Public Service®
16805 WCR 19 1/2; Platteville, Colorado 80651

Public Service
Company of Colorado

May 13, 1996
Fort St. Vrain
P-96034

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

ATTN: Mr. Michael F. Weber, Chief
Decommissioning and
Regulatory Issues Branch

Docket No. 50-267

SUBJECT: **Final Survey Plan, Extension of Proposed Embedded Pipe Treatment to Include Large Diameter Pipes, and Proposal to Grout Diamond Wire Saw Kerfs**

REFERENCES:
1. PSCo Letter, Fisher to Weber, dated October 12, 1995 (P-95077)
2. PSCo Letter, Borst to Weber, dated March 5, 1996 (P-96009)

Dear Mr. Weber:

This letter requests NRC approval of a treatment to aggressively decontaminate and then seal with grout two types of inaccessible surfaces during decommissioning activities at the Fort St. Vrain Generating Station (FSV). These surfaces include large diameter embedded piping, and the narrow kerfs left by the diamond wire saw in concrete surfaces of the Prestressed Concrete Reactor Vessel (PCRV). Public Service Company of Colorado (PSCo) and its decommissioning contractor, the Westinghouse Team, have been aggressively decontaminating these surfaces; however, contamination levels in some locations remain above the Site Specific Guideline Values (SGLVs). PSCo does not consider that further decontamination efforts on these inaccessible surfaces are reasonable, as discussed below.

In Reference 1, PSCo requested NRC approval to treat piping which is embedded in concrete at FSV by a three-phased program of (1) performing aggressive decontamination, (2) grouting pipes with residual contamination that exceeds the SGLVs,

NL10
1/1

and (3) notifying the NRC of any embedded pipe survey measurement that exceeds 100,000 dpm/100 cm^2, prior to grouting. This proposed treatment was previously requested for embedded piping 3 inches in diameter and smaller.

In Reference 2, PSCo indicated that our decontamination efforts were progressing with larger diameter piping, and that we might wish to apply the proposed embedded piping treatment to some of these larger diameter pipes. Embedded pipes larger than 3 inches in diameter are easier to survey than the smaller pipes because commercially available GM detector assemblies will fit inside. However, larger pipes are just as difficult and time consuming to decontaminate as smaller diameter pipes, their contaminated areas cannot be cut out as would be done if they were not embedded, their contaminated surfaces are not reasonable exposure pathways after they have been filled with grout, and the dose consequences associated with low levels of residual contamination are not significant. The attachment to this letter describes the large diameter pipes to be included, the aggressive decontamination efforts being performed, and the dose consequences associated with grouting large diameter pipes that do not meet the SGLVs, which are less than 2.4 mrem per year.

In addition, PSCo requests approval to treat the narrow diamond wire saw kerfs in the PCRV concrete by flushing them with high pressure water and then filling them with grout. There are three saw kerf areas, each approximately one-half inch high, that were cut into the PCRV surfaces around the inner cavity during the horizontal cuts for removal of the top head concrete, upper sidewall concrete, and lower sidewall concrete sections. These saw kerf surfaces were exposed to concrete cutting slurry as the diamond wire cut through, but their contamination levels cannot be measured because they are too narrow to allow insertion of a survey instrument. The configuration of the kerfs is also incompatible with use of specialized instrumentation, like the TLD assemblies developed for use with embedded piping at FSV. PSCo proposes to aggressively decontaminate the kerf by washing with high pressure water, and to then seal these kerf surfaces from future access by filling them with grout. A further description of PSCo's proposed treatment of these kerf surfaces is also provided in the attachment to this letter. The dose consequences associated with grouting kerf surfaces are bounded by the embedded piping dose consequences.

PSCo considers that the additional decontamination efforts required to achieve the SGLVs in large diameter pipes, and in the diamond wire saw kerf surfaces in the PCRV, are not a reasonable use of decommissioning resources. The additional decontamination efforts associated with the surfaces in this submittal would be similar to those evaluated in the Reference 1 submittal, which ranged from additional decontamination at a cost estimated to be an additional \$2.76 million (for a hypothetical level of effort which may not be sufficient to meet the SGLVs), to complete dismantlement and disposal of PCRV and Reactor Building concrete at a cost estimated to be \$33.9 million.

PSCo considers the treatment of inaccessible surfaces described herein represents a reasonable approach to reducing residual contamination levels ALARA. In order to support ongoing FSV decommissioning work activities, we request NRC approval of this submittal in conjunction with the approval of our proposed treatment of small diameter embedded piping, by May 24, 1996.

If you have any questions regarding this information, please contact Mr. M. H. Holmes at (303) 620-1701.

Sincerely,

Frederick J. Borst

Frederick J. Borst
Decommissioning Program Director

FJB/SWC

Attachment

cc: with attachment

Regional Administrator, Region IV

Mr. Robert M. Quillin, Director
Radiation Control Division
Colorado Department of Public Health and Environment

ATTACHMENT TO P-96034

PROPOSED INCLUSION OF LARGE DIAMETER PIPES IN EMBEDDED PIPING TREATMENT AND PROPOSAL TO FILL DIAMOND WIRE SAW KERFS WITH GROUT

This Attachment describes two proposed actions related to decontamination and final survey of surfaces embedded in concrete in the Fort St. Vrain (FSV) Prestressed Concrete Reactor Vessel (PCRV) and Reactor Building. Both of these actions involve allowing residual contamination on inaccessible surfaces to remain in place, after aggressive decontamination efforts have not been successful at achieving the Site Specific Guideline Values (SGLVs), and to then seal these surfaces with grout.

The proposed actions are as follows:

1. Include large diameter embedded pipes in the embedded piping treatment previously proposed by PSCo, in our October 12, 1995, letter (P-95077) and in several subsequent submittals of additional information. This would permit PSCo to perform aggressive decontamination efforts, as described in our April 12, 1996 letter (P-96028), and fill with grout any pipes that exceed the SGLVs; we will notify the NRC of any individual measurement that exceeds 100,000 dpm/100 cm^2, prior to grouting.

2. Treat inaccessible diamond wire saw kerf surfaces by aggressively decontaminating them with high pressure water, and then filling the kerf grooves with grout.

For each of these proposed actions, this Attachment includes a description of:

- The surfaces that PSCo proposes to grout, including large diameter pipes and diamond wire saw kerf areas,
- Aggressive decontamination efforts being performed, and
- Radiological consequences associated with grouting these areas.

LARGE DIAMETER PIPES

Description of Piping and Decontamination Efforts

The large diameter inaccessible embedded pipes that PSCo proposes to treat by aggressive decontamination and by grouting pipes that exceed the SGLVs include:

- PCRV tendon tubes
- Reactor Building drains
- PCRV core bore holes
- PCRV side wall penetrations

The sizes, lengths, contamination levels, decontamination plans, and survey plans were provided in PSCo's March 5, 1996, letter (P-96009) and are repeated here for completeness. Updated information is included where appropriate, as follows:

PCRV TENDON TUBES

Survey Unit Description and Basis:

This survey unit consists of tubes or conduits that housed the PCRV pre-stressing tendons. These tubes pass through the PCRV concrete vertically, circumferentially, and horizontally (cross head). During decommissioning, the tendons were detensioned and removed from the tubes prior to performing the top head and beltline concrete cuts. Also, plugs were inserted into tendon tubes in the vicinity of the cut locations, to minimize the spread of contaminated cutting slurry. The tubes were cut inside the PCRV while making the concrete cuts. After the concrete cuts were made, there were 230 embedded tube sections consisting of 4.5 inch (approximately 87% of the sections) and 7 inch (approximately 13%) O.D. tubes varying in length from 10 to 104 feet. Most tubes have gentle bends.

Based on characterization surveys performed on the removed tendons, their potential for contamination is from concrete slurry entering the tube during concrete cutting. These tubes are divided into four survey units due to their common size, configuration, and contamination potential.

Characterization Surveys:

Characterization surveys are being performed on approximately 5% to 10% of the tubes using an expandable detector assembly which consists of three 1.13 inch diameter GM tubes. To date, more than 95% of the surface activity measurements are below SGLVs, after final cleaning of the tubes.

Decontamination Plans:

Tubes in these survey units that do not meet the SGLVs are being aggressively decontaminated with a wire brush/absorbent swab to remove slurry and any residual loose surface contamination that might have accumulated in the tubes from concrete cutting. Final swabs of the tubes are surveyed for loose surface contamination and decontamination efforts will continue until a cloth passing through the tubes meets a criterion equivalent to 75% of the removable SGLV, as described in PSCo's letter dated April 12, 1996 (P-96028). This effort is expected to be sufficient to reduce most residual contamination levels below current SGLVs.

Final Survey Plans:

Total surface activity measurements will be taken on a minimum of 30 of the 230 tube sections. At least 200 total surface activity measurements will be taken, using an expandable detector assembly which consists of three 1.13 inch diameter GM tubes. Surface activity scanning, due to the inaccessibility of the tubes for detectors capable of scanning, will be limited to the open ends of the 30 tubes surveyed. Removable surface activity measurements are planned to be taken at each end of the 30 tubes resulting in 60 individual measurements.

SYSTEM 72 - REACTOR BUILDING DRAINS

Survey Unit Basis:

This survey unit consists of embedded portions of the reactor building drain system. There is approximately 500 feet of 4 to 8 inch diameter piping embedded in concrete in the floor of the reactor building. All this piping has elbows, p-traps, and cleanout connections that are difficult to decontaminate. The function of the lines was to drain water from various areas of the reactor building to either the liquid waste sump or to the reactor building sump. Drains from known radioactive sources (e.g., Helium purification system, contaminated laundry) were routed to the liquid waste sump. Other drains were routed to the reactor building sump. Non-embedded sections of lines found to be contaminated are being removed and disposed of as radioactive waste.

Characterization Surveys:

Characterization has been performed in various parts of the system. The survey indicated fixed contamination levels up to 80,000 dpm/100 cm^2 in the main drain header to the liquid waste sump. Contamination has also been detected in the drain headers to the reactor building sump but at much lower levels.

Decontamination Plans:

The pipe sections in the survey units will be aggressively decontaminated using primarily high pressure water or grit blast techniques.

Final Survey Plans:

These pipe sections will be surveyed using GM detector assemblies. Most accessible portions of these lines will be surveyed. Surface activity scanning will be performed on the open ends of all of the pipe sections up to the first elbow. Measurements for removable activity will be taken at the ends of each pipe section and absorbent swabs passed through the lines.

CORE BORE HOLES

Survey Unit Basis:

This survey unit consists of core bore holes in the sides of the PCRV. Core bore holes were made during decommissioning to determine the depth of PCRV side wall activation and as starter holes or access holes for concrete cutting. The holes are straight and are 4 inches in diameter and 6 to 10 feet in length. There are about 30 total core bore holes. These penetrations are grouped together due to their common size, contamination potential (concrete cutting slurry) and material characteristics (i.e., concrete survey surface includes a natural material background component).

Characterization Surveys:

Characterization surveys have been performed on numerous core bore holes. The average contamination levels for some core bore holes exceeded the SGLVs, and the highest measurement to date has been approximately 47,000 dpm/100 cm^2. Post decontamination surveys will be performed.

Decontamination Plans:

The tubes in this survey unit that do not meet the SGLVs are being aggressively decontaminated using high pressure water. Various other aggressive techniques have been used, such as a wire brush/absorbent swab to remove slurry and any residual loose surface contamination, and a cylinder hone which has been used on most holes.

Final Survey Plans:

Each core bore hole will be surveyed by taking approximately 4 or 5 total surface activity measurements in each hole for a total of 120 to 150 measurements using a GM assembly which consists of three 1.75 inch diameter (standard size) GM tubes. Surface activity scanning will be performed over the surface area within the core bore holes (at least 25%) using the assembly. Removable surface activity measurements are planned to be taken at each end of the holes.

MISCELLANEOUS PENETRATIONS-PRIMARY COOLANT AFFECTED

Survey Unit Basis:

This survey unit consists of penetrations in the sides of the PCRV which provided for various instrumentation functions. These penetrations are straight and are 4 to 6 inches in diameter and 8 to 10 feet in length. Penetrations in this group include:

Outlet Coolant Thermometer Penetrations (7)
PCRV Relief Valve Penetration (1)
Plateout Probe Penetration (2)
Process and Moisture Instrument Penetrations (6)
Circulator Instrument Penetrations (4)
Thermocouple Penetrations (1)

During plant operation these penetrations were exposed to primary coolant. The penetrations were also exposed to shield water during the decommissioning and the insides were cut during beltline concrete cutting.

Characterization Surveys:

Characterization surveys performed prior to decontamination indicated contamination above 100,000 dpm/100 cm^2 in some areas. Post decontamination surveys indicate most contamination levels less than SGLVs.

Decontamination Plans:

The penetrations in this survey unit are being aggressively decontaminated, primarily using grit blast techniques. These efforts are expected to remove most residual contamination to within SGLVs. The Outlet Coolant Thermometer Penetrations have been the most difficult to clean because of their configuration and because of their higher exposure to both primary coolant and PCRV shield water.

Final Survey Plans:

Each penetration will be surveyed by taking 4 or 5 total surface activity measurements with GM detector assemblies for a total of 80 to 100 measurements. Surface activity scanning will be performed over at least 25% of the surface area within each penetration. Removable surface activity measurements will be taken at the ends of each penetration.

MISCELLANEOUS PENETRATIONS-SLURRY AFFECTED

Survey Unit Basis:

This survey unit consists of penetrations in the sides of the PCRV which provided for various instrumentation or monitoring functions. The large diameter penetrations are straight with 4 inch diameters and 6 to 10 feet lengths. Penetrations in this group include:

Horizontal neutron detector wells (2)

During plant operation these penetrations did not penetrate the PCRV liner and therefore were not exposed to primaiy coolant or to shield water during decommissioning. These penetrations were cut during top head or beltline concrete cutting.

Characterization Surveys:

All characterization surveys have been performed to date, and all of the surfaces in the horizontal neutron detector wells are less than the SGLVs.

Decontamination Plans:

The tubes in this survey unit were wiped to remove slurry and any residual loose surface contamination that might have accumulated in the tubes from concrete cutting. This effort was sufficient to reduce residual contamination levels below SGLVs, and no further efforts are planned.

Final Survey Plans:

Each penetration will be surveyed. Approximately 4 or 5 total surface activity measurements will be taken with the detector type appropriate for the penetration size/configuration. Surface activity scanning will be performed over at least 25% of the accessible surface of each penetration. Removable surface activity measurements will be taken at the penetration openings (each end). Although both of the horizontal neutron detector wells presently meet the SGLVs (based on characterization survey data), they are included in this request to permit grouting in the event that final survey efforts identify measurements above the SGLVs.

Radiological Consequences Associated With Grouting Large Diameter Pipes

Dose Consequences

PSCo evaluated the dose consequences associated with grouting large diameter embedded pipes using the same scenarios previously submitted for small diameter embedded piping, in PSCo letters dated October 12, 1995 (P-95077) and January 18, 1996 (P-96003). These scenarios included an occupancy scenario where a shop or office is located adjacent to a concrete surface where embedded pipes terminated, and a dismantlement scenario where the PCRV and Reactor Building concrete structures would be dismantled and buried, and an individual constructed a residence on top of the burial site.

It is noted that these scenarios are hypothetical in that PSCo has no plans to occupy or dismantle the Reactor Building or PCRV within the foreseeable future. It is also noted that all information previously provided for small diameter embedded piping (see PSCo letters dated October 12, 1995 and January 18, 1996) regarding the calculation assumptions and exposure pathways from grouted pipe sections remains valid for large diameter piping, with the exception that the analysis described below takes credit for the shielding provided by the grout.

The analysis for each scenario is as follows:

1. Occupancy Scenario

Assumptions:

- 10 inch diameter pipe -- conservatively bounds all large diameter pipes identified previously (8, 7, 6, and 4 inch diameter)
- Three 10 inch pipes are assumed to be close enough to contribute to dose; this is conservative and representative of areas like the core outlet thermocouple penetrations
- 10 foot long pipe sections
- Average contamination level on pipe inner surfaces is conservatively assumed to be 100,000 dpm/100 cm^2
- Predominant radionuclides are cobalt-60 and cesium-137, consistent with FSV decommissioning experience
- Distance from the end of the pipe to the maximum exposed individual is 1 meter
- Exposure time is 2080 hours, an entire work year
- Pipe is filled with concrete grout -- this is in accordance with the proposed action, although previous submittals for small diameter piping did not take credit for grout shielding

Results:

a. Dose rate, based on a Microshield calculation (copy attached):
2.61 E-4 mrem/hr per pipe

b. Dose contribution:

Based on the above assumptions and dose rate, the individual dose is 1.6 mrem per year, which is much less than the 10 mrem annual dose identified in Section 4.2 of the FSV Decommissioning Plan acceptance criteria for public dose contributions from soil and water pathways.

2. <u>Dismantlement Scenario</u>

Assumptions:

- 10 inch diameter pipe -- conservatively bounds all large diameter pipes identified previously
- Three 10 inch pipes are assumed to be buried close enough to contribute to dose to an individual 1 meter away
- 10 foot long pipe sections
- Average contamination level is conservatively assumed to be 100,000 dpm/100 cm^2
- Predominant radionuclides are cobalt-60 and cesium-137, consistent with FSV decommissioning experience
- The combined shielding effects of the concrete around the pipes and the fill dirt covering the pipes are assumed to reduce exposure rates by a factor of ten. The Health Physics and Radiological Health Handbook, 1984, indicates that a factor of ten reduction in dose is achieved with about 14 inches of earth or 9 inches of concrete. This reduction is a reasonable assumption considering that dismantlement debris including embedded pipes would most likely be randomly deposited in a burial location, and would have to be covered by at least 3 feet of fill dirt to make a suitable construction site. Excavation for a building foundation would be of short duration and the dirt removed would most likely be replaced with concrete (with greater shielding value) and additional dirt.
- The resident of the house spends 50% of the time, on an annual basis (4380 hours), 1 meter from the pipes
- Pipe is filled with concrete grout -- this is in accordance with the proposed action, although previous submittals for small diameter piping did not take credit for grout shielding

Results:

a. Dose rate, based on a Microshield calculation (copy attached): 1.85 E-4 mrem/hr per pipe -- this includes the calculated dose rate of 1.85 E-3 mrem/hr divided by the dose rate reduction factor of 10, from the earth and concrete fill

b. Dose contribution:

Based on the above assumptions and dose rate, the individual dose is 2.4 mrem per year, which is much less than the 10 mrem annual dose identified in Section 4.2 of the FSV Decommissioning Plan acceptance criteria for public dose contributions from soil and water pathways. This is the more limiting of the two scenarios, as was the case for small diameter embedded piping.

PSCo does not consider that elevated contamination areas (i.e., areas greater than 100,000 dpm/100 cm^2) are likely because large diameter piping surfaces can be surveyed much more completely than for small diameter pipes. However, the dose consequences can still be shown to be not significant. Using the dismantlement scenario, which resulted in the larger dose, if 10 percent of the area included contamination at 1,000,000 dpm/100 cm^2, the resulting dose would be an additional 2.4 mrem, for a total of 4.8 mrem/year. This is considered highly unlikely, but is still less than half of the 10 mrem annual dose criterion identified above.

PSCo considers that the above analyses are conservative for several reasons. Neither renovation nor dismantlement of the Reactor Building or PCRV is proposed in the foreseeable future. Also, removal of FSV debris to a location that would be prepared and opened for residential construction is even more unlikely. The assumed average contamination level of 100,000 dpm/100 cm^2 is substantially greater than the contamination levels that PSCo expects to remain in large diameter embedded pipes. Also, assumed exposure durations are conservative in that it is not likely that a worker would spend an entire work year in the same location, 1 meter from a wall, and it is also unlikely that an individual would spend one-half of an entire year located 1 meter from a buried pipe. Further, the analyses do not take credit for radioactive decay during the time period that would elapse before renovation or dismantlement activities might occur.

Activity Remaining in Embedded Pipes

PSCo also evaluated the total activity projected to be left in large diameter embedded pipes, after aggressive decontamination. This activity is estimated based on the descriptions provided above, as follows:

Assumptions:

- 12,000 feet, at an average of 6 inch diameter
- 5 percent of pipe surface has residual contamination exceeding SGLVs
- Average contamination is 20,000 dpm/100 cm^2

Results:

Activity that could remain in embedded large diameter piping that exceeds SGLVs and will be grouted:

7.9 E-5 Ci

This activity is a small fraction of the 9.35 E-3 Ci that PSCo determined could possibly remain in the rest of the FSV facility, at contamination levels less than the SGLVs, as described in PSCo's January 18, 1996, letter (P-96003).

MicroShield 4.00 - Serial #4.00-00028
Public Service Co. of Colorado

Page : 1
DOS File: SGPEN3.MS4
Run Date: May 7, 1996
Run Time: 4:44 p.m. Tuesday
Duration: 0:00:31

Case Title: 1 meter from side of 10 ft, 10 in pipe @ 100K DPM (grouted)

GEOMETRY 10 - Cylinder Surface - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	113.6525	3.0	8.7
Dose point coordinate Y:	152.4	5.0	.0
Dose point coordinate Z:	0.0	0.0	.0
Cylinder surface height:	304.8	10.0	.0
Cylinder surface radius:	12.7254	0.0	5.0
Shield 1:	0.9271	0.0	.4
Air Gap:	100.0	3.0	3.4

Source Area: 24370.6 sq cm 26.2323 sq ft. 3777.45 sq in.

MATERIAL DENSITIES (g/cm^3)

Material	Cylinder Material	Shield 1 Cylinder	Transition Shield	Air Gap
Air			0.00102	0.00102
Concrete	2.35			
Iron		7.86		

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Axial (along Z)	20
Circumferential	20

SOURCE NUCLIDES

Nuclide	curies	microCi/Sqcm	Nuclide	curies	microCi/Sqcm
Ba-137m	6.9233e-006	2.8408e-004	Co-60	3.6604e-006	1.5020e-004
Cs-137	7.3185e-006	3.0030e-004			

================================ RESULTS ================================

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec) No Buildup	Energy Fluence Rate (MeV/sq cm/sec) With Buildup	Exposure Rate In Air (mR/hr) No Buildup	Exposure Rate In Air (mR/hr) With Buildup
0.6	2.305e+005	1.130e-001	2.898e-001	2.206e-004	5.656e-004
1.0	1.354e+005	1.402e-001	2.877e-001	2.584e-004	5.303e-004
1.5	1.354e+005	2.510e-001	4.495e-001	4.223e-004	7.563e-004
TOTAL:	5.014e+005	5.042e-001	1.027e+000	9.013e-004	1.852e-003 *

MicroShield 4.00 - Serial #4.00-00028
Public Service Co. of Colorado

Page : 1
DOS File: SGPEN3C.MS4
Run Date: May 7, 1996
Run Time: 4:49 p.m. Tuesday
Duration: 0:00:20

Case Title: 1 meter from end of 10 ft, 10 in pipe @ 100K DPM (grouted)

GEOMETRY 8 - Cylinder Volume - End Shields

	centimeters	feet and inches	
Dose point coordinate X:	0.0	0.0	.0
Dose point coordinate Y:	404.8	13.0	3.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	304.8	10.0	.0
Cylinder radius:	12.7254	0.0	5.0
Air Gap:	100.0	3.0	3.4

Source Volume: 155063. cm^3 5.47599 cu ft. 9462.51 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Air Gap
Air		0.00102
Concrete	2.35	

BUILDUP
Method: Buildup Factor Tables
The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
Radial	16
Circumferential	16
Axial (along Z)	16

SOURCE NUCLIDES

Nuclide	curies	microCi/cm^3	Nuclide	curies	microCi/cm^3
Ba-137m	6.9237e-006	4.4651e-005	Co-60	3.6594e-006	2.3600e-005
Cs-137	7.3189e-006	4.7200e-005			

================================ RESULTS ================================

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.6	2.305e+005	1.697e-002	3.810e-002	3.312e-005	7.436e-005
1.0	1.354e+005	2.061e-002	4.060e-002	3.799e-005	7.485e-005
1.5	1.354e+005	3.710e-002	6.641e-002	6.242e-005	1.117e-004
TOTAL:	5.013e+005	7.468e-002	1.451e-001	1.335e-004	2.609e-004 *

DIAMOND WIRE SAW KERF AREAS

Description of Kerf Areas and Decontamination Activities

The diamond wire saw kerf areas are horizontal grooves in the PCRV concrete, approximately 1/2 inch high, that were created during the three horizontal cuts: (1) to remove the top head concrete, (2) to remove the upper sidewall concrete, and (3) to remove the lower sidewall concrete. The attached sketch illustrates the path of the diamond wire for the top head horizontal cut, and the kerf area is marked. For the two lower horizontal cuts, the diamond wire was inserted into circumferential tendon tubes and was then drawn through the concrete; these two lower kerfs are approximately 18 inches deep. The total surface area in all three kerfs, including both upper and lower kerf surfaces, is about 830 square feet.

The diamond wire saw kerf surfaces were exposed to concrete cutting slurry as the diamond wire cut through, but their contamination levels cannot be measured because they are too narrow to insert a survey instrument. PSCo has performed aggressive decontamination by washing the surfaces with high pressure water, using a long handled spray nozzle.

PSCo proposes to seal these aggressively decontaminated kerf surfaces from future access by filling them with grout. The kerf grooves are too narrow to represent any reasonable accessible surface, however, sealing them with grout prevents any contamination from being released in the future. For example, if a roof leak allowed water to run down the side of the PCRV, it could not get into the kerf area after it has been sealed with grout.

Radiological Consequences from Grouting Kerf Areas

Although there is no way to determine the residual contamination levels in the kerfs after aggressive decontamination, they are estimated at 50,000 dpm/100 cm^2 for the top head kerf and 10,000 dpm/100 cm^2 for the two lower kerfs. These contamination levels are estimated by comparison to similar surfaces, as follows. The upper kerf was exposed to more highly contaminated concrete cutting slurry, and its contamination level should be similar to that found in the connecting core bore holes; the highest contamination level found in the core bore holes was 47,000 dpm/100 cm^2, prior to decontamination. The lower kerfs are expected to be similar to the adjacent PCRV wall surfaces; contamination levels of 5,000 to 6,000 dpm/100 cm^2 are the highest measurements on the PCRV side wall concrete, prior to decontamination with high pressure water.

With the only exposure pathway inside the PCRV cavity, there is no credible occupancy scenario associated with the kerf areas.

During a dismantlement scenario, it is most likely that the PCRV would be rubblized and disposed of, most likely by burying the debris on site. This scenario would likely fill debris into the Reactor Building, from Level 1 to grade level, as much as possible. Rubblizing would most likely disperse contaminated kerf surfaces so that their effectiveness as a radiation source would be substantially diluted. Since the kerf area surface contamination levels are expected to be no greater than the residual contamination levels already evaluated for embedded piping, and since kerf area surface contamination would most likely be dispersed more than contamination in embedded pipes during a hypothetical dismantlement scenario, the dose consequences from the proposed grouted kerf areas are bounded by the previously described dose estimates for embedded piping.

The activity potentially remaining on the kerf area surfaces is estimated to be approximately 5.5 E-5 curies. This estimate is based on a conservative estimate of 50,000 dpm/100 cm^2 distributed over the top head kerf area and 10,000 dpm/100 cm^2 over the kerf surfaces of the two lower horizontal cuts. This activity is a small fraction of the 9.35 E-3 curie activity that could remain in the rest of the FSV facility, as estimated in PSCo's January 18, 1996, letter (P-96003).

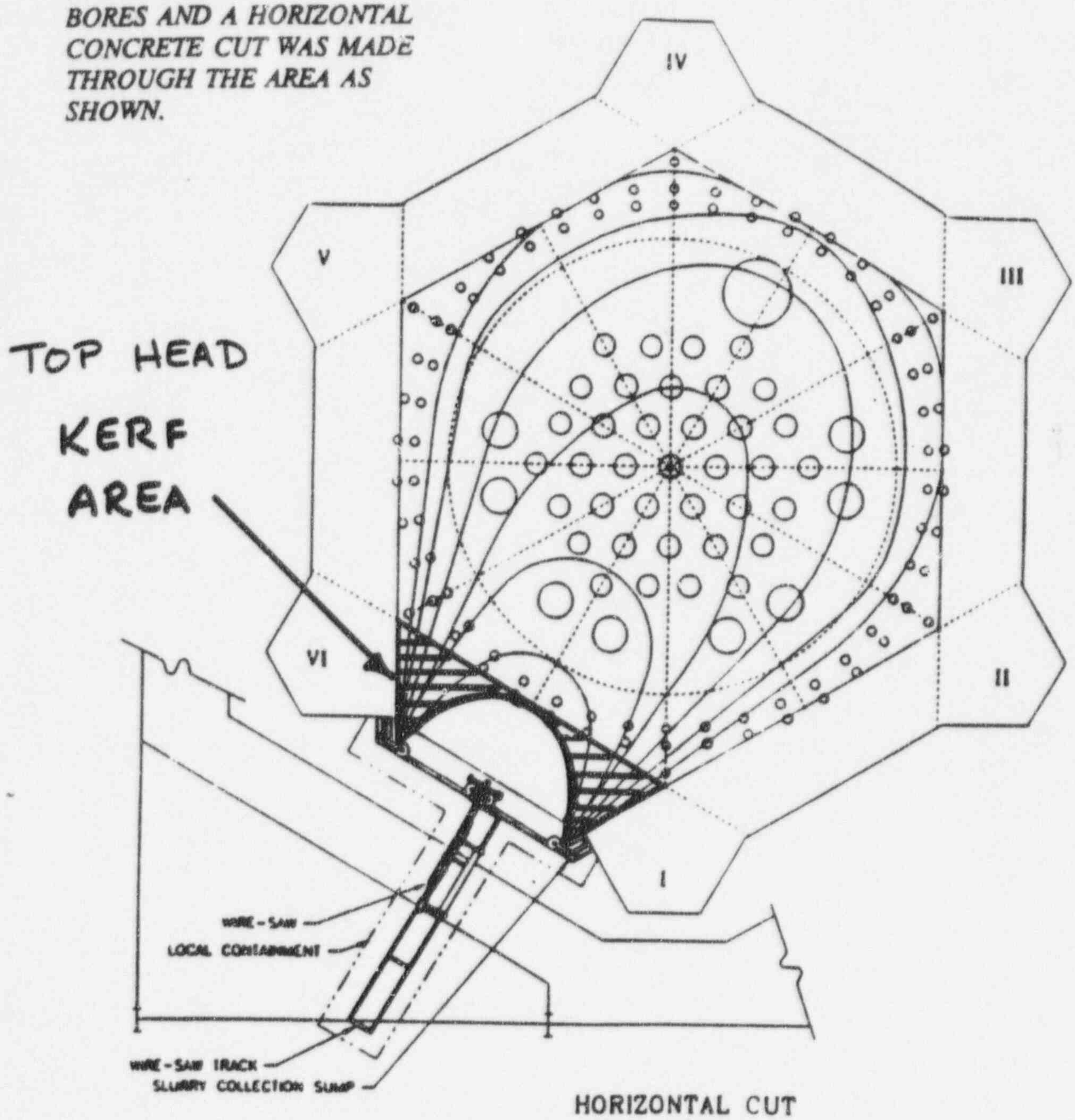
Revised Total FSV Activity Estimate

The additional contamination proposed in this letter results in a revised total activity estimate as follows:

Total Activity Previously Identified (P-96003)	9.35 E-3 Ci
Activity Estimated for Large Diameter Embedded Piping	7.9 E-5 Ci
Activity Estimated for Kerf Areas	5.5 E-5 Ci
Revised Total Estimated Activity Remaining in FSV Facility	9.48 E-3 Ci

PCRV TOP HEAD REMOVAL

THE DIAMOND WIRE SAW WAS THREADED THROUGH THE HORIZONTAL CORE BORES AND A HORIZONTAL CONCRETE CUT WAS MADE THROUGH THE AREA AS SHOWN.



HORIZONTAL CUT
SCALE 3/16" = 1'