Public Service Company of Colorado
5909 East 38th Avenue, Denver, Colorado 80207

September 15, 1982
Fort St. Vrain
Unit No. 1
P-82394
FSV-63
FSV-74A 50-267

Mr. George Kuzmycz Project Manager
Special Projects Branch
Division of Project Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Status of Cracked Fuel Element Webs

REFERENCES: PSC Letter P-82130 dated 5/4/82
PSC Letter P-78146 dated 9/6/78

Dear Mr. Kuzmycz:

The purpose of this letter is to update the status of the cracked fuel element webs discovered as a result of the Segment 2 nondestructive examination program. The letter also presents PSC's reasons for believing that these cracked webs do not constitute a significant hazard to public health and safety and briefly describes current plans for further evaluation of the cracks.

In letter P-82130, dated May 4, 1982, PSC reported that a hairline crack was seen on the center of one face of fuel element 1-2415. Observations of the element in the FSV Hot Service Facility (HSF) indicated that the crack extends across the minimum cross-section between the element face and a coolant hole and vertically down the full length of the element. Based upon observations in the HSF, it appeared that the crack did not extend from the coolant hole to the nearby dowel socket.

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Based upon later review by General Atomic Company (GAC) of the video tapes made during the examinations, it was determined that a similar, but thinner crack might also exist on the corresponding face of fuel element 1-0172. (Fuel element 1-0172 was located in the initial core directly under fuel element 1-2415.) In order to determine conclusively whether a crack also occurred in fuel element 1-0172, it, along with 1-2415 and three other fuel elements, were sent to San Diego for closer examination in the GAC Hot Cells. The core location of these elements is shown in Figure 1.

Elements 1-2415 and 1-0172 were viewed for the first time in the GAC Hot Cells on July 7, 1982. The initial examination revealed that, 1) element 1-0172 does, in fact, have a crack similar to that in element 1-2415, and 2) the crack in element 1-2415, contrary to observations in the HSF, does extend to the dowel socket. This new information was reported to you by telephone on July 8, 1982 and was discussed further in Bethesda on July 14, 1982. Later examinations indicate that the crack also extends to the dowel socket.

The three additional elements sent to GAC were 1-0108, 2-2693, and 5-0801. Element 1-0108 was selected for further examination because it was next to element 1-2415 in the core and had similar irradiation conditions. Element 2-2693 was chosen because it is a control element and also had irradiation conditions similar to element 1-2415. Element 5-0801 was chosen because it may have experienced higher than average stresses.

A thorough visual examination of these five elements at GAC has revealed no cracks other than those described above.

Because of the locations of the cracks in elements 1-2415 and 1-0172, the cracks were hypothesized to have been caused by stresses resulting from an improper fit between the dowel in element 1-0172 and the corresponding dowel socket in element 1-2415. However, a stacking test was performed, and element 1-2415 was placed on top of element 1-0172 without difficulty. While the elements were in this stacked configuration, the clearance between the dowel and dowel socket was determined by moving element 1-2415 as far as it would go to the left and the right and observing the change in position of the crack in this element relative to the stationary crack in element 1-0172. A double exposure photograph recorded the relative movement. This test indicated that the clearance is approximately 1 mm, which is as it should be.

In addition to these examinations at GAC, PSC has been conducting a visual examination of all Segment 2 fuel elements as they are loaded into shipping casks for delivery to the Arco, Idaho storage site. These examinations are performed in the fuel handling machine with a remotely operated camera. To date, the examinations have revealed no additional fuel element cracks. The decision to perform these additional examinations was made prior to confirmation of the crack in element 1-0172.

With regard to the safety-related aspects of the cracked webs, PSC believes that these cracks do not constitute a significant hazard to public health and safety. As discussed in letter P-82130, the cracks do not involve the area around the fuel rods; therefore, fuel integrity is not affected by the cracks. The presence of the cracks did not affect the cooling geometry of the fuel or the ability of the fuel handling machine to safely remove the fuel elements.

Maintenance of proper cooling geometry is the most important safety issue which one might associate with cracking of fuel element webs. In this regard, it should be noted that the consequences of fuel element damage resulting in coolant flow obstruction were reviewed with the NRC in response to questions raised in 1978 concerning fluctuations at FSV. Those evaluations were documented in letter P-78146, dated September 6, 1978.

In P-78146, a conservative bounding assessment was made of a scenario in which coolant flow through an entire column is blocked due to misalignment resulting from dowel failure. A conservative evaluation of fuel particle failure, fission product release, and reactivity control was conducted. The consequences of coolant flow restoration were also assessed. This assessment is applicable in that it envelopes the consequences that might occur in the unlikely event that limited cracks of the type discovered were to propagate through a fuel element to the extent that cooling geometry were somehow altered. It was concluded that the consequences of this conservative scenario are well within those previously accepted by NRC for other Fort St. Vrain accident sequences.

Based upon the above considerations, PSC believes that the cracked webs do not constitute a significant hazard to public health and safety. PSC continually monitors the circulating activity of the primary coolant helium. Any fuel abnormalities that significantly alter the cooling geometry would be readily detected and action quickly initiated to mitigate the consequences of any adverse fuel geometries.

Further evaluations of the cracked fuel element webs are planned for FY-83. It is currently planned that GAC will, under DOE funding, perform scoping analyses of the operating history of the elements with cracked webs. These analyses may provide insight regarding why the cracks occurred.

In addition, it is currently planned that post-irradiation examination of the fuel elements with cracked webs will continue at GAC under FY-83 DOE funding. Destructive examination will begin, and measurements of mechanical properties will be performed. The results of these physical examinations can be used in conjunction with the analyses discussed above.

Finally, as analyses and examinations proceed, PSC and GAC will continue to assess the safety-related aspects of the cracked webs in light of any new information which may be gained. PSC will continue to keep you informed of any new developments regarding these efforts.

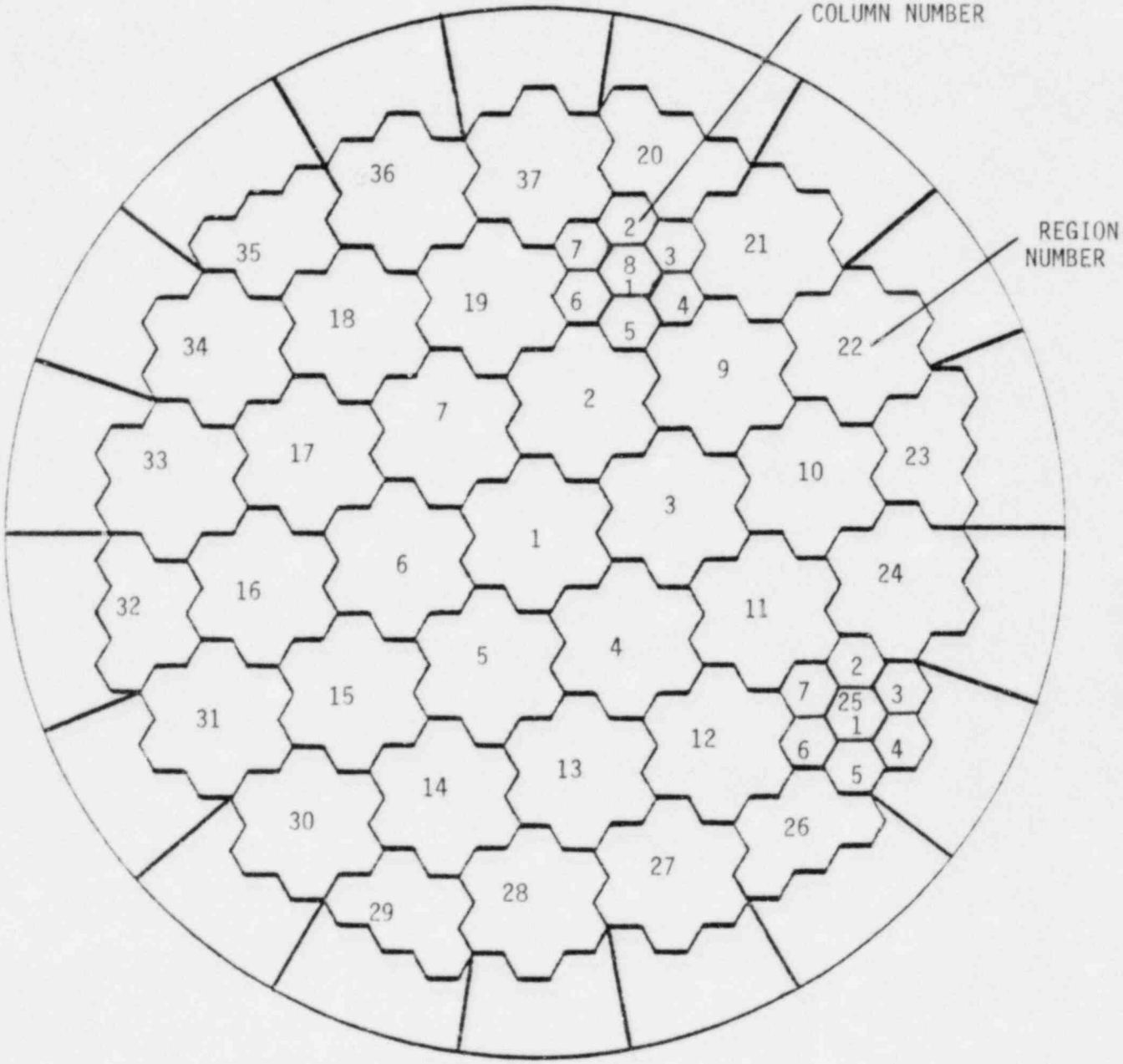
Very truly yours,

M. H. Holmes

for H.L. Brey, Manager
Nuclear Engineering Division

HLB/SEF:pa

FIGURE 1 CORE POSITION OF ELEMENTS
(Shipped To GAC)



ELEMENT	REGION	COLUMN	ACTIVE CORE LAYER
1-2415	8	5	3
1-0172	8	5	4
1-0108	8	6	3
2-2693	8	1	3
5-0801	25	3	4

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W. H. Hubner

for H.L. Brey, Manager
Nuclear Engineering Division

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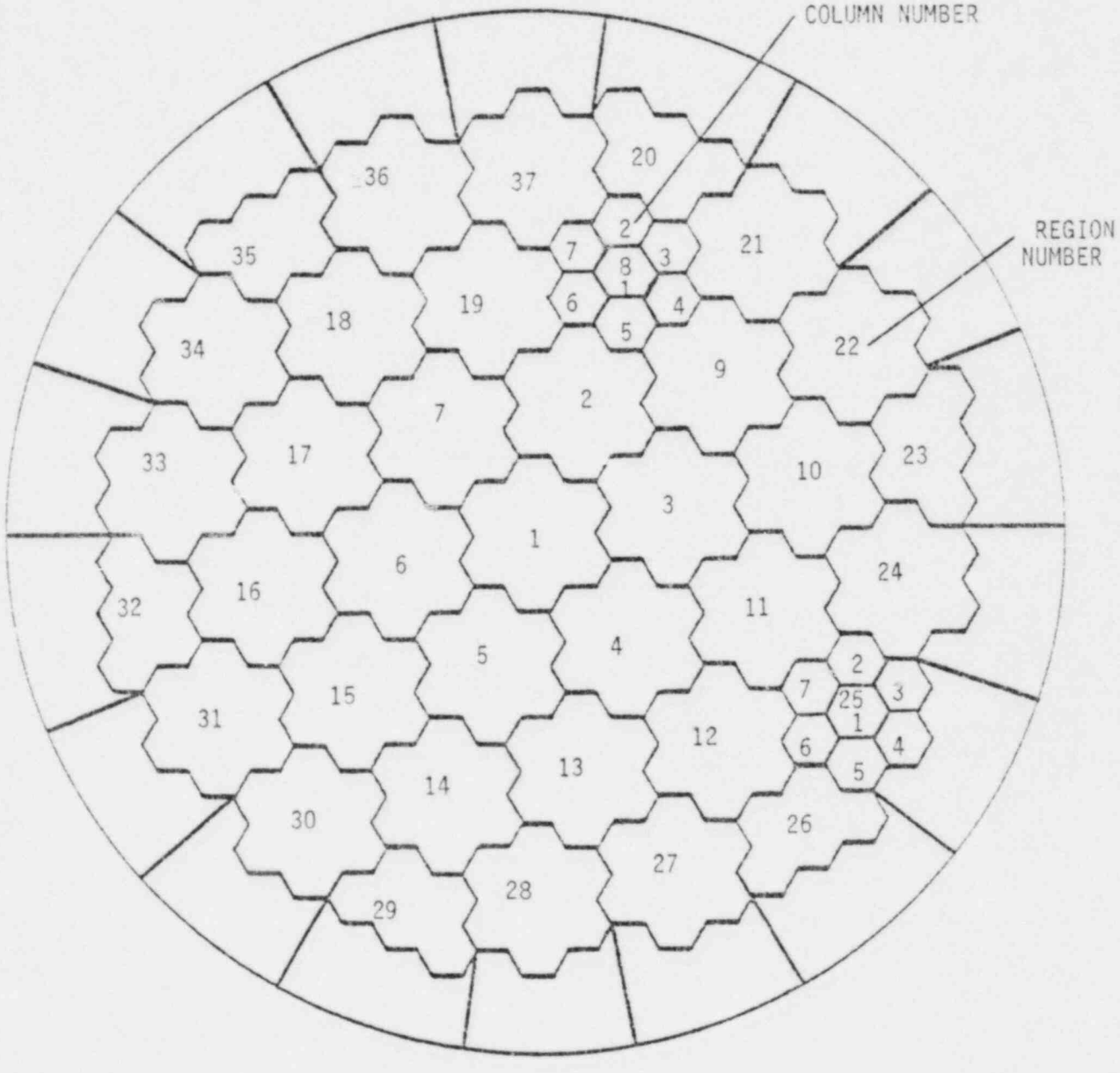

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