	5.64E+06
9	Co-60	0.00E+00	7.20E+06	1.70E+07	0.00E+00	0.00E+00	0.00E+00	1.71E+07
10	Zn-65	4.76E+08	1.63E+09	7.53E+08	0.00E+00	7.92E+08	0.00E+00	1.38E+09
11	Se-75	2.36E+08	1.50E+08	2.96E+08	1.29E+08	2.19E+08	1.89E+08	1.99E+08
12	Rb-86	0.00E+00	2.25E+09	1.11E+09	0.00E+00	0.00E+00	0.00E+00	5.77E+07
13	Sr-89	2.11E+10	0.00E+00	6.06E+08	0.00E+00	0.00E+00	0.00E+00	4.34E+08
14	Sr-90	1.73E+11	0.00E+00	4.39E+10	0.00E+00	0.00E+00	0.00E+00	2.16E+09
15	Y-91	6.94E+03	0.00E+00	1.85E+02	0.00E+00	0.00E+00	0.00E+00	4.98E+05
16	Zr-95	6.40E+02	1.56E+02	1.11E+02	0.00E+00	1.68E+02	0.00E+00	7.77E+04
17	Nb-95	5.84E+04	2.41E+04	1.39E+04	0.00E+00	1.72E+04	0.00E+00	2.03E+07
18	Nb-97	3.16E-12	6.74E-13	2.43E-13	0.00E+00	5.27E-13	0.00E+00	2.13E-07
19	Mo-99	0.00E+00	2.12E+07	4.14E+06	0.00E+00	3.17E+07	0.00E+00	6.99E+06
20	Tc-99m	2.81E+00	5.79E+00	7.46E+01	0.00E+00	6.23E+01	3.03E+00	1.68E+03
21	Ru-103	8.47E+02	0.00E+00	2.83E+02	0.00E+00	1.76E+03	0.00E+00	1.03E+04
22	Ru-106	1.60E+04	0.00E+00	2.00E+03	0.00E+00	1.90E+04	0.00E+00	1.22E+05
23	Ag-110m	3.30E+07	2.41E+07	1.60E+07	0.00E+00	3.45E+07	0.00E+00	1.25E+09
24	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	Sb-126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	Te-127m	3.80E+07	1.26E+07	4.59E+06	1.10E+07	9.35E+07	0.00E+00	1.53E+07
28	Te-129m	5.50E+07	1.89E+07	8.47E+06	2.11E+07	1.38E+08	0.00E+00	3.28E+07
29	I-131	2.77E+09	3.27E+09	1.44E+09	1.07E+12	3.82E+09	0.00E+00	1.17E+08
30	I-133	3.70E+07	5.39E+07	1.58E+07	9.80E+09	6.34E+07	0.00E+00	9.12E+06
31	Cs-134	3.02E+09	5.62E+09	5.68E+08	0.00E+00	1.45E+09	5.93E+08	1.53E+07
32	Cs-136	5.03E+09	1.48E+10	5.52E+09	0.00E+00	5.90E+09	1.21E+09	2.25E+08
33	Cs-137	1.04E+11	1.22E+11	8.66E+09	0.00E+00	3.28E+10	1.33E+10	3.82E+08
34	Ba-140	2.45E+07	2.45E+04	1.26E+06	0.00E+00	5.83E+03	1.51E+04	6.03E+06
35	La-140	4.14E+00	1.63E+00	4.19E-01	0.00E+00	0.00E+00	0.00E+00	1.92E+04
36	Ce-141	4.29E+03	2.62E+03	3.08E+02	0.00E+00	8.07E+02	0.00E+00	1.35E+06
37	Ce-144	1.98E+05	8.11E+04	1.11E+04	0.00E+00	3.28E+04	0.00E+00	1.14E+07

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All nuclides (except H-3 and C-14) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28
C-14 calculated per ODCM equation 2.3-32 (reference ERS-LMR-12-001)

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-21

PV-1/2 DEPOSITION PARAMETERS (D/Q) FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

DISTANCES TO THE CONTROL LOCATIONS, IN MILES

SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	6.00E-10	8.60E-09	3.14E-09	1.76E-09	8.12E-10	5.70E-10	4.24E-10	3.29E-10	2.63E-10	2.15E-10
NNE	6.66E-10	5.64E-09	1.98E-09	2.55E-09	1.33E-09	1.07E-09	6.75E-10	5.23E-10	4.56E-10	3.74E-10
NE	1.03E-09	1.57E-09	1.32E-09	3.62E-09	2.63E-09	1.64E-09	1.23E-09	6.13E-10	7.85E-10	6.42E-10
ENE	1.13E-09	1.55E-09	3.69E-09	3.27E-09	2.31E-09	1.29E-09	1.21E-09	6.78E-10	6.72E-10	3.89E-10
E	1.35E-09	1.28E-08	4.09E-09	3.12E-09	1.91E-09	1.36E-09	1.01E-09	7.83E-10	4.15E-10	5.10E-10
ESE	9.82E-10	7.85E-09	4.40E-09	2.46E-09	1.47E-09	1.03E-09	5.65E-10	5.05E-10	3.25E-10	3.00E-10
SE	2.76E-09	6.41E-09	3.52E-09	1.97E-09	1.18E-09	8.27E-10	5.68E-10	4.40E-10	2.93E-10	2.43E-10
SSE	2.22E-09	4.66E-09	3.01E-09	1.68E-09	1.02E-09	7.14E-10	4.25E-10	3.29E-10	2.19E-10	1.80E-10
S	3.00E-09	4.81E-09	3.76E-09	2.10E-09	1.36E-09	9.52E-10	5.12E-10	3.96E-10	2.68E-10	2.20E-10
SSW	1.44E-08	2.89E-09	7.83E-10	8.84E-10	5.70E-10	4.00E-10	2.55E-10	1.98E-10	1.84E-10	1.51E-10
SW	1.89E-08	5.55E-09	1.55E-09	8.71E-10	2.61E-10	3.94E-10	1.57E-10	2.50E-10	2.54E-10	2.08E-10
WSW	1.57E-09	6.63E-09	1.36E-09	1.04E-09	5.44E-10	2.39E-10	3.84E-10	2.98E-10	2.17E-10	1.78E-10
W	3.78E-10	2.95E-09	1.84E-09	1.03E-09	6.63E-10	4.66E-10	1.37E-10	2.68E-10	1.12E-10	1.75E-10
WNW	4.54E-10	4.13E-10	3.09E-10	4.71E-10	7.35E-10	5.16E-10	1.93E-10	1.10E-10	1.12E-10	1.80E-10
NW	4.52E-10	4.09E-10	2.86E-10	1.18E-09	7.04E-10	4.94E-10	3.37E-10	2.10E-10	2.09E-10	1.71E-10
NNW	3.40E-10	2.05E-09	1.63E-09	9.12E-10	5.86E-10	4.13E-10	2.79E-10	2.16E-10	1.73E-10	1.42E-10

ATTACHMENT K
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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-22

CV-1 AND CV-2 DEPOSITION PARAMETERS (D/Q) FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-10	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.10E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-23

VV-1 AND VV-2 DEPOSITION PARAMETERS $(\overline{D/Q})$ FOR CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR (meters^{-2})

Same as Table 2.3-22

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-24

TV-2 DEPOSITION PARAMETERS $(\overline{D/Q})$ FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

Same as Table 2.3-22

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-25

CB-2 DEPOSITION PARAMETERS $(\overline{D/Q})$ FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

Same as Table 2.3-22

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-26

DV-2 DEPOSITION PARAMETERS ($\overline{D/Q}$) FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

Same as Table 2.3-22

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (0-5 MILES)

TABLE 2.3-27

WV-2 DEPOSITION PARAMETERS $(\overline{D/Q})$ FOR
CONTINUOUS RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

Same as Table 2.3-22

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-28

PV-1/2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	.600	2.340	--	.572	.707	2.510
NNE	.673	3.220	--	.524	2.920	3.220
NE	.766	1.280	.660	.111	.660	1.200
ENE	1.010	5.080	--	.702	--	1.760
E	1.370	4.420	.401	1.290	1.290	4.420
ESE	.984	6.390	--	2.340	6.390	6.180
SE	11.000	3.680	.466	.466	1.300	3.680
SSE	7.060	3.220	.423	.105	3.140	4.320
S	5.780	1.540	1.410	--	2.610	2.730
SSW	2.040	1.040	.578	.208	1.040	1.460
SW	1.610	1.120	--	.693	.979	1.120
WSW	1.710	1.310	.370	--	1.190	1.310
W	.377	.659	.138	--	.518	.659
WNW	.424	.746	.497	.029	.746	.746
NW	.447	.425	--	.070	.488	.422
NNW	.340	1.840	--	.043	.545	1.92

ATTACHMENT L
Page 2 of 7
CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-29

CV-1 AND CV-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	25.40	2.05	--	.693	.847	2.19
NNE	18.80	2.02	--	.459	1.850	2.11
NE	63.40	29.30	.455	.078	.455	30.40
ENE	65.90	8.92	--	.661	--	32.20
E	38.00	3.90	.382	1.020	1.020	22.70
ESE	17.10	3.56	--	1.380	3.560	3.56
SE	13.80	3.03	.350	.350	1.100	3.03
SSE	10.50	2.65	.317	.094	2.570	3.68
S	10.60	1.05	.934	--	1.860	1.95
SSW	5.59	1.26	.663	.266	1.260	4.42
SW	3.94	2.21	--	1.320	1.920	2.21
WSW	27.50	2.65	.596	--	2.380	2.65
W	31.60	1.23	.645	--	.960	1.23
WNW	39.10	2.23	1.490	.045	2.230	2.23
NW	70.60	15.00	--	.276	1.990	15.60
NNW	31.50	6.52	--	.068	1.090	9.91

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Page 3 of 7
CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-30

VV-1 AND VV-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

Same as Table 2.3-29

ATTACHMENT L
Page 4 of 7
CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-31

TV-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	20.20	2.05	--	.693	.847	2.190
NNE	34.90	2.02	--	.459	1.850	2.110
NE	54.20	29.30	.455	.078	.455	30.400
ENE	57.50	8.92	--	.661	--	32.200
E	38.10	3.90	.382	1.020	1.020	22.700
ESE	18.60	3.56	--	1.380	3.560	3.560
SE	19.00	3.03	.351	.351	1.100	3.030
SSE	13.30	2.65	.318	.094	2.570	3.690
S	11.30	10.40	.934	--	1.860	1.950
SSW	6.44	1.26	.664	.266	1.260	4.430
SW	3.95	2.21	--	1.320	1.920	2.210
WSW	25.10	2.65	.597	--	2.380	2.650
W	28.40	1.23	.646	--	.961	1.230
WNW	30.90	2.23	1.490	.045	2.230	2.230
NW	56.10	14.90	--	.276	1.980	15.500
NNW	25.10	6.53	--	.068	1.100	9.920

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-32

CB-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

Same as Table 2.3-31

ATTACHMENT L

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CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-33

DV-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 meters^{-2})

Same as Table 2.3-29

ATTACHMENT L
Page 7 of 7
CONTINUOUS RELEASE DEPOSITION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-34

WV-2 DEPOSTION PARAMETERS (D/Q) FOR CONTINUOUS RELEASES
>500 HRS/YR OR >150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(1E-9 $meters^{-2}$)

Same as Table 2.3-29

ATTACHMENT M
Page 1 of 3
BATCH RELEASE DISPERSION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-35

CV-1 AND CV-2 DISPERSION PARAMETERS (X/Q) FOR BATCH RELEASES
≥500 HRS/YR OR ≥150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(sec/m^3)

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	8.21E-5	8.38E-6	--	3.72E-6	4.34E-6	8.82E-6
NNE	3.04E-5	4.71E-6	--	1.40E-6	4.38E-6	4.87E-6
NE	4.59E-5	2.21E-5	6.05E-7	1.38E-7	6.05E-7	2.28E-5
ENE	3.72E-5	5.25E-6	--	5.66E-7	--	1.88E-5
E	2.93E-5	3.79E-6	5.15E-7	1.17E-6	1.17E-6	1.78E-5
ESE	2.47E-5	5.61E-6	--	2.34E-6	5.61E-6	5.61E-6
SE	2.14E-5	5.00E-6	8.13E-7	8.13E-7	2.03E-6	5.00E-6
SSE	2.21E-5	6.31E-6	1.11E-6	3.92E-7	6.13E-6	8.49E-6
S	2.15E-5	3.03E-6	2.76E-6	--	4.93E-6	5.14E-6
SSW	2.18E-5	6.58E-6	3.81E-6	1.82E-6	6.58E-6	1.78E-5
SW	1.82E-5	1.03E-5	--	6.67E-6	9.12E-6	1.03E-5
WSW	1.09E-4	1.29E-5	4.10E-6	--	1.19E-5	1.29E-5
W	1.49E-4	1.05E-5	6.55E-6	--	8.77E-6	1.05E-5
WNW	1.91E-4	1.72E-5	1.28E-5	1.23E-6	1.72E-5	1.72E-5
NW	3.08E-4	6.13E-5	--	3.80E-6	1.36E-5	6.36E-5
NNW	1.80E-4	3.54E-5	--	1.35E-6	9.27E-6	5.29E-5

*Measured relevant to center point between BV-1 and BV-2 Containment Buildings

Period of Record: 1976 - 1980

ATTACHMENT M
Page 2 of 3
BATCH RELEASE DISPERSION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-36

VV-1 AND VV-2 DISPERSION PARAMETERS (X/Q) FOR BATCH RELEASES ≥500 HRS/YR OR ≥150 HRS/QTR FOR SPECIAL DISTANCES (IDENTIFIED IN ATTACHMENT E TABLE 2.2-3) (sec/m^3)

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	9.75E-5	1.00E-5	--	4.21E-6	4.95E-6	1.06E-5
NNE	3.78E-5	5.11E-6	--	1.43E-6	4.72E-6	5.30E-6
NE	6.13E-5	2.70E-5	6.20E-7	1.40E-7	6.20E-7	2.81E-5
ENE	4.83E-5	5.58E-6	--	5.71E-7	--	2.24E-5
E	3.66E-5	3.99E-6	5.25E-7	1.19E-6	1.19E-6	2.10E-5
ESE	2.99E-5	6.13E-6	--	2.43E-6	6.13E-6	6.13E-6
SE	2.55E-5	5.29E-6	8.24E-7	8.24E-7	2.13E-6	5.29E-6
SSE	2.65E-5	6.72E-6	1.12E-6	3.95E-7	6.53E-6	9.22E-6
S	2.52E-5	3.14E-6	2.83E-6	--	5.29E-6	5.53E-6
SSW	2.60E-5	7.34E-6	4.15E-6	1.92E-6	7.34E-6	2.09E-5
SW	2.13E-5	1.18E-5	--	7.41E-6	1.04E-5	1.18E-5
WSW	1.34E-4	1.51E-5	4.46E-6	--	1.38E-5	1.51E-5
W	1.77E-4	1.25E-5	7.40E-6	--	1.02E-5	1.25E-5
WNW	2.33E-4	2.07E-5	1.49E-5	1.30E-6	2.07E-5	2.07E-5
NW	3.32E-4	8.57E-5	--	4.24E-6	1.64E-5	8.85E-5
NNW	1.90E-4	4.69E-5	--	1.45E-6	1.09E-5	6.75E-5

*Measured relevant to center point between BV-1 and BV-2 Containment Buildings

Period of Record: 1976 - 1980

ATTACHMENT M
Page 3 of 3
BATCH RELEASE DISPERSION PARAMETERS (SPECIAL DISTANCES)

TABLE 2.3-37

PV-1/2 DISPERSION PARAMETERS (X/Q) FOR BATCH RELEASES
≥500 HRS/YR OR ≥150 HRS/QTR FOR SPECIAL DISTANCES
(IDENTIFIED IN ATTACHMENT E TABLE 2.2-3)
(sec/m^3)

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	3.09E-9	3.30E-6	--	1.13E-6	1.34E-6	3.36E-6
NNE	2.85E-9	2.68E-6	--	6.52E-7	2.47E-6	2.68E-6
NE	2.02E-10	7.42E-9	5.44E-7	1.24E-7	5.44E-7	5.51E-9
ENE	1.02E-9	3.21E-6	--	6.29E-7	--	1.67E-9
E	2.15E-9	2.91E-6	4.96E-7	1.14E-6	1.14E-6	2.91E-6
ESE	6.90E-9	4.97E-6	--	1.95E-6	4.97E-6	4.81E-6
SE	2.91E-6	3.52E-6	6.02E-7	6.02E-7	1.43E-6	3.52E-6
SSE	4.91E-6	3.56E-6	6.53E-7	2.18E-7	3.47E-6	4.71E-6
S	2.41E-6	1.78E-6	1.65E-6	--	2.84E-6	2.96E-6
SSW	4.83E-6	2.52E-6	1.50E-6	6.60E-7	2.52E-6	3.96E-6
SW	4.82E-6	2.75E-6	--	1.78E-6	2.44E-6	2.75E-6
WSW	5.77E-7	2.81E-6	8.79E-7	--	2.57E-6	2.81E-6
W	2.88E-9	1.68E-6	4.89E-7	--	1.37E-6	1.68E-6
WNW	3.40E-9	1.61E-6	1.13E-6	1.10E-7	1.61E-6	1.61E-6
NW	1.34E-9	3.31E-8	--	2.03E-7	1.07E-6	3.10E-8
NNW	1.52E-9	3.73E-6	--	1.73E-7	1.31E-6	3.81E-6

*Measured relevant to BV-1 natural draft cooling tower

Period of Record: 1976 - 1980

ATTACHMENT N
Page 1 of 1
BATCH RELEASE DISPERSION PARAMETERS (0 - 5 MILES)

TABLE 2.3-38

PV-1/2 DISPERSION PARAMETERS (D/Q) FOR
CONTINUOUS RELEASES ≥500 HRS/YR OR ≥150 HRS/QTR
(sec/m^3)

DISTANCES TO THE CONTROL LOCATIONS, IN MILES

SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	2.75E-15	1.07E-5	4.10E-6	2.61E-6	1.51E-6	1.13E-6	8.84E-7	7.13E-7	5.93E-7	5.06E-7
NNE	5.90E-17	5.39E-6	2.83E-6	2.19E-6	1.36E-6	1.13E-6	8.05E-7	6.51E-7	5.64E-7	4.81E-7
NE	4.45E-16	1.67E-8	7.39E-8	2.28E-6	1.72E-6	1.19E-6	9.28E-7	6.76E-7	7.34E-7	5.32E-7
ENE	1.92E-15	8.87E-8	2.60E-6	2.21E-6	1.66E-6	1.13E-6	9.25E-7	7.23E-7	6.06E-7	3.82E-7
E	1.84E-15	5.10E-6	2.77E-6	2.23E-6	1.44E-6	1.12E-6	8.74E-7	6.92E-7	5.11E-7	4.82E-7
ESE	2.96E-13	5.26E-6	3.48E-6	2.04E-6	1.34E-6	9.93E-7	6.70E-7	5.76E-7	4.37E-7	3.83E-7
SE	9.16E-8	3.13E-6	3.38E-6	1.99E-6	1.31E-6	9.58E-7	7.14E-7	5.74E-7	4.32E-7	3.68E-7
SSE	3.50E-8	4.86E-6	3.33E-6	1.95E-6	1.29E-6	9.42E-7	6.55E-7	5.24E-7	3.95E-7	3.32E-7
S	1.22E-7	4.12E-6	3.97E-6	2.34E-6	1.59E-6	1.17E-6	7.75E-7	6.24E-7	4.74E-7	4.00E-7
SSW	1.75E-5	6.22E-6	2.84E-6	2.18E-6	1.48E-6	1.08E-6	7.83E-7	6.31E-7	5.62E-7	4.77E-7
SW	2.08E-5	9.11E-6	3.47E-6	2.19E-6	1.25E-6	1.11E-6	8.19E-7	7.17E-7	6.89E-7	5.85E-7
WSW	8.56E-8	9.35E-6	3.16E-6	2.29E-6	1.46E-6	1.01E-6	9.06E-7	7.52E-7	5.99E-7	5.07E-7
W	5.44E-17	4.52E-6	4.21E-6	2.49E-6	1.69E-6	1.25E-6	4.86E-7	7.68E-7	5.80E-7	5.48E-7
WNW	9.25E-18	1.44E-8	5.66E-8	1.92E-6	1.59E-6	1.17E-6	7.75E-7	4.61E-7	5.28E-7	4.89E-7
NW	2.61E-16	1.98E-8	8.37E-8	2.24E-6	1.46E-6	1.08E-6	8.09E-7	6.12E-7	5.42E-7	4.60E-7
NNW	1.91E-15	3.91E-6	3.66E-6	2.15E-6	1.40E-6	1.08E-6	8.03E-7	6.48E-7	5.37E-7	4.56E-7

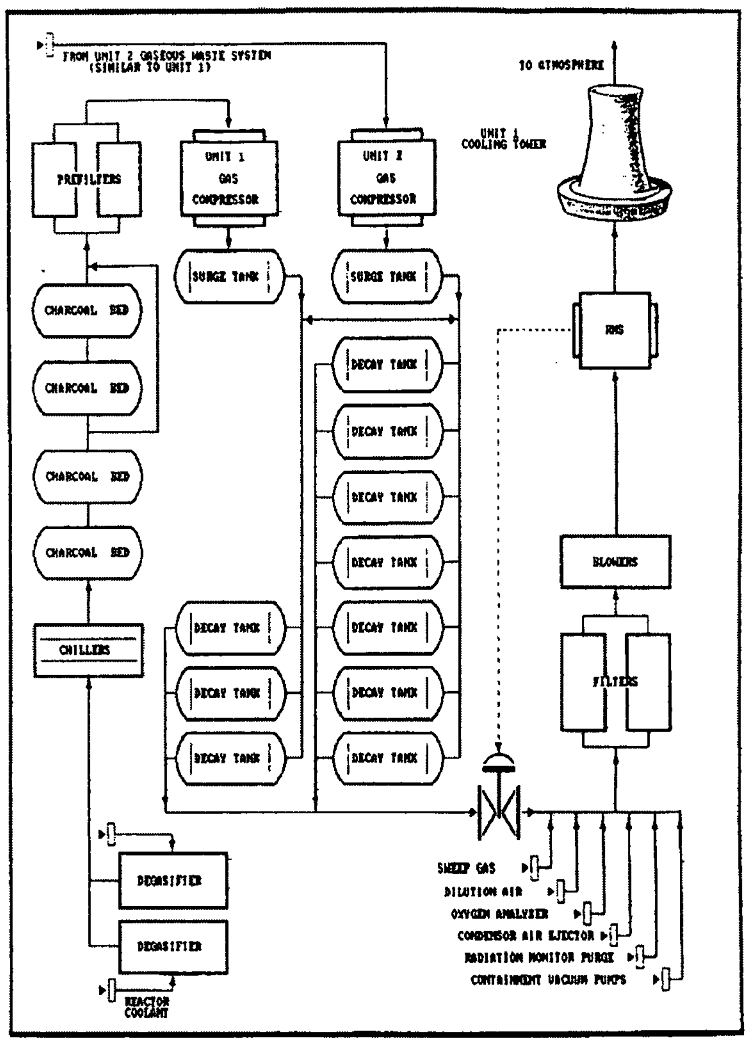
ATTACHMENT O

Page 1 of 1

GASEOUS RADWASTE SYSTEM

FIGURE 2.4-1

BV-1 AND 2 GASEOUS RADWASTE SYSTEM



ATTACHMENT P

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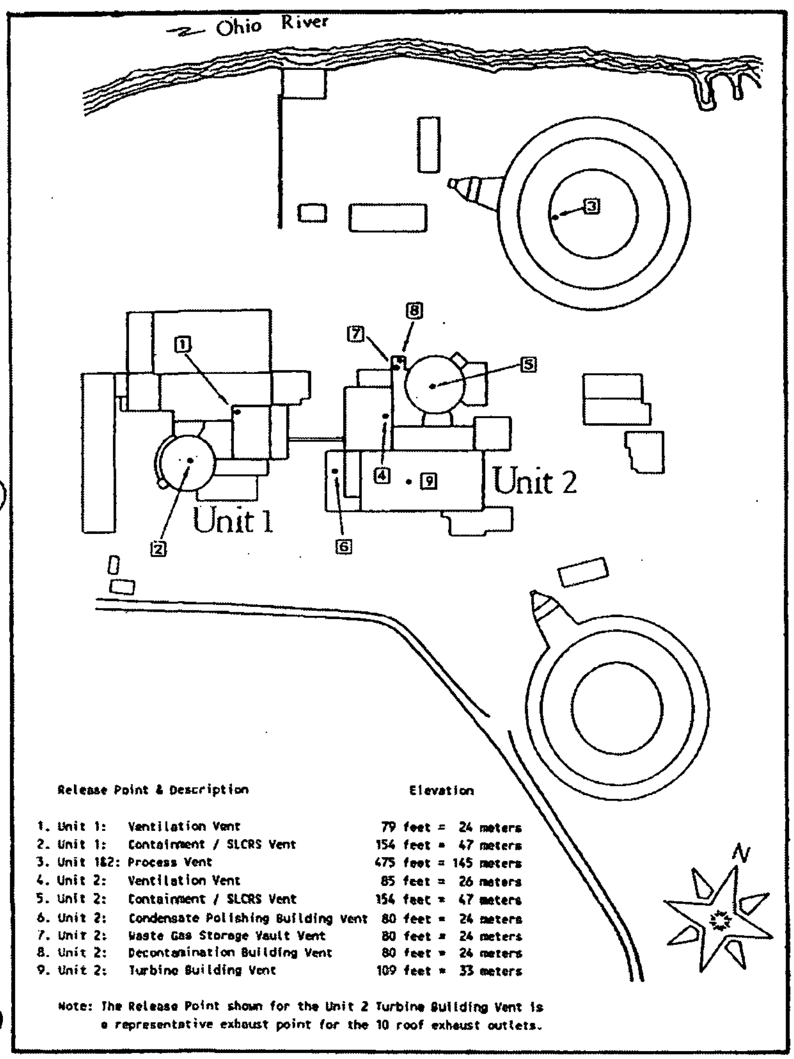
BV-1 AND BV-2 GASEOUS EFFLUENT RELEASE POINTS

FIGURE 2.4-2

BV-1 AND 2 GASEOUS EFFLUENT RELEASE POINTS



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ATTACHMENT Q

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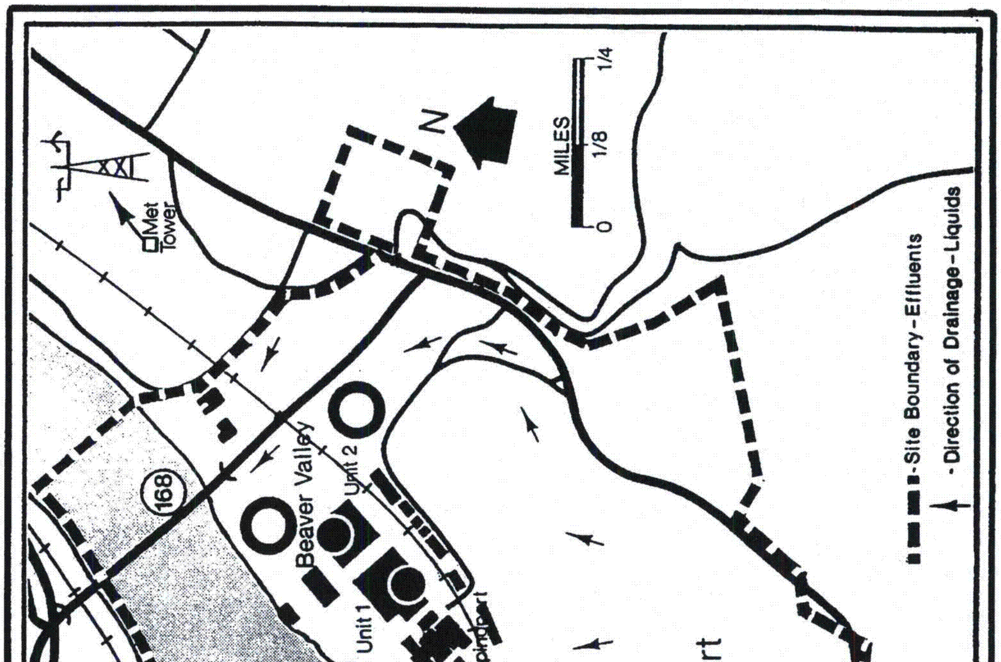
SITE BOUNDARY FOR GASEOUS EFFLUENTS

Figure 5-1



Beaver Valley Power Station

Unit 1/2

1/2-ODC-2.03

ODCM: Radiological Environmental Monitoring Program

Document Owner
Manager, Nuclear Environmental and Chemistry

Revision Number	6
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	10/07/14

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure provides documentation of the Radiological Environmental Monitoring Program (REMP) as specified in the Radiological Branch Technical Position.[3.1.1]

2.0 SCOPE

2.1 This procedure is applicable to liquid and gaseous effluents at Beaver Valley Power Station.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 Radiological Environmental Monitoring Program Requirements – Enclosing Branch Technical Position, Revision 1, (Generic Letter 79-65) 1979.

3.1.2 Regulatory Guide 1.109, Calculation of Annual Dose to Man From Routine Releases of Reactor Effluents For the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Revision 1, 1977.

3.1.3 NUREG-1301, Offsite Dose Calculation Manual Guidance; Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1).

3.1.4 Regulatory Guide 1.111, Methods For Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases From Light-Water-Cooled Reactors, Revision 1, July 1977.

3.1.5 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.6 1/2-ADM-0100, Procedure Writers Guide

3.1.7 1/2-ADM-0101, Review and Approval of Documents

3.1.8 CR 04-00149, Radiation Protection Performance Committee Actions Items. CA-12 required obtaining GPS satellite data for use in the REMP.

3.1.9 CR 05-01169, Chemistry Action Plan for transition of RETS, REMP and ODCM. CA-17, revise procedure 1/2-ODC-2.03 to convert Radiation Protection responsibilities to Nuclear Environmental and Chemistry.

3.1.10 CR 05-01390, Include GPS data in 2004 REMP Report and related 1/2-ODC and 1/2-ENV procedures. CA-02, revise ODCM procedure 1/2-ODC-2.03 to include an update of REMP sample locations (using the GPS Satellite data).

3.1.11 CR 10-77489, Fixed incorrect sample designations for TLD #94 and #95; changed sample point designation #49 to #49A; clarified garden sampling requirements.

3.1.12 CA G203-2011-97516-001, Retire TLD Station #88 and add Station #88A.

3.1.13 CR G203-2011-02332, Inability to meet ODCM requirements for REMP milk sampling in 2011 and CA G203-2011-02332-1, Make changes to the ODCM.

3.1.14 CR G203-2013-03554, Reduction in milk sample location, in 2013 Searight's Dairy farm stopped producing milk and permanently closed.

3.1.15 10 CFR 72.104, Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS.

10-7-14 3-7-14

3.2 **Commitments**

3.2.1 10 Code of Federal Regulations (CFR) 50 Appendix I

4.0 RECORDS AND FORMS

4.1 **Records**

4.1.1 Calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g., letter or calculation package) with an appropriate RTL number.

4.2 **Forms**

4.2.1 None.

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

5.1.1 None

5.2 Limitations

5.2.1 None

6.0 ACCEPTANCE CRITERIA

6.1 Changes to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculation. 10-7-14

6.1.1 Changes to this procedure shall be prepared in accordance with 1/2-ADM-0100, PROCEDURE WRITER'S GUIDE [3.1.6] and 1/2-ADM-1640, CONTROL OF THE OFFSITE DOSE CALCULATION MANUAL. [3.1.5].

6.1.2 Changes to this procedure shall be reviewed and approved in accordance with NOP-SS-3001, PROCEDURE REVIEW AND APPROVAL [3.1.7] and 1/2-ADM-1640[3.1.5].

7.0 PREREQUISITES

7.1 None

8.0 PROCEDURE

8.1 REMP Overview

8.1.1 Attachment A, Table 3.0-1 presents the exposure pathways and sampling and monitoring requirements for Beaver Valley Power Station Radiological Environmental Monitoring Program (REMP). The attachment provides details on site number, sector, distance, sample point description, sampling and collection frequency, analysis, and analysis frequency for various exposure pathways in the vicinity of the Beaver Valley Power Station.

8.1.2 Attachment B, Figures 3.0-1 through 3.0-6 show the location of the various sampling points.

8.2 Sampling and Analysis Program

8.2.1 Environmental samples shall be collected and analyzed according to Attachment A, Table 3.0-1. Analysis methods used shall be capable of achieving the detection capabilities in 1/2-ODC-3.03, Table 4.12-1.

8.2.2 Results of the radiological environmental monitoring are intended to supplement the results of the radiological effluent monitoring by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways.

8.2.2.1 The specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from the station operation.

8.2.2.2 The initial radiological environmental monitoring program should be conducted for the first three (3) years of commercial operation (or other period corresponding to a maximum burnup in the initial core cycle). Following this period, program changes may be proposed based on operational experience.

8.2.3 Deviations from the required sampling schedule are acceptable if samples cannot be obtained because of hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment, and other legitimate reasons.

8.2.3.1 If samples cannot be obtained due to sampling equipment malfunction then every effort shall be made to complete corrective action to restore equipment prior to the end of the next sampling period.

8.2.3.2 All Deviations from the sampling schedule shall be documented in the annual REMP report.

8.3 **Crosscheck Program**

8.3.1 Laboratories performing analysis for the purposes of the Radiological Environment Monitoring (REMP) program shall participate in the Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparisons Studies (Crosscheck) Program or equivalent program. Laboratories include those of the licensee and laboratories contracted by the licensee

8.3.1.1 Participation in the crosscheck program shall include all of the determinations (sample medium-radionuclide combination) that are offered by EPA and that also are included in the monitoring program.

8.3.1.2 The results of analysis of the crosscheck samples shall be included in the annual REMP report. The participants in the crosscheck program may provide their program code to the Nuclear Regulatory Commission (NRC) so that crosscheck data may be reviewed directly in lieu of submission in the annual REMP report.

8.3.1.3 If any results of the crosscheck program are outside the specified control limits, then the laboratory shall investigate the cause of the problem and take appropriate corrective action to resolve the discrepancy. The results of any investigation and corrective actions taken shall be included in the annual REMP report.

8.3.2 Participation in the crosscheck program is based upon the need to perform independent checks to validate precision and accuracy of the measurements of radioactive material in environmental sample matrices. This participation is part of the quality assurance program for environmental monitoring in order to demonstrate the results are reasonably valid.

8.4 **Land Use Census Program**

8.4.1 A census shall be conducted annually during the growing season to determine the location of the nearest milk animal, and nearest garden greater than fifty (50) square meters (500 sq. ft.) producing broad leaf vegetation in each of the sixteen (16) meteorological sectors within a distance of eight (8) km (5 miles).

8.4.1.1 For elevated releases as defined in Regulatory Guide 1.111[3.1.4], the census shall also identify the locations of all milk animals, and gardens greater than fifty (50) square meters producing broad leaf vegetation out to a distance of five (5) km (3 miles) for each radial sector.

8.4.1.2 If the land use census determines that the milk animals or gardens are present at a location which yields a calculated thyroid dose greater than those previously sampled, or if the land use census results in changes in the location used in Offsite Dose Calculation Manual (ODCM) dose calculations, then a written report shall be submitted to the Director of Operating Reactors, NRR (with a copy to the Director of the NRC Regional Office) within thirty (30) days identifying the new location (distance and direction).

8.4.1.3 Milk animal or garden locations resulting in higher calculated doses shall be added to the surveillance program as soon as practicable. The sampling location (excluding the control sample location) having the lowest calculated dose may then be dropped from the surveillance program at the end of the grazing or growing season during which the census was conducted. Any location from which milk can no longer be obtained may be dropped from the surveillance program after notifying the NRC in writing that they are no longer obtainable at that location.

8.4.1.4 The results of the land-use census shall be reported in the annual REMP report.

8.4.1.5 The census of milk animals and gardens producing broad leaf vegetation is based on the requirement in Appendix I of 10 CFR Part 50 [3.2.1] to "Identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in monitoring programs for evaluating doses to individuals from principal pathways of exposure." The consumption of milk from animals grazing on contaminated pasture and of leafy vegetation contaminated by airborne radioiodine is a major potential source of exposure. Samples from milk animals are considered a better indicator of radioiodine in the environment than vegetation.

8.4.1.6 If the land use census reveals milk animals are not present or are unavailable for sampling then vegetation must be sampled.

8.4.1.7 The fifty (50) square meter garden, considering twenty (20) % used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and a vegetation yield of two (2) kg/m^2, will produce the twenty-six (26) kg/yr assumed in Regulatory Guide 1.109 [3.1.2], for child consumption of leafy vegetation.

8.5 Direct Radiation Monitoring Program

8.5.1 The increase in the number of direct radiation stations is to better characterize the individual exposure (mrem) and population exposure (man-rem) in accordance with Criterion 64 - monitoring radioactivity releases, of 10 CFR Part 50, Appendix A. The NRC will place a similar amount of stations in the area between the two rings designated in 1/2-ODC-3.03, Table 3.12-1.

- END -

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EXPOSURE PATHWAY AND SAMPLING REQUIREMENTS

TABLE 3.0-1

PROGRAM DETAILS

	EXPOSURE PATHWAY AND/OR SAMPLE	SITE NO.	SECTOR [1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
1.	AIRBORNE Radioiodine and Particulates	13	11	1.49	Old Meyer Farm	Continuous sampler operation with collection at least weekly	Radioiodine Cartridge: I-131 analysis weekly. Particulate Sampler: Gross beta analysis following filter change[5]; Gamma isotopic analysis on composite (by location) quarterly.
		30	4	0.43	Shippingport (Cook's Ferry S.S.)		
		32	15	0.75	Midland (North S.S.)		
		46.1	2/3	2.28	Industry, McKeel's Service - Rt. 68		
		48	10	16.40	Weirton Water Tower, Collier Way		
2.	DIRECT RADIATION	10	3/4	0.94	Shippingport Post Office	Continuous measurement with quarterly collection.	Gamma dose quarterly.
		13	11	1.49	Old Meyer Farm		
		14	11	2.53	Hookstown Boro		
		15	14	3.75	Georgetown Post Office		
		27	7	6.14	Brunton Farm		
		28	1	8.60	Sherman Farm		
		29B	3	7.97	Friendship Ridge		
		30	4	0.43	Shippingport (Cook's Ferry S.S.)		
		32	15	0.75	Midland (North S.S.)		
		45	5	2.19	Christian House Baptist Chapel - Rt. 18		
		45.1	6	1.92	Raccoon Twp., Kennedy's Corner		
		46	3	2.49	Industry, Midway Drive		
		46.1	2/3	2.28	Industry - McKeel's Service - Rt. 68		
		47	14	4.88	East Liverpool Water Dept.		
		48	10	16.40	Weirton Water Tower, Collier Way		
		51	5	8.00	Aliquippa (Sheffield S.S.)		
		59	6	0.99	236 Green Hill Rd.		
		60	13	2.51	444 Hill Rd.		
		70	1	3.36	236 Engle Rd.		
		71	2	6.01	Brighton Twp., First Western Bank		

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EXPOSURE PATHWAY AND SAMPLING REQUIREMENTS

TABLE 3.0-1

PROGRAM DETAILS

EXPOSURE PATHWAY AND/OR SAMPLE	SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
2. DIRECT RADIATION (continued)	72	3	3.25	Ohioview Lutheran Church - Rear	Continuous measurement with quarterly collection.	Gamma dose quarterly.
	73	4	2.48	618 Squirrel Run Road		
	74	4	6.92	137 Poplar Ave. - CCBC		
	75	5	4.08	117 Holt Road		
	76	6	3.80	Raccoon Elementary School		
	77	6	5.52	3614 Green Garden Road		
	78	7	2.72	Raccoon Municipal Building		
	79	8	4.46	106 Rt. 151 - Ted McWilliams Auto Body		
	80	9	8.27	Raccoon Park Office, Rt. 18		
	81	9	3.69	Millcreek United Presby. Church		
	82	9	6.99	2697 Rt. 18		
	83	10	4.26	735 Mill Creek Road		
	84	11	8.35	Hancock Co. Senior Center		
	85	12	5.73	2048 Rt. 30		
	86	13	6.18	1090 Ohio Ave., E. Liverpool		
	87	14	7.04	50103 Calcutta Smith's Ferry Rd.		
	88A	15	2.8	Route 168, Midland Heights		
	89	15	4.72	488 Smith Ferry Rd., Ohioville		
	90	16	5.20	6286 Tuscarawras Rd.		
	91	2	3.89	Pine Grove & Doyle Roads		
	92	12	2.81	Georgetown Rd. (Georgetown S.S.)		
	93	16	1.10	104 Linden - Sunrise Hills		
	94	10	2.37	McCleary Road & Pole Cat Hollow Rd.		
	95	8	2.25	832 McCleary Road		

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EXPOSURE PATHWAY AND SAMPLING REQUIREMENTS

TABLE 3.0-1 (continued)

PROGRAM DETAILS

EXPOSURE PATHWAY AND/OR SAMPLE	SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
3. WATERBORNE a) Surface (River)	49A 2.1	3 14	4.92 1.43	Upstream of Montgomery Dam[4] Midland – ATI Allegheny Ludlam	Composite sample with sample collection at least monthly[6].	Gamma isotopic analysis monthly; tritium analysis on composite (by location) quarterly.
b) Drinking Water	4 5	15 14	1.26 4.90	Midland Water Dept. East Liverpool Water Dept.	Composite sample with sample collection at least bi-weekly[6].	I-131 analysis bi-weekly; gamma isotopic analysis on composite (by location) monthly; tritium analysis on composite (by location) quarterly.
c) Ground Water				None required[7]		
d) Shoreline Sediment	2A	12	0.31	BVPS Outfall Vicinity	Semi-annually.	Gamma isotopic analysis semi-annually.
4. INGESTION a) Milk[11]	27 *[8] *[8] *[8] *[8] 96	7 -- -- -- 10	6.16 -- -- -- 10.48	Brunton's (large local dairy) Windsheimer Farm	At least bi-weekly when animals are on pasture; at least monthly at other times.	Gamma isotopic and I-131 analysis on each sample.
b) Fish	2A 49A	12 3	0.31 4.92	BVPS Outfall Vicinity Upstream of Montgomery Dam	Semi-annually one sample of available species.	Gamma isotopic analysis. On edible portion.
c) Food Products (Leafy Vegetables)[11]	-- -- -- --	-- -- -- --	-- -- --	Three (3) locations within 5 miles of BVPS (Shippingport, Industry, and Georgetown)[9, 10, 11] One (1) control location (Weirton, W. V. area)[9, 10, 11]	Annually at harvest time.[10, 11, 12]	Gamma isotopic and I-131 analysis on edible portion.

TABLE 3.0-1 (continued)

PROGRAM DETAILS

EXPOSURE PATHWAY AND/OR SAMPLE	SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES

[1] Sector numbers 1-16 correspond to the 16 compass direction sectors N - NNW.

[2] Distance (in miles) is as measured from the midpoint between Unit 1 and Unit 2 Containment Buildings.

[3] All Sample Points are in the Commonwealth of Pennsylvania and the states of Ohio and West Virginia. Maps showing the approximate locations of the Sample Points are provided as Attachment B, Figures 3.0-1 through 3.0-6 and Attachment C.

[4] This is a Control Station and is presumed to be outside the influence of BVPS effluents.

[5] A gamma isotopic analysis is to be performed on each sample when the gross beta activity is found to be greater than 10 times the mean of the Control Station sample.

[6] Composite samples are obtained by collecting an aliquot at intervals not exceeding 2 hours. For the upstream surface water location site 49A, a weekly grab sample, composited each month is also acceptable.

[7] Collection of Ground Water samples is not required as the hydraulic gradient or recharge properties are directed toward the river because of the high terrain in the river valley at the BVPS; thus, station effluents do not affect local wells and ground water sources in the area.

[8] These Sample Points will vary and are chosen based upon calculated annual deposition factors (highest)..

[9] Exact location may vary due to availability of food products.

[10] When ODCM milk sample requirements are met, one type of broad leaf vegetation is to be sampled from the three (3) indicator locations and one (1) control location.

[11] When there are not enough milk sample locations available to meet the ODCM requirements, three (3) different types of broad leaf vegetation are to be sampled at each of two (2) indicator locations based on the highest predicted annual average ground D/Q (as determined from the previous year's Land Use Census results), in addition to those samples described in Note 10. Three (3) different types of broad leaf vegetation shall also be sampled at one (1) control location when in this condition.

[12] The primary sources of broad leaf vegetation are cabbage or lettuce. However, other acceptable substitutes are vegetables having leaves with large surface area, to be combined with the edible portion of the plant for analysis.

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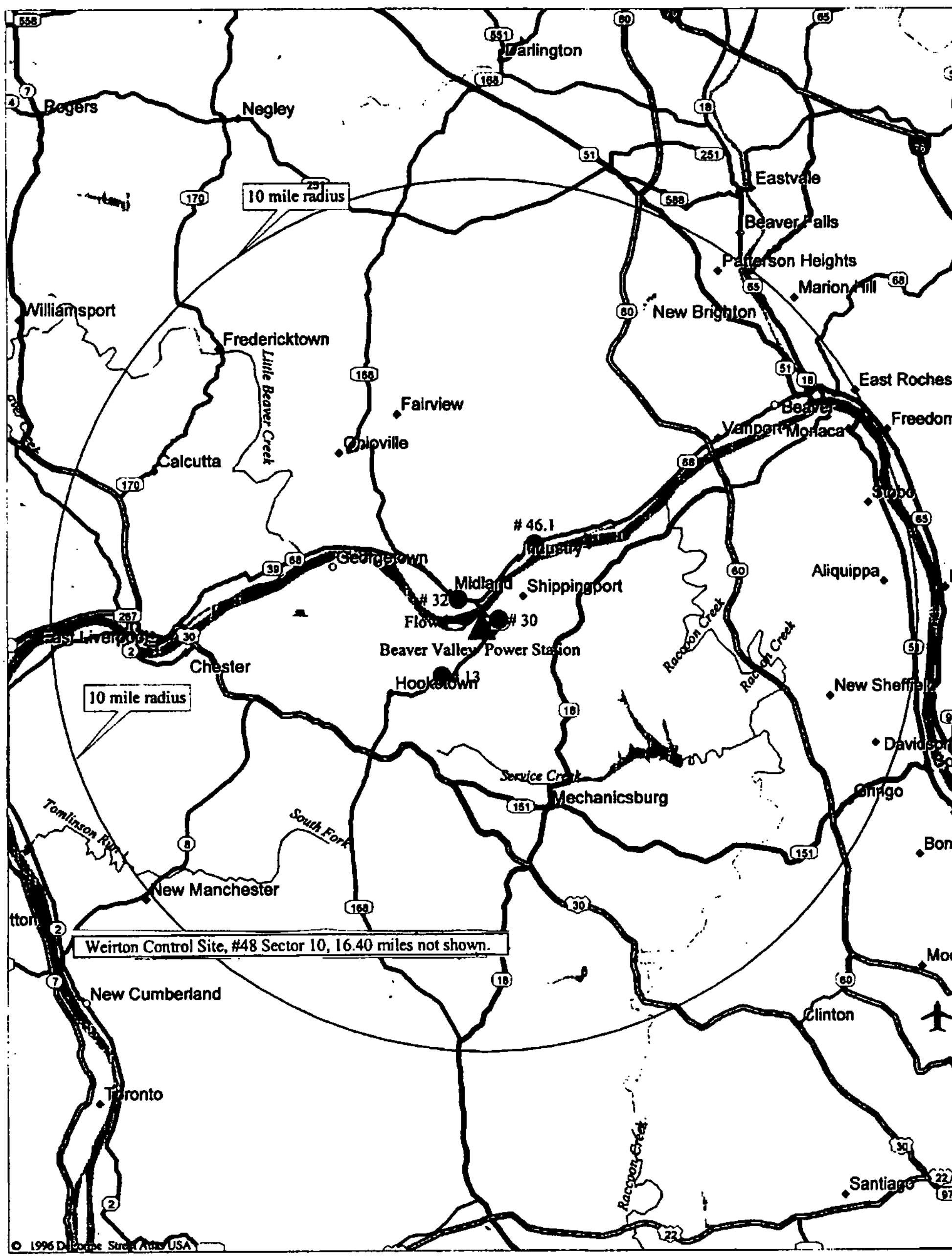
LOCATION OF SAMPLING SITES

FIGURE 3.0-1
AIR SAMPLING LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-1 (Continued)
AIR SAMPLING LOCATIONS

Sector	Site #	Distance (miles)	Location
11	13	1.49	Old Meyer Farm
4	30	0.43	Shippingport (Cook's Ferry S.S.)
15	32	0.75	Midland (North S.S.)
2/3	46.1	2.28	Industry - McKeel's Service - Rt. 68
10	48	16.40	Weirton Water Tower, Collier Way

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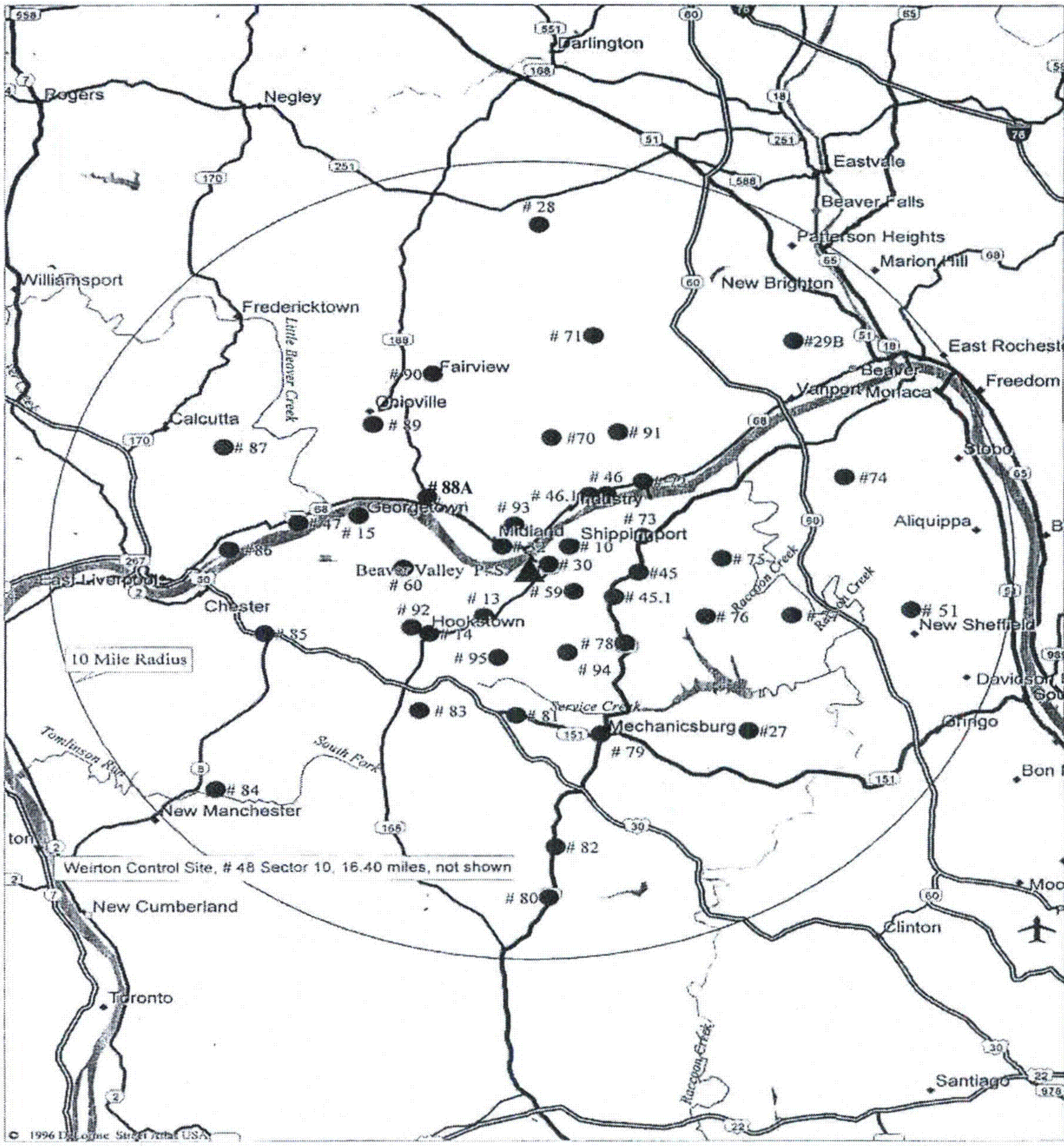
LOCATION OF SAMPLING SITES
FIGURE 3.0-2

TLD LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-2 (continued)

TLD LOCATIONS

Southeast

Sector	Site #	Distance (miles)	Location		Sector	Site #	Distance (miles)	Location
7	27	6.14	Brunton Farm		7	78	2.72	Raccoon Municipal Bldg.
6	45.1	1.92	Raccoon Twp., Kennedy Corners		8	79	4.46	106 Rt. 151- Ted McWilliams Auto Body
5	51	8.00	Aliquippa (Sheffield S.S.)		9	80	8.27	Raccoon Park Office, Rt. 18
6	59	0.99	236 Green Hill Road		9	82	6.99	2697 Rt. 18
6	76	3.80	Raccoon Elementary School		8	94	2.25	McCleary & Pole Cat Hollow Roads
6	77	5.52	3614 Green Garden Road					

Northwest

Sector	Site #	Distance (miles)	Location		Sector	Site #	Distance (miles)	Location
14	15	3.75	Georgetown Post Office		14	87	7.04	50103 Calcutta Smith's Ferry Rd.
15	32	0.75	Midland (North S.S.)		15	88A	2.8	Route 168; Midland Heights
14	47	4.88	E. Liverpool Water Dept.		15	89	4.72	488 Smith Ferry Rd., Ohioville
13	60	2.51	444 Hill Road		16	90	5.20	6286 Tuscarawras Rd.
13	86	6.18	1090 Ohio Avenue, E. Liverpool		16	93	1.10	104 Linden - Sunrise Hills

Northeast

Sector	Site #	Distance (miles)	Location		Sector	Site #	Distance (miles)	Location
3/4	10	0.94	Shippingport Post Office		1	70	3.36	236 Engle Rd.
1	28	8.60	Sherman Farm		2	71	6.01	Brighton Twp., First Western Bank
3	29B	7.97	Friendship Ridge		3	72	3.25	Ohioview Luthern Church - Rear
4	30	0.43	Shippingport (Cook's Ferry S.S.)		4	73	2.48	618 Squirrel Run Rd.
5	45	2.19	Christian House Baptist Chapel - Rt 18		4	74	6.92	137 Poplar Ave. - CCBC
3	46	2.49	Industry, Midway Dr.		5	75	4.08	117 Holt Rd.
2/3	46.1	2.28	Industry – McKeel's Service – Rt 68		2	91	3.89	Pine Grove Rd. & Doyle Rd.

Southwest

Sector	Site #	Distance (miles)	Location		Sector	Site #	Distance (miles)	Location
11	13	1.49	Old Meyer Farm		11	84	8.35	Hancock Co. Senior Center
11	14	2.53	Hookstown Boro		12	85	5.73	2048 Rt. 30
10	48	16.40	Weirton Water Tower, Collier Way		12	92	2.81	Georgetown Rd. (Georgetown S.S.)
9	81	3.69	Millcreek United Presby. Church		10	95	2.37	832 McCleary Rd.
10	83	4.26	735 Mill Creek Rd.					

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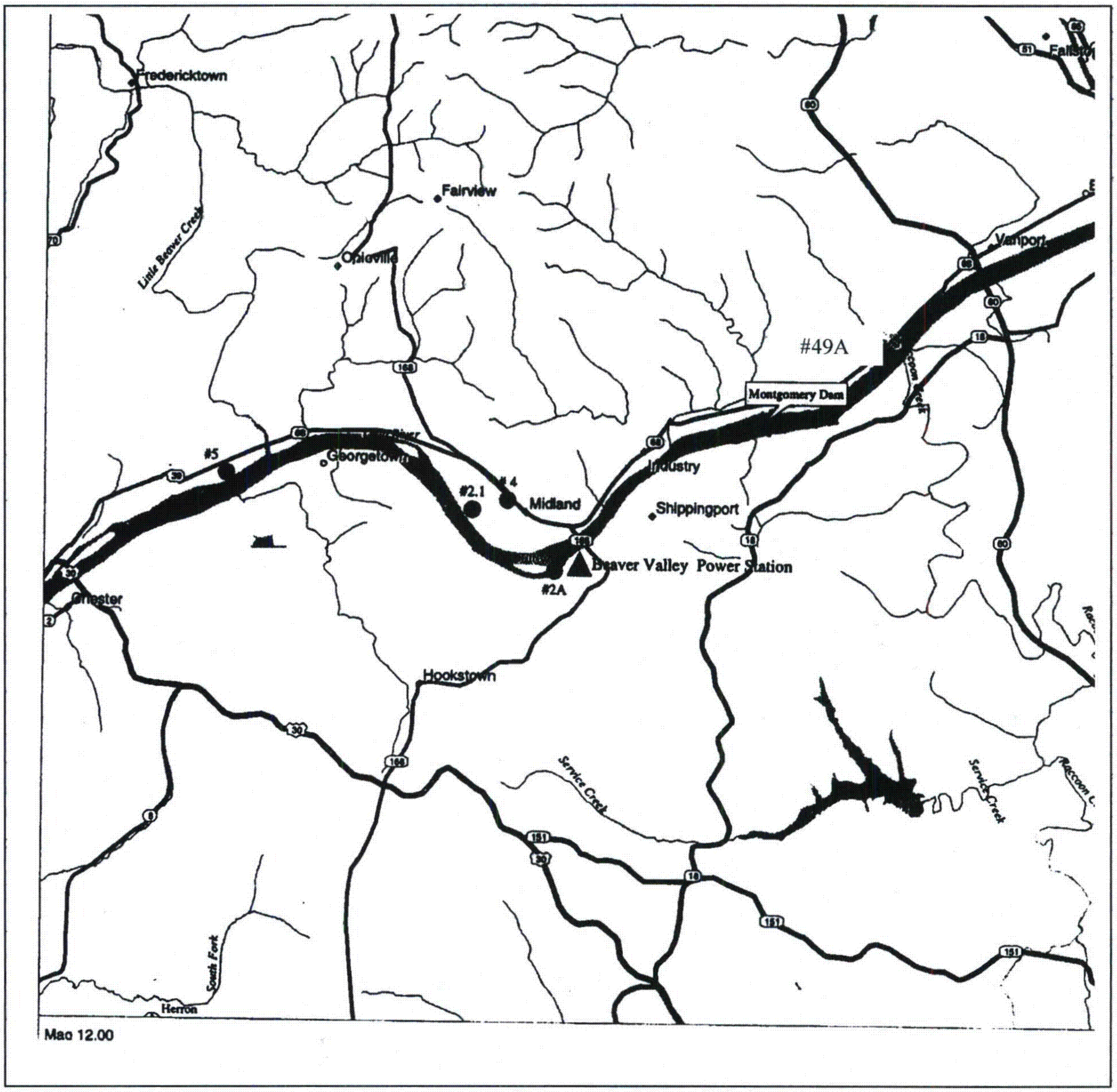
LOCATION OF SAMPLING SITES
FIGURE 3.0-3

SHORELINE SEDIMENT, SURFACE WATER, AND DRINKING WATER SAMPLING LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-3 (Continued)

SHORELINE SEDIMENT, SURFACE WATER, AND DRINKING WATER SAMPLING LOCATIONS

Sample Type	Sector	Site #	Distance (miles)	Location
Surface Water	14	2.1	1.43	Midland - ATI Allegheny Ludlam
Surface Water	3	49A	4.92	Upstream of Montgomery Dam
Sediment	12	2A	0.31	BVPS Outfall Vicinity
Sediment*	3	49A	4.93	Upstream of Montgomery Dam
Drinking Water	15	4	1.26	Midland Water Dept.
Drinking Water	14	5	4.90	East Liverpool Water Dept.

* Site #49A added – control site.

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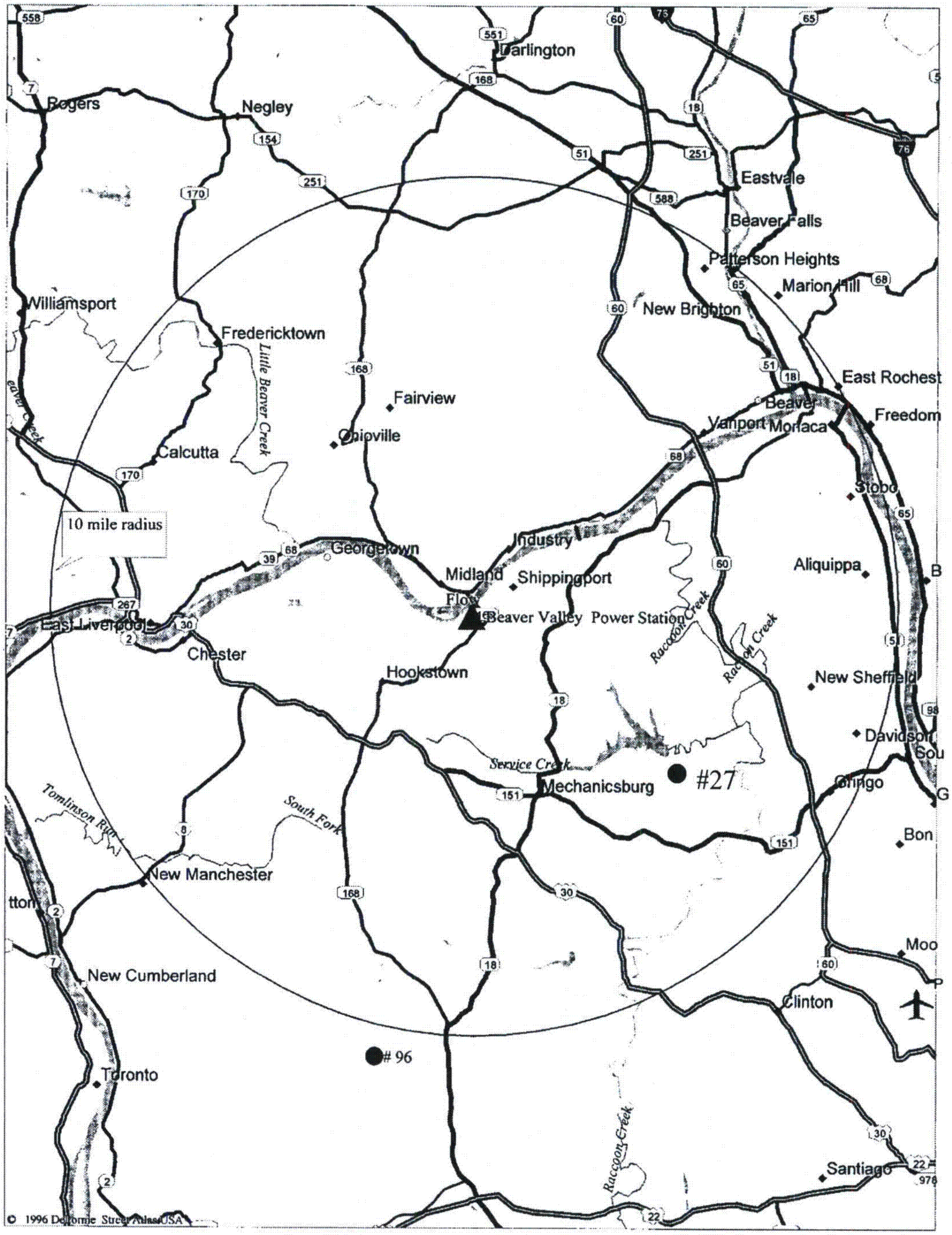
LOCATION OF SAMPLING SITES

FIGURE 3.0-4

MILK SAMPLING LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-4 (Continued)
MILK SAMPLING LOCATIONS

Sector	Site #	Distance (miles)	Location
7	27	6.16	Brunton's Dairy
10**	96	10.48	Windsheimer Farm
	*		
	*		
	*		

*Three dairies based on highest deposition factors.
** Control Location.

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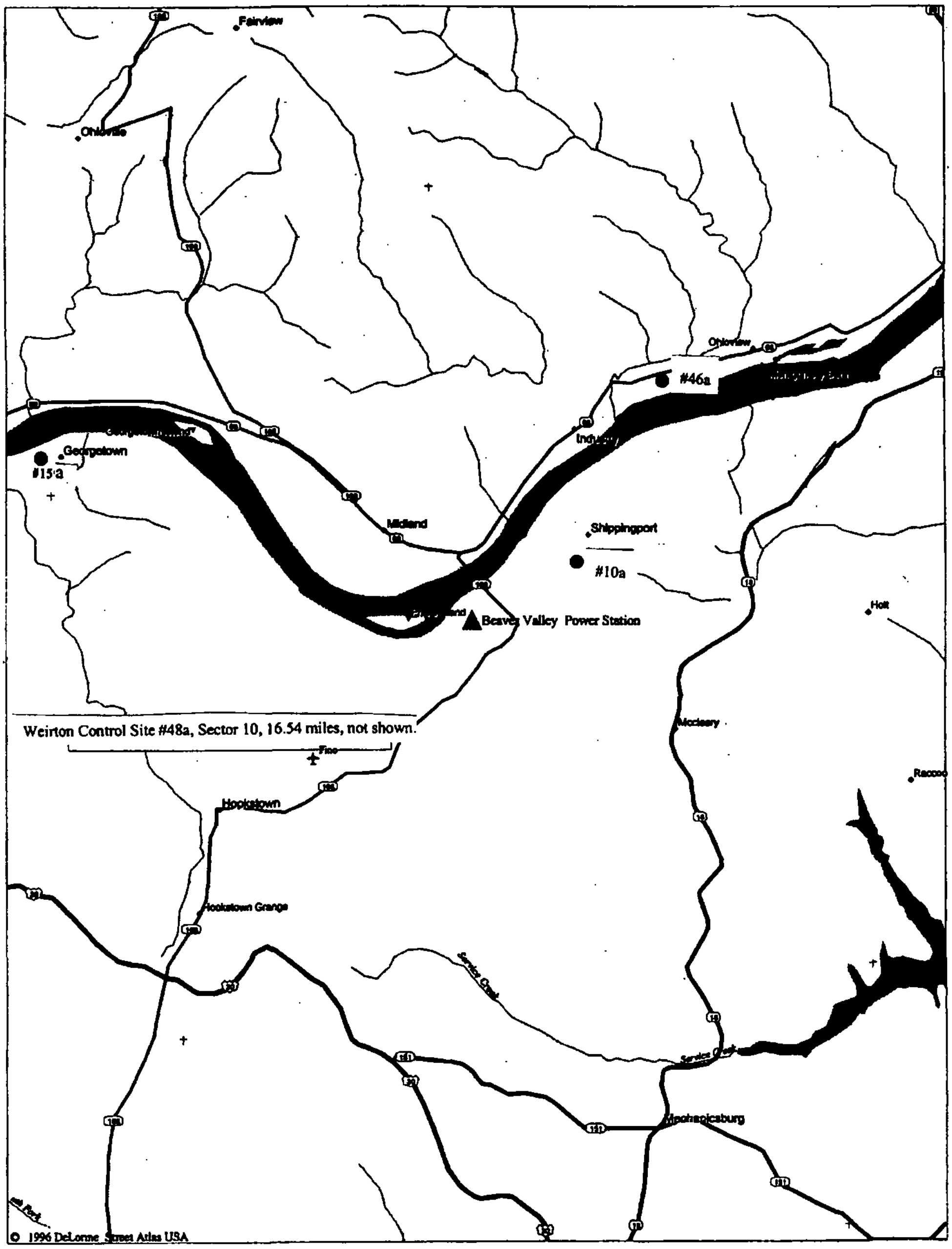
LOCATION OF SAMPLING SITES
FIGURE 3.0-5
FOODCROP SAMPLING LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-5 (Continued)
FOODCROP SAMPLING LOCATIONS

Site #	Description
10*	Shippingport Boro
15*	Georgetown Boro
46*	Industry Boro
48*	Weirton Area

** Individual garden locations may change based upon availability. The requirements are met as long as one garden is sampled from each of these communities.*

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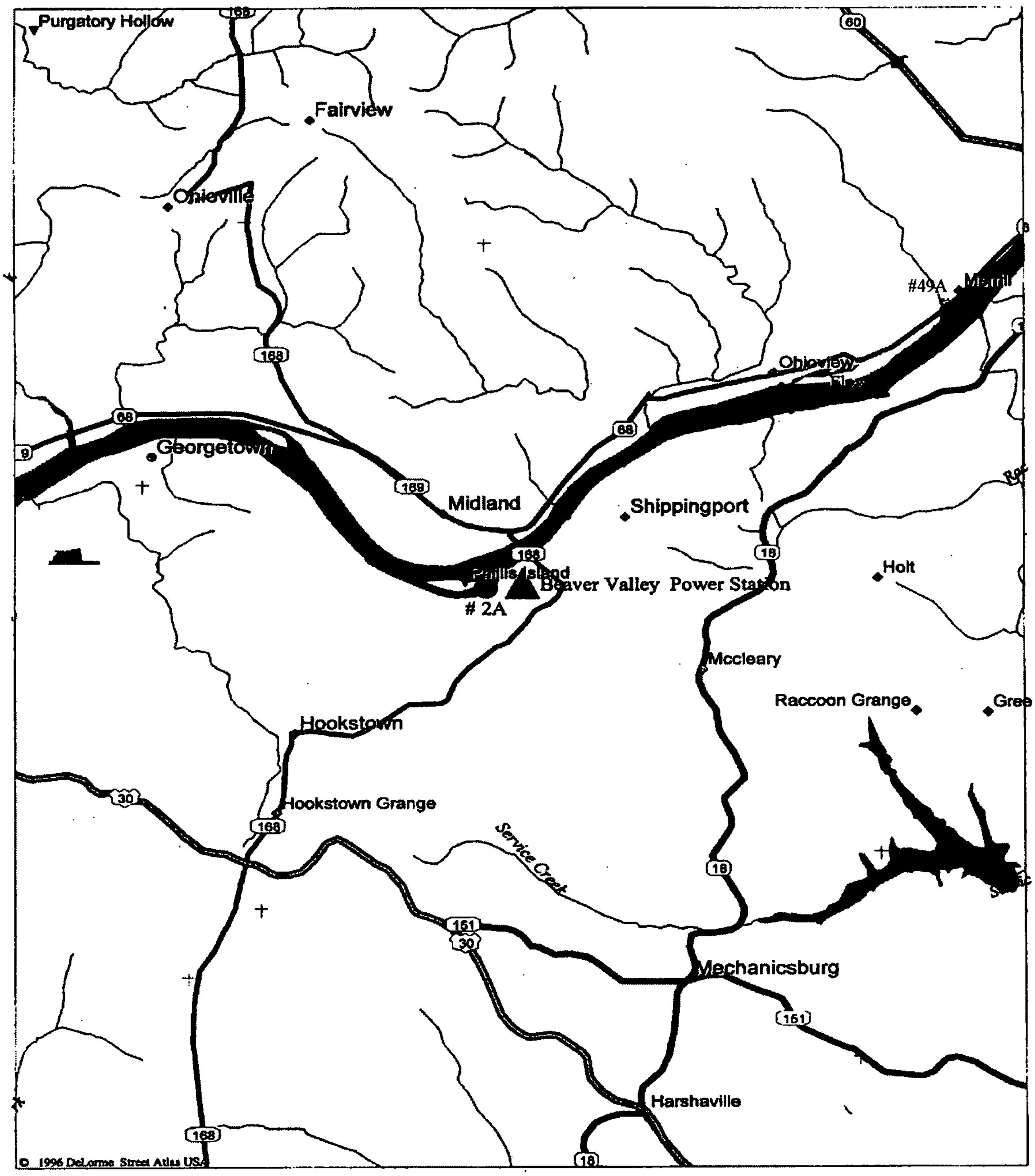
LOCATION OF SAMPLING SITES
FIGURE 3.0-6
FISH SAMPLING LOCATIONS



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LOCATION OF SAMPLING SITES
FIGURE 3.0-6 (Continued)
FISH SAMPLING LOCATIONS

Sector	Site #	Distance (miles)	Location
12	2A	0.31	BVPS Outfall Vicinity
3	49A	4.93	Upstream of Montgomery Dam

RTL#: A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-2.04

ODCM: Information Related to 40 CFR 190

Document Owner
Manager, Nuclear Environmental & Chemistry

Revision Number	2
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	10/07/14

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure provides the steps to be taken when the Total Dose of ODCM Control 4.11.4.1 exceeds twice the limit of any of the ODCM Controls specifying an Offsite Dose Limit.(3.1.2)

1.1.1 Prior to issuance of this procedure, these items were located in Section 4 of the old ODCM.

2.0 SCOPE

2.1 This procedure is applicable to all station personnel that are qualified to perform activities as described and referenced in this procedure.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 40 CFR Part 190

3.1.2 1/2-ODC-3.03, ODCM: Controls for RETS and REMP Programs

3.1.3 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.4 1/2-ADM-0100, Procedure Writer's Guide

3.1.5 1/2-ADM-0101, Review and Approval of Documents

3.1.6 CR 05-01169, Chemistry Action Plan for Transition of RETS, REMP and ODCM. CA-18, Revise procedure 1/2-ODC-2.04 to change document owner from Manager, Radiation Protection to Manager, Nuclear Environmental & Chemistry.

3.1.7 10 CFR 72.104, Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS. 4-7-01

3.2 Commitments

3.2.1 10 CFR 20.405(c), Special Reports

3.2.2 NUREG-1301, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 The Offsite Dose Limits used to show compliance to this procedure are as follows:

5.1.1 ODCM Control 3.11.2.a; Liquid Effluents: $\leq$ 1.5 mrem/quarter Total Body or $\leq$ 5 mrem/quarter any Organ.

5.1.2 ODCM Control 3.11.2.b; Liquid Effluents: $\leq$ 3 mrem/year Total Body or $\leq$ 10 mrem/year any Organ.

5.1.3 ODCM Control 3.11.2.2.a; Gas Effluent-Noble Gas: $\leq$ 5 mrad/quarter Gamma, or $\leq$ 10 mrad/quarter Beta

5.1.4 ODCM Control 3.11.2.2.b; Gas Effluents-Noble Gas: $\leq$ 10 mrad/year Gamma $\leq$ 20 mrad/year Beta

5.1.5 ODCM Control 3.11.2.3.a; Gas Effluents-Particulates & Iodines: $\leq$ 7.5 mrem/quarter any organ

5.1.6 ODCM Control 3.11.2.3.b; Gas Effluents-Particulates & Iodines: $\leq$ 15 mrem/year any organ

5.1.7 ODCM Control 3.11.4.1; All Fuel Cycle Sources: $\leq$ 25 mrem/year Total Body or any Organ, except the thyroid, which is limited to $\leq$ 75 mrem/year

6.0 ACCEPTANCE CRITERIA

6.1 Any changes to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.[3.2.2]

6.1.1 All changes to this procedure shall be prepared in accordance with 1/2-ADM-0100[3.1.4] and 1/2-ADM-1640.[3.1.3]

6.1.2 All changes to this procedure shall be reviewed and approved in accordance with 1/2-ADM-0101[3.1.5] and 1/2-ADM-1640.[3.1.3]

7.0 PREREQUISITES

7.1 The user of this procedure shall be familiar with ODCM structure and content.

8.0 PROCEDURE

8.1 Information Related To 40 CFR 190

8.1.1 CONTROL 3.11.4.1 requires that when the calculated doses associated with the effluent releases exceed twice the limits of ODCM CONTROL 3.11.1.2.a, 3.11.1.2.b, 3.11.2.2.a, 3.11.2.2.b, 3.11.2.3.a, or 3.11.2.3.b, the following shall be performed:

8.1.1.1 Calculations shall be made including direct radiation contributions from the units (including outside storage tanks, the onsite Independent Spent Fuel Storage Installation (ISFSI), etc.) to determine whether the dose or dose commitment to any MEMBER OF THE PUBLIC from all facility releases of radioactivity and to radiation from uranium fuel cycle sources, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), exceeds the limits of ≤ 25 mrem to the total body or any organ, except the thyroid, which is limited to ≤ 75 mrem for a calendar year. 10-7-14 10-7-14

8.1.1.1.1 If any of these limits are exceeded, prepare and submit to the Commission within 30 days a Special Report pursuant to 10 CFR 20.405(c).[3.2.1] The following shall be included in the Special Report:

8.1.1.1.1.1 Define the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the limits of ODCM CONTROL 3.11.4.1.

8.1.1.1.1.2 Include the schedule for achieving conformance within the limits of ODCM CONTROL 3.11.4.1.

8.1.1.1.1.3 Include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. 10-7-14

8.1.1.1.1.4 Describe levels of radiation and concentrations of radioactive material involved, and the cause of exposure levels or concentrations.

8.1.1.1.1.5 If the estimated dose(s) exceeds the limits of ODCM CONTROL 3.11.4.1, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

8.2 Inside The Site Boundary Radiation Doses

8.2.1 In regards to assessment of radiation doses (from Radioactive Effluents) to MEMBERS OF THE PUBLIC due to their activities inside the site boundary, the following is provided:

8.2.1.1 A separate assessment of radiation doses from radioactive effluents to MEMBERS OF THE PUBLIC due to their activities inside the site boundary is generally not necessary because the exposure time for individuals not occupationally associated with the plant site is minimal in comparison to the exposure time considered for the dose calculation at or beyond the site boundary.

8.2.1.2 For reporting purposes, separate guidance for calculating radiation doses to a MEMBER OF THE PUBLIC inside the site boundary is not needed because the dose assessments for an offsite MEMBER OF THE PUBLIC is also assumed to be for a MEMBER OF THE PUBLIC conducting activities onsite.

8.2.1.2.1 This is verified by showing that the ground release χ/Q dispersion parameter used for dose calculation at the site boundary (0.352 miles NW) is greater than the χ/Q dispersion parameter at the location where a MEMBER OF THE PUBLIC would most likely have the maximum exposure time (0-0.5 miles N and 0-0.5 miles NNW). A comparison of these χ/Q dispersion parameters is as follows:

χ/Q Used for Dose Calculation	χ/Q Where an Assumed MEMBER OF THE PUBLIC Would Most Likely Have the Maximum Exposure Time		χ/Q References from 1/2-ODC-2.02
Site Boundary 0.352 miles NW	Inside the Site Boundary 0-0.5 miles N	Inside the Site Boundary 0-0.5 miles NNW	See Attachment F
9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	Table 2.2-4
1.03E-4 sec/m^3	2.76E-5 sec/m^3	6.01E-5 sec/m^3	Table 2.2-5
7.35E-5 sec/m^3	2.44E-5 sec/m^3	5.57E-5 sec/m^3	Table 2.2-7
9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	Table 2.2-8
9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	Table 2.2-9
7.35E-5 sec/m^3	2.44E-5 sec/m^3	5.57E-5 sec/m^3	Table 2.2-10

- END -

RTL#: A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-3.01

ODCM: Dispersion Calculation Procedure and Source Term Inputs

Document Owner
Manager, Nuclear Environmental & Chemistry

Revision Number	1
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	12/29/06

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure contains the basic methodology that was used for calculating dispersion (χ/Q) and deposition (D/Q).

1.1.1 Prior to issuance of this procedure, these items were located in Appendix A of the old ODCM.

1.2 This procedure also contains the input parameters to the various computer codes used by the Licensee and its subcontractors for determination of the liquid and gaseous source term mixes.

1.2.1 Prior to issuance of this procedure, these items were located in Appendix B of the old ODCM.

2.0 SCOPE

2.1 This procedure is applicable to all station personnel (including subcontractors) that are qualified to perform activities as described and referenced in this procedure.

3.0 REFEFERENCES AND COMMITMENTS

3.1 References

3.1.1 NUS-2173, Development Of Terrain Adjustment Factors For Use At the Beaver Valley Power Station, For the Straight-Line Atmospheric Dispersion Model, NUS Corporation, June 1978

3.1.2 NUREG/CR-2919, XOQDOQ: Computer Program For The Meteorological Evaluation Of Routine Effluent Releases At Nuclear Power Stations, September, 1982

3.1.3 Regulatory Guide 1.23, Meteorological Measurement Program for Nuclear Power Plants

3.1.4 Regulatory Guide 1.111, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Coded Reactors, Revision 1, July 1977

3.1.5 NRC Gale Code,

3.1.6 SWEC LIQ1BB Code,

3.1.7 SWEC GAS1BB Code,

3.1.8 NUREG-1301, Offsite Dose Calculation Manual Guidance, Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

3.1.9 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.10 1/2-ADM-0100, Procedure Writer's Guide

3.1.11 1/2-ADM-0101, Review and Approval of Documents

3.1.12 CR 05-01169, Chemistry Action Plan for Transition of RETS, REMP and ODCM. CA-19, Revise procedure 1/2-ODC-3.01 to change document owner from Manager, Radiation Protection to Manager, Nuclear Environmental & Chemistry.

3.2 Commitments

3.2.1 None

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting generation of dispersion, deposition, or source term mixes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 This procedure contains the information that was previously contained in Appendix A and Appendix B of the previous BV-1 and 2 Offsite Dose Calculation Manual.

5.1.1 In regards to this, the Tables that were transferred from Appendix A and Appendix B to the appropriate ATTACHMENTS of this procedure will still contain a prefix denoting an "A" or "B".

6.0 ACCEPTANCE CRITERIA

6.1 Any change to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.

6.1.1 All changes to this procedure shall be prepared in accordance with 1/2-ADM-0100[3.1.10] and 1/2-ADM-1640.[3.1.9]

6.1.2 All changes to this procedure shall be reviewed and approved in accordance with 1/2 ADM-0101[3.1.11] and 1/2-ADM-1640.[3.1.9]

7.0 PREREQUISITES

7.1 The user of this procedure shall be familiar with ODCM structure and content.

8.0 PROCEDURE

8.1 Summary of Dispersion and Deposition Methodology

8.1.1 Annual average and grazing season average values of relative concentration (χ/Q) and deposition (D/Q) were calculated for continuous and intermittent gaseous releases of activity from the site according to the straight-line airflow (Gaussian) model described in RG-1.111.[3.1.4]

8.1.1.1 Undecayed and undepleted sector average χ/Q and D/Q values were obtained for each of sixteen 22.5-degree sectors at the site boundary and maximum individual receptors.

8.1.1.2 For an elevated release, (i.e.; occurring at a height that is twice the height or more of a nearby structure) credit was taken for the effective release height which is comprised of the physical release height plus momentum plume rise minus the terrain height at a given receptor.

8.1.1.3 A building wake correction factor was used to adjust calculations for ground-level releases.

8.1.1.4 Airflow reversals were also accounted for by applying site-specific terrain recirculation factors for both ground and elevated releases at the site.[3.1.1]

8.1.1.5 The methodology employed in the calculation of intermittent release χ/Q and D/Q values is that described in NUREG/CR-2919.[3.1.2]

8.1.2 The site continuous gaseous release points that have been evaluated include the following:

8.1.2.1 PV-1/2: The Unit 1/2 Gaseous Waste/Process Vent attached to the Unit 1 natural draft cooling tower

8.1.2.2 CV-1 and CV-2: The Unit 1 Rx Containment/SLCRS Vented the Unit 2 SLCRS Filtered Pathway

8.1.2.3 VV-1 and VV-2: The Unit 1 Ventilation Vent and the Unit 2 SLCRS Unfiltered Pathway

8.1.2.4 TV-2: The Unit 2 Turbine Building Vent

8.1.2.5 CB-2: The Unit 2 Condensate Polishing Building Vent

8.1.2.6 DV-2: The Unit 2 Decontamination Building Vent

8.1.2.7 WV-2: The Unit 2 Gaseous Waste Storage Tank Vault Vent

8.1.3 The intermittent releases are from PV-1/2, VV-1, VV-2, CV-1 and CV-2.

8.1.4 Only PV-1/2 was considered to be an elevated release with all other release points being treated as ground level releases. A summary of the release characteristics and their locations is given in ATTACHMENT A.

8.1.5 Onsite meteorological data for the period January 1, 1976 through December 31, 1980 were used as input for the annual-average calculations.

8.1.5.1 The grazing season was represented by a six-month period from May 1 through October 31 for each year of the 5-year meteorological data base. This grazing season corresponds reasonably well with the growing season.

8.1.5.2 The data were collected according to guidance in NRC RG-1.23[3.1.3] as described in Section 2.3 of the BVPS-2 FSAR.

8.1.5.3 The parameters used in the χ/Q and D/Q calculations consist of wind speed, wind direction, and ΔT as an indicator of atmospheric stability. The lower level winds (35 ft) and ΔT (150-35 ft) were used for all release points except the Process Vent which required the use of 500 ft winds and ΔT (500-35 ft) which are representative of the release height (510 ft).

8.1.6 The annual average and grazing season χ/Q and D/Q values for the continuous and intermittent radioactive releases were calculated at the site boundary, nearest resident, nearest vegetable garden, nearest milk cow, nearest milk goat, and nearest meat animal.

8.1.6.1 In the case of the Process Vent releases, several of each receptor type were evaluated in each downwind sector to determine the maximum χ/Q and D/Q values.

8.1.6.2 The distances of the limiting maximum individual receptors from the radioactive release points are given in ATTACHMENT E (Table 2.2-3) of 1/2-ODC-2.02.

8.1.6.3 The continuous release annual average χ/Q values at the special locations for the Containment Vents, Ventilation Vents, Process Vent, Turbine Building Vents, Decontamination Building Vent, Waste Gas Storage Vault Vent, and Condensate Polishing Building Vent are given in ATTACHMENT F (Tables 2.2-4 through 2.2-10) of 1/2-ODC-2.02. Continuous release annual average χ/Q's for these same release points are also given at ten incremental downwind distances of 0-5 miles.

8.1.6.4 Continuous release D/Q values for these same release points are given in ATTACHMENT K (Tables 2.3-21 through 2.3-27) of 1/2-ODC-2.02 for the same 0-5 mile incremental distances, and in ATTACHMENT L (Tables 2.3-28 through 2.3-34) of 1/2-ODC-2.02 for the special locations.

8.1.6.5 Due to their location adjacent to the Containment Building, the Decontamination Building and Gaseous Waste Storage Tank Vault χ/Q's and D/Q's are the same as the Containment Vent χ/Q's and D/Q's.

8.1.6.6 Likewise, the Turbine Building Vent χ/Q's and D/Q's apply to the Condensate Polishing Building as well due to its location adjacent to the Turbine Building.

8.1.7 ATTACHMENT M (Tables 2.3-35 through 2.3-38) of 1/2-ODC-2.02 contain short term χ/Q values for batch releases originating from the Containment Vent, Ventilation Vent, and Process Vent releases respectively.

8.1.7.1 The values in these tables are based on 32 hours per year of Containment and Ventilation Vent purges and 74 hours per year of Process Vent purges.

8.2 <u>Summary of Source Term Inputs</u>

8.2.1 <u>Liquid Source Term Inputs</u>

8.2.1.1 Inputs to the NRC Gale Code used for generation of BV-1 Liquid Source Term Mixes are shown in ATTACHMENT B (Table B:1a).

8.2.1.2 Inputs to the SWEC LIQ1BB Code used for generation of BV-2 Liquid Source Term Mixes are shown in ATTACHMENT B (Table B:1b)

8.2.2 <u>Gaseous Source Term Inputs</u>

8.2.2.1 Inputs to the SWEC GAS1BB Code for generation of BV-1 Gaseous Source Term Mixes are shown in ATTACHMENT C (Table B:2a)

8.2.2.2 Inputs to the SWEC GAS1BB Code for generation of BV-2 Gaseous Source Term Mixes are shown in ATTACHMENT C (Table B:2b)

Beaver Valley Power Station	Procedure Number: 1/2-ODC-3.01	
Title: ODCM: Dispersion Calculation Procedure and Source Term Inputs	Unit: 1/2	Level Of Use: General Skill Reference
	Revision: 1	Page Number: 8 of 12

ATTACHMENT A
Page 1 of 1
BV-1 AND 2 RELEASE CONDITIONS

TABLE A:1

	VV-1 VENTILATION VENT (PAB EXHAUST) VV-2 SLCRS UNFILTERED PATHWAY	CV-1 RX CONTAINMENT/ SLCRS VENT CV-2 RX CONTAINMENT/ SLCRS FILTERED PATHWAY	PV-1/2 GASEOUS WASTE/PROCESS VENT	TV-2 TURBINE BUILDING VENT
TYPE OF RELEASE	GROUND LEVEL	GROUND LEVEL	ELEVATED	GROUND LEVEL
	Long Term And Short Term	Long Term And Short Term	Long Term And Short Term	Long Term And Short Term
Release Point Height (m)	26	47	155	33
Adjacent Building Height (m)	19	44	155	33
Relative Location To Adjacent Structures	E. Side Of Primary Auxiliary Bldg	Top Center Of Containment Dome	Atop Cooling Tower	Turbine Building
Exit Velocity(m/sec)	NA	NA	9.4	NA
Internal Stack Diameter (m)	NA	NA	0.25	NA
Building Cross-Sectional Area (m^2)	1600	1600	NA	NA
Purge Frequency* (hours/year)	32	32	74	NA
Purge Duration (hrs/release)	8	8	NA	NA

*Applied to Short Term calculations only

ATTACHMENT B
Page 1 of 2
LIQUID SOURCE TERM INPUTS

TABLE B:1a
INPUTS TO GALE CODE FOR GENERATION OF BV-1 LIQUID SOURCE TERM MIXES

BV-1 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	345.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	60.000
Letdown Cation Demineralizer Flow	6.000
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.620
Mass Of Steam In Each Steam Generator (thousand lbs)	6.772
Mass Of Liquid In Each Steam Generator (thousand lbs)	97.000
Total Mass Of Secondary Coolant (thousand lbs)	1296.000
Mass Of Water In Steam Generator (thousand lbs)	291.000
Blowdown Rate (thousand lbs/hr)	33.900
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	0.000
Radwaste Dilution Flow (thousand gpm)	22.500

BV-1 LIQUID WASTE INPUTS

STREAM	FLOW RATE (gal/day)	FRACTION OF PCA	FRACTION DISCHARGE	COLLECTION TIME (days)	DELAY TIME (days)	DECONTAMINATION FACTORS I	Cs	OTHERS
Shim Bleed Rate	1.32E4	1.000	0.000	11.260	7.220	1E7	1E7	1E7
Equipment Drains	6.00E2	1.000	0.000	11.260	7.220	1E7	1E7	1E7
Clean Waste Input	7.50E1	1.000	1.000	0.071	0.648	1E5	2E4	1E5
Dirty Waste Input	1.35E3	0.035	1.000	0.071	0.648	1E5	2E4	1E5
Blowdown	9.75E4	--	1.000	0.071	0.648	1E5	2E4	1E5
Untreated Blowdown	0.0	--	--	--	--	--	--	--

ATTACHMENT B
Page 2 of 2
LIQUID SOURCE TERM INPUTS

TABLE B:1b
INPUTS TO SWEC LIQ1BB CODE FOR GENERATION OF BV-2 LIQUID SOURCE TERM MIXES

BV-2 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	22.300
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	.700
Radwaste Dilution Flow (thousand gpm)	7.800

BV-2 LIQUID WASTE INPUTS

STREAM	FLOW RATE (gal/day)	FRACTION OF PCA	FRACTION DISCHARGE	COLLECTION TIME (hrs)	DELAY TIME (hrs)	DECONTAMINATION FACTORS I	DECONTAMINATION FACTORS CsRb	DECONTAMINATION FACTORS OTHERS
Containment Sump	40	1.000	1.0	35.5	6.2	1E3	1E4	1E4
Auxiliary Building Sump	200	0.100	1.0	35.5	6.2	1E3	1E4	1E4
Miscellaneous Sources	700	0.010	1.0	35.5	6.2	1E3	1E4	1E4
Rx Plant Samples	35	1.000	1.0	35.5	6.2	1E3	1E4	1E4
Lab Drains	400	0.002	1.0	35.5	6.2	1E3	1E4	1E4
Cond. Demin. Rinse Water	2685	1.1E-4	1.0	35.5	6.2	1E3	1E4	1E4
CVCS	60	--	1.0	1300	173	1E4	4E3	1E5
Turbine Bldg.Drains	7200	--	1.0	--	--	--	--	--

ATTACHMENT C
Page 1 of 2
GASEOUS SOURCE TERM INPUTS

TABLE B:2a
INPUTS TO SWEC GAS1BB CODE FOR GENERATION OF BV-1 GASEOUS SOURCE TERM MIXES

BV-1 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	52.000
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	0.000
Radwaste Dilution Flow (thousand gpm)	15.000

BV-1 GASEOUS WASTE INPUTS	VALUE
There Is Not Continuous Stripping Of Full Letdown Flow	
Hold Up Time For Xenon (days)	39.000
Hold Up Time For Krypton (days)	2.000
Primary Coolant Leak To Auxiliary Building (lb/day)	160.000
Auxiliary Building Leak Iodine Partition Factor	7.5E-3
Gas Waste System Particulate Release Fraction	0.000
Auxiliary Building Charcoiodine Release Fraction	1.000
Auxiliary Building Particulate Release Fraction	1.000
Containment Volume (million cu-ft)	1.800
Frequency Of Primary Coolant Degassing (times/yr)	2.000
Primary To Secondary Leak Rate (lb/day)	100.000
There Is A Kidney Filter	
Containment Atmosphere Cleanup Rate (thousand cfm)	2.000
Purge Time Of Containment (hours)	8.000
There Is Not A Condensate Demineralizer	
Iodine Partition Factor (gas/liq) In Steam Generator	0.010
Frequency Of Containment Building High Vol Purge (times/yr)*	4.000
Containment Volume Purge Iodine Release Fraction	1.000
Containment Volume Purge Particulate Release Fraction	1.000
Steam Leak To Turbine Building (lbs/hr)	1700.000
Fraction Iodine Released From Blowdown Tank Vent	0.000
Fraction Iodine Released From Main Condensate Air Ejector	0.440
There Is Not A Cryogenic Off Gas System	

*2 cold and 2 hot purges

ATTACHMENT C
Page 2 of 2
GASEOUS SOURCE TERM INPUTS

TABLE B:2b
INPUTS TO SWEC GAS1BB CODE FOR GENERATION OF BV-2 GASEOUS SOURCE TERM MIXES

BV-2 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	22.300
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	.700
Radwaste Dilution Flow (thousand gpm)	7.800

BV-2 GASEOUS WASTE INPUTS	VALUE
There Is Not Continuous Stripping Of Full Letdown Flow	
Hold Up Time For Xenon (days)	45.800
Hold Up Time For Krypton (days)	2.570
Primary Coolant Leak To Auxiliary Building (lb/day)	160.000
Auxiliary Building Leak Iodine Partition Factor	7.5E-3
Gas Waste System Particulate Release Fraction	0.000
Auxiliary Building Charcoiodine Release Fraction	0.100
Auxiliary Building Particulate Release Fraction	0.010
Containment Volume (million cu-ft)	1.800
Frequency Of Primary Coolant Degassing (times/yr)	2.000
Primary To Secondary Leak Rate (lb/day)	100.000
There Is A Kidney Filter	
Containment Atmosphere Cleanup Rate (thousand cfm)	20.000
Purge Time Of Containment (hours)	8.000
There Is Not A Condensate Demineralizer	
Iodine Partition Factor (gas/liq) In Steam Generator	0.010
Frequency Of Containment Building High Vol Purge (times/yr)*	4.000
Containment Volume Purge Iodine Release Fraction	1.000
Containment Volume Purge Particulate Release Fraction	1.000
Steam Leak To Turbine Building (lbs/hr)	1700.000
Fraction Iodine Released From Blowdown Tank Vent	0.000
Fraction Iodine Released From Main Condensate Air Ejector	0.270
There Is Not A Cryogenic Off Gas System	

*2 cold and 2 hot purges

RTL#: A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-3.02

ODCM: Bases For ODCM Controls

Document Owner
Manager, Nuclear Environmental and Chemistry

Revision Number	2
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	12/29/06

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure contains the Bases for the ODCM Controls that were transferred from the Bases Section of the Technical Specification per Unit 1/2 Amendments 1A-188/2A-70, and in accordance with Generic Letter 89-01 and NUREG-1301 (Generic Letter 89-01, Supplement No. 1) **[ITS]** and T.S. 5.5.2.[3.1.5, 3.2.10]

1.1.1 Prior to issuance of this procedure, these items were located in Appendix D of the old ODCM.

1.2 This procedure also contains the Bases for the ODCM Controls (for Radiation Monitoring Instrumentation) that were duplicated from the Bases Section of the Technical Specification per Unit 1/2 Amendments 1A-246/2A-124, and in accordance with NUREG-1431.[3.1.6, 3.2.11]

1.3 This procedure also contains the Bases for the ODCM Controls (for Liquid Holdup Tank Activity Limits and for Gas Decay/Storage Tank Activity Limits) that were transferred from the Bases Section of the Technical Specification per Unit 1/2 Amendments 1A-250/2A-130, and in accordance with NUREG-1431.[3.1.7, 3.2.11]

2.0 SCOPE

2.1 This procedure is applicable to all station personnel that are qualified to perform activities as described and referenced in this procedure.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 1/2-ODC-2.01, ODCM: Liquid Effluents

3.1.2 1/2-ODC-2.02, ODCM: Gaseous Effluents

3.1.3 1/2-ODC-3.03, ODCM: Controls for RETS and REMP Programs

3.1.4 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.5 Unit 1/2 Technical Specification 6.8.6, including Amendments 1A-188/2A-70 (LAR 1A-175/2A-37), Implemented August 7, 1995

3.1.6 Unit 1/2 Technical Specification 3.3.3.1, including Amendments 1A-246/2A-124 (LAR 1A-287/2A-159), Implemented April 11, 2002

3.1.7 Unit 1/2 Technical Specifications 3.11.1.4, 3.11.2.5 and 6.8.6, including Amendments 1A-250/2A-130 (LAR 1A-291/2A-163), Implemented August 7, 2002

3.1.8 1/2-ADM-0100, Procedure Writer's Guide

3.1.9 1/2-ADM-0101, Review and Approval of Documents

3.1.10 CR 05-01169, Chemistry Action Plan for Transition of RETS, REMP and ODCM. CA-20, Revise procedure 1/2-ODC-3.02 to change document owner from Manager, Radiation Protection to Manager, Nuclear Environmental and Chemistry. CR 05-03306, Incorporated Improved Technical Specifications (ITS).

3.1.11 **[ITS]** T.S. 5.5.2

3.2 Commitments

3.2.1 10 CFR Part 20

3.2.2 10 CFR Part 50

3.2.3 40 CFR Part 141

3.2.4 40 CFR Part 190

3.2.5 Regulatory Guide 1.109, Calculation Of Annual Doses To Man From Routine Releases Of Reactor Effluents For The Purpose Of Evaluating Compliance With 10 CFR Part 50, Appendix I, Revision 1, October, 1977

3.2.6 Regulatory Guide 1.111, Methods For Estimating Atmospheric Transport And Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors, Revision 1, July, 1977

3.2.7 Regulatory Guide 1.113, Estimating Aquatic Dispersion Of Effluents From Accidental And Routine Reactor Releases For The Purpose Of Implementing Appendix I, April, 1977

3.2.8 NUREG-0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978

3.2.9 NUREG-0737, Clarification of TMI Action Plan Requirements, October, 1980

3.2.10 NUREG-1301, Offsite Dose Calculation Manual Guidance. Standard Radiological Effluent Controls For Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

3.2.11 NUREG-1431, Standard Technical Specifications - Westinghouse Plants Specifications

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (eg; letter or calculation package) with an appropriate RTL number.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 The numbering of each specific ODCM Bases contained in this procedure does not appear to be sequential. This is intentional, as all ODCM Bases numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

5.2 This procedure includes Improved Technical Specifications (**[ITS]**) information that is NOT applicable to current Technical Specifications (**[CTS]**) and **[CTS]** information that is NOT applicable in **[ITS]**. The **[CTS]** information shall be used prior to the **[ITS]** effective date. The **[ITS]** information shall be used on or after the **[ITS]** effective date.

6.0 ACCEPTANCE CRITERIA

6.1 Any change to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appenidx I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.[3.2.10]

6.1.1 All changes to this procedure shall be prepared in accordance with 1/2-ADM-0100[3.1.8] and 1/2-ADM-1640.[3.1.4]

6.1.2 All changes to this procedure shall be reviewed and approved in accordance with 1/2-ADM-0101[3.1.9] and 1/2-ADM-1640.[3.1.4]

7.0 PREREQUISITES

7.1 The user of this procedure shall be familiar with ODCM structure and content.

8.0 PROCEDURE

8.1 See ATTACHMENT A for a complete description of Bases for ODCM Controls associated with Instrumentation.

8.2 See ATTACHMENT B for a complete description of Bases for ODCM Controls associated with Liquid Effluents.

8.3 See ATTACHMENT C for a complete description of Bases for ODCM Controls associated with Gaseous Effluents.

8.4 See ATTACHMENT D for a complete description of Bases for ODCM Controls associated with Total Dose.

8.5 See ATTACHMENT E for a complete description of Bases for ODCM Controls associated with the Radiological Environmental Monitoring Program (REMP).

-END-

ATTACHMENT A
Page 1 of 1
BASES FOR ODCM CONTROLS: INSTRUMENTATION

3/4.3.3.1 RADIATION MONITORING INSTRUMENTATION

The OPERABILITY of the radiation monitoring channels ensures that: 1) the radiation levels are continually measured in the areas served by the individual channels; 2) the alarm or automatic action is initiated when the radiation level trip setpoint is exceeded; and 3) sufficient information is available on selected plant parameters to monitor and assess these variables following an accident. This capability is consistent with the recommendations of NUREG-0737.[3.2.9]

3/4.3.3.9 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with Section 1 of this manual to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.[3.2.1, 3.2.2]

3/4.3.3.10 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with Section 2 of this manual to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the waste gas holdup system. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.[3.2.1, 3.2.2]

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Page 1 of 2
BASES FOR ODCM CONTROLS: LIQUID EFFLUENTS

3/4.11.1.1 LIQUID EFFLUENT CONCENTRATION

This CONTROL is provided to ensure that the concentration of radioactive materials released in Liquid waste effluents from the site to unrestricted areas will be less than 10 times the EC's specified in 10 CFR Part 20, Appendix B (20.1001-20-2402), Table 2, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposure within (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to an individual and (2) the limits of 10 CFR Part 20.1302 to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.[3.2.1, 3.2.2]

3/4.11.1.2 LIQUID EFFLUENT DOSE

This CONTROL is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR 141. The dose calculations in the procedure 1/2-ODC-2.01 implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in procedure1/2-ODC-2.01 for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, and Regulatory Guide 1.113. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.113.[3.1.1, 3.2.2, 3.2.3, 3.2.5, 3.2.7, 3.2.8]

This CONTROL applies to the release of liquid effluents for Beaver Valley Power Station, Unit No. 1 or Unit No. 2. These units have shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

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BASES FOR ODCM CONTROLS: LIQUID EFFLUENTS

3/4.11.1.3 LIQUID WASTE TREATMENT SYSTEM

The CONTROL that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents. This specification applies to Beaver Valley Power Station, Unit No. 1 or Unit No. 2.[(3.2.2)]

3/4.11.1.4 LIQUID HOLDUP TANKS

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

ATTACHMENT C
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BASES FOR ODCM CONTROLS: GASEOUS EFFLUENTS

3/4.11.2.1 GASEOUS EFFLUENT DOSE RATE

This CONTROL is provided to ensure that the dose at anytime at the site boundary from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20 for unrestricted areas. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area, either within or outside the site boundary, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For individuals who may at times be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the site boundary to ≤ 500 mrem/year to the total body or to ≤ 3,000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background of a child via the inhalation pathway to ≤ 1,500 mrem/year.[3.2.1]

3/4.11.2.2 DOSE, NOBLE GASES

This CONTROL is provided to implement the requirements of Sections II.B, III.A, and IV.A of Appendix I, 10 CFR Part 50. The CONTROL implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the release of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in procedure 1/2-ODC-2.02 for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, and Regulatory Guide 1.111. The equations in procedure 1/2-ODC-2.02 are provided for determining the air doses at the exclusion area boundary, and are based upon the historical average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111. This specifications applies to the release of gaseous effluents from Beaver Valley Power Station, Unit No. 1 or Unit No. 2.[3.1.2, 3.2.2, 3.2.5, 3.2.6, 3.2.8]

3/4.11.2.3 DOSE, RADIOIODINES, RADIOACTIVE MATERIAL IN PARTICULATE FORM AND RADIONUCLIDES OTHER THAN NOBLE GASES

ATTACHMENT C
Page 2 of 3
BASES FOR ODCM CONTROLS: GASEOUS EFFLUENTS

This CONTROL is provided to implement the requirements of Sections II.C, III.A, and IV.A of Appendix I, 10 CFR Part 50. The CONTROLS are the guides set forth in Section II.C of Appendix I.[3.2.2]

The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The calculational methods in procedure 1/2-ODC-2.02 are for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, and Regulatory Guide 1.111. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for radioiodines, radioactive material in particulate form, and radionuclides other than noble gases are dependent on the existing radionuclide pathways to man, in the unrestricted area. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man. This CONTROL applies to radioactive material in particulate form and radionuclides other than noble gases released from Beaver Valley Power Station, Unit No. 1 or Unit No.2.[3.1.2, 3.2.2, 3.2.6, 3.2.7]

ATTACHMENT C
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BASES FOR ODCM CONTROLS: GASEOUS EFFLUENTS

3/4.11.2.4 GASEOUS RADWASTE TREATMENT SYSTEM

The CONTROL that the appropriate portions of these systems be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and design objective Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents. This specification applies to gaseous radwaste from Beaver Valley Power Station, Unit No. 1 or Unit No. 2.[3.1.2, 3.2.2]

3/4.11.2.5 BV-1 GASEOUS WASTE STORAGE TANKS

Restricting the quantity of radioactivity contained in each gas storage tank provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting total body exposure to an individual located at the nearest exclusion area boundary for two hours immediately following the onset of the release will not exceed 0.5 rem. The specified limit restricting the quantity of radioactivity contained in each gas storage tank was specified to ensure that the total body exposure resulting from the postulated release remained a suitable fraction of the reference value set forth in 10 CFR 100.11 (a)(1).

3/4.11.2.5 BV-2 GASEOUS WASTE STORAGE TANKS

Restricting the quantity of radioactivity contained in any connected group of gaseous waste storage tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting total body exposure to an individual located at the nearest exclusion area boundary for two hours immediately following the onset of the release will not exceed 0.5 rem. The specified limit restricting the quantity of radioactivity contained in any connected group of gaseous waste storage tanks was specified to ensure that the total body exposure resulting from the postulated release remained a suitable fraction of the reference value set forth in 10 CFR 100.11(a)(1). The curie content limit is applied individually to each gaseous waste storage tank and collectively to the number of unisolated gaseous waste storage tanks.

ATTACHMENT D

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BASES FOR ODCM CONTROLS: TOTAL DOSE

3/4.11.4 TOTAL DOSE

This CONTROL is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20 by 46 FR 18525. The CONTROL requires the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. For sites containing up to 4 reactors, it is highly unlikley that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the units (including outside storages tanks, etc.) are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 5 miles must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in ODCM CONTROL 3.11.1.1 and 3.11.2.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.[3.1.3, 3.2.1, 3.2.2, 3.2.4]

ATTACHMENT E
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BASES FOR ODCM CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3/4.12.1 MONITORING PROGRAM

The radiological monitoring program required by this CONTROL provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of MEMBER(S) OF THE PUBLIC resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. The initially specified monitoring program will be effective for at least the first 3 years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The detection capabilities required by ODCM Control 3.12.1, Table 4.12-1 are state-of-the-art for routine environmental measurements in industrial laboratories. The LLD's for drinking water meet the requirements of 40 CFR 141.[3.1.3, 3.2.3]

3/4.12.2 LAND USE CENSUS

ODCM CONTROL 3.12.2 is provided to ensure that changes in the use of unrestricted areas are identified and that modifications to the monitoring programs are made if required by the results of this census. The best survey information from the door-to-door survey, aerial survey, or by consulting with local agriculture authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were used: 1) that 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/square meter.[3.1.3, 3.2.2]

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

The ODCM CONTROL 3.12.3 for participation in an Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of a quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.[3.1.3]

RTL #A9.621B

Beaver Valley Power Station

Unit 1/2

1/2-ODC-3.03

ODCM: Controls for RETS and REMP Programs

Document Owner
Manager, Nuclear Environmental and Chemistry

Revision Number	12
Level Of Use	General Skill Reference
Safety Related Procedure	Yes
Effective Date	10/07/14

TABLE OF CONTENTS

1.0 PURPOSE

1.1 This procedure includes selected Definitions and Tables as delineated in Section 1 of the Technical Specifications and selected Applicability and Surveillance Requirement statements as delineated in T.S. 3.0.

1.1.1 Prior to issuance of this procedure, these items were located in Appendix C of the old ODCM, and were added to this procedure for reference purposes, even though they are currently described in the Technical Specifications.

1.2 This procedure contains the controls for the Radiological Effluent Technical Specification (RETS) that were transferred from the Technical Specifications per Unit 1/2 Amendments 1A-188/2A-70, and in accordance with Generic Letter 89-01 and NUREG-1301.(3.2.10)

1.2.1 Prior to issuance of this procedure, these items were located in Appendix C of the old ODCM.

1.3 This procedure contains the reporting requirements for the Radioactive Effluent Release Report and the Annual Radiological Environmental Operating Report that were transferred from the Technical Specifications per Unit 1/2 Amendments 1A-188/2A-70 and in accordance with Generic Letter 89-01 and NUREG-1301.(3.2.10)

1.3.1 Prior to issuance of this procedure, these items were located in Appendix E of the old ODCM.

1.4 This procedure contains the controls for Radiation Monitoring Instrumentation that were transferred from the Technical Specification per Unit 1/2 Amendments 246/124, and in accordance with NUREG-1431.(3.2.11)

1.5 This procedure contains the controls for Liquid Holdup Tank Activity Limits and for Gas Decay/Storage Tank Activity Limits that were transferred from the Technical Specification per Unit 1/2 Amendment 250/130, and in accordance with NUREG-1431.(3.1.6, 3.2.11)

1.6 This procedure provides the Radiological Effluent Controls and Reporting Requirements required for T.S. 5.5.1, T.S. 5.5.2, T.S. 5.5.8, T.S. 5.6.1, and T.S. 5.6.2.

2.0 SCOPE

2.1 This procedure is applicable to all station personnel that are qualified to perform activities as described and referenced in this procedure.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 1/2-ODC-2.01, ODCM: Liquid Effluents

3.1.2 1/2-ODC-2.02, ODCM: Gaseous Effluents

3.1.3 1/2-ODC-3.02, ODCM: Bases for ODCM Controls

3.1.4 Unit 1/2 Technical Specification 6.8.6, including Amendments 188/70 (LAR 1A-175/2A-137) Implemented August 7, 1995.

3.1.5 Unit 1/2 Technical Specification 3.3.3.1, including Amendments 246/124 (LAR 1A-287/2A-159) Implemented April 11, 2002

3.1.6 Unit 1/2 Technical Specification 3.11.1.4, 3.11.2.5, 6.8.6 and 6.9.3, including Amendments 250/130 (LAR 1A-291/2A-163) Implemented August 7, 2002

3.1.7 1/2-ADM-1640, Control of the Offsite Dose Calculation Manual

3.1.8 1/2-ADM-0100, Procedure Writer's Guide

3.1.9 NOP-SS-3001, Procedure Review and Approval

3.1.10 CR 981489, ODCM Table 4.11-2 Row A (Waste Gas Storage Tank Discharge). CA-01, Revise Appendix C of the ODCM (Table 4.11-2) to add clarification as to where and when tritium samples are to be obtained for GWST discharges.

3.1.11 CR 981490, ODCM Table 4.11-2 Note e, and Related Chemistry Department Procedures. CA-01, Revise Appendix C of the ODCM (Table 4.11-2, note e) to specify the proper tritium sample point.

3.1.12 CR 993021, Apparent failure to test RM-1DA-100 trip function as required by ODCM. No ODCM changes are required for this CR.

3.1.13 CR 001682, ODCM Action 28 Guidance. CA-02, Revise Appendix C of the ODCM (Table 3.3-13, Action 28) to differentiate actions associated with Inoperable Process Flow Rate Monitors vs. Sample Flow Rate Monitors.

3.1.14 CR 02-05711, TS and ODCM changes not reflected in 1OM.54.3.L5 Surveillance Log. CA-01, Revise 1/2-ODC-3.03 to add a requirement for applicable station groups notification of pending ODCM changes.

3.1.15 CR 03-06123, Enhance Table 3.3-6 of 1/2-ODC-3.03 to Add More Preplanned Method of Monitoring. CA-01, Revise Table 3.3-6 and Table 4.3-3 to allow use of Eberline SPING Channel 5 as an additional 2nd PMM when the Unit 1 Mid or High Range Noble Gas Effluent Monitors are Inoperable.

3.1.16 CR 03-06281, Gaseous Tritium Sampling Required by ODCM (1/2-ODC-3.03) Unclear for Chemistry. CA-01, Revise procedure Attachment K Table 4.11-2 for RP & Chemistry sampling of Gaseous Effluent Pathways to show which effluent pathways need sampled for compliance to ODCM Control 3.11.2.1 requirements.

3.1.17 CR 03-07487, Results of NQA Assessment of the Radiological Effluents Program. CA-01, Revise Calculation Package No. ERS-ATL-95-007 to clarify the term "Surface Water Supply" per guidance presented in NUREG-0800 SRP 15.7.3. CA-05, Revise 1/2-ODC3.03 Control 3.11.1.4 to update the activity limits for the outside storage tanks.

3.1.18 CR 03-07668, Benchmark Effluent & Environmental Programs VS Papers Presented at 13th REMP/RETS Workshop. CA-01, Evaluate procedure Attachment K Table 4.11-2 to reduce the amount of Effluent Samples obtained during a power transient.

3.1.19 CR 03-09288, LAR 1A-321 & 2A-193, Increased Flexibility in Mode Restraints. CA-19, Review LAR 1A-321/2A-193 to identify the affected Rad Effluent procedures, programs, manuals, and applicable plant modification documents that will need to be revised to support implementing the LAR.

3.1.20 CR 03-09959, RFA-Rad Protection Provide Clarification to ODCM 1/Day Air Tritium Sample. CA-01, Revise ODCM procedure 1/2-ODC-3.03 Attachment K (Table 4.11-2 note c & note e) to allow sampling of the appropriate building atmosphere.

3.1.21 CR 03-11726, Typographical Error Found in ODCM 3.11.2.5. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment O, Control 3.11.2.5 to correct a typographical error. Specifically, the final word in Action (a) needs changed from "nad" to "and".

3.1.22 CR 04-01643, Procedure Correction – Typographical Error in the ODCM. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment F, (Table 3.3-13 and 4.3-13) to correct a typographical error. Specifically, the Asset Number for the Vacuum Gauge used for measurement of sample flow (from the Alternate Sampling Device) needs changed from [PI-1GW-13] to [PI-1GW-135].

3.1.23 CR 04-02275, Discrepancies in Table 3.3-13 of the ODCM. CA-01, Revise ODCM procedure 1/2-ODC-3.03, Attachment F, (Table 3.3-13 and 4.3-13) to add clarification that the "Sampler Flow Rate Monitors are the devices used for "Particulate and Iodine Sampling".

3.1.24 Unit 1 Technical Specification Amendment No. 275 (LAR 1A-302) to License No. DPR-66. This amendment to the Unit 1 license was approved by the NRC on July 19, 2006.

3.1.25 Vendor Calculation Package No. 8700-UR(B)-223, Impact of Atmospheric Containment Conversion, Power Uprate, and Alternative Source Terms on the Alarm Setpoints for the Radiation Monitors at Unit 1.

3.1.26 Engineering Change Package No. ECP-04-0440, Extended Power Uprate.

3.1.27 CR 06-04908, Radiation Monitor Alarm Setpoint Discrepancies. CA-03; revise ODCM procedure 1/2-ODC-3.03 to update the alarm setpoints of [RM-1VS-110] and [RM-1GW-109] for incorporation of the Extended Power Uprate per Unit 1 TS Amendment No. 275.

3.1.28 Calculation Package No. ERS-MPD-93-007, BVPS-1 Gaseous Radioactivity Monitor Emergency Action Levels.

3.1.29 SAP Order 200197646-0110: Revise ODCM procedure 1/2ODC-3.03, 1/2-HPP-3.06.001, 1/2-ENV-05.01, Form 1/2-HPP-3.06.001.F05 and Form 1/2-ENV-05.01.F05 to incorporate revised outside liquid storage tank activity limits via Calculation Package No. ERS-ATL-95-007, R2.

3.1.30 CR 06-04944: ODCM 3.03 Attachment E conflict between Applicability and Action Statement. CA-01; revise ODCM procedure 1/2-ODC-3.03, Attachment E to clarify Applicability for tank level indicating devices is during additions to the tank.

3.1.31 CR 05-03306: Incorporated Improved Technical Specifications. This includes transfer of programmatic controls for BV-2 Noble Gas Effluent Steam Monitors [2MSS-RQ101A], [2MSS-RQ101B] and [2MSS-RQ101C] from the Technical Specifications to ODCM procedure 1/2-ODC-3.03 (Attachment D Tables 3.3-6 and 4.3-3). This was permitted via Unit 1/2 Technical Specification Amendments No. 278/161.

3.1.32 Unit 1 and 2 Technical Specifications: ITS 5.5.1, Offsite Dose Calculation Manual

3.1.33 Unit 1 and 2 Technical Specifications: ITS 5.5.2, Radioactive Effluent Controls Program

3.1.34 Unit 1 and 2 Technical Specifications: ITS, 5.5.8, Explosive Gas and Storage Tank Radioactivity Monitoring Program

3.1.35 Unit 1 and 2 Technical Specification: ITS 5.6.1, Annual Radiological Environmental Operating Report

3.1.36 Unit 1 and 2 Technical Specifications: ITS 5.6.2, Radioactive Effluent Release Report

3.1.37 SAP Order 200240681: Revise ODCM procedure 1/2-ODC-3.03 (Attachment E Table 3.3-12) to add an alternate Action when the primary Flow Rate Measurement Device [FT-1CW-101-1] is not OPERABLE. The alternate Action (25A) uses local measurements (as described in 1MSP-31.06-I) to determine a total dilution flow rate during liquid effluent releases.

3.1.38 CR 07-12924 and SAP Order 200247228-0410: Revise ODCM procedure 1/2-ODC-3.03 (Attachment F Tables 3.3-13 and 4.3-13) to clarify the Functional Location of the Sampler Flow Rate Monitors for the BV-2 gaseous effluent release pathways. Specifically, the procedure was changed to refer to Functional Location [2HVS-FIT101-1] instead of [2HVS-FIT101], [2RMQ-FIT301-1] instead of [2RMQ-FIT301], [2HVL-FIT112-1] instead of [2HVL-FIT112], and [2RMQ-FIT303-1] instead of [2RMQ-FIT303].

3.1.39 SAP Order 200247228-0450: Revise 1/2-ODC-3.03 Attachment E Table 3.3-12 and Attachment F, Tables 3.3-13 & 4.3-13 to provide added clarifications, as follows; (1) add the word "or" where it is missing from Attachment F, Table 3.3-13 & 4.3-13, (2) remove grab samples from the list of alternates in Table 3.3-13 and 4.3-13, because a grab sample is an "action", not an "alternate", (3) add notations in Table 3.3-12 and 3.3-13 to indicate that Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b and 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days, and (4) remove surveillances for Preplanned Method of Monitoring (PMM) from Table 4.3-3, because surveillances only apply to instruments, not methods.

3.1.40 SAP Order 200240681-0020 and 0040: Revise 1/2-ODC-3.03 Attachment E, Table 3.3-12, Table 4.3-12 and Action 25A to clarify the 1st and 2nd alternates to the flow rate measurement devices used for the cooling tower blowdown line.

3.1.41 SAP Order 200197646-0300 and CR07-31083: Revise ODCM procedure 1/2-ODC-3.03 to add a definition for Channel Functional Test and revise the definition for Channel Operational Test to indicate that these definitions have the same requirements and, therefore, are considered equal.

3.1.42 CR G203-2011-02332, Inability to meet ODCM requirements for REMP milk sampling in 2011 and CA G203-2011-02332-1, Make changes to the ODCM.

3.2 Commitments

3.2.1 10 CFR Part 20, Standards for Protection Against Radiation

3.2.2 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities

3.2.3 40 CFR Part 141

3.2.4 40 CFR Part 190, Environmental Radiation Protection Standards For Nuclear Power Operations.

3.2.5 Regulatory Guide 1.109, Calculation Of Annual Doses To Man From Routine Releases Of Reactor Effluents For The Purpose Of Evaluating Compliance With 10 CFR Part 50, Appendix I, Revision 1, October 1977

3.2.6 Regulatory Guide 1.111, Methods For Estimating Atmospheric Transport And Dispersion Of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors, Revision 1, July 1977

3.2.7 Regulatory Guide 1.113, Estimating Aquatic Dispersion Of Effluents From Accidental And Routine Reactor Releases For The Purpose Of Implementing Appendix I, April 1977

3.2.8 NUREG-0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978

3.2.9 NUREG-0737, Clarification of TMI Action Plan Requirements, October 1980

3.2.10 NUREG-1301, Offsite Dose Calculation Manual Guidance; Standard Radiological Effluent Controls For Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

3.2.11 NUREG-1431, Standard Technical Specifications - Westinghouse Plants Specifications

3.2.12 NUREG-0800, Standard Review Plan, Postulated Radioactive Releases Due to Liquid-Containing Tank Failures, July 1981

3.2.13 Licensee Response to NRC Unresolved Item 50-334/83-30-05. The Radiation Monitor Particle Distribution Evaluation showed that the Licensee must continue to use correction factors to determine particulate activity in samples obtained from the effluent release pathways.

3.2.14 10 CFR 72.104 Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS.

10-7-14

4.0 RECORDS AND FORMS

4.1 Records

4.1.1 Any calculation supporting ODCM changes shall be documented, as appropriate, by a retrievable document (e.g.; letter or calculation package) with an appropriate RTL number.

4.2 Forms

4.2.1 None

5.0 PRECAUTIONS AND LIMITATIONS

5.1 The numbering of each specific ODCM Control, ODCM Surveillance Requirement and ODCM Table contained in this procedure does not appear to be sequential. This is intentional, as all ODCM Control, ODCM Surveillance Requirement and ODCM Table numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

5.2 The numbering of each specific ODCM Report contained in this procedure does not appear to be sequential. This is intentional, as all ODCM Report numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

6.0 ACCEPTANCE CRITERIA

6.1 Any change to this procedure shall contain sufficient justification that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, 10 CFR 72.104 and Appendix I to 10 CFR 50, and not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.(3.2.10)

6.1.1 All changes to this procedure shall be prepared in accordance with 1/2-ADM-0100(3.1.8) and 1/2-ADM-1640.(3.1.7)

6.1.2 Pending changes to this procedure shall be provided to applicable station groups. For example, IF Control 3.11.1.1 is being changed, THEN the proposed changes shall be provided to the applicable station groups (i.e.; owner of the procedures), identified in the MATRIX of ODCM procedure 1/2-ODC-1.01. This will allow the station groups to revise any affected procedures concurrent with the ODCM change.(3.1.14)

6.1.3 All changes to this procedure shall be reviewed and approved in accordance with NOP-SS-3001 (3.1.9) and 1/2-ADM-1640.(3.1.7)

7.0 PREREQUISITES

7.1 The user of this procedure shall be familiar with ODCM structure and content.

8.0 PROCEDURE

8.1 See ATTACHMENT A for a Table of Operational Modes and a Table of Frequency Notation.

8.2 See ATTACHMENT B for a list of defined terms used throughout the ODCM.

8.3 See ATTACHMENT C thru ATTACHMENT S for a complete description of all ODCM Controls.

8.4 See ATTACHMENT T for a description of the Annual Report required by the REMP Controls.

8.5 See ATTACHMENT U for a description of the Annual Report required by the RETS Controls.

- END -

ATTACHMENT A
Page 1 of 2
ODCM CONTROLS: OPERATIONAL MODES AND FREQUENCY NOTATION

TABLE 1.1

MODES

MODE	TITLE	REACTIVITY CONDITION (k_{eff})	% RATED THERMAL POWER[(a)]	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	≥ 0.99	> 5	NA
2	Startup	≥ 0.99	≤ 5	NA
3	Hot Standby	< 0.99	NA	≥ 350
4	Hot Shutdown[(b)]	< 0.99	NA	$350 > T_{avg} > 200$
5	Cold Shutdown[(b)]	< 0.99	NA	≤ 200
6	Refueling[(c)]	NA	NA	NA

(a) Excluding decay heat.
(b) All reactor vessel head closure bolts fully tensioned.
(c) One or more reactor vessel head closure bolts less than fully tensioned.

ATTACHMENT A
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ODCM CONTROLS: OPERATIONAL MODES AND FREQUENCY NOTATION

TABLE 1.2

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours
D	At least once per 24 hours
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
R	At least once per 18 months
S/U	Prior to each reactor startup
P	Completed prior to each release
N.A.	Not applicable

ATTACHMENT B
Page 1 of 3
ODCM CONTROLS: DEFINITIONS

The defined terms of this section appear in capitalized type and are applicable throughout these CONTROLS.

ACTION shall be those additional requirements specified as corollary statements to each principal CONTROL and shall be part of the CONTROLS.

CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL OPERATIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

CHANNEL FUNCTIONAL TEST shall be the injection of a simulated signal into the channel as close to the primary sensor as practicable to verify OPERABILITY including alarm and/or trip functions. **SINCE** these requirements are the same as those shown for CHANNEL OPERATIONAL TEST, **THEN** these definitions are considered equivalent.

CHANNEL OPERATIONAL TEST shall be the injection of a simulated signal into the channel as close to the primary sensor as practicable to verify OPERABILITY including alarm and/or trip functions. **SINCE** these requirements are the same as those shown for CHANNEL FUNCTIONAL TEST, **THEN** these definitions are considered equivalent.

FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.2.

GASEOUS RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

MEMBER(S) OF THE PUBLIC (10 CFR 20 and/or 10 CFR 50) means any individual except when that individual is receiving an occupational dose. **This definition is used to show compliance to ODCM CONTROL 3.11.1.1, 3.11.1.4, 3.11.2.1 and 3.11.2.5 that are based on 10 CFR Part 20. This definition is also used to show compliance to ODCM Controls 3.11.1.2, 3.11.1.3, 3.11.2.2, 3.11.2.3 and 3.11.2.4 that are based on 10 CFR Part 50.**

ATTACHMENT B

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ODCM CONTROLS: DEFINITIONS

MEMBER(S) OF THE PUBLIC (40 CFR 190) means any individual that can receive a radiation dose in the general **environment**, whether he may or may not also be exposed to radiation in an occupation associated with a nuclear fuel cycle. However, an individual is not considered a MEMBER OF THE PUBLIC during any period in which he is engaged in carrying out any operation which is part of the nuclear fuel cycle. **This definition is used to show compliance to an ODCM CONTROL 3.11.4.1 that is based on 40 CFR Part 190.**

OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents (which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI)), in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by T.S. 5.5.2 and (2) descriptions of the information that should be included in the Radiological Environmental Operating and Annual Radioactive Effluent Release Reports that are also required by T.S. 5.6.1 and T.S. 5.6.2. 10-7-14

OPERABLE/OPERABILITY A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electric power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related safety function(s).

MODE shall correspond to any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature specified in ATTACHMENT A Table 1.1.

PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating conditions, in such a manner that replacement air or gas is required to purify the confinement.

RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 2900 MWt.

REPORTABLE EVENT shall be any of those conditions specified in Section 50.73 to 10 CFR Part 50.

SHUTDOWN means reactor power change to 0% power.

SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee. The Figure for Liquid Effluent Site Boundary is contained in 1/2-ODC-2.01. The Figure for Gaseous Effluent Site Boundary is contained in 1/2-ODC-2.02.

STARTUP means reactor power change from 0% power.

SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

ATTACHMENT B
Page 3 of 3
ODCM CONTROLS: DEFINITIONS

THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

UNRESTRICTED AREA means any area access to which is neither limited nor controlled by the licensee.

VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal absorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment (such a system is not considered to have any effect on noble gas effluents). Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating conditions, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

ATTACHMENT C
Page 1 of 4
ODCM CONTROLS: APPLICABILITY AND SURVEILLANCE REQUIREMENTS

CONTROLS: APPLICABILITY

3.0.1 ODCM CONTROLS shall be met during the MODES or other conditions specified in the Applicability; except as provided in ODCM CONTROL 3.0.2

3.0.2 Upon discovery of a failure to meet the ODCM CONTROL, the associated ODCM ACTION requirements shall be met, except as provided in ODCM CONTROL 3.0.5. If the ODCM CONTROL is met or no longer applicable prior to expiration of the specified time intervals, completion of the ODCM ACTION requirements is not required unless otherwise stated.

3.0.3 When an ODCM CONTROL is not met and the associated ODCM ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the ODCM CONTROL is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

1. MODE 3 within 7 hours,
2. MODE 4 within 13 hours, and
3. MODE 5 within 37 hours.

Where corrective measures are completed that permit operation in accordance with the ODCM CONTROL or ACTIONS, completion of the actions required by ODCM CONTROL 3.0.3 is not required.

Exceptions to these requirements are stated in the individual ODCM CONTROLS.

3.0.4 When an ODCM CONTROL is not met, entry into an MODE or specified condition in the Applicability shall only be made:

a. When the associated ODCM ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time, or

b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this ODCM CONTROL are stated in the individual ODCM CONTROLS, or

c. When an allowance is stated in the individual value, parameter, or other ODCM CONTROL.

This ODCM CONTROL shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ODCM ACTIONS or that are part of a shutdown of the unit.

ATTACHMENT C
Page 2 of 4
ODCM CONTROLS: APPLICABILITY AND SURVEILLANCE REQUIREMENTS

3.0.5 Equipment removed from service or declared inoperable to comply with ODCM ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to ODCM CONTROL 3.0.1 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

ATTACHMENT C

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ODCM CONTROLS: APPLICABILITY AND SURVEILLANCE REQUIREMENTS

CONTROLS: SURVEILLANCE REQUIREMENTS

4.0.1 Surveillance Requirements shall be met during the MODES or other conditions specified for individual ODCM CONTROLS unless otherwise stated in the ODCM Surveillance Requirement. Failure to meet an ODCM Surveillance, whether such failure is experienced during the performance of the Surveillance or between performance of the Surveillance, shall be failure to meet the ODCM CONTROL. Failure to perform a Surveillance within the specified Frequency, shall be failure to meet the ODCM CONTROL except as provided in ODCM Surveillance Requirement 4.0.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.

4.0.2 The specified Frequency for each ODCM Surveillance Requirement is met if the Surveillance is performed within ±1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met.

For Frequencies specified as "once," the above interval extension does not apply.

If a Completion Time requires periodic performance or "once per..." basis, the above Frequency extension applies to each performance after the initial performance.

Exceptions to this Specification are stated in the individual Specifications.

4.0.3 If it is discovered that an ODCM Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the ODCM CONTROL not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified surveillance interval, whichever is greater. This delay period is permitted to allow performance of the ODCM Surveillance. A risk evaluation shall be performed for any ODCM Surveillance delayed greater than 24 hours and the risk impact shall be managed.

If the ODCM Surveillance is not performed within the delay period, the ODCM CONTROL must immediately be declared not met, and the applicable ODCM ACTION(s) must be entered.

When the ODCM Surveillance is performed within the delay period and the ODCM Surveillance is not met, the ODCM CONTROL must immediately be declared not met, and the applicable ODCM ACTION(s) must be entered.

ATTACHMENT C
Page 4 of 4
ODCM CONTROLS: APPLICABILITY AND SURVEILLANCE REQUIREMENTS

4.0.4 Entry into a MODE or other specified condition in the Applicability of a ODCM CONTROL shall only be made when the ODCM Surveillances have been met within their allowed surveillance interval, except as provided by ODCM Surveillance Requirement 4.0.3. When an ODCM CONTROL is not met due to Surveillances not having been met, entry into a MODE or other specified condition in the Applicability shall only be made in accordance with ODCM CONTROL 3.0.4. This provision shall not prevent entry into MODES or other specified conditions in the Applicability, that are required to comply with ODCM ACTION requirements or that are part of a shutdown of the unit.

ATTACHMENT D
Page 1 of 8
ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

CONTROLS: RADIATION MONITORING (HIGH RANGE INSTRUMENTATION)

3.3.3.1 The radiation monitoring instrumentation channels shown in Table 3.3-6 shall be OPERABLE with their alarm/trip setpoints within the specified limits.

APPLICABILITY: As shown in Table 3.3-6.

ACTION:

a. With a radiation monitoring channel alarm/trip setpoint exceeding the value shown in ODCM Control 3.3.3.1, Table 3.3-6, adjust the setpoint to within the limit within 4 hours or declare the channel inoperable.

b. With one or more radiation monitoring channels inoperable, take the ACTION shown in ODCM Control 3.3.3.1, Table 3.3-6.

c. The provisions of ODCM Control 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.1 Each radiation monitoring instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL OPERATIONAL TEST operations during the modes and at the frequencies shown in ODCM Control 3.3.3.1, Table 4.3-3.

ATTACHMENT D
Page 2 of 8
ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 3.3-6

BV-1 RADIATION MONITORING INSTRUMENTATION

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[a]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	SETPOINT[1]	NOMINAL MEASUREMENT RANGE	ACTION
1. Noble Gas Effluent Monitors - SPINGS[4]					
a. Reactor Building/SLCRS (CV-1; Also called Elevated Release)					
Mid Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1VS-110 Ch 7)			≤ 1660 cpm	1E-3 to 1E+3 uCi/cc[2]	
1st PMM: (RM-1VS-112 SA-10)					
2nd PMM: (RM-1VS-107B, or 110 Ch 5)					
3rd PMM: Grab Sampling every 12 hours					
High Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1VS-110 Ch 9)			NA	1E-1 to 1E+5 uCi/cc[2]	35
1st PMM: (RM-1VS-112 SA-9					
2nd PMM: (RM-1VS-107B, or 110 Ch 5)					
3rd PMM: Grab Sampling every 12 hours					
b. Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)					
Mid Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1VS-109 Ch 7)			≤ 1390 cpm	1E-3 to 1E+3 uCi/cc[2]	
1st PMM: (RM-1VS-111 SA-10)					
2nd PMM: (RM-1VS-101B, or 109 Ch 5)					
3rd PMM: Grab Sampling every 12 hours					
High Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1VS-109 Ch 9)			NA	1E-1 to 1E+5 uCi/cc[2]	
1st PMM: (RM-1VS-111 SA-9)					
2nd PMM: (RM-1VS-101B, or 109 Ch 5)					
3rd PMM: Grab Sampling every 12 hours					
c. Gaseous Waste/Process Vent System (PV-1/2)					
Mid Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1GW-109 Ch 7)			NA	1E-3 to 1E+3 uCi/cc[3]	
1st PMM: (RM-1GW-110 SA-10)					
2nd PMM: (RM-1GW-108B, or 109 Ch 5)					
3rd PMM: Grab Sampling every 12 hours					
High Range Noble Gas	(1)	1, 2, 3, & 4			35
Pri: (RM-1GW-109 Ch 9)			≤ 1.76E+5 cpm	1E-1 to 1E+5 uCi/cc[3]	
1st PMM: (RM-1GW-110 SA-9)					
2nd PMM: (RM-1GW-108B, or 109 Ch5)					
3rd PMM: Grab Sampling every 12 hours					

(a) Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

ATTACHMENT D
Page 3 of 8
ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 3.3-6 (Continued)

BV-1 RADIATION MONITORING INSTRUMENTATION

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[a]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	SETPOINT[1]	NOMINAL MEASUREMENT RANGE	ACTION
2. Noble Gas Effluent Steam Monitors					
a. Atmospheric Steam Dump Valve and Code Safety Relief Valve Discharge					
Pri: (RM-1MS-100A) PMM: (Form 1/2-HPP-4.02.009.F01)	(1)	1, 2, 3, & 4	≤ 50 cpm	1E-1 to 1E+3 uCi/cc	35
Pri: (RM-1MS-100B) PMM: (Form 1/2-HPP-4.02.009.F01)	(1)	1, 2, 3, & 4	≤ 50 cpm	1E-1 to 1E+3 uCi/cc	35
Pri: (RM-1MS-100C) PMM: (Form 1/2-HPP-4.02.009.F01)	(1)	1, 2, 3, & 4	≤ 50 cpm	1E-1 to 1E+3 uCi/cc	35
b. Auxiliary Feedwater Pump Turbine Exhaust					
Pri: (RM-1MS-101) PMM: (Form 1/2-HPP-4.02.009.F01)	(1)	1, 2, 3, & 4	≤ 170 cpm	1E-1 to 1E+3 uCi/cc	35

(a) Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

ATTACHMENT D
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ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 3.3-6 (Continued)

BV-2 RADIATION MONITORING INSTRUMENTATION

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[a]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	SETPOINT[1]	NOMINAL MEASUREMENT RANGE	ACTION
1. Noble Gas Effluent Monitors					
a. SLCRS Filtered Pathway (CV-2; Also called Elevated Release)					
Midrange Noble Gas (Xe-133)					
Pri: (2HVS-RQ109C) 1st PMM: (2HVS-RQ109D) 2nd PMM: (2HVS-RQ109B) 3rd PMM: Grab Sampling every 12 hours	(1)	1, 2, 3, & 4	NA	1E-4 to 1E+2 μCi/cc	35
High Range Noble Gas (Xe-133)					
Pri: (2HVS-RQ109D) 1st PMM: (2HVS-RQ109C) 2nd PMM: (2HVS-RQ109B) 3rd PMM: Grab Sampling every 12 hours	(1)	1, 2, 3, & 4	NA	1E-1 to 1E+5 μCi/cc	35
2. Noble Gas Effluent Steam Monitors					
a. Main Steam Discharge (Kr-88)					
Pri: (2MSS-RQ101A) PMM: Form 1/2-HPP-4.02.009.F01	1/SG	1, 2, 3, & 4	≤ 3.9E-2 μCi/cc	1E-2 to 1E+3 μCi/cc	35
Pri: (2MSS-RQ101B) PMM: Form 1/2-HPP-4.02.009.F01	1/SG	1, 2, 3, & 4	≤ 3.9E-2 μCi/cc	1E-2 to 1E+3 μCi/cc	35
Pri: (2MSS-RQ101C) PMM: Form 1/2-HPP-4.02.009.F01	1/SG	1, 2, 3, & 4	≤ 3.9E-2 μCi/cc	1E-2 to 1E+3 μCi/cc	35

[a] Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

ATTACHMENT D
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ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 3.3-6 (Continued)

TABLE NOTATIONS

(1) Above background

(2) Nominal range for Ch 7 and Ch 9. The Alarm is set on Ch 7.

(3) Nominal range for Ch 7 and Ch 9. The Alarm is set on Ch 9.

(4) Other SPING-4 channels are not applicable to this ODCM Control.

ACTION STATEMENTS

ACTION 35 With the number of OPERABLE channels less than required by the Minimum Channels OPERABLE requirement, either restore the inoperable Channel(s) to OPERABLE status within 72 hours, or:

a) Initiate the preplanned alternate method of monitoring the appropriate parameter(s), and

b) Return the channel to OPERABLE status within 30 days, or generate a condition report and explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

ATTACHMENT D
Page 6 of 8
ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 4.3-3 (Continued)

BV-1 RADIATION MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[(a)]

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
1. Noble Gas Effluent Monitors - SPINGS				
a. Reactor Building/SLCRS (CV-1; Also called Elevated Release)				
Mid Range Noble Gas Pri: (RM-1VS-110 Ch 7) 1st PMM: (RM-1VS-112 SA-10) 2nd PMM: (RM-1VS-107B, or VS-110 Ch 5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
High Range Noble Gas Pri: (RM-1VS-110 Ch 9) 1st PMM: (RM-1VS-112 SA-9) 2nd PMM: (RM-1VS-107B, or VS-110 Ch 5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
b. Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)				
Mid Range Noble Gas Pri: (RM-1VS-109 Ch 7) 1st PMM: (RM-1VS-111 SA-10) 2nd PMM: (RM-1VS-101B, or VS-109 Ch 5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
High Range Noble Gas Pri: (RM-1VS-109 Ch 9) 1st PMM: (RM-1VS-111 SA-9) 2nd PMM: (RM-1VS-101B, or VS-109 Ch 5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
c. Gaseous Waste Process Vent System (PV-1,2)				
Mid Range Noble Gas Pri: (RM-1GW-109 Ch 7) 1st PMM: (RM-1GW-110 SA-10) 2nd PMM: (RM-1GW-108B, or GW-109 Ch 5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
High Range Noble Gas Pri: RM-1GW-109 Ch 9) 1st PMM: (RM-1GW-110 SA-9) 2nd PMM: (RM-1GW-108B, or GW-109 Ch5) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4

(a) Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

ATTACHMENT D

ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 4.3-3 (Continued)

BV-1 RADIATION MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[(a)]

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
2. Noble Gas Effluent Steam Monitors				
a. Atmospheric Steam Dump Valve and Code Safety Relief Valve Discharge				
Pri: (RM-1MS-100A) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4
Pri: (RM-1MS-100B) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4
Pri: (RM-1MS-100C) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4
b. Auxiliary Feedwater Pump Turbine Exhaust				
Pri: (RM-1MS-101) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4

(a) Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

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ODCM CONTROLS: RADIATION MONITORING INSTRUMENTATION

TABLE 4.3-3 (Continued)

BV-2 RADIATION MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, PMM = Preplanned Method of Monitoring[(a)]

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
1. Noble Gas Effluent Monitors				
a. SLCRS Unfiltered Pathway (CV-2; Also called Elevated Release)				
Mid Range Noble Gas Pri: (2HVS-RQ109C) 1st PMM: (2HVS-RQ109D) 2nd PMM: (2HVS-RQ109B) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
High Range Noble Gas Pri: (2HVS-RQ109D) 1st PMM: (2HVS-RQ109C) 2nd PMM: (2HVS-RQ109B) 3rd PMM: Grab Sampling every 12 hours	S	R	M	1, 2, 3, & 4
2. Noble Gas Effluent Steam Monitors				
a. Main Steam Discharge (Kr-88)				
Pri: (2MSS-RQ101A) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4
Pri: (2MSS-RQ101B) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4
Pri: (2MSS-RQ101C) PMM: (Form 1/2-HPP-4.02.009.F01)	S	R	M	1, 2, 3, & 4

(a) Instruments or actions shown as PMM are the preplanned methods to be used when the primary instrument is inoperable. SINCE the PMM instruments shown are not considered comparable alternate monitoring channels, THEN the ODCM Surveillance Requirements do not apply to the PMM. Therefore, the reporting requirement of Action 35b would still apply when inoperability of the primary instrument exceeds 30 days.

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

CONTROLS: RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

3.3.3.9 In accordance with T.S. 5.5.2.a, the radioactive liquid effluent monitoring instrumentation channels shown in ODCM Control 3.3.3.9, Table 3.3-12 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of ODCM CONTROL 3.11.1.1 are not exceeded. The alarm/trip setpoints of the radiation monitoring channels shall be determined in accordance with 1/2-ODC-2.01.

Applicability - During Releases Through the Flow Path:

a. For all Gross Activity (e.g.; Beta or Gamma) Radioactivity Monitors

b. For all Flow Rate Measurement Devices

Applicability - During Liquid Additions to the Tank:

a. For all Tank Level Indicating Devices

Action:

a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above specification, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or correct the alarm/trip setpoint.

b. With one or more radioactive liquid effluent monitoring instrumentation channels inoperable, take the ACTION shown in ODCM Control 3.3.3.9, Table 3.3-12 or conservatively reduce the alarm setpoint. Exert a best effort to return the channel to operable status within 30 days, and if unsuccessful, generate a Condition Report and explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. [a]

c. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.9 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated operable by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST operations at the frequencies shown in ODCM Control 3.3.3.9, Table 4.3-12.

[a] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 3.3-12

V-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments Alt = Alternate Instruments [(a)]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1. Gross Activity Monitors Providing Automatic Termination Of Release		
a. Liquid Waste Effluents Monitor Pri: [RM-1LW-104]	(1)	23
b. Liquid Waste Contaminated Drain Monitor Pri: [RM-1LW-116]	(1)	23
c. Auxiliary Feed Pump Bay Drain Monitor Pri: [RM-1DA-100]	(1)	24
2. Gross Activity Monitors Not Providing Termination Of Release		
a. Component Cooling-Recirculation Spray Heat Exchangers River Water Monitor Pri: [RM-1RW-100]	(1)	24
3. Flow Rate Measurement Devices		
a. Liquid Radwaste Effluent Line Pri: [FR-1LW-104] for [RM-1LW-104]	(1)	25
b. Liquid Waste Contaminated Drain Line Pri: [FR-1LW-103] for [RM-1LW-116]	(1)	25
c. Cooling Tower Blowdown Line Pri: [FT-1CW-101-1], or 1st Alt: [FT-1CW-101] and [2CWS-FT101], or 2nd Alt: Perform 1MSP-31.06-I	(1)	25A
4. Tank Level Indicating Devices (for tanks outside plant building)		
a. Primary Water Storage Tank Pri: [LI-1PG-115A] for [1BR-TK-6A]	(1)	26
b. Primary Water Storage Tank Pri: [LI-1PG-115B] for [1BR-TK-6B]	(1)	26
c. Steam Generator Drain Tank Pri: [LI-1LW-110] for [1LW-TK-7A]	(1)	26
d. Steam Generator Drain Tank Pri: [LI-1LW-111] for [1LW-TK-7B]	(1)	26

[(a)] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 3.3-12 (continued)

BV-2 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments Alt = Alternate Instruments [(a)]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1. Gross Radioactivity Monitor Providing Alarm, And Automatic Termination Of Release		
a. Liquid Waste Process Effluent Monitor Pri: [2SGC-RQ100]	(1)	23
2. Gross Radioactivity Monitors Providing Alarm, But Not Providing Termination Of Release		
a. None Required		
3. Flow Rate Measurement Devices		
a. Liquid Radwaste Effluent Pri: [2SGC-FS100]	(1)	25
b. Cooling Tower Blowdown Line Pri: [FT-1CW-101-1], or 1st Alt: [FT-1CW-101] and [2CWS-FT101], or 2nd Alt: Perform 1MSP-31.06-I	(1)	25A
4. Tank Level Indicating Devices (for tanks outside plant buildings)		
a. None Required		

(a) Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.9 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 3.3-12 (continued)

ACTION STATEMENTS

Action 23 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may be initiated (or resumed) provided that prior to release:

1. At least two independent samples are analyzed in accordance with ODCM SURVEILLANCE REQUIREMENT 4.11.1.1.1, and at least two technically qualified members of the Facility Staff independently verify the release rate calculations[1] and discharge valving, or

2. Initiate monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

Otherwise, suspend release of radioactive effluents via this pathway.

Action 24 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. That at least once per 12 hours grab samples are analyzed for gross radioactivity (beta or gamma) at a Lower Limit of Detection (LLD) of at least 1E-7 uCi/ml, or

2. Initiate monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

(1) Since the computer software used for discharge permit generation automatically performs the release rate calculations, then the independent signatures on the discharge permit for "preparer" and "reviewer" satisfy the requirement for "...two technically qualified members of the Facility Staff independently verify the release rate calculations..."

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

Table 3.3-12 (continued)

ACTION STATEMENTS

Action 25 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. The flow rate is estimated at least once per 4 hours during actual releases. (Pump curves may be used to estimate flow), or

2. Initiate monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

Action 25A With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue by using the method required for the 1st Alternate, or by using the instruments required by the 2nd Alternate, as follows:

1. 1st Alternate: Initiate monitoring with the comparable alternate monitoring channel, which includes both [FT-1CW-101] and [2CWS-FT101]. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement, or

2. 2nd Alternate: The dilution flow rate is calculated at least once per 4 hours during actual releases using the methods described in procedure 1MSP-31.06-I[1].

Action 26 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, liquid additions to this tank may continue provided:

1. The tank liquid level is estimated during all liquid additions to the tank, or

2. Initiate monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

[1] **NOTE:** This MSP requires local water height measurements to calculate the total cooling tower blowdown flow rate. As a guide, the combined flow rate result of this procedure should be similar to the ODCM design value 22,800 gpm (i.e., BV-1 flow rate = 15,000 gpm, + BV-2 flow rate = 7,800 gpm) which assumes operation of a BV-1 Turbine Plant RW Pump, a BV-1 Rx Plant RW Pump, a BV-2 SWS Pump, and normal evaporation via the cooling tower plume.

ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 4.3-12

BV-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. Gross Beta or Gamma Radioactivity Monitors Providing Alarm And Automatic Termination Of Release				
a. Liquid Radwaste Effluent Line Pri: (RM-1LW-104)	D	P(5)	R(3)	Q(1)
b. Liquid Waste Contaminated Drain Line Pri: (RM-1LW-116)	D	P(5)	R(3)	Q(1)
c. Auxiliary Feed Pump Bay Drain Monitor Pri: (RM-1DA-100)	D	D	R(3)	Q(1)
2. Gross Beta Or Gamma Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination Of Release				
a. Component Cooling - Recirculation Spray Heat Exchangers River Water Monitor Pri: (RM-1RW-100)	D	M(5)	R(3)	Q(2)
3. Flow Rate Monitors				
a. Liquid Radwaste Effluent Lines Pri: (FR-1LW-104) for (RM-1LW-104)	D(4)	NA	R	Q
b. Liquid Waste Contaminated Drain Line Pri: (FR-1LW-103) for (RM-1LW-116)	D(4)	NA	R	Q
c. Cooling Tower Blowdown Line Pri: [FT-1CW-101-1), or 1st Alt: [FT-1CW-101] and [2CWS-FT101] **NOTE:** SINCE the 2nd Alternate to the Cooling Tower Blowdown Line is a procedure, (i.e., 1MSP-31.06-I), THEN Surveillance Requirements do not apply to the 2nd Alternate.	D(4)	NA	R	Q

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 4.3-12 (continued)

BV-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
4. Tank Level Indicating Devices (for tanks outside plant buildings)				
a. Primary Water Storage Tank Pri: (LI-1PG-115A) for (1BR-TK-6A)	D*	NA	R	Q
b. Primary Water Storage Tank Pri: (LI -1PG-115B) for (1BR-TK-6B)	D*	NA	R	Q
c. Steam Generator Drain Tank Pri: (LI-1LW-110) for (1LW-TK-7A)	D*	NA	R	Q
d. Steam Generator Drain Tank Pri: (LI-1LW-111) for (1LW-TK-7B)	D*	NA	R	Q

*During liquid additions to the tank.

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ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 4.3-12 (continued)

BV-2 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. Gross Radioactivity Monitor Providing Alarm And Automatic Termination Of Release				
a. Liquid Waste Process Effluent Pri: (2SGC-RQ100)	D	$P^{(5)}$	$R^{(7)(3)}$	$Q^{(6)}$
2. Flow Rate Measurement Devices				
a. Liquid Radwaste Effluent Pri: (2SGC-FS100)	$D^{(4)}$	NA	R	Q
b. Cooling Tower Blowdown Line Pri: [FT-1CW-101-1], or 1st Alt: [FT-1CW-101] and [2CWS-FT101]	$D^{(4)}$	NA	R	Q
NOTE: SINCE the 2nd Alternate to the Cooling Tower Blowdown Line is a procedure, (i.e., 1MSP-31.06-I), THEN Surveillance Requirements do not apply to the 2nd Alternate.				
3. Tank Level Indicating Devices (for tanks outside plant buildings)				
a. None Required				

ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 4.3-12 (continued)

TABLE NOTATION

(1) The CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.
2. Downscale failure.
3. Instrument controls not set in operate mode.

(2) The CHANNEL OPERATIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.
2. Downscale failure.
3. Instrument controls are not set in operate mode.

(3) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified by the National Bureau of (Standards/NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS/NIST. These standards should permit calibrating the system over its intended range of energy and rate capabilities. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used, at intervals of at least once per 18 months. This can normally be accomplished during refueling outages. (Existing plants may substitute previously established calibration procedures for this requirement).

(4) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or batch releases are made.

(5) A SOURCE CHECK may be performed utilizing the installed means or flashing the detector with a portable source to obtain an upscale increase in the existing count rate to verify channel response.

ATTACHMENT E

ODCM CONTROLS: RETS INSTRUMENTATION FOR LIQUID EFFLUENTS

TABLE 4.3-12 (continued)

TABLE NOTATION

(6) The CHANNEL CALIBRATION shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(7) The CHANNEL CALIBRATION shall also demonstrate that Control Room Alarm Annunciation occurs if either of the following conditions exist:

1. Downscale failure.

2. Instrument controls are not set in operate mode.

CONTROLS: RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

3.3.3.10 In accordance with T.S. 5.5.2.a, the radioactive gaseous effluent monitoring instrumentation channels shown in ODCM Control 3.3.3.10, Table 3.3-13 shall be operable with their alarm/trip setpoints set to ensure that the limits of ODCM CONTROL 3.11.2.1 are not exceeded. The alarm/trip setpoints of the radiation monitoring channels shall be determined in accordance with 1/2-ODC-2.02.

Applicability: During releases through the flow path.

Action:

a. With a radioactive gaseous process or effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of ODCM CONTROL 3.11.2.1 are met, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or correct the alarm/trip setpoint.

b. With one or more radioactive gaseous effluent monitoring instrumentation channels inoperable, take the ACTION shown in ODCM Control 3.3.3.10, Table 3.3-13 or conservatively reduce the alarm setpoint. Exert a best effort to return the channel to operable status within 30 days, and if unsuccessful, generate a Condition Report and explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. [a]

c. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.10 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated operable by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST operations at the frequencies shown in ODCM Control 3.3.3.10, Table 4.3-13.

[a] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

ATTACHMENT F
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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments Alt = Alternate Instruments [a]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. Gaseous Waste/Process Vent System (PV-1/2)			
a. Noble Gas Activity Monitor Pri: [RM-1GW-108B], or Alt For Continuous Release: **[RM-1GW-109 Ch 5]** may only be used as the comparable alternate monitoring channel for continuous releases via this pathway. Alt For Batch Releases: **[NONE, see Action 27]**; For information, [RM-1GW-109 Ch 5] SHALL NOT be used as the comparable alternate monitoring channel for batch releases of the BV-1 GWDTs or the BV-2 GWSTs. Specifically, SINCE this channel does not perform the same automatic isolation function as the primary channel, THEN ACTION 27 shall be followed for batch releases of the BV-1 GWDTs or the BV-2 GWSTs via this pathway.	(1)	*	27,29,30A,30B
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1GW-109], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1GW-110], or 2nd Alt: Continuous collection via RASP Pump	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: [FR-1GW-108], or Alt: [RM-1GW-109 Ch 10]	(1)	*	28A
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 1.b) Pri: [RM-1GW-109 Ch 15], or 1st Alt: Rotometer [FM-1GW-101] and Vacuum Gauge [PI-1GW-135], or 2nd Alt: RASP Pump Flow Instrument	(1)	*	28B
2. Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)			
a. Noble Gas Activity Monitor Pri: [RM-1VS-101B], or Alt: [RM-1VS-109 Ch 5]	(1)	*	29,30A
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1VS-109], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1VS-111], or 2nd Alt: Continuous collection via RASP Pump	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: [FR-1VS-101], or Alt: [RM-1VS-109 Ch 10]	(1)	*	28A
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 2.b) Pri: [RM-1VS-109 Ch 15], or 1st Alt: Rotometer [FM-1VS-102] and Vacuum Gauge [PI-1VS-659], or 2nd Alt: RASP Pump Flow Instrument	(1)	*	28B

* During Releases via this pathway.

[a] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

ATTACHMENT F

ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13 (continued)

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments Alt = Alternate Instruments [(a)]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
3. Reactor Building/SLCRS (CV-1; Also called Elevated Release)			
a. Noble Gas Activity Monitor Pri: [RM-1VS-107B], or Alt: [RM-1VS-110 Ch 5]	(1)	*	29,30A
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1VS-110], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1VS-112], or 2nd Alt: Continuous collection via RASP Pump	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: [FR-1VS-112], or Alt: [RM-1VS-110 Ch 10]	(1)	*	28A
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 3.b) Pri: [RM-1VS-110 Ch 15], or 1st Alt: Rotometer [FM-1VS-103] and Vacuum Gauge [PI-1VS-660], or 2nd Alt: RASP Pump Flow Instrument	(1)	*	28B

* During Releases via this pathway.

(a) Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

ATTACHMENT F

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments   Alt = Alternate Instruments [(a)]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. SLCRS Unfiltered Pathway (VV-2; Also called Ventilation Vent)			
a. Noble Gas Activity Monitor Pri: [2HVS-RQ101B]	(1)	*	29, 30B
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVS-RQ101], or Alt: Continuous collection via RASP Pump	(1)	*	32
c. Process Flow Rate Monitor Pri: Monitor Item 29 for [2HVS-VP101]	(1)	*	28A
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 1.b) Pri: [2HVS-FIT101-1], or Alt: RASP Pump Flow Instrument	(1)	*	28B
2. SLCRS Filtered Pathway (CV-2; Also called Elevated Release)			
a. Noble Gas Activity Monitor Pri: [2HVS-RQ109B]	(1)	*	29, 30B
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVS-RQ109] High Flow Path, or Alt: Continuous collection via RASP Pump	(1)	*	32
c. Process Flow Rate Monitor Pri: Monitor Item 29 for [2HVS-FR22], or 1st Alt: [2HVS-FI22A and FI22C], or 2nd Alt: [2HVS-FI22B and FI22D]	(1)	*	28A
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 2.b) Pri: Monitor Item 28 & 72 for [2HVS-DAU109B), or Alt: RASP Pump Flow Instrument	(1)	*	28B
3. Decontamination Building Vent (DV-2)			
a. Noble Gas Activity Monitor Pri: [2RMQ-RQ301B]	(1)	*	29
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2RMQ-RQ301], or Alt: Continuous collection via RASP Pump	(1)	*	32
c. Process Flow Rate Monitor	None	None	None
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 3.b) Pri: [2RMQ-FIT301-1], or Alt: RASP Pump Flow Instrument	(1)	*	28B

* During Releases via this pathway.

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

[a] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments   Alt = Alternate Instruments [a]

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
4. Condensate Polishing Building Vent (CB-2)			
a. Noble Gas Activity Monitor Pri: [2HVL-RQ112B]	(1)	*	29
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVL-RQ112], or Alt: Continuous collection via RASP Pump	(1)	*	32
c. Process Flow Rate Monitor	None	None	None
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 4.b) Pri: [2HVL-FIT112-1], or Alt: RASP Pump Flow Instrument	(1)	*	28B
5. Waste Gas Storage Vault Vent (WV-2)			
a. Noble Gas Activity Monitor Pri: [2RMQ-RQ303B]	(1)	*	29
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2RMQ-RQ303], or Alt: Continuous collection via RASP Pump	(1)	*	32
c. Process Flow Rate Monitor	None	None	None
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 5.b) Pri: [2RMQ-FIT303-1], or Alt: RASP Pump Flow Instrument	(1)	*	28B

* During Releases via this pathway.

[a] Condition Report generation and reporting in the Radioactive Effluent Release Report (per Control 3.3.3.10 Action b) do not apply when using an alternate to satisfy inoperability of the primary instrument beyond 30 days.

TABLE 3.3-13 (continued)

ACTION STATEMENTS

Action 27 APPLICABLE FOR BATCH RELEASES OF BV-1 GASEOUS WASTE DECAY TANKS OR BV-2 GASEOUS WASTE STORAGE TANKS

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the Unit 1 Gaseous Waste Decay Tanks (GWDT's) or the Unit 2 Gaseous Waste Storage Tanks (GWST's) may be released to the environment provided that prior to initiating (or resuming) the release:

1. At least two independent samples of the tank's content are analyzed and at least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge valve lineup, or
2. Initiate continuous monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM Control requirement.

Otherwise, suspend releases of radioactive effluents via this pathway.

Action 28A APPLICABLE FOR BV-1 SYSTEM EFFLUENT FLOW RATE MEASURING DEVICES OR BV-2 PROCESS FLOWRATE MONITORS

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. The system/process flow rate is estimated at least once per 4 hours (or assumed to be at the ODCM design value[1]), or
2. Initiate continuous monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM Control requirement.

(1) In lieu of estimating the system/process flow rate at least once per 4 hours, the system/process flow rate can be assumed to be at the following ODCM design values:

1,450 cfm = BV-1 Gaseous Waste/Process Vent System (PV-1,2)
62,000 cfm = BV-1 Auxiliary Building Ventilation System (VV-1)
49,300 cfm = BV-1 Reactor Building/SLCRS (CV-1)
23,700 cfm = BV-2 SLCRS Unfiltered Pathway (VV-2)
59,000 cfm = BV-2 SLCRS Filtered Pathway (CV-2)

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13 (continued)

ACTION STATEMENTS

Action 28B APPLICABLE FOR BV-1 SAMPLER FLOW RATE MEASURING DEVICES OR BV-2 SAMPLER FLOWRATE MONITORS

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. The sampler flow rate is estimated at least once per 4 hours, or
2. Initiate continuous monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM Control requirement.

Action 29 APPLICABLE FOR CONTINUOUS RELEASES

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. Grab samples (or local monitor readings)(1) are taken at least once per 12 hours. If grab samples are taken, these samples are to be analyzed for gross activity within 24 hours, or
2. Initiate continuous monitoring with the comparable alternate monitoring channel. ODCM Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

(1) For BV-2, there are situations where the local monitor (e.g.; the RM-80) is capable of performing the intended monitoring function, but the communications are lost to the Control Room. In this case, the local monitor can be read at least once per 12 hours in-lieu of obtaining grab samples at least once per 12 hours.

ATTACHMENT F

ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 3.3-13 (continued)

ACTION STATEMENTS

Action 30A APPLICABLE FOR THE INITIAL BATCH PURGE OF THE BV-1 REACTOR CONTAINMENT

With the number of channels OPERABLE less than required by minimum Channels OPERABLE requirement, immediately suspend PURGING of Reactor Containment via this pathway if both RM-1VS-104A and B are not OPERABLE with the purge/exhaust system in service. The following should also be noted:

1. As stated, this Action is applicable for INOPERABLE monitors only when performing the initial batch purge of the reactor containment atmosphere (i.e.; immediately after reactor containment atmosphere equalization).

2. Since all other releases of reactor containment atmosphere (i.e.; after the initial batch purge) are considered continuous releases, then this Action is not applicable. Therefore, Action 29 is applicable for INOPERABLE monitors when performing a continuous release of the reactor containment atmosphere.

Action 30B APPLICABLE FOR THE INITIAL BATCH PURGE OF THE BV-2 REACTOR CONTAINMENT

With the number of channels OPERABLE less than required by Minimum Channels OPERABLE requirement, immediately suspend PURGING of Reactor Containment via this pathway if both 2HVR-RQ104A and 104B are not OPERABLE with the purge/exhaust system in service. The following should also be noted:

1. As stated, this Action is applicable for INOPERABLE monitors only when performing the initial batch purge of the reactor containment atmosphere (i.e.; immediately after reactor containment atmosphere equalization).

2. Since all other releases of reactor containment atmosphere (i.e.; after the initial batch purge) are considered continuous releases, then this Action is not applicable. Therefore, Action 29 is applicable for INOPERABLE monitors when performing a continuous release of the reactor containment atmosphere.

Action 32 APPLICABLE FOR CONTINUOUS RELEASES

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in ODCM Control 3.11.2.1, Table 4.11-2, or sampled and analyzed once every 12 hours.

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 4.3-13

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. Gaseous Waste/Process Vent System (PV-1/2)				
a. Noble Gas Activity Monitor Pri: [RM-1GW-108B], or **<u>Alt For Continuous Release:</u> [RM-1GW-109 Ch 5]** This channel may only be used as the comparable alternate monitoring channel for continuous releases via this pathway. **<u>Alt For Batch Releases:</u> [NONE, See Action 27];** For information, [RM-1GW-109 Ch 5] SHALL NOT be used as the comparable alternate monitoring channel for batch releases of the BV-1 GWDTs or the BV-2 GWSTs. Specifically, <u>SINCE</u> this channel does not perform the same automatic isolation function as the primary channel, <u>THEN</u> ACTION 27 shall be followed for batch releases of the BV-1 GWDTs or the BV-2 GWSTs via this pathway	P	P(4)	R(3)	Q(1)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1GW-109], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1GW-110], or 2nd Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. System Effluent Flow Rate Measuring Device Pri: [FR-1GW-108], or Alt: [RM-1GW-109 Ch 10]	P	NA	R	Q
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 1.b) Pri: [RM-1GW-109 Ch 15], or 1st Alt: (Rotometer: FM-1GW-101 and Vacuum Gauge: PI-1GW-135), or 2nd Alt: RASP Pump Flow Instrument	D*	NA	R	Q
2. Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)				
a. Noble Gas Activity Monitor Pri: [RM-1VS-101B], or Alt: [RM-1VS-109 Ch 5]	D	M(4), P(4)***	R(3)	Q(2)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1VS-109], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1VS-111], or 2nd Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. System Effluent Flow Rate Measurement Device Pri: [FR-1VS-101], or Alt: [RM-1VS-109 Ch 10]	D	NA	R	Q
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 2.b) Pri: [RM-1VS-109 Ch 15], or 1st Alt: Rotometer [FM-1VS-102] and Vacuum Gauge [PI-1VS-659], or 2nd Alt: RASP Pump Flow Instrument	D	NA	R	Q

* During Releases via this pathway.

*** During purging of Reactor Containment via this pathway.

TABLE 4.3-13

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments   Alt = Alternate Instruments

INSTRUMENT	CHANNE L CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
3. Reactor Building/SLCRS (CV-1; Also called Elevated Release)				
a. Noble Gas Activity Monitor Pri: [RM-1VS-107B], or Alt: [RM-1VS-110 Ch 5]	D	M(4), P(4)***	R(3)	Q(2)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [RM-1VS-110], or 1st Alt: Filter Paper & Charcoal Cartridge for [RM-1VS-112], or 2nd Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. System Effluent Flow Rate Measuring Device Pri: [FR-1VS-112], or Alt: [RM-1VS-110 Ch 10]	D	NA	R	Q
d. Sampler Flow Rate Measuring Device Used for Particulate and Iodine Sample Collection (see 3.b) Pri: [RM-1VS-110 Ch 15], or 1st Alt: Rotometer [FM-1VS-103] and Vacuum Gauge [PI-1VS-660], or 2nd Alt: RASP Pump Flow Instrument	D	NA	R	Q

* During releases via this pathway.

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 4.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. SLCRS Unfiltered Pathway (VV-2; Also called Ventilation Vent)				
a. Noble Gas Activity Monitor Pri: [2HVS-RQ101B]	D	M(4), P(4)***	R(3)(6)	Q(5)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVS-RQ101], or Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: (Monitor Item 29 for [2HVS-VP101]	D	NA	R	Q
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 1.b) Pri: [2HVS-FIT101-1], or Alt: RASP Pump Flow Instrument	D	NA	R	Q
2. SLCRS Filtered Pathway (CV-2; Also called Elevated Release)				
a. Noble Gas Activity Monitor Pri: [2HVS-RQ109B]	D	M(4), P(4)***	R(3)(6)	Q(5)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVS-RQ109] High Flow Path, or Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: Monitor Item 29 for [2HVS-FR22], or 1st Alt: [2HVS-FI22A and FI22C], or 2nd Alt: [2HVS-FI22B and FI22D]	D	NA	R	Q
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 2.b) Pri: Monitor Items 28 and 72 for [2HVS-DAU109B], or Alt: RASP Pump Flow Instrument	D	NA	R	Q
3. Decontamination Building Vent (DV-2)				
a. Noble Gas Activity Monitor Pri: [2RMQ-RQ301B]	D	M(4)	R(3)(6)	Q(5)
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2RMQ-RQ301], or Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. Process Flow Rate Monitor	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 3.b) Pri: [2RMQ-FIT301-1], or Alt: RASP Pump Flow Instrument	D	NA	R	Q

*** During purging of Reactor Containment via this pathway.

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 4.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments Alt = Alternate Instruments

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
4. Condensate Polishing Building Vent (CB-2)				
a. Noble Gas Activity Monitor Pri: [2HVL-RQ112B]	D	$M^{(4)}$	$R^{(3)(6)}$	$Q^{(5)}$
b. Particulate and Iodine Sampler Pri: Filter Paper & Charcoal Cartridge for [2HVL-RQ112], or Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. Process Flow Rate Monitor	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 4.b) Pri: [2HVL-FIT112-1], or Alt: RASP Pump Flow Instrument	D	NA	R	Q
5. Waste Gas Storage Vault Vent (WV-2)				
a. Noble Gas Activity Monitor Pri: [2RMQ-RQ303B]	D	$M^{(4)}$	$R^{(3)(6)}$	$Q^{(5)}$
b. Particulate and Iodine Samples Pri: Filter Paper & Charcoal Cartridge for [2RMQ-RQ303], or Alt: Continuous collection via RASP Pump	W	NA	NA	NA
c. Process Flow Rate Monitor	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Used for Particulate and Iodine Sample Collection (see 5.b) Pri: [2RMQ-FIT303-1], or Alt: RASP Pump Flow Instrument	D	NA	R	Q

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ODCM CONTROLS: RETS INSTRUMENT FOR GASEOUS RELEASES

TABLE 4.3-13 (continued)

TABLE NOTATION

(1) The CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if any of the following conditions exist:

a. Instrument indicates measured levels above the alarm/trip setpoint.
b. Downscale failure.
c. Instrument controls not set in operate mode.

(2) The CHANNEL OPERATIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if any of the following conditions exist:

a. Instrument indicates measured levels above the alarm/trip setpoint.
b. Downscale failure.
c. Instrument controls not set in operate mode.

(3) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified be National Bureau of Standards or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards should permit calibrating the system over its intended range of energy and rate capabilities. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used, at intervals of at least once per 18 months. This can normally be accomplished during refueling outages.

(4) A SOURCE CHECK may be performed utilizing the installed means or flashing the detector with a portable source to obtain an upscale increase in the existing count rate to verify channel response.

(5) The CHANNEL OPERATIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(6) The CHANNEL CALIBRATION shall also demonstrate that Control Room Alarm Annunciation occurs if either of the following conditions exist:

1. Downscale failure.
2. Instrument controls are not set in operate mode.

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ODCM CONTROLS: LIQUID EFFLUENT CONCENTRATION

CONTROLS: LIQUID EFFLUENT CONCENTRATION

3.11.1.1 In accordance with T.S. 5.5.2.b and T.S. 5.5.2.c, the concentration of radioactive material released at any time from the site (see 1/2-ODC-2.01, Figure 5-1) shall be limited to 10 times the EC's specified in 10 CFR Part 20, Appendix B (20.1001-20.2402), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. This is referred to as the ODCM Effluent Concentration Limit (OEC). For dissolved or entrained noble gases, the concentration shall be limited to 2E-4 uCi/ml total activity.

Applicability: At all times.

Action:

a. With the concentration of radioactive material released from the site to unrestricted areas exceeding the above limits; immediately restore the concentration within the above limits, and

b. Submit a Special Report to the Commission within 30 days in accordance with 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1).

c. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.1.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of ODCM Control 3.11.1.1, Table 4.11-1*.

4.11.1.1.2 The results of radioactive analysis shall be used in accordance with 1/2-ODC-2.01 to assure that the concentration at the point of release are maintained within the limits of ODCM CONTROL 3.11.1.1.

4.11.1.1.3 When BV-1 primary to secondary leakage exceeds 0.1 gpm (142 gpd), samples of the Turbine Building Sump shall be obtained every 8 hours to ensure that the Turbine Building Sump concentration does not exceed 1 OEC. Once it is determined that an OEC is reached, the Turbine Building Sump shall be routed to the Chemical Waste Sump.

ATTACHMENT G
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ODCM CONTROLS: LIQUID EFFLUENT CONCENTRATION

SURVEILLANCE REQUIREMENTS (continued)

4.11.1.1.4 When BV-2 primary to secondary leakage exceeds 0.1 gpm (142 gpd), samples of the Turbine Building Sump shall be obtained every 8 hours to ensure that the Turbine Building Sump concentration does not exceed 1 OEC. Once it is determined that an OEC is reached, the Turbine Building Sump shall be routed to Steam Generator blowdown hold tank (2SGC-TK21A or 2SGC-TK21B).

4.11.1.1.5 Prior to the BV-2 Recirculation Drain Pump(s) (2DAS-P215A/215B) discharging to catch basin 16, a grab sample will be taken. The samples will be analyzed for gross activity at a sensitivity of at least 1E-7 uCi/ml. Water volume discharged shall be estimated from the number of pump operations unless alternate flow or volume instrumentation is provided.

* Radioactive liquid discharges are normally via batch modes. BV-1 and BV-2 Turbine Building Drains shall be monitored as specified in ODCM SURVEILLANCE REQUIREMENT 4.11.1.1.3 and 4.11.1.1.4. The BV-2 Recirculation drain pump discharge shall be monitored as specified in ODCM SURVEILLANCE REQUIREMENT 4.11.1.1.5, respectively.

ATTACHMENT G
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ODCM CONTROLS: LIQUID EFFLUENT CONCENTRATION

TABLE 4.11-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
A. Batch Waste Release Tanks[d]	P Each Batch[h]	P Each Batch[h]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	P One Batch/M[h]	M	Dissolved And Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch[h]	M Composite[b]	H-3	1E-5
			Gross Alpha	1E-7
	P Each Batch[h]	Q Composite[b]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Continuous Releases[e][g]	Grab Sample[g]	W Composite[c]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	Grab Sample[g]	M	Dissolved And Entrained Gases (Gamma Emitters)	1E-5
	Grab Sample[g]	M Composite[c]	H-3	1E-5
			Gross Alpha	1E-7
	Grab Sample[g]	Q Composite[c]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6

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ODCM CONTROLS: LIQUID EFFLUENT CONCENTRATION

TABLE 4.11-1 (continued)

TABLE NOTATION

(a) The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ Sb}{(E)(V)(2.22)(Y)\ \exp(-\lambda\Delta T)}$$

where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume);

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute);

E is the counting efficiency (as counts per transformation);

V is the sample size (in units of mass or volume);

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

ΔT is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

The value of S_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y and ΔT should be used in the calculations.

The LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

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ODCM CONTROLS: LIQUID EFFLUENT CONCENTRATION

TABLE 4.11-1 (continued)

TABLE NOTATION

(b) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

(c) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

(d) A batch release exists when the discharge of liquid wastes is from a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

(e) A continuous release exists when the discharge of liquid wastes is from a non-discrete volume; e.g., from a volume of a system having an input flow during the continuous release. Releases from the Turbine Building Drains and the AFW Pump Bay Drain System and Chemical Waste Sump are considered continuous when the primary to secondary leak rate exceeds 0.1 gpm (142 gpd).

(f) The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should be reported as "less than" the nuclide's LLD, and should not be reported as being present at the LLD level for that nuclide. The "less than" values should not be used in the required dose calculations. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the Radioactive Effluent Release Report.

(g) When radioactivity is identified in the secondary system, a RWDA-L should be prepared on a monthly basis to account for the radioactivity that will eventually be discharged to the Ohio River.

(h) Whenever the BV-2 Recirculation Drain Pump(s) are discharging to catch basin 16, sampling will be performed by means of a grab sample taken every 4 hours during pump operation.

ATTACHMENT H
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ODCM CONTROLS: LIQUID EFFLUENT DOSE

CONTROLS: LIQUID EFFLUENT DOSE

3.11.1.2 In accordance with T.S.5.5.2.d and T.S. 5.5.2.c, the dose or dose commitment to MEMBER(S) OF THE PUBLIC from radioactive materials in liquid effluents released from the reactor unit (see 1/2-ODC-2.01 Figure 5-1), which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be limited: 10-7-14

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and

b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

<u>Applicability</u>: At all times.

<u>Action</u>:

a. With the calculated dose from the release of radioactive materials in liquid effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce the releases, and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits. (This Special Report shall also include (1) the results of radiological analyses of the drinking water source and (2) the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act).* 10-7-14

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.2.1 <u>Dose Calculations</u>. Cumulative dose contributions from liquid effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be determined in accordance with 1/2-ODC-2.01 at least once per 31 days. 10-7-14

* Applicable only if drinking water supply is taken from the receiving water body within three miles of the plant discharge (three miles downstream only).

ATTACHMENT I
Page 1 of 1
ODCM CONTROLS: LIQUID RADWASTE TREATMENT SYSTEM

CONTROLS: LIQUID RADWASTE TREATMENT SYSTEM

3.11.1.3 In accordance with T.S.5.5.2.f, the Liquid Radwaste Treatment System shall be used to reduce the radioactive materials in each liquid waste batch prior to its discharge when the projected doses due to liquid effluent releases from the reactor unit (see 1/2-ODC-2.01 Figure 5-1) when averaged over 31 days would exceed 0.06 mrem to the total body or 0.2 mrem to any organ.

Applicability: At all times.

Action:

a. With liquid waste being discharged without treatment and exceeding the limits specified, prepare and submit to the Commission within 30 days pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1) a Special Report which includes the following information:

1. Identification of the inoperable equipment or subsystems and the reason for inoperability.
2. Action(s) taken to restore the inoperable equipment to operational status, and
3. Summary description of action(s) taken to prevent a recurrence.

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.3.1 Doses due to liquid releases shall be projected at least once per 31 days, in accordance with 1/2-ODC-2.01.

ATTACHMENT J

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ODCM CONTROLS: LIQUID HOLDUP TANKS

CONTROLS: LIQUID HOLDUP TANKS

3.11.1.4 In accordance with T.S.5.5.8, the quantity of radioactive material contained in each of the following tanks shall be limited to the values listed below, excluding tritium and dissolved or entrained noble gases.

a. ≤ 18 Curies: 1BR-TK-6A (Unit 1 Primary Water Storage Tank)
b. ≤ 18 Curies: 1BR-TK-6B (Unit 1 Primary Water Storage Tank)
c. ≤ 7 Curies: 1LW-TK-7A (Unit 1 Steam Generator Drain Tank)
d. ≤ 7 Curies: 1LW-TK-7B (Unit 1 Steam Generator Drain Tank)
e. ≤ 6 Curies: 1QS-TK-1 (Unit 1 Refueling Water Storage Tank-RWST)
f. ≤ 62 Curies: 2QSS-TK21 (Unit 2 Refueling Water Storage Tank-RWST)
g. ≤ 10 Curies: Unit 1 and 2 miscellaneous temporary outside radioactive liquid storage tanks.

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in the tank exceeding the limit, perform calculations to determine compliance to the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2. These calculations shall be performed at the nearest potable water supply, and the nearest surface water supply in the unrestricted area (i.e.; at the entrance to the Midland Water Treatment Facility). IF the limits of 10 CFR Part 20 are determined to be exceeded, THEN immediately suspend all additions of radioactive material to the tank and within 48 hours reduce the tank contents to within the limits set forth in 10 CFR Part 20, and

b. Submit a Special Report in accordance with 10 CFR 50.4 (b) (1) within 30 days and include a schedule and a description of activities planned and/or taken to reduce the contents to within the limits set forth in 10 CFR Part 20.

c. The provisions ODCM Control 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.4.1 The quantity of radioactive material contained in each of the above listed tanks (except the Unit 1 and 2 RWST's) shall be determined to be within the above limit by analyzing a representative sample of the tank's contents at least once per 7 days when radioactive materials are being added to the tank.

4.11.1.4.2 SINCE additions of radioactive material to the Unit 1 and 2 RWST's are normally made at the end of a refueling outage (i.e.; drain down of the reactor cavity back to the RWST), THEN compliance to this limit shall be performed as follows:

The quantity of radioactive material contained in the Unit 1 and 2 RWST's shall be determined to be within the above limit by analyzing a representative sample of the tank's contents within 7 days after transfer of reactor cavity water to the respective Unit's RWST.

ATTACHMENT K
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ODCM CONTROLS: GASEOUS EFFLUENT DOSE RATE

CONTROLS: GASEOUS EFFLUENT DOSE RATE

3.11.2.1 In accordance with T.S.5.5.2.c and T.S. 5.5.2.g, the dose rate in the unrestricted areas (see 1/2-ODC-2.02 Figure 5-1) due to radioactive materials released in gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), from the site shall be limited to the following values: 10-7-14

a. The dose rate limit for noble gases shall be ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin*, and

b. The dose rate limit, inhalation pathway only, for I-131, tritium and all radionuclides in particulate form (excluding C-14) with half-lives greater than eight days shall be ≤ 1500 mrem/yr to any organ.

Applicability: At all times.

Action:

a. With the dose rate(s) exceeding the above limits, immediately decrease the release rate to comply with the above limits(s), and

b. Submit a Special Report to the Commission within 30 days pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1).

c. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.1.1 The dose rate due to noble gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be determined to be within the above limits in accordance with 1/2-ODC-2.02. 10-7-14

4.11.2.1.2 The dose rate, inhalation pathway only, for I-131, tritium and all radionuclides in particulate form (excluding C-14) with half-lives greater than eight days in gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be determined to be within the above limits in accordance with the methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in ODCM Control 3.11.2.1, Table 4.11-2. 10-7-14

*During containment purge the dose rate may be averaged over 960 minutes.

ATTACHMENT K

ODCM CONTROLS: GASEOUS EFFLUENT DOSE RATE

TABLE 4.11-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
A. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1E-4
	Each Tank* Grab Sample	Each Tank*	H-3*	1E-6
B. Containment Purge	P Each Purge[b] Grab Sample	P Each Purge[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6
C. Ventilation Systems[h] VV-1 (U1 PAB/Ventilation Vent) CV-1 (U1 Rx Cont/SLCRS Vent) PV-1/2 (U1/2 GW/Process Vent) VV-2 (U2 SLCRS Unfiltered Path) CV-2 (U2 SLCRS Filtered Path) DV-2 (U2 Decon Bldg Vent) WV-2 (U2 Waste Gas Vault Vent) CB-2 (U2 Cond Pol Bldg Vent)	M[b][c][e] Grab Sample	M[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6

* The H-3 concentration shall be estimated prior to release and followed up with an H-3 grab sample from the Ventilation System during release.

ATTACHMENT K
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ODCM CONTROLS: GASEOUS EFFLUENT DOSE RATE

TABLE 4.11-2 (continued)

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
D. All Ventilation Systems Listed Above (in C.) Which Produce Continuous Release	Continuous[f]	W[d] Charcoal Sample	I-131	1E-12
			I-133	1E-10
	Continuous[f]	W[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1E-11
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1E-11
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1E-11
	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta And Gamma	1E-6

ATTACHMENT K
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ODCM CONTROLS: GASEOUS EFFLUENT DOSE RATE

TABLE 4.11-2 (continued)

TABLE NOTATION

(a) The Lower Limit of Detection (LLD) is defined in Table Notation (a) of ODCM Control 3.11.1.1, Table 4.11-1 for ODCM Surveillance Requirement 4.11.1.1.

(b) Samples (grab particulate, iodine & noble gas) and analysis shall also be performed following SHUTDOWN, STARTUP, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period. This requirement does not apply if (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

Clarification: All samples shall be obtained within 24 hours of reaching the intended steady state power level, and analyzed within 48 hours of reaching the intended steady state power level.

Applicability: Unit 1 Ventilation Systems (VV-1, CV-1 and/or PV-1/2), or Unit 2 Ventilation Systems (VV-2, CV-2 and/or PV-1/2), as appropriate. Specifically, sample the ventilation release path(s) that show a factor of 3 increase on the noble gas effluent monitor. [3.1.16] [3.1.18]

(c) Tritium grab samples shall be taken at least once per 24 hours (from the appropriate ventilation release path of the refueling canal area) when the containment refueling canal is flooded. Sampling may be terminated after completion of vessel defueling. Sampling shall resume upon commencement of vessel refueling.

Applicability - (MODE 6): Unit 1 Ventilation System (VV-1 or CV-1), or Unit 2 Ventilation System (VV-2 or CV-2), that is aligned to the Reactor Containment Building atmosphere. In lieu of sampling the ventilation release path, samples may be obtained from the Reactor Containment Building atmosphere. [3.1.11] [3.1.19]

(d) Part 1: Samples (continuous particulate & iodine) shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from sampler.

Applicability for Part 1: Unit 1 and Unit 2 Ventilation Systems (VV-1, CV-1, PV-1/2, VV-2, CV-2, DV-2, WV-2 & CB-2).

Part 2: Samples (continuous particulate & iodine) shall also be changed at least once per 24 hours for at least 7 days following each SHUTDOWN, STARTUP, or THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

Clarification: All samples shall be changed within 24 hours of reaching the intended steady state power level, and analyzed within 48 hours of reaching the intended steady state power level.

Applicability for Part 2: Unit 1 Ventilation Systems (VV-1, CV-1 and/or PV-1/2), or Unit 2 Ventilation Systems (VV-2, CV-2 and/or PV-1/2), as appropriate. Specifically, change out the continuous particulate, iodine samples for the ventilation release path(s) that show a factor of 3 increase on the noble gas effluent monitor. [3.1.16] [3.1.18]

ODCM CONTROLS: GASEOUS EFFLUENT DOSE RATE

(e) Tritium grab samples shall be taken at least once per 7 days (from the appropriate ventilation release path of the spent fuel pool area) whenever spent fuel is in the spent fuel pool.

Applicability: Unit 1 Ventilation System (CV-1), or Unit 2 Ventilation System (CV-2) that is aligned to the Fuel Handling Building atmosphere. In lieu of sampling the ventilation release path, samples may be obtained from the Fuel Handling Building atmosphere. (3.1.11) (3.1.19)

(f) The average ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with ODCM CONTROLS 3.11.2.1, 3.11.2.2, and 3.11.2.3.

Clarification: The average ratio of the sample flow rate to the sampled stream flow rate can be determined, but it must not be used in dose and dose rate calculation. Specifically, use of this ratio would provide non-conservative dose calculations, and would compromise licensee response to NRC Unresolved Item 50-334/83-30-05. For information, a comprehensive three-year Radiation Monitor Particle Study was performed in response to the unresolved item's concern that the effluent monitors were not collecting representative samples per ANSI N13.1. The results of that study concluded that a correction factor (minimum CF of 2) must be applied to particulate sample volume calculations and subsequent dose and dose rate calculations. Specifically, the minimum CF of 2 must be utilized in-lieu of actual ratios of sample flow rate to the sampled stream flow rate. In summary, the minimum CF of 2 provides adequate compensation for any negative bias in particulate sample collection. (3.2.13)

Applicability: Unit 1 Ventilation Systems (VV-1, CV-1 & PV-1/2), and Unit 2 Ventilation Systems (VV-2 & CV-2).

(g) The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD level for that nuclide. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

(h) Only when this release path is in use.

Applicability: Unit 1 and Unit 2 Ventilation Systems (VV-1, CV-1, PV-1/2, VV-2, CV-2, DV-2, WV-2 & CB-2).

ATTACHMENT L
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ODCM CONTROLS: DOSE- NOBLE GASES

CONTROLS: DOSE-NOBLE GASES

3.11.2.2 In accordance with T.S. 5.5.2.e and T.S. 5.5.2.h,, the air dose from the reactor unit in unrestricted areas (see 1/2-ODC-2.02 Figure 5-1), due to noble gases released in gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be limited to the following: 10-7-14

a. During any calendar quarter, to ≤ 5 mrad for gamma radiation and ≤ 10 mrad for beta radiation.

b. During any calendar year, to ≤ 10 mrad for gamma radiation and ≤ 20 mrad for beta radiation.

Applicability: At all times.

Action:

a. With the calculated air dose from radioactive noble gases in gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken to reduce the releases and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits. 10-7-14

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.2.1 Dose Calculations. Cumulative dose contributions shall be determined in accordance with 1/2-ODC-2.02 at least once every 31 days.

ATTACHMENT M

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ODCM CONTROLS: DOSE - RADIOIODINES AND PARTICULATES

CONTROLS: DOSE-RADIOIODINES, RADIOACTIVE MATERIAL IN PARTICULATE FORM, AND RADIONUCLIDES OTHER THAN NOBLE GASES

3.11.2.3 In accordance with T.S. 5.5.2.e and T.S. 5.5.2.i, the dose to MEMBER(S) OF THE PUBLIC from radioiodines and radioactive materials in particular form (excluding C-14), and radionuclides (other than noble gases) with half-lives greater than eight days in gaseous effluents releases from the reactor unit (see 1/2-ODC-2.02 Figure 5-1), which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be limited to the following:

a. During any calendar quarter to ≤ 7.5 mrem to any organ, and

b. During any calendar year to ≤ 15 mrem to any organ.

Applicability: At all times.

Action:

a. With the calculated dose from the release of radioiodines, radioactive materials in particulate form, (excluding C-14), and radionuclides (other than noble gases) with half-lives greater than eight days, in gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to reduce the releases and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits.

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.3.1 Dose Calculations. Cumulative dose contributions shall be determined in accordance with 1/2-ODC-2.02 at least once every 31 days.

ATTACHMENT N
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ODCM CONTROLS: GASEOUS RADWASTE TREATMENT SYSTEM

CONTROLS: GASEOUS RADWASTE TREATMENT SYSTEM

3.11.2.4 In accordance with T.S. 5.5.2.f, Item 6, the Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases from the reactor unit (see 1/2-ODC-2.02 Figure 5-1), when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The appropriate portions of the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases from the reactor unit (see 1/2-ODC-2.02 Figure 5-1) when averaged over 31 days would exceed 0.3 mrem to any organ.

Applicability: At all times.

Action:

a. With gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which includes the following information.

1. Identification of the inoperable equipment or subsystems and the reason for inoperability,

2. Action(s) taken to restore the inoperable equipment to operational status, and

3. Summary description of action(s) taken to prevent a recurrence.

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.4.1 Doses due to gaseous releases from the site shall be projected at least once per 31 days, in accordance with 1/2-ODC-2.02.

ATTACHMENT O
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ODCM CONTROLS: GAS STORAGE TANKS

CONTROLS: GAS STORAGE TANKS

3.11.2.5 In accordance with T.S. 5.5.8, the quantity of radioactivity contained in the following gas storage tanks(s) shall be limited to the noble gas values listed below (considered as Xe-133).

a. $\leq$52,000 Curies: Each BV-1 Waste Gas Decay Tank (1GW-TK-1A, or 1GW-TK-1B, or 1GW-TK-1C)

b. $\leq$19,000 Curies: Any connected group of BV-2 Gaseous Waste Storage Tanks (2GWS-TK25A thru 2GWS-TK25G)

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in any gas storage tank exceeding the above limit, immediately suspend all additions of radioactive material to the tank and within 48 hours reduce the tank contents to within the limit, and

b. Submit a Special Report in accordance with 10 CFR 50.4 (b)(1) within 30 days and include a schedule and a description of activities planned and/or taken to reduce the contents to within the specified limits.

c. The provisions of ODCM Control 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.5.1 For BV-1 Waste Gas Decay Tanks: The quantity of radioactive material contained in each BV-1 Waste Gas Decay Tank shall be determined to be within the above limit at least once per 24 hours when radioactive materials are being added to the tank. Performance of this surveillance is required when the gross concentration of the primary coolant is greater than 100 uCi/ml.

For BV-2 Gaseous Waste Storage Tanks: The quantity of radioactive material contained in any connected group of BV-2 Gaseous Waste Storage Tanks shall be determined to be within the above limit at least once per 24 hours when radioactive materials are being added to the tanks.

ATTACHMENT P
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ODCM CONTROLS: TOTAL DOSE

CONTROLS: TOTAL DOSE

3.11.4.1 In accordance with T.S. 5.5.2.j, the annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be limited to ≤ 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to ≤ 75 mrems. 10-7-14

Applicability: At all times.

Action:

a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), exceeding twice the limits of ODCM CONTROL 3.11.1.2a, 3.11.1.2b, 3.11.2.2a, 3.11.2.2b, 3.11.2.3a, or 3.11.2.3b, calculations shall be made including direct radiation contributions from the units (including outside storage tanks, the onsite Independent Spent Fuel Storage Installation (ISFSI), etc.) to determine whether the above limits of ODCM CONTROL 3.11.4.1 have been exceeded. If such is the case, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR 20.405(c), shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources and the onsite Independent Spent Fuel Storage Installation (ISFSI), including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete. 10-7-14

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.4.1.1 Cumulative dose contributions from liquid and gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), shall be determined in accordance with ODCM SURVEILLANCE REQUIREMENTS 4.11.1.2.1, 4.11.2.2.1, and 4.11.2.3.1. 10-7-14

ATTACHMENT P
Page 2 of 2
ODCM CONTROLS: TOTAL DOSE

4.11.4.1.2 Cumulative dose contributions from direct radiation from the units (including outside storage tanks, the onsite Independent Spent Fuel Storage Installation (ISFSI), etc.) shall be determined in accordance with 1/2-ODC-2.04. This requirement is applicable only under conditions set forth in Action a. of ODCM CONTROL 3.11.4.1. 10-7-14

ATTACHMENT Q
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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A program shall be provided to monitor the radiation and radionuclides in the environs of the plant. The program shall provide (1) representative measurements of radioactivity in the highest potential exposure pathways, and (2) verification of the accuracy of the effluent monitoring program and modeling of environmental exposure pathways. The program shall (1) be contained in the ODCM (2) conform to the guidance of the Appendix I to 10 CFR Part 50, and (3) include the following:

1. Monitoring, sampling, analysis, and reporting of radiation and radionuclides in the environment in accordance with the methodology and parameters in the ODCM,
2. A Land Use Census to ensure that changes in the use of areas at and beyond the site boundary are identified and that modifications to the monitoring program are made if required by the results of the census, and
3. Participation in an Interlaboratory Comparison Program to ensure that independent checks on the precision and accuracy of the measurements of radioactive materials in the environmental sample matrices are performed as part of the quality assurance program for environmental monitoring.

3.12.1 The radiological environmental monitoring program shall be conducted as specified in ODCM Control 3.12.1, Table 3.12-1.

Applicability: At all times.

Action:

a. With the radiological environmental monitoring program not being conducted as specified in ODCM Control 3.12.1, Table 3.12-1, prepare and submit to the Commission, in the Annual Radiological Environmental Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period.

b. With the level of radioactivity in an environmental sampling medium at one or more of the locations specified in ODCM Control 3.12.1, Table 3.12.1 exceeding the limits of ODCM Control 3.12.1, Table 3.12-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of affected calendar quarter a Special Report pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1) which includes an evaluation of any release conditions, environmental factors or other aspects which caused the limits of ODCM Control 3.12.1, Table 3.12-2 to be exceeded. This report is not required if the measured level of radioactive was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Report.

   When more than one of the radionuclides in ODCM Control 3.12.1, Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

$$\frac{\text{Concentration (1)}}{\text{Limit Level (1)}} + \frac{\text{Concentration (2)}}{\text{Limit Level (2)}} + \ldots \geq 1.0$$

c. With milk or fresh leafy vegetable samples unavailable from the required number of locations selected in accordance with ODCM CONTROL 3.12.2 and listed in the ODCM, obtain replacement samples. The locations from which samples were unavailable may then be deleted from those required by ODCM Control 3.12.1, Table 3.12-1 and the ODCM provided the locations from which the replacement samples were obtained are added to the environmental monitoring program as replacement locations, if available.

d. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.1.1 The radiological environmental monitoring samples shall be collected pursuant to ODCM Control 3.12.1, Table 3.12-1 from the locations given in the ODCM and shall be analyzed pursuant to be requirements of ODCM Control 3.12.1, Tables 3.12-1 and 4.12-1.

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 3.12-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[(a)] OF ANALYSIS
1. AIRBORNE a. Radioiodine And Particulates	5 locations 1. One sample from a control location 10-20 miles distant and in the least prevalent wind direction 2. One sample from vicinity of community having the highest calculated annual average ground level D/Q.	Continuous operation of sampler with sample collection at least weekly.	Each radioiodine canister. Analyze for I-131; Particulate sampler. Analyze for gross beta weekly [(b)]; Perform gamma isotopic analysis on composite (by location) sample at least quarterly.
2. DIRECT RADIATION	40 locations ≥ 2 TLDs or a pressurized ion chamber at each location.	Continuous measurement with collection at least quarterly.	Gamma dose, quarterly.

[(a)] Analysis frequency same as sampling frequency unless otherwise specified.

[(b)] Particulate samples are not counted for ≥ 24 hours after filter change. Perform gamma isotopic analysis on each sample when gross beta is >10 times the yearly mean of control samples.

**Sample locations are given on figures and tables in 1/2-ODC-2.03.

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 3.12-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS**	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[(a)] OF ANALYSIS
3. WATERBORNE a. Surface	2 locations. 1. One sample upstream. 2. One sample downstream.	Composite* sample collected over a period not to exceed 1 month.	Gamma isotopic analysis of composite sample by location monthly; Tritium analysis of composite sample at least quarterly.
b. Drinking	2 locations.	Composite* sample collected over a period not to exceed 2 weeks.	I-131 analysis of each composite sample; Gamma isotopic analysis of composite sample (by location) monthly; Tritium analysis of composite sample quarterly.
c. Groundwater	N/A - No wells in lower elevations between plant and river		
d. Sediment From Shoreline	1 location.	Semi-annually.	Gamma isotopic analysis semi-annually.

(a) Analysis frequency same as sampling frequency unless otherwise specified.

*Composite samples shall be collected by collecting an aliquot at intervals not exceeding two hours. For the upstream surface water location, a weekly grab sample, composited each month based on river flow at time of sampling, is also acceptable.

**Sample locations are given on figures and tables in 1/2-ODC-2.03.

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 3.12-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS**	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[(a)] OF ANALYSIS
4. INGESTION a. Milk	4 locations.[(b) (c)] 1. Three samples selected on basis of highest potential thyroid dose using milch census data. 2. One local large dairy.	Atleast bi-weekly when animals are on pasture; at least monthly at other times.	Gamma isotopic and I-131 analysis of each sample.
b. Fish	2 locations.	Semi-annual. One sample of available species.	Gamma isotopic analysis on edible portions.
c. Food Products (Leafy Vegetables)	4 locations. [(c)] 1. Three locations within 5 miles. 2. One control location. 3. Two locations based on highest predicted annual avg. ground D/Q when milk locations are unavailable. [(c)]	Annually at time of harvest. [(c)]	Gamma isotopic analysis and I-131 analysis on edible portion.

(a) Analysis frequency same as sampling frequency unless otherwise specified.
(b) Other dairies may be included as control station or for historical continuity. These would not be modified on basis of milch animal census.
(c) When ODCM milk sample requirements are met, one type of broad leaf vegetation is to be sampled from the three (3) indicator locations and one (1) control location. When there are not enough milk sample locations available to meet the ODCM requirements, three (3) different types of broad leaf vegetation are to be sampled at each of two (2) indicator locations based on the highest predicted annual average ground D/Q (as determined from the previous year's Land Use Census), in addition to those samples described above. Three (3) different types of broad leaf vegetation shall also be sampled at one (1) control location when in this condition. The primary sources of broad leaf vegetation are cabbage or lettuce. However, other acceptable substitutes are vegetables having leaves with large surface area, to be combined with the edible portion of the plant for analysis.
**Sample locations are given on figures and tables in 1/2-ODC-2.03.

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 3.12-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

		REPORTING LEVELS			
ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, WET)	MILK (pCi/l	BROAD LEAF VEGETABLES (pCi/kg, WET)
H-3	2E+4[(a)]				
Mn-54	1E+3		3E+4		
Fe-59	4E+2		1E+4		
Co-58	1E+3		3E+4		
Co-60	3E+2		1E+4		
Zn-65	3E+2		2E+4		
Zr/Nb-95	4E+2				
I-131	2[(b)]	0.9		3	1E+2
Cs-134	30	10	1E+3	60	1E+3
Cs-137	50	20	2E+3	70	2E+3
Ba/La-140	2E+2			3E+2	

(a) For drinking water samples. This is a 40 CFR Part 141 value. If no drinking water pathway exists, a value of 3E+4 pCi/l may be used.

(b) If no drinking water pathway exists, a value of 20 pCi/l may be used.

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 4.12-1

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)[a][e]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GAS (pCi/m^3)	FISH (pCi/kg, WET)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, WET)	SEDIMENT (pCi/kg, DRY)
Gross Beta	4	1E-2				
H-3	2000[d]					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-95	30[c]					
Nb-95	15[c]					
I-131	1[b]	7E-2		1	60	
Cs-134	15	5E-2	130	15	60	150
Cs-137	18	6E-2	150	18	80	180
Ba-140	60[c]			60		
La-140	15[c]			15		

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ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 4.12-1 (continued)

TABLE NOTATION

(a) The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ S_b}{(E)(V)(2.22)(Y)\ \exp(-\lambda \Delta T)}$$

where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume);

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute);

E is the counting efficiency (as counts per transformation);

V is the sample size (in units of mass or volume);

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

ΔT is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

The value of S_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples). Typical values of E, V, Y and ΔT should be used in the calculations.

ODCM CONTROLS: REMP-PROGRAM REQUIREMENTS

TABLE 4.12-1 (continued)

TABLE NOTATION

The LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLD's will be achieved under routine conditions. Occasionally, background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLD's unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Report.

(b) If no drinking water pathway exists, a value of 15 pCi/l may be used.

(c) If parent and daughter are totaled, the most restrictive LLD should be applied.

(d) If no drinking water pathway exists, a value of 3000 pCi/l may be used.

(e) This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall be identified in the Annual Radiological Environmental Report.

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ODCM CONTROLS: REMP - LAND USE CENSUS

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING - LAND USE CENSUS

3.12.2 A land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 square feet producing broad leaf vegetation in each of the 16 meteorological sectors within a distance of five miles. For elevated releases as defined in Regulatory Guide 1.111, (Rev. 1), July, 1977, the land use census shall also identify the locations of all milk animals and all gardens of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of three miles.

Applicability: At all times.

Action:

a. With a land use census identifying a location(s) which yields a calculated dose or dose commitment greater than the values currently being calculated in ODCM SURVEILLANCE REQUIREMENT 4.11.2.3.1, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the new location(s).

b. With a land use census identifying a milk animal location(s) which yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with ODCM CONTROL 3.12.1 prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the new location. The new location shall be added to the radiological environmental monitoring program within 30 days, if possible. The milk sampling program shall include samples from the three active milk animal locations, having the highest calculated dose or dose commitment. Any replaced location may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted.

c. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.2.1 The land use census shall be conducted at least once per 12 months between the dates of June 1 and October 1 using that information which will provide the best results, such as by a door-to-door survey*, aerial survey, or by consulting local agriculture authorities.

* Confirmation by telephone is equivalent to door-to-door.

ATTACHMENT S
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ODCM CONTROLS: REMP - INTERLABORATORY COMPARISON PROGRAM

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING - INTERLABORATORY COMPARISON PROGRAM

3.12.3 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program.

Applicability:

At all times.

Action:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Report.

b. The provisions of ODCM CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.3.1 The results of analyses performed as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Report.

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ODCM CONTROLS: ANNUAL REMP REPORT

CONTROLS: ANNUAL REMP REPORT

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT (3)

6.9.2 In accordance with T.S. 5.6.1, the Radiological Environmental Operating Report covering
the operation of the unit during the previous calendar year shall be submitted before May 15 of each year. The report shall include summaries, interpretations, and analyses of trends of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives outlined in the Offsite Dose Calculation Manual (ODCM) and in 10 CFR Part 50 Appendix I Sections IV.B.2, IV.B.3, and IV.C.

The annual radiological environmental reports shall include:

- Summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period, including a comparison with pre-operational studies, operational controls (as appropriate), and previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment.
- The results of the land use censuses required by ODCM CONTROL 3.12.2.
- If harmful effects or evidence of irreversible damage are detected by the monitoring, the report shall provide an analysis of the problem and a planned course of action to alleviate the problem.
- Summarized and tabulated results in the format of ODCM Control 6.9.2, Table 6.9-1 of all radiological environmental samples taken during the report period. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.
- A summary description of the radiological environmental monitoring program.
- A map of all sampling locations keyed to a table giving distances and directions from one reactor.
- The results of licensee participation in the Interlaboratory Comparison Program required by ODCM CONTROL 3.12.3.

(3) A single submittal may be made for a multiple unit site. The submittal should combine those sections that are common to all units at the station.

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ODCM CONTROLS: ANNUAL REMP REPORT

TABLE E:6.9-1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name Of Facility ______________ Docket No. ________

Location Of Facility ______________ Reporting Period ________
(County, State)

MEDIUM OF PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMITS OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN(F)[b] RANGE[b]	LOCATIONS WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS MEAN(F)[b] RANGE[b]	NONROUTINE REPORTED MEASUREMENTS
				NAME DISTANCE AND DIRECTION	MEAN(F)[b] RANGE[b]		

[a] Nominal Lower limits of Detection (LLD) as defined in Table Notation [a] of Table 4.12-1 of ODCM CONTROL 3.11.1.1.
[b] Mean and range based upon detectable measurement only. Fraction of detectable measurement at specified locations is indicated in parenthesis (f).

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ODCM CONTROLS: ANNUAL RETS REPORTS

CONTROLS: RETS REPORT

RADIOACTIVE EFFLUENT RELEASE REPORT [4]

6.9.3 In accordance with T.S. 5.6.2, the Radioactive Effluent Release Report (RERR) covering the operation of the unit during the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program (PCP) and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I Section IV.B.1.

This report is prepared and submitted in accordance with 1/2-ENV-01.05, and at a minimum, shall contain the following:

- A summary of the quantities of radioactive liquid and gaseous effluent and solid waste released from the unit as outlined in Regulatory Guide 1.21, Revision 1, June, 1974, "Measuring, Evaluating, And Reporting Radioactivity In Solid Wastes And Releases Of Radioactive Materials In Liquid And Gaseous Effluents From Light-Water-Cooled Nuclear Power Plants," with data summarized on a quarterly basis following the format of Appendix B thereof.
- An assessment of radiation doses from the radioactive liquid and gaseous effluents released, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), from the unit during each calendar quarter as outlined in Regulatory Guide 1.21. In addition, the unrestricted area boundary maximum noble gas gamma air and beta air doses shall be evaluated. The assessment of radiation doses shall be performed in accordance with this manual.
- Any licensee initiated changes to the ODCM made during the 12 month period.
- Any radioactive liquid or gaseous effluent monitoring instrumentation channels not returned to OPERABLE status within 30 days, and why the inoperability was not corrected in a timely manner. This applies to the liquid or gaseous effluent monitoring instrumentation channels required to be OPERABLE per ODCM CONTROLS 3.3.3.9 and 3.3.3.10.
- Any ODCM SURVEILLANCE REQUIREMENT deficiencies. This applies to monitoring, sampling and analysis and dose projection.
- The reasons when unusual circumstances result in LLD's higher than required by ODCM CONTROL 3.11.1.1, Table 4.11-1 and ODCM CONTROL 3.11.2.1, Table 4.11-2.

(4) A single submittal may be made for a multiple unit site. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

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ODCM CONTROLS: ANNUAL RETS REPORTS

CONTROLS: ANNUAL RETS REPORT (continued)

- The following information for each type of solid waste shipped offsite during the report period:

  - container volume
  - total curie quantity (determined by measurement or estimate)
  - principal radionuclides (determined by measurement or estimate)
  - type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms)
  - type of container (e.g., LSA, Type A, Type B, Large Quantity)
  - solidification agent (e.g., cement)
  - classification and other requirements specified by 10 CFR Part 61

- An annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing of wind speed, wind direction, atmospheric stability, and precipitation (if measured) on magnetic tape, or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

- An assessment of the radiation doses due to the radioactive liquid and gaseous effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), released from the unit or station during the previous calendar year.

- An assessment of the radiation doses from radioactive effluents, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), to MEMBER(S) OF THE PUBLIC due to their activities inside the site boundary see 1/2-ODC-2.01 Figure 5.1 and 1/2-ODC-2.02 Figure 5-1 during the report period. All assumptions used in making these assessments (e.g., specific activity, exposure time, and location) shall be included in these reports. The assessment of radiation doses shall be performed in accordance with 1/2-ODC-2.04.

- An assessment of radiation doses to the likely most exposed real individual from reactor releases, which is considered to include the onsite Independent Spent Fuel Storage Installation (ISFSI), for the previous calendar year to show conformance with 40 CFR 190, Environmental Radiation Protection Standards For Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Revision 1. The SKYSHINE Code (available from Radiation Shielding Information Center, (ORNL)) is acceptable for calculating the dose contribution from direct radiation due to N-16.

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ODCM CONTROLS: ANNUAL RETS REPORTS

- If quantities of radioactive materials released during the reporting period are significantly above design objectives, the report must cover this specifically.