UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Ivan W. Smith, Chairman
Dr. Cadet H. Hand
Dr. Emmeth A. Luebke

In the Matter of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. (San Onofre Nuclear Generating Station, Units 2 and 3)	Docket Nos. 50-361 OL 50-362 OL January 26, 1981

MEMORANDUM AND ORDER
(Motions for Summary Disposition)

BACKGROUND AND SUMMARY

By Memorandum and Order of January 27, 1978 the Board accepted several contentions of the Intervenor Friends of the Earth (FOE) and others, including FOE Contention 1a relating to dewatering well cavities at San Onofre Nuclear Generating Station (SONGS) and FOE Contention 9 relating to uranium fuel costs. By separate motions the Applicant[1/] and the NRC Staff[2/]

1/ Applicant's Motion for Summary Disposition of Intervenors Friends of the Earth, et al.'s Contentions 1a (Dewatering Wells) and 9 (Uranium Fuel Costs) June 6, 1980.

2/ NRC Staff Motion for Summary Disposition on Contention 1(a) (Dewatering Well Cavities) August 1, 1980, and NRC Staff Motion for Summary Disposition on Intervenors' Contention 9 (Uranium Prices) August 15, 1980.

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move for summary disposition under the provisions of 10 CFR §2.749 asserting that there is no genuine issue of material fact relating to either contention.

Intervenor FOE opposes the Applicant's motion for summary disposition on the dewatering well Contention 1(a), although it agrees with most of Applicant's statements of material fact. FOE affirmatively does not oppose the Applicant's motion for summary disposition on uranium fuel costs, Contention 9.[3/] FOE did not answer the NRC Staff's motions. No other intervenor has addressed the motions.

In this order the Board grants the motions on uranium fuel costs, Contention 9. We grant in part, and as a matter of discretion deny in part the motions for summary disposition on dewatering well cavities, Contention 1a.

3/ Intervenors' Statement of Material Facts Regarding Intervenor F.O.E. Et Al.'s Contention 1a (Dewatering Wells) As to Which Genuine Issues Exist to be Heard August 15, 1980, and Brief in Opposition to Motion For Summary Disposition of Intervenor F.O.E. Et Al.'s Contention 1a (Dewatering Wells) and 9 (Uranium Fuel Costs.) August 15, 1980.

Although the heading of FOE's brief indicates that it opposes summary disposition on the issue of uranium fuel costs, the brief (at p.1) states expressly: "Intervenor F.O.E. Et Al, Presents No Opposition To The Motion For Summary Disposition Regarding Contention #9 (Uranium Fuel Costs)".

DISCUSSION

Contention 1a (dewatering well cavities)

Contention 1a:

> Whether the cavities caused by Applicant's temporary dewatering of the San Onofre Unit 2 and 3 site will have an unacceptable adverse effect on the capability of structures and equipment of San Onofre Units 2 and 3 to withstand the design basis seismic events.

Applicant's Motion on Contention 1a

Applicant summarizes its position on the factual issues raised by this contention as follows:

> The Dewatering Well Contention arose because of FOE's apprehension that cavern-like voids had been created under the San Onofre Nuclear Generating Station, Units 2 and 3 site (hereafter the "Site") by operation of the Site construction dewatering well system. The presence of subsurface features had been detected, but the nature and extent of such subsurface features created by the Site construction dewatering system had not been defined as of the last prehearing conference in December, 1977. Uncertainty as to the nature and extent of these subsurface features gave rise to FOE's apprehensions and resulted in the Dewatering Contention.
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> Applicant's subsequent investigation, analysis, and demobilization of the relatively small subsurface cavities created by the Site construction dewatering well system, as summarized herein and more fully explained in the accompanying affidavits of Lucien Hersh, John A. Barneich, Robert L. McNeill, Jay L. Smith, and Kenneth P. Baskin, demonstrates that FOE's apprehensions leading to the Dewatering Contention were misplaced. The relatively small subsurface cavities caused by the Site construction dewatering system have been properly demobilized with sand and/or grout. Even if these cavities had not been demobilized, they would not have had an unacceptable

adverse effect on the capability of structures and equipment of San Onofre Nuclear Generating Station, Units 2 and 3 (hereafter "SONGS 2 and 3") to withstand the Design Basis Earthquake. 1/

1/ The Design Basis Earthquake design criterion for SONGS 2 and 3 is .67g. Safety Evaluation of the San Onofre Nuclear Generating Station, Units 2 and 3, U.S. Atomic Energy Commission, October 20, 1972, at p. 16.

Licensee approaches the contention by separating the factual consideration into eight statements of material fact which we address in the following paragraphs. Intervenor FOE agrees with Applicant's Statements of Material Fact Nos. 1 through 5; asserts want of knowledge as to Statements of Material Fact Nos. 6 and 7; and challenges the assumptions of Statement of Material Fact No. 8 with respect to the design basis or safe shutdown earthquake. 4/

In its own motion, discussed below, the NRC Staff supports the Applicant's motion and, with a minor exception, (p.8 n.11), accepts the Applicant's Statements of Material Fact and supporting affidavits.

4/ Applicant's brief in support of motion, pp. 10-11.

Intervenor's Statement of Material Facts Regarding Intervenor F.O.E. et al.'s Contention 1a (Dewatering Wells) as to Which Genuine Issues Exist to be Heard. August 15, 1980.

Applicant's Statements of Material Fact

Statement of Material Fact No. 1: The geology of the San Mateo formation underlying the San Onofre Nuclear Generating Station, Units 2 and 3 site (hereinafter the "site"), is such that subsurface cavities are not naturally occurring phenomena.

This fact is attested to by the affidavit of Lucien Hersh, a professional civil engineer with training and experience in structural mechanics and design. He has been personally involved in the construction of SONGS 2 and 3 since 1971. Hersh states (¶7, p.5) that no subsurface cavities were revealed or indicated during the extensive excavation and boring program associated with the site preparation process.

From another affidavit, that of Jay L. Smith, an engineering geologist, we gather and accept the following facts: 1) Smith has been associated with the SONG project since 1969; 2) from 1969-1971 he supervised geologic mapping of the San Mateo Formation at the site and its environs; 3) the San Mateo Formation underlies the site to a depth of approximately 936 feet; 4) Smith has investigated well exposed sea cliffs of the San Mateo Formation, the exposed formation from construction excavations at the site, has personally entered man-sized borings drilled below foundation grade at the site and reviewed a large number of borings drilled at the site; and 5) during his 11 years investigating and reviewing the site he found neither surface nor subsurface manifestations of cavities other

than those associated with the dewatering wells. Smith further states that the chemical analyses of the San Mateo Formation sandstone confirm mineralogical analyses which show a general absence of soluble carbonates and sulfates and concludes subsurface cavity formation by chemical dissolution is not possible. He reviews the geologic history and formation of the San Mateo Formation and notes that rock types likely to contain natural subsurface cavities such as limestone, and bedded or domed salt are completely absent in the site area. The overall conclusion Smith reaches is that neither physical, chemical nor structural characteristics conducive to the natural formation of subsurface cavities exist at the site. Smith Affidavit, passim.

This evidence is convincing. The San Mateo Formation is characterized by the absence of natural cavities. The NRC Staff accepts the Applicant's position that the cavities were not naturally occurring. Staff motion, pp. 5-7. The Intervenors agree with Applicant's material Statement of Fact No. 1. Intervenor's statement, p. 1. There is no genuine issue of fact to be heard here.

> Statement of Material Fact No. 2: All excavations and borings performed on the Site, including those associated with the construction-dewatering wells, confirm that there are no natural cavities in the San Mateo Formation underlying the Site.

This fact is substantiated by the specific facts noted concerning Fact No. 1 above. As is the case with Statement of Material Fact No. 1, the NRC Staff does not challenge the

Applicants' position. Staff motion, pp. 5-7. The Intervenors agree with Applicants' Material Statement of Fact No. 2. Intervenors statement, p. 1.

The Board finds there is no genuine issue of fact to be heard here.

Statement of Material Fact No. 3: The operation of the construction dewatering system on the Site caused subsurface cavities to be formed adjacent to five dewatering wells.

Dewatering wells were installed on the site in order to remove water from the excavation area to allow construction of the portions of the structure located below the water table. The well system consisted of ten operating wells on the site (Wells 1 through 10), two operating wells off the site (Wells 11 and 12) and one test well. During the decommissioning of the wells after the foundations had been constructed, settling occurred at Well 6 indicating a potential subsurface cavity. This triggered a massive investigation to examine the settling and to respond to this unpredicted event. E.g. Hersh Affidavit, pp. 5-7; McNeill Affidavit, passim.

The affidavit of Robert L. McNeill, a geotechnical engineer, presents a number of hypotheses which would or could account for the formation of cavities adjacent to the dewatering wells. Exhibit B, accompanying his affidavit, is a 14-page paper titled "Mechanisms of Cavity Formation." According to Exhibit B dewatering wells had been designed to prevent subsurface erosion,

with louvers sized to retain the filter gravel and the filter gravel sized to retain the native sand. As long as all elements remained intact, no subsurface erosion could occur. Since veritable cavities formed, the implication was that some of the components did not remain intact. Direct investigation showed corrosion of some of the casings which would have led to a loss of gravel and subsequent erosion of the surrounding San Mateo Formation (i.e., cavity formation). In addition, erosion could have been caused if there had been arching in the annulus between the casing and the wellbore during placement of the gravel or if there had been compaction and settlement of the gravel under the hydraulic gradient of pumping. The largest cavities were found at Wells 6, 7 and 8, where corrosion of the casing was significant, but a small cavity was found at Well 3 where the casing was unaffected by corrosion. No single cause was assigned to the absence of the gravel, that absence being the necessary starting point in cavity formation. Id. pp.1-6.

McNeill also describes in detail the development of the cavities which were all related to the loss of gravel pack. McNeill Affidavit, pp. 8-11.

The NRC Staff has reviewed this material and does not challenge it. The Intervenors agree with Applicants' Statement of Material Fact No. 3. Intervenor's statement, p.1. There is no genuine issue of fact to be heard here.

Statement of Material Fact No. 4: An extensive field and laboratory investigation of the 10 operational construction dewatering wells on the Site detected all significant cavities underlying the Site and defined the depth, lateral extent, and characteristics of the cavities and the in-fill material associated with the cavities.

The affidavit of Lucien Hersh includes Exhibit A which shows the location of the one test well, the ten on-site and two off-site operational wells at SONGS. Hersh was Chairman of the Task Force established to examine and respond to the problem of cavities associated with the dewatering system. Affidavit, p.8. At the request of the NRC Staff, the Task Force submitted 18 reports[5/] documenting the investigation and demobilization of the construction dewatering wells. Also there were five meetings with NRC personnel to discuss the problems and representatives of the Intervenors were present at two of these meetings. Hersh Affidavit, p.10.

Each well was analyzed by one or more of the basic investigation procedures to discover if cavities existed. These consisted of exploratory drilling in areas surrounding the wells, Id. p.10, deep drilling/cross-hole seismic studies, Id. p.11, and airlift cleaning of the gravel pack and removal of well casings, Id. p.12. During the drilling, soil samples were obtained for laboratory testing and to further interpret

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5/ References Numbered 1 through 18, Applicant's List of Project References, June 6, 1980, accompanying Applicant's Brief.

visual material classifications. For some holes, gyroscopic and slope-indicator surveys were performed to determine the location of the bore-hole with depth. Id. p.13.

Grout was placed in the cavities and bore holes using both gravity and pressure injection methods. The test well was demobilized by filling the casing with gravity grout. No cavity was associated with that well. Wells Nos. 11 and 12, located outside the site were demobilized by cutting off the casing below grade, filling the casing with sand, capping the casing and compacting the area around the casing and backfilling with compacted material up to grade. The distance of Wells Nos. 11 and 12 from the site preclude any cavities associated with those wells having effects upon the Seismic Category I structures. Id. p.14. Each of the remaining 10 wells were investigated thoroughly and demobilized by appropriate methods. Id. pp.13-17. See also Barneich Affidavit, pp.6-9.

The NRC Staff reviewed the Applicant's reports and investigated the site. As we note below, the Staff's expert John T. Greeves found the investigative procedures used by the Applicants to be adequate and that the results have been satisfactory. Greeves Affidavit, p.6. The Intervenors agree with Applicants' Statement of Material Fact No. 4. Intervenors' statement, p.1.

There is no genuine issue of material fact to be heard here.

Statement of Material Fact No. 5: Significant characteristics of the detected cavities are that they were sand filled, limited in areal extent, rather lobate in shape, and predominantly located in the draw-down zone developed by the construction dewatering process on the Site.

The Affidavits of L. Hersh (pp. 15-25), R. McNeill (p.14), and J. Barneich (p.7), document the investigations of the dewatering wells and the subsequent findings. The Statement of Material Fact No. 5 is not challenged by the NRC Staff. The FOE agrees with Applicant's Statement of Material Fact No. 5. Intervenor's statement, p.1.

The Board finds Statement of Material Fact No. 5 to be adequately supported. There is no genuine issue of fact to be heard here.

Statement of Material Fact No. 6: All detected cavities have been properly filled with sand or grout and contain no open voids.

FOE's answer to this statement was, "As to Applicants' Material Statement of Fact #6, Intervenors have no independent knowledge that the cavities contain no open voids other than statements of the applicants and cannot agree or disagree with said statement based on such lack of independent knowledge." Intervenor's statement, p.1.

The Board is convinced of the thoroughness of the Applicants' investigation of the site and of the cavities detected in association with the dewatering wells. See finding on Statements of Material Facts Nos. 4, and 5, supra. The subsequent filling and demobilization of the dewatering wells is presented in detail

by the Applicant. Hersh Affidavit, pp. 11-26; Barneich Affidavit, p.7 and Exhibit A, McNeill Affidavit, p.11. Staff Motion, p.7-8, Greeve's Affidavit, pp. 3-4.

There is no genuine issue to be heard as to Statement of Material Fact No. 6.

> Statement of Material Fact No. 7: The NRC Staff has approved or been informed of each step of the Applicants' program to investigate and demobilize all cavities caused by the Site construction dewatering system, and is satisfied that the cavities caused by Applicants' construction dewatering of the Site can have no unacceptable adverse effect on the capability of structures and equipment of San Onofre Nuclear Generating Station, Units 2 and 3, to withstand the Design Basis Earthquake.

FOE responds to this statement of material fact to the effect that FOE cannot state whether NRC knows of and approves Applicants' investigative and demobilization efforts or whether NRC is satisfied that the dewatering well cavities will have no adverse effects on the capability of SONGS to withstand the design basis earthquake. According to FOE, only the NRC can state its position, and that this is properly done through the issuance of the Staff's Safety Evaluation Report (SER). Intervenors Statement, pp. 1-2.

FOE ignores the affidavit of Kenneth Baskin, Applicant's Manager of Nuclear Engineering and Licensing who outlines the extensive exchange of information between Applicant and NRC of the dewatering well issue. Baskin reports that there are no

outstanding requests for information from the NRC on this issue and that he has no reason to believe that the Staff is dissatisfied with Applicants' efforts. Baskin Affidavit, pp. 8-9.

We therefore assume that FOE's concern was that the Staff has not stated its position (in the form of an SER) on this subject. FOE cites Duke Power Co. (William B. McGuire Nuclear Power Plant, Units 1 and 2) LBP-77-20, 5 NRC 680 (1977) where another licensing board ruled that it was then not appropriate to grant summary disposition of a safety issue prior to the issuance of the SER on the issue.

We do not believe that the licensing board ruling in McGuire is apposite here. The board in McGuire observed that until the Staff's review of a safety issue is complete, an otherwise essential safety issue cannot be disposed of. In this case, as we discuss below, the Staff has indicated that it has indeed reviewed the issue and has filed its own motion for summary disposition. We infer from FOE's failure to answer the Staff's motion that it agrees that the NRC Staff has informed itself and approves of the Applicant's method of investigating and demobilizing the dewatering well cavities at SONG. In any event, there is no genuine material factual issue relating to the existence of the Staff's review remaining to be heard.

> Statement of Material Fact No. 8: Analysis of the maximum effects of the detected cavities on the performance of Seismic Category I structures, considering static, as well as Design Basis Earthquake loading conditions, indicates that any cavities caused by the Applicants' construction - dewatering of the Site can have no unacceptable adverse effect on the capability of structures and equipment of San Onofre Nuclear Generating Station, Units 2 and 3, to withstand the Design Basis Earthquake.

The Applicant presents the Affidavits of Berneich, Hersh and McNeill to support this statement. Applicant's Brief, p. 18.

FOE does not expressly agree or disagree with Applicant's statement of material fact No. 8 nor with the affidavits of Messrs. Berneich, Hersh and McNeill. On balance, FOE seems to agree with Applicant on this issue as far as the present design basis earthquake is concerned. FOE's Brief, pp. 4-7. In sum FOE identifies the remaining triable issue on the dewatering well cavities as:

> There has been no showing that this contention does not present a triable issue of fact nor is this contention being challenged at all. The issue of fact to be tried is whether the design basis earthquake, that is, the earthquake which could cause the maximum vibratory ground motion has been properly assigned.
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> It is Intervenor FOE et al's position that if the presently assigned design basis earthquake is found, after a full hearing and trial, to be correct, then there may very well be no triable issue of fact as to the adverse effects of the dewatering cavities. If, however, the board finds on the basis of evidence introduced at the hearing that the design basis earthquake has not been properly assigned as the safe shutdown earthquake, there is a triable issue of fact as to whether the cavities will have an unacceptable adverse effect on the withstand [sic] capabilities of the structures and equipment in light of the new properly assigned design basis earthquake.

FOE's brief, p.5.

Nevertheless, because of the importance of the issue, the board has on its own evaluated the affidavits and other data presented in support of Statement of Material Fact No. 8 under the assumption that the present design basis earthquake is correctly assigned to SONGS. We discuss later the issue of whether or not this assumption is correct.

The evaluation of soil-structure-interaction for earthquake response of structures, liquefaction of the site soil, slope stability of the adjacent switch yard slopes, foundation design parameters for the support of structures, maximum earthquake ground motion parameters, and subsurface cavities created by construction dewatering wells is the subject of an affidavit by J. Barneich, San Onofre project manager for earthquake engineering and soil dynamics. He is employed by Woodward-Clyde Consultants, geotechnical engineering consultants, and he is responsible for Woodward-Clyde's soil and rock testing laboratory. He was responsible for the cavities task force's analysis of cavity stability, both statically and when subjected to seismic shaking associated with the design basis earthquake. He was also responsible for the evaluation of effects of cavities on the design soil stiffness parameters and on the estimated settlement of Category 1 structures. Barneich Affidavit, pp. 1-3.

Barneich postulates a mechanism for earthquake behavior of a cavity wherein the excess pore water pressure developed in the walls of the cavity due to seismic shaking could cause

the wall material to collapse and simulate cavity-infill soil. Id. p.9. The native soil in the San Mateo formation at the site is very dense, 100% relative density, and has very efficient grain packing. Tests show that the native soil fails by particulating grain-by-grain and bulks to increased volume by about 20%. Id. p.9. This bulking is resisted by the existing soil in the cavity. The expansion of the cavity by wall failure is self-stabilizing. Id. p.10.

Seismic shaking could conceivably cause liquefaction of the cavity-infill material. This could generate an excess pore pressure in the cavity-infill soil. The dissipation of this excess pore water pressure into the adjacent native soil could tend to reduce the stiffness of the native soil. This reduction or local softening of native soils adjacent to cavities could lead to additional settlement and reduction in bearing capacity of adjacent structures. Id. p.10.

Barneich states that quantitative evaluation of the effects of seismic shaking on the stability of the detected dewatering well cavities involved a 6-stage evaluation plan: (1) characterize the cavity at well 8 in a finite-element model along with adjacent soil and structures; (2) perform a dynamic response analysis of the model developed in stage (1) using the design basis earthquake acceleration-time history and calculate the resulting stresses in the cavity infill soil and surrounding native soil; (3) using the results of stage (2),

perform a time-sequenced analysis of dissipation of pore water pressure generated due to the liquefaction of the cavity infill soil; (4) from the results of stage (3), determine the most critical configuration of instantaneous softening of the soil adjacent to the cavity and its effects on the supporting capacity of the soil beneath the adjacent Unit 3 containment structure; (5) extrapolate the results of the analysis in stage (4) to other cavities and structures; and (6) quantify the effects on foundation soil stiffness parameters used in seismic design of the structures, as well as the effects on the bearing capacity of structures and allowable settlement of structures. Id. pp. 10-11; Barneich affidavit, Exhibits B and C.

The results identify the maximum extent of cavity dimensions at Well 8, and the maximum extent of localized softening of the adjacent native soils as defined by contours of equal pore pressure ratio (the pore pressure/confining pressure) of 1.0 and 0.3 during or after the design basis earthquake. The higher the pore pressure ratio, the lower the effective confining pressure. The stiffness of the soil is approximately proportional to the effective confining pressure. These reductions in stiffness represent a transient condition, and the soil was found to stabilize to the pre-earthquake condition within about an hour after the design basis earthquake. Barneich Affidavit, pp. 12-13.

The Well 8 results were extrapolated to Well 6 and Well 7 cavities by proportioning the size of the pore pressure ratio contours to the size of the cavities at Well 6 and 7 to obtain estimates of pore pressure ratio contours for these wells. Id. p.13. The combined effects of the Wells 6 and 7 cavities on the adjacent Auxiliary Building; the individual effects of the Well 6 cavity on the adjacent Unit 2 Fuel Handling Building was evaluated; the combined effects of the Wells 7 and 8 cavities on the adjacent Unit 3 Fuel Handling Building, as well as the effects of the Well 8 cavity on the adjacent containment structure were assessed. These evaluations were made by calculating the potential reduction in soil stiffness or support characteristics of the foundation material caused by an adjacent cavity. The calculation involved making conservative assumptions regarding the relationships between the geometry and spatial location of the cavity and the body of soil dominating the support of the structure. For the static analyses, the geometric area enclosed within each cavity (see Hersh Affidavit) was assumed to have no soil stiffness at all. Id. p.14.

The dynamic response analyses originally performed for the design of Seismic Category I structures were made assuming ±30% variation in soil stiffness parameters. The maximum reduction in soil stiffness for any of these structures as calculated by the analyses of cavity effects is 8%, well within the ±30% variation used in the original design. Id. p.15.

The static settlements of the Unit 3 Containment Structure, the Auxiliary Building, and the Units 2 and 3 Fuel Handling Buildings were estimated to be less than 1/2 inch. The settlement of a structure is conservatively assumed to increase in direct proportion to the calculated maximum decrease in soil stiffness attributable to a subsurface cavity affecting the structure. Based on this assumption, the change in settlement in the structures affected by the detected cavities is calculated to be less than one-tenth of an inch. This change is considered to be well within acceptable settlement tolerances for Seismic Category I structures. Id. pp.15-16.

A second analysis of the effect of the cavities on the settlement of the structures was made by calculating the potential change in the volume of the soil beneath the Containment Structure due to the drainage of excess pore pressures. This analysis confirms that settlement attributable to the cavities is less than 1/10-in. for all structures affected by the cavities at Wells 6, 7, and 8. The original factor of safety against bearing failure for the structures was in excess of 100. The maximum 8% reduction in soil stiffness corresponds to about the same reduction in strength. This factor was applied to calculated factors of safety against bearing failures for the various Seismic Category I structures. The results of this calculation showed the factors of safety to remain in excess of 100 for all structures. Id. p.16.

The effect of the cavity at Well 8 on the electrical cable tunnel structure (see pp. 23-25, infra) was based on the results of the pore-pressure dissipation analyses by assuming that the tunnel would be unsupported in the area of the cavity. The cavities at Wells 3, 5 and 10 lie outside the soil dominating the support of the nearest major Seismic Category I structures and have no measurable effect on adjacent structures. Id. pp. 16-17. See also Exhibit F, and Hersh Affidavits.

Barneich concluded that: (1) all significant subsurface cavities at the Site were detected by the investigation; (2) the measured size, location, and configuration of the cavities is sufficiently accurate to evaluate the effects on structures; (3) the detected cavities will have no detrimental effect on Seismic Category I structures; and (4) that all dewatering wells have been adequately demobilized by backfilling with sand, gravel, and/or grout. Id. pp. 17-18.

The analyses show that the effects of seismic shaking on the cavity will lead to a small, local reduction in stiffness in the soil supporting the adjacent structure during seismic shaking. This reduction in stiffness will be a transient phenomenon lasting for less than one hour after the earthquake. Analyses of the effects of the reduction in soil stiffness on adjacent structures indicate no detrimental effect to the integrity of any adjacent structure or instructure components. pp. 17, supra.

Staff's Motion on Contention 1a

The NRC Staff moves for summary disposition of Contention 1a on essentially the same grounds as does Applicant. The Staff presents four statements of material fact which parallel Applicants' statements numbered 4 through 8. The Staff's statements are:

1. That the Applicants have adequately investigated the SONGS 2 and 3 site for voids and cavities.

2. That existing voids and cavities have been adequately filled with grouting material.

3. That detailed analyses using conservative assumptions show that even if fill materials were assumed to fail in the worst possible manner, the voids would pose no significant hazard to the seismic Category I structures on site.

4. That a detailed analysis of the void cavity 8 shows that a worst case failure of that cavity's fill materials would not have an adverse effect on the SONGS 2 and 3 electrical tunnel, the closest seismic category I structure to that filled void.

Staff Motion, following p. 11.

In support of its motion the Staff presents the affidavit of John T. Greeves a Geotechnical engineer with the NRC's Hydrologic and Geotechnical Engineering Branch, Division of Engineering, and the affidavit of Romuald E. Lipinski, a structural engineer with the Office of Nuclear Reactor Regulation.

Mr. Greeves describes the exploration, mechanical measurement, geophysical surveys, analyses and testing performed by the Applicant with respect to the dewatering cavities. This

evidence has been discussed by the Board above in relation to the Applicant's motion. Mr. Greeves concludes that the techniques used to identify the cavities and the procedures used to fill them were suitable and satisfy the need to identify and to stabilize all the cavities. He states further that Applicants evaluation of the response of the foundation soil and cavity fill material to dynamic loading is conservative. Greeves, Affidavit, p.2. The geological investigating techniques conform to or exceed Regulatory Guide 1.132, "Site Investigation for Foundation of Nuclear Power Plants" September, 1977. Id. p.3. The methods are acceptable to assess the potential impact on adjacent structures during seismic or other conditions. Id. p.6.

In addition, Mr. Greeves reports:

> Based on inspection of the Applicants reports and my own site investigations, I found that grout was placed in cavities to fill any void spaces and provide some densification of the in-fill sand within the disturbed zone. Grouting was performed in stages on a grid pattern. The water-cement ratio varied from 5:1 to 3/4:1 for the grout mixes used. Grout pressures were generally limited to one psi per foot of depth. These grouting procedures and the close spacing of the grout holes constitutes an intensive effort for the application of standard foundation treatment techniques and provide a great assurance that cavities have been filled.

Greeves' Affidavit, p.3.

Mr. Lipinski analyzed the cavities problem and solution with respect to Electrical Cable Tunnel Structure. He concurred with the Applicant's determination that the only Category I structure which might be affected by the dewatering wells is the seismic Category I electrical tunnel structure which is located next to the containment base of Unit 3 and crosses the cavity of well 8. According to Mr. Lipinski, the Bechtel Power Corporation analyzed the tunnel to be capable of spanning across the cavity for a distance of 25 feet. This electrical tunnel extends from the safety equipment building to the fuel handling building between the containment structure and the tank building and houses safety-related electrical cables. Lipinski Affidavit, p.3.

In the analysis, the soil and the structures were postulated as a combined system and the dynamic response of the soil-structure system was evaluated using the computer program. FLUSH. The model included the Unit 3 containment structure, the tunnel structure, the grout and the soil filled cavity. The control motion was specified at the finished grade of the plant site as a peak acceleration of 0.67g and the total duration of 80 seconds. The structural analysis of the tunnel was performed by the Applicants with four major assumptions (a-d) listed below:

a. The stiffness of the foundation material was reduced to zero within the area where the ratio of pore pressure is greater than 0.3. The span of 25 feet, for the tunnel, was estimated on that basis.

The staff accepted this assumption.

b. Combination of three components of seismic response was done using the method described in the NUREG/CR-0098, "Development of Criteria for Seismic Review of Selected Nuclear Power Plants" by N. M. Newmark Consulting Engineering Services, Urbana, Illinois, May 1978.

Id. p.4.

These calculations did not use the method approved by the Staff, i.e., SRSS. (Square root, sum of the squares) (SRP §3.7.2). The Staff felt that the combination of the three-dimensional components of seismic motion should not be based entirely on these criteria. It could not confirm the correctness of the calculations and the applicants were requested to perform a confirmatory analysis based on the criteria in the Standard Review Plan, Section 3.7. Id. p.5.

c. The tunnel was assumed to behave as a box-type beam for flexural consideration. The change in cross-section has been disregarded.

The Staff had a question with respect to this assumption. The Staff concurred with Applicants' assumption that a uniform cross-section will result in a lower fundamental frequency. This is significant because it results in the highest amplitude

of vibratory motion and produces the highest stresses. The Staff felt, however, that the stresses in the area of discontinuity of the tunnel may be higher when the abrupt change in the cross-section is considered, and for this reason believed that the actual configuration of the tunnel should be investigated. This conclusion was based on the commonly accepted fact that a break in uniformity of the cross-section of a member produces "stress risers" and very often it becomes the critical section from the point of view of structural design. Furthermore, the analysis did not consider stresses due to longitudinal wave propagation.

The fourth assumption was that:

d. Seismic loading has been calculated using 1.5 times the peak response of the applicable response spectrum. The response spectra used are the same as those used for other Category I structures of the San Onofre Plant Units 2 and 3.

The Staff accepted assumption d.

In response to Staff questions on assumptions b and c, the Applicants demonstrated that the technique of combination of three components of seismic responses based on the NUREG/CR-0098 methodology is equivalent to the square root of the sum of squares (SRSS). They reanalyzed the tunnel for the condition with one end fixed and the other simply supported. The Applicants also performed another analysis which accounted for the stresses due to longitudinal wave propagation. On the basis of the above, the Staff concluded that the structural design of

the tunnel is conservative and would not be adversely impacted by the presence of the dewatering well cavity.

As a result of its review, the Staff found that the Applicant has adequately performed structural investigations and analyses which show that the cavities existing at the site will not have any adverse effect on the electrical tunnel or any other seismic Class I adjacent structures at SONGS 2 and 3. Lipinsky Affidavit, passim.

Conclusion on Contention 1a

Based upon reliable, probative and substantial evidence presented by the Applicant and the NRC Staff the board finds that cavities do not naturally exist at SONGS; that some were created by the dewatering wells during construction; that all of them have been located and identified according to size and shape, that they have all been filled with sand or grout; and that adequate analysis and testing demonstrates that the cavities will not have an adverse effect upon the capability of the structures to withstand the design basis seismic events. Intervenor FOE has not answered Applicant's motion for summary disposition on any factual grounds and has not answered the Staff's motion on any grounds. Therefore the decisions sought

by both the Applicant and the Staff, shall be rendered to the extent that it is appropriate.[6/]

However the board does not agree that Contention 1a should be dismissed in its entirety. It is a part of a larger contention, No. 1, which alleges that the earthquake which could cause the maximum vibratory ground motions has not been assigned as the safe shutdown earthquake.[7/] We agree with FOE that if, after hearing, it has been established that the correct safe shutdown earthquake has not been assigned to SONGS

6/ The Summary Disposition rule, 10 CFR §2.749 provides in pertinent part at §2.749(b):

> ..When a motion for summary decision is made and supported as provided in this section, a party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact. If no such answer is filled, the decision sought, if appropriate, shall be rendered.

7/ Accepted by Memorandum and Order, January 27, 1978. The Board declined to narrow Contention 1 in its Memorandum and Order of August 6, 1980.

Units 2 and 3, there will remain a genuine issue of material fact as to whether the cavities, as treated, will have an adverse effect on the capabilities of the structure and equipment to withstand the correct safe shutdown earthquake.

Therefore as to the design basis earthquake currently assigned to SONGS Units 2 and 3, it is the ruling of the Board that there is no genuine issue of material fact relating to FOE Contention 1a; that the issue may be considered under FOE Contention 1, which challenges the correctness of the design basis earthquake.

Contention 9 (Uranium Fuel Costs)

FOE Contention 9:

> In light of accelerating costs of uranium, the decreased availability of domestic uranium and the lack of any guarantee that SONGS 2 & 3 will have a fuel supply, the cost-benefit analysis previously adopted for SONGS 2 & 3 is shown to be clearly erroneous and a proper cost-benefit analysis would now show that the costs outweigh the benefits and that the operation of SONGS 2 & 3 will not be in the best interest of the public and will not be in conformance with NEPA.

As noted above, (p.2 supra) FOE does not oppose Applicant's motion for summary disposition on the uranium fuel costs contention and has not answered Staff's motion on the same contention. The contention does not present a serious safety, environmental or common defense and security

issue. 10 CFR §2.760a. Therefore the decision requested by the Applicant and the Staff in their respective motions is appropriate in this operating license proceeding without an evaluation of the evidence supporting them.

Also, the Board has examined the affidavits of Messrs. Bridenbecker and Jaye, submitted by Applicant in support of its motion, and the affidavits of Messrs. Patterson and Roberts, submitted by the NRC Staff in support of its motion. The affiants are experts on the subject of uranium fuel availability and costs. The affidavits present a rational basis upon which the Board may conclude that there is no genuine issue of material fact on the uranium fuel costs contention.

Therefore we grant the motion for summary disposition of Contention 9.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

Emmeth A. Luebke
ADMINISTRATIVE JUDGE

Dr. Cadet H. Hand, Jr. by J.W.S.
ADMINISTRATIVE JUDGE

Gustave A. Linenberger, Chairman
ADMINISTRATIVE JUDGE

Bethesda, Maryland
January 26, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY, ET AL.	)	Docket No.(s) 50-361 50-362
	)	
(San Onofre Nuclear Generating Station, Unit Nos. 2 and 3)	)	
	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
28th day of Jan 1981.

Eugenia M. Pleasant
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY, ET AL.	)	Docket No.(s) 50-361OL 50-362OL
	)	
(San Onofre Nuclear Generating Station, Units 1 and 2)	)	

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