50-277/278 A0479

GE Nuclear Energy

NEDC-32790
DRF B33-00293, Section 15
Class 2
October 1997

Peach Bottom 2 & 3 - Recirc Piping Reanalysis Uniform Support Motion (Reg. Guide 1.60 Free-Field Motion and ASME Code Case N-411 Damping)

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D. K. Henrie

PLEASE PLACE THIS DOCUMENT IN THE PUBLIC DOCUMENT ROOM FOR PEACH BOTTOM UNITS 2 + 3, DOCKET NOS. 50-277 AND 50-278. THE STAFF IS USING THIS DOCUMENT AS PART OF ITS REVIEW UNDER TACS M99465 AND M99466.

PLEASE CALL ME AT 415-1470 IF YOU HAVE ANY QUESTIONS.

THANKS,

Lee Williams

PEACH BOTTOM PROJECT MANAGER

GE Nuclear Energy

175 Curtner Avenue
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Recirc Piping Reanalysis Uniform Support Motion (Reg. Guide 1.60 Free-Field Motion and ASME Code Case N-411 Damping)

Prepared By

D. K. Henrie

GE NUCLEAR ENERGY
Engineering and Licensing Consulting Services
175 Curtner Avenue, San Jose, CA 95125

October 3, 1997
dkh9734

cc: C. J. Lung
P. B. Shah

TO: L. J. Tilly

FROM: D. K. Henrie

SUBJECT: **Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Seismic Response Spectra Based on Regulatory Guide 1.60 Free-Field Earthquake and ASME Code Case N-411 Damping.**

REFERENCES:

(1) Design Record File No. DRF B33-00293, "Peach Bottom 2 & 3 Recirculation Piping Revised Response Spectra Analysis", September 1997.

(2) GE Document 383HA691, Rev. 0, "Seismic Analysis of Peach Bottom 2 RPV and Internals", April 6,1972.

(3) GE Document GE-NE-771-60-0994, Rev. 2, "Shroud Mechanical Program - Peach Bottom 2 & 3 Seismic Analysis", June 1995.

(4) Bechtel Power Corporation Specification 11187-G-14, "General Project Requirements for Seismic Design and Analysis of Equipment and Equipment Supports for the Peach Bottom Atomic Power Station, Units 2 & 3, Philadelphia Electric Company", Rev. June 30,1982.

(5) Engineering Mechanics Research, Inc. Engineering Computer Program SCOTH, "A Spectrum COmpatible Time History Generation Computer Program", Version 3.0, March 1993.

(6) NEDE-30824, 84NED040, Class II, "ECP RINEX01 User's Manual", November 1984.

PURPOSE

This letter transmittal formally documents the Uniform Support Motion (USM) seismic response spectra which were utilized in the Peach Bottom 2 & 3 recirculation piping seismic re-analysis.

As is indicated by the dates on the verification forms corresponding to each analytical phase required to generate the recirculation piping USM seismic spectra, the verification of the piping seismic input was completed before the piping analysis was performed. This transmittal provides the formal documentation of the verified seismic input motion spectra used in the analysis.

RECIRCULATION PIPING RE-ANALYSIS SEISMIC INPUT MOTION

The seismic input motion spectra for the re-analysis of the Peach Bottom 2 & 3 recirculation piping are given in Attachment A of this letter transmittal. The recirculation piping input motion provided in Attachment A is given in terms of North-South, East-West and Vertical components of Uniform Support Motion (USM) response spectra for the Peach Bottom 2 & 3 Design Earthquake (DE) and the Maximum Credible Earthquake (MCE) and is based on Regulatory Guide 1.60 free-field motion and ASME Code Case N-411 damping. As is indicated below, the North-South and East-West spectra were generated from the North-South and East-West primary structure seismic models, respectively. Furthermore, as indicated in the figure titles in Attachment A, the DE corresponds to the Operating Basis Earthquake (OBE) and the MCE to the Safe Shutdown Earthquake (SSE).

BACKGROUND

Site Seismic Licensing Design Basis Free-Field Motion. As indicated in the Peach Bottom 2 & 3 Updated Final Safety Analysis Report (UFSAR), the site seismic licensing design basis is defined by the smoothed Housner free-field spectra. From Subsection 2.5.3.6, "Seismic Design Criteria", and Appendix C, "Structural Design Criteria" of the UFSAR, all Seismic Class I structures were designed in accordance with the Housner spectra provided in Figures C.3.1 and C.3.2 of Appendix A. Figure C.3.1 defines the free-field Design Earthquake (DE) with a Zero Period Acceleration (ZPA) equal to 0.05g and Figure C.3.2 the Maximum Credible Earthquake (MCE) with a ZPA equal to 0.12g. The DE corresponds to the Operating Basis Earthquake (OBE) and the MCE corresponds to the Safe Shutdown Earthquake (SSE).

For analytical purposes, the S69°E component of the July 12,1952 Taft, California earthquake was selected to meet the requirements of Figures C.3.1 and C.3.2 for the purpose of generating floor response spectra required for seismic design adequacy evaluations of structures, piping and equipment. From Subsection C.3.3 on Page C.3-4 of Appendix C of the UFSAR, ***"the response spectrum specified for the site design earthquake and the response spectrum of the July 12,1952 Taft, California S69°E Earthquake normalized for the 5 percent design earthquake are compared in Figure C.3.12 for 2 percent of critical damping since only this value was used for developing floor spectrum curves."***

Also, from Page C.3-5, "***To assure the aseismic integrity of equipment, an earthquake time-history is selected whose raw spectrum response curve is greater than or equal to the site design spectrum response curve.***

This time-history is applied at the base of the building to generate, at selected elevations, additional time-histories and spectrum response curves. These time-histories and spectrum response curves are then utilized to assure the aseismic integrity of the equipment. Other seismic Class I structures were also dynamically analyzed following the same procedure."

Recirculation Piping Seismic Input Motion Used in Existing Analyses. The seismic input motion spectra for the seismic analysis of the existing replacement recirculation piping at Peach Bottom 2 & 3 was provided to GE by the Philadelphia Electric Company. The seismic input spectra is contained in Reference 4 and corresponds to Elevation 135'-0" of the reactor building.

The reactor building spectra in Reference 4 was generated by Bechtel by applying the Taft earthquake (described above) to a six-node, mathematical, center-line, beam element seismic model of the reactor building only and the seismic acceleration time histories and corresponding amplified response spectra at the model nodes generated. The nuclear island, comprised of the RPV and internals, biological shield wall and pedestal, was not represented in the analytical model. Consequently, the spectra presented in Reference 4 do not account for the dynamic interaction between the reactor building and the nuclear island.

In the center-of-gravity approach utilized in many of the piping analyses performed for the earlier plants, the seismic response spectra corresponding to the center-of-gravity of the primary structure supporting the piping system being analyzed is taken as the USM response spectra which is applied uniformly at all piping support locations in the piping seismic analyses.

For Peach Bottom 2 & 3, there are no recirculation piping support points on the reactor building. Only the much smaller diameter secondary RHR piping, which branches off from the recirculation piping, has supports in the reactor building (i.e., at the drywell penetrations). One of the snubbers which supports the recirculation pump is attached to a radial beam which spans between the shield wall and the drywell. The elevation of the support location at the drywell end of the radial beam corresponds to Elevation 135'-0" of the reactor building.

Based on the foregoing, it is very clear that it was inappropriate to apply the Reference 4 spectra at Elevation 135"-0" of the reactor building in the USM response spectrum analysis of the replacement recirculation piping.

RECIRCULATION PIPING SEISMIC REANALYSIS

The correct recirculation piping USM input response spectra, based on the Housner free-field input motion, were developed and applied to Loop B of the Peach Bottom 3 recirculation piping models. The technical basis for the generation of the USM spectra is as follows.

As discussed above, the Peach Bottom 2 & 3 site seismic licensing design basis free-field input motion is defined by Housner spectra given in Figures C.3.1 and C.3.2 in Appendix C of the UFSAR for the DE and for the MCE, respectively. Consequently, spectrum consistent synthetic

time histories, scaled to the required ZPA levels for the horizontal and vertical components of the DE and the MCE, were generated based on the Figures C.3.1 and C.3.2 Housner spectra. The required ZPA values are:

Design Earthquake (DE):

Horizontal ZPA = 0.05g (1)

Vertical ZPA = (2/3) x 0.05g = 0.033g (2)

Maximum Credible Earthquake (MCE):

Horizontal ZPA = 0.12g (3)

Vertical ZPA = (2/3) x 0.12g = 0.08g (4)

The Housner synthetic time histories were then applied to the Peach Bottom 2 & 3 primary structure North-South and East-West seismic models and the response spectra at the recirculation piping individual support locations generated for both the DE and the MCE. Because the Peach Bottom 2 & 3 primary structure seismic model vertical fundamental frequency is beyond the vertical seismic free-field input motion ZPA frequency, the vertical primary structure model is rigid with respect to the vertical seismic free-field input motion. Consequently, there is no amplification of the seismic vertical free-field motion through the primary structure. It then follows that the vertical input motion to each of the recirculation piping individual vertical supports is equal to the vertical free-field motion.

The input motions at the recirculation individual were then enveloped and applied as USM to the recirculation piping. Many of the piping responses exceeded the ASME Code allowable values. The greatest exceedance was by a factor of 3.13. Consequently, using the correct input motion for the recirculation piping and the current analytical methodology contained in the Peach Bottom 2 & 3 USFAR, it was not possible to demonstrate the seismic design adequacy of the recirculation piping to the Peach Bottom 2 & 3 site licensing design basis seismic input motion. Also, it is noted that the overload margins would be much greater if the correct USM piping input spectra had been generated based on the Taft earthquake. This is due to the fact that free-field spectra from the Taft earthquake envelop the Housner free-field spectra, as is illustrated in Figure C.3.12 of the Peach Bottom 2 & 3 UFSAR.

In order to demonstrate the seismic design adequacy of the recirculation piping, as currently installed at Peach Bottom 2 & 3, to the site specific licensing design basis seismic input motion, it was necessary to apply the Regulatory Guide 1.60 seismic free-field input motion in conjunction with the methodology contained in the US NRC Standard Review Plan (SRP), Sections 3.7.1, 3.7.2 and 3.7.3 and in Regulatory Guides 1.92, 1.122 as well as ASME Code Case

N-411 damping. This approach was acceptable to the NRC staff. Also, because of GE's high confidence (and the technical basis for that high confidence level) that the piping responses calculated using this approach would be within the ASME Code allowable, the NRC allowed both units to remain in operation while the actual piping analyses were being performed.

The activities described below were completed to generate the appropriate seismic input motions required for the seismic reanalysis of the Peach Bottom 2 & 3 recirculation piping:

Peach Bottom 2 & 3 Primary Structure Seismic Models. A sketch applicable to both the Peach Bottom 2 & 3 North-South and East-West primary structure seismic models is given in Figure E1 of Attachment E to this letter. The Eigen Summary Tables for the North-South and the East-West models are given in Tables E1 and E2, respectively. The eigenanalysis input geometries for the North-South and East-West primary structures are also provided in Attachment E.

The Peach Bottom 2 & 3 North-South and East-West primary structure seismic models were originally developed in 1972, Reference 2, and reconstituted for the Reference 3 Peach Bottom 2 & 3 shroud repair program which was completed in 1995. Because the seismic spectra at Elevation 135'-00" of the reactor building were inappropriately used for the seismic design adequacy evaluation of the replacement recirculation piping in 1984, for the current evaluation it was necessary to generate the appropriate seismic input spectra to the recirculation piping based on the Housner site licensing design basis seismic free-field input motion. Consequently, the Housner spectrum consistent synthetic time histories, developed for the Peach Bottom 2 & 3 shroud repair program, were applied to the primary structure seismic model and the piping seismic input spectra generated. However, as indicated above, when the Housner-based spectra were applied to the recirculation piping analytical models, the piping responses exceeded ASME Code allowables by up to a factor of 3.13.

Subsequently, the primary structure models were again applied to generate recirculation piping input spectra based on the Regulatory Guide 1.60 seismic free-field input motion appropriately scaled for the Peach Bottom 2 & 3 peak ground accelerations. In this analysis the GESSAR spectrum consistent synthetic time histories were applied to the primary structure model. The piping responses, based on the GESSAR synthetic time histories, ASME Code Case N-411 damping, and the corresponding analytical methodology currently acceptable to the US NRC, exceeded the corresponding ASME Code allowables by up to 13%.

The primary structure seismic modes were applied a third time in order to remove additional conservatism in the recirculation piping seismic input motion spectra. Regulatory Guide 1.60 spectrum consistent synthetic time histories were regenerated based on the SCOTH methodology, using the Engineering Computer Code (ECP) SCOTH (Reference 5). The resulting synthetic time histories were applied to the primary structure model and the recirculation piping seismic input motion generated. The resulting recirculation piping responses for Loops A and B of Units 2 and 3, based on the SCOTH synthetic time histories, ASME Code Case N-411 damping, and the corresponding analytical methodology currently acceptable to the US NRC, were all within the ASME Code allowables.

Reg. Guide 1.60, Seismic Free-Field Motion. The Regulator Guide 1.60 free-field spectrum consistent synthetic time history plots (North-South, East-West and Vertical) based on the SCOTH methodology and normalized to a 1.0g ZPA are provided in Figures D4, D10 and D16, respectively, of Attachment D. Corresponding displacement and velocity time history plots are also provided in Attachment D. Spectral plots, which compare the Regulatory Guide 1.60 source spectra with corresponding spectra generated from the synthetic time histories for oscillator damping values of 0.5%, 2.0% and 7.0%, are also provided.

Reg. Guide 1.60, Recirculation Piping, ISM Seismic Response Spectra. The SCOTH generated, Regulatory Guide 1.60 spectrum consistent, synthetic time histories were applied to the Peach Bottom 2 & 3 primary structure seismic models and the seismic input motions at the recirculation piping individual support locations generated. The recirculation piping ISM generated unbroadened and broadened (± 15%) spectra are provided in Attachment C for the DE and the MCE. All spectra are provided at 2.0%, 3.0% and 5.0% oscillator damping. Spectra are provided for the North-South, East-West and Vertical directions.

Reg. Guide 1.60, Recirculation Piping, USM Seismic Response Spectra. The enveloped components of the North-South, East-West and Vertical recirculation piping ISM spectra presented in Attachment C are provided in Attachment B for the unbroadened curves at 2.0%, 3.0% and 5.0% oscillator damping.

Reg. Guide 1.60, Recirculation Piping, Code Case N-411 Damping, USM Seismic Response Spectra. The ASME Code Case N-411 spectral accelerations corresponding to the enveloped spectra presented in Attachment B are given by the spectral curves provided in Attachment A for the North-South, East-West and Vertical directions for both the DE and the MCE. The spectral accelerations contained in these curves were generated at the recirculation piping natural frequencies using the GE Engineering Computer Program RINEX03 (Reference 6). The Attachment A spectra were utilized in the final Peach Bottom 2 & 3 recirculation piping seismic reanalysis.

If there are any questions, or if I can be of additional help, please call me at (408) 925-5964 or page me at (408) 932-3194.

D.K. Henrie, Principal Engineer
Engineering and Licensing Consulting Services

Verified by: P. B. Shah, Senior Engineer
Engineering and Licensing Consulting Services

ATTACHMENT "A"

FECO Energy Company
Peach Bottom Atomic Power Station, Units 2 & 3

Recirculation Piping Uniform Support Motion (USM)
ASME Code Case N-411 Seismic Input Motion Response Spectra

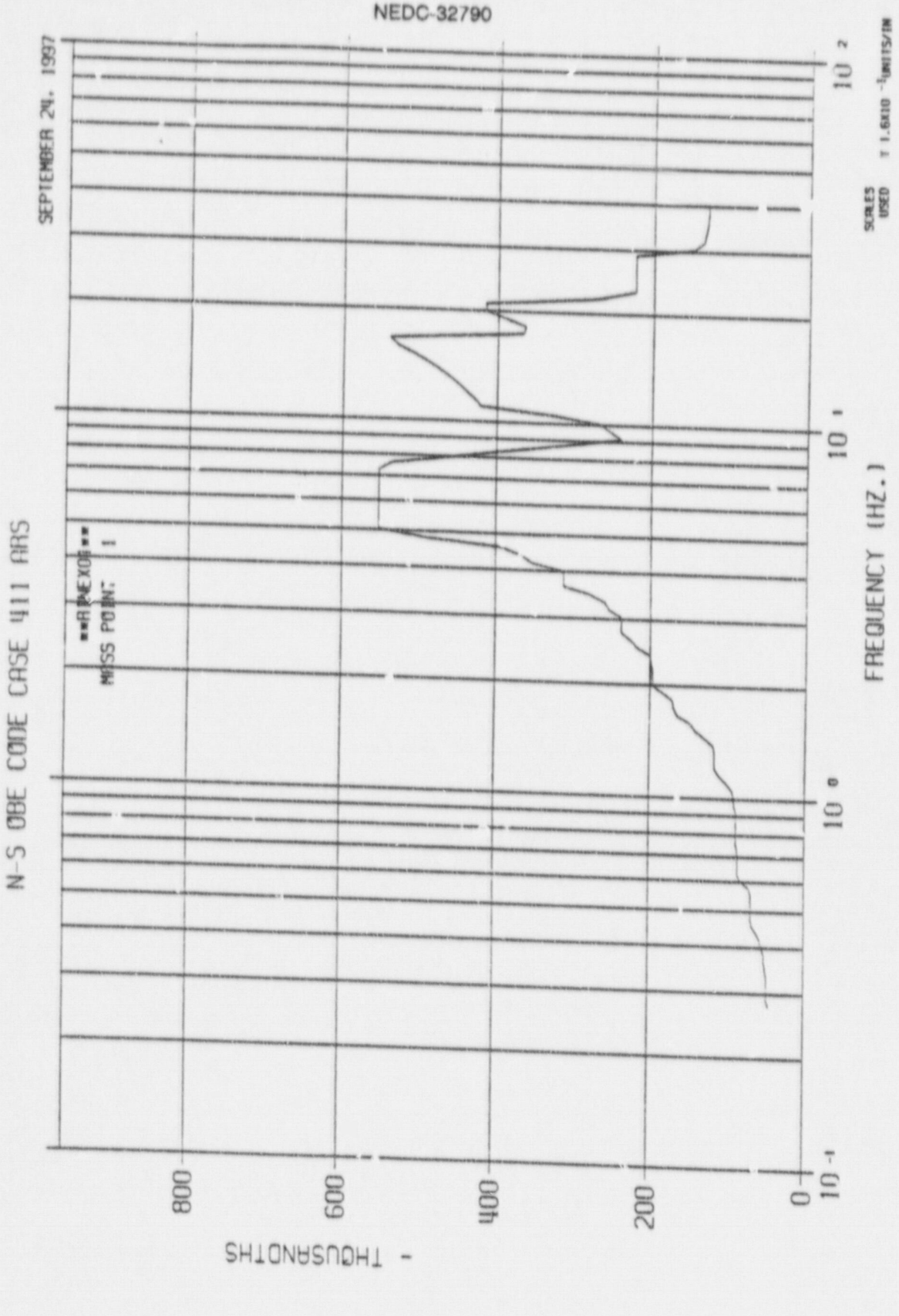


Figure A1 Peach Bottom 2 & 3 - Recirculation Piping USM, OBE (~Design Earthquake) North-South Response Spectra, Code Case N-411

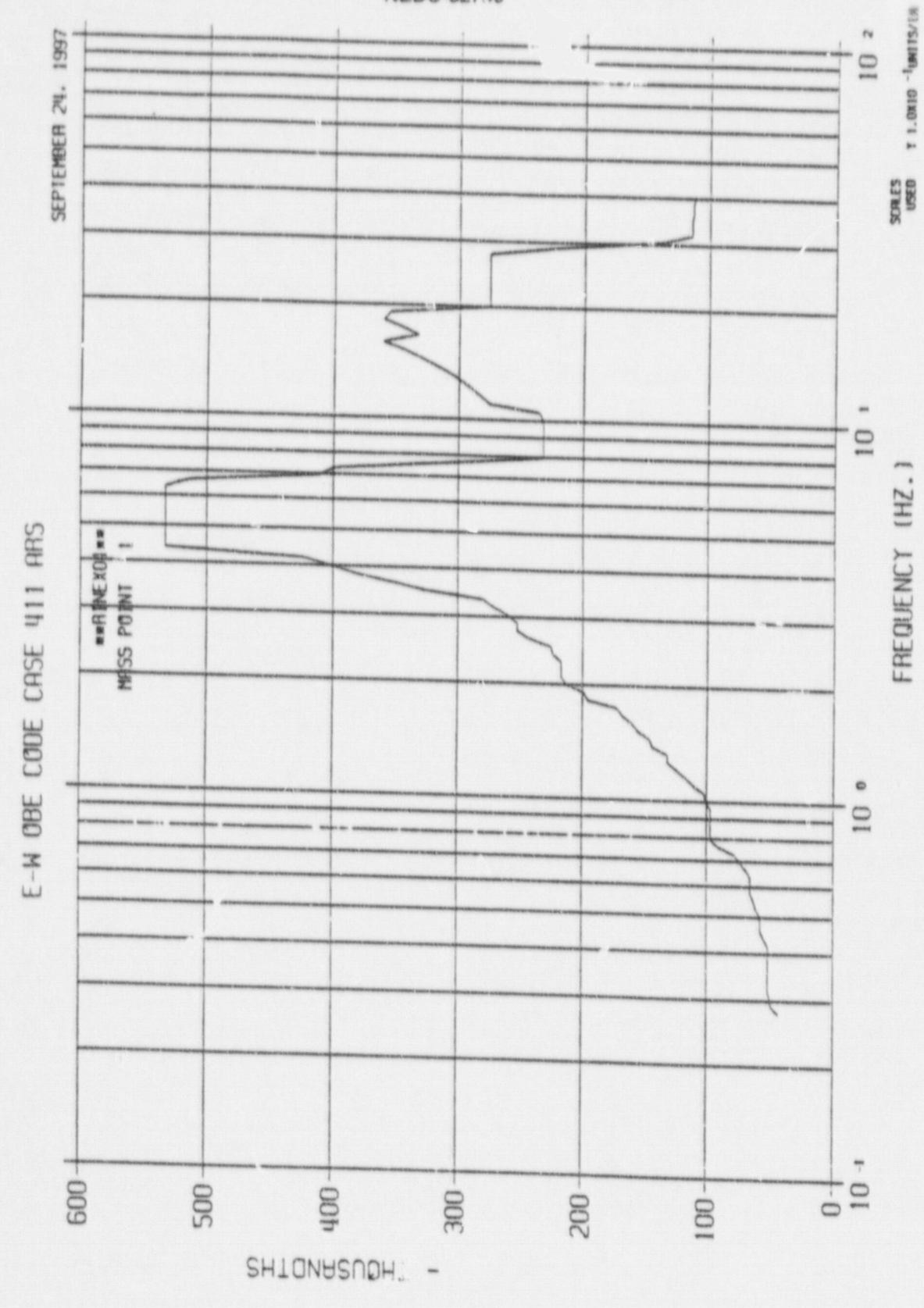


Figure A2 Peach Bottom 2 & 3 - Recirculation Piping USM, OBE (~Design Earthquake) East-West Response Spectra, Code Case N-411 Damping

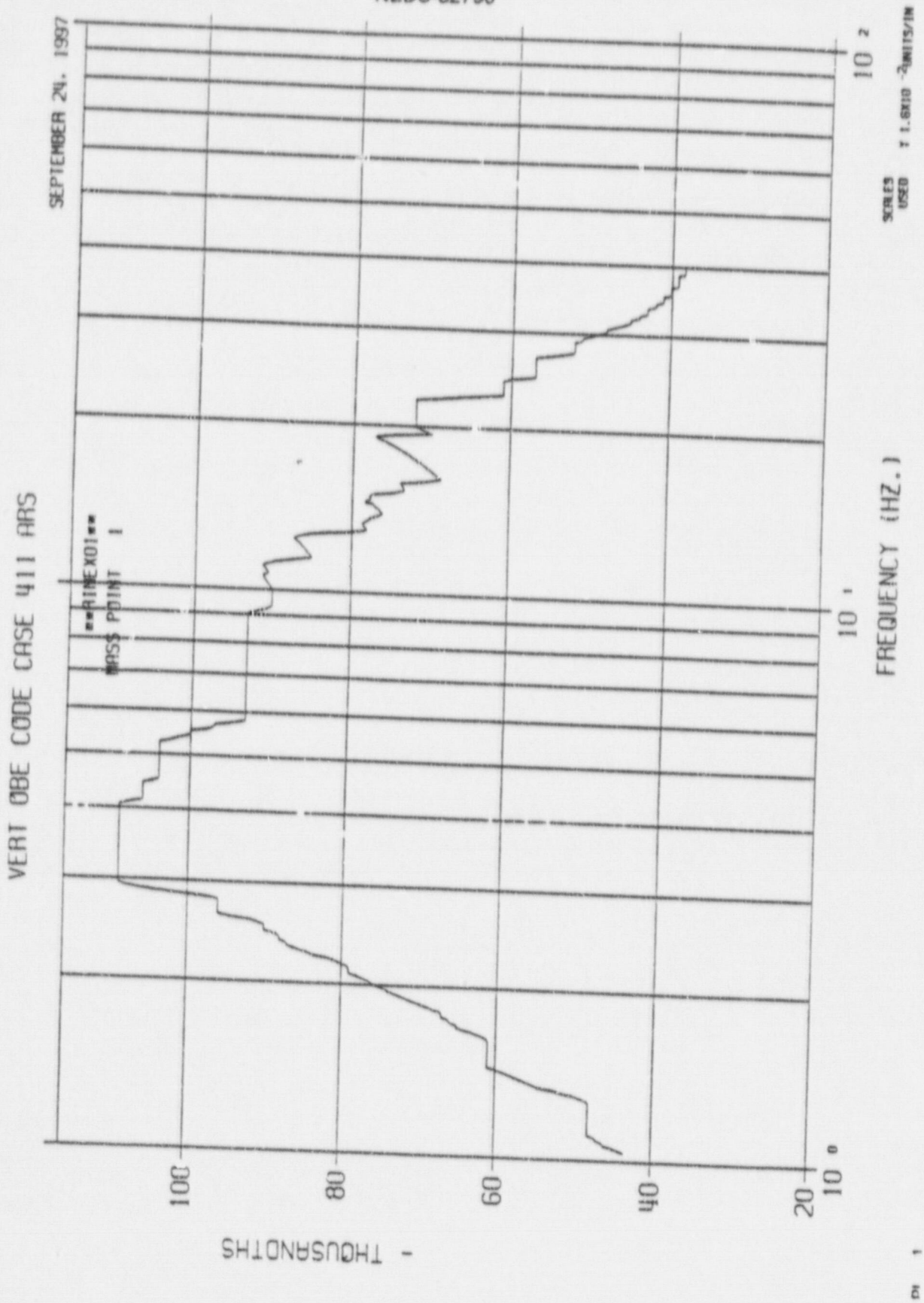


Figure A3 Peach Bottom 2 & 3 - Recirculation Piping USM, OBE (~Design Earthquake) Vertical Response Spectra, Code Case N-411 Damping

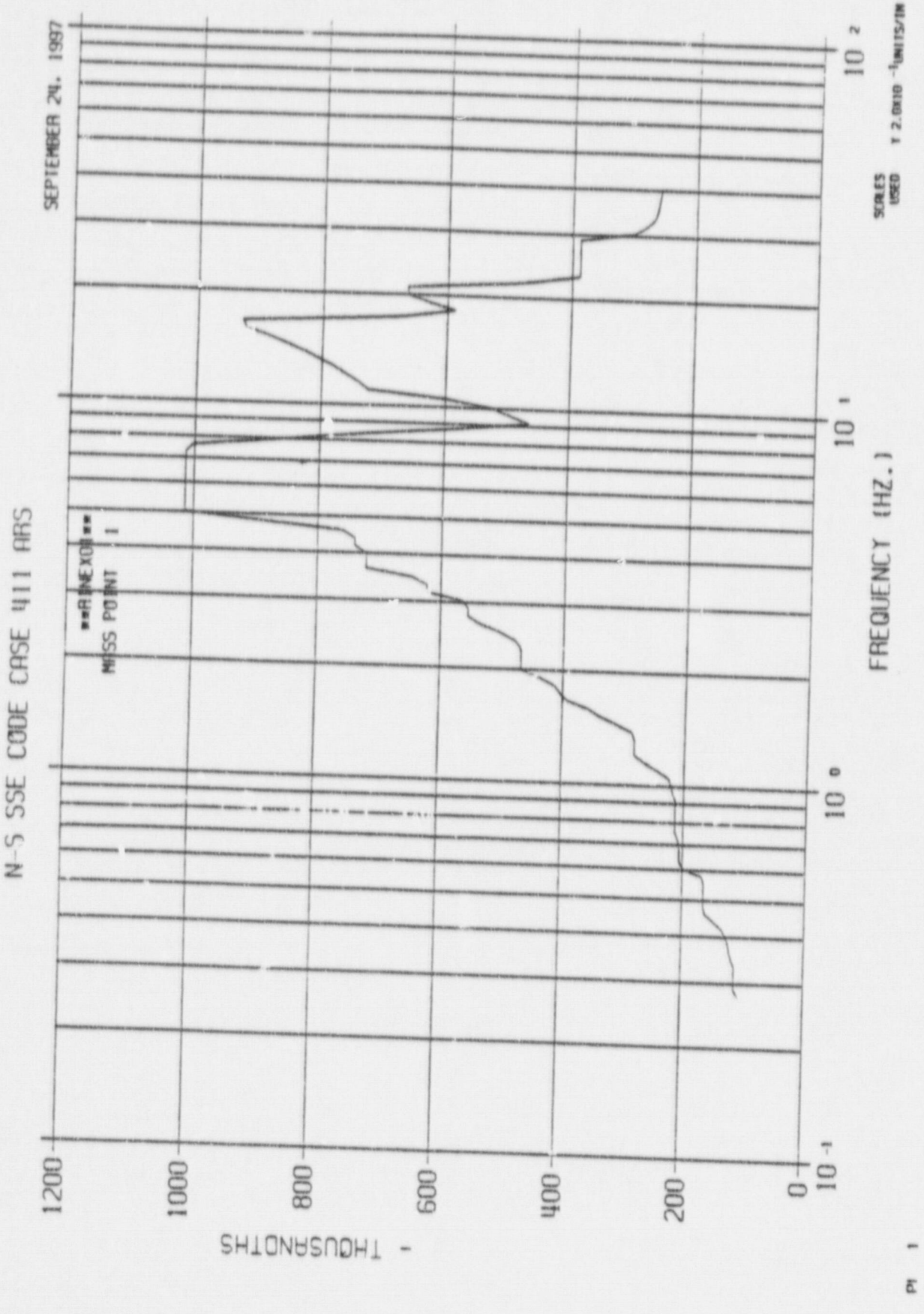


Figure A4 **Peach Bottom 2 & 3 - Recirculation Piping USM, SSE (~Maximum Credible Earthquake), North-South Response Spectra, Code Case N-411 Damping**

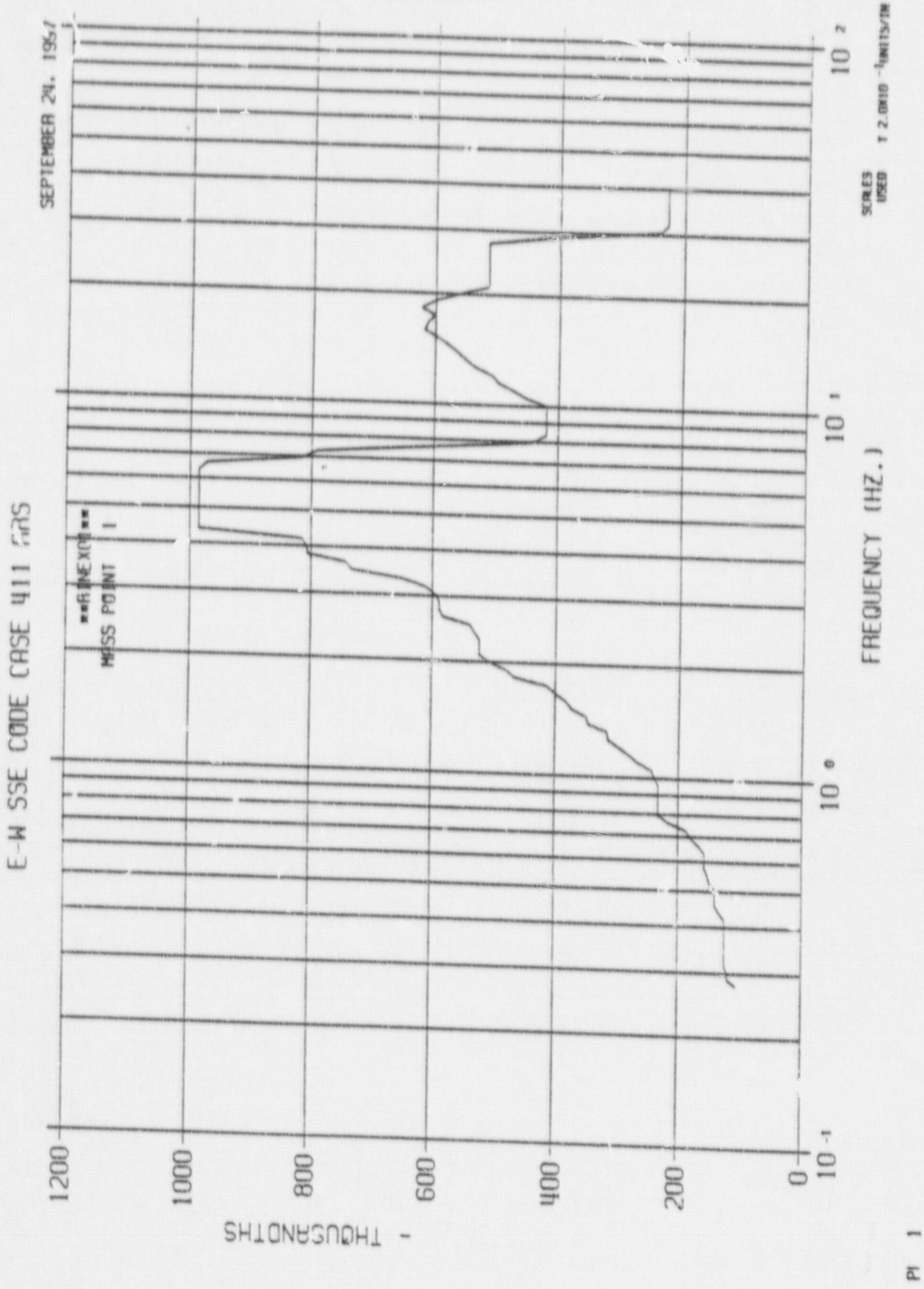


Figure A5 Peach Bottom 2 & 3 - Recirculation Piping USM, SSE (~Maximum Credible Earthquake), East-West Response Spectra, Code Case N-411 Damping

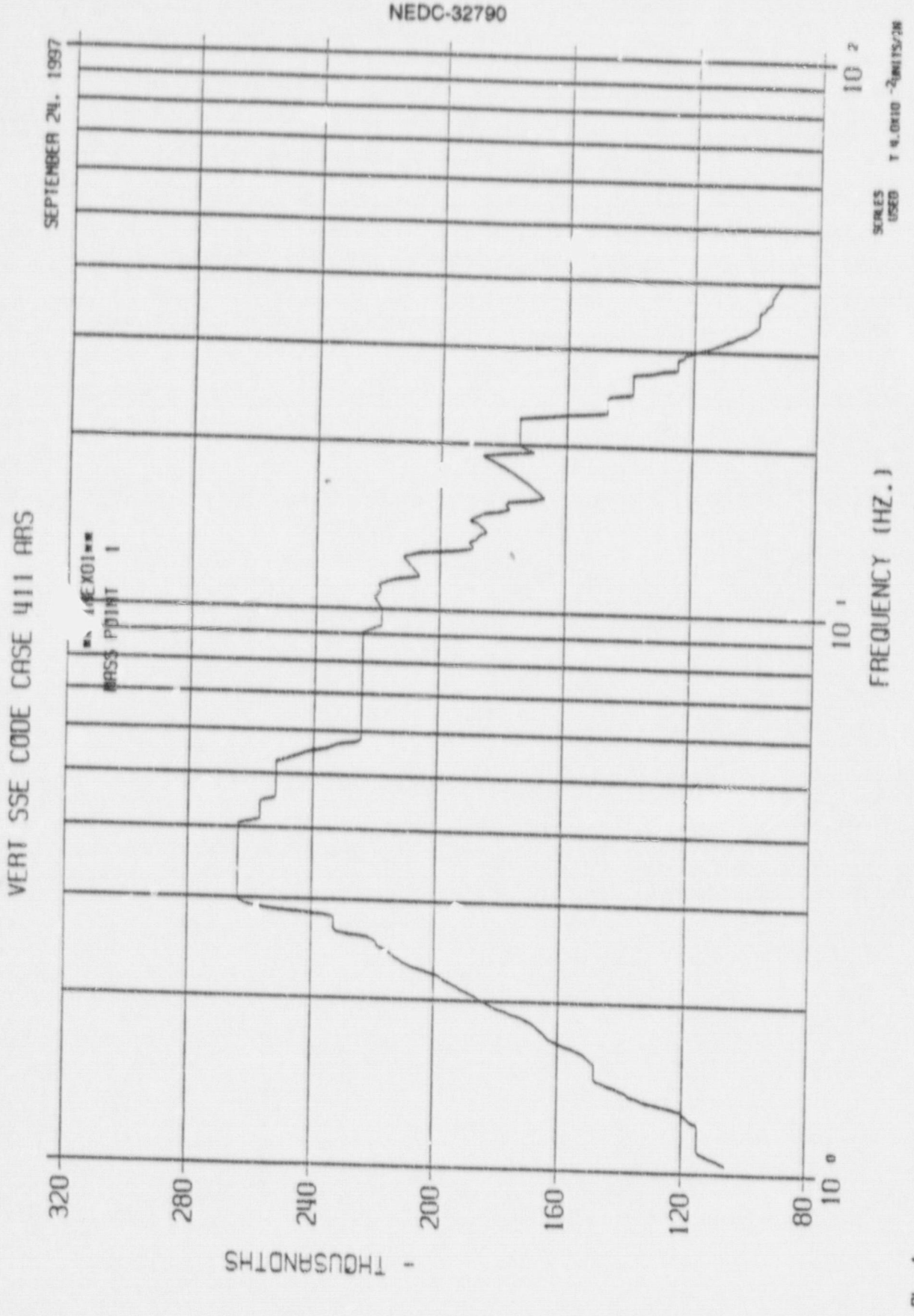


Figure A6 **Peach Bottom 2 & 3 - Recirculation Piping USM, SSE (~Maximum Credible Earthquake), Vertical Response Spectra, Code Case N-411 Damping**

ATTACHMENT "B"

PECO Energy Company
Peach Bottom Atomic Power Station, Units 2 & 3

Recirculation Piping Uniform Support Motion (USM)
Seismic Input Motion Response Spectra

Figure B1 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Design Earthquake, Horizontal North-South

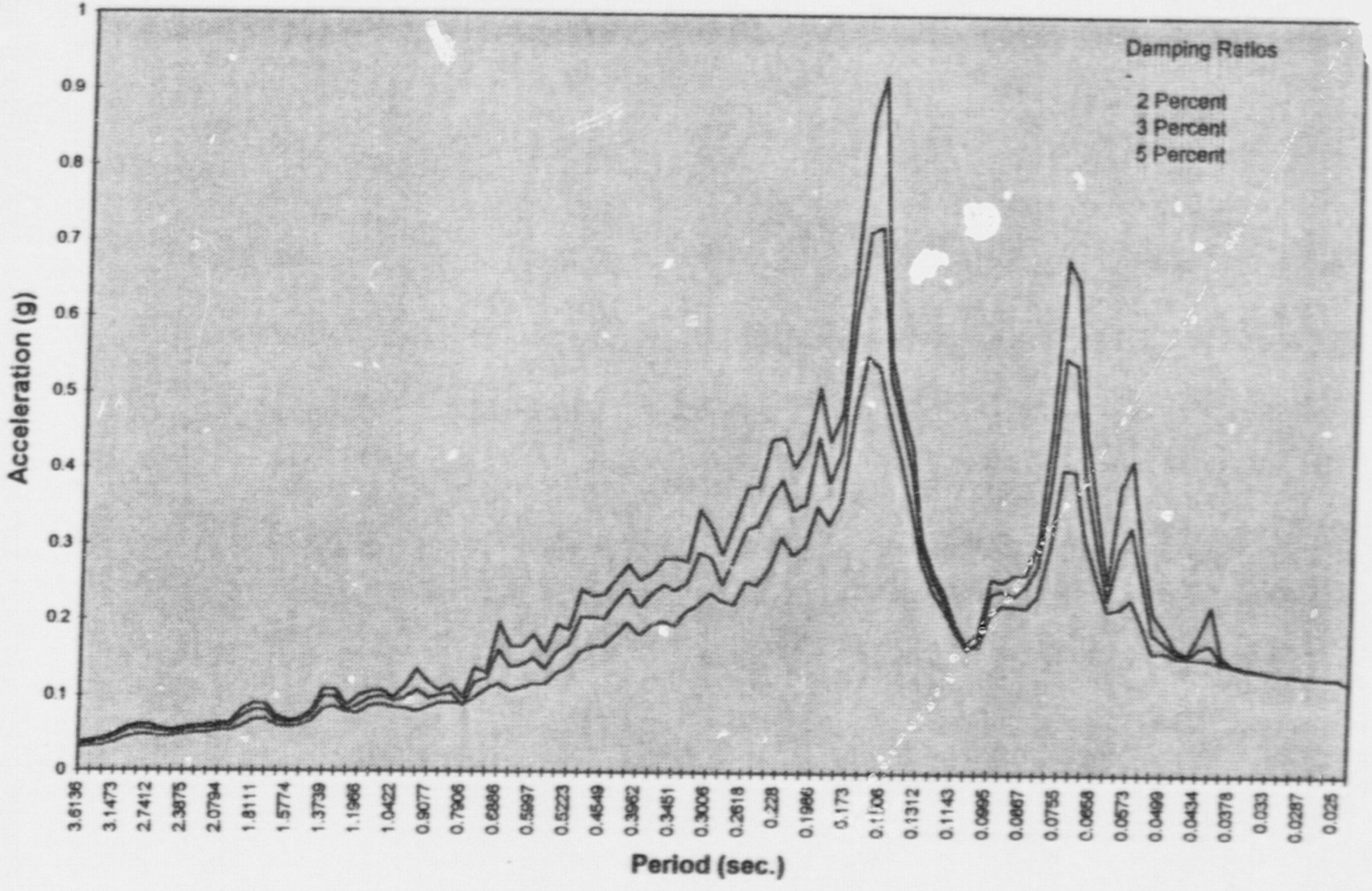


Figure B2 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Design Earthquake, Horizontal East-West

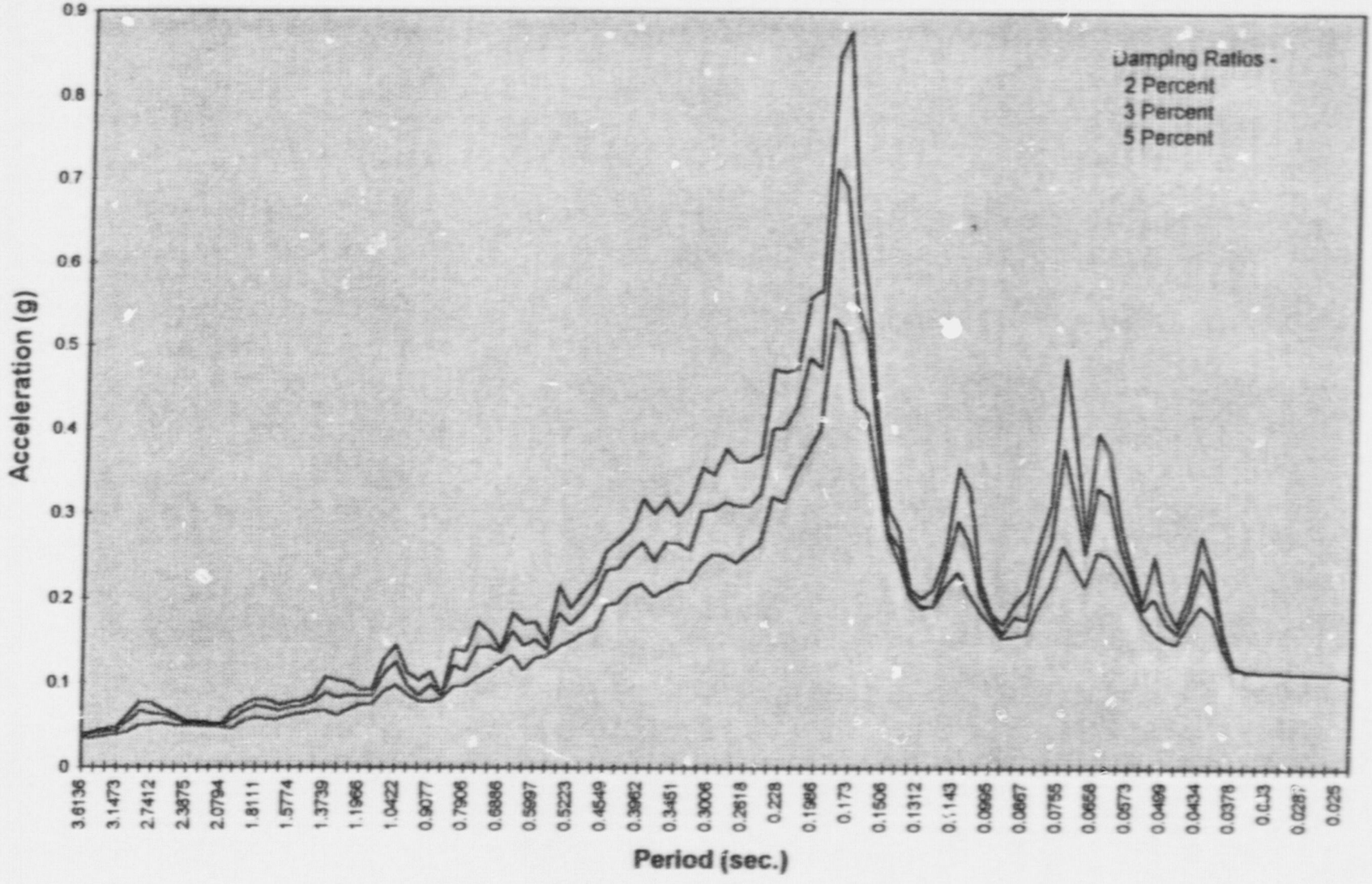


Figure B3 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Design Earthquake, Vertical

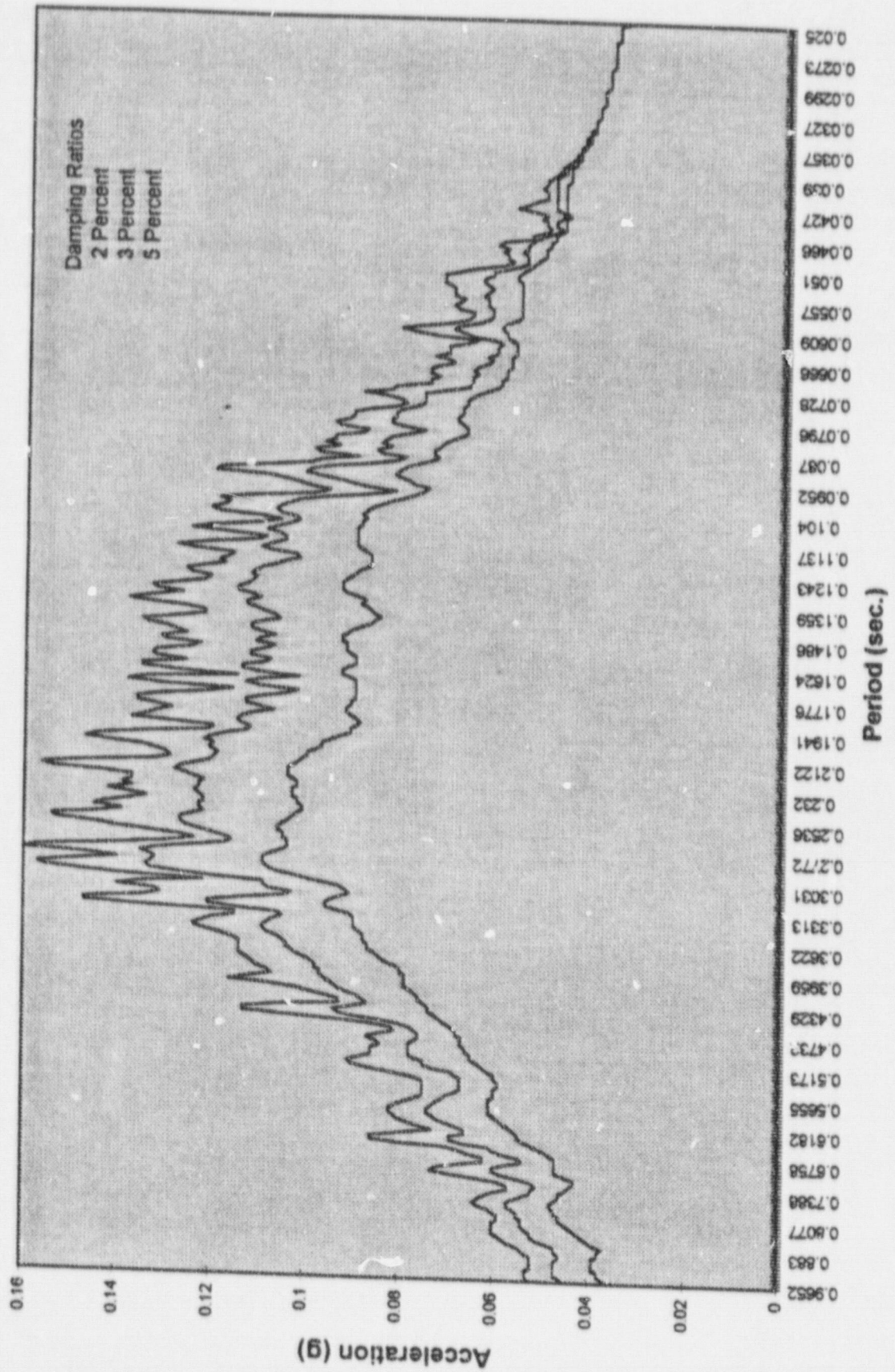


Figure B4 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Maximum Credible Earthquake, Horizontal North-South

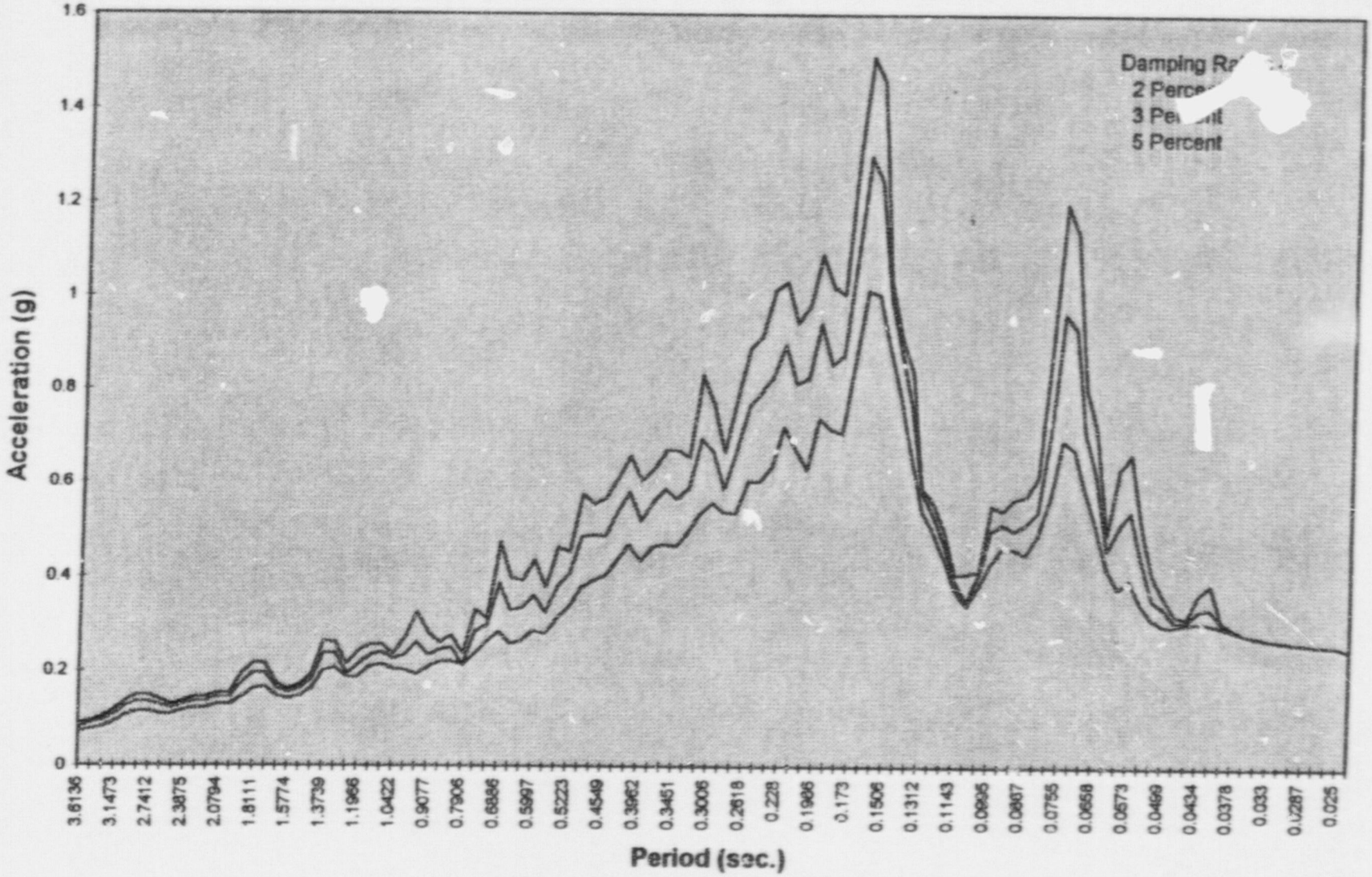
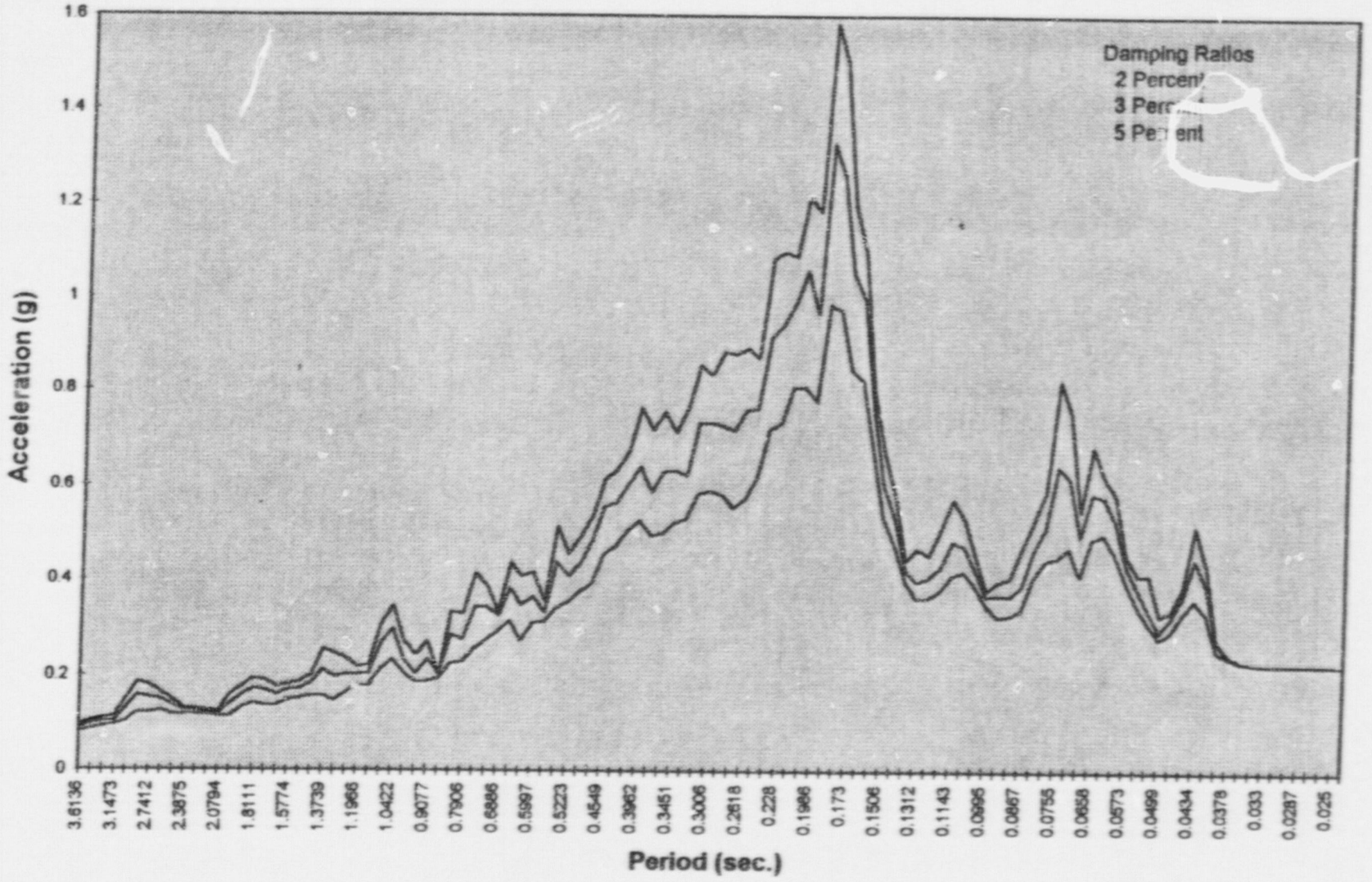


Figure B5 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Maximum Credible Earthquake, Horizontal East-West



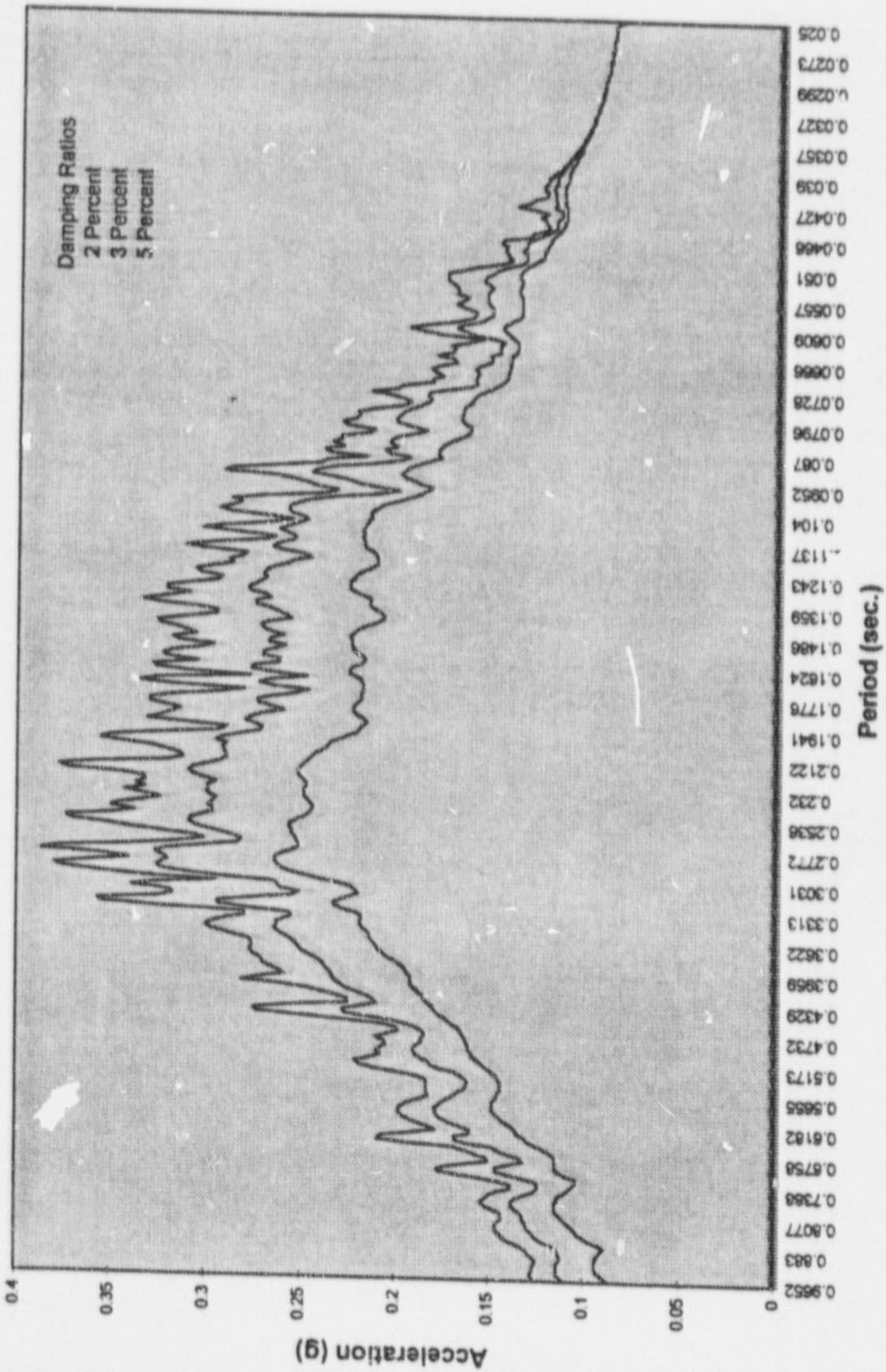


Figure B6 Peach Bottom 2 & 3 - Recirculation Piping Reanalysis, Uniform Support Motion, Maximum Credible Earthquake, Vertical

ATTACHMENT "C"

PECO Energy Company
Peach Bottom Atomic Power Station, Units 2 & 3

Recirculation Piping Independent Support Motion (ISM)
Seismic Input Motion Response Spectra

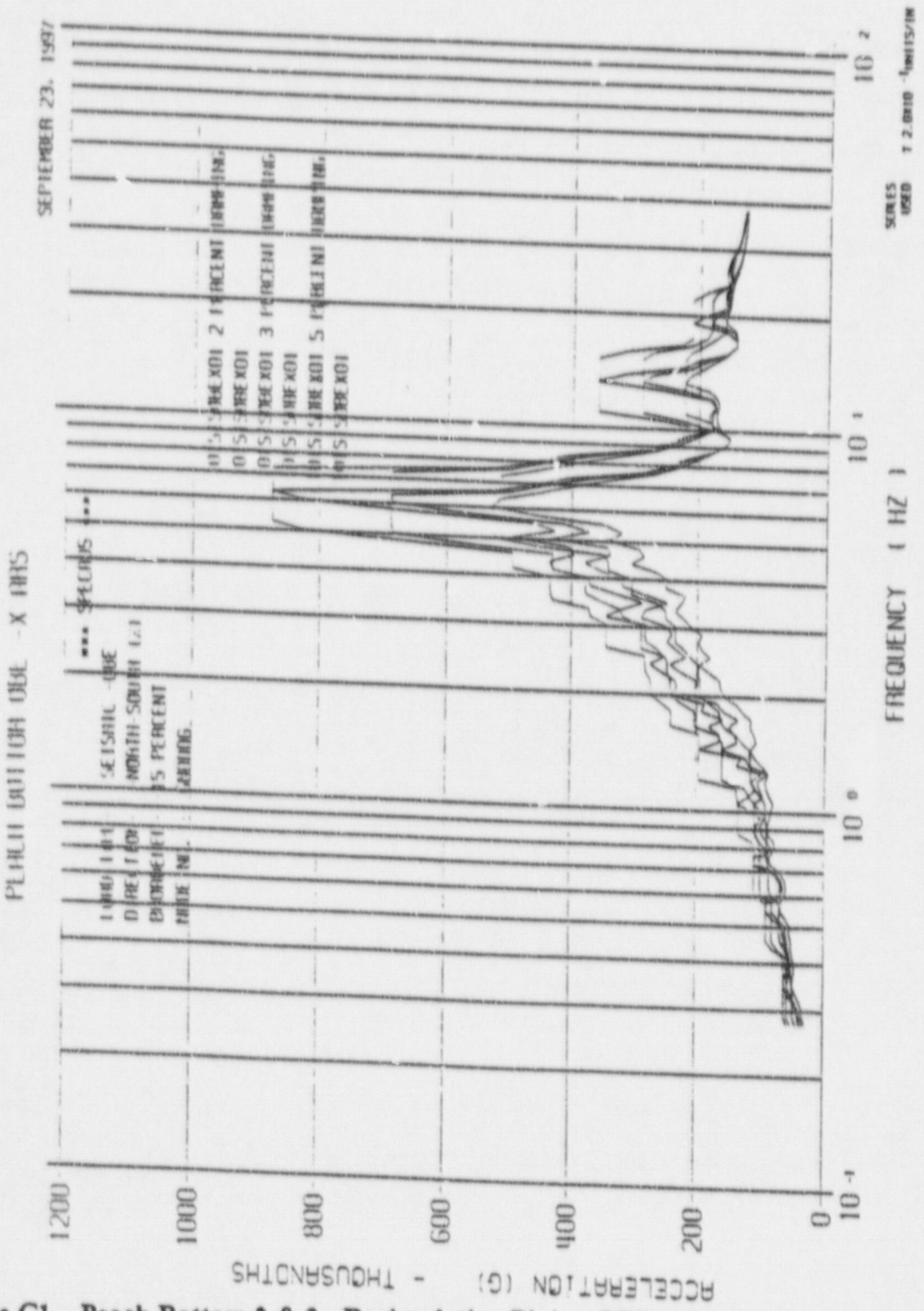


Figure C1 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 6

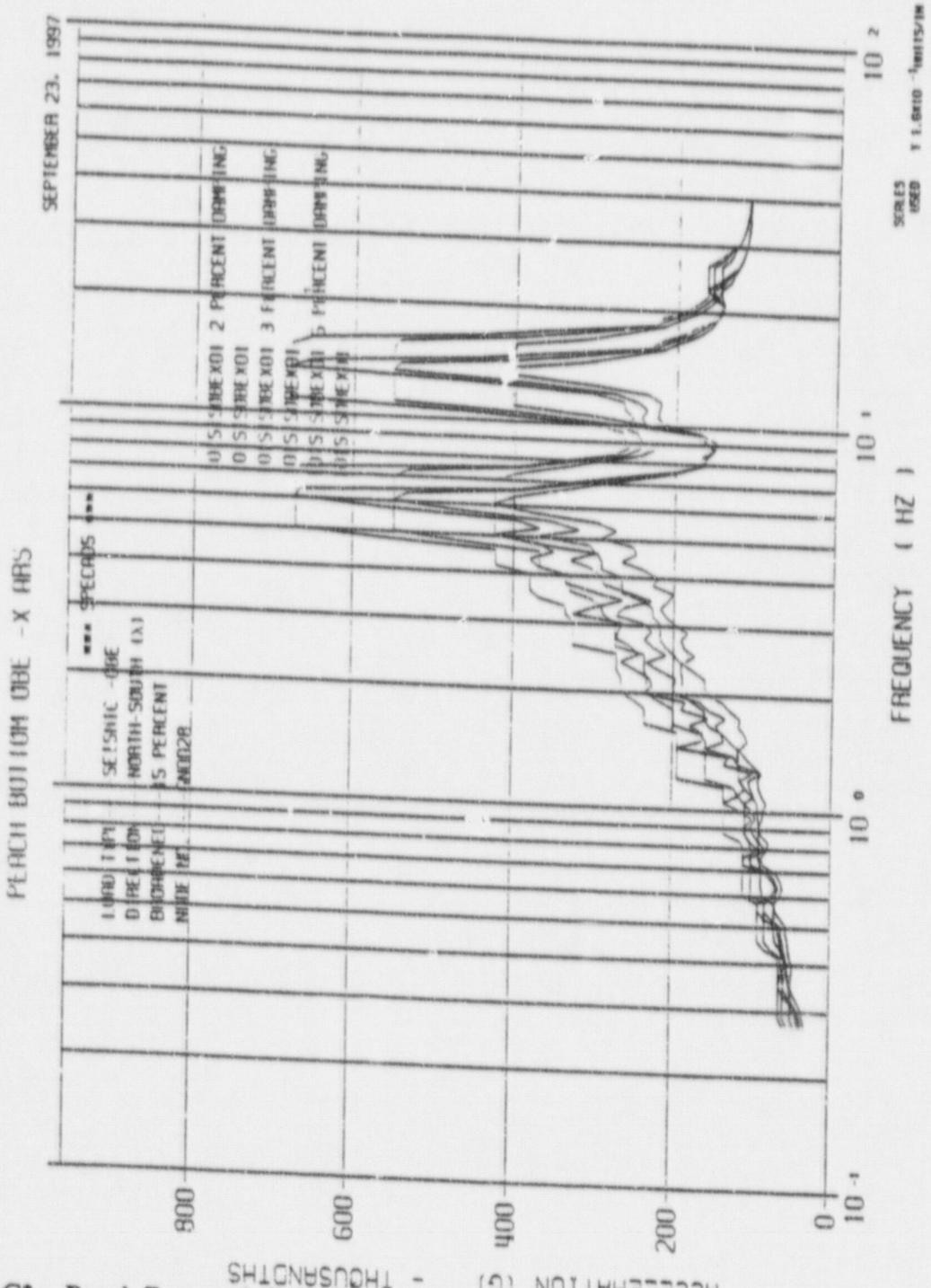


Figure C2 **Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 28**

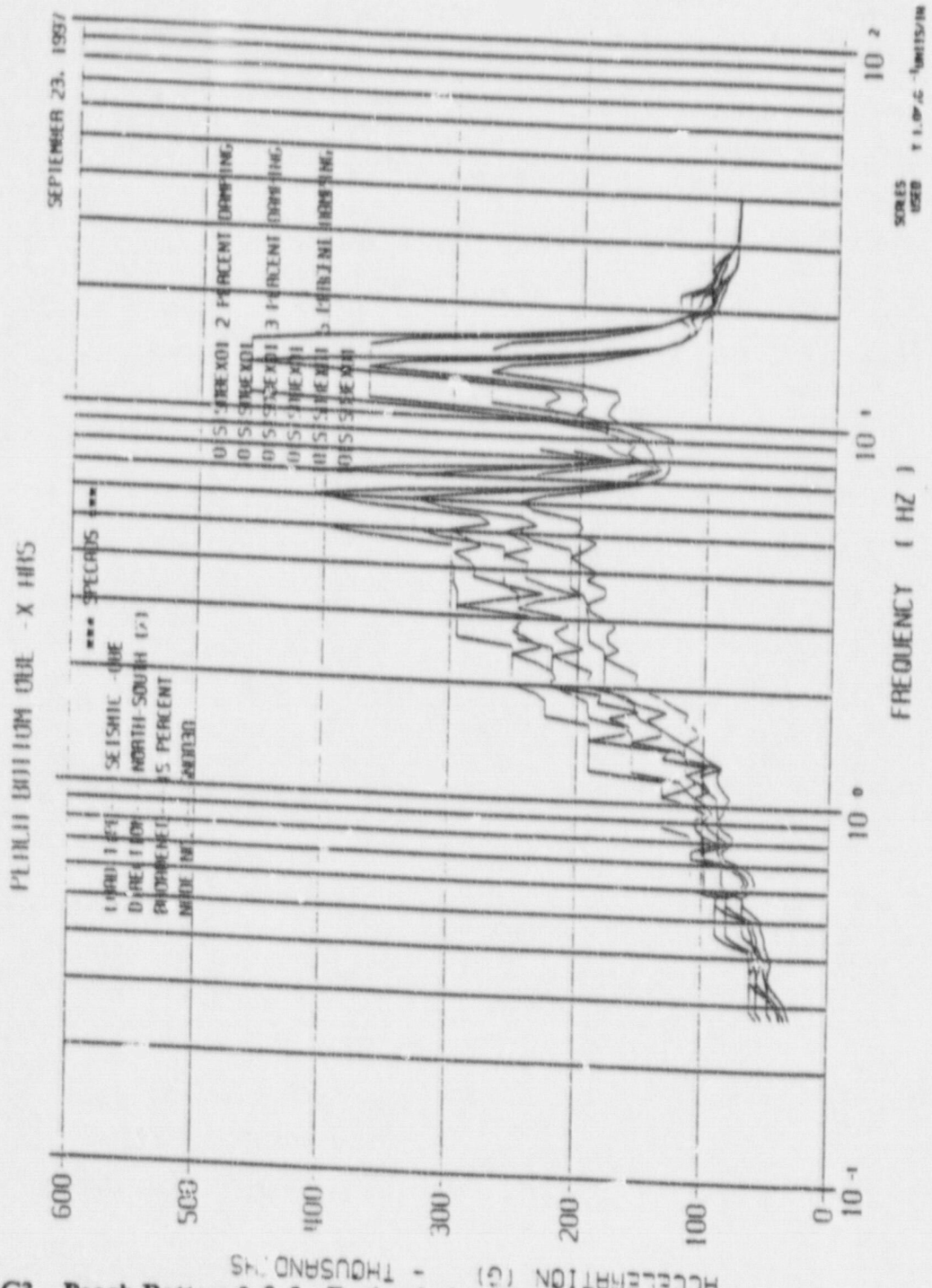


Figure C3 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 30

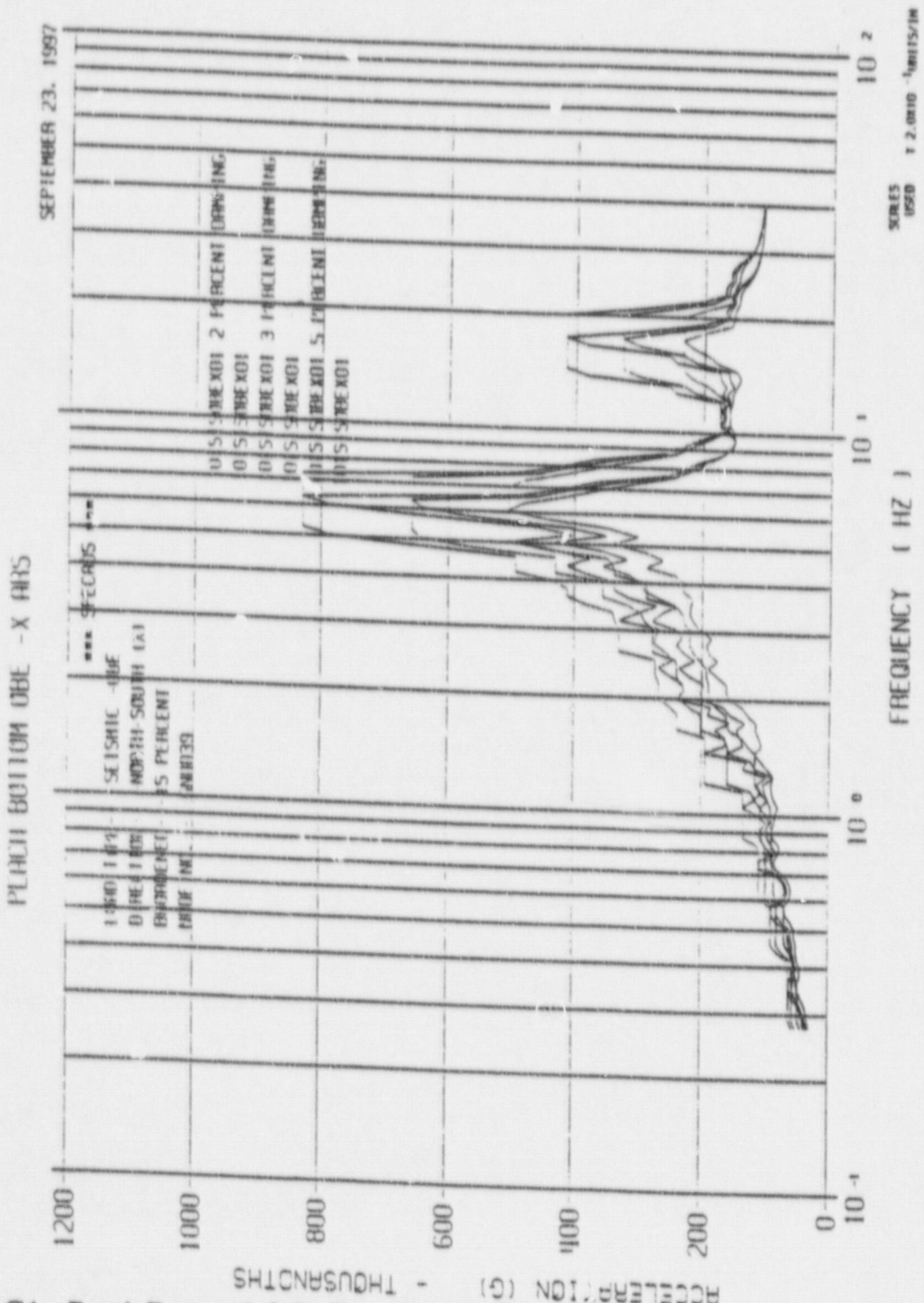


Figure C4 **Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 39**

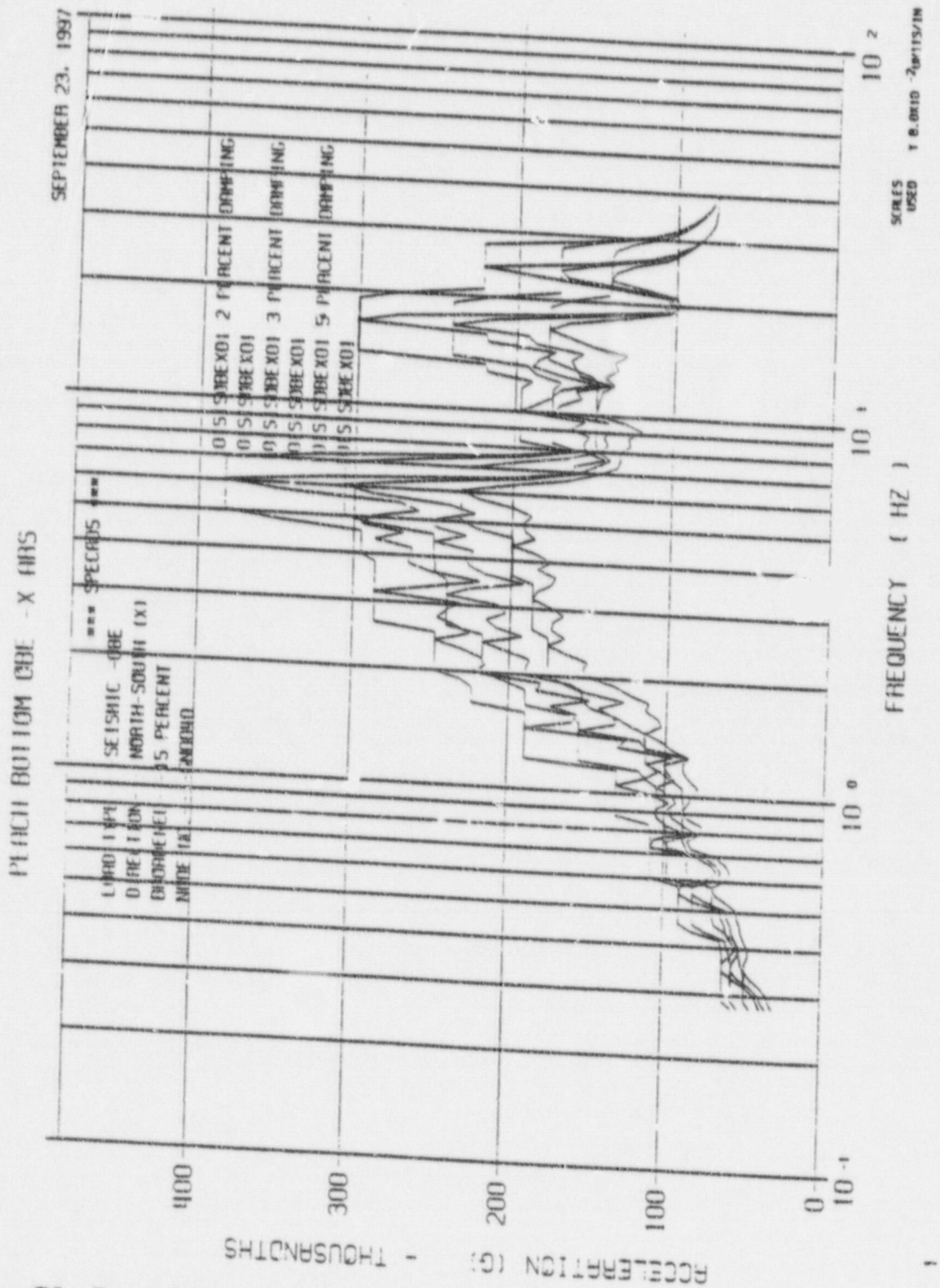


Figure C5 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 40

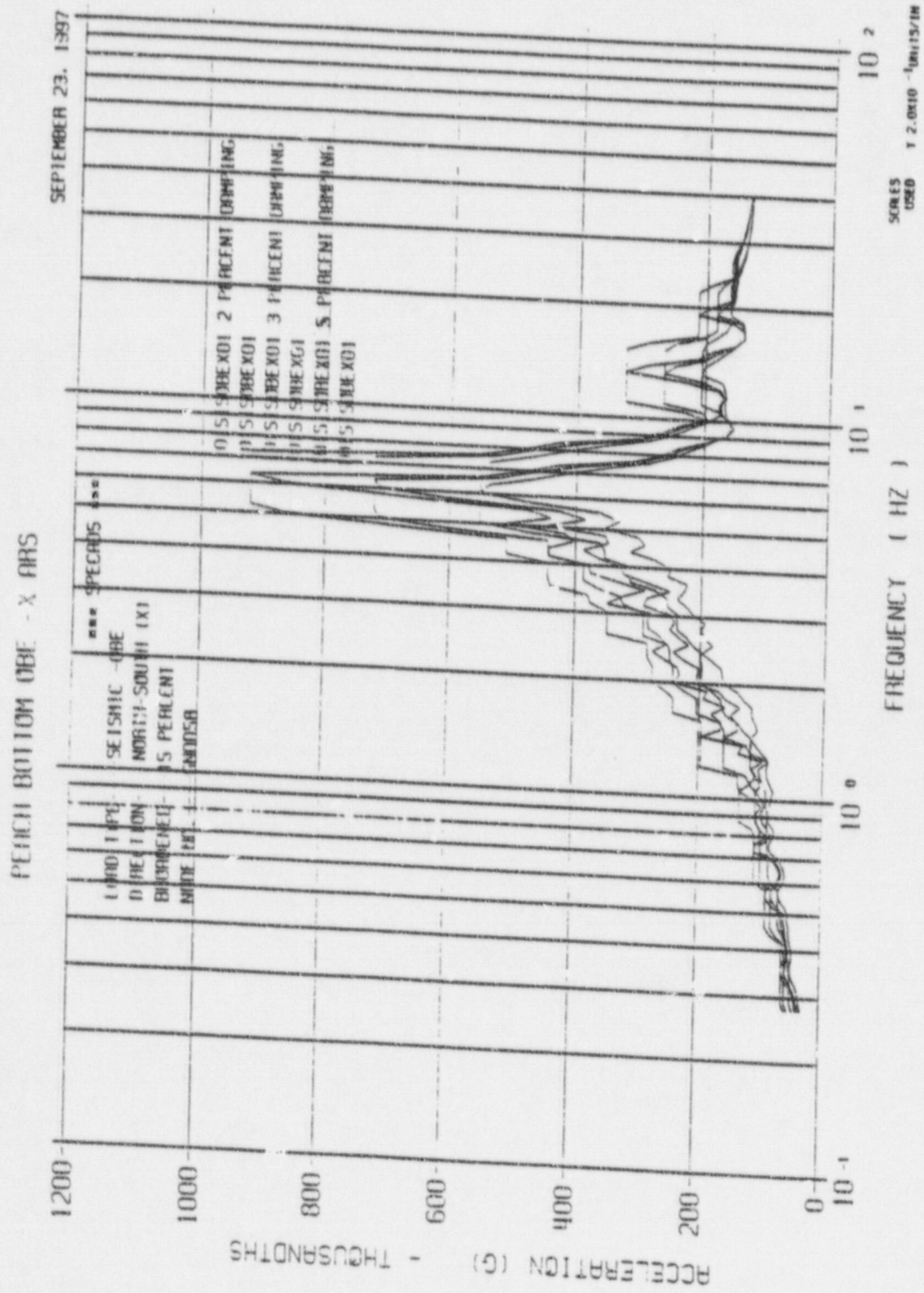


Figure C6 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, North-South, Node 58

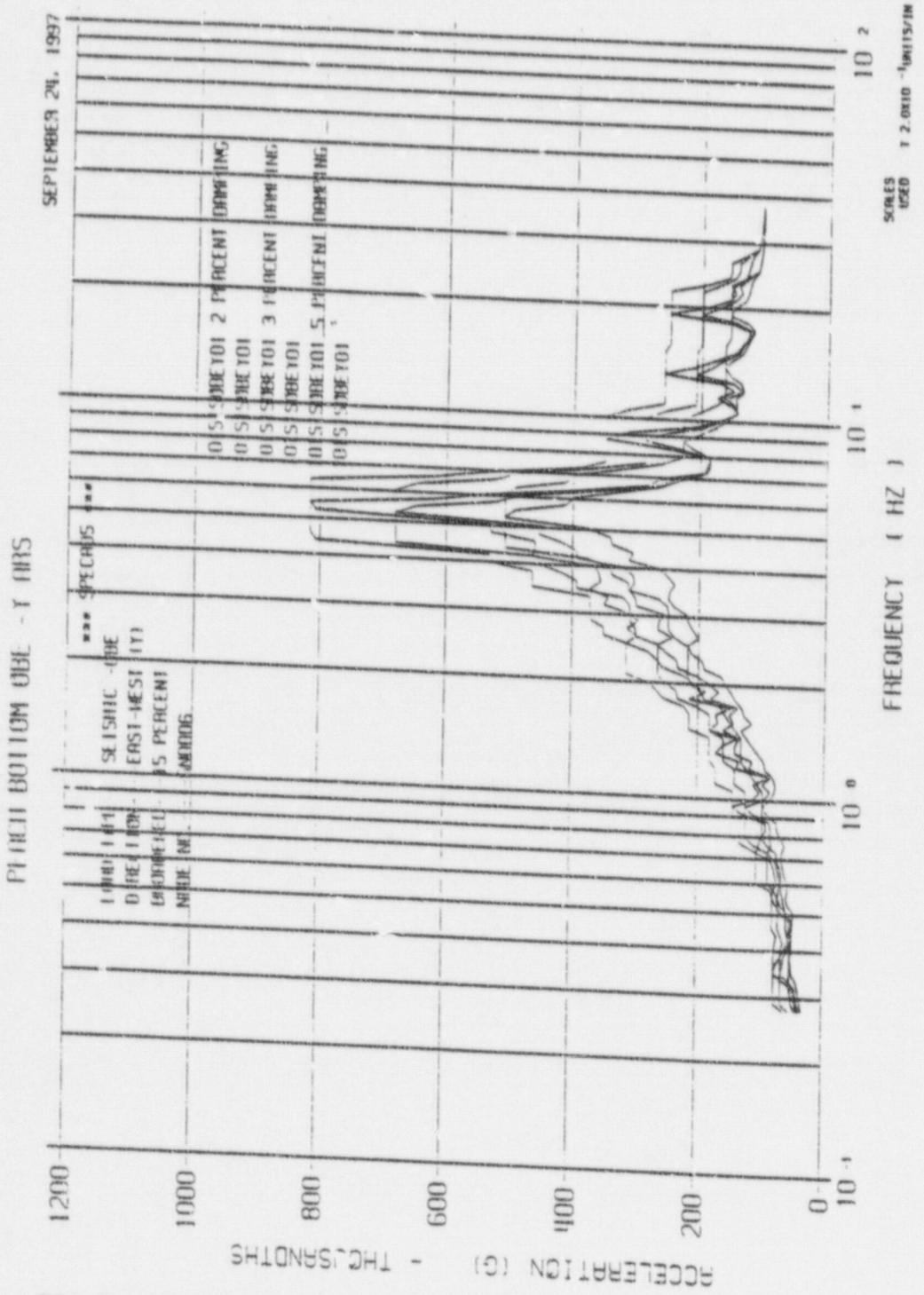


Figure C7 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 6

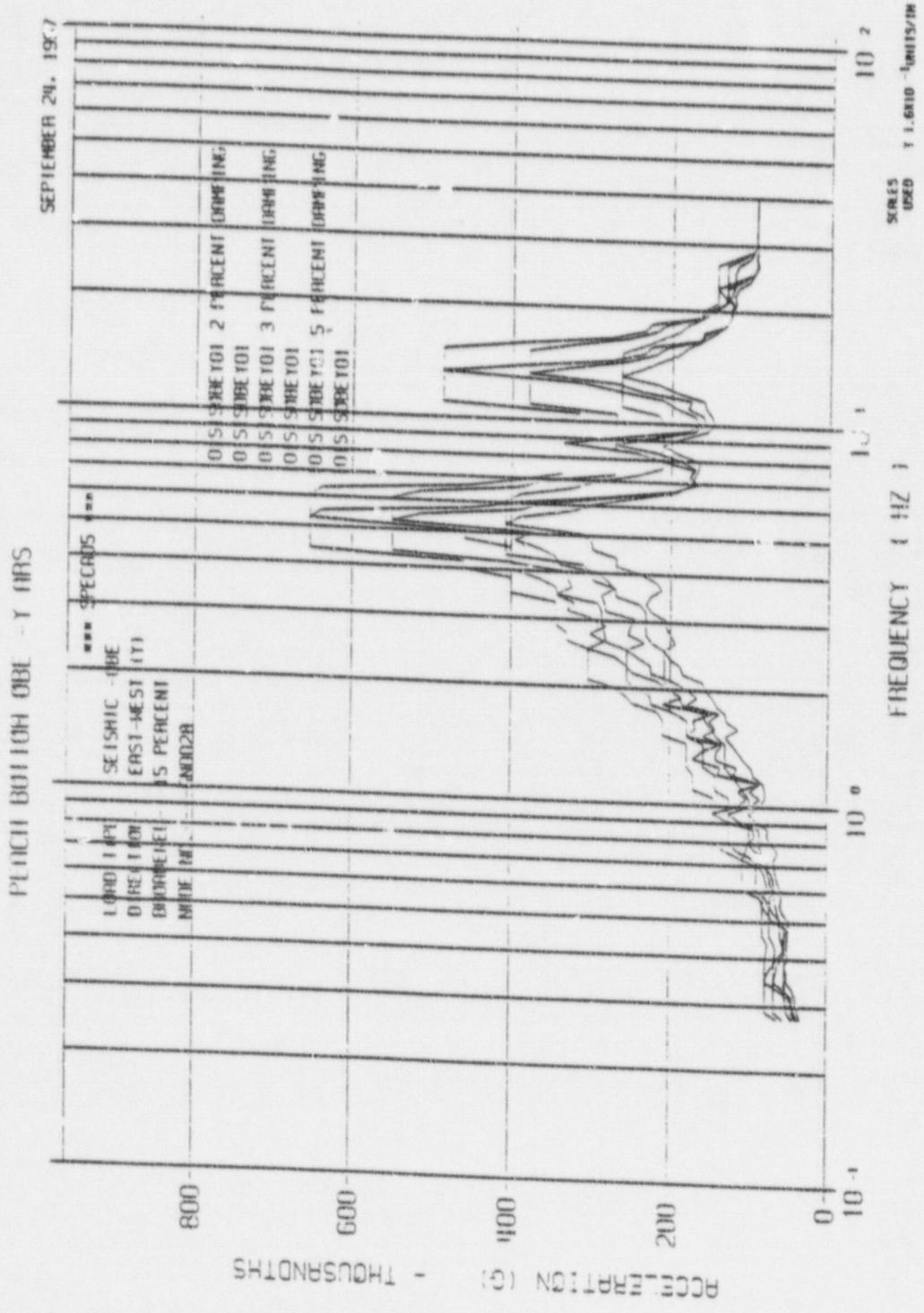


Figure C8 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 28

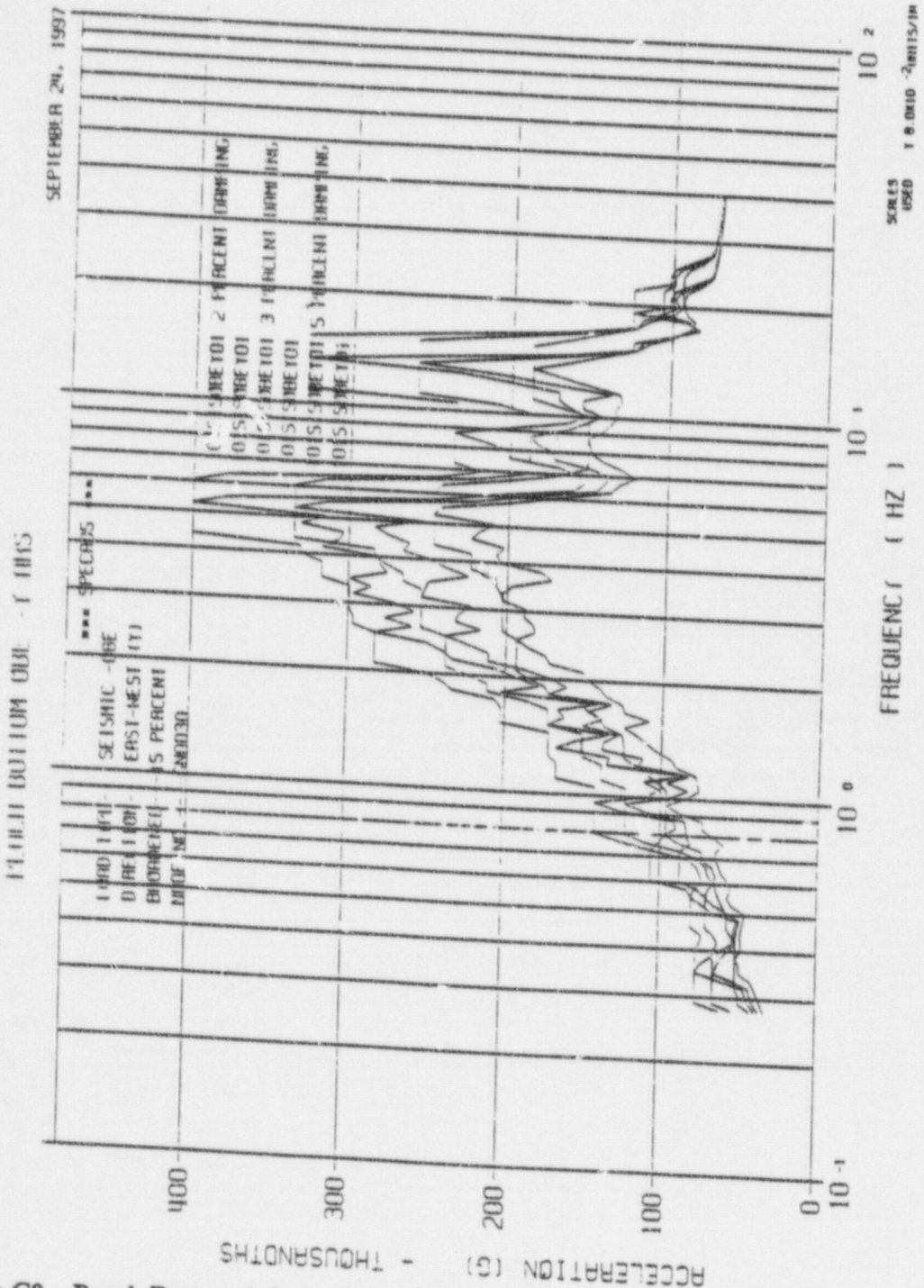


Figure C9 **Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 30**

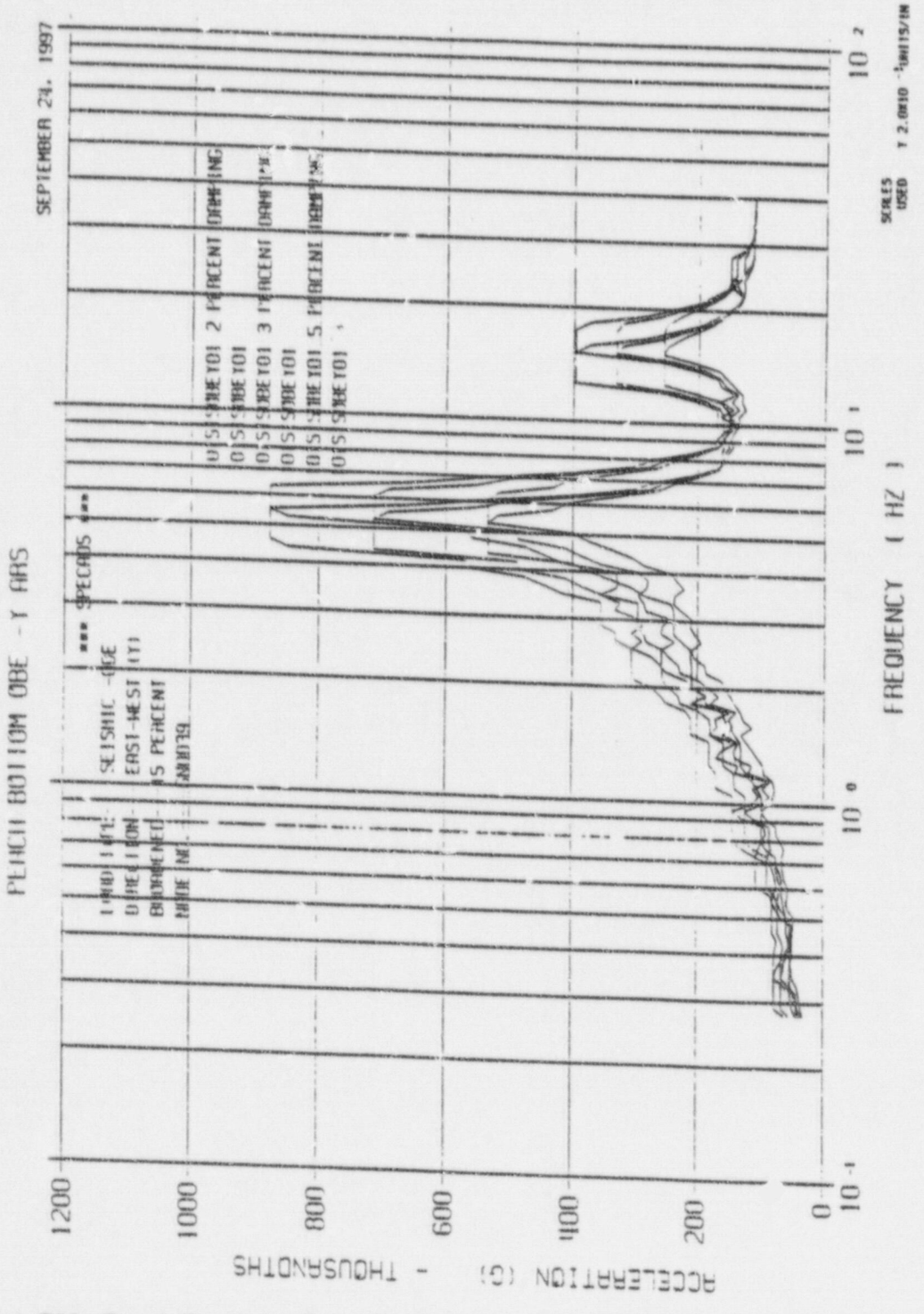


Figure C10 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 39

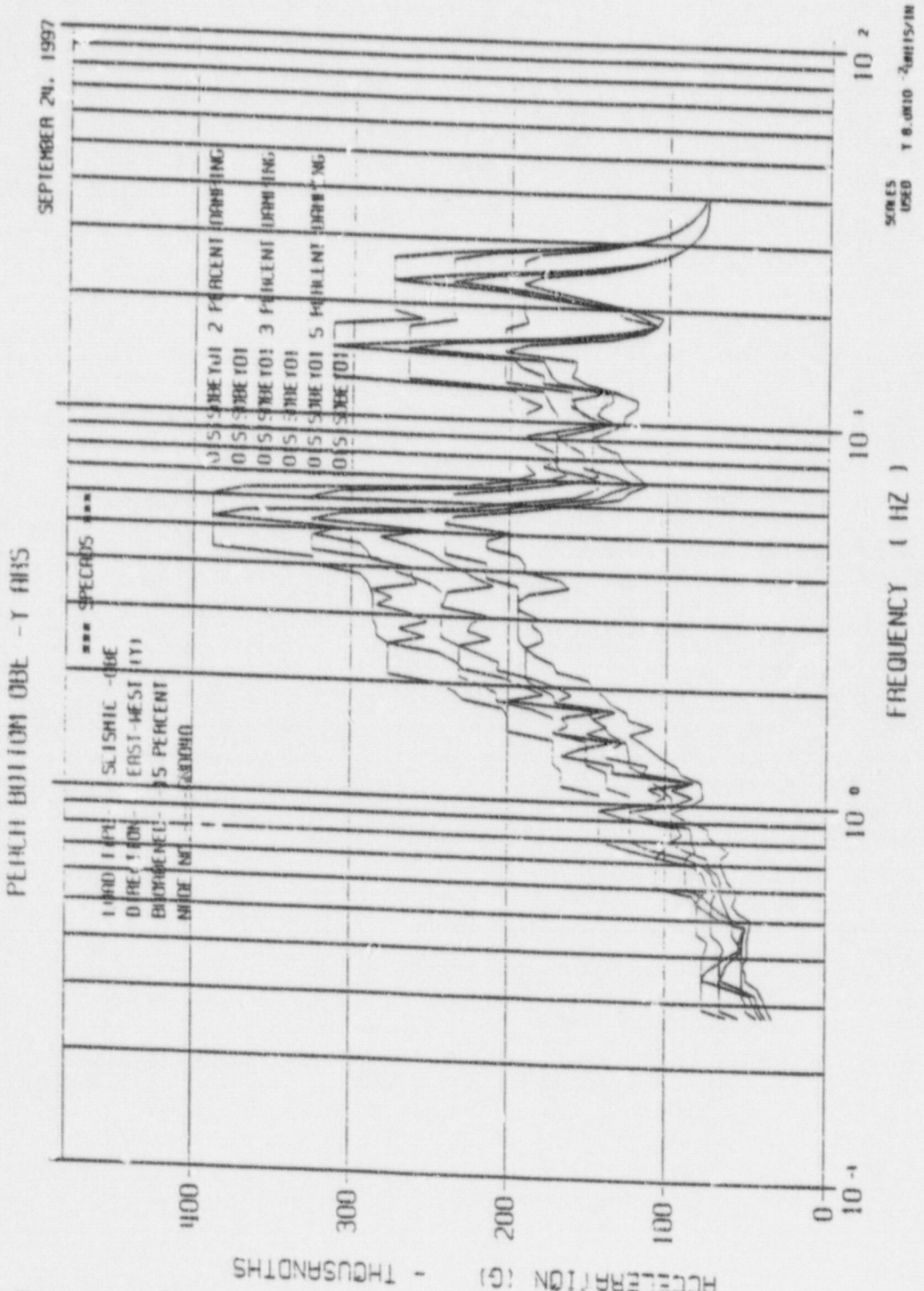


Figure C11 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 40

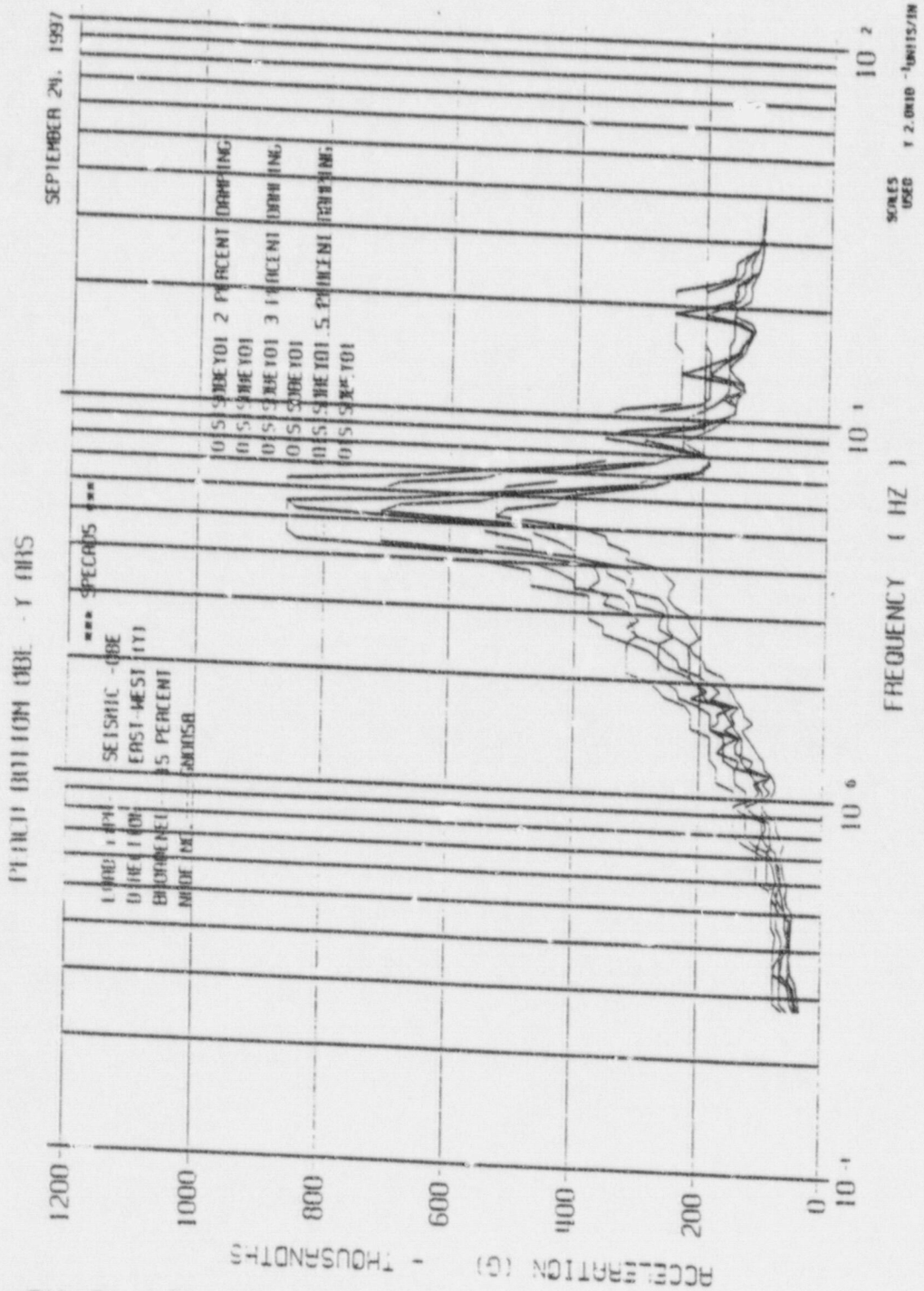


Figure C12 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, East-West, Node 58

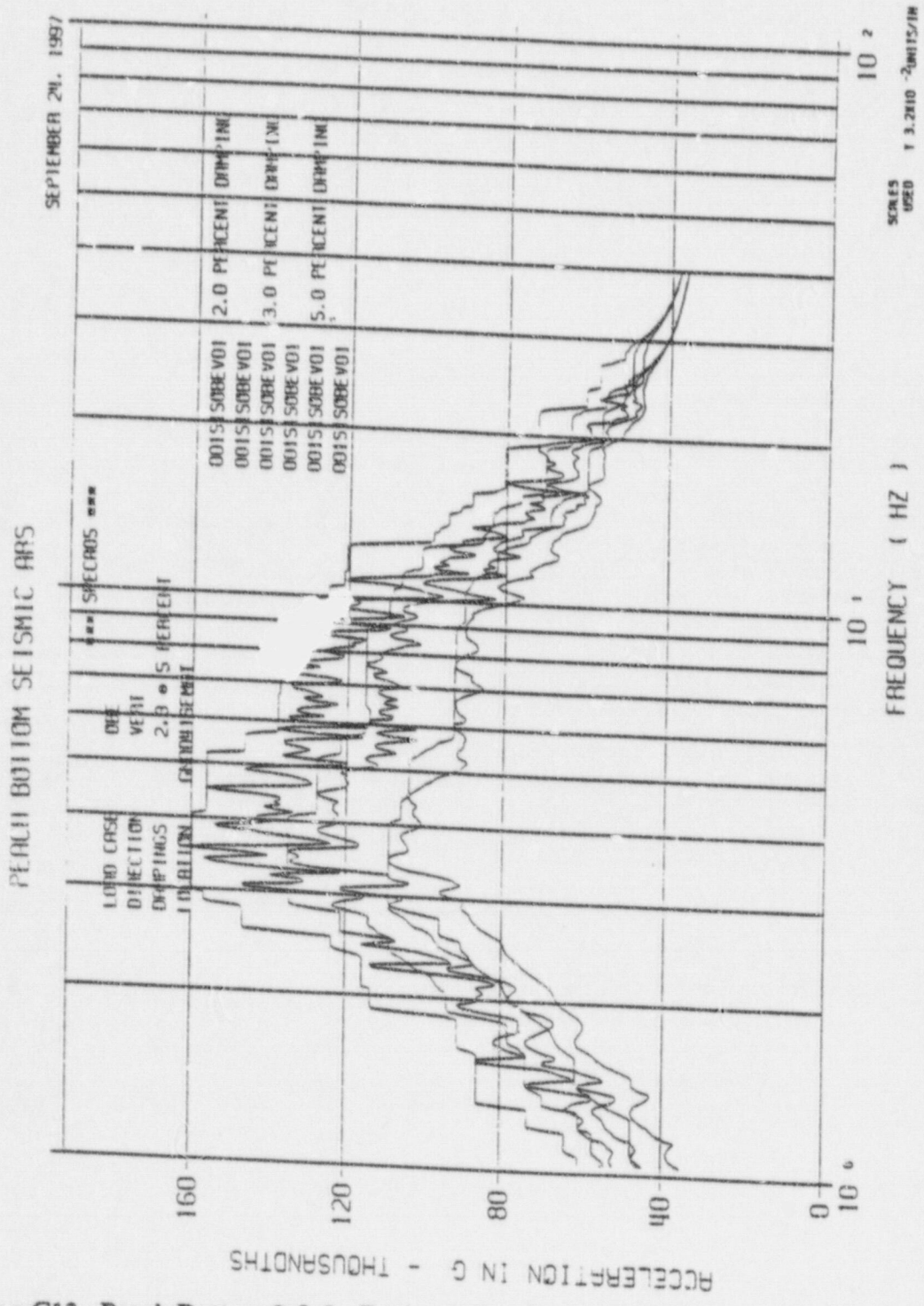


Figure C13 Peach Bottom 2 & 3 - Recirculation Piping OBE (~Design Earthquake) Independent Support Motion Spectra, Vertical (At All Supports)

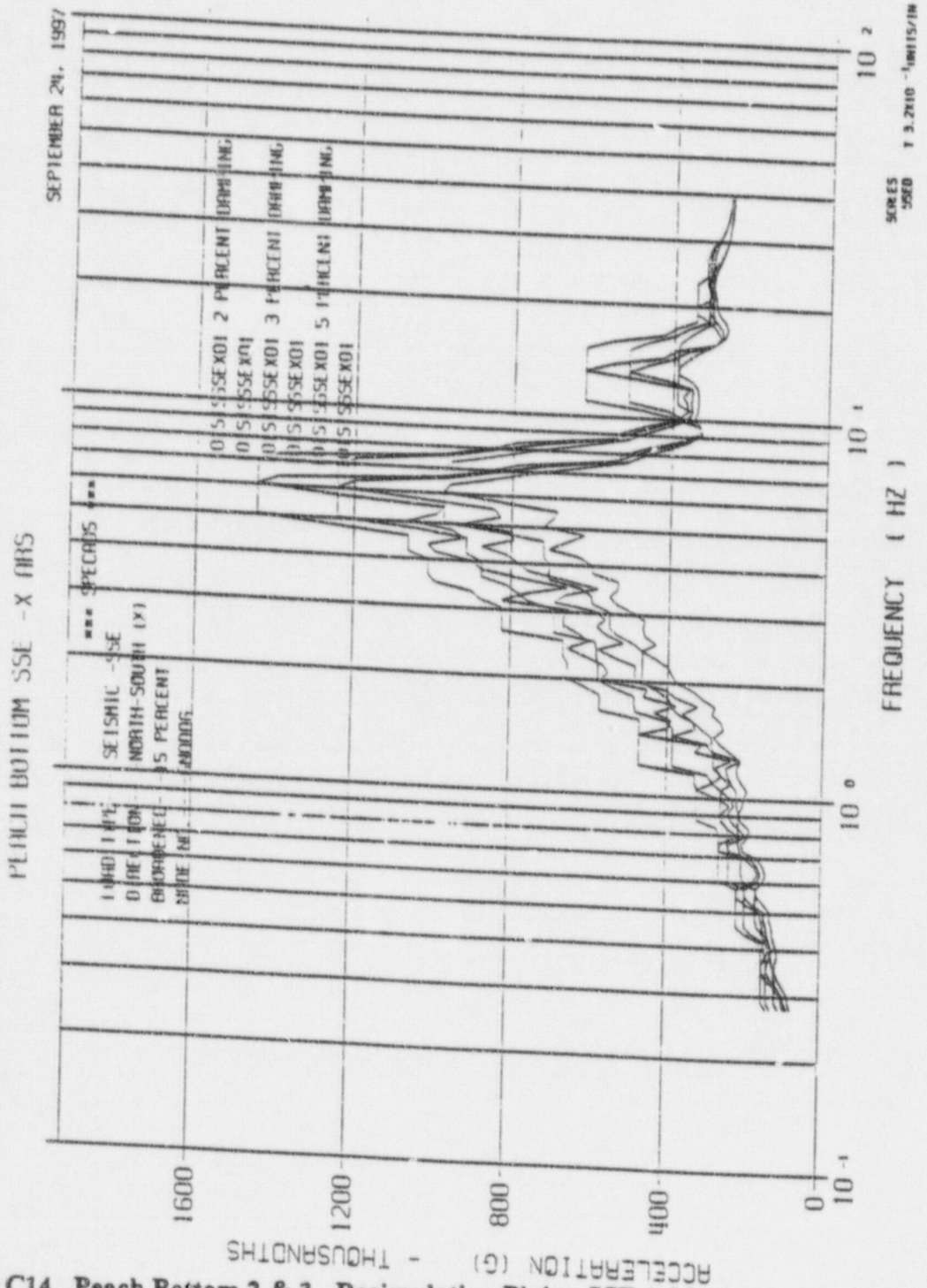


Figure C14 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 6

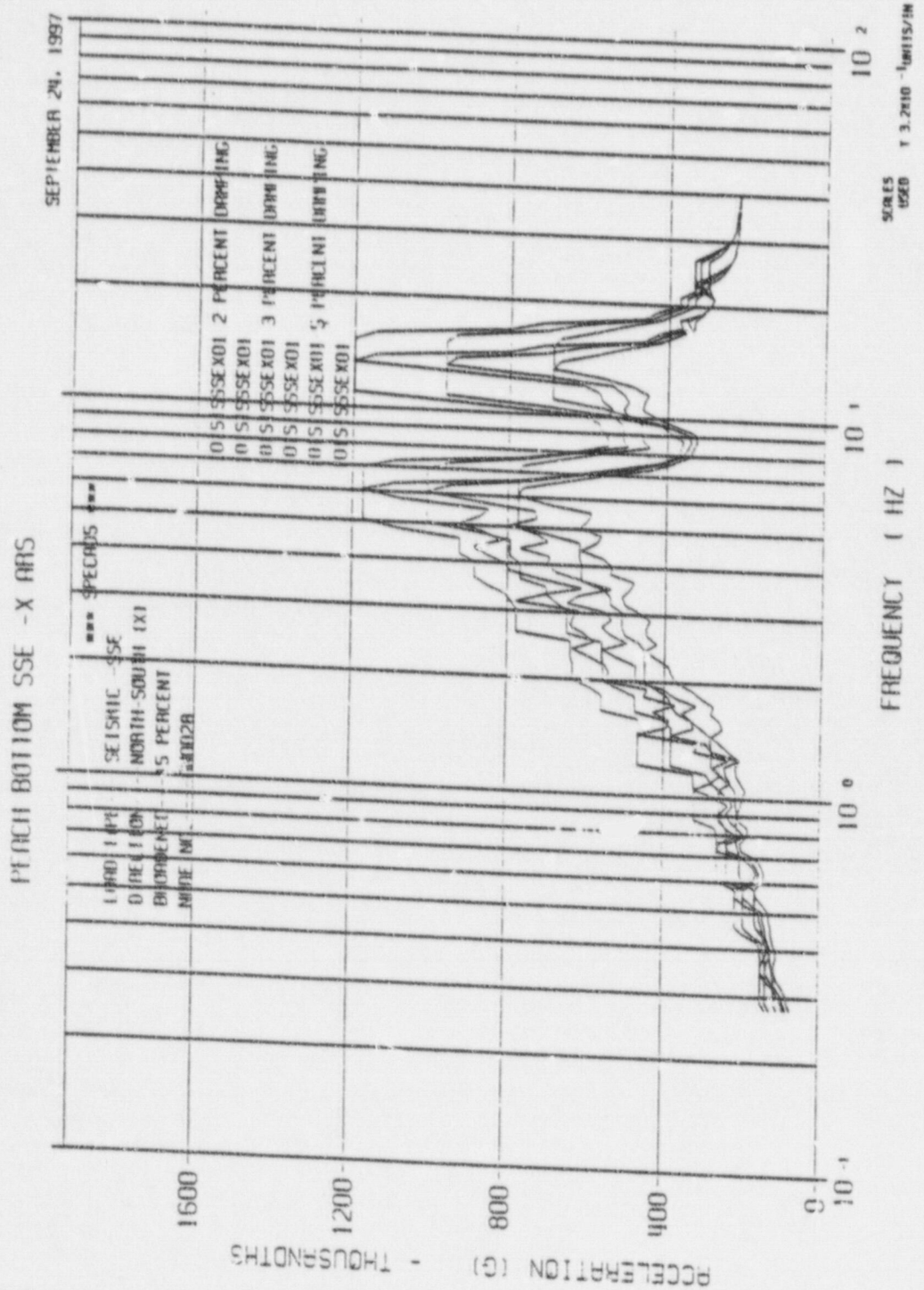


Figure C15 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 28

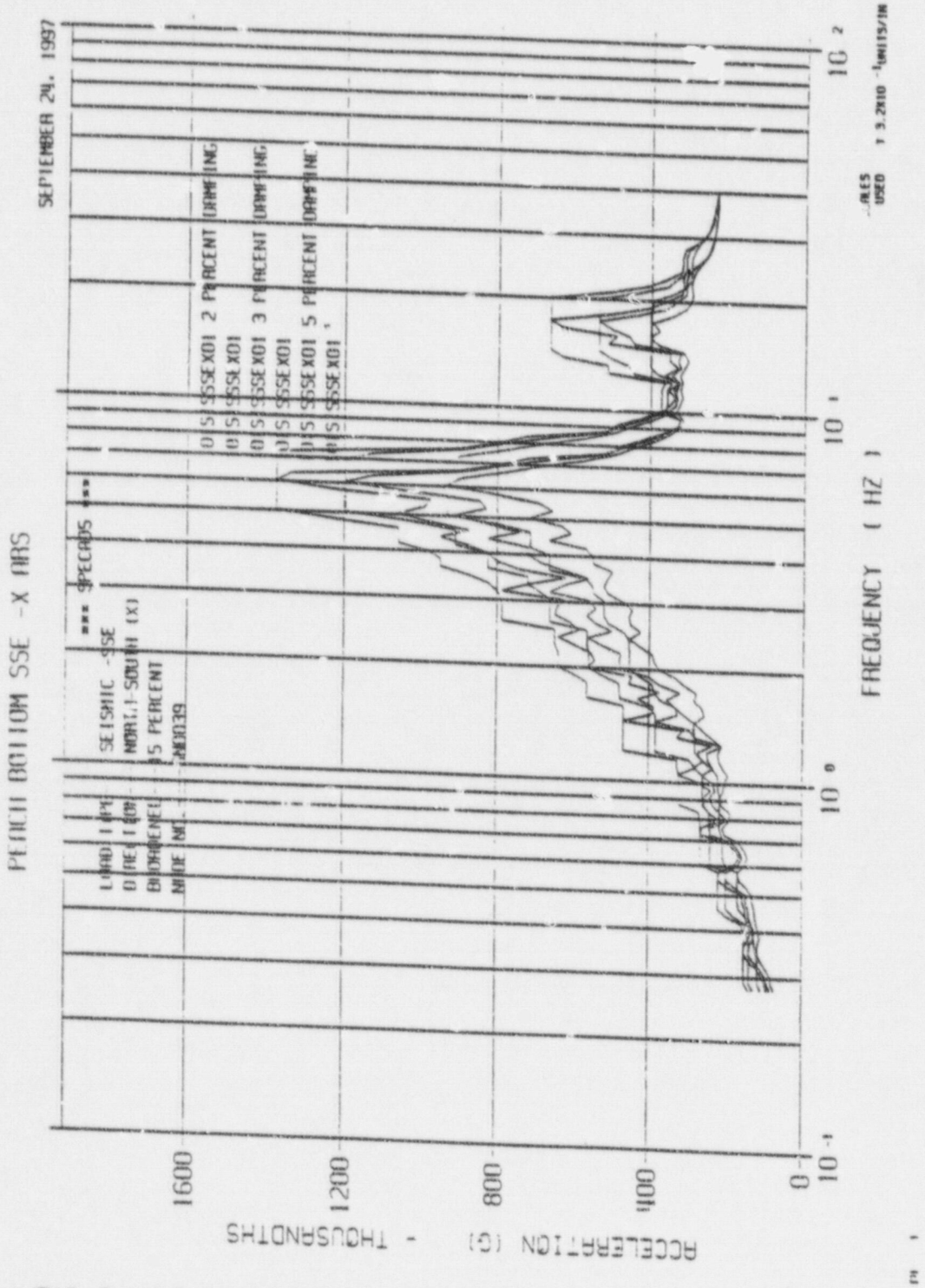


Figure C17 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 39

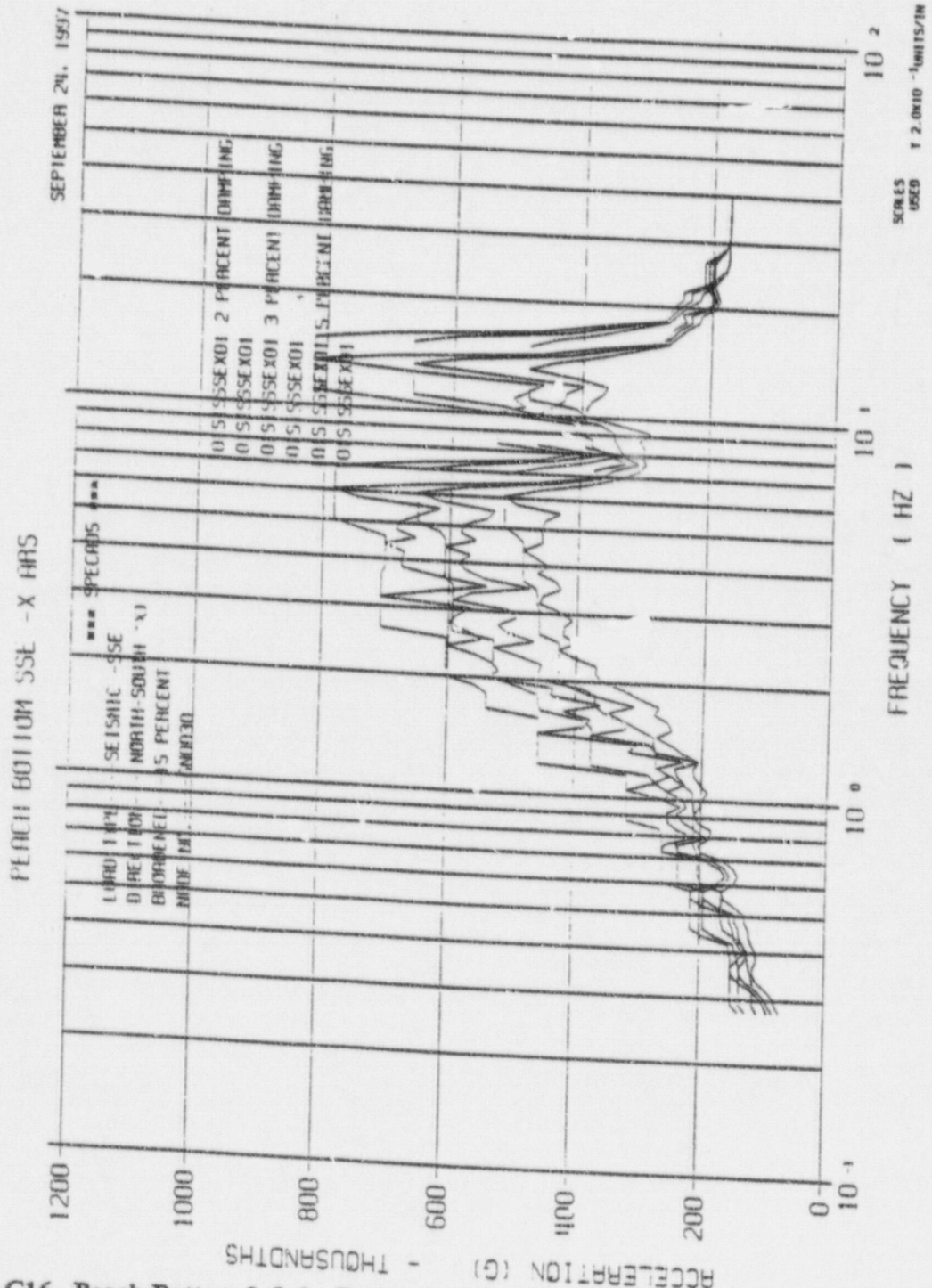


Figure C16 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 30

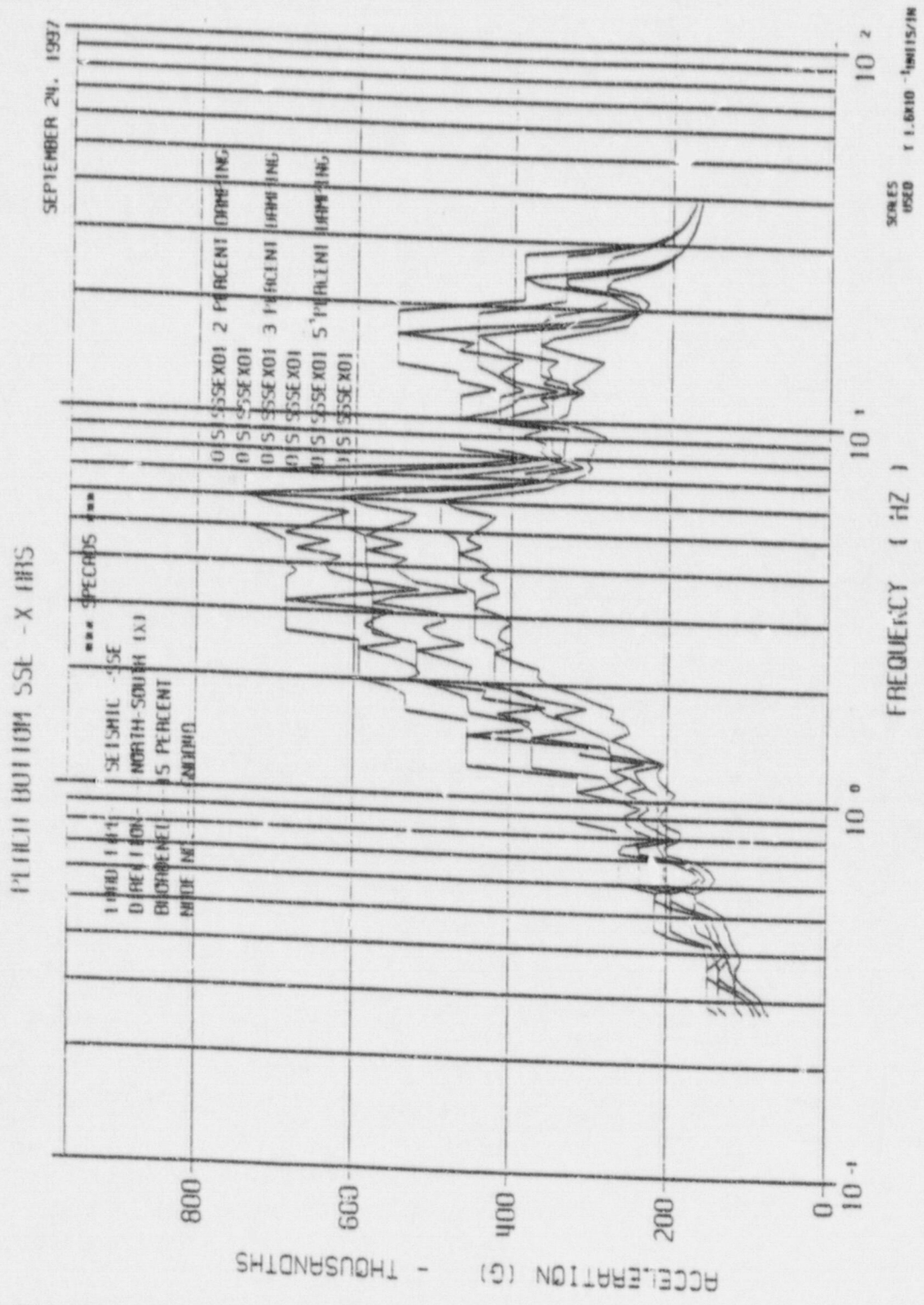


Figure C18 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 40

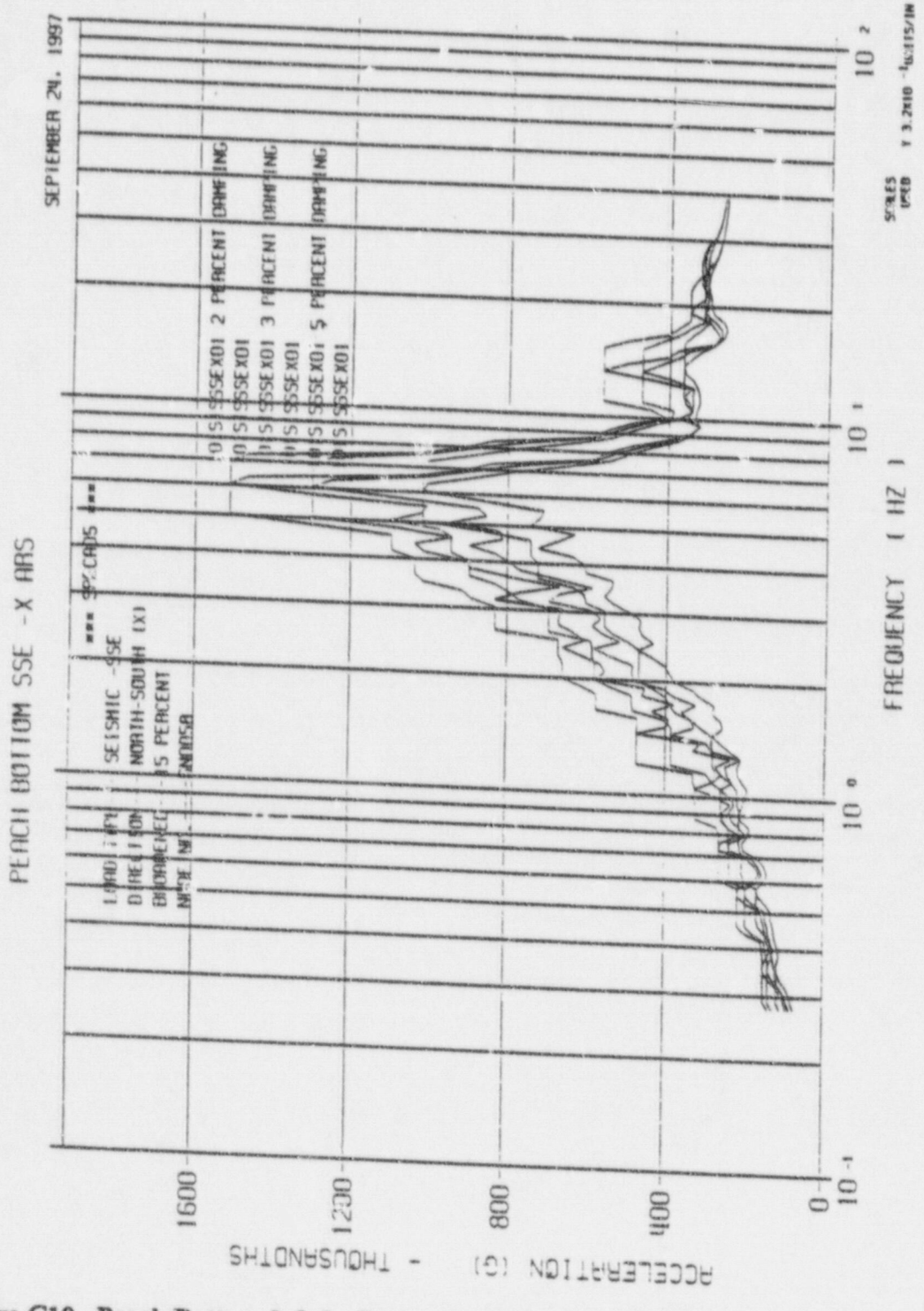


Figure C19 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, North-South, Node 58

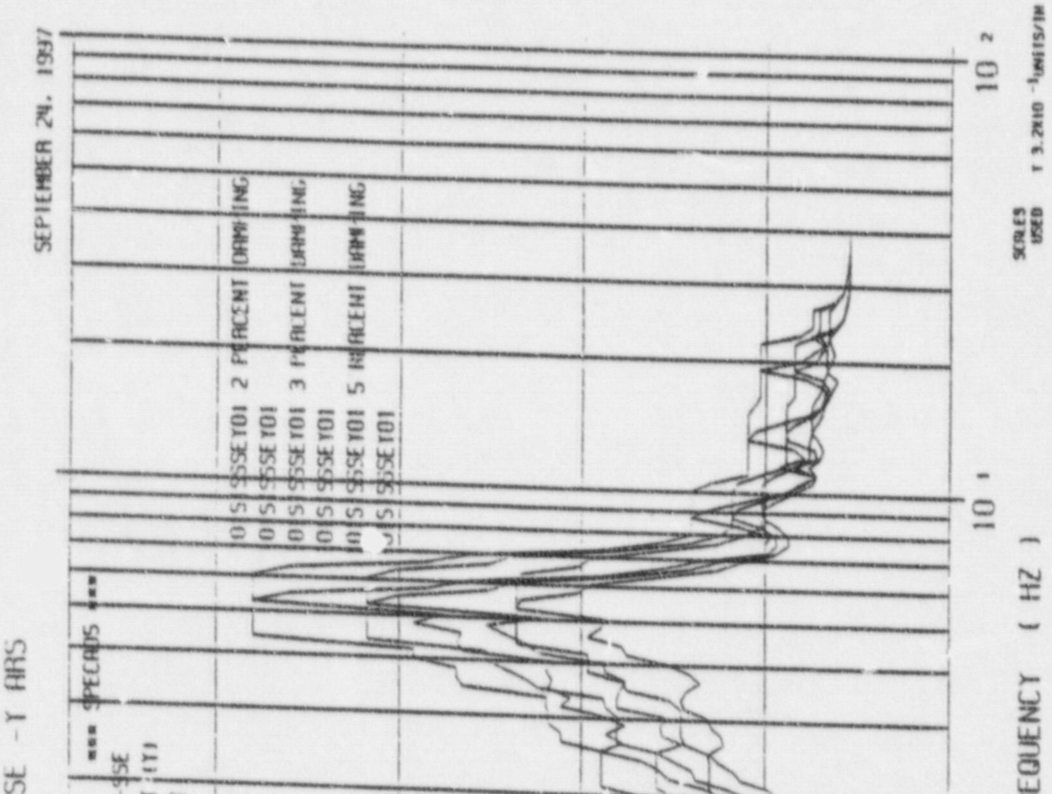


Figure C20 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 6

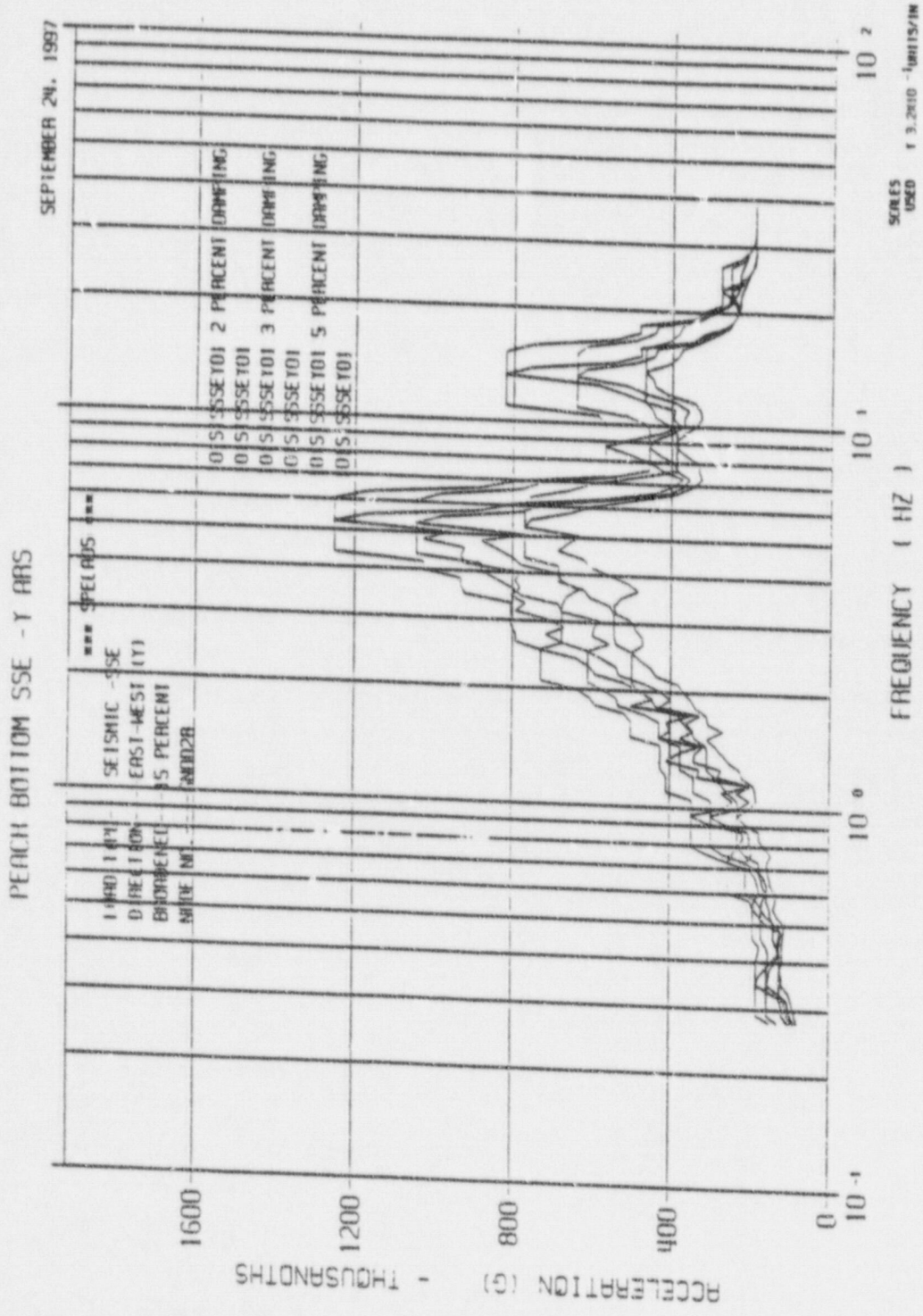


Figure C21 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 28

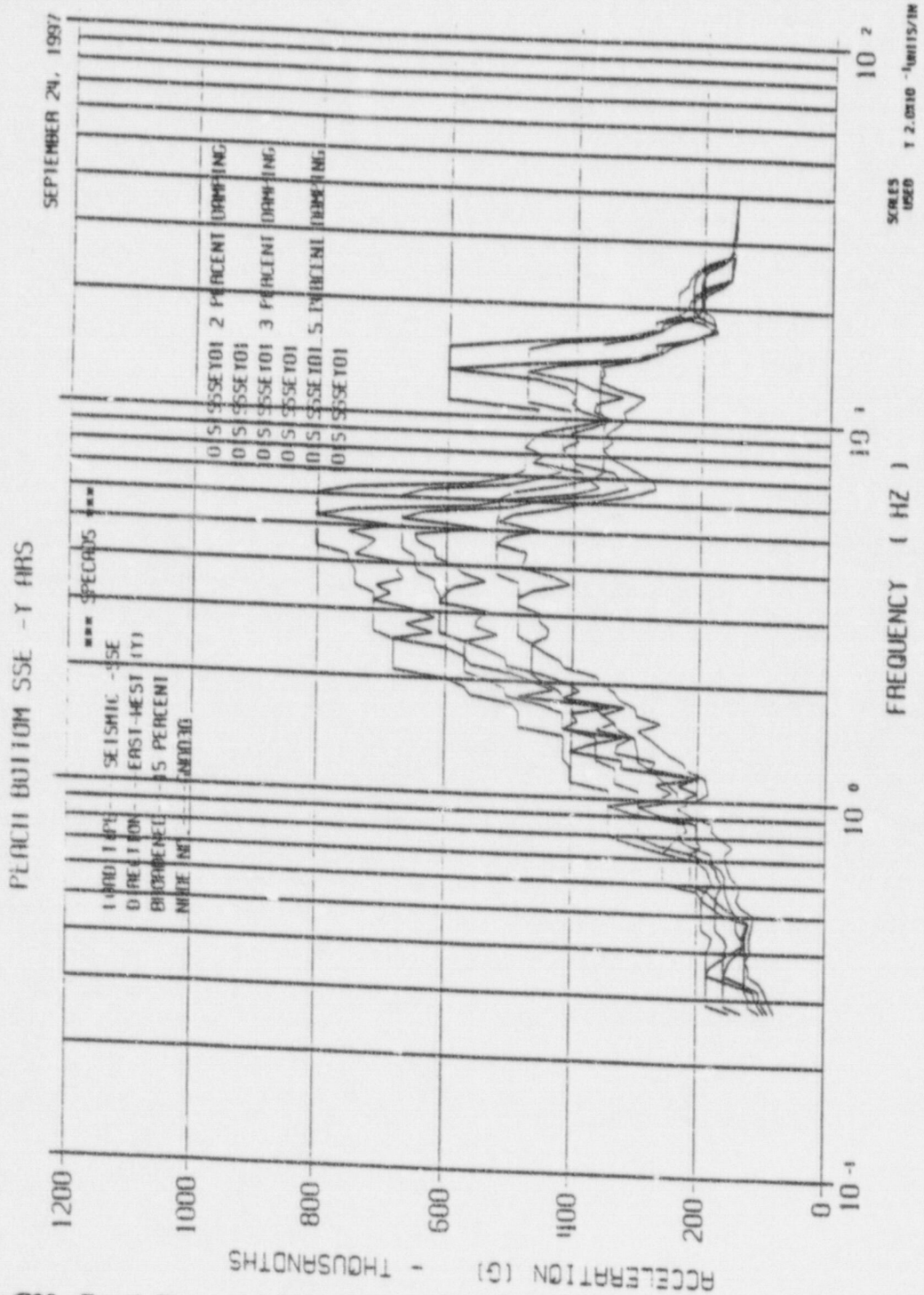


Figure C22 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 30

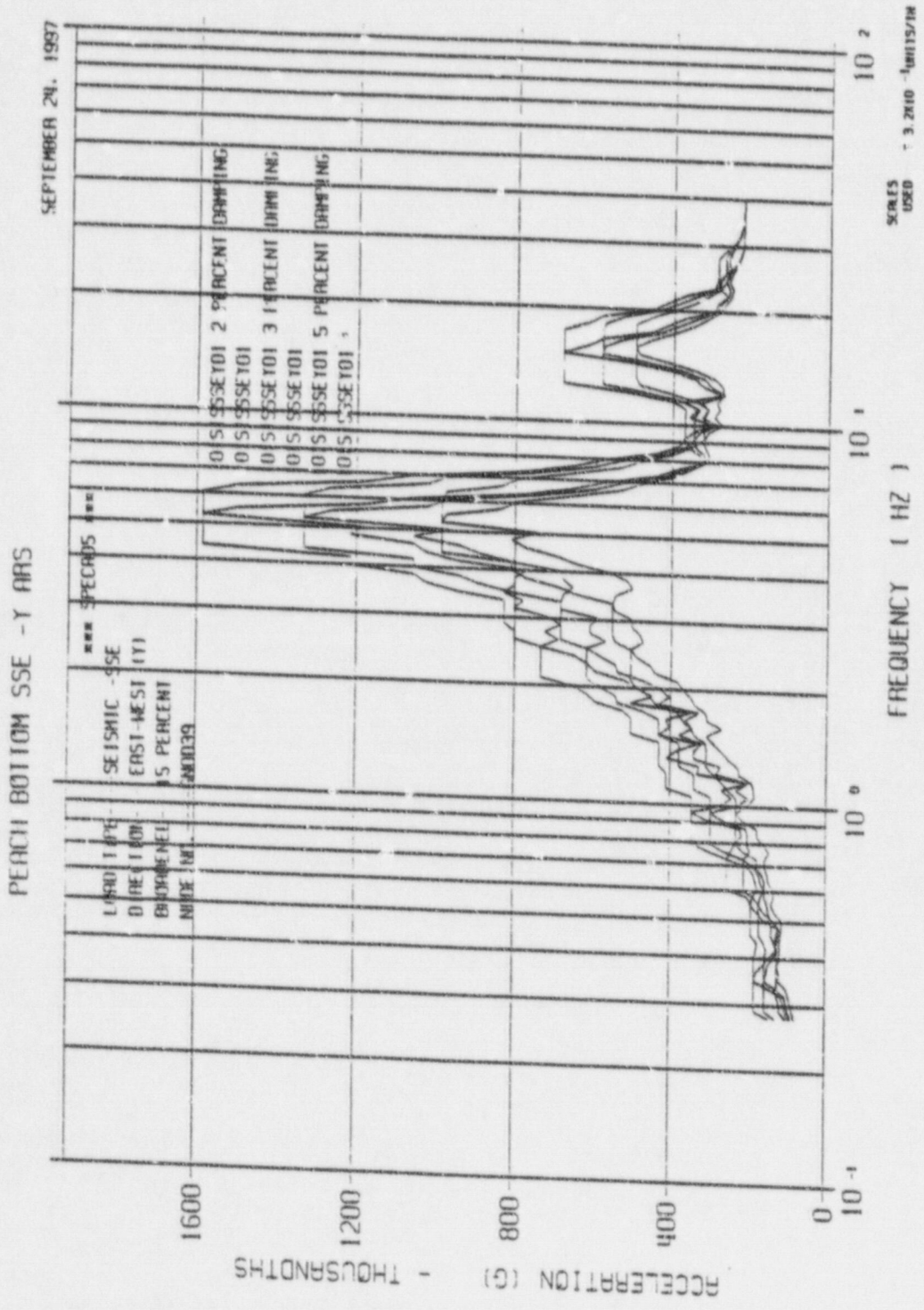


Figure C23 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 39

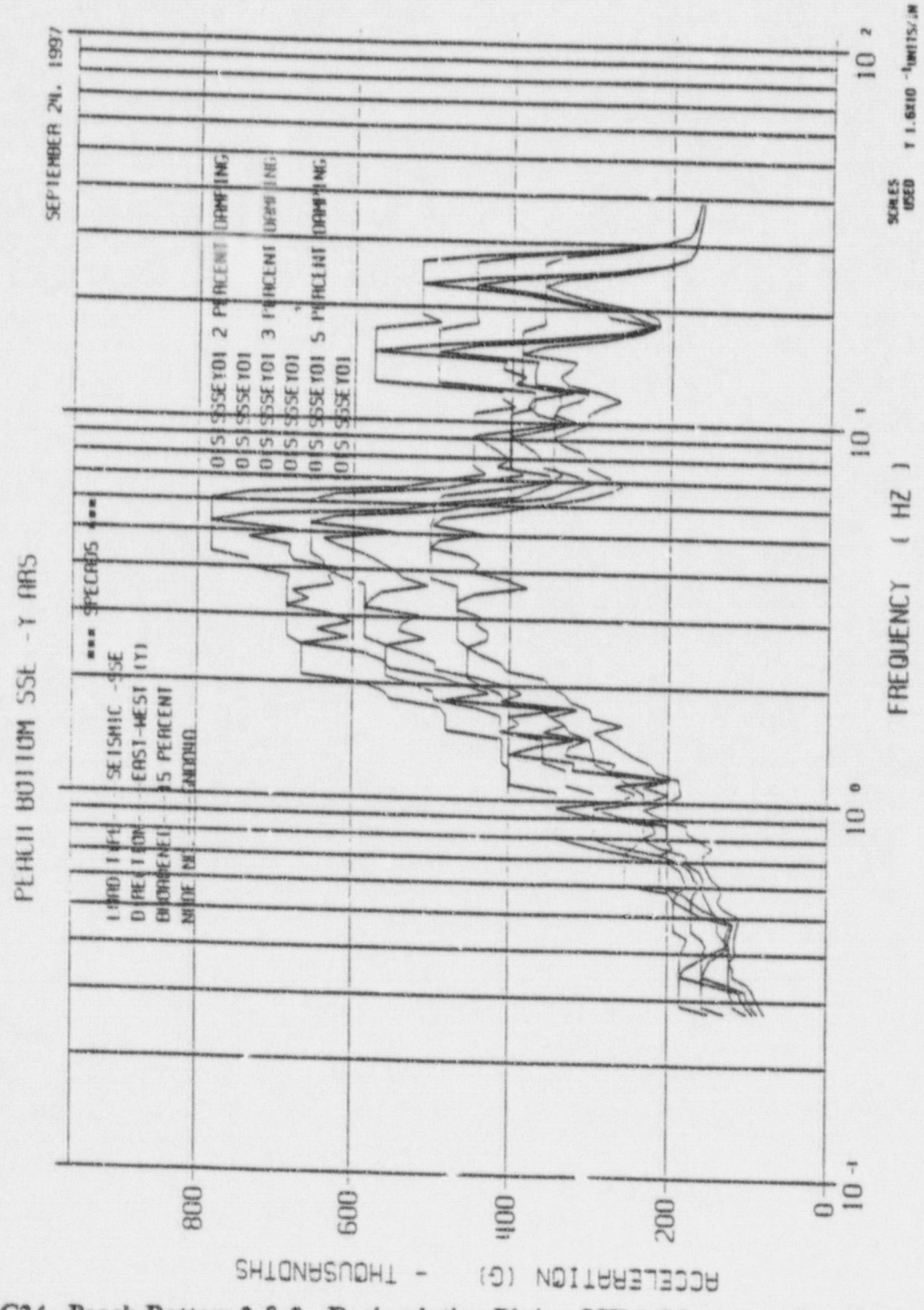


Figure C24 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 40

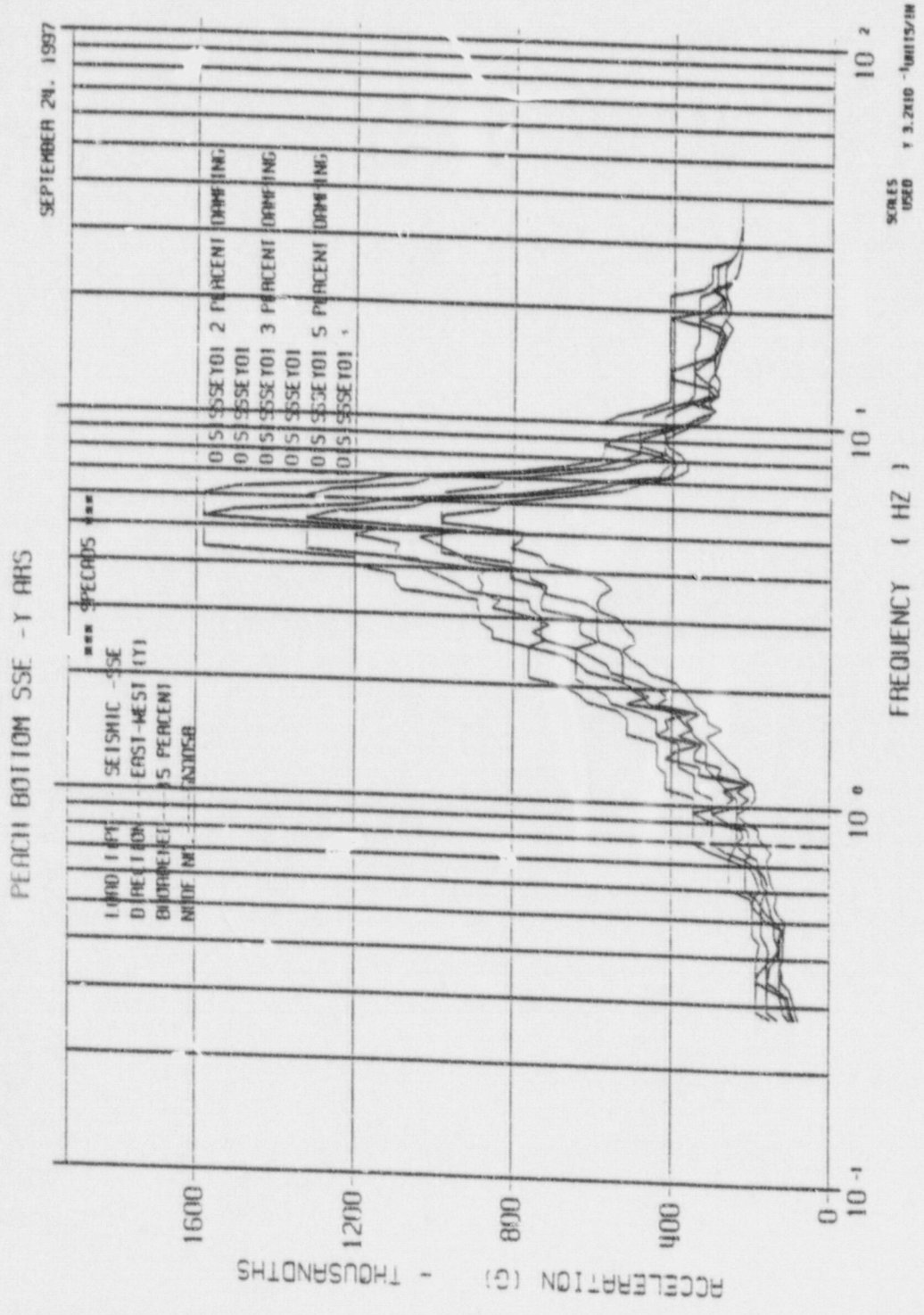


Figure C25 Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, East-West, Node 58

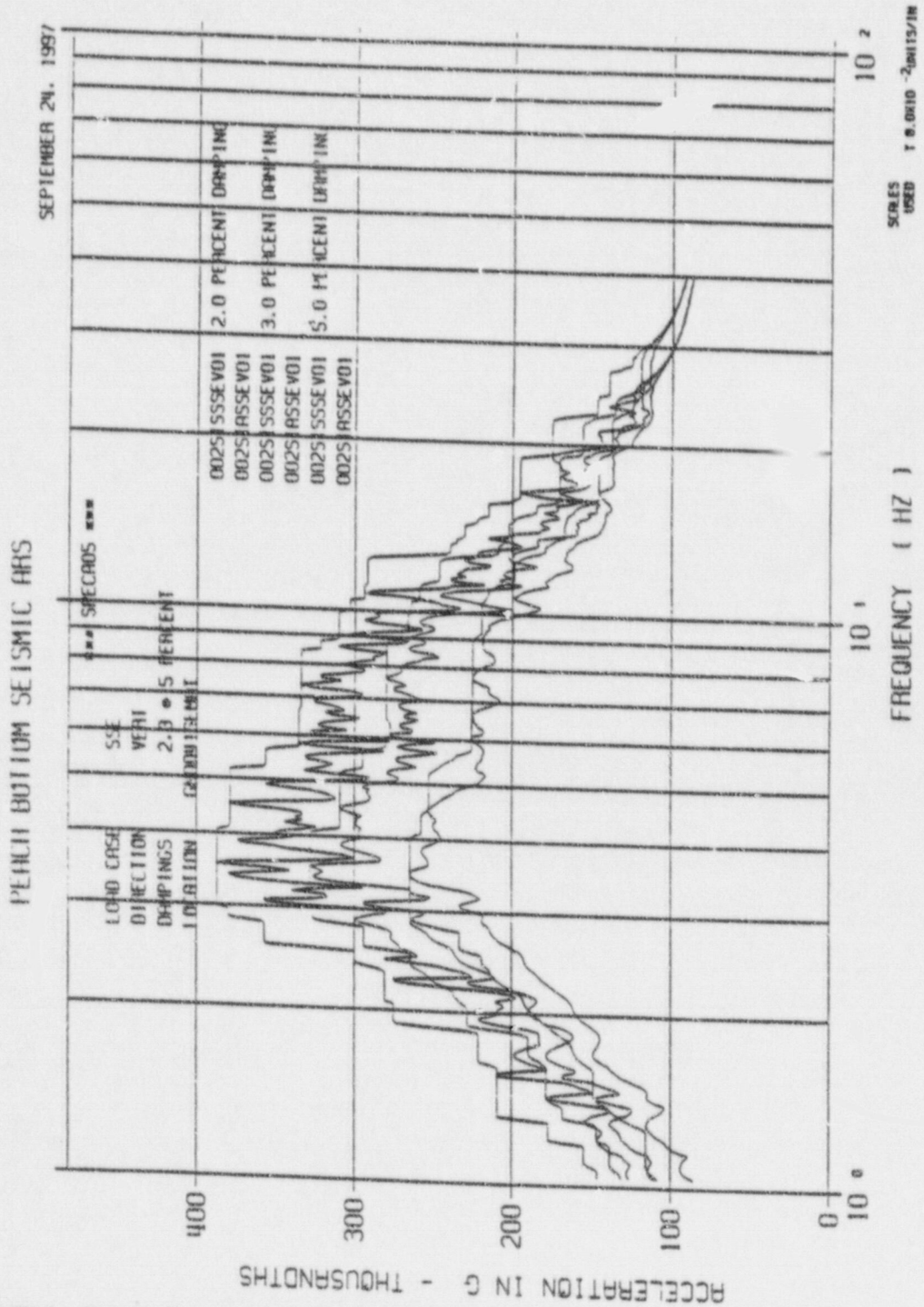


Figure C26 **Peach Bottom 2 & 3 - Recirculation Piping SSE (~Maximum Credible Earthquake), Independent Support Motion Spectra, Vertical (at all supports)**

ATTACHMENT "D"

PECO Energy Company
Peach Bottom Atomic Power Station, Units 2 & 3

Regulatory Guide 1.60 Seismic Free-Field Motion

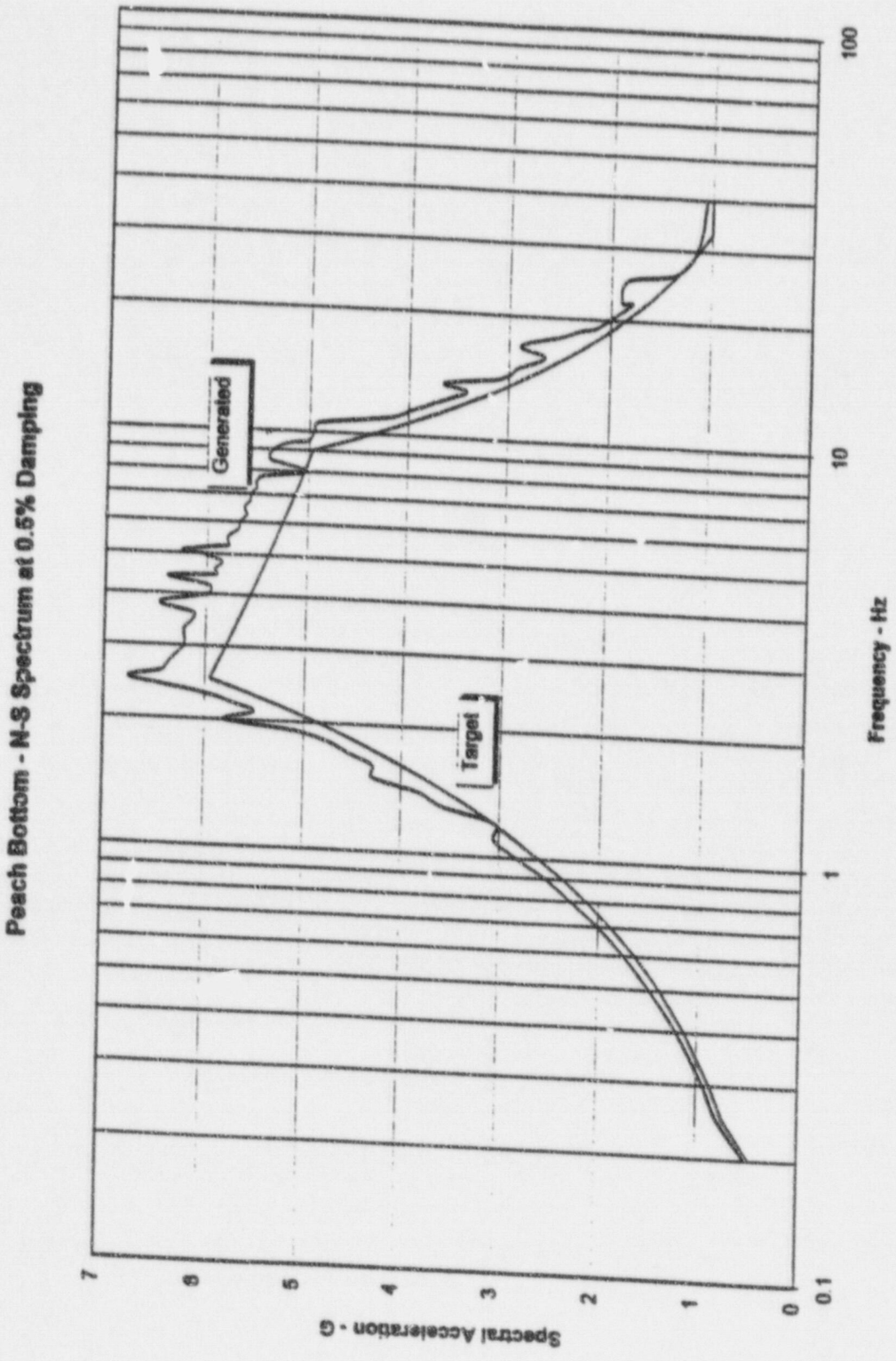


Figure D1 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - N/S, 0.5% Damping, ZPA = 1.0g.

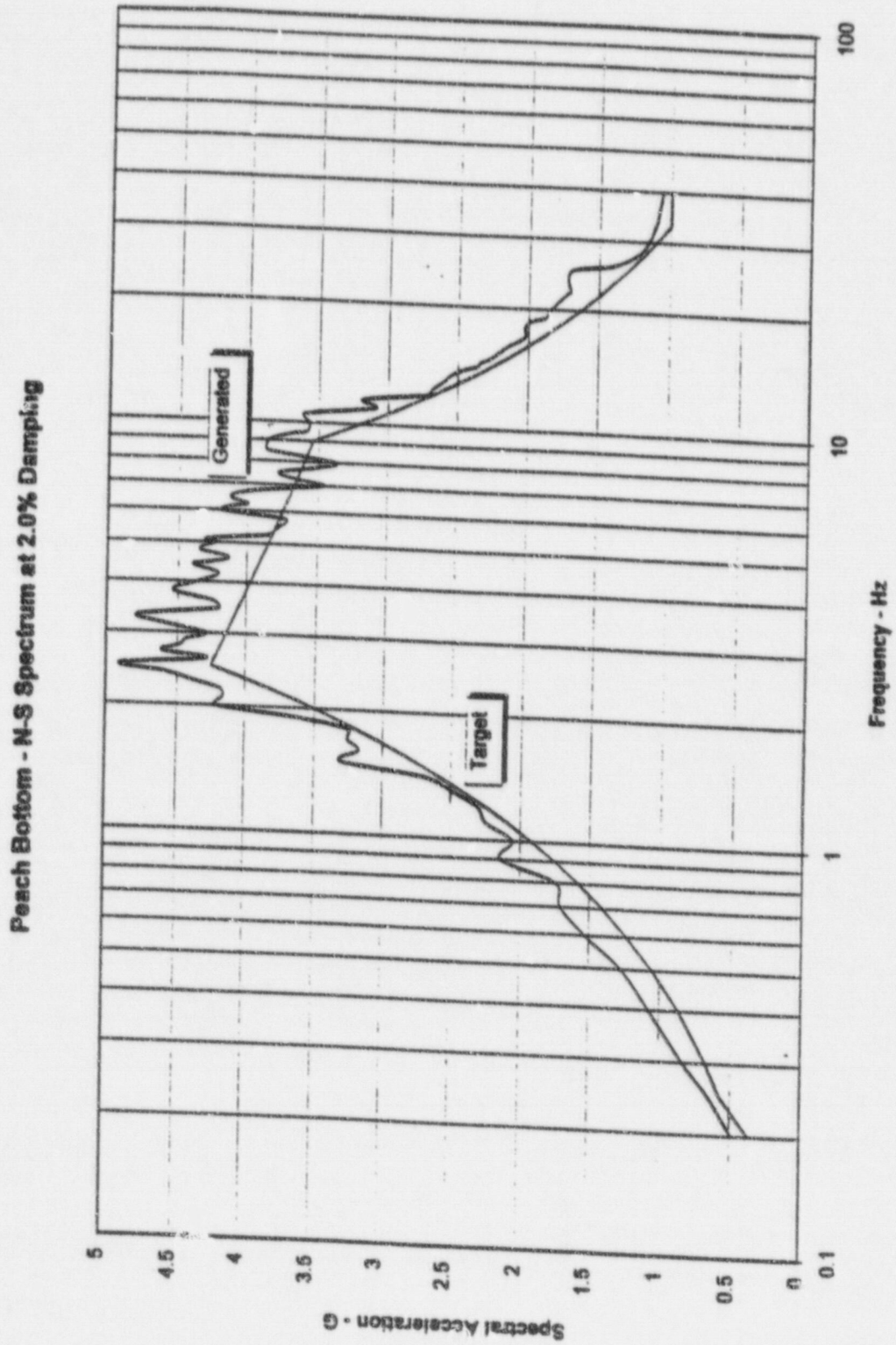


Figure D2 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - N/S, 2.0% Damping, ZPA = 1.0g.

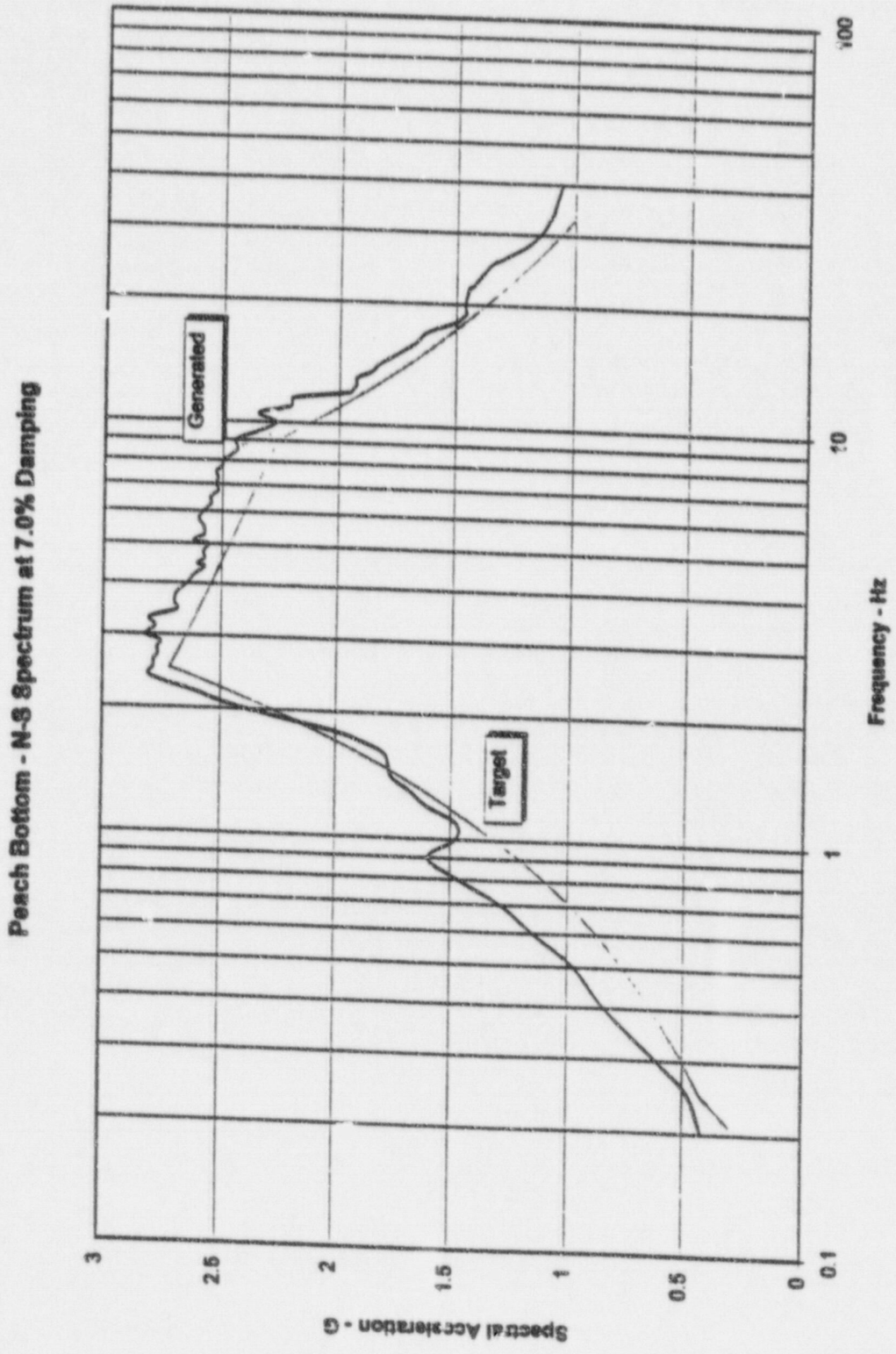


Figure D3 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - N/S, 7.0% Damping, ZPA = 1.0g.

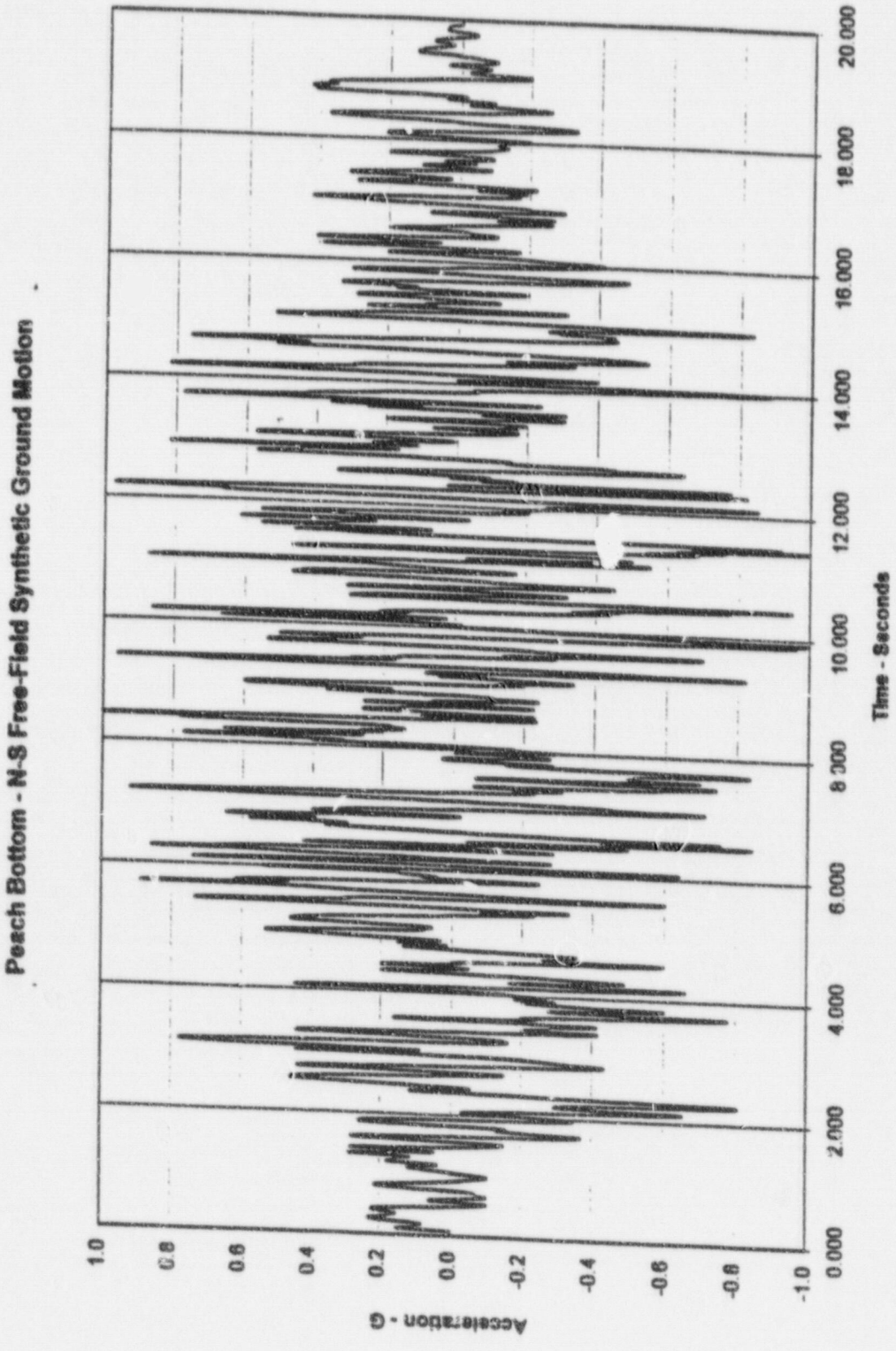


Figure D4 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Acceleration Time History - N/S, ZPA = 1.0g.

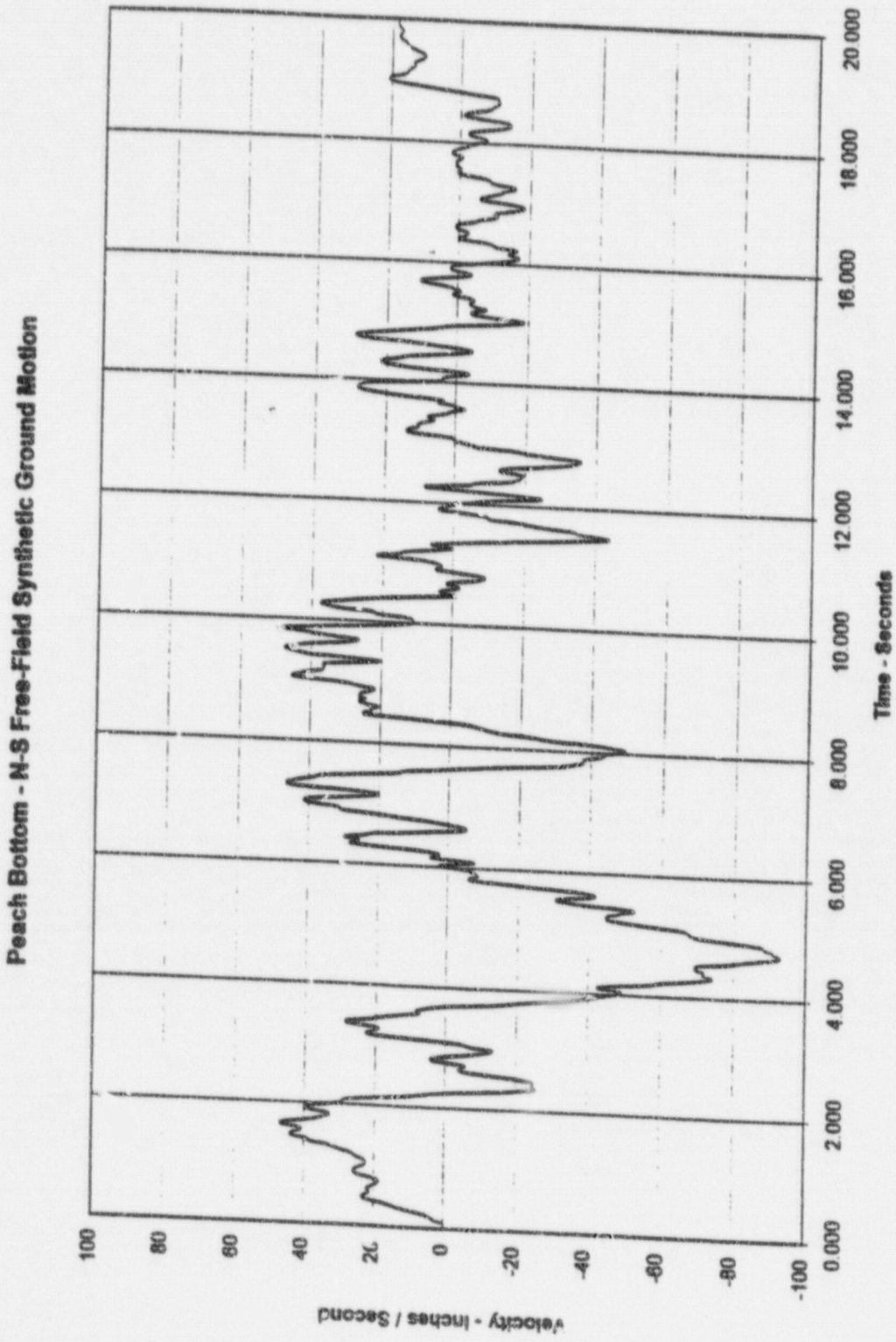


Figure D5 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Velocity Time History - N/S.

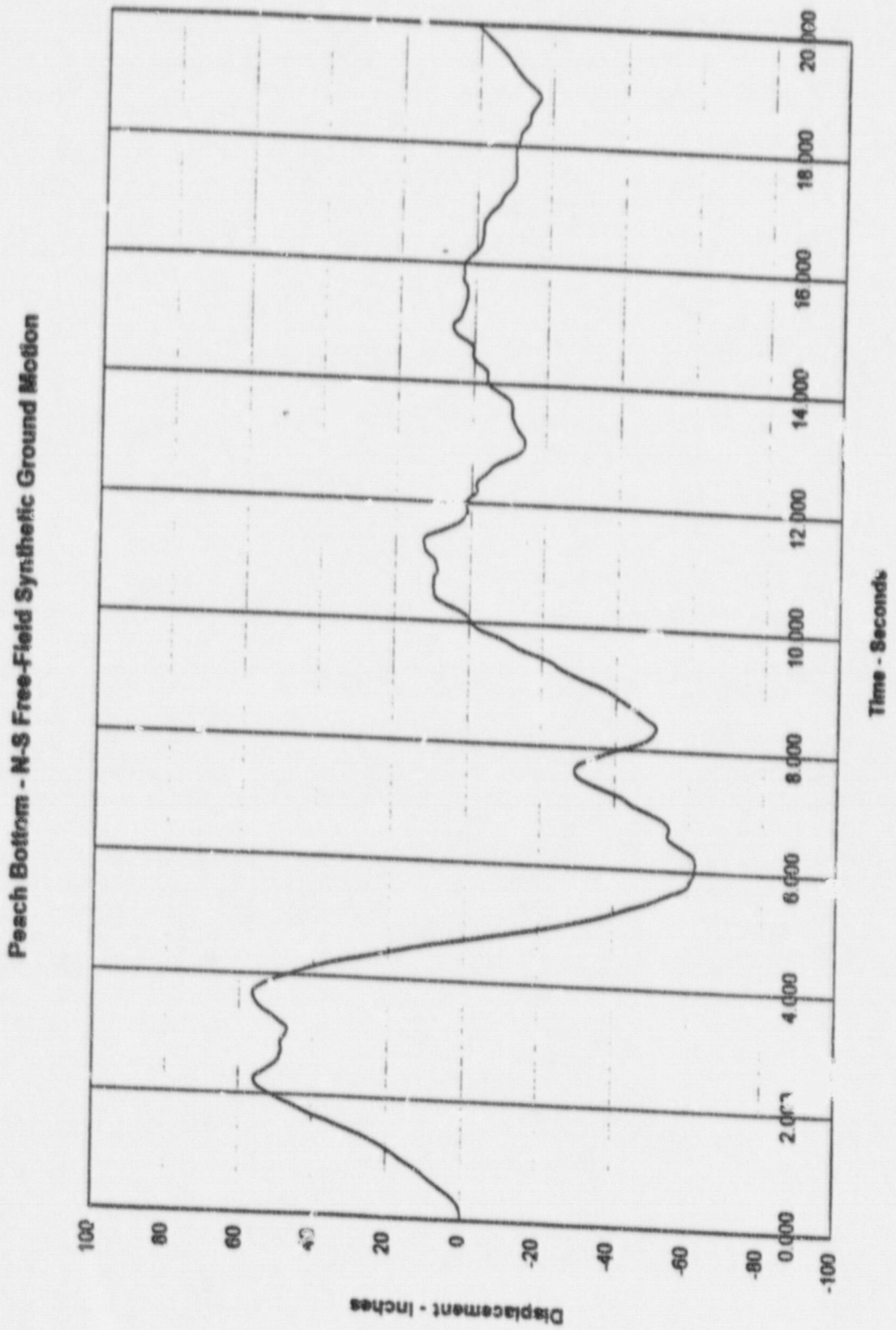


Figure D6 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Displacement Time History - N/S, Peak Ground Displacement = 36 Inches.

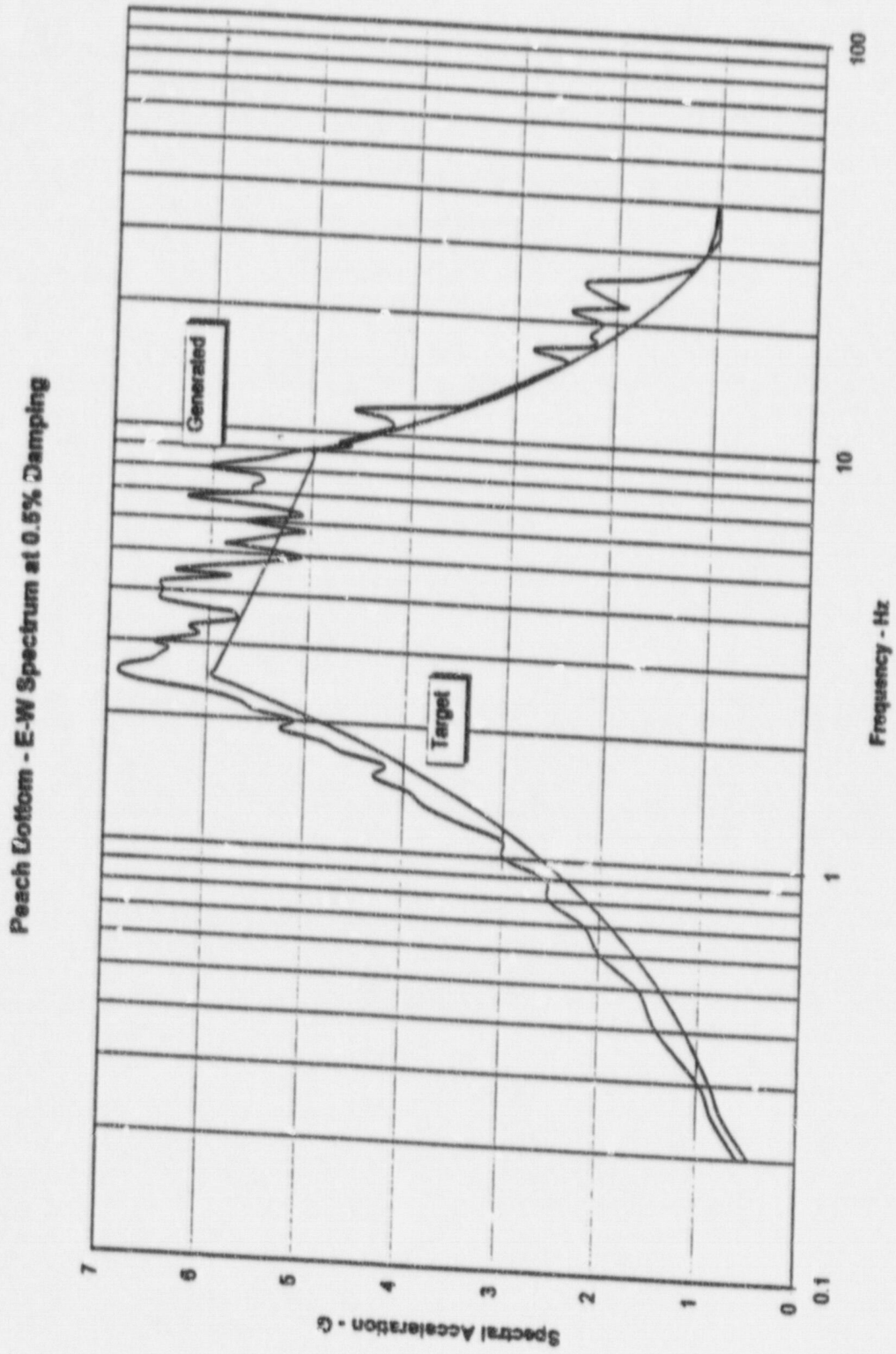


Figure D7 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - E/W, 0.5% Damping, ZPA = 1.0g.

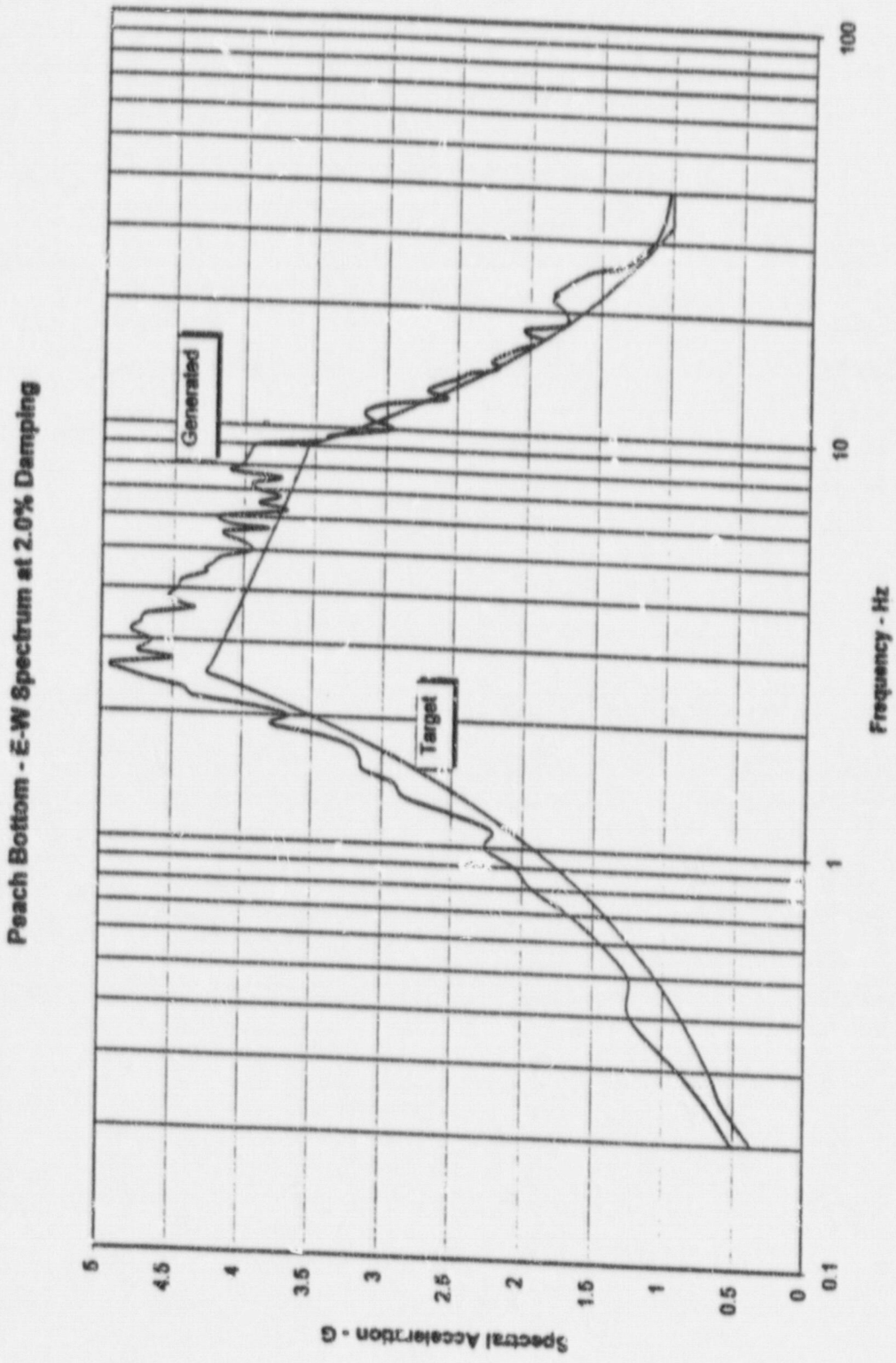


Figure D8 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - E/W, 2.5% Damping, ZPA = 1.0g.

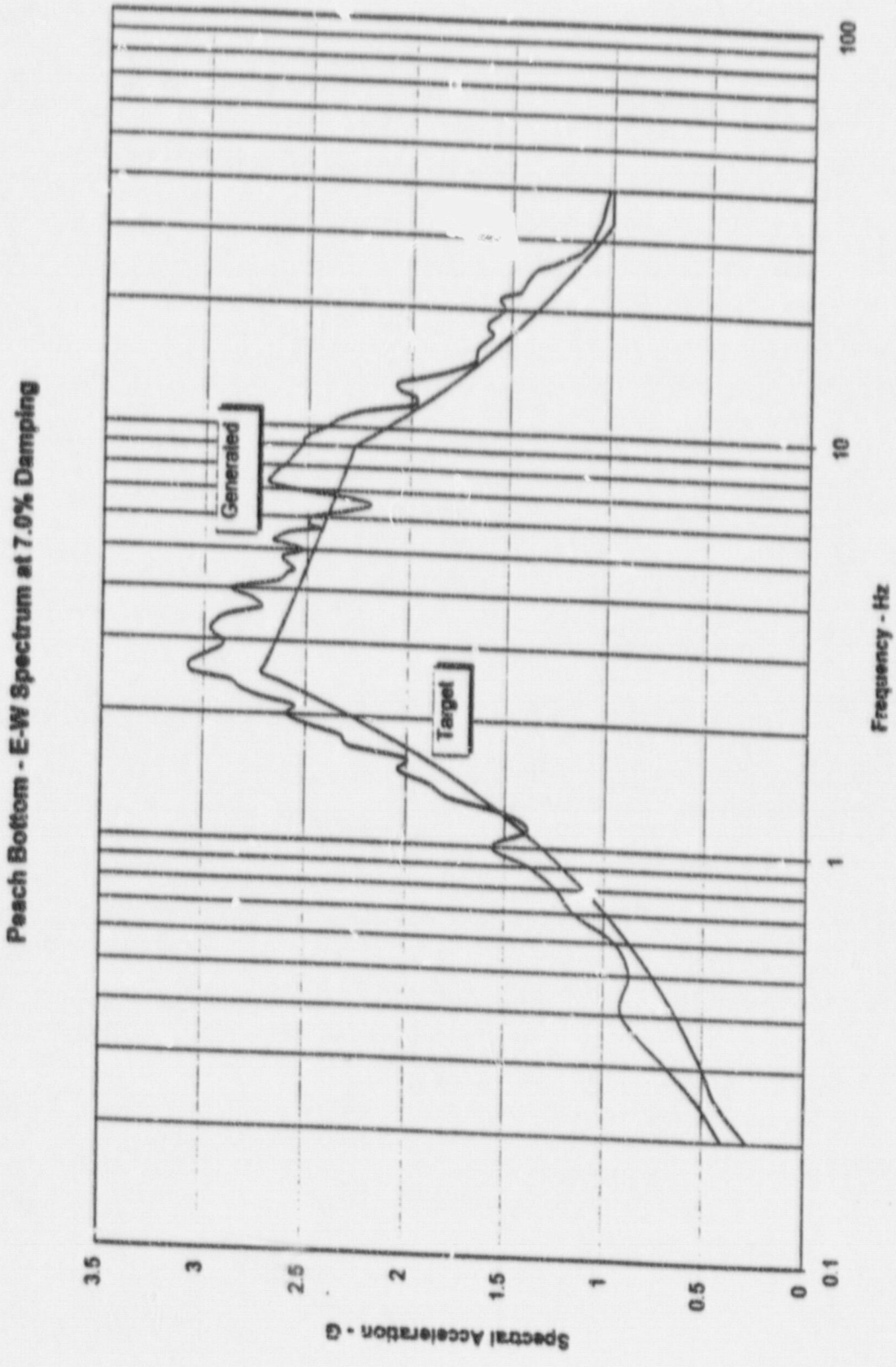


Figure D9 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - E/W, 7.0% Damping, ZPA = 1.0g.

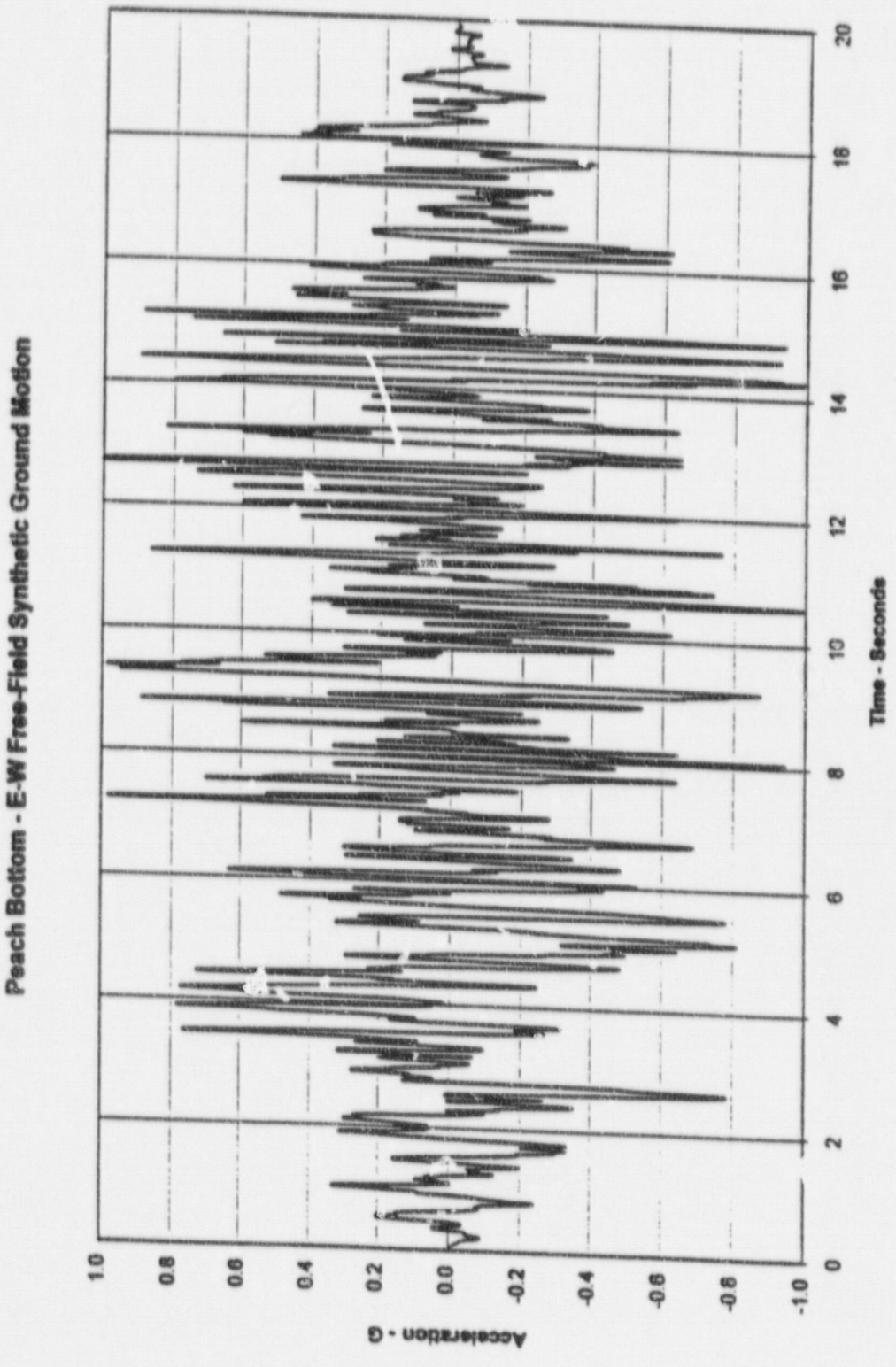


Figure D10 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Acceleration Time History - E/W, ZPA = 1.0g.

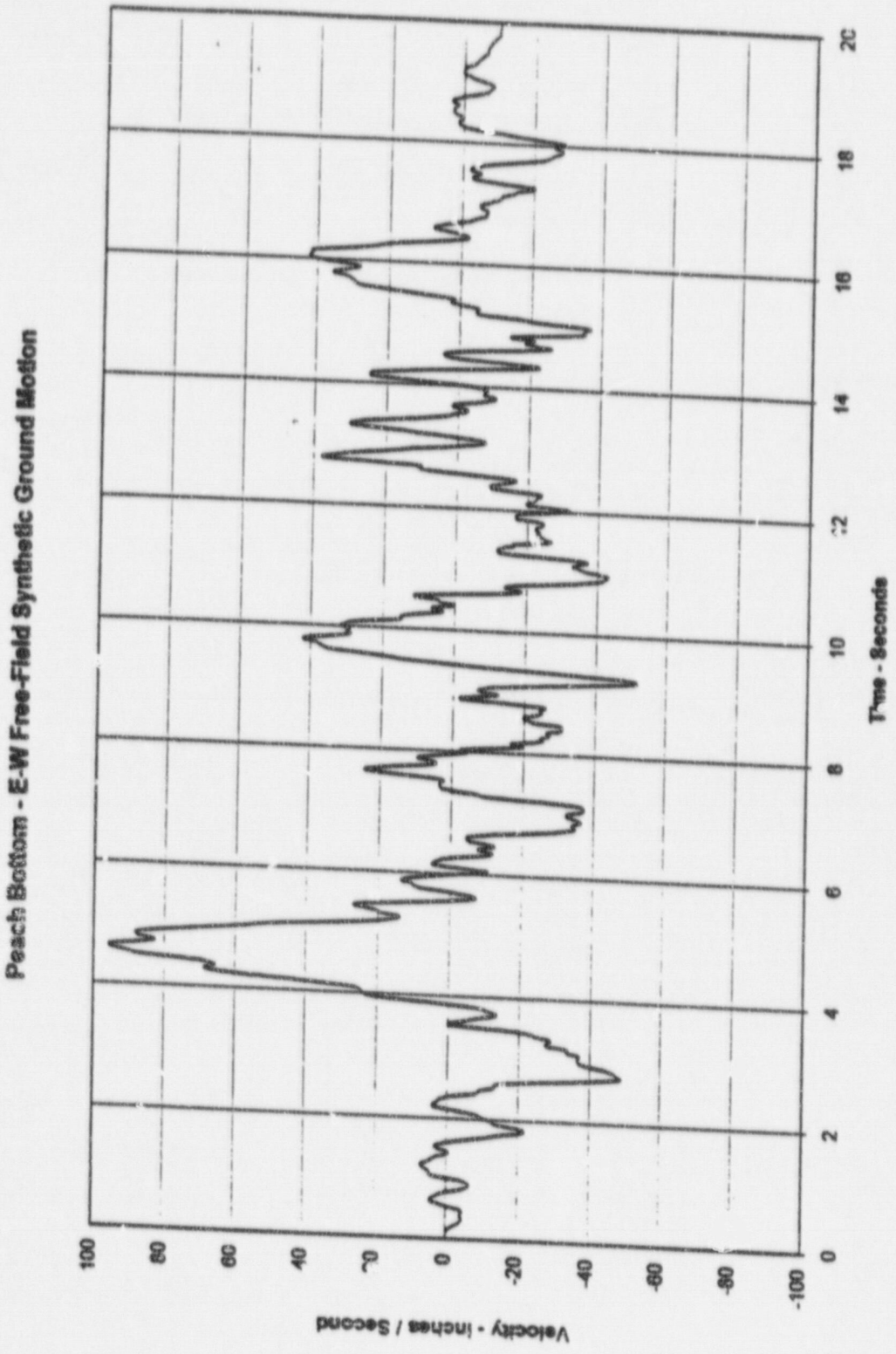


Figure D11 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Velocity Time History - E/W.

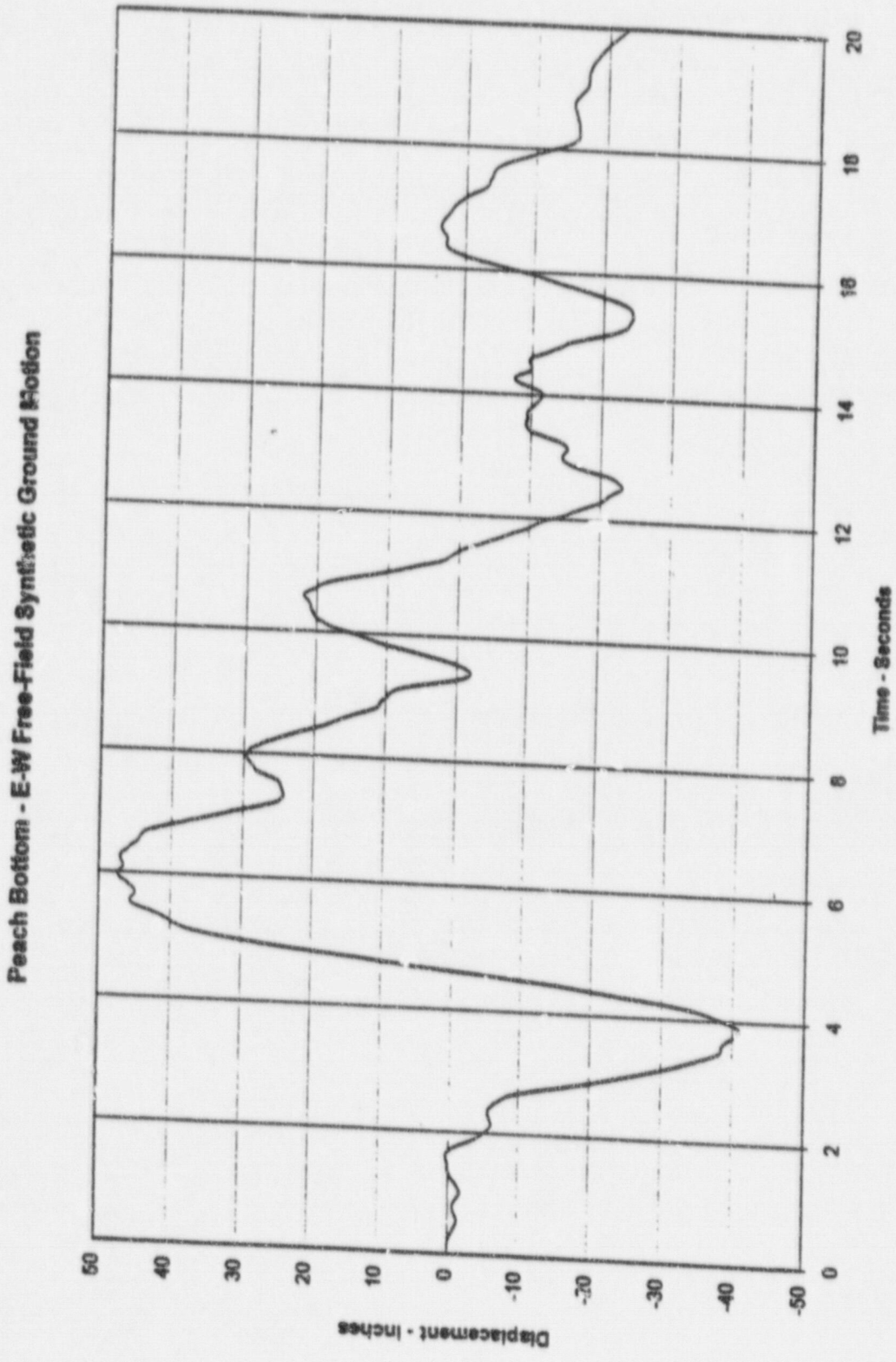


Figure D12 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Displacement Time History - E/W, Peak Ground Displacement = 36 Inches.

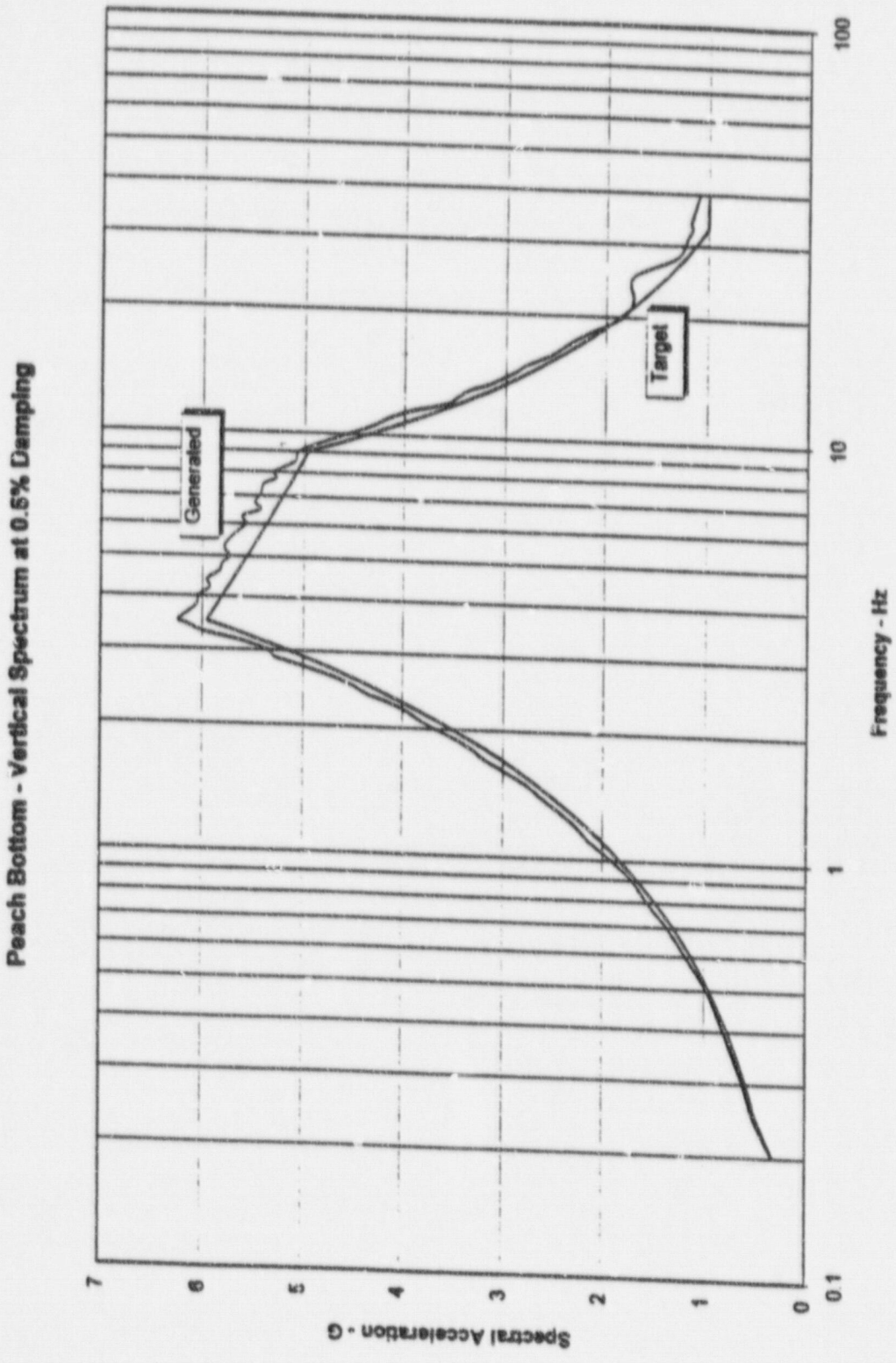


Figure D13 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - Vert., 0.5% Damping, ZPA = 1.0g.

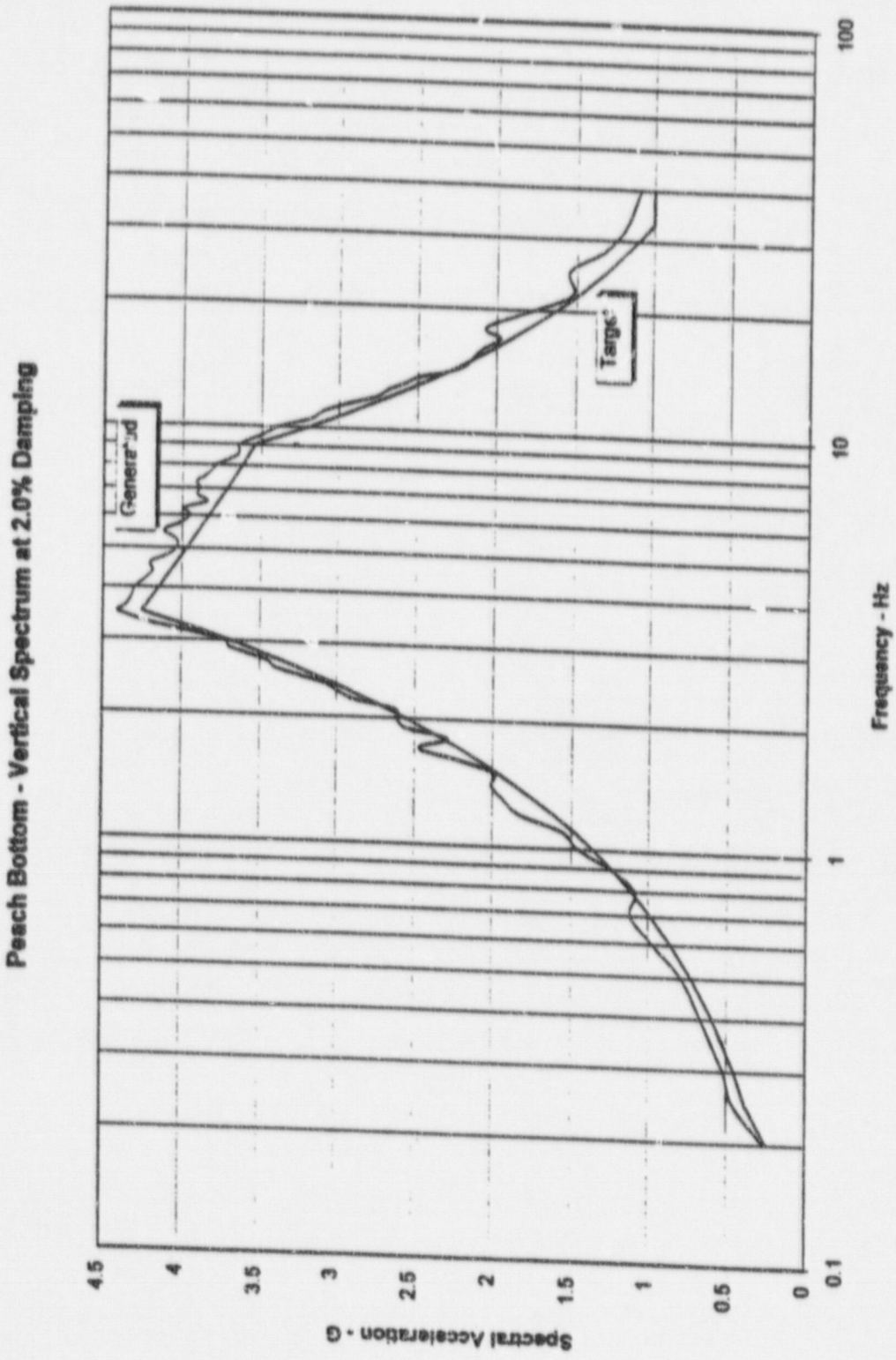


Figure D14 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - Vert., 2.0% Damping, ZPA = 1.0g.

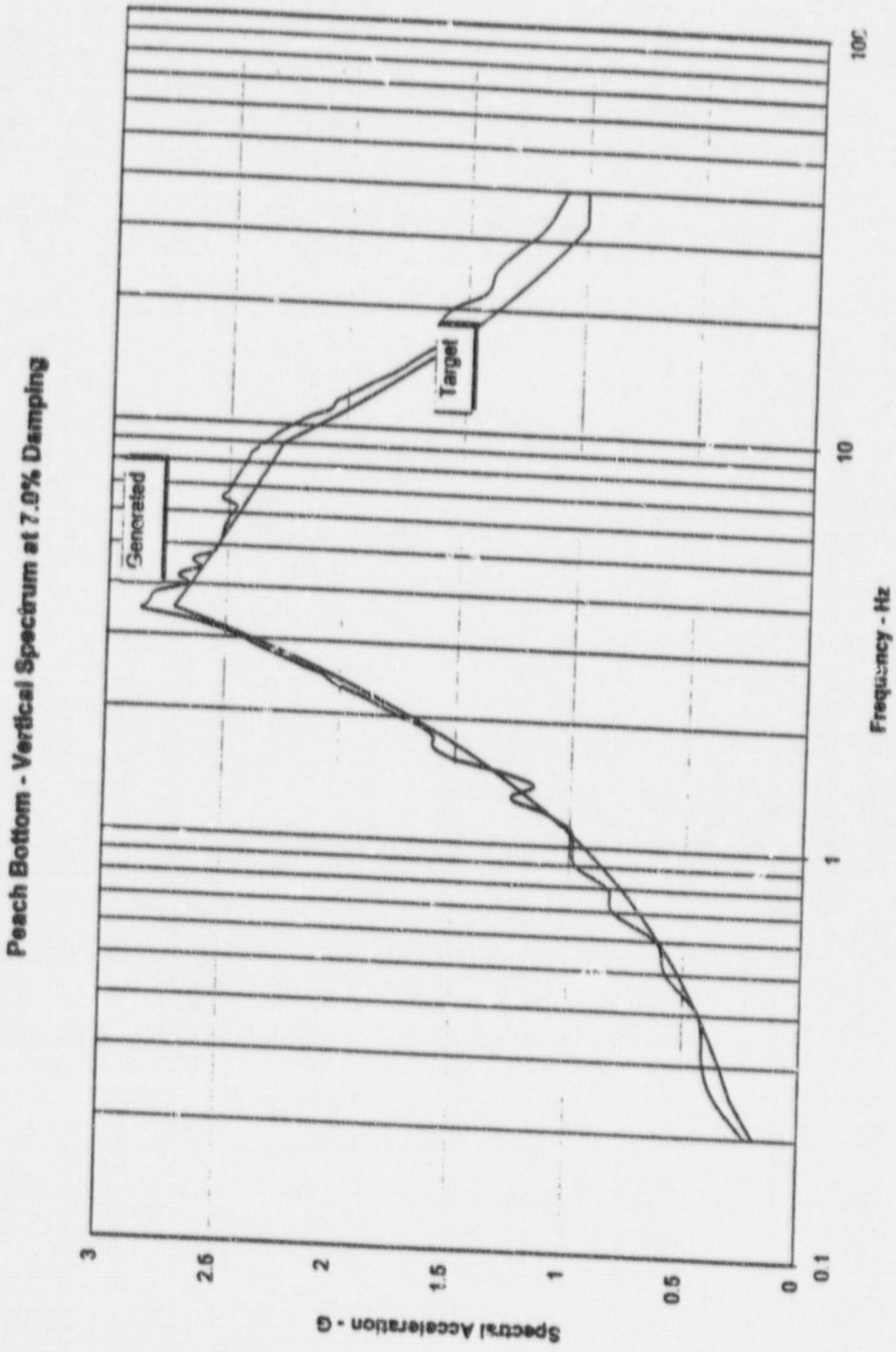


Figure D15 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field Response Spectra from Synthetic Acceleration Time History - Vert., 7.0% Damping, ZPA = 1.0g.

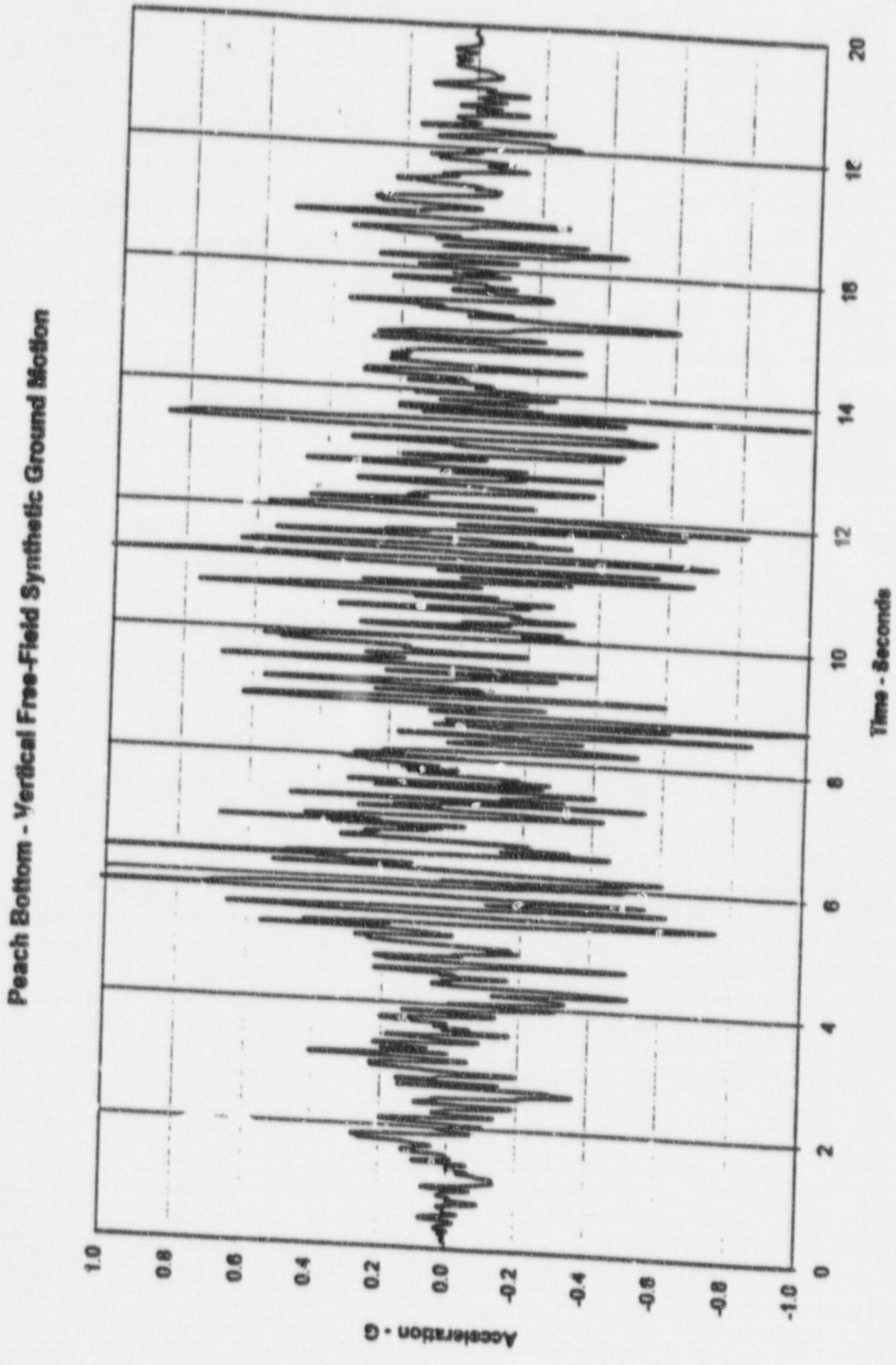


Figure D16 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Acceleration Time History - Vertical, ZPA = 1.0g.

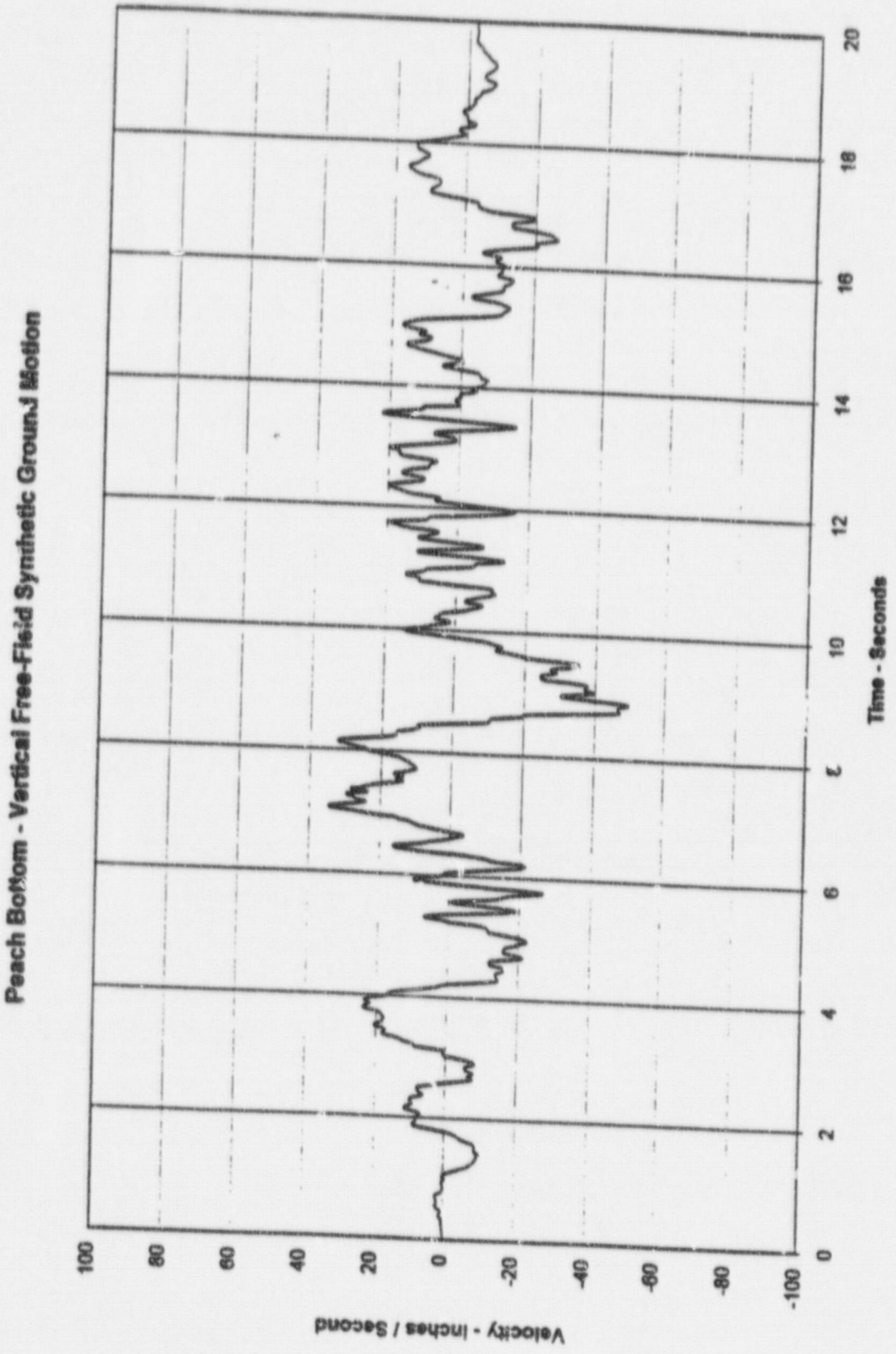


Figure D17 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Velocity Time History - Vertical.

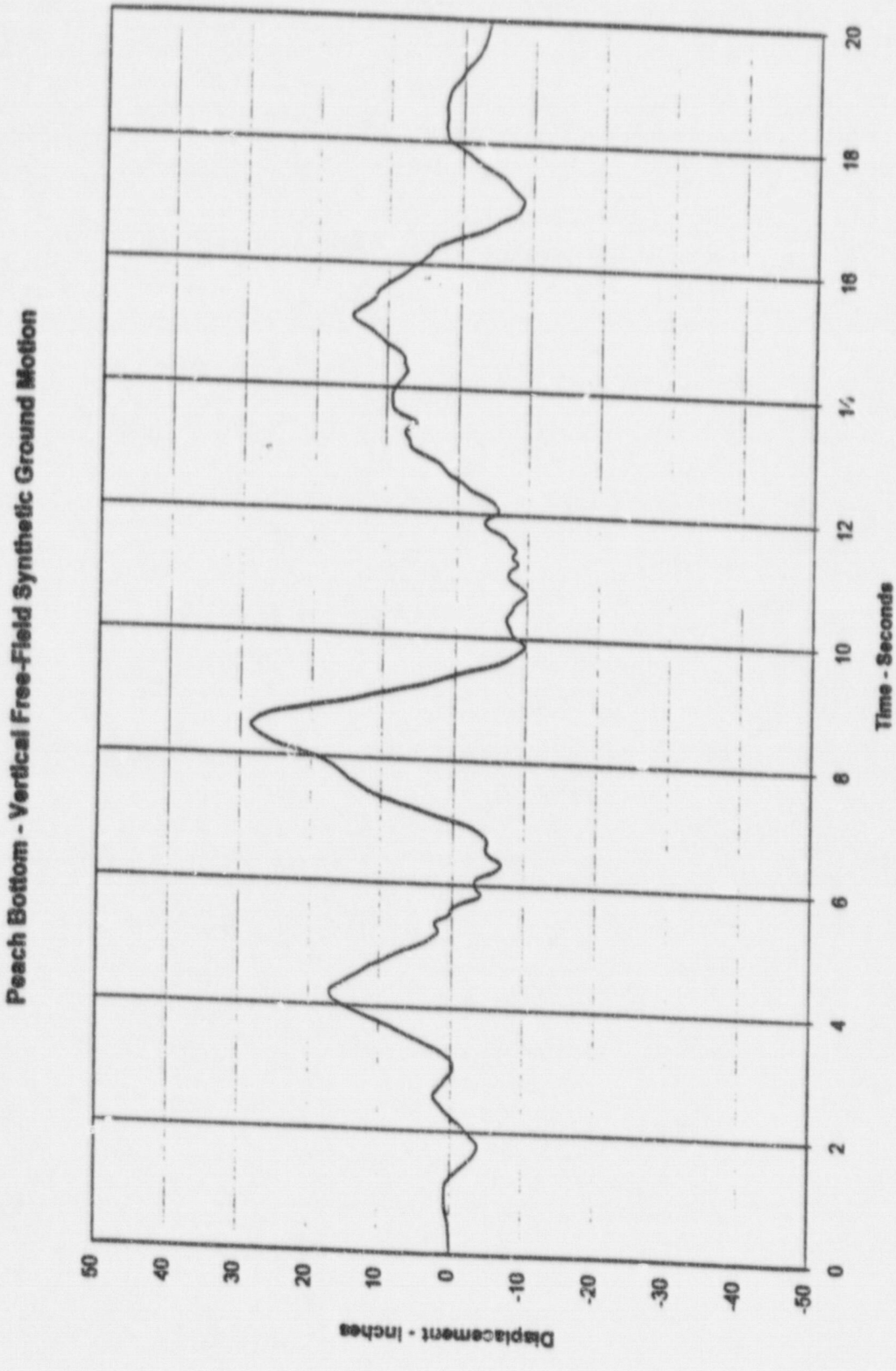


Figure D18 Peach Bottom 2 & 3 - Regulatory Guide 1.60 Free-Field, Synthetic Displacement Time History - Vertical, Peak Ground Displacement = 36 Inches.

ATTACHMENT "E"

PECO Energy Company
Peach Bottom Atomic Power Station, Units 2 & 3

Primary Structure Seismic Model Sketch and Eigenanalysis Input Geometry for North-South and East-West Models

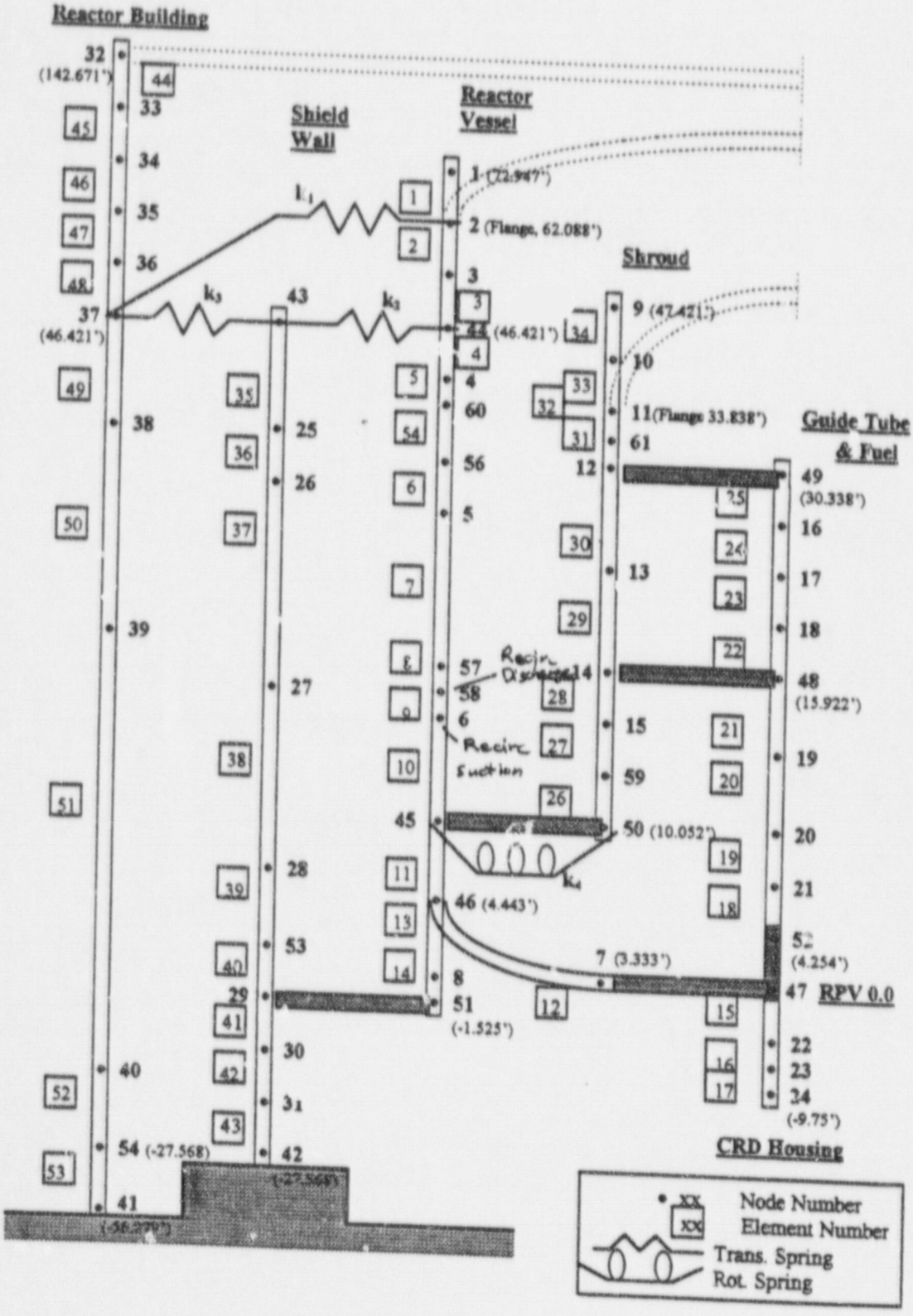


Figure E1 Peach Bottom 2 and 3 - Primary Structure Seismic Model

Table E1 Peach Bottom 2 & 3 - North/South Primary Structure Seismic Model
Eigen Summary Table

VAX 8 08-21-97 16:31 S A P 4 G 0 7 V - PEACH BOTTOM 3, N-S BASELINE,
Analysis for Recirc. Piping (w/GE11) - OBE

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**** E I G E N V A L U E S U M M A R Y T A B L E ****

MODE NUMBER	CIRCULAR FREQUENCY (RAD/TIME)	FREQUENCY (HERTZ)	PERIOD (TIME)	NODE NUMBER	DEG OF FREEDOM	MAXIMUM DISPLACEMT	NODE NUMBER	DEG OF FREEDOM	MAXIMUM ROTATION
1	2.8072E+01	4.4678E+00	2.2382E-01	17	1	3.3017E-01	18	5	4.7482E-02
2	3.1984E+01	5.0905E+00	1.9645E-01	32	1	2.0352E-01	16	5	4.2350E-03
3	3.2957E+01	5.2453E+00	1.9065E-01	24	1	6.4189E-01	24	5	9.6130E-02
4	3.9220E+01	6.2420E+00	1.6021E-01	32	1	1.0909E-01	16	5	6.1697E-03
5	5.8941E+01	9.3807E+00	1.0660E-01	2	1	1.1068E-01	16	5	2.2468E-02
6	7.5136E+01	1.1958E+01	8.3624E-02	32	1	1.6404E-01	32	5	5.5352E-03
7	8.9508E+01	1.4246E+01	7.0197E-02	61	1	1.8382E-01	16	5	3.1464E-02
8	9.2042E+01	1.4649E+01	6.8264E-02	61	1	2.8326E-01	16	5	4.4804E-02
9	1.1733E+02	1.8673E+01	5.3553E-02	18	1	3.2306E-01	17	5	1.2345E-01
10	1.1969E+02	1.9050E+01	5.2494E-02	39	1	2.6182E-02	17	5	2.6220E-03
11	1.3920E+02	2.2154E+01	4.5138E-02	20	1	2.2764E-01	19	5	3.3852E-02
12	1.6310E+02	2.5958E+01	3.8523E-02	20	1	5.1031E-01	19	5	1.1366E-01
13	1.8712E+02	2.9782E+01	3.3578E-02	25	1	5.6594E-02	19	5	1.0226E-02
14	1.8879E+02	3.0046E+01	3.3282E-02	25	1	1.1944E-01	19	5	1.9680E-02
15	1.9055E+02	3.0326E+01	3.2974E-02	33	1	2.9630E-01	33	5	9.6976E-03
16	2.3823E+02	3.7915E+01	2.6375E-02	17	1	3.4640E-02	18	5	9.8357E-03

VAX3 08-21-97 16:29 S A P 4 G 0 7 V - PEACH BOTTOM 3, E-W BASELINE,
Analysis for Recirc. Piping (w/GE11) - OBE

**** E I G E N V A L U E S U M M A R Y T A B L E ****

MODE NUMBER	CIRCULAR FREQUENCY (RAD/TIME)	FREQUENCY (HERTZ)	PERIOD (TIME)	NODE NUMBER	DEG OF FREEDOM	MAXIMUM DISPLACEMT	NODE NUMBER	DEG OF FREEDOM	MAXIMUM ROTATION
1	2.2875E+01	3.6407E+00	2.7467E-01	32	1	2.4236E-01	32	5	5.0550E-03
2	2.8069E+01	4.4673E+00	2.2385E-01	17	1	3.3015E-01	10	5	4.7469E-02
3	3.2955E+01	5.2449E+00	1.9066E-01	24	1	6.4181E-01	24	5	9.6096E-02
4	3.5519E+01	5.6531E+00	1.7689E-01	32	1	4.8540E-02	16	5	7.0387E-03
5	5.8307E+01	9.2798E+00	1.0776E-01	2	1	9.8483E-02	16	5	1.9604E-02
6	6.0129E+01	9.5698E+00	1.0450E-01	34	1	1.4893E-01	16	5	1.1226E-02
7	8.9472E+01	1.4240E+01	7.0225E-02	61	1	1.8325E-01	16	5	3.1382E-02
8	9.2041E+01	1.4649E+01	6.8265E-02	61	1	2.8371E-01	16	5	4.4882E-02
9	1.0989E+02	1.7489E+01	5.7178E-02	39	1	2.6220E-02	17	5	1.3343E-03
10	1.1733E+02	1.8673E+01	5.3552E-02	18	1	3.2311E-01	17	5	1.2347E-01
11	1.3399E+02	2.1326E+01	4.6892E-02	33	1	2.9472E-01	34	5	1.7574E-03
12	1.3920E+02	2.2154E+01	4.5139E-02	20	1	2.2757E-01	19	5	3.3841E-02
13	1.6310E+02	2.5958E+01	3.8524E-02	20	1	5.1025E-01	19	5	1.1363E-01
14	1.7556E+02	2.7941E+01	3.5789E-02	40	1	2.6851E-02	19	5	3.5386E-03
15	1.8853E+02	3.0005E+01	3.3328E-02	25	1	1.3200E-01	19	5	2.2048E-02
16	2.1645E+02	3.4449E+01	2.9028E-02	39	1	2.5815E-02	11	5	7.9068E-04

Table E2 Peach Bottom 2 & 3 - East/West Primary Structure Seismic Model
Eigen Summary Table

PEACH BOTTOM 2 & 3, N-S BASELINE MODEL (w/GE11) - Eigenvalue Analysis

61	2	0	1	1	0		1	0	0	1	1
1	14										
1	1	1	1	1	1	1	0.		0.	72.947	70.00
2	0	1	1	1	0	1	0.		0.	62.088	70.00
3	0	1	1	1	0	1	0.		0.	54.875	70.00
4	0	1	1	1	0	1	0.		0.	41.542	70.00
5	0	1	1	1	0	1	0.		0.	27.505	70.00
6	0	1	1	1	0	1	0.		0.	13.463	70.00
7	47	1	1	1	47	1	0.		0.	3.333	70.00
8	0	1	1	1	0	1	0.		0.	0.959	70.00
9	1	1	1	1	1	1	0.		0.	47.421	70.00
10	1	1	1	1	1	1	0.		0.	41.588	70.00
11	0	1	1	1	0	1	0.		0.	33.838	70.00
12	49	1	1	1	0	1	0.		0.	30.338	70.00
13	0	1	1	1	0	1	0.		0.	23.135	70.00
14	48	1	1	1	0	1	0.		0.	15.922	70.00
15	0	1	1	1	0	1	0.		0.	12.987	70.00
16	0	1	1	1	0	1	0.		0.	26.734	70.00
17	0	1	1	1	0	1	0.		0.	23.130	70.00
18	0	1	1	1	0	1	0.		0.	19.526	70.00
19	0	1	1	1	0	1	0.		0.	13.005	70.00
20	0	1	1	1	0	1	0.		0.	10.088	70.00
21	0	1	1	1	0	1	0.		0.	7.171	70.00
22	0	1	1	1	0	1	0.		0.	-3.250	70.00
23	0	1	1	1	0	1	0.		0.	-6.500	70.00
24	0	1	1	1	0	1	0.		0.	-9.750	70.00
25	0	1	1	1	0	1	0.		0.	37.379	70.00
26	0	1	1	1	0	1	0.		0.	28.337	70.00
27	0	1	1	1	0	1	0.		0.	14.504	70.00
28	0	1	1	1	0	1	0.		0.	5.984	70.00
29	51	1	1	1	51	1	0.		0.	-1.525	70.00
30	0	1	1	1	0	1	0.		0.	-6.744	70.00
31	0	1	1	1	0	1	0.		0.	-17.026	70.00
32	0	1	1	1	0	1	0.		0.	142.671	70.00
33	0	1	1	1	0	1	0.		0.	130.671	70.00
34	0	1	1	1	0	1	0.		0.	110.921	70.00
35	0	1	1	1	0	1	0.		0.	85.421	70.00
36	0	1	1	1	0	1	0.		0.	65.421	70.00
37	0	1	1	1	0	1	0.		0.	46.421	70.00
38	0	1	1	1	0	1	0.		0.	31.421	70.00
39	0	1	1	1	0	1	0.		0.	16.421	70.00
40	0	1	1	1	0	1	0.		0.	-13.579	70.00
41	1	1	1	1	1	1	0.		0.	-56.079	70.00
42	1	1	1	1	1	1	0.		0.	-27.328	70.00
43	0	1	1	1	0	1	0.		0.	46.421	70.00
44	0	1	1	1	0	1	0.		0.	46.421	70.00
45	50	1	1	1	0	1	0.		0.	10.052	70.00
46	0	1	1	1	0	1	0.		0.	4.443	70.00
47	0	1	1	1	0	1	0.		0.	0.000	70.00
48	0	1	1	1	0	1	0.		0.	15.922	70.00
49	0	1	1	1	0	1	0.		0.	30.338	70.00
50	0	1	1	1	0	1	0.		0.	10.052	70.00
51	0	1	1	1	0	1	0.		0.	-1.525	70.00
52	47	1	1	1	47	1	0.		0.	4.254	70.00
53	0	1	1	1	0	1	0.		0.	-.525	70.00
54	0	1	1	1	1	1	0.		0.	-27.568	70.00
55	1	1	1	1	1	1	1000.000		0.	0.	70.00
56	0	1	1	1	0	1	0.		0.	30.338	70.00
57	0	1	1	1	0	1	0.		0.	15.922	70.00
58	0	1	1	1	0	1	0.		0.	15.083	70.00
59	0	1	1	1	0	1	0.		0.	10.958	70.00
60	0	1	1	1	0	1	0.		0.	40.375	70.00
61	0	1	1	1	0	1	0.		0.	32.453	70.00
9	54	9		31							

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```
  1    1  0.0          0.0
70.00     3967000.0     0.300
  2    1  0.0          0.0
70.00     3974000.0     0.300
  3    1  0.0          0.0
70.00     3686000.0     0.300
  4    1  0.0          0.0
70.00     1656000.0     0.420
  5    1  0.0          0.0
70.00     3686000.0     0.300
  6    1  0.0          0.0
70.00     4320000.0     0.300
  7    1  0.0          0.0
70.00     432000.00     0.200
  8    1  0.0          0.0
70.00     4160000.0     0.261
  9    1  0.0          0.0
70.00     455000.00     0.250
  1  21.34     10.67       10.67
  2  36.14     18.07       18.07
  3  34.268    17.134      17.134
  4  36.336    18.168      18.168
  5  6.85      3.425       3.425
  6  6.236     3.118       3.118
  7  24.148    12.074      12.074
  8  8.39      4.195       4.195
  9  9.512     4.756       4.756
 10  8.95      4.475       4.475
 11  8.683     4.3415      4.3415
 12  8.7       4.35        4.35
 13  8.604     4.302       4.302
 14  7.0486    3.5243      3.5243
 15  8.347     4.1735      4.1735
 16  6.77      3.385       3.385
 17  7.38      3.69        3.69
 18  7.4       3.7         3.7
 19  6.34      3.17        3.17
 20  7.42      3.71        3.71
 21  336.04    168.02      168.02
 22  210.02    105.01      105.01
 23   .936     0.468       0.468
 24   7.72     3.86        3.86
 25   3.00     1.50        1.50
 26  4536.     2268.       2268.
 27  3598.     1799.       1799.
 28  2768.     1384.       1384.
 29  3300.     1650.       1650.
 30  2940.     1470.       1470.
 31  7480.     3740.       3740.
       0
       0
       0
       0
  1    1    2   55    1    1
  2    2    3   55    1    2
  3    3   44   55    1    2
  4   44    4   55    1    2
  5    4   60   55    1    2
  6   56    5   55    1    2
  7    5   57   55    1    2
  8   57   58   55    1    2
  9   58    6   55    1    2
 10    6   45   55    1    2
 11   45   46   55    1    3
 12   46    7   55    1    4
```

```
0.01   899.48     899.48
0.01  2077.89    2077.89
0.01  1771.02    1771.02
0.01  1351.53    1351.53
0.01   310.43     310.43
0.01   283.08     283.08
0.01   20.836     20.836
0.01   5.465      5.465
0.01  392.406    392.40
0.01  326.905    326.90
0.01  298.487    298.48
0.01   300.       300.
0.01   .2858      .2858
0.01   .6848      .6848
0.01   .223       .223
0.01   584.76     584.76
0.01   644.76     644.76
0.01   648.64     648.64
0.01   547.07     547.07
0.01   651.11     651.11
0.01  21381.0    21381.0
0.01  13809.87   13809.8
0.01  100000.    100000.
0.01    186.       186.
0.01   1190.      1190.
0.01 10200000.  10200000.
0.01  6490000.   6490000.
0.01  5730000.   5730000.
0.01  5870000.   5870000.
0.01  6210000.   6210000.
0.01 17900000.  17900000.
```

```
111111          70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
```

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```
13   46    8   55    2    6
14    8   51   55    2    6                                          70.0
15   47   22   55    5   15                                          70.0
16   22   23   55    5   15                                          70.0
17   23   24   55    5   15                                          70.0
18   52   21   55    3   14                                          70.0
19   21   20   55    3   14                  1                       70.0
20   20   19   55    3   14                                          70.0
21   19   48   55    3   11                                          70.0
22   48   18   55    4   13                         1                70.0
23   18   17   55    4   13                  1                       70.0
24   17   16   55    4   13                                          70.0
25   16   49   55    4   13                                          70.0
26   50   59   55    3   12                         1                70.0
27   59   15   55    3   12                                          70.0
28   15   14   55    3   11                                          70.0
29   14   13   55    3   10                                          70.0
30   13   12   55    3   10                                          70.0
31   12   61   55    3    9                                          70.0
32   61   11   55    3    9                                          70.0
33   11   10   55    3    8                   111111                  70.0
34   10    9   55    3    7                                          70.0
35   43   25   55    6   16                                          70.0
36   25   26   55    6   17                                          70.0
37   26   27   55    6   18                                          70.0
38   27   28   55    6   19                                          70.0
39   28   53   55    6   20                                          70.0
40   53   29   55    6   20                                          70.0
41   29   30   55    7   21                                          70.0
42   30   31   55    7   22                                          70.0
43   31   42   55    7   22                                          70.0
44   32   33   55    8   23                                          70.0
45   33   34   55    8   24                                          70.0
46   34   35   55    8   25                                          70.0
47   35   36   55    9   26                                          70.0
48   36   37   55    9   27                                          70.0
49   37   38   55    9   28                                          70.0
50   38   39   55    9   29                                          70.0
51   39   40   55    9   30                                          70.0
52   40   54   55    9   31                                          70.0
53   54   41   55    9   31                                          70.0
54   60   56   55    1    2                                          70.0
 8    4                                                             70.0
      0
 1    2   37                  1    0
 2   44   43                  1    0                           32400.207
 3   43   37                  1    0                           480076.81
 4   45   50                  0    2                           280112.04
 1    3    9    0   1.0           0.00                         46189376.0
  0.00       -1.51           0.00              -1.51            0.00
 2    4   10    0   1.0           0.00
  0.00       -.403           0.00              -.403            0.00
 3    4   11    0   1.0           0.00
  0.00       -.403           0.00              -.403            0.00
 4    5   12    0   1.0           0.00
  0.00       -2.436          0.00              -2.436           0.00
 5    5   13    0   1.0           0.00
  0.00       -2.436          0.00              -2.436           0.00
 6    6   14    0   1.0           0.00
  0.00       -1.9935         0.00              -1.9935          0.00
 7    6   15    0   1.0           0.00
  0.00       -1.9935         0.00              -1.9935          0.00
 8    4   11    0   1.0           0.00
  0.00       -1.510          0.00              -1.510           0.00
 9    7   21    0   1.0           0.00         -.8340           0.00
```

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```
     0.00          -.8340            0.00
 10    12    16      0    1.0            0.00            -.3780            0.00
     0.00          -.3780            0.00
 11    13    17      0    1.0            0.00            -.3780            0.00
     0.00          -.3780            0.00
 12    14    18      0    1.0            0.00            -.3780            0.00
     0.00          -.3780            0.00
 13    14    19      0    1.0            0.00            -.8340            0.00
     0.00          -.8340            0.00
 14    15    20      0    1.0            0.00            -.8340            0.00
     0.00          -.8340            0.00
  2     0  9.959               0.        0.        0.        0.        0.
  3     0  13.977              0.        0.        0.        0.        0.
  4     0  1[illegible].828             0.        0.        0.        0.        0.
  5     0  18.853              0.        0.        0.        0.        0.
  6     0  12.716              0.        0.        0.        0.        0.
  7     0  10.708              0.        0.        0.        0.        0.
  8     0   0.33               0.        0.        0.        0.        0.
 11     0  1.81                0.        0.        0.        0.        0.
 12     0  6.277               0.        0.        0.        0.        0.
 13     0  2.128               0.        0.        0.        0.        0.
 14     0  7.750               0.        0.        0.        0.        0.
 15     0  4.319               0.        0.        0.        0.        0.
 16     0  4.[illegible]89              0.        0.        0.        0.        0.
 17     0  4.389               0.        0.        0.        0.        0.
 18     0  4.389               0.        0.        0.        0.        0.
 19     0  1.586               0.        0.        0.        0.        0.
 20     0  1.586               0.        0.        0.        0.        0.
 21     0  1.586               0.        0.        0.        0.        0.
 22        0.680               0.        0.        0.        0.        0.
 23     0  0.680               0.        0.        0.        0.        0.
 24     0  2.210               0.        0.        0.        0.        0.
 25     0  8.705               0.        0.        0.        0.        0.
 26     0  11.90               0.        0.        0.        0.        0.
 27     0  11.106              0.        0.        0.        0.        0.
 28     0  26.834              0.        0.        0.        0.        0.
 29     0  14.166              0.        0.        0.        0.        0.
 30     0  13.304              0.        0.        0.        0.        0.
 31     0  19.155              0.        0.        0.        0.        0.
 32     0  11.610              0.        0.        0.        0.        0.
 33     0  8.69                0.        0.        0.        0.        0.
 34     0  25.68               0.        0.        0.        0.        0.
 35     0  421.95              0.        0.        0.        0.        0.
 36     0  504.30              0.        0.        0.        0.        0.
 37     0  564.43              0.        0.        0.        0.        0.
 38     0  276.03              0.        0.        0.        0.        0.
 39     0  512.39              0.        0.        0.        0.        0.
 40     0  753.40              0.        0.        0.        0.        0.
 44     0   2.718              0.        0.        0.        0.        0.
  0
        0
  0     1  32                          33                  1                 1
END
```

N-S 4/4

PEACH BOTTOM 2 & 3, E-W BASELINE MODEL (w/GE11) - Eigenvalue Analysis

```
   61    2    0    1    1    0          1    0    0          1                    1
    1   14
    1    1    1    1    1    1    1     0.          0.     72.947          70.00
    2    0    1    1    1    0    1     0.          0.     62.088          70.00
    3    0    1    1    1    0    1     0.          0.     54.875          70.00
    4    0    1    1    1    0    1     0.          0.     41.542          70.00
    5    0    1    1    1    0    1     0.          0.     27.505          70.00
    6    0    1    1    1    0    1     0.          0.     13.463          70.00
    7   47    1    1    1   47    1     0.          0.      3.333          70.00
    8    0    1    1    1    0    1     0.          0.      0.959          70.00
    9    1    1    1    1    1    1     0.          0.     47.421          70.00
   10    1    1    1    1    1    1     0.          0.     41.588          70.00
   11    0    1    1    1    0    1     0.          0.     33.838          70.00
   12   49    1    1    1    0    1     0.          0.     30.338          70.00
   13    0    1    1    1    0    1     0.          0.     23.135          70.00
   14   48    1    1    1    0    1     0.          0.     15.922          70.00
   15    0    1    1    1    0    1     0.          0.     12.987          70.00
   16    0    1    1    1    0    1     0.          0.     26.734          70.00
   17    0    1    1    1    0    1     0.          0.     23.130          70.00
   18    0    1    1    1    0    1     0.          0.     19.526          70.00
   19    0    1    1    1    0    1     0.          0.     13.005          70.00
   20    0    1    1    1    0    1     0.          0.     10.088          70.00
   21    0    1    1    1    0    1     0.          0.      7.171          70.00
   22    0    1    1    1    0    1     0.          0.     -3.250          70.00
   23    0    1    1    1    0    1     0.          0.     -6.500          70.00
   24    0    1    1    1    0    1     0.          0.     -9.750          70.00
   25    0    1    1    1    0    1     0.          0.     37.379          70.00
   26    0    1    1    1    0    1     0.          0.     28.337          70.00
   27    0    1    1    1    0    1     0.          0.     14.504          70.00
   28    0    1    1    1    0    1     0.          0.      5.984          70.00
   29   51    1    1    1   51    1     0.          0.     -1.525          70.00
   30    0    1    1    1    0    1     0.          0.     -6.744          70.00
   31    0    1    1    1    0    1     0.          0.    -17.036          70.00
   32    0    1    1    1    0    1     0.          0.    142.671          70.00
   33    0    1    1    1    0    1     0.          0.    130.671          70.00
   34    0    1    1    1    0    1     0.          0.    110.921          70.00
   35    0    1    1    1    0    1     0.          0.     85.421          70.00
   36    0    1    1    1    0    1     0.          0.     65.421          70.00
   37    0    1    1    1    0    1     0.          0.     46.421          70.00
   38    0    1    1    1    0    1     0.          0.     31.421          70.00
   39    0    1    1    1    0    1     0.          0.     16.421          70.00
   40    0    1    1    1    0    1     0.          0.    -13.579          70.00
   41    1    1    1    1    1    1     0.          0.    -56.079          70.00
   42    1    1    1    1    1    1     0.          0.    -27.328          70.00
   43    0    1    1    1    0    1     0.          0.     46.421          70.00
   44    0    1    1    1    0    1     0.          0.     46.421          70.00
   45   50    1    1    1    0    1     0.          0.     10.052          70.00
   46    0    1    1    1    0    1     0.          0.      4.443          70.00
   47    0    1    1    1    0    1     0.          0.      0.000          70.00
   48    0    1    1    1    0    1     0.          0.     15.922          70.00
   49    0    1    1    1    0    1     0.          0.     30.338          70.00
   50    0    1    1    1    0    1     0.          0.     10.052          70.00
   51    0    1    1    1    0    1     0.          0.     -1.525          70.00
   52   47    1    1    1   47    1     0.          0.      4.254          70.00
   53    0    1    1    1    0    1     0.          0.      -.525          70.00
   54    0    1    1    1    1    1     0.          0.    -27.568          70.00
   55    1    1    1    1    1    1  1000.000       0.      0.             70.00
   56    0    1    1    1    0    1     0.          0.     30.338          70.00
   57    0    1    1    1    0    1     0.          0.     15.922          70.00
   58    0    1    1    1    0    1     0.          0.     15.083          70.00
   59    0    1    1    1    0    1     0.          0.     10.958          70.00
   60    0    1    1    1    0    1     0.          0.     40.375          70.00
   61    0    1    1    1    0    1     0.          0.     32.453          70.00
    9   54    9        31
```

E-W 1/4

```
  1    1  0.0          0.0
70.00      3967000.0      0.300
  2    1  0.0          0.0
70.00      3974000.0      0.300
  3    1  0.0          0.0
70.00      3686000.0      0.300
  4    1  0.0          0.0
70.00      1656000.0      0.420
  5    1  0.0          0.0
70.00      3686000.0      0.300
  6    1  0.0          0.0
70.00      4320000.0      0.300
  7    1  0.0          0.0
70.00      432000.00      0.200
  8    1  0.0          0.0
70.00      4160000.0      0.261
  9    1  0.0          0.0
70.00      455000.00      0.250
  1   21.34     10.67      10.67
  2   36.14     18.07      18.07
  3   34.268    17.134     17.134
  4   36.336    18.168     18.168
  5   6.85      3.425      3.425
  6   6.236     3.118      3.118
  7   24.148    12.074     12.074
  8   8.39      4.195      4.195
  9   9.512     4.756      4.756
 10   8.95      4.475      4.475
 11   8.683     4.3415     4.3415
 12   8.7       4.35       4.35
 13   8.604     4.302      4.302
 14   7.0486    3.5243     3.5243
 15   8.347     4.1735     4.1735
 16   6.77      3.385      3.385
 17   7.38      3.69       3.69
 18   7.4       3.7        3.7
 19   6.34      3.17       3.17
 20   7.42      3.71       3.71
 21   336.04    168.02     168.02
 22   210.02    105.01     105.01
 23     .8      0.400      0.400
 24    2.12     1.06       1.06
 25    2.52     1.26       1.26
 26   2806.     1403.      1403.
 27   2716.     1358.      1358.
 28   2332.     1166.      1166.
 29   2860.     1430.      1430.
 30   2700.     1350.      1350.
 31   7940.     3870.      3870.
       0
       0
       0
       0
  1    1    2   55   1    1
  2    2    3   55   1    2
  3    3   44   55   1    2
  4   44    4   55   1    2
  5    4   60   55   1    2
  6   56    5   55   1    2
  7    5   57   55   1    2
  8   57   58   55   1    2
  9   58    6   55   1    2
 10    6   45   55   1    2
 11   45   46   55   1    3
 12   46    7   55   1    4

0.01   899.48     899.48
0.01  2077.89    2077.89
0.01  1771.02    1771.02
0.01  1351.53    1351.53
0.01   310.43     310.43
0.01   283.08     283.08
0.01   20.836     20.836
0.01   5.465      5.465
0.01  392.406    392.40
0.01  326.905    326.90
0.01  298.487    298.48
0.01   300.       300.
0.01   .2858      .2858
0.01   .6848      .6848
0.01   .223       .223
0.01   584.76     584.76
0.01   644.76     644.76
0.01   648.64     648.64
0.01   547.07     547.07
0.01   651.11     651.11
0.01  21381.0    21381.0
0.01  13809.87   13809.8
0.01  100000.    100000.
0.01    50.4       50.4
0.01   450.       450.
0.01  3870000.   3870000.
0.01  3770000.   3770000.
0.01  4210000.   4210000.
0.01  4510000.   4510000.
0.01  4420000.   4420000.
0.01 12900000.  12900000.

111111
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
                70.0
```

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```
13   46    8   55    2    6                                                  70.0
14    8   51   55    2    6                                                  70.0
15   47   22   55    5   15                                                  70.0
16   22   23   55    5   15                                                  70.0
17   23   24   55    5   15                                                  70.0
18   52   21   55    3   14                                                  70.0
19   21   20   55    3   14                                                  70.0
20   20   19   55    3   14                                                  70.0
21   19   48   55    3   11                                                  70.0
22   48   18   55    4   13                                                  70.0
23   18   17   55    4   13                                                  70.0
24   17   16   55    4   13                                                  70.0
25   16   49   55    4   13                                                  70.0
26   50   59   55    3   12                                                  70.0
27   59   15   55    3   12                                                  70.0
28   15   14   55    3   11                                                  70.0
29   14   13   55    3   10                                                  70.0
30   13   12   55    3   10                                                  70.0
31   12   61   55    3    9                                                  70.0
32   61   11   55    3    9                                                  70.0
33   11   10   55    3    8                                                  70.0
34   10    9   55    3    7                                                  70.0
35   43   25   55    6   16                                                  70.0
36   25   26   55    6   17                                                  70.0
37   26   27   55    6   18                                                  70.0
38   27   28   55    6   19                                                  70.0
39   28   53   55    6   20                                                  70.0
40   53   29   55    6   20                                                  70.0
41   29   30   55    7   21                                                  70.0
42   30   31   55    7   22                                                  70.0
43   31   42   55    7   22                                                  70.0
44   32   33   55    8   23                                                  70.0
45   33   34   55    8   24                                                  70.0
46   34   35   55    8   25                                                  70.0
47   35   36   55    9   26                                                  70.0
48   36   37   55    9   27                                                  70.0
49   37   38   55    9   28                                                  70.0
50   38   39   55    9   29                                                  70.0
51   39   40   55    9   30                                                  70.0
52   40   54   55    9   31                                                  70.0
53   54   41   55    9   31                                                  70.0
54   60   56   55    1    2                                                  70.0
 8    4                                                                      70.0
      0
```

```
1    2   37                                                                  32400.207
2   44   43                                                                  480076.81
3   43   37                                                                  280112.04
4   45   50                                                                  46189376.0
1    3    9    0   1.0                                                       0.00
 0.00       -1.51                                                  -1.51
2    4   10    0   1.0                                                       0.00
 0.00       -.403                                                  -.403
3    4   11    0   1.0                                                       0.00
 0.00       -.403                                                  -.403
4    5   12    0   1.0                                                       0.00
 0.00       -2.436                                                 -2.436
5    5   13    0   1.0                                                       0.00
 0.00       -2.436                                                 -2.436
6    6   14    0   1.0                                                       0.00
 0.00       -1.9935                                                -1.9935
7    6   15    0   1.0                                                       0.00
   0.00     -1.9935                                                -1.9935
8    4   11    0   1.0                                                       0.00
   0.00     -1.510                                                 -1.510
9    7   21    0   1.0                                                       0.00
                                                                    -.8340
```

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```
      0.00          -.8340                    0.00
10      12    16      0    1.0          0.00          -.3780          0.00
      0.00          -.3780                    0.00
11      13    17      0    1.0          0.00          -.3780          0.00
      0.00          -.3780                    0.00
12      14    18      0    1.0          0.00          -.3780          0.00
      0.00          -.3780                    0.00
13      14    19      0    1.0          0.00          -.8340          0.00
      0.00          -.8340                    0.00
14      15    20      0    1.0          0.00          -.8340          0.00
      0.00          -.8340                    0.00
  2     0  9.959                  0.      0.      0.      0.      0.
  3     0  13.977                 0.      0.      0.      0.      0.
  4     0  11.828                 0.      0.      0.      0.      0.
  5     0  18.853                 0.      0.      0.      0.      0.
  6     0  12.716                 0.      0.      0.      0.      0.
  7     0  10.708                 0.      0.      0.      0.      0.
  8     0   0.33                  0.      0.      0.      0.      0.
 11     0  1.8                    0.      0.      0.      0.      0.
 12     0  6.277                  0.      0.      0.      0.      0.
 13     0  2.128                  0.      0.      0.      0.      0.
 14     0  7.750                  0.      0.      0.      0.      0.
 15     0  1.339                  0.      0.      0.      0.      0.
 16     0  4.389                  0.      0.      0.      0.      0.
 17     0  4.389                  0.      0.      0.      0.      0.
 18     0  4.389                  0.      0.      0.      0.      0.
 19     0  1.586                  0.      0.      0.      0.      0.
 20     0  1.586                  0.      0.      0.      0.      0.
 21     0  1.586                  0.      0.      0.      0.      0.
 22     0  0.680                  0.      0.      0.      0.      0.
 23     0  0.680                  0.      0.      0.      0.      0.
 24     0  2.210                  0.      0.      0.      0.      0.
 25     0  8.705                  0.      0.      0.      0.      0.
 26     0  11.90                  0.      0.      0.      0.      0.
 27     0  11.106                 0.      0.      0.      0.      0.
 28     0  26.834                 0.      0.      0.      0.      0.
 29     0  14.166                 0.      0.      0.      0.      0.
 30     0  13.304                 0.      0.      0.      0.      0.
 31     0  19.155                 0.      0.      0.      0.      0.
 32     0  11.610                 0.      0.      0.      0.      0.
 33     0  8.69                   0.      0.      0.      0.      0.
 34     0  25.68                  0.      0.      0.      0.      0.
 35     0  421.95                 0.      0.      0.      0.      0.
 36     0  504.30                 0.      0.      0.      0.      0.
 37     0  564.43                 0.      0.      0.      0.      0.
 38     0  276.03                 0.      0.      0.      0.      0.
 39     0  512.39                 0.      0.      0.      0.      0.
 40     0  753.40                 0.      0.      0.      0.      0.
 44     0   2.728                 0.      0.      0.      0.      0.
  0
      0
  0     1   32                    33              1               1
END
```

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