BSC

Design Calculation or Analysis Cover Sheet

Complete only applicable items.

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2. Page 1

3. System	4. Document Identifier
Wet Handling Facility (WHF)	050-SYC-WH00-00800-000-00A

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WHF Tier 1 Seismic Analysis - 2007 Geotechnical Data

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8. Notes/Comments

N/A

Attachments	Total Number of Pages
For List of Attachments See Contents on Pages 4, 5, 15, and 16	54 and one CD

RECORD OF REVISIONS

9. No.	10. Reason For Revision	11. Total # of Pgs.	12. Last Pg. #	13. Originator (Print/Sign/Date)	14. Checker (Print/Sign/Date)	15. EGS (Print/Sign/Date)	16. Approved/Accepted (Print/Sign/Date)
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DISCLAIMER

The calculations contained in this document were developed by Bechtel SAIC Company, LLC (BSC) are intended solely for the use of BSC in its work for the Yucca Mountain Project.

CONTENTS

ATTACHMENTS Page

Note: * Title of the CD files are listed in Section 5: LIST OF ATTTACHMENT, page 15 of this calculation.

FIGURES

TABLES

ACRONYMS

3D	Three-Dimensional
BDBGM	Beyond Design Base Ground Motion (10000 Year Return Period)
C.G.	Center of Gravity
DBGM-2	Design Basis Ground Motion (2000 Year Return Period)
FE	Finite Element
FEM	Finite Element Model
FEs	Finite Elements
IBC	International Building Code
ITS	Important To Safety
NRC	Nuclear Regulatory Commission
PDC	Project Design Criteria
SASSI	System for Analysis of Soil-Structure Interaction
SRSS	Square Root of Sum of Squares
SSI	Soil Structure Interaction
TAD	Transportation, Aging, and Disposal
WHF	Wet Handling Facility
YMP	Yucca Mountain Project

1. PURPOSE

The purpose of this calculation is to perform Response-Spectrum Analysis of the Wet Handling Facility (WHF) (Ref. 2.2.9) using updated 2007 response spectra (Ref. 2.2.3 and 2.2.4) and updated soil spring coefficients (Ref. 2.2.2) along with SAP2000 Stick Model that was developed in Reference 2.2.9.

Results of the Response-Spectrum Analysis will yield updated shear wall seismic demand forces, the diaphragm accelerations and story drift. These results will be compared to the WHF seismic analysis based on 2004 soil and input spectra to validate the WHF design calculations for revised seismic analysis. This comparison will be the subject of a subsequent calculation.

2. REFERENCES

2.1. PROJECT PROCEDURES/DIRECTIVES

2.1.1. BSC (Bechtel SAIC Company) 2007. EG-PRO-3DP-G04B-00037, Rev. 9, *Calculations and Analyses*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070717.0004.

2.1.2. BSC (Bechtel SAIC Company) 2007. IT-PRO-0011 Rev.07, ICN 0, *Software Management*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: DOC.20070905.0007.

2.1.3. ORD (Office of Repository Development) 2006. *Repository Project Management Automation Plan.* 000-PLN-MGR0-00200-000, Rev. 00E. Las Vegas, Nevada: U.S. Department of Energy, Office of Repository Development. ACC: ENG.20070326.0019.

2.2. DESIGN INPUTS

2.2.1. BSC (Bechtel SAIC Company) 2006. *Project Design Criteria Document.* 000-3DR-MGR0-00100-000-006. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061201.0005.

2.2.2. BSC (Bechtel SAIC Company) 2007. *Wet Handling Facility Soil Spring Constants and Damping Values – 2007 Soil Data*, 050-SYC-WH00-00700-000-00A, Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070808.0020.

2.2.3. MO0706DSDR5E4A.001. *Seismic Design Spectra for the Surface Facilities Area at 5E-4 APE for Multiple Dampings. Submittal date: 06/14//2007* [DIRS 181422]. *[TVB-8691].*

2.2.4. MO0706DSDR1E4A.001. *Seismic Design Spectra for the Surface Facilities Area at 1E-4 APE for Multiple Dampings. Submittal date: 06/14/2007* [DIRS 181421]. *[TVB-8690].*

2.2.5. DOE (U.S. Department of Energy) 2005. *Software Validation Report for: SAP2000 Version9.1.4.* Document ID: 11198-SVR-9.1.4-00-Win2000. Las Vegas, Nevada: U.S. Department of Energy, Office of Repository Development. ACC: MOL.20051012.0425 [DIRS 176790].

2.2.6. BSC (Bechtel SAIC Company) 2006, *Basis of Design for the TAD Canister-Based Repository Design Concept*. 000-3DR-MGR0-00300-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061023.0002.

2.2.7. ICC (International Code Council) 2003. *International Building Code 2000, with Errata to the 2000 International Building Code.* Falls Church, Virginia: International Code Council. TIC: 251054; 257198. ISBN: 1-892395-25-8.

2.2.8. BSC (Bechtel SAIC Company) 2006. *Seismic Analysis and Design Approach Document*. 000-30R-MGR0-02000-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061214.0008.

2.2.9. BSC (Bechtel SAIC Company) 2007. *Tier 1 Seismic Analysis Using a Multiple Stick Model of the WHF*, 050-SYC-WH00-00200-000-00A, Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070326.0034.

2.2.10. ASCE 4-98. 2000.. *Seismic Analysis of Safety-Related Nuclear Structures and Commentary on Standard for Seismic Analysis of Safety Related Nuclear Structures.* New York, New York: American Society of Civil Engineers, TIC 253158, ISBN 07844-0433-X.

2.2.11. SAP 2000 V9.1.14, 2005, Window 2000 STN: 11198-9.1.4-00. [DIRS 178238]

2.3. DESIGN CONSTRAINTS

None.

2.4. DESIGN OUTPUTS

The results of this calculation will be compared to the results of the WHF seismic calculation (Ref. 2.2.9), which used the 2004 soil properties and ground input spectra.

3. ASSUMPTIONS

3.1. ASSUMPTIONS REQUIRING VERIFICATION

None

3.2. ASSUMPTIONS NOT REQUIRING VERIFICATION

None

4. METHODOLOGY

4.1. QUALITY ASSURANCE

This calculation was prepared in accordance with EG-PRO-3DP-G04B-00037, Rev. 9, *Calculations and Analyses* (Ref. 2.1.1). Section 5.1.2 of the *Basis of Design for the TAD Canister-Based Repository Design Concept* (Ref. 2.2.6) classifies the WHF structure as ITS. Therefore, the final version of this document is designated as QA: QA.

4.2. USE OF SOFTWARE

The commercially available Microsoft Office Excel 2000 spreadsheet code, which is a component of Microsoft Office 2000 Professional, is used to perform computations and graphing of the Figures in Sections 6 and 7. These results were verified by checks using hand calculations and Figures are checked though visual inspections. Usage of Microsoft Office 2000 Professional in this calculation constitutes Level 2 software usage, as defined in IT-PRO-0011 (Ref. 2.1.2). Microsoft Office 2003 Professional is listed in the current Level 2 Usage Controlled Software Report, as well as the *Repository Project Management Automation Plan* (Reference 2.1.3, Table 6-1). Microsoft Office Excel 2000 (9.0.8950 SP3) was executed on a PC running the Microsoft Windows 2000 Professional Version 2000 Service Pack 4 operating system.

The calculation process and equations are documented in Section 6 for checking by manual calculation. The structural engineering software program SAP2000, Version 9.1.4, (STN 11198-9.1.4-00) (Ref. 2.2.11) is used in this calculation to perform the static and dynamic analyses of the multiple stick models. The software program was run on a PC with Windows 2000 operating platform. The SAP2000 evaluation performed for this calculation is fully within the range of the validation performed for SAP2000 (Reference 2.2.5)

4.3. ANALYSIS METHOD

The analysis method consists of the following steps.

- Copy the "Lump Mass Beam Stick" finite element model of the Wet Handling Facility (WHF) from the Calculation of "Tier 1 Seismic Analysis Using a Multiple Stick Model of the WHF", 050-SYC-WH00-00200-000-00A (Ref. 2.2.9). The WHF wall elevations and plans taken from Reference 2.2.9 are included in Attachments A and B.

- In above model, replace the 2004 soil spring constants with the 2007 spring constants established in the calculation "Wet Handling Facility Soil Spring Constants and Damping – 2007 soil data" (Ref. 2.2.2).

- With the new soil spring constants, perform modal analysis using SAP 2000. From results of this analysis, establish the modes primarily influenced by soil effects.

- Per *Seismic Analysis and Design Approach* (Table 7-1, Ref. 2.2.8), concrete structure damping is 7% for DBGM-2 and 10% for BDBGM, while soil damping is 20% for both DBGM-2 and BDBGM (Step 4, Section C3, Ref. 2.2.8). The SAP 2000 program limits an input to a single damping input spectrum. Therefore, it is necessary to develop Hybrid Response Spectra curves for Spectral values to envelope primarily soil influenced modes (20% damping) and higher frequency modes (7% and 10% damping for DBGM-2 and BDBGM, respectively). These Hybrid curves will be constructed from the Spectral values given in “Seismic Design Spectra for Surface Facilities Area at 5E-4 APE for Multiple Dampings” (Ref. 2.2.3) and in “Seismic Design Spectra for Surface Facilities Area at 1E-4 APE” for Multiple Dampings” (Ref. 2.2.4). The seismic data in References 2.2.3and 2.2.4 have been entered into the Technical Data Management Database, but they are unqualified and are not currently included on an interface exchange drawing. Completion of these activities is being tracked in the Document Input Reference System database via TBV-8691 and TBV- 8690.

- Perform the response spectrum analysis for the following cases:

  - DBGM-2 Lower Bound Soil conditions of 30’ and 100’ alluvium

  - DBGM-2 Median Soil conditions of 30’ and 100’ alluvium

  - DBGM-2 Upper Bound Soil conditions of 30’ and 100’ alluvium

  - BDBGM Lower Bound Soil conditions of 30’ and 100’ alluvium

  - BDBGM Median Soil conditions of 30’ and 100’ alluvium

  - BDBGM Upper Bound Soil conditions of 30’ and 100’ alluvium

5. LIST OF ATTACHMENTS

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Attachment A	Wall Elevations	20
Attachment B	Plans Showing Wall and Slab Thicknesses	6
Attachment C	SAP2000 Stick Model Input	27
Attachment D	DBGM-2 Lower Bound 30' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment E	DBGM-2 Median 30' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment F	DBGM-2 Upper Bound 30' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment G	DBGM-2 Lower Bound 100' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment H	DBGM-2 Median 100' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment I	DBGM-2 Upper Bound 100' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
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Attachment N	BDBGM Median 100' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment O	BDBGM Upper Bound 100' Alluvium Modal Analysis, Response Spectrum Analysis, and DL+.25LL Analysis	CD
Attachment P	Base Shear Calculation and Story Drift for DBGM-2 and BDBGM Input Ground Motions	CD
Attachment Q	Story Diaphragm Accelerations	CD

Attachment R	SAP 2000 Database Files	CD
Attachment S	Directional Building Responses	CD
Attachment T	Excel and Word Files used in the preparation of this calculation and for future downstream analysis	CD
Attachment U	IBC Base Shear Calculation	CD

6 BODY OF CALCULATION

6.1 SEISMIC MODELING AND ANALYSIS

The SAP2000 "beam-Stick" model from calculation of Tier 1 Seismic Analysis using a Multiple Stick Model of the WHF, "050-SYC-WH00-00200-000-00A" (Ref. 2.2.9) is used as the basis for this calculation with updated soil spring stiffnesses from Design Calculation "*Wet Handling Facility Soil Spring Constants and Damping Values – 2007 Soil Data*, 050-SYC-WH00-00700-000-00A" (Ref. 2.2.2).

Soil structure interaction is considered by using frequency independent soil springs with six degrees of freedom. The springs are placed at the center of mass (SAP2000 node-1099 and 2099 of the pool basemat and grade basemat level respectively). The spring properties calculated for 2,000 and 10,000-year return period seismic events are used to analyze DBGM-2 and BDBGM basis ground motions. Six sets of springs are calculated to define lower bound, median and upper bound stiffness values for 30 ft depth of alluvium and 100 ft depth of alluvium for each seismic event in Design Calculation 050-SYC-WH00-00700-000-00A (Ref. 2.2.2).

Following analyses are performed on the "beam-stick" model described above, using hybrid response spectra developed in section 6.2:

- Modal analysis utilizing the upper bound, median and lower bound soil cases for 30' and 100' alluvium depth for the Design Basis Ground Motion (DBGM-2) case.

- Modal analysis utilizing the upper bound, median and lower bound soil cases for 30' and 100' alluvium depth for the Beyond Design Basis Ground Motion (BDBGM) case.

- Response Spectrum Analysis for the DBGM-2 cases utilizing appropriate hybrid response spectra developed in section 6.2 Analysis will utilize the 10 percent method per section 3.2.7 of ASCE 4-98 (Ref. 2.2.10) for combining modal responses and the square root of sum of the squares (SRSS) method for combining the North/South (referred to as HY), East/West (referred to as HX) and Vertical (referred to as VZ) spectral cases.

- Response Spectrum Analysis for the BDBGM cases utilizing appropriate hybrid response spectra developed in section 6.2. Analysis will utilize the 10 percent method per section 3.2.7 of ASCE 4-98 (Ref. 2.2.10) for combining modal responses and the square root sum of the squares (SRSS) method for combining the North/South (referred to as HY), East/West (referred to as HX) and Vertical (referred to as VZ) spectral cases.

- 1g vertical case to determine the DL + 25%LL case.

6.2 MODAL ANALYSIS AND HYBRID RESPONSE SPECTRA DEVELOPMENT

From the modal analysis results for the various soil spring cases described above it is observed that the first three modes are SSI dominated modes with greater than 76% of the mass participating in each of these modes. Modal analysis is performed with water as static mass in pool. Refer to the modal analyses results summarized in following Tables 1 to 12. Based on these results, damping values of 20% will be utilized for the first three soil modes and 7% damping (Ref. 2.2.8, Sec. 7.2.4.3 and Ref. 2.2.10, Table 3-2) will be used for the remaining modes in the response spectrum analysis for DBGM-2. For the BDBGM response spectrum analysis, damping values of 20% will be utilized for first three soil modes and 10% damping (Ref. 2.2.8, Sec. 7.2.4.3 and Ref. 2.2.10, Table 3-2) will be used for the remaining modes.

SAP2000 allows only the input of a single response spectra curve for a given response spectrum analysis case. To consider the effect of different damping values for each mode the modal damping over ride feature is utilized. Since the YMP spectra is defined at various damping values a 'hybrid' spectra is required for input into SAP2000. This 'hybrid' spectra is developed by combining the 20% and 7% damped spectra defined in Reference 2.2.3 for DBGM-2 analysis. Likewise the 20% and 10% damped spectra defined in reference 2.2.4 are used in developing the 'hybrid' spectra for the BDBGM analysis. Since the first three modes are soil deformation dominant, 20% damping value is applied to these modes. The 'hybrid' spectra consist of the 20% spectral acceleration up to the frequency of the third mode and the 7% or 10% spectral acceleration at frequencies above the third mode. Since the third mode frequency varies for each of the soil conditions, a series of 'hybrid' spectra are developed to be used for the various soil conditions. See Attachment T Excel file "DBGM and BDBGM" for the computation of the "Hybrid" Spectra. SAP 2000 assigns 5% damping as default value to Response Spectra. Since damping value give to a Response Spectra has no impact on the analysis, it was left as it is in the modal input.

The 20%, 10% and 7% Response Spectra data used in the development of 'Hybrid' spectra are taken from Ref. 2.2.3 and Ref. 2.2.4 below which are cited in the Project Design Criteria Document (Ref. 2.2.1).

- DBGM-2 DTN: MO0706DSDR5E4A.001. *Seismic Design Spectra for the Surface Facilities Area at 5E-4 APE for Multiple Dampings*. Submittal date: 06/14/07 (Ref. 2.2.3).
- BDBGM DTN: MO0706DSDR1E4A.001. *Seismic Design Spectra for the Surface Facilities Area at 1E-4 APE for Multiple Dampings*. Submittal date: 06/14/07 (Ref. 2.2.4).

The resulting 'Hybrid' spectra are shown in Figures 1 to 24. Tables 1 to 12, list the Modal Frequencies of all the soil cases for DBGM-2 and DBDGM. The Frequencies in bold letters highlight the Frequency of the translational Soil Modes. As described in section 4.3, these translational frequencies of the soil modes will be used to develop the horizontal and vertical Hybrid Response Spectra (Figures 1 to 24) of all soil cases for DBGM-2 and BDBGM.

As concluded in Attachment S, in all DBGM-2 and BDBGM cases, first three modes of vibration are dominated by translational and rotational movements of the soil, whereas, higher modes are influenced by a combination of soil and structural effects. This is also obvious from a large frequency jump from the third mode to the fourth mode (see Tables 1 to 12). Per Reference 2.2.2 Section 7.1, the soil damping is 20% and Reference 2.2.8, section 7.2.4.3 requires the usage of ASCE4-98 (Ref. 2.2.10), table 3-2 structural damping value of 7% and 10% for DBGM-2 and BDBGM concrete structures respectively. Thus, Hybrid Response Spectra utilized 20% damping frequency spectra as the base to cover the first three frequencies while using 7% and 10% damping frequencies spectra for DBGM-2 and BDBGM respectively, for higher frequency modes.

Table 1 DBGM-2 Lower Bound 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	Mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 30L	1	0.2228	0.0057	0.8558	0.0005	0.0057	0.8558	0.0005	**4.4878**
DBGM 30L	2	0.2151	0.8850	0.0068	0.0002	0.8906	0.8626	0.0006	**4.6491**
DBGM 30L	3	0.1558	0.0003	0.0006	0.9944	0.8909	0.8632	0.9950	**6.4173**
DBGM 30L	4	0.0920	0.0138	0.1052	0.0005	0.9048	0.9684	0.9955	10.8697
DBGM 30L	5	0.0835	0.0826	0.0104	0.0000	0.9874	0.9788	0.9956	11.9814
DBGM 30L	6	0.0704	0.0010	0.0065	0.0000	0.9884	0.9853	0.9956	14.2144
DBGM 30L	7	0.0546	0.0000	0.0142	0.0000	0.9884	0.9995	0.9956	18.3285
DBGM 30L	8	0.0512	0.0114	0.0000	0.0000	0.9998	0.9995	0.9956	19.5373
DBGM 30L	9	0.0461	0.0002	0.0004	0.0003	1.0000	1.0000	0.9959	21.6960
DBGM 30L	10	0.0397	0.0000	0.0000	0.0000	1.0000	1.0000	0.9959	25.1955
DBGM 30L	11	0.0363	0.0000	0.0000	0.0000	1.0000	1.0000	0.9959	27.5412
DBGM 30L	12	0.0350	0.0000	0.0000	0.0000	1.0000	1.0000	0.9959	28.5939

Source: Attachment D

Table 2 DBGM-2 Median 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	Mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 30M	1	0.1852	0.0022	0.8223	0.0003	0.0022	0.8223	0.0003	**5.3995**
DBGM 30M	2	0.1787	0.8564	0.0027	0.0001	0.8586	0.8250	0.0004	**5.5955**
DBGM 30M	3	0.1261	0.0002	0.0005	0.9896	0.8588	0.8254	0.9900	**7.9304**
DBGM 30M	4	0.0795	0.0045	0.1311	0.0004	0.8634	0.9565	0.9904	12.5745
DBGM 30M	5	0.0726	0.1129	0.0025	0.0001	0.9763	0.9590	0.9905	13.7803
DBGM 30M	6	0.0619	0.0011	0.0133	0.0000	0.9774	0.9723	0.9905	16.1466
DBGM 30M	7	0.0505	0.0000	0.0272	0.0000	0.9774	0.9995	0.9905	19.8146
DBGM 30M	8	0.0479	0.0223	0.0000	0.0000	0.9997	0.9995	0.9905	20.8610
DBGM 30M	9	0.0422	0.0003	0.0005	0.0007	1.0000	1.0000	0.9912	23.6691
DBGM 30M	10	0.0387	0.0000	0.0000	0.0000	1.0000	1.0000	0.9912	25.8250
DBGM 30M	11	0.0362	0.0000	0.0000	0.0000	1.0000	1.0000	0.9913	27.6146
DBGM 30M	12	0.0347	0.0000	0.0000	0.0002	1.0000	1.0000	0.9914	28.8434

Source: Attachment E

Table 3 DBGM-2 Upper Bound 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	Mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 30U	1	0.1577	0.0005	0.7658	0.0002	0.0005	0.7658	0.0002	**6.3418**
DBGM 30U	2	0.1517	0.8074	0.0007	0.0001	0.8079	0.7665	0.0002	**6.5939**
DBGM 30U	3	0.1028	0.0001	0.0003	0.9792	0.8081	0.7668	0.9795	**9.7281**
DBGM 30U	4	0.0707	0.0007	0.1567	0.0003	0.8088	0.9236	0.9798	14.1523
DBGM 30U	5	0.0641	0.1472	0.0000	0.0002	0.9560	0.9236	0.9799	15.6020
DBGM 30U	6	0.0564	0.0018	0.0263	0.0000	0.9578	0.9499	0.9800	17.7219
DBGM 30U	7	0.0455	0.0001	0.0496	0.0000	0.9578	0.9995	0.9800	21.9619
DBGM 30U	8	0.0438	0.0419	0.0000	0.0000	0.9998	0.9995	0.9800	22.8364
DBGM 30U	9	0.0387	0.0001	0.0003	0.0014	0.9999	0.9998	0.9814	25.8608
DBGM 30U	10	0.0374	0.0001	0.0001	0.0005	1.0000	0.9999	0.9818	26.7236
DBGM 30U	11	0.0360	0.0000	0.0000	0.0001	1.0000	0.9999	0.9820	27.7644
DBGM 30U	12	0.0341	0.0000	0.0001	0.0009	1.0000	1.0000	0.9828	29.3120

Source: Attachment F

Table 4 DBGM-2 Lower Bound 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	Mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 100L	1	0.2610	0.0090	0.8869	0.0006	0.0090	0.8869	0.0006	**3.8317**
DBGM 100L	2	0.2532	0.9135	0.0105	0.0002	0.9225	0.8974	0.0008	**3.9501**
DBGM 100L	3	0.1931	0.0003	0.0008	0.9970	0.9228	0.8982	0.9978	**5.1787**
DBGM 100L	4	0.1079	0.0166	0.0806	0.0005	0.9395	0.9787	0.9983	9.2721
DBGM 100L	5	0.0964	0.0563	0.0142	0.0000	0.9958	0.9930	0.9983	10.3772
DBGM 100L	6	0.0785	0.0004	0.0024	0.0000	0.9962	0.9954	0.9983	12.7406
DBGM 100L	7	0.0580	0.0000	0.0044	0.0000	0.9962	0.9998	0.9983	17.2528
DBGM 100L	8	0.0539	0.0037	0.0000	0.0000	0.9999	0.9998	0.9983	18.5484
DBGM 100L	9	0.0482	0.0001	0.0002	0.0001	1.0000	1.0000	0.9984	20.7263
DBGM 100L	10	0.0402	0.0000	0.0000	0.0000	1.0000	1.0000	0.9984	24.8847
DBGM 100L	11	0.0364	0.0000	0.0000	0.0000	1.0000	1.0000	0.9984	27.5100
DBGM 100L	12	0.0351	0.0000	0.0000	0.0000	1.0000	1.0000	0.9984	28.4837

Source: Attachment G

Table 5 DBGM-2 Median 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	Mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 100M	1	0.2064	0.0039	0.8552	0.0004	0.0039	0.8552	0.0004	**4.8455**
DBGM 100M	2	0.1998	0.8865	0.0046	0.0001	0.8904	0.8598	0.0005	**5.0040**
DBGM 100M	3	0.1468	0.0002	0.0005	0.9941	0.8906	0.8603	0.9946	**6.8104**
DBGM 100M	4	0.0876	0.0087	0.1132	0.0004	0.8993	0.9735	0.9950	11.4185
DBGM 100M	5	0.0799	0.0897	0.0067	0.0001	0.9890	0.9802	0.9951	12.5159
DBGM 100M	6	0.0664	0.0007	0.0070	0.0000	0.9897	0.9872	0.9951	15.0674
DBGM 100M	7	0.0540	0.0000	0.0124	0.0000	0.9897	0.9996	0.9951	18.5196
DBGM 100M	8	0.0508	0.0100	0.0000	0.0000	0.9998	0.9996	0.9951	19.6885
DBGM 100M	9	0.0444	0.0002	0.0004	0.0004	1.0000	1.0000	0.9955	22.5236
DBGM 100M	10	0.0393	0.0000	0.0000	0.0000	1.0000	1.0000	0.9955	25.4529
DBGM 100M	11	0.0363	0.0000	0.0000	0.0000	1.0000	1.0000	0.9955	27.5673
DBGM 100M	12	0.0349	0.0000	0.0000	0.0001	1.0000	1.0000	0.9955	28.6852

Source: Attachment H

Table 6 DBGM-2 Upper Bound 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	mode Unitless	Period Sec	UX Unitless	UY Unitless	UZ Unitless	SumUX Unitless	SumUY Unitless	SumUZ Unitless	Frequency (Hz)
DBGM 100U	1	0.1688	0.0011	0.7978	0.0002	0.0011	0.7978	0.0002	**5.9256**
DBGM 100U	2	0.1628	0.8363	0.0013	0.0001	0.8374	0.7991	0.0003	**6.1433**
DBGM 100U	3	0.1135	0.0002	0.0004	0.9859	0.8375	0.7994	0.9862	**8.8103**
DBGM 100U	4	0.0746	0.0018	0.1478	0.0003	0.8394	0.9472	0.9865	13.4035
DBGM 100U	5	0.0680	0.1319	0.0006	0.0001	0.9712	0.9479	0.9867	14.6980
DBGM 100U	6	0.0587	0.0013	0.0191	0.0000	0.9725	0.9670	0.9867	17.0336
DBGM 100U	7	0.0485	0.0000	0.0325	0.0000	0.9725	0.9995	0.9867	20.6287
DBGM 100U	8	0.0463	0.0271	0.0000	0.0000	0.9997	0.9995	0.9867	21.5864
DBGM 100U	9	0.0400	0.0003	0.0004	0.0012	1.0000	0.9999	0.9878	24.9804
DBGM 100U	10	0.0381	0.0000	0.0000	0.0001	1.0000	0.9999	0.9879	26.2690
DBGM 100U	11	0.0361	0.0000	0.0000	0.0001	1.0000	1.0000	0.9880	27.6806
DBGM 100U	12	0.0344	0.0000	0.0000	0.0004	1.0000	1.0000	0.9884	29.0651

Source: Attachment I

Table 7 BDBGM Lower Bound 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 30L	1	0.2397	0.0078	0.8526	0.0005	0.0078	0.8526	0.0005	**4.1725**
BDBGM 30L	2	0.2306	0.8800	0.0095	0.0002	0.8877	0.8621	0.0007	**4.3372**
BDBGM 30L	3	0.1631	0.0004	0.0007	0.9944	0.8881	0.8628	0.9951	**6.1304**
BDBGM 30L	4	0.0966	0.0199	0.0998	0.0007	0.9081	0.9626	0.9958	10.3558
BDBGM 30L	5	0.0871	0.0774	0.0139	0.0000	0.9854	0.9765	0.9959	11.4837
BDBGM 30L	6	0.0754	0.0018	0.0073	0.0000	0.9873	0.9838	0.9959	13.2708
BDBGM 30L	7	0.0550	0.0000	0.0156	0.0000	0.9873	0.9994	0.9959	18.1849
BDBGM 30L	8	0.0515	0.0127	0.0001	0.0000	0.9999	0.9995	0.9959	19.4141
BDBGM 30L	9	0.0475	0.0001	0.0005	0.0002	1.0000	1.0000	0.9961	21.0626
BDBGM 30L	10	0.0400	0.0000	0.0000	0.0000	1.0000	1.0000	0.9961	24.9713
BDBGM 30L	11	0.0363	0.0000	0.0000	0.0000	1.0000	1.0000	0.9961	27.5214
BDBGM 30L	12	0.0351	0.0000	0.0000	0.0000	1.0000	1.0000	0.9962	28.5234

Source: Attachments J

Table 8 BDBGM Median 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 30M	1	0.1980	0.0033	0.8289	0.0003	0.0033	0.8289	0.0003	**5.0511**
BDBGM 30M	2	0.1906	0.8598	0.0040	0.0001	0.8631	0.8328	0.0004	**5.2456**
BDBGM 30M	3	0.1322	0.0003	0.0005	0.9901	0.8633	0.8334	0.9905	**7.5647**
BDBGM 30M	4	0.0826	0.0074	0.1201	0.0005	0.8707	0.9534	0.9911	12.0996
BDBGM 30M	5	0.0752	0.1031	0.0040	0.0001	0.9738	0.9575	0.9912	13.2918
BDBGM 30M	6	0.0650	0.0016	0.0118	0.0000	0.9754	0.9693	0.9912	15.3870
BDBGM 30M	7	0.0509	0.0000	0.0299	0.0000	0.9754	0.9992	0.9912	19.6297
BDBGM 30M	8	0.0482	0.0244	0.0000	0.0000	0.9998	0.9993	0.9912	20.7256
BDBGM 30M	9	0.0439	0.0002	0.0007	0.0006	1.0000	1.0000	0.9918	22.8032
BDBGM 30M	10	0.0392	0.0000	0.0000	0.0000	1.0000	1.0000	0.9918	25.5236
BDBGM 30M	11	0.0363	0.0000	0.0000	0.0000	1.0000	1.0000	0.9918	27.5809
BDBGM 30M	12	0.0348	0.0000	0.0000	0.0001	1.0000	1.0000	0.9919	28.7259

Source: Attachments K

Table 9 BDBGM Upper Bound 30' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies With Water									
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 30U	1	0.1669	0.0010	0.7828	0.0002	0.0010	0.7828	0.0002	**5.9927**
BDBGM 30U	2	0.1605	0.8200	0.0012	0.0001	0.8209	0.7840	0.0003	**6.2310**
BDBGM 30U	3	0.1078	0.0002	0.0004	0.9806	0.8211	0.7844	0.9809	**9.2805**
BDBGM 30U	4	0.0731	0.0014	0.1408	0.0004	0.8225	0.9253	0.9813	13.6779
BDBGM 30U	5	0.0663	0.1307	0.0002	0.0002	0.9532	0.9255	0.9815	15.0937
BDBGM 30U	6	0.0582	0.0018	0.0208	0.0000	0.9550	0.9462	0.9815	17.1751
BDBGM 30U	7	0.0459	0.0000	0.0531	0.0000	0.9550	0.9993	0.9815	21.7729
BDBGM 30U	8	0.0441	0.0447	0.0000	0.0000	0.9998	0.9993	0.9815	22.6843
BDBGM 30U	9	0.0399	0.0002	0.0005	0.0014	0.9999	0.9998	0.9829	25.0669
BDBGM 30U	10	0.0380	0.0000	0.0001	0.0001	1.0000	0.9999	0.9830	26.3014
BDBGM 30U	11	0.0361	0.0000	0.0000	0.0001	1.0000	1.0000	0.9831	27.6966
BDBGM 30U	12	0.0344	0.0000	0.0000	0.0004	1.0000	1.0000	0.9835	29.0992

Source: Attachment L

Table 10 BDBGM Lower Bound 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies	With Water								
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 100L	1	0.3005	0.0124	0.8943	0.0007	0.0124	0.8943	0.0007	**3.3276**
BDBGM 100L	2	0.2914	0.9192	0.0145	0.0002	0.9316	0.9087	0.0010	**3.4315**
BDBGM 100L	3	0.2237	0.0004	0.0009	0.9975	0.9320	0.9096	0.9985	**4.4704**
BDBGM 100L	4	0.1228	0.0198	0.0694	0.0005	0.9517	0.9791	0.9990	8.1411
BDBGM 100L	5	0.1079	0.0454	0.0164	0.0000	0.9972	0.9954	0.9990	9.2675
BDBGM 100L	6	0.0885	0.0004	0.0017	0.0000	0.9976	0.9972	0.9990	11.2940
BDBGM 100L	7	0.0594	0.0000	0.0027	0.0000	0.9977	0.9998	0.9990	16.8293
BDBGM 100L	8	0.0552	0.0023	0.0000	0.0000	1.0000	0.9999	0.9990	18.1280
BDBGM 100L	9	0.0498	0.0000	0.0001	0.0001	1.0000	1.0000	0.9991	20.0726
BDBGM 100L	10	0.0406	0.0000	0.0000	0.0000	1.0000	1.0000	0.9991	24.6543
BDBGM 100L	11	0.0364	0.0000	0.0000	0.0000	1.0000	1.0000	0.9991	27.4902
BDBGM 100L	12	0.0352	0.0000	0.0000	0.0000	1.0000	1.0000	0.9991	28.4090

Source: Attachments M

Table 11 BDBGM Median 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies	With Water								
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 100M	1	0.2321	0.0062	0.8711	0.0005	0.0062	0.8711	0.0005	**4.3078**
BDBGM 100M	2	0.2248	0.8995	0.0073	0.0002	0.9057	0.8784	0.0006	**4.4493**
BDBGM 100M	3	0.1665	0.0003	0.0006	0.9957	0.9060	0.8791	0.9963	**6.0057**
BDBGM 100M	4	0.0963	0.0138	0.0962	0.0005	0.9198	0.9753	0.9968	10.3799
BDBGM 100M	5	0.0872	0.0724	0.0112	0.0000	0.9922	0.9865	0.9968	11.4710
BDBGM 100M	6	0.0724	0.0007	0.0045	0.0000	0.9928	0.9910	0.9968	13.8095
BDBGM 100M	7	0.0560	0.0000	0.0087	0.0000	0.9928	0.9997	0.9968	17.8589
BDBGM 100M	8	0.0523	0.0070	0.0000	0.0000	0.9999	0.9997	0.9969	19.1112
BDBGM 100M	9	0.0466	0.0001	0.0003	0.0002	1.0000	1.0000	0.9971	21.4713
BDBGM 100M	10	0.0398	0.0000	0.0000	0.0000	1.0000	1.0000	0.9971	25.1046
BDBGM 100M	11	0.0363	0.0000	0.0000	0.0000	1.0000	1.0000	0.9971	27.5321
BDBGM 100M	12	0.0350	0.0000	0.0000	0.0000	1.0000	1.0000	0.9971	28.5635

Source: Attachments N

Table 12 BDBGM Upper Bound 100' Alluvium Modal Analysis

TABLE: Modal Participating Mass Ratios and Frequencies	With Water								
OutputCase Soil Spring	**Mode** Unitless	**Period** Sec	**UX** Unitless	**UY** Unitless	**UZ** Unitless	**SumUX** Unitless	**SumUY** Unitless	**SumUZ** Unitless	**Frequency (Hz)**
BDBGM 100U	1	0.1855	0.0021	0.8249	0.0003	0.0021	0.8249	0.0003	**5.3922**
BDBGM 100U	2	0.1791	0.8589	0.0026	0.0001	0.8611	0.8275	0.0004	**5.5849**
BDBGM 100U	3	0.1261	0.0002	0.0004	0.9897	0.8613	0.8279	0.9901	**7.9316**
BDBGM 100U	4	0.0797	0.0043	0.1302	0.0004	0.8656	0.9581	0.9905	12.5482
BDBGM 100U	5	0.0727	0.1118	0.0024	0.0001	0.9774	0.9605	0.9906	13.7471
BDBGM 100U	6	0.0622	0.0011	0.0131	0.0000	0.9786	0.9736	0.9906	16.0762
BDBGM 100U	7	0.0507	0.0000	0.0259	0.0000	0.9786	0.9995	0.9906	19.7296
BDBGM 100U	8	0.0481	0.0211	0.0000	0.0000	0.9997	0.9995	0.9906	20.7834
BDBGM 100U	9	0.0422	0.0003	0.0005	0.0007	1.0000	1.0000	0.9913	23.7087
BDBGM 100U	10	0.0388	0.0000	0.0000	0.0000	1.0000	1.0000	0.9913	25.7993
BDBGM 100U	11	0.0362	0.0000	0.0000	0.0000	1.0000	1.0000	0.9914	27.6136
BDBGM 100U	12	0.0347	0.0000	0.0000	0.0002	1.0000	1.0000	0.9915	28.8410

Source: Attachment O

HYBRID RESPONSE SPECTRA
with 2007 geotechnical properties

(See Figure 1 through 24 on the following pages)

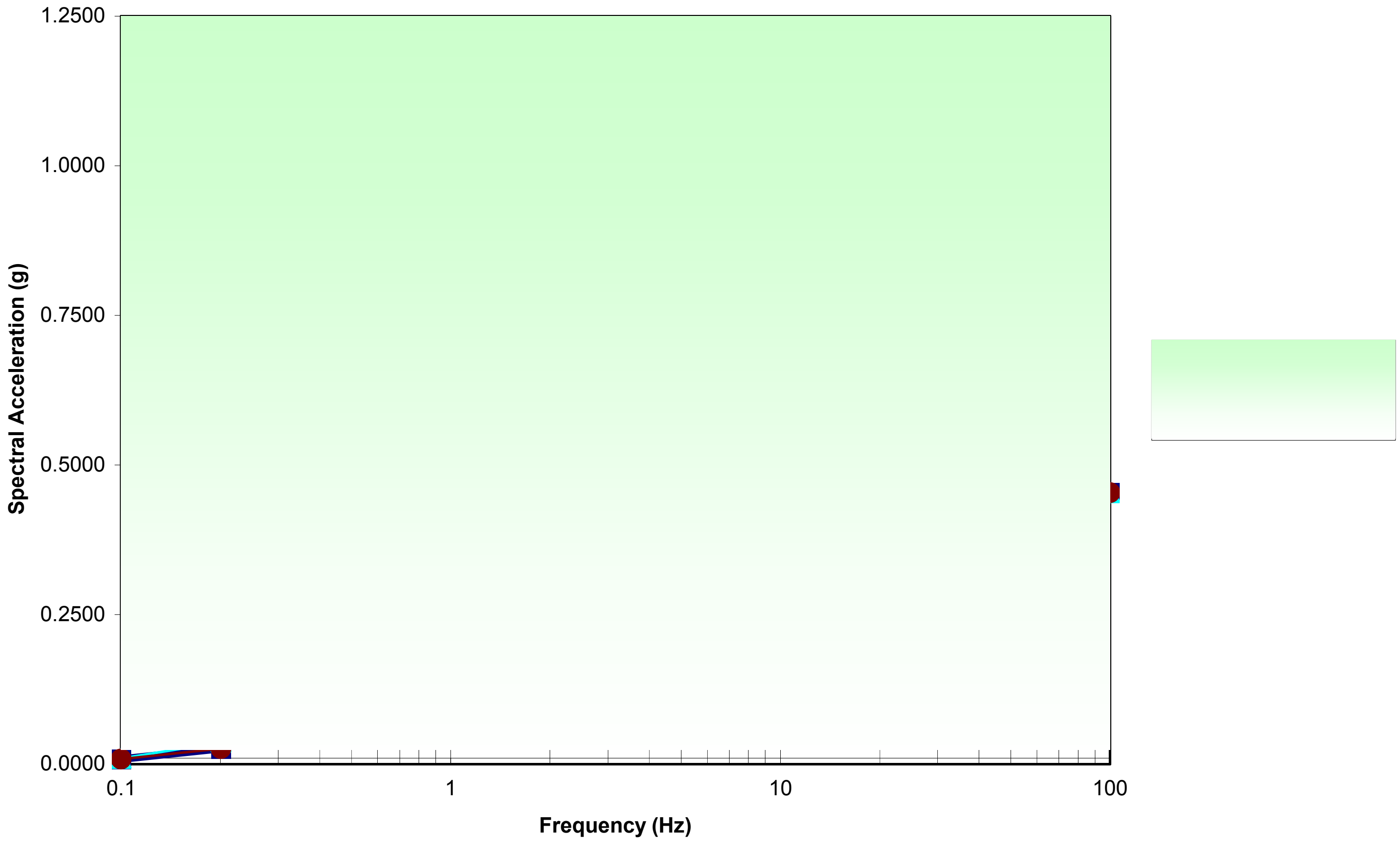


Figure 1 2007 DBGM-2 30' Lower Bound Alluvium Horizontal Response Spectra

-

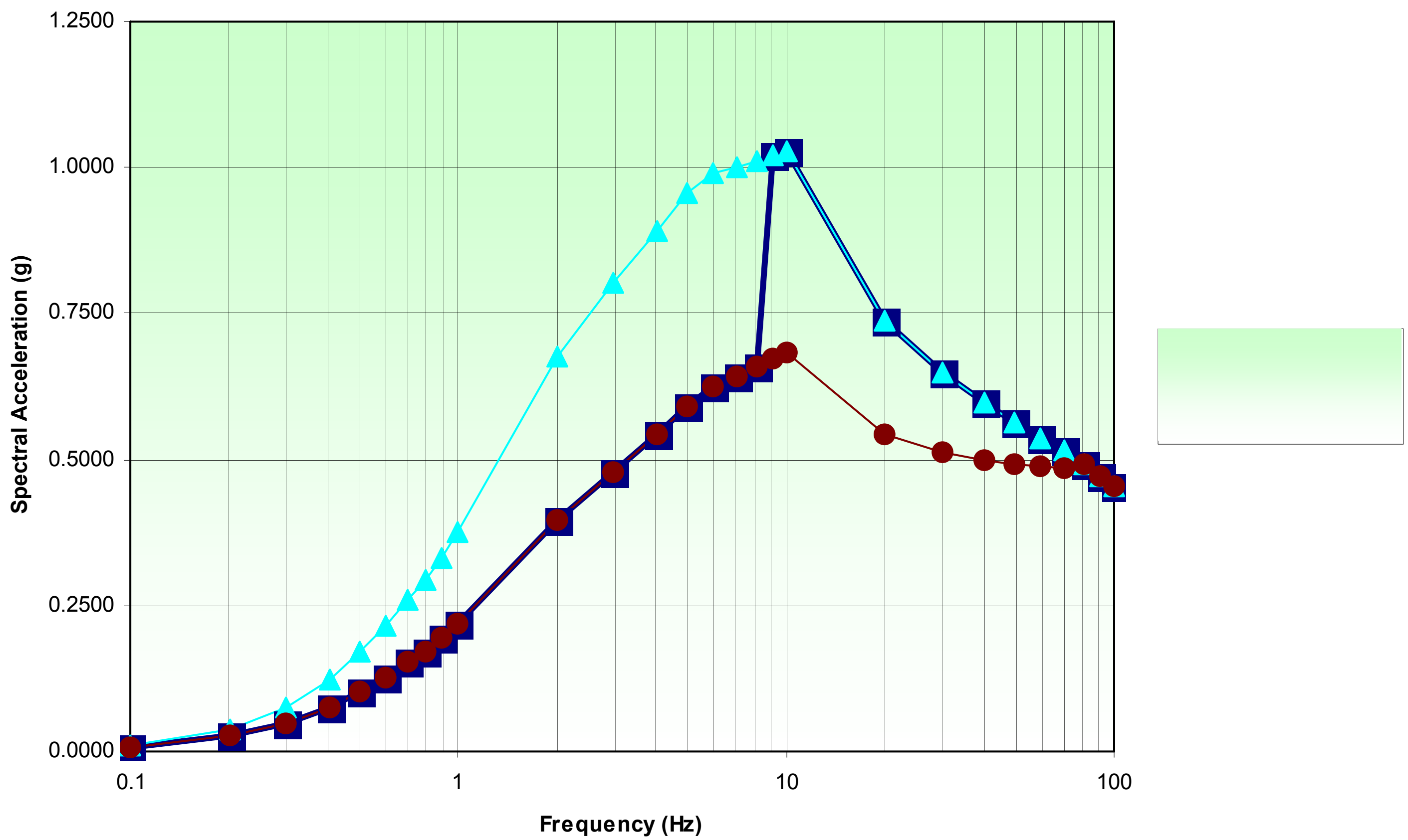


Figure 2 2007 DBGM-2 30' Median Alluvium Horizontal Response Spectra

-

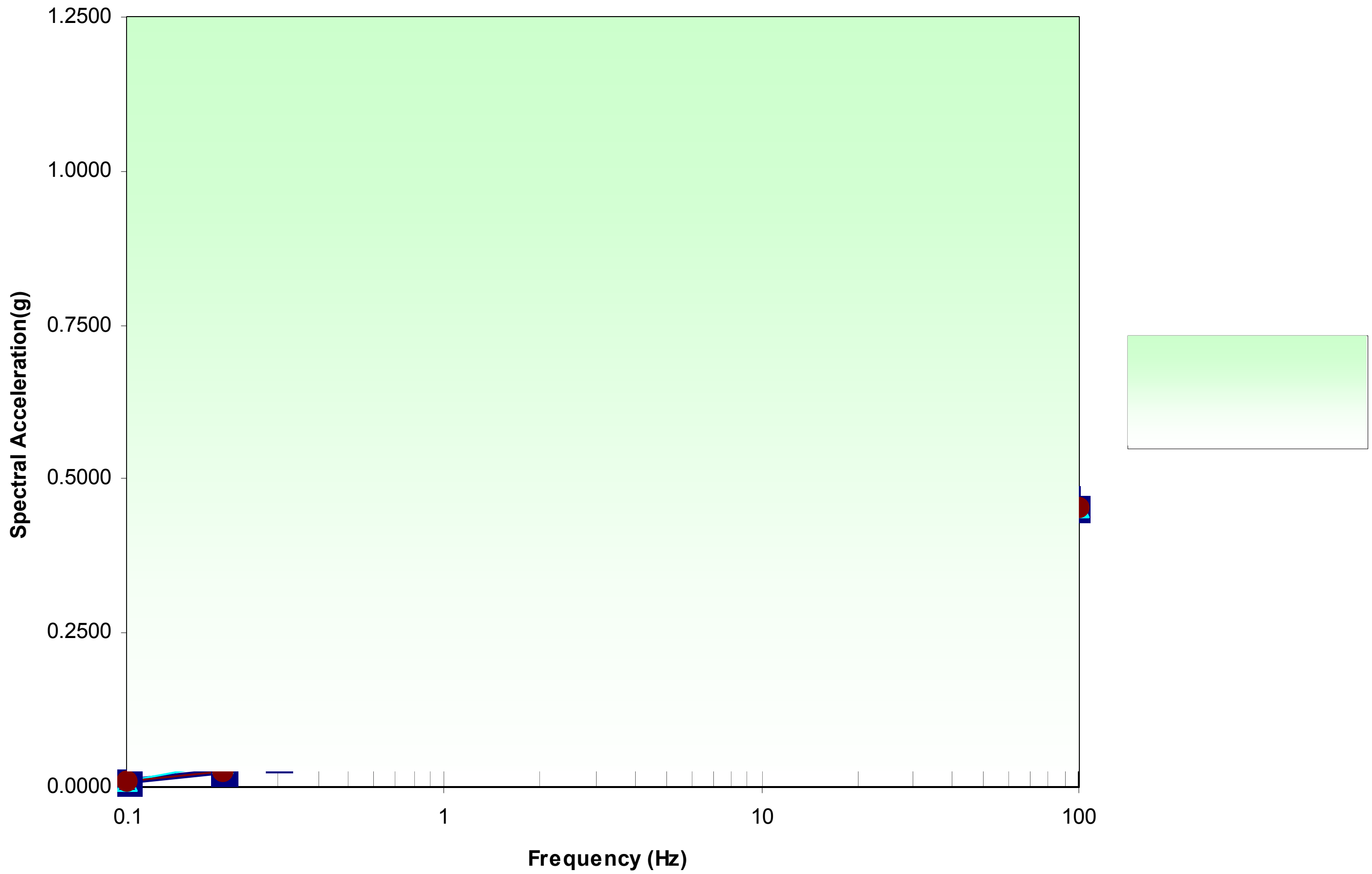


Figure 3 2007 DBGM-2 30' Upper Bound Alluvium Horizontal Response Spectra

-

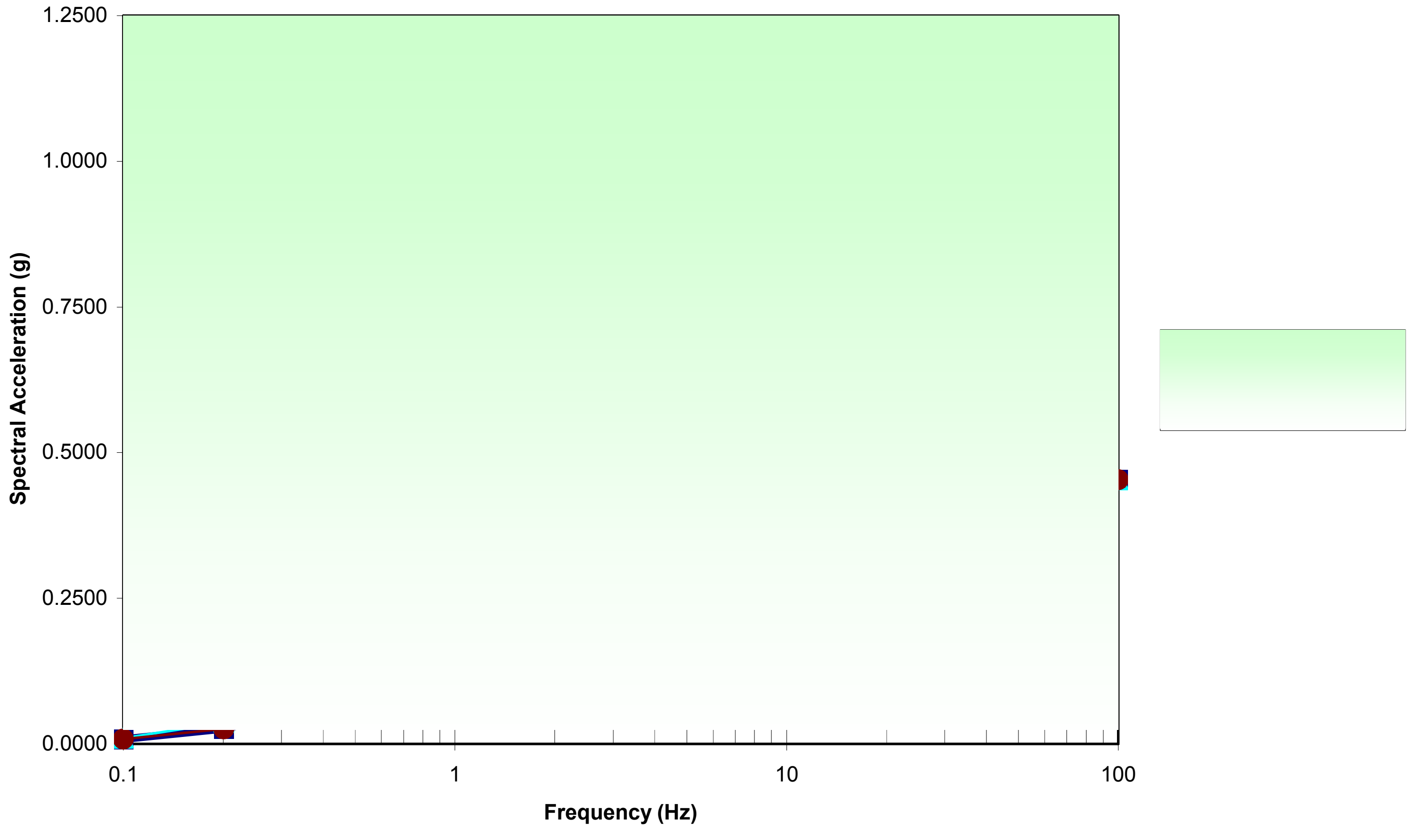


Figure 4 2007 DBGM-2 100' Lower Bound Alluvium Horizontal Response Spectra

-

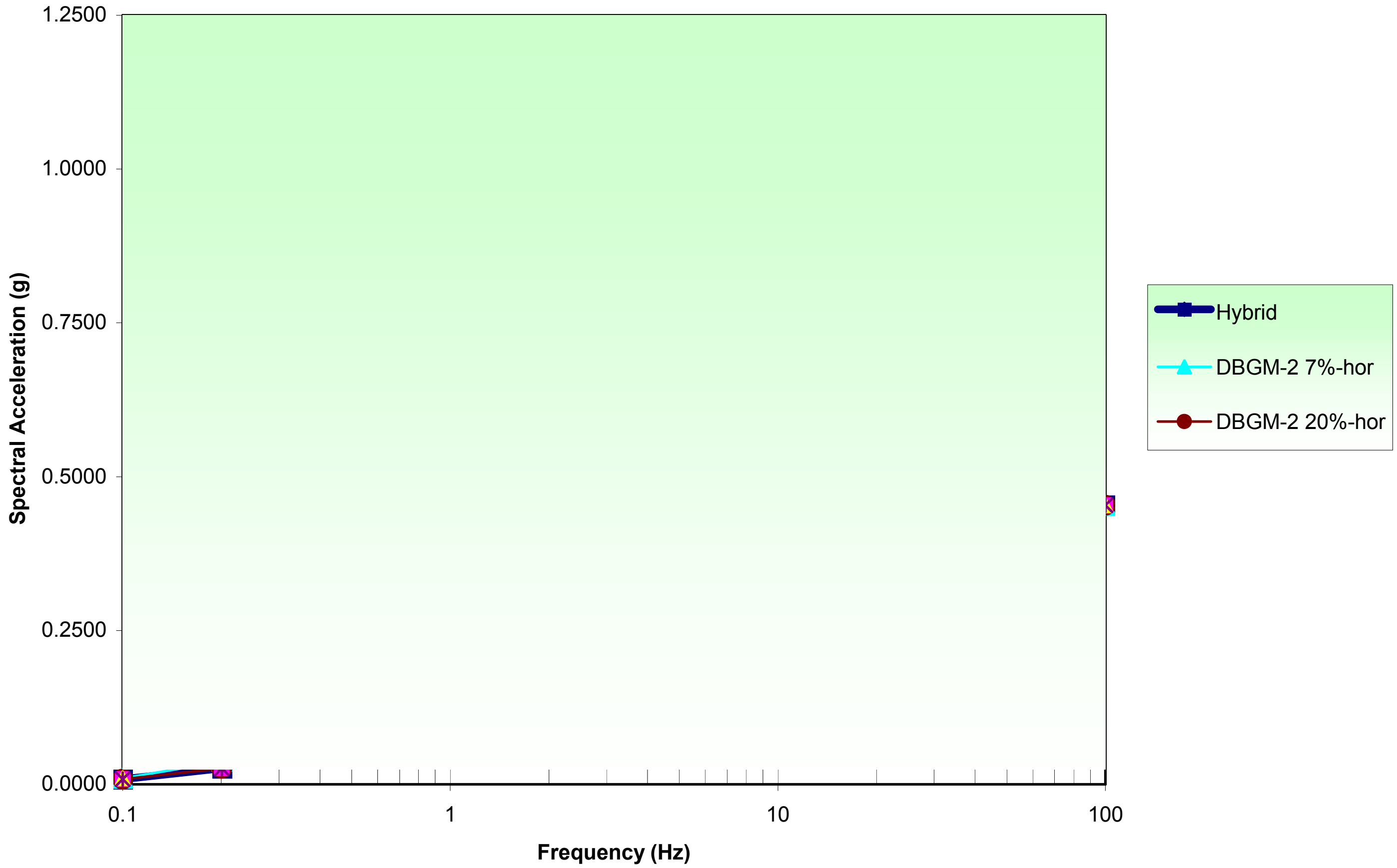


Figure 5 2007 DBGM-2 100' Median Alluvium Horizontal Response Spectra

-

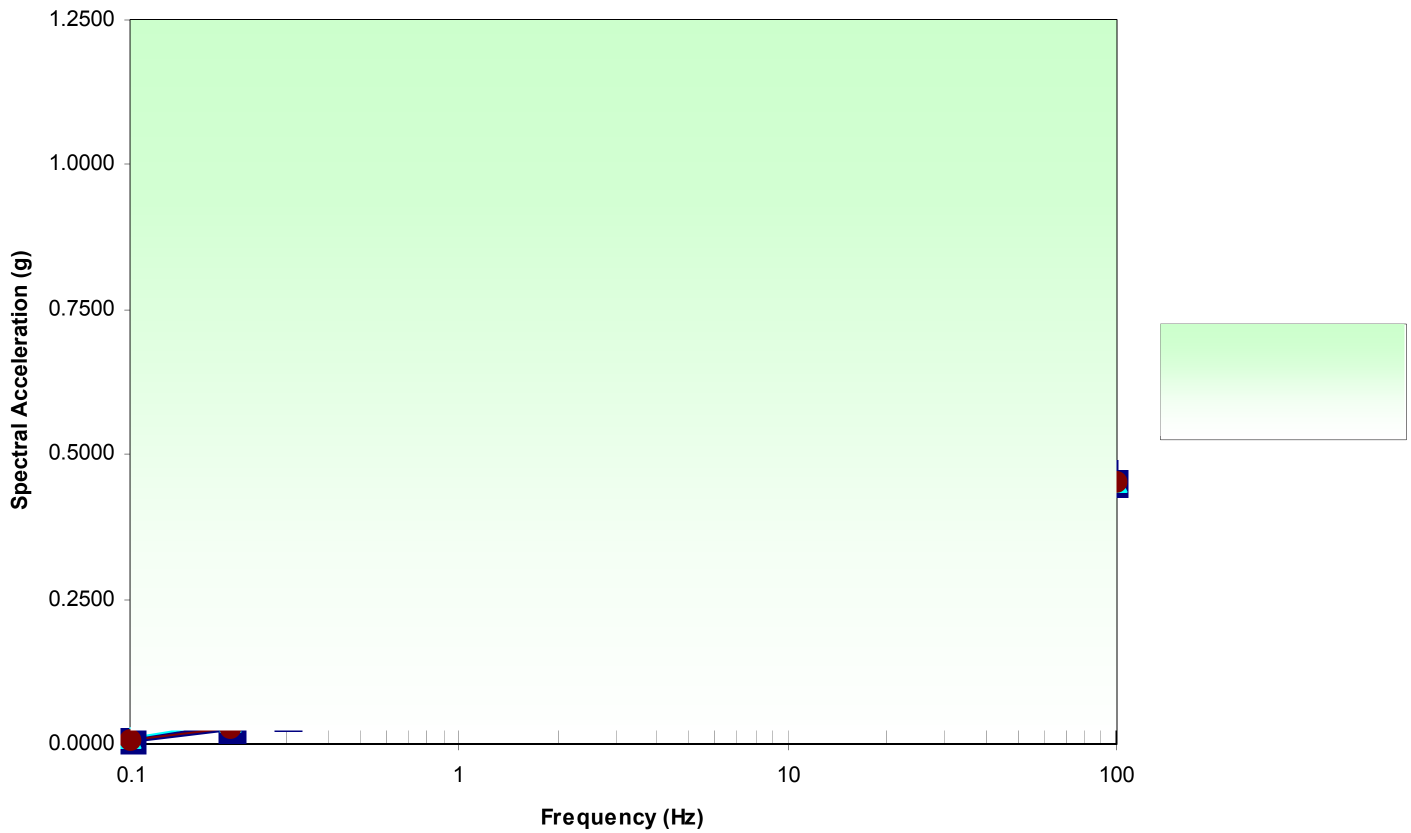


Figure 6 2007 DBGM-2 100' Upper Bound Alluvium Horizontal Response Spectra

-

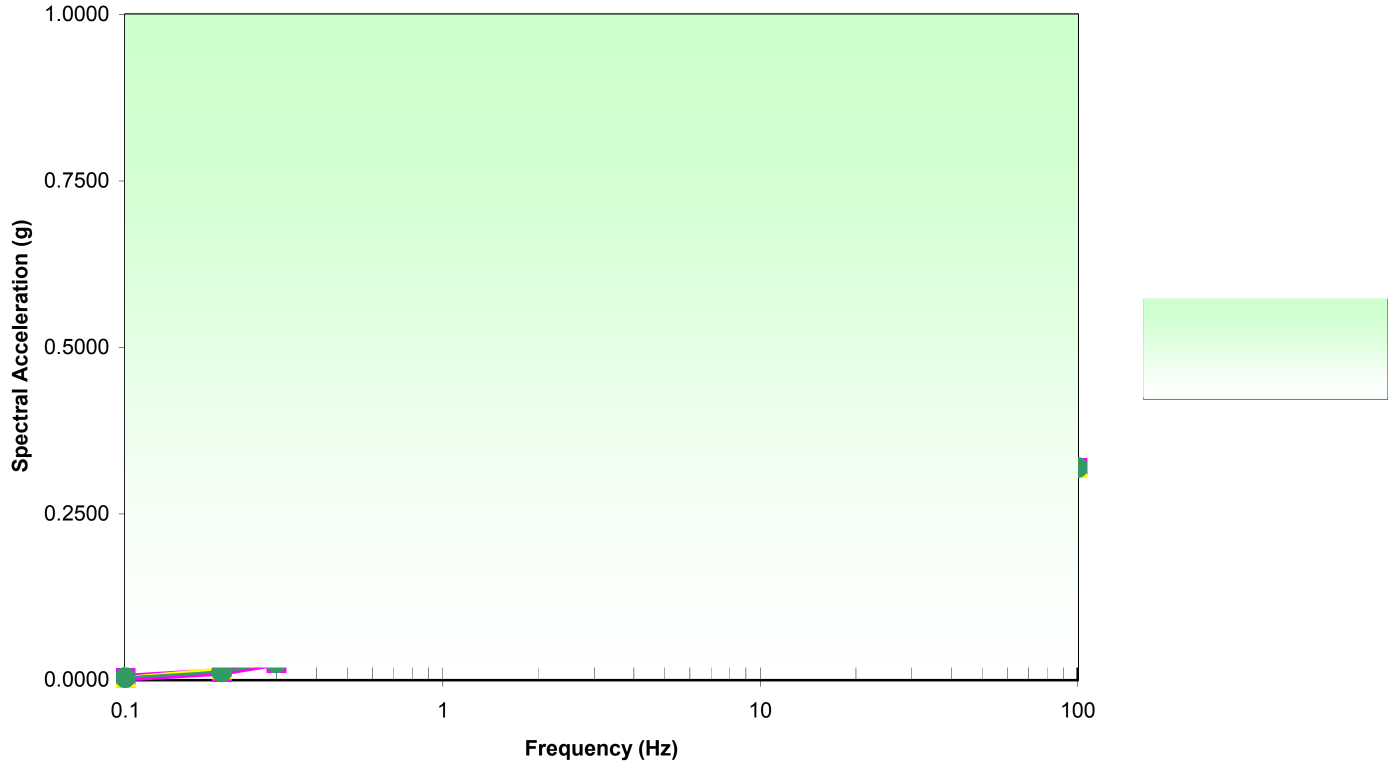


Figure 7 2007 DBGM-2 30' Lower Bound Alluvium Vertical Response Spectra

-

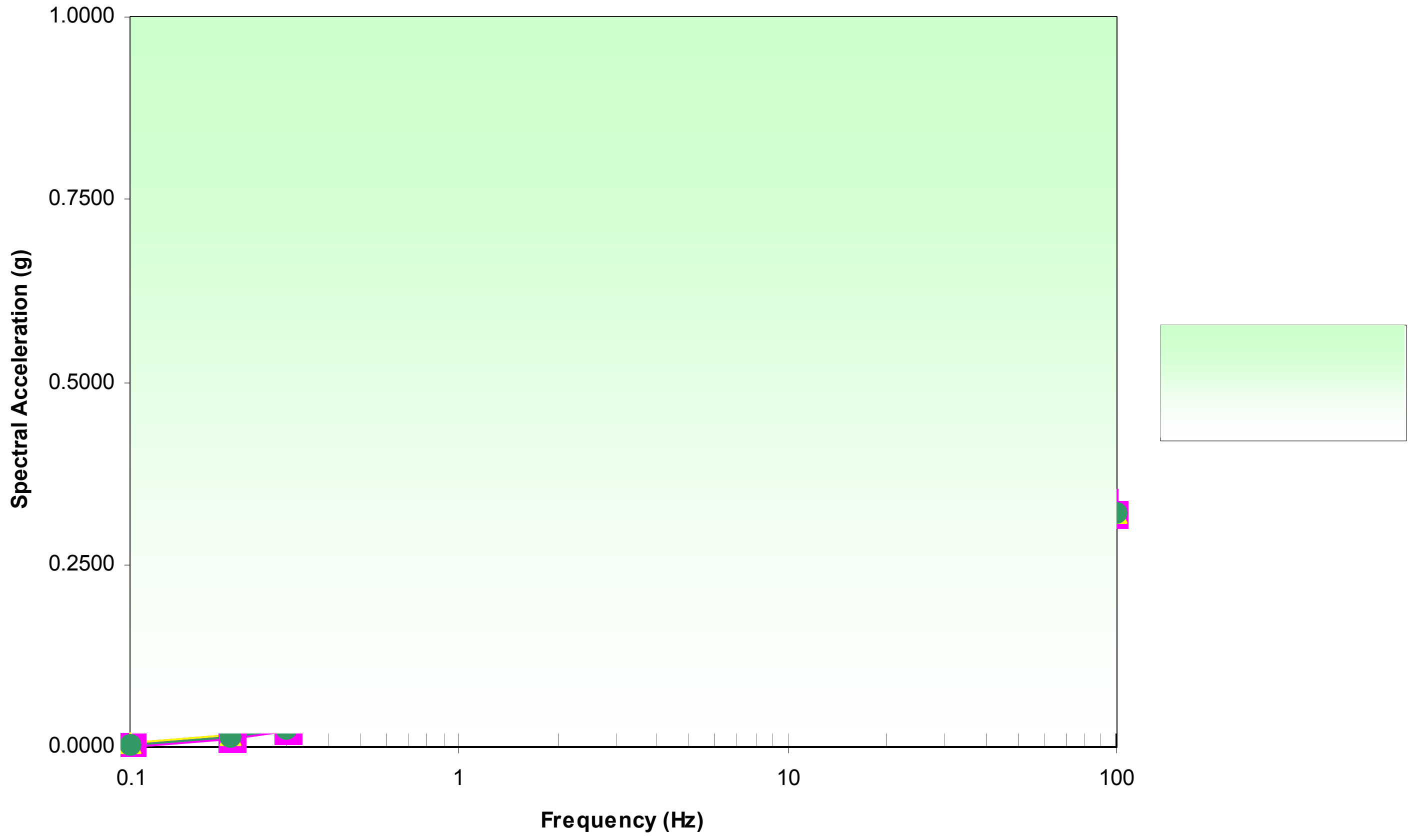


Figure 8 2007 DBGM-2 30' Median Alluvium Vertical Response Spectra

-

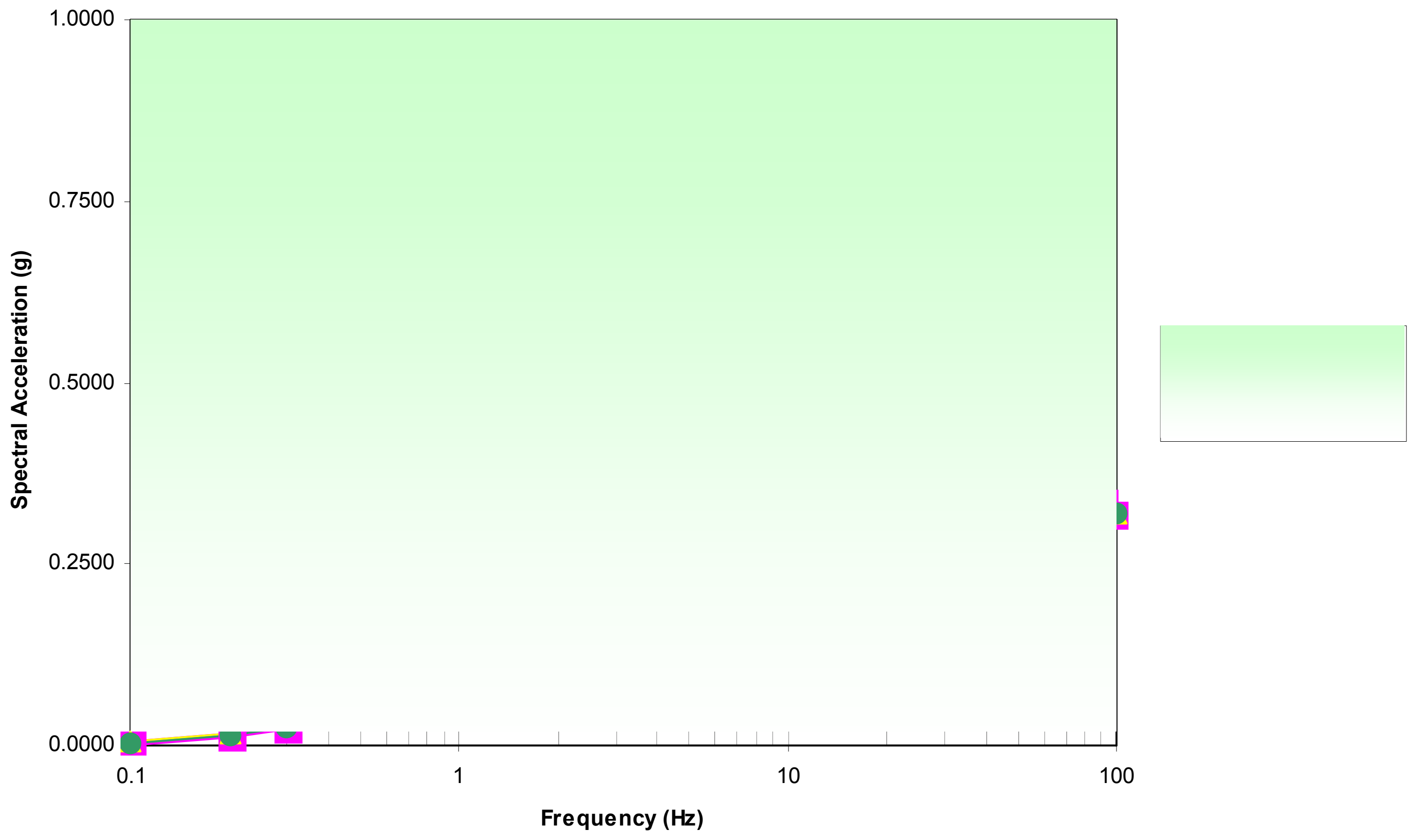


Figure 9 2007 DBGM-2 30' Upper Bound Alluvium Vertical Response Spectra

-

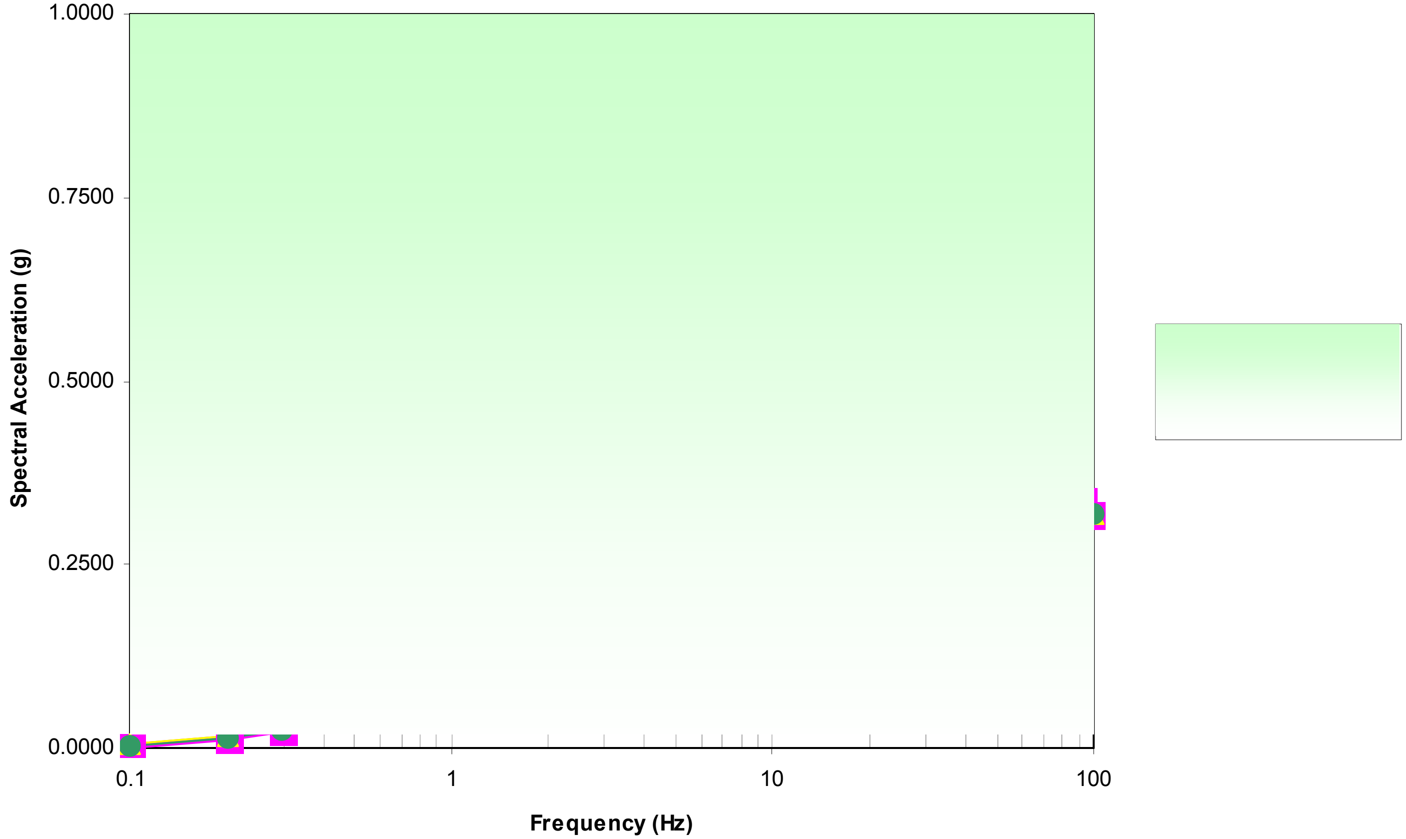


Figure 10 2007 DBGM-2 100' Lower Bound Alluvium Vertical Response Spectra

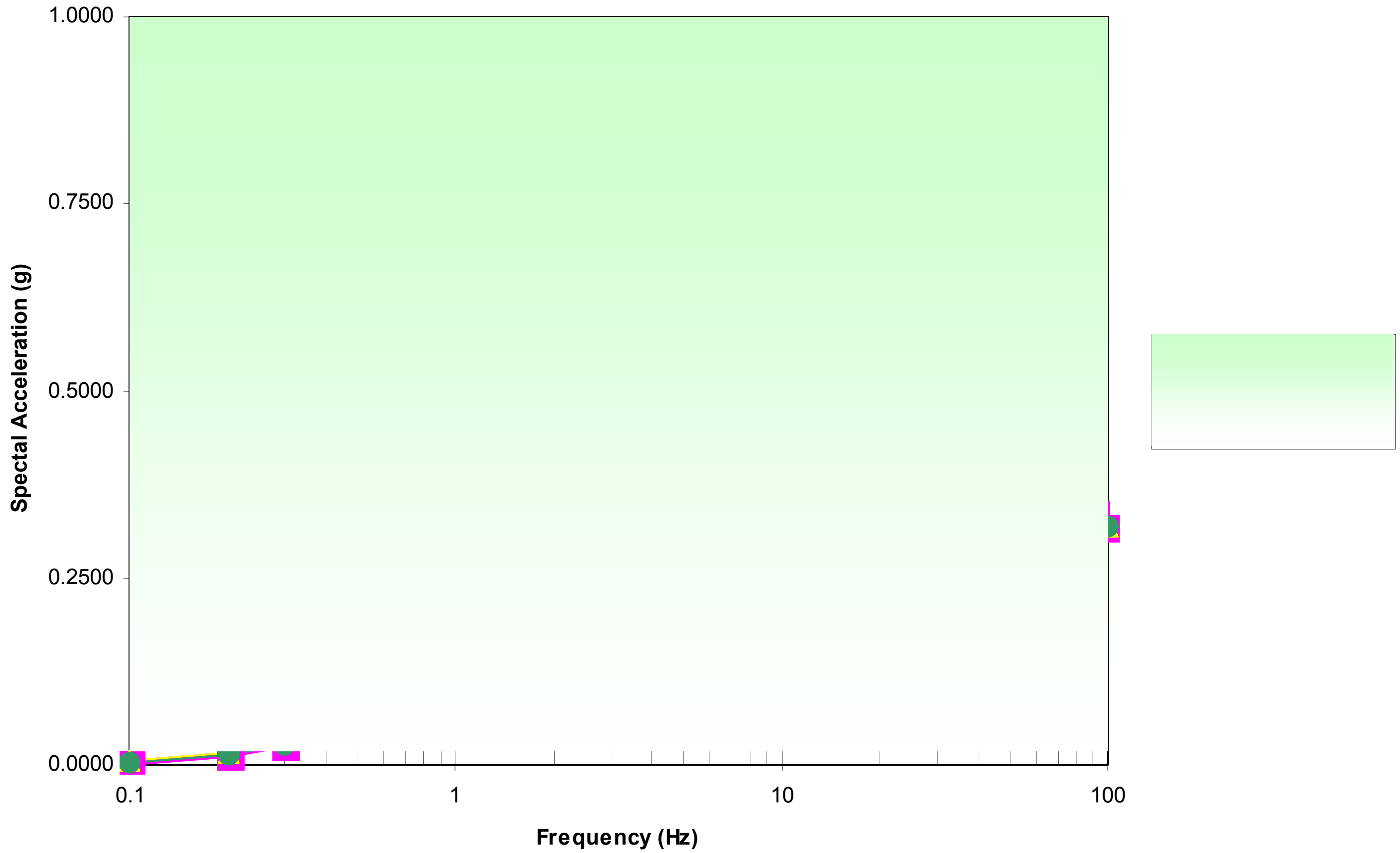


Figure 11 2007 DBGM-2 100' Median Alluvium Vertical Response Spectra

-

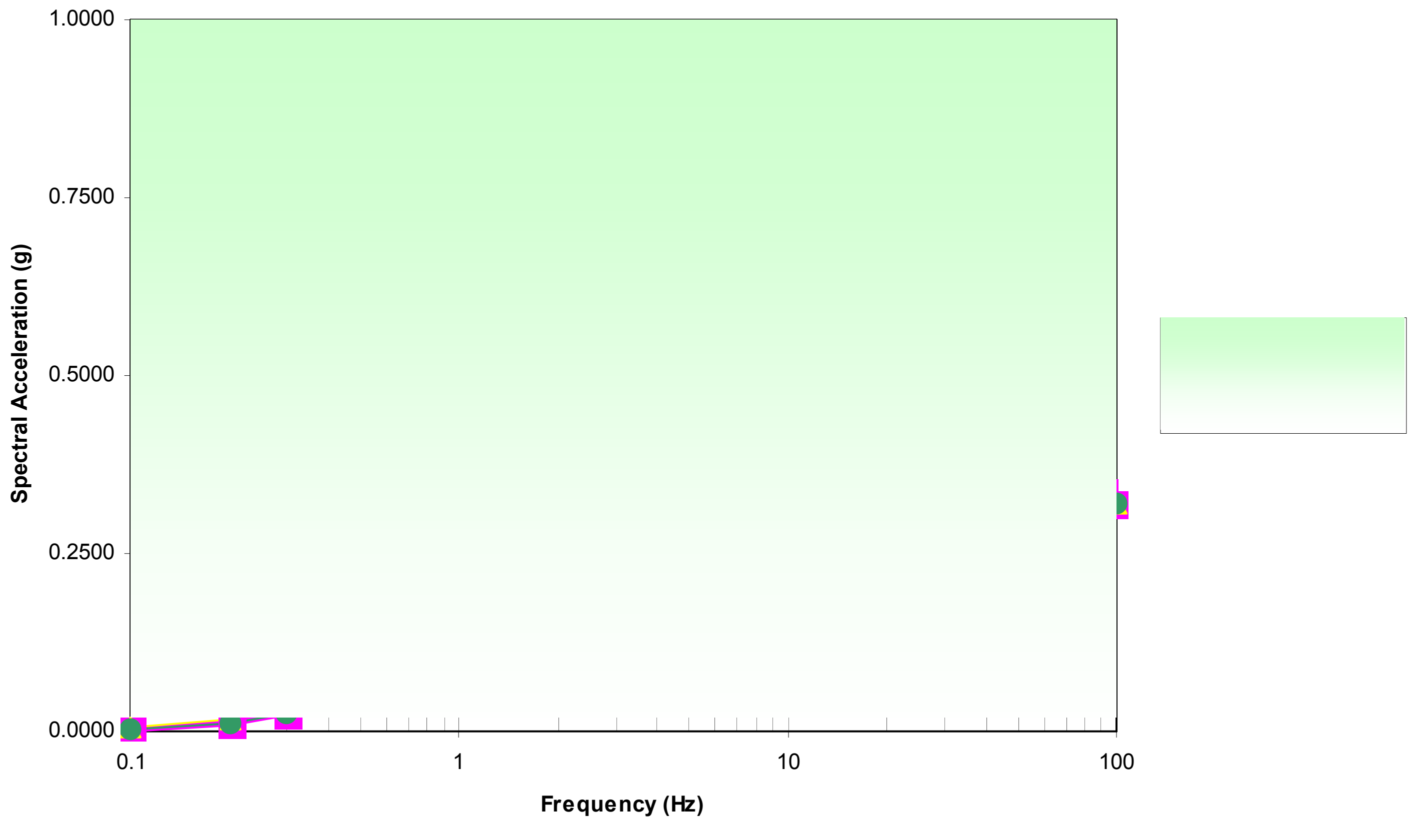


Figure 12 2007 DBGM-2 100' Upper Bound Alluvium Vertical Response Spectra

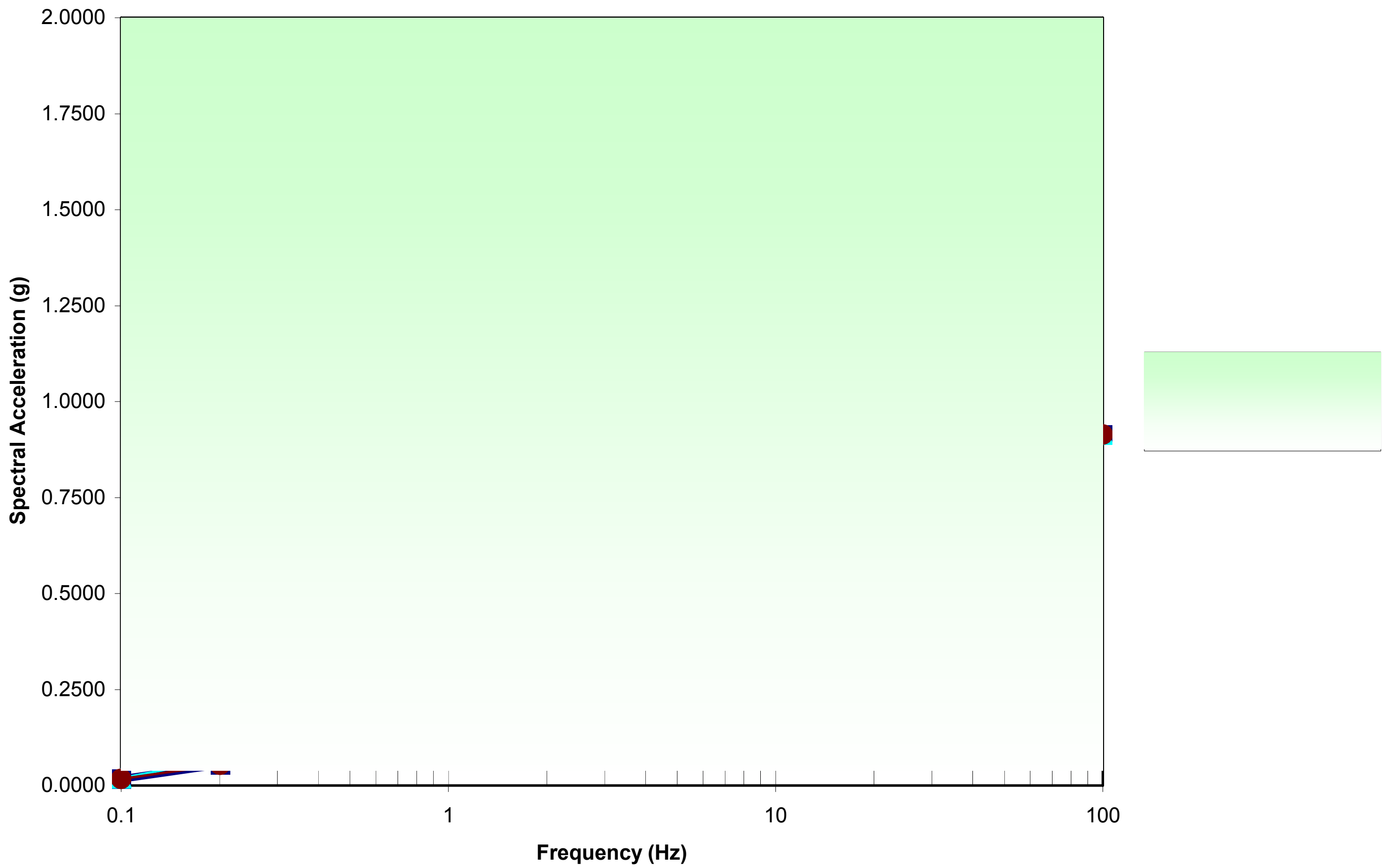


Figure 13 2007 BDBGM 30' Lower Bound Alluvium Horizontal Response Spectra

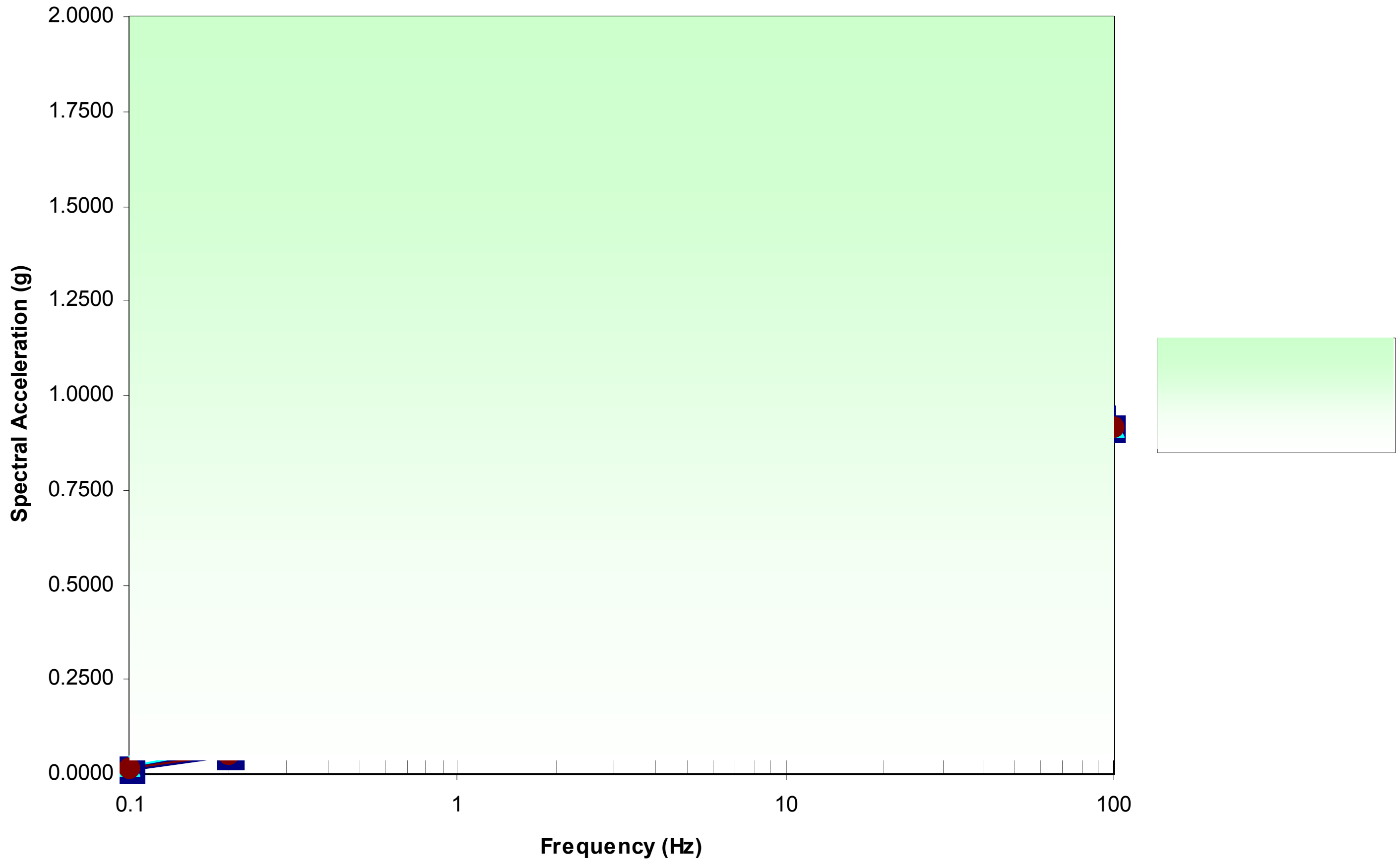


Figure 14 2007 BDBGM 30' Median Alluvium Horizontal Response Spectra

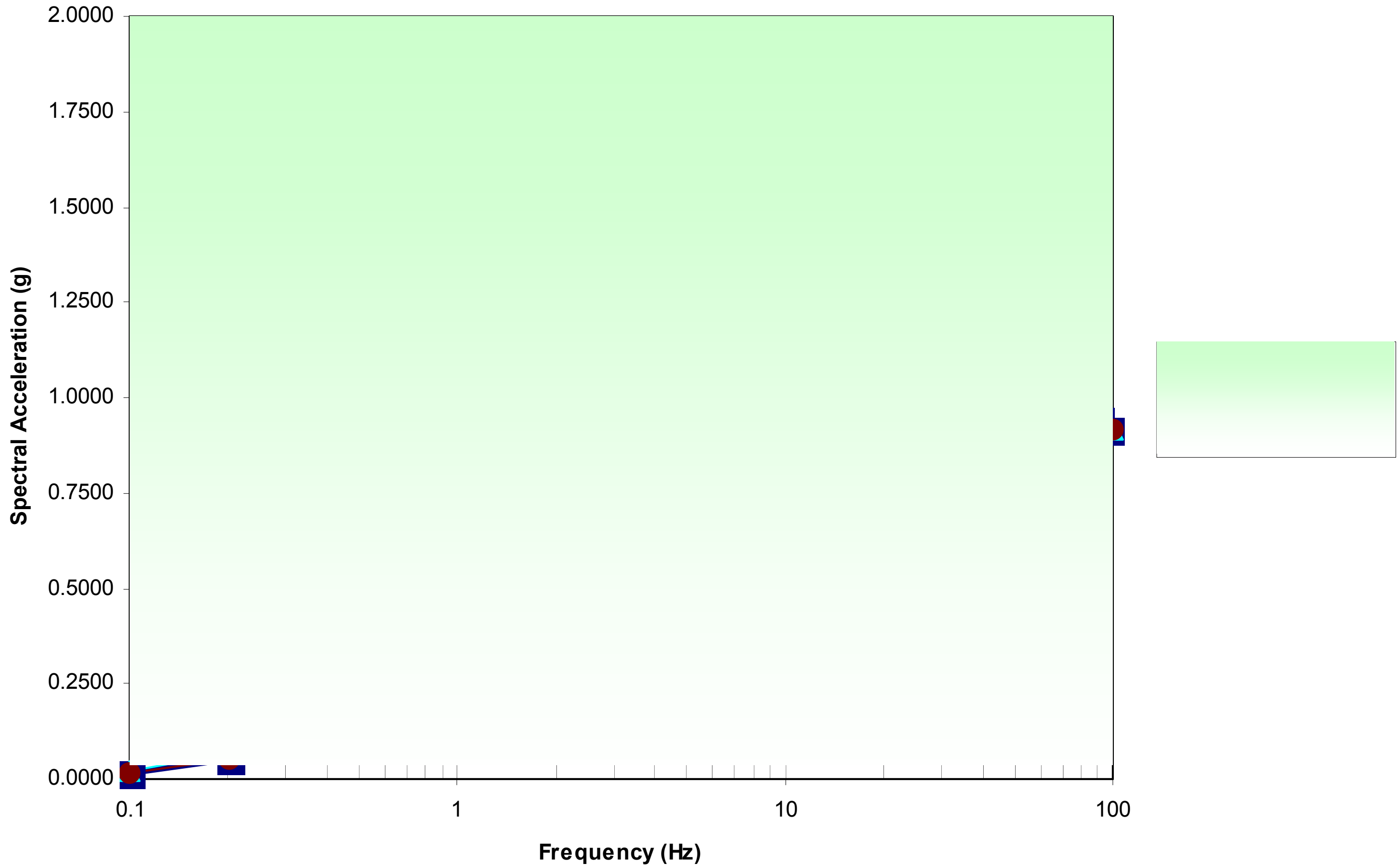


Figure 15 2007 BDBGM 30' Upper Bound Alluvium Horizontal Response Spectra

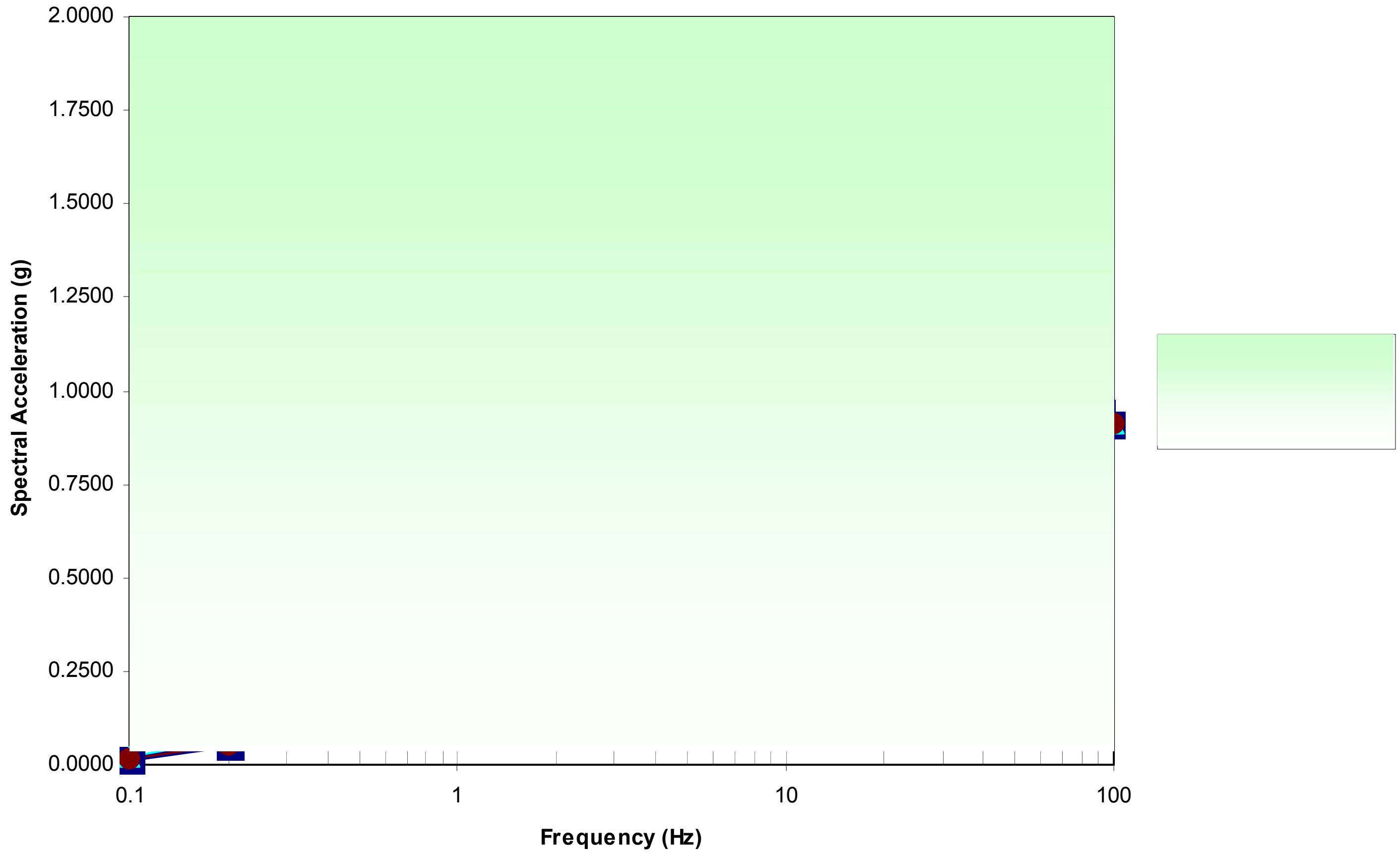


Figure 16 2007 BDBGM 100' Lower Bound Alluvium Horizontal Response Spectra

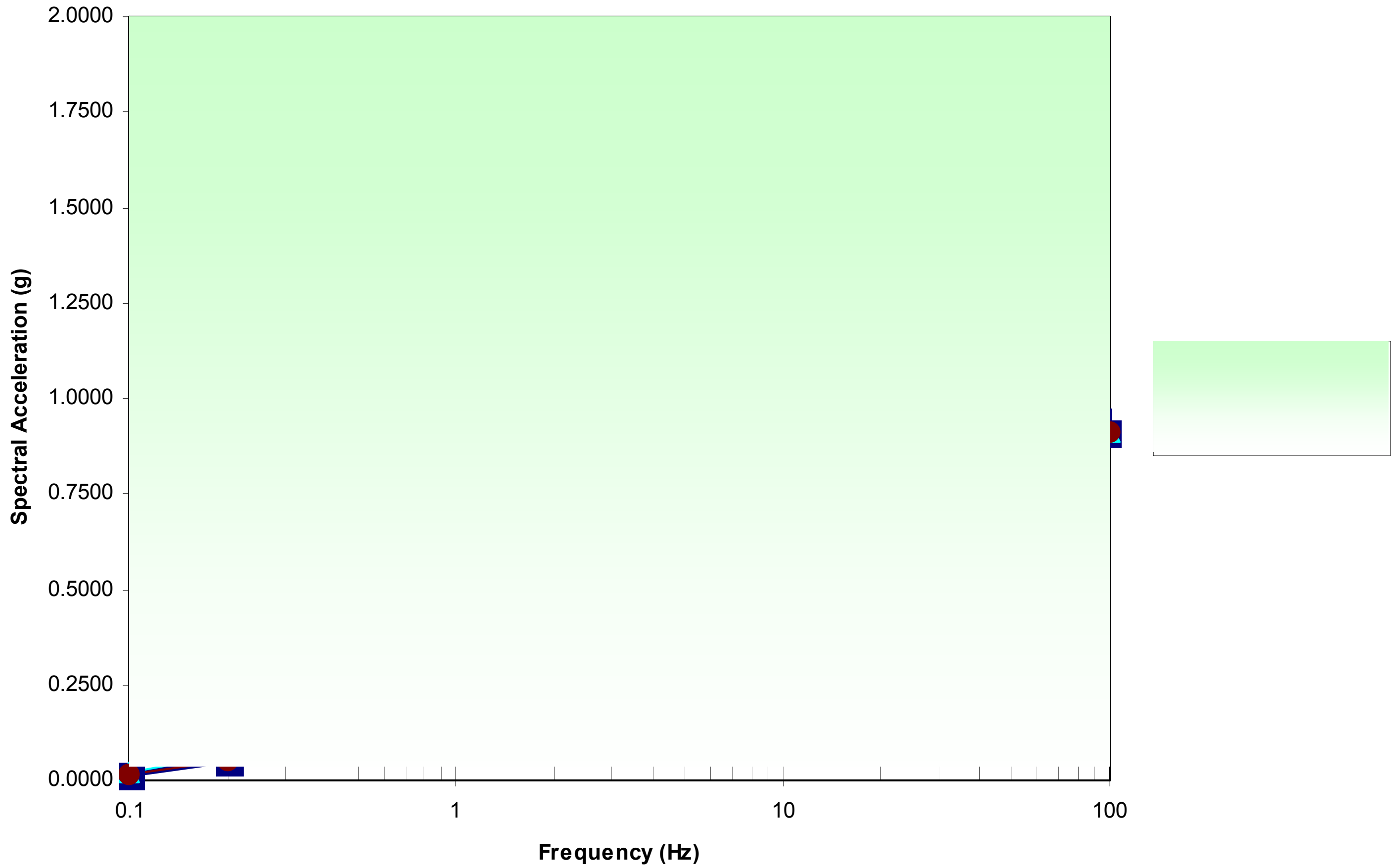


Figure 17 2007 BDBGM 100' Median Alluvium Horizontal Response Spectra

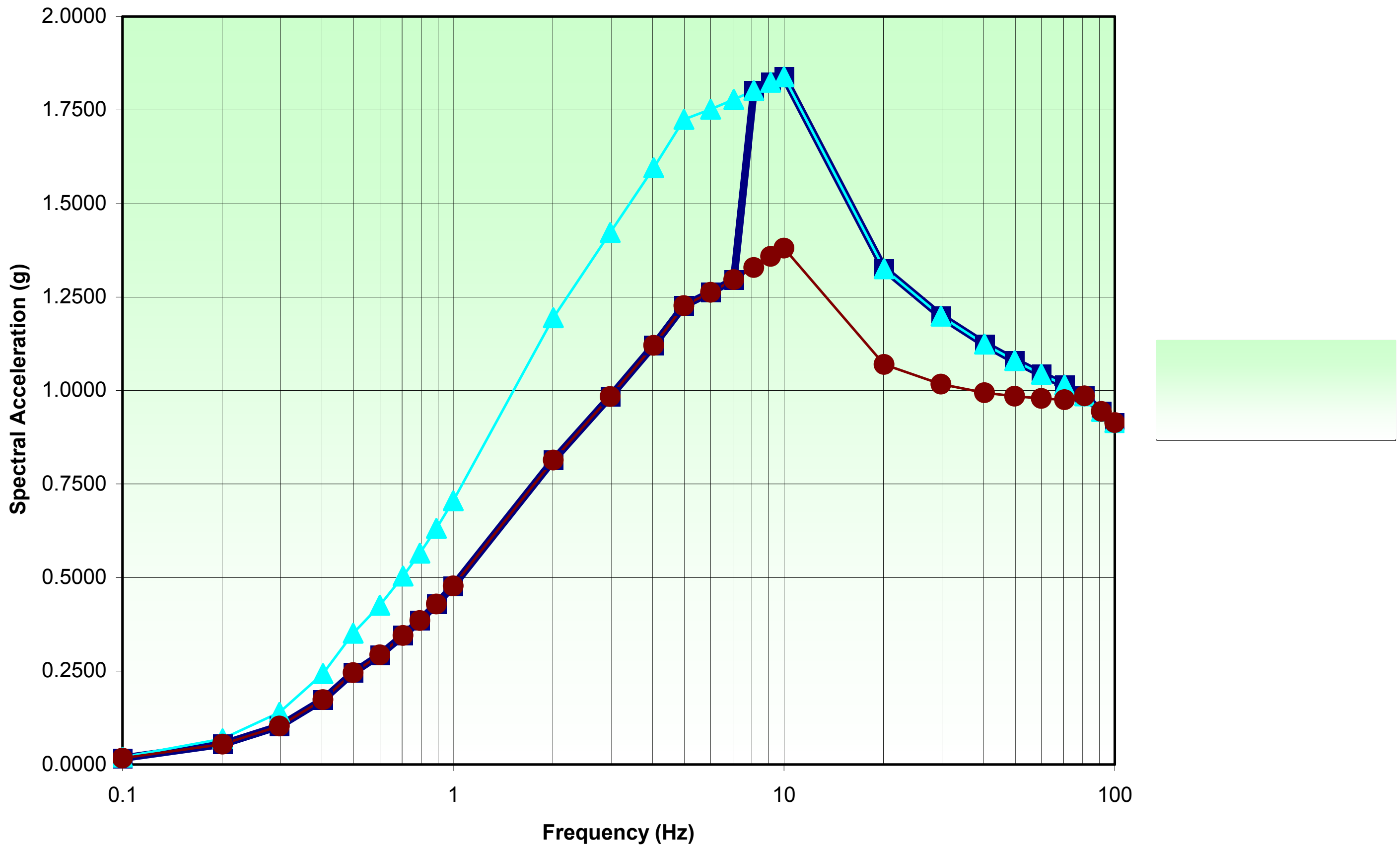


Figure 18 2007 BDBGM 100' Upper Bound Alluvium Horizontal Response Spectra

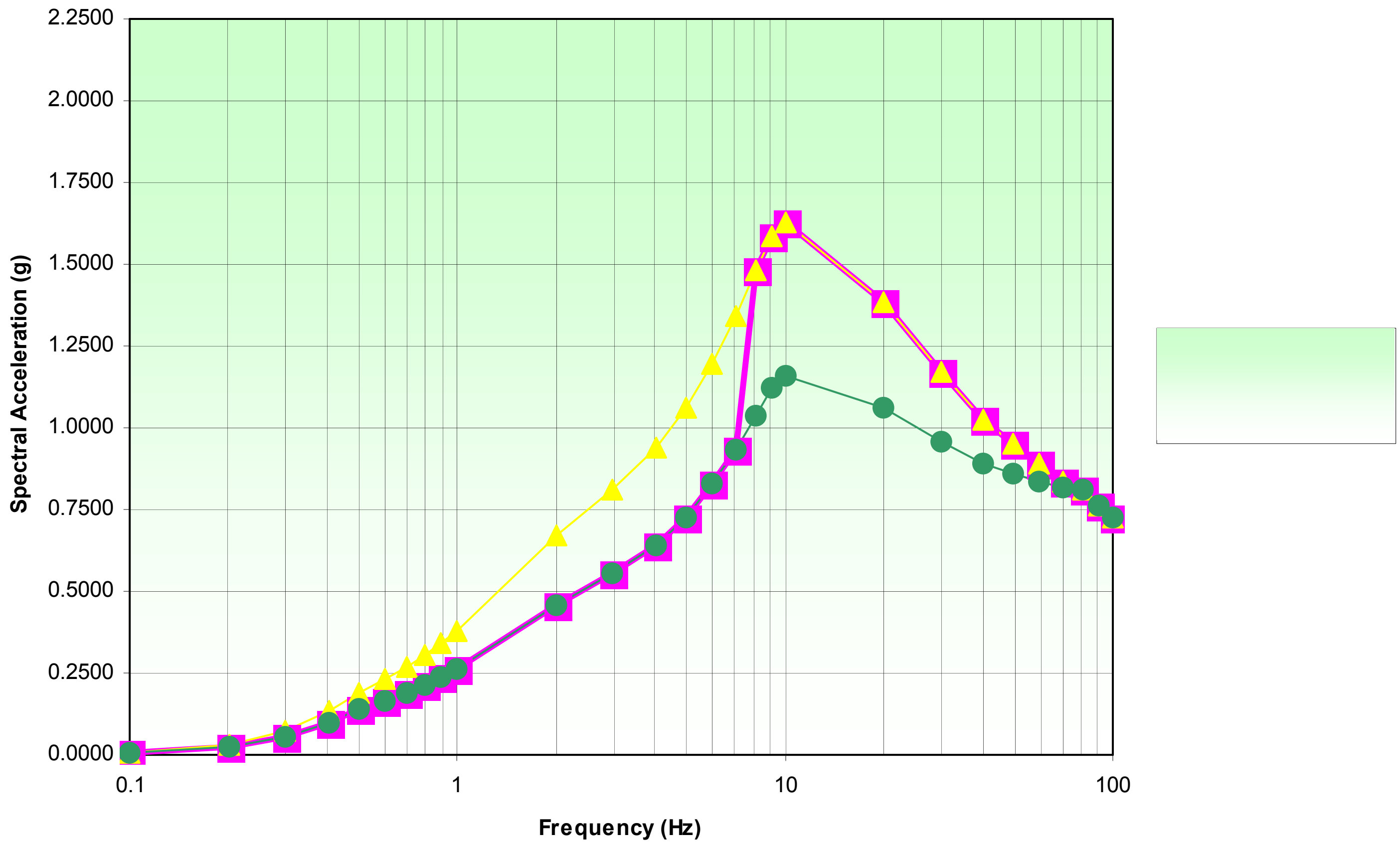


Figure 19 2007 BDBGM 30' Lower Bound Alluvium Vertical Response Spectra

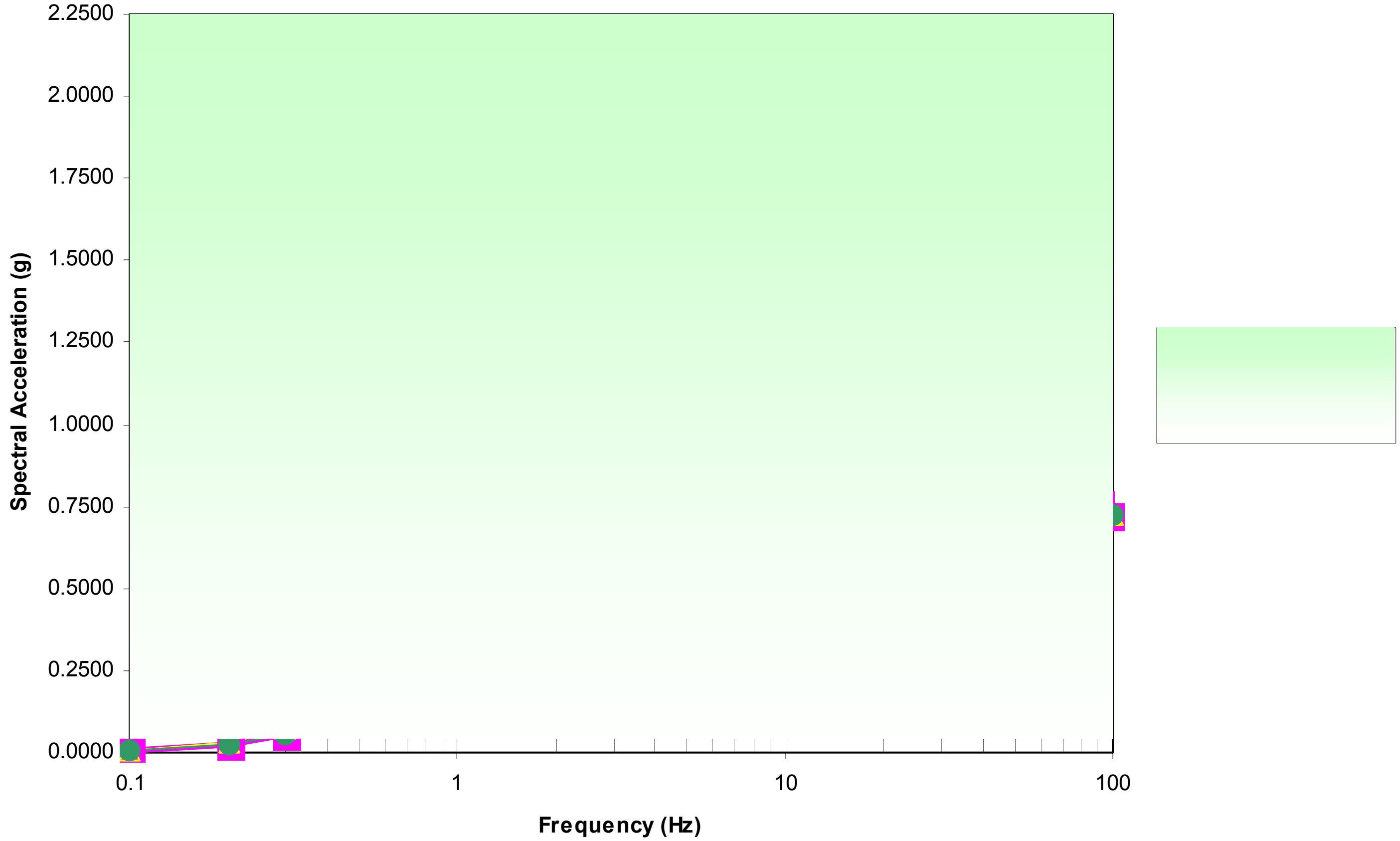


Figure 20 2007 BDBGM 30' Median Alluvium Vertical Response Spectra

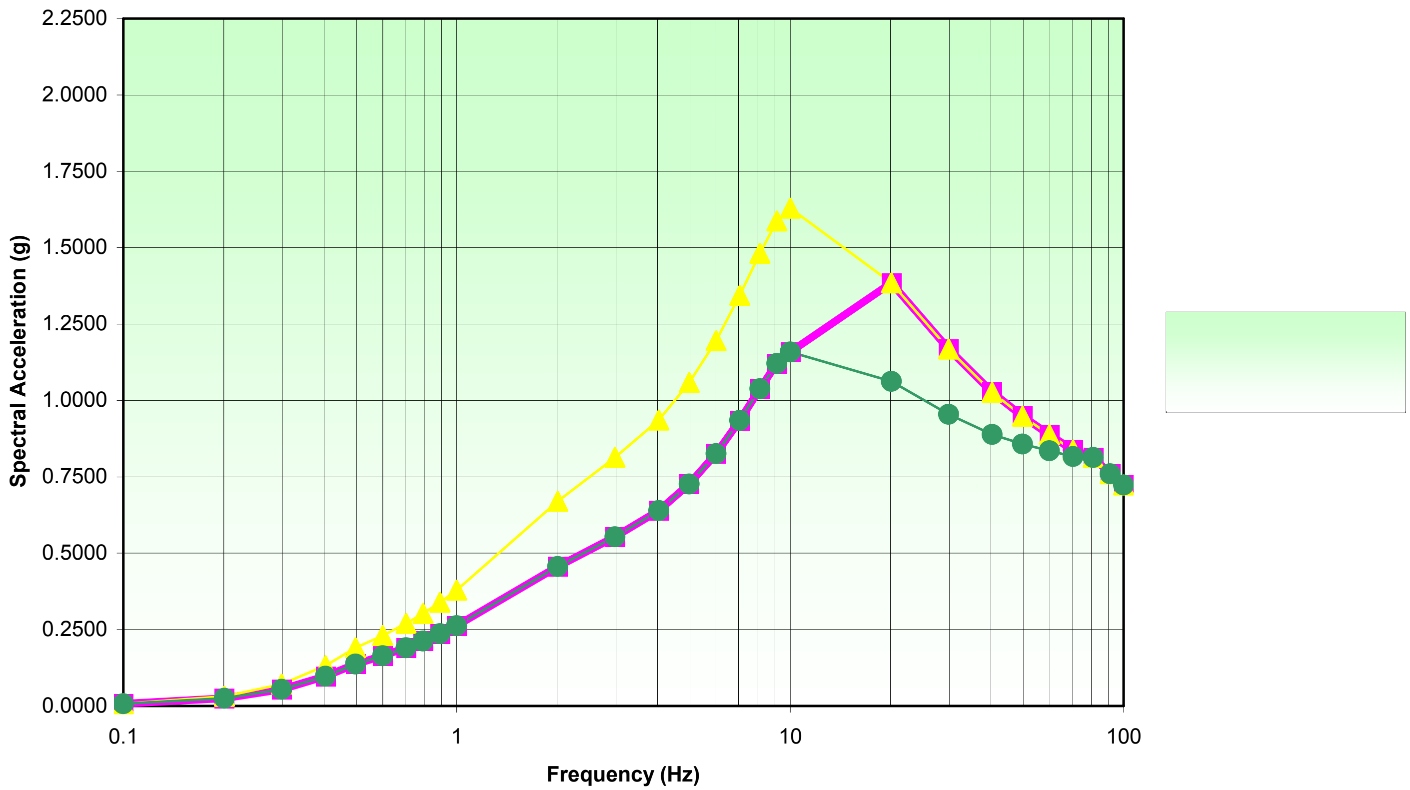


Figure 21 2007 BDBGM 30' Upper Bound Alluvium Vertical Response Spectra

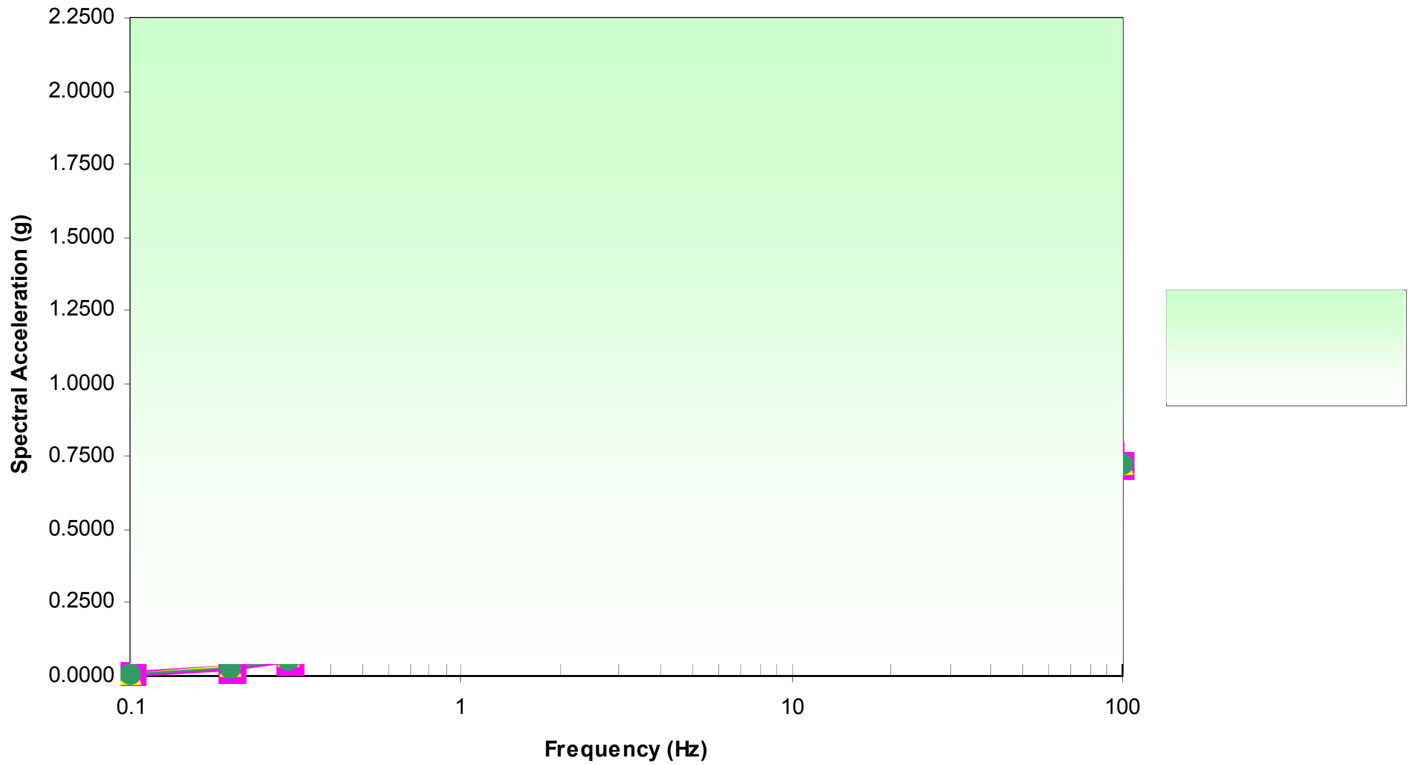


Figure 22   2007 BDBGM 100' Lower Bound Alluvium Vertical Response Spectra

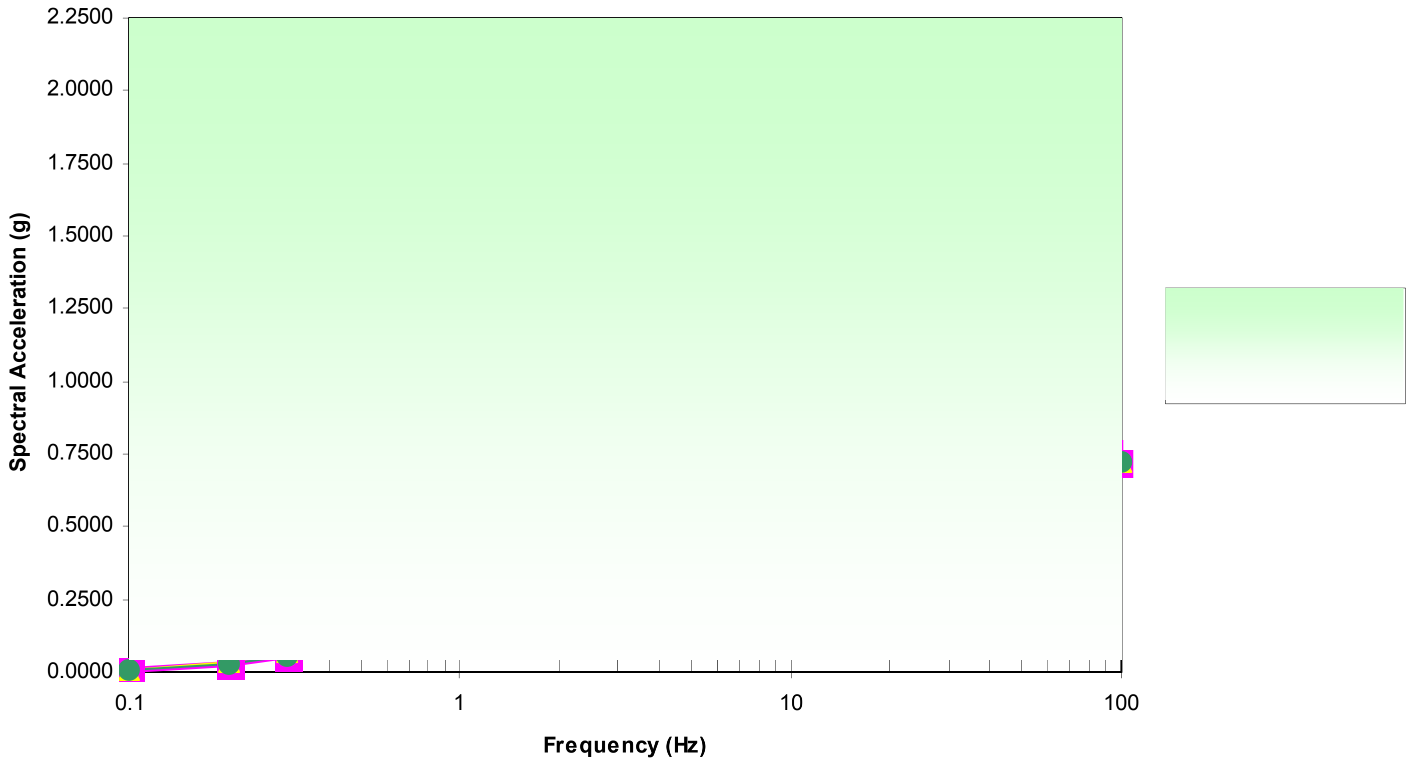


Figure 23 2007 BDBGM 100' Median Alluvium Vertical Response Spectra

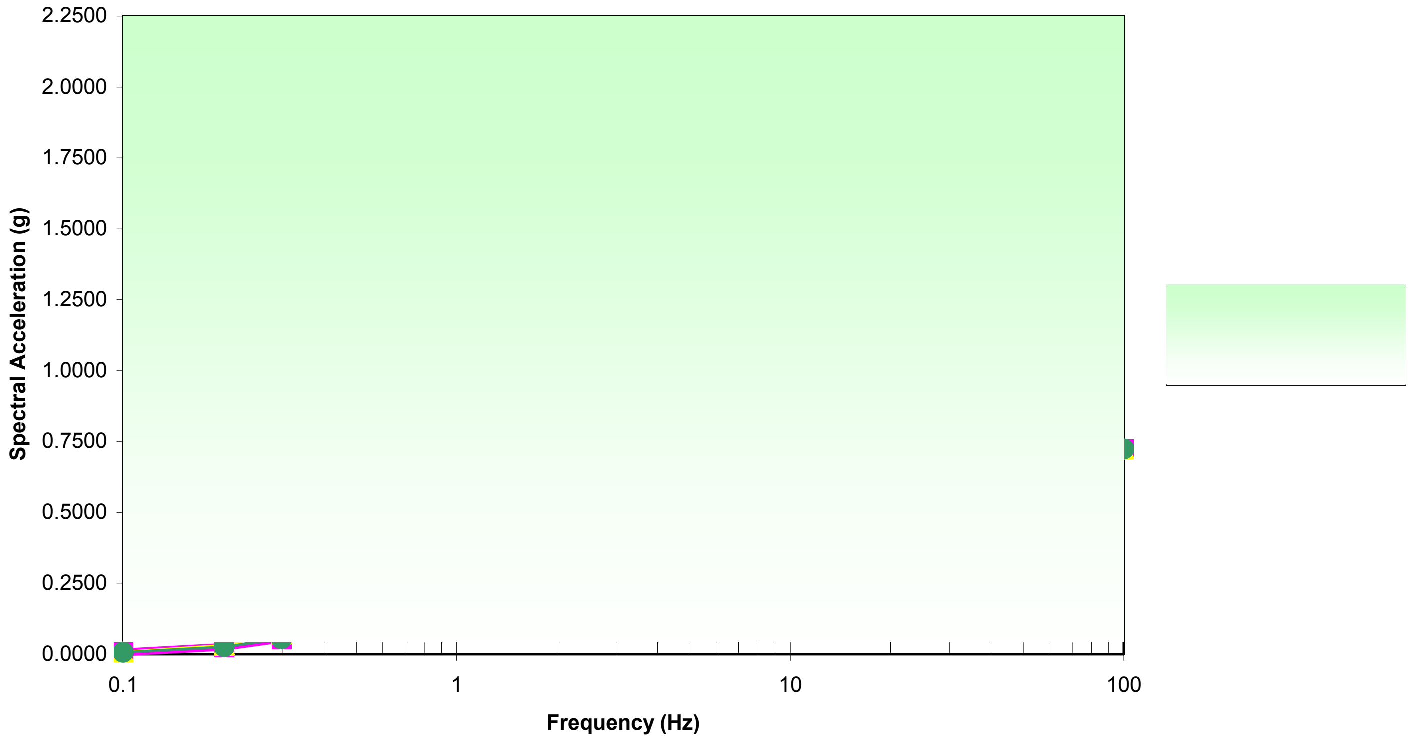


Figure 24 2007 BDBGM 100' Upper Bound Alluvium Vertical Response Spectra

7 RESULTS AND CONCLUSIONS

7.1 RESULTS

7.1.1 Modal Analysis Results:

- Tables 1-12 of Section 6.2 list Modal Analysis results for DBGM-2 and BDBGM 30’ and 100’ lower, median, and upper bound alluvium soil conditions.

7.1.2 Seismic Structural Responses of SRSS Spectra Combinations:

- **Diaphragm Accelerations of SRSS Spectra Combinations**:

From the Base Shears shown in Tables 17 and 18, the governing load cases occur in the 30 ft alluvium upper bound soil case for both DBGM-2 and BDBGM. The diaphragm accelerations for all these governing cases are shown in Tables 13 and 14.

Table 13 Diaphragm Accelerations for DBGM-2 30' Alluvium Upper Bound SRSS Combination*

Diaphragm Level	East - West X - Acceleration		North - South Y - Acceleration		Vertical Z - Acceleration	
	ft /sec^2	g's	ft /sec^2	g's	ft /sec^2	g's
-52' (Node 1099)	13.369	0.415	12.955	0.402	10.498	0.326
0' (Node 2099)	17.000	0.528	15.741	0.489	13.445	0.418
32' (Node 3099)	22.023	0.684	20.465	0.636	17.603	0.547
40' (Node 4099)	22.380	0.695	21.878	0.679	15.470	0.480
80' (Node 5099)	28.956	0.899	29.335	0.911	16.160	0.502
100' (Node 6099)	35.735	1.110	41.844	1.299	20.515	0.637

Source: Attachments F & R g =32.2 ft/sec^2

Table 14 Diaphragm Accelerations for BDBGM 30' Alluvium Upper Bound SRSS Combination*

Diaphragm Level	East - West X - Acceleration		North - South Y - Acceleration		Vertical Z - Acceleration	
	ft /sec^2	g's	ft /sec^2	g's	ft /sec^2	g's
-52' (Node 1099)	24.676	0.766	24.204	0.752	27.161	0.844
0' (Node 2099)	33.583	1.043	31.434	0.976	34.883	1.083
32' (Node 3099)	43.998	1.366	41.080	1.276	43.547	1.352
40' (Node 4099)	44.803	1.391	43.571	1.353	39.242	1.219
80' (Node 5099)	56.847	1.765	57.891	1.798	41.161	1.278
100' (Node 6099)	68.438	2.125	78.494	2.438	49.366	1.533

Source: Attachments L & R g =32.2 ft/sec^2

* DBGM-2 30' upper and BDBGM 30' upper bound cases are the governing cases. See Tables 17 and 18.

- **SRSS Story Drifts:**

Maximum SRSS Story Drifts occur in the 100' lower bound soil conditions for the DBGM-2 input ground motions and are summarized in Table 15. These values represent the relative displacement between diaphragms.

Table 15 Story Drifts for DBGM-2 100' Alluvium Lower Bound SRSS Combination

East-West (Global X)				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004* (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.179816416	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.112228572	52	0.00018
0'-0" (SAP 2000 joint 2099)	0.292044988	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.078986498	40	0.00016
40'-0" (SAP 2000 joint 4099)	0.371031486	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.058767754	40	0.00012
80'-0" (SAP 2000 joint 5099)	0.42979924	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.033636779	20	0.00014
100'-0" (SAP 2000 joint 6099)	0.463436019			

North-South (Global Y)				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004* (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.166691108	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.125407075	52	0.00020
0'-0" (SAP 2000 joint 2099)	0.292098183	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.09118927	40	0.00019
40'-0" (SAP 2000 joint 4099)	0.383287453	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.082255844	40	0.00017
80'-0" (SAP 2000 joint 5099)	0.465543297	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.047357764	20	0.00020
100'-0" (SAP 2000 joint 6099)	0.512901061			

Data Source: Attachment G. *Calculation: Attachment P*

Note: 1099, 2099, 4099, 5099 and 6099 represent the joint numbers at the mass centers for each diaphragm. The floor at 32'-0' is not considered a full diaphragm and is not included in the story drift table.

* *Story drift ratio of 0.*004 is referenced in section 4.2.11.4.10 of PDC (Ref. 2.2.1).

Above values are most critical values. See Attachment P.

Maximum SRSS Story Drifts occur in the 100’ lower bound soil conditions for the BDBGM input ground motions and are summarized in Table 16. These values represent the relative displacement between adjacent diaphragms.

Table 16 Story Drifts for BDBGM 100' Alluvium Lower Bound SRSS Combination

East-West (Global X)				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004* (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.498773488	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.272010384	52	0.00044
0'-0" (SAP 2000 joint 2099)	0.770783872	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.185892317	40	0.00039
40'-0" (SAP 2000 joint 4099)	0.956676189	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.147204551	40	0.00031
80'-0" (SAP 2000 joint 5099)	1.10388074	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.086289654	20	0.00036
100'-0" (SAP 2000 joint 6099)	1.190170394			

North-South (Global Y)				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004* (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.462715284	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.309929839	52	0.00050
0'-0" (SAP 2000 joint 2099)	0.772645123	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.216430837	40	0.00045
40'-0" (SAP 2000 joint 4099)	0.98907596	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.202098691	40	0.00042
80'-0" (SAP 2000 joint 5099)	1.19117465	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.115025121	20	0.00048
100'-0" (SAP 2000 joint 6099)	1.306199771			

Data Source: Attachment M *Calculation: Attachment P*

Note: 1099, 2099, 4099, 5099 and 6099 represent the joint numbers at the mass centers for each diaphragm. The floor at 32'-0' is not considered a full diaphragm and is not included in the story drift table.

** Story drift ratio of 0.*004 is referenced in section 4.2.11.4.10 of PDC (Ref. 2.2.1).

Above values are most critical values. See Attachment P.

- **Base Shears of SRSS combinations:**

Base Shears of SRSS combinations for each of the soil cases are computed in Attachment P and the results are summarized in Tables 17 and 18 for DBGM-2 and BDBGM respectively.

Table 17 and Table 18 are the Base Shear of SRSS spectra combinations of each soil condition. These Base Shears are the summation shear force in the ground level shear walls. The shear forces are the SRSS combination of the X, Y, and Z direction response spectrum analysis cases.

Table 17 Base Shears for DBGM-2 SRSS Combination

Ground Floor Base Shear		
Soil Case	North/South (Global Y) kips	East/West (Global X) kips
DBGM-2 AT 0'-0"		
30' Lower Bound Alluvium	81845	82601
30' Median Alluvium	86891	88160
30' Upper Bound Alluvium	**88488**	**90774**
100' Lower Bound Alluvium	76746	76749
100' Median Alluvium	84742	85168
100' Upper Bound Alluvium	88620	90456

Source: Attachment F Calculation: Attachment P
Maximum Base Shears are shown in bold numbers

Table 18 Base Shears for BDBGM SRSS Combination

Ground Floor Base Shear		
Soil Case	North/South (Global Y) kips	East/West (Global X) kips
BDBGM AT 0'-0"		
30' Lower Bound Alluvium	162580	164518
30' Median Alluvium	174863	176093
30' Upper Bound Alluvium	**177047**	**180563**
100' Lower Bound Alluvium	147640	147859
100' Median Alluvium	164974	166045
100' Upper Bound Alluvium	176875	178520

Source: Attachment F Calculations: Attachment P
Maximum Base Shears are shown in bold numbers

7.1.3 DBGM-2 Seismic Structural Responses for Individual Component Spectra:

In this section, the structure is analyzed for spectral excitation applied individually in North-South, East-West and Vertical direction. The spectral excitation in individual directions will be termed herein as Component Based Spectral Excitation. Only DBGM-2 30' alluvium upper bound case is analyzed, because this case is the governing case as established before (see Tables 17 and 18) in SRSS cases.

- **DBGM-2 Component Based Spectral Accelerations**:

Component Based Spectral accelerations at the center of mass of each diaphragm for DBGM-2 controlling soil case (30' alluvium upper bound) are summarized in Table 19 and Table 20 and plotted on Figure 25 for horizontal spectra. Table 21 lists the Component Based maximum acceleration for vertical ground motion spectra.

Table 19 East-West Component Based Spectral Accelerations for DBGM-2 30' Upper Bound*

DBGM-2 30' Alluvium Upper Bound Diaphragm East-West Spectra Accelerations						
	East - West X - Acceleration		North - South Y - Acceleration		Vertical Z - Acceleration	
Diaphragm Level	ft /sec^2	g's	ft /sec^2	g's	ft /sec^2	g's
-52' (Node 1099)	13.341	0.414	0.808	0.025	0.343	0.011
0' (Node 2099)	16.960	0.527	1.074	0.033	0.371	0.012
32' (Node 3099)	21.280	0.661	1.945	0.060	5.672	0.176
40' (Node 4099)	22.265	0.691	1.828	0.057	2.974	0.092
80' (Node 5099)	28.827	0.895	1.496	0.046	0.436	0.014
100' (Node 6099)	34.432	1.069	6.239	0.194	7.253	0.225

Source: Attachment Q g =32.2 ft/sec^2

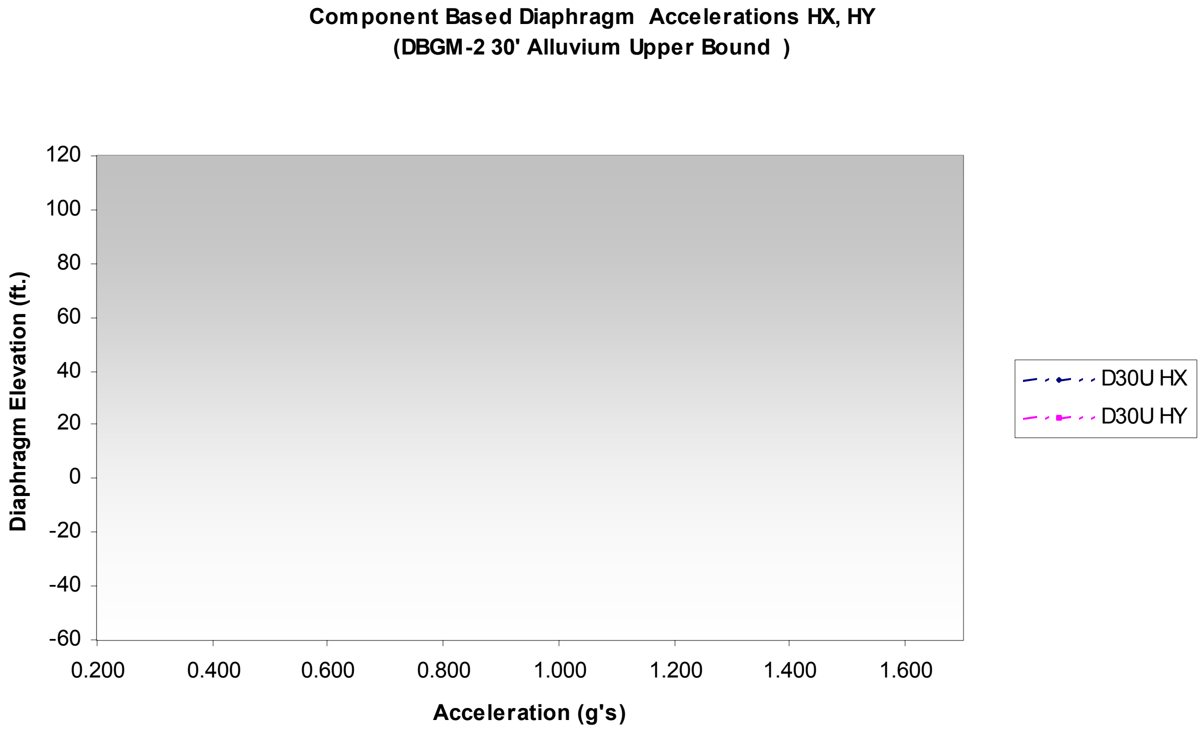
Table 20 North-South Component Based Spectral Accelerations for DBGM-2 30' Upper Bound*

DBGM-2 30' Alluvium Upper Bound Diaphragm North-South spectra Accelerations						
	East - West X - Acceleration		North - South Y - Acceleration		Vertical Z - Acceleration	
Diaphragm Level	ft /sec^2	g's	ft /sec^2	g's	ft /sec^2	g's
-52' (Node 1099)	0.797	0.025	12.924	0.401	0.445	0.014
0' (Node 2099)	0.983	0.031	15.693	0.487	0.506	0.016
32' (Node 3099)	5.505	0.171	20.326	0.631	5.697	0.177
40' (Node 4099)	2.063	0.064	21.792	0.677	1.730	0.054
80' (Node 5099)	2.678	0.083	29.289	0.910	1.054	0.033
100' (Node 6099)	9.341	0.290	41.346	1.284	7.496	0.233

Source: Attachment Q g =32.2 ft/sec^2

* DBGM-2 30' upper and BDBGM 30' upper cases are the governing cases. See Tables 17 and 18.

Figure 25 Component Based Spectral Accelerations for DBGM-2: 30' Upper Bound*



* DBGM-2 30' upper and BDBGM 30' upper cases are the governing cases. See Table 17 and 18.

Table 21 Vertical Component Based Spectral Accelerations for DBGM-2 30' Upper Bound*

DBGM-2 30' Alluvium Upper Bound Diaphragm Vertical Spectra Maximum Accelerations						
	East - West X - Acceleration		North - South Y - Acceleration		Vertical Z - Acceleration	
Diaphragm Level	ft /sec^2	g's	ft /sec^2	g's	ft /sec^2	g's
-52' (Node 1099)	0.336	0.010	0.385	0.012	10.483	0.326
0' (Node 2099)	0.631	0.020	0.589	0.018	13.430	0.417
32' (Node 3099)	1.378	0.043	1.370	0.043	15.660	0.486
40' (Node 4099)	0.945	0.029	0.637	0.020	15.082	0.468
80' (Node 5099)	0.533	0.017	0.654	0.020	16.12	0.501
100' (Node 6099)	2.046	0.064	1.577	0.049	17.666	0.549

Source: Attachment Q g =32.2 ft/sec^2

* DBGM-2 30' upper and BDBGM 30' upper cases are the governing cases. See Tables 17 and 18.

- **Component Based Story Drifts:**

  Table 22 lists the Component Based Story Drift for the DBGM-2 controlling soil case (100' alluvium lower bound soil condition) per sheet "Nodal displacements-Absolute" of "Joint Displacement Summary.xls" in CD Attachment P. These values represent the maximum relative displacement between diaphragms in the same direction of Ground Motion Spectra for all soil conditions.

Table 22 Component Based Story Drifts for DBGM-2 100' Alluvium Lower Bound

DBGM-2 100' Alluvium Lower Bound East-West (Global X) Drifts				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004 (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.1798	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.112228572	52	0.00018
0'-0" (SAP 2000 joint 2099)	0.2920	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.078986498	40	0.00016
40'-0" (SAP 2000 joint 4099)	0.3710	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.058767754	40	0.00012
80'-0" (SAP 2000 joint 5099)	0.4298	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.033636779	20	0.00014
100'-0" (SAP 2000 joint 6099)	0.4634			

DBGM-2 100' Alluvium Lower Bound North-South (Global Y) Drifts				
Diaphragm Level	Story Displacement, Δ (inches)	Story Drift (inches)	Story Height (feet)	Drift Ratio < 0.004* (story drift / story height)
-52'-0" (SAP 2000 joint 1099)	0.1667	0'-0" (Δ2099-Δ1099)		(Δ2099-Δ1099) / 52'
		0.125407075	52	0.00020
0'-0" (SAP 2000 joint 2099)	0.2921	40'-0" (Δ4099-Δ2099)		(Δ4099-Δ2099) / 40'
		0.09118927	40	0.00019
40'-0" (SAP 2000 joint 4099)	0.3833	80'-0" (Δ5099-Δ4099)		(Δ5099-Δ4099) / 40'
		0.082255844	40	0.00017
80'-0" (SAP 2000 joint 5099)	0.4655	100'-0" (Δ6099-Δ5099)		(Δ6099-Δ5099) / 20'
		0.047357764	20	0.00020
100'-0" (SAP 2000 joint 6099)	0.5129			

Data Source: Attachment G. *Calculation: Attachment P*

Note: 1099, 2099, 4099, 5099 and 6099 represent the joint numbers at the mass centers for each diaphragm. The floor at 32'-0' is not considered a full diaphragm and is not included in the story drift table.

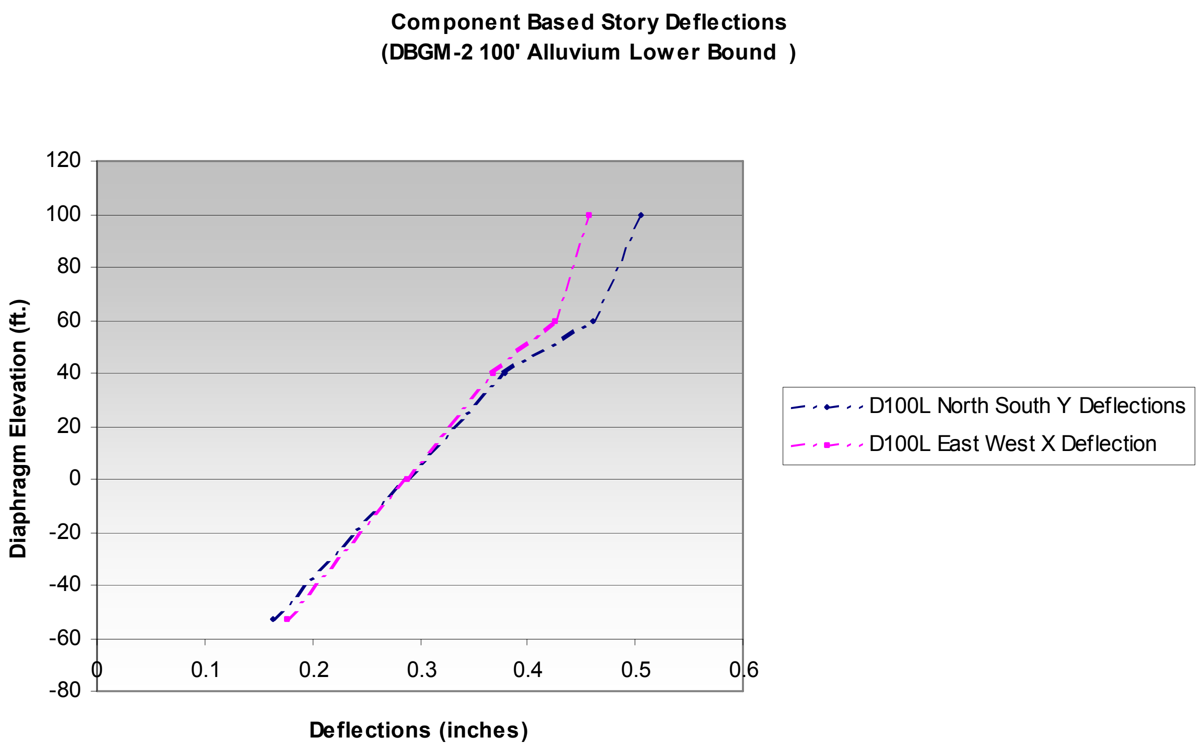
* *Story drift ratio of 0.*004 is referenced in section 4.2.11.4.10 of PDC (Ref. 2.2.1).

Story Drifts computed for the 100’ lower bound soil conditions for the BDBGM input ground motions are summarized in Table 16. These values represent the relative displacement between diaphragms.

Figure 26 plot the distribution of the story deflections throughout the height of the building for controlling story drift case (DBGM-2 100’ alluvium lower bound). Only the local top roof at 100’ shows the less deflection due to the low mass to be excited by horizontal spectra.

Figure 26 Component Based DBGM-2 Deflections:

100’ Alluvium lower Bound



- **Story Shears for DBGM-2 of Component Based Spectra:**

  Table 23 lists the Story Shears of component-based spectra for DBGM-2 30' and 100' alluvium for all soil cases. The component based Story Shears are the summation the in plane shear forces of all shear walls subject to same direction of horizontal ground motion spectra.

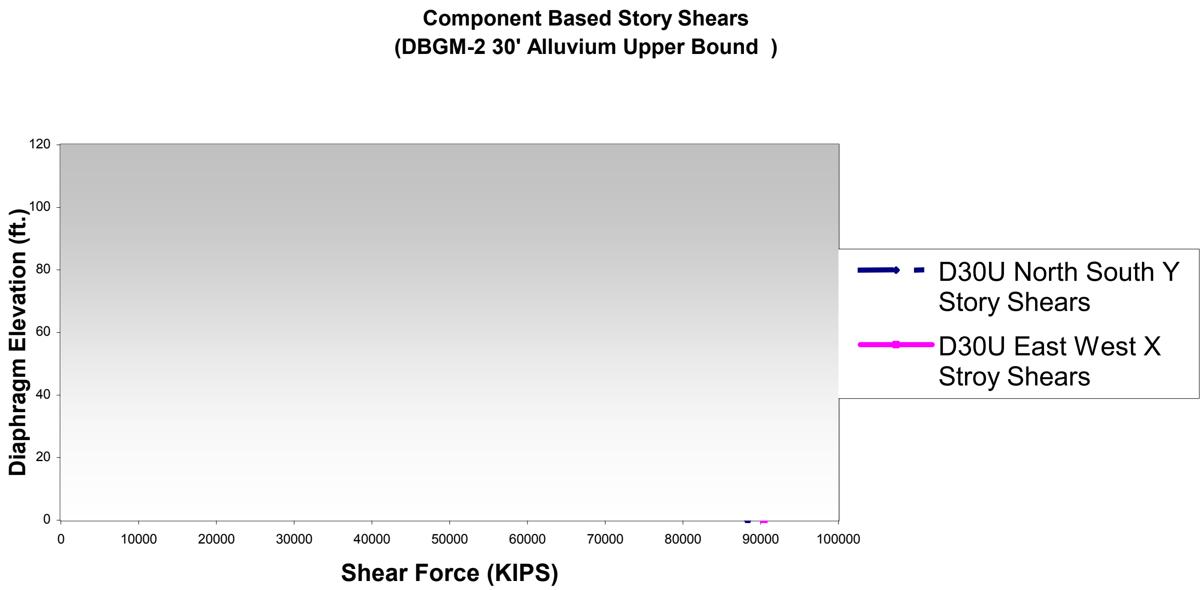
Table 23 Component Based Story Shears for DBGM-2 30' and 100' Alluvium

DBGM-2 Horizontal Spectra Story Shears		
Soil Case	**North/South (Global Y) kips**	**East/West (Global X) kips**
DBGM-2 at Ground Level (0'-0")		
30' Lower Bound Alluvium	80581	81421
30' Median Alluvium	86362	87648
30' Upper Bound Alluvium	88331	**90398**
100' Lower Bound Alluvium	75004	75095
100' Median Alluvium	83841	84447
100' Upper Bound Alluvium	**88343**	90027
DBGM-2 at Second Floor of 32'-0"		
30' Lower Bound Alluvium	25089	35329
30' Median Alluvium	27375	38265
30' Upper Bound Alluvium	28034	**39651**
100' Lower Bound Alluvium	22993	32380
100' Median Alluvium	26349	36710
100' Upper Bound Alluvium	**28201**	39462
DBGM-2 at Second Floor of 40'-0"		
30' Lower Bound Alluvium	48244	45043
30' Median Alluvium	53131	49513
30' Upper Bound Alluvium	54217	**51443**
100' Lower Bound Alluvium	43843	40850
100' Median Alluvium	50928	47060
100' Upper Bound Alluvium	**54888**	51329
DBGM-2 at Third Floor of 80'-0"		
30' Lower Bound Alluvium	8212	7386
30' Median Alluvium	9701	8136
30' Upper Bound Alluvium	10104	8422
100' Lower Bound Alluvium	7091	6558
100' Median Alluvium	8925	7582
100' Upper Bound Alluvium	**10338**	**8470**

Source: Attachments D to I *Calculation: Attachment P*

Figure 27 plots the distribution of the Story Shear throughout the height of the building for controlling soil case (DBGM-2 30' alluvium upper bound). As shown on the plot, the Story Shears are reasonable as they accumulate down through the height of the building.

Figure 27 Component Based Story Shear of DBGM-2 30' Alluvium Upper Bound



CD Attachment Output:

- Member forces for DBGM-2 and BDBGM seismic events are included in CD attachments D thru O.
- Building accelerations at diaphragm levels are included in CD Attachments D thru O.
- Base shear and Story Drift calculations are included in CD Attachment P.
- Comparison of Base Shear calculated in this calculation with that calculated following IBC (Ref. 2.2.7) is included in CD Attachment U.

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7.2 CONCLUSIONS

Results from this calculation are consistent with the results obtained in the original WHF seismic analysis (Ref. 2.2. 9). As expected the fundamental frequencies obtained in this calculation are lower than those obtained in Reference 2.2.9 as a result of softer soil springs computed using the 2007 geotechnical data.

As seen in Table 17, for DBGM-2, Base Shear of East-West and North-South direction of 30' upper bound alluvium case bounds all other soil cases. As established in attachment P, maximum Story Drifts in both horizontal directions occurs in 100' lower bound alluvium for both DBGM-2 and BDBGM. These Story Drifts are listed in Tables 15 and 16 and are well within the allowable limits.

By comparing base shear results to IBC base shear (Attachment U), it is seen that the Base Shears computed in a Response-Spectrum Analysis using the YMP site specific Response Spectra yields a Base Shear approximately 4.9 times greater than the Base Shear computed using the IBC 2000 requirements. This is comparable to the 4.5 reduction factor used by IBC 2000 for reinforced concrete shear wall buildings (Table 1617.6. of Ref. 2.2.7).

After comparing and observing the combined results (SRSS) (Attachment S) from the SAP2000 output with individual directions (x, y and z), it is concluded that because of the torsional effect at the floor El. 32'-0", there is an increase in acceleration and displacement at floor El. 32'-0" compare to the floor El. 40'-0".

This calculation develops the required information to perform a comparison with the seismic analysis results obtained using the 2004 strain compatible soil properties and free field ground input spectra.

Results from this comparison will determine if the existing WHF structural designs are adequate or will be revised using results from this calculation.

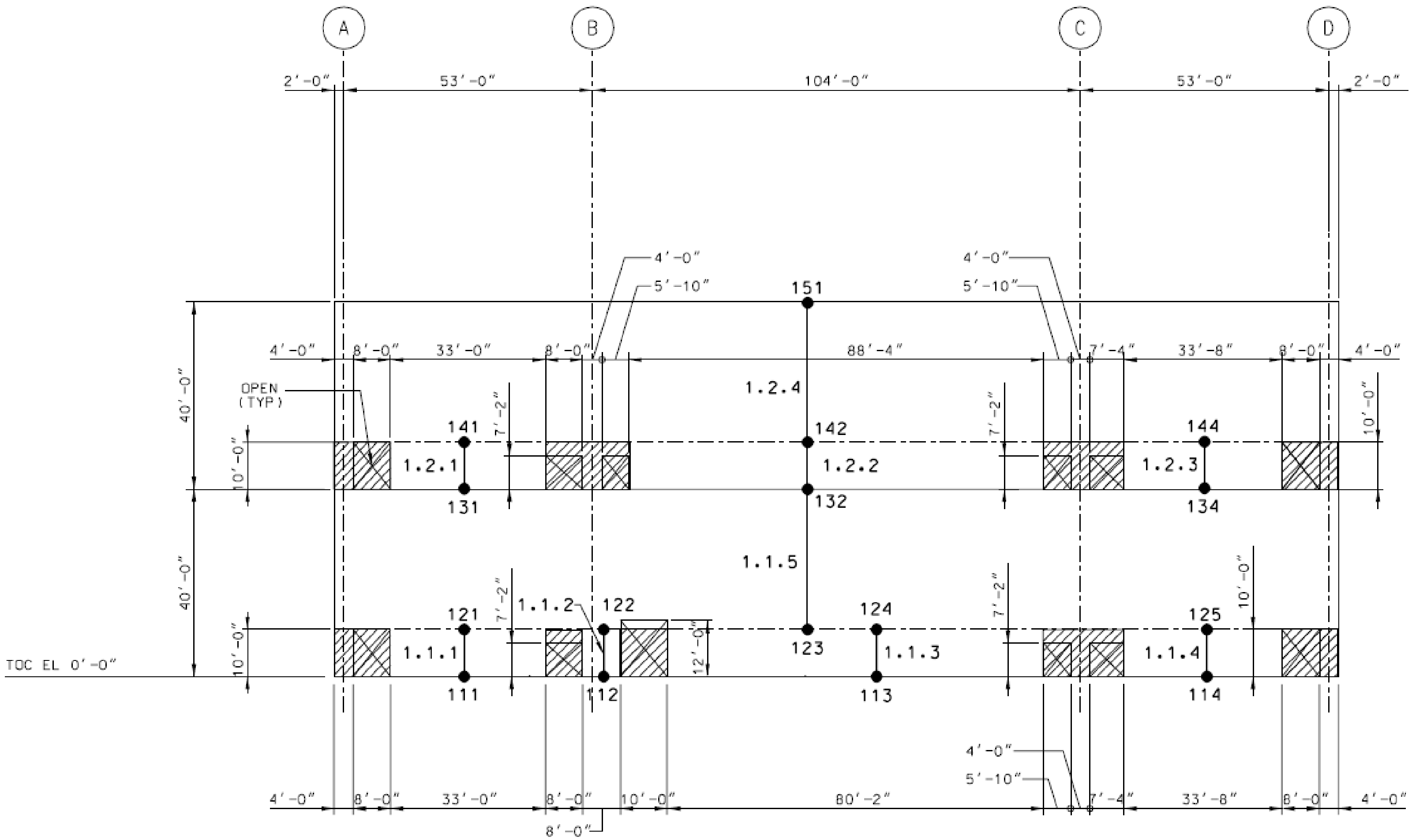
ATTACHMENT A

(Source: Attachment A of Ref. 2.2.9 of this calculation)

Wall Elevations

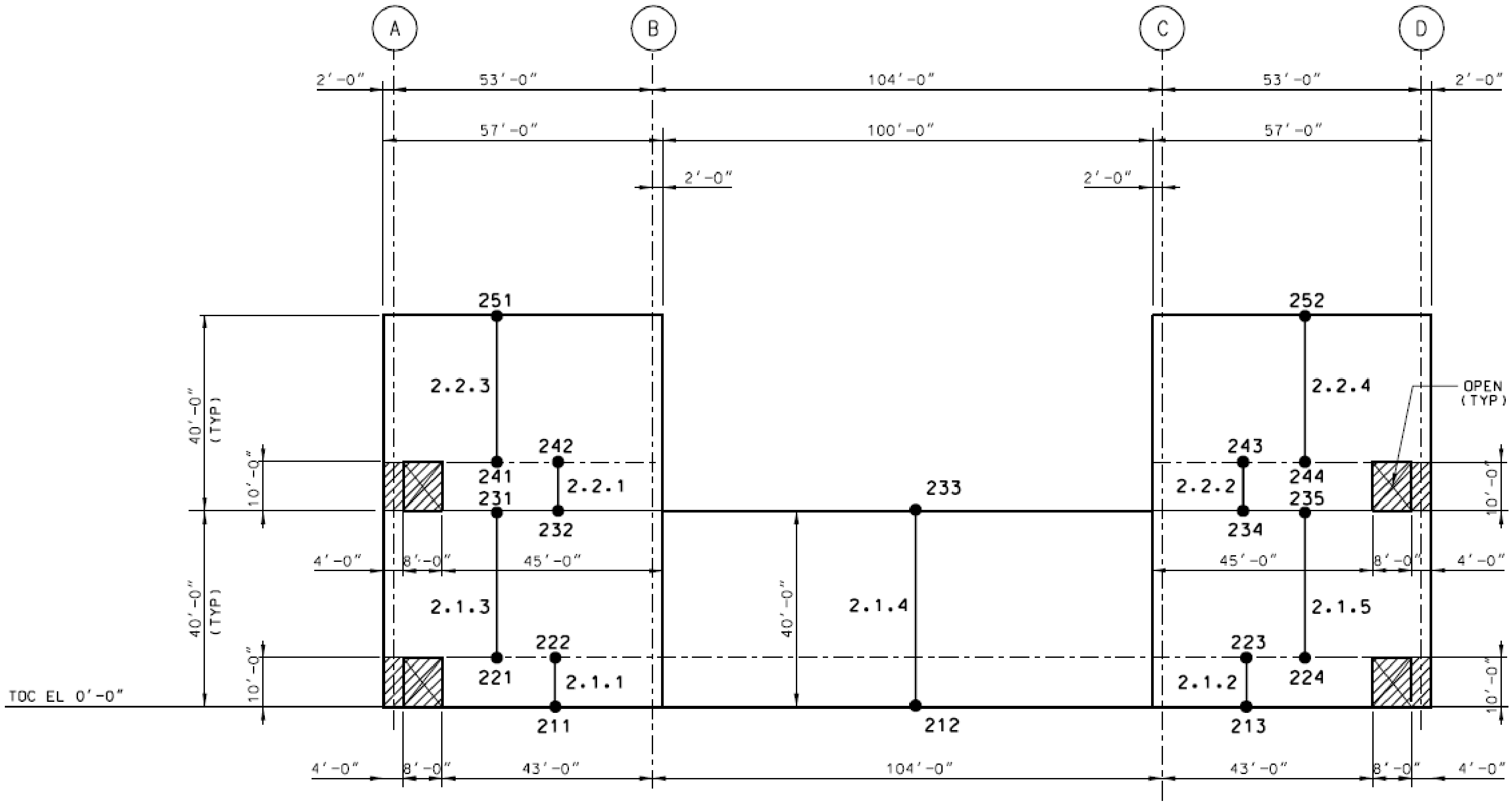
FIGURES

Page



ELEVATION ALONG COL LINE "1"
(LOOKING EAST)

Figure A1



ELEVATION ALONG COL "2"
(LOOKING EAST)

Figure A2

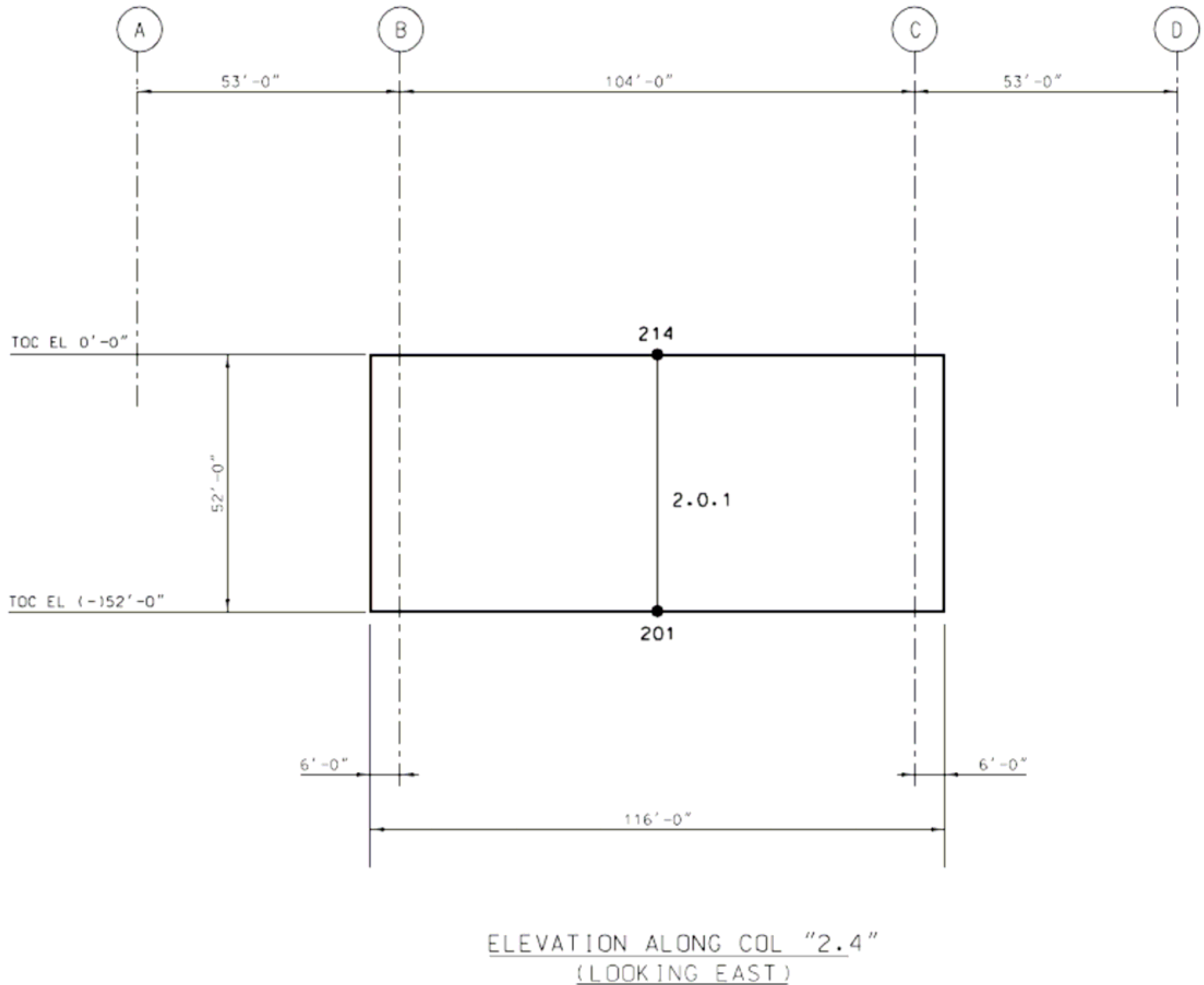

A
B
C
D
53'-0"
104'-0"
53'-0"
TOC EL 0'-0"
214
52'-0"
2.0.1
TOC EL (-)52'-0"
201
6'-0"
6'-0"
116'-0"
ELEVATION ALONG COL "2.4"
(LOOKING EAST)

Figure A3

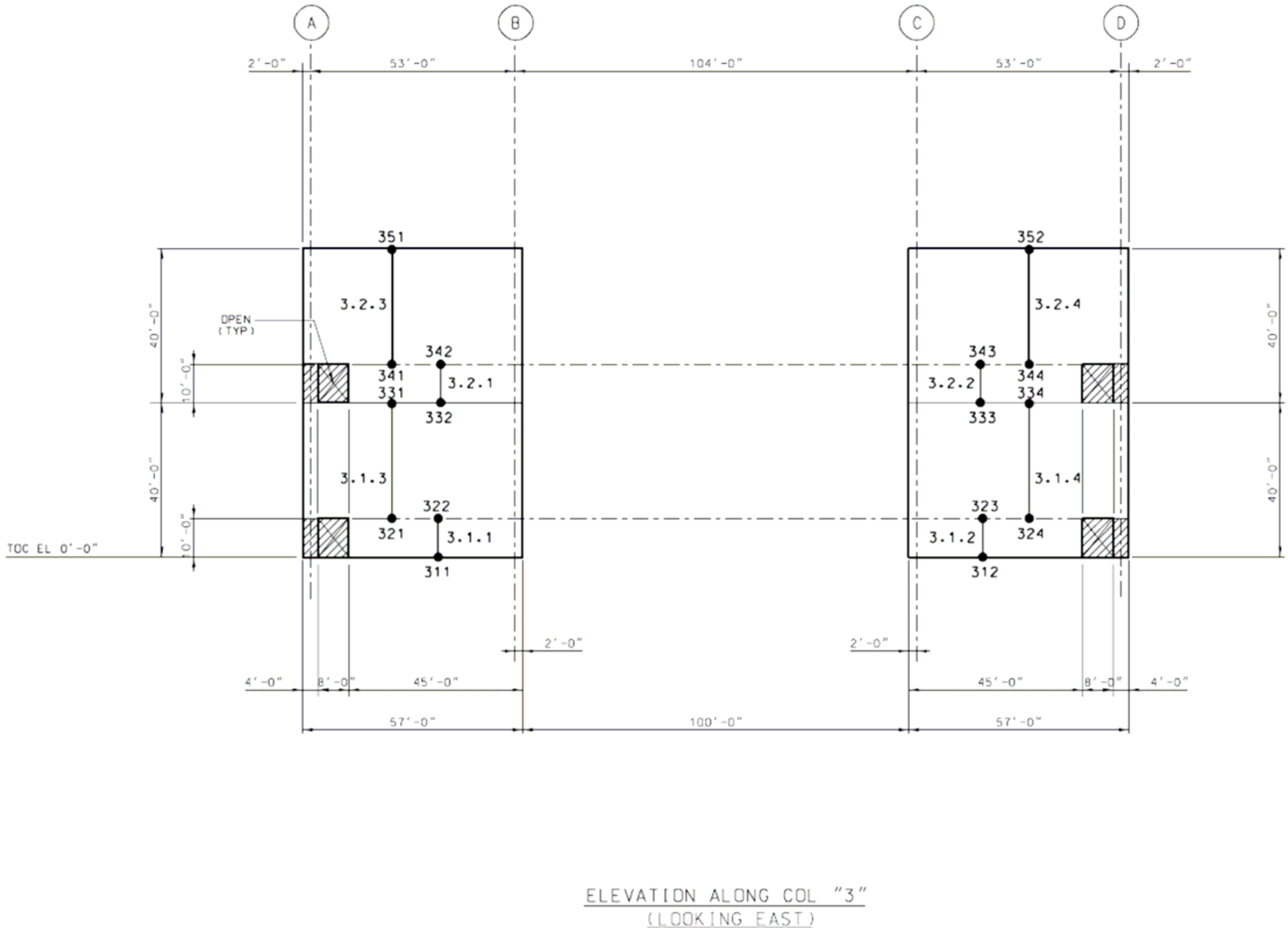

A
B
C
D
2'-0"
53'-0"
104'-0"
53'-0"
2'-0"
351
352
3.2.3
3.2.4
OPEN
(TYP)
342
343
341
331
344
334
3.2.1
3.2.2
332
333
3.1.3
3.1.4
322
323
321
324
3.1.1
3.1.2
311
312
40'-0"
10'-0"
40'-0"
10'-0"
TOC EL 0'-0"
2'-0"
2'-0"
4'-0"
8'-0"
45'-0"
45'-0"
8'-0"
4'-0"
57'-0"
100'-0"
57'-0"
ELEVATION ALONG COL "3"
(LOOKING EAST)

Figure A4

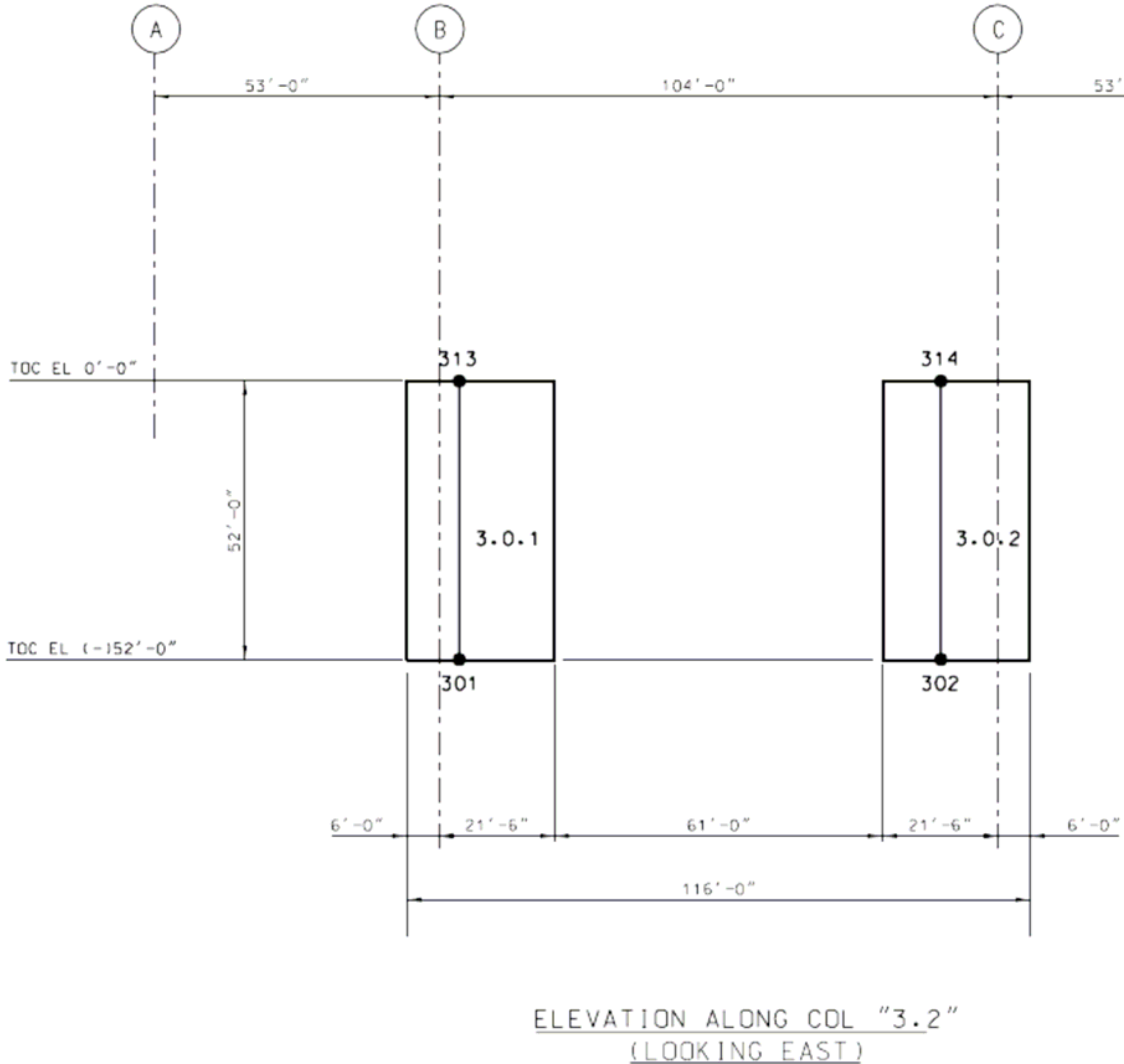

A
B
C
D
53'-0"
104'-0"
53'-0"
TOC EL 0'-0"
TOC EL (-152'-0"
52'-0"
313
314
3.0.1
3.0.2
301
302
6'-0"
21'-6"
61'-0"
21'-6"
6'-0"
116'-0"
ELEVATION ALONG COL "3.2"
(LOOKING EAST)

Figure A5

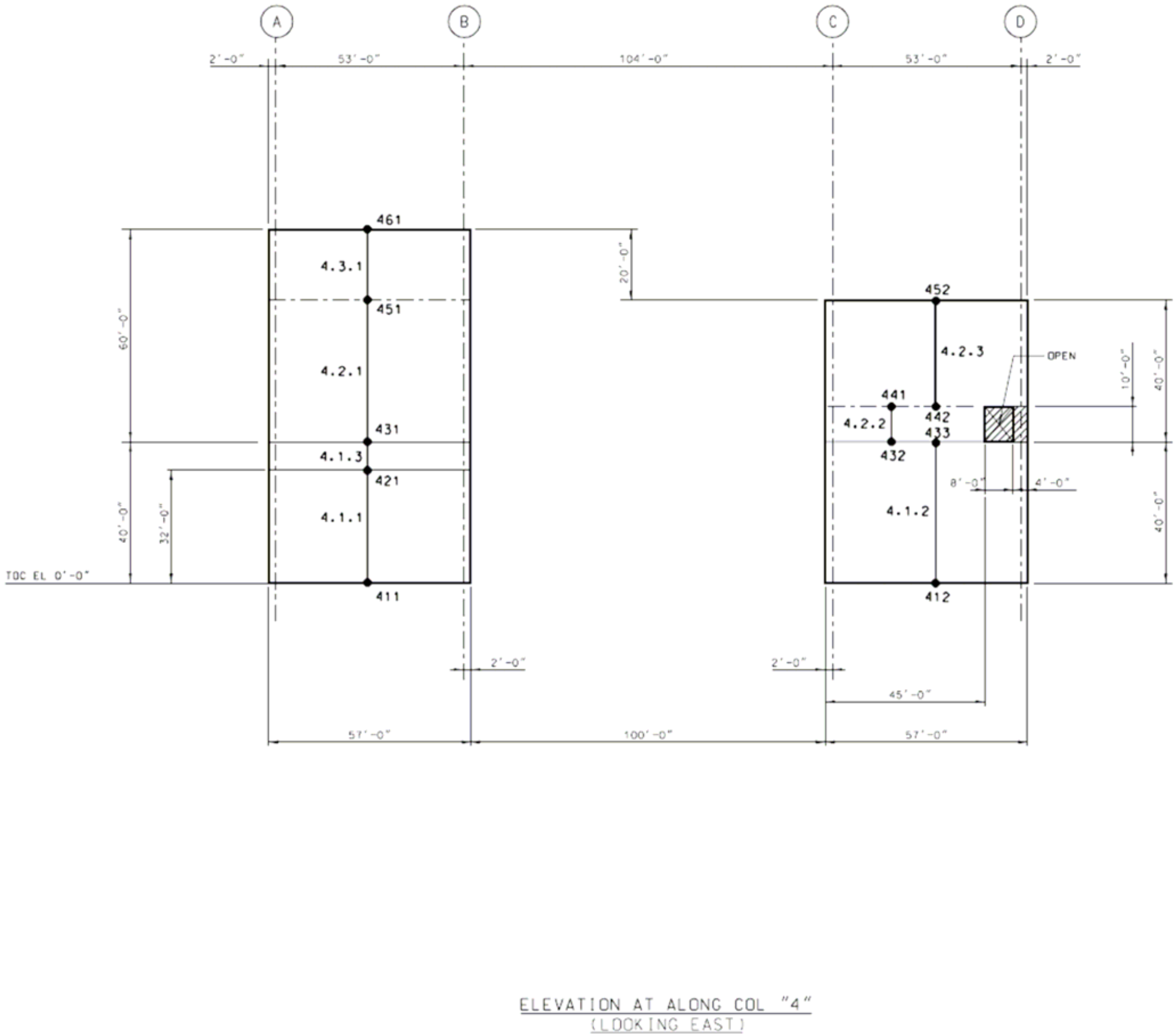

A
B
C
D
2'-0"
53'-0"
104'-0"
53'-0"
2'-0"
461
4.3.1
451
4.2.1
431
4.1.3
421
4.1.1
411
20'-0"
452
4.2.3
OPEN
441
442
4.2.2
433
432
4.1.2
412
60'-0"
40'-0"
32'-0"
TOC EL 0'-0"
10'-0"
40'-0"
40'-0"
8'-0"
4'-0"
2'-0"
2'-0"
45'-0"
57'-0"
100'-0"
57'-0"
ELEVATION AT ALONG COL "4"
(LOOKING EAST)

Figure A6

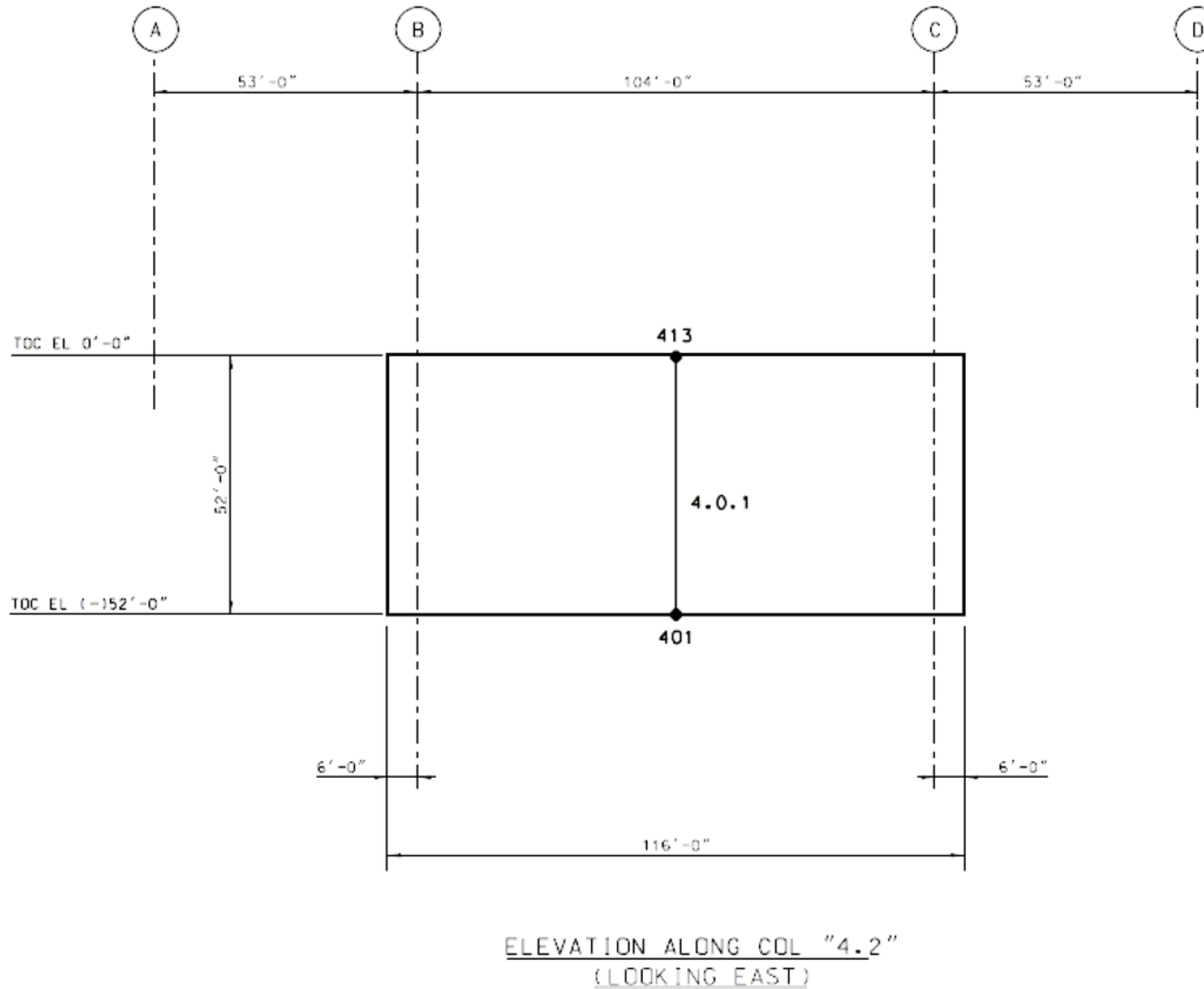

A
B
C
D
53'-0"
104'-0"
53'-0"
TOC EL 0'-0"
413
52'-0"
4.0.1
TOC EL (-)52'-0"
401
6'-0"
6'-0"
116'-0"
ELEVATION ALONG COL "4.2"
(LOOKING EAST)

Figure A7

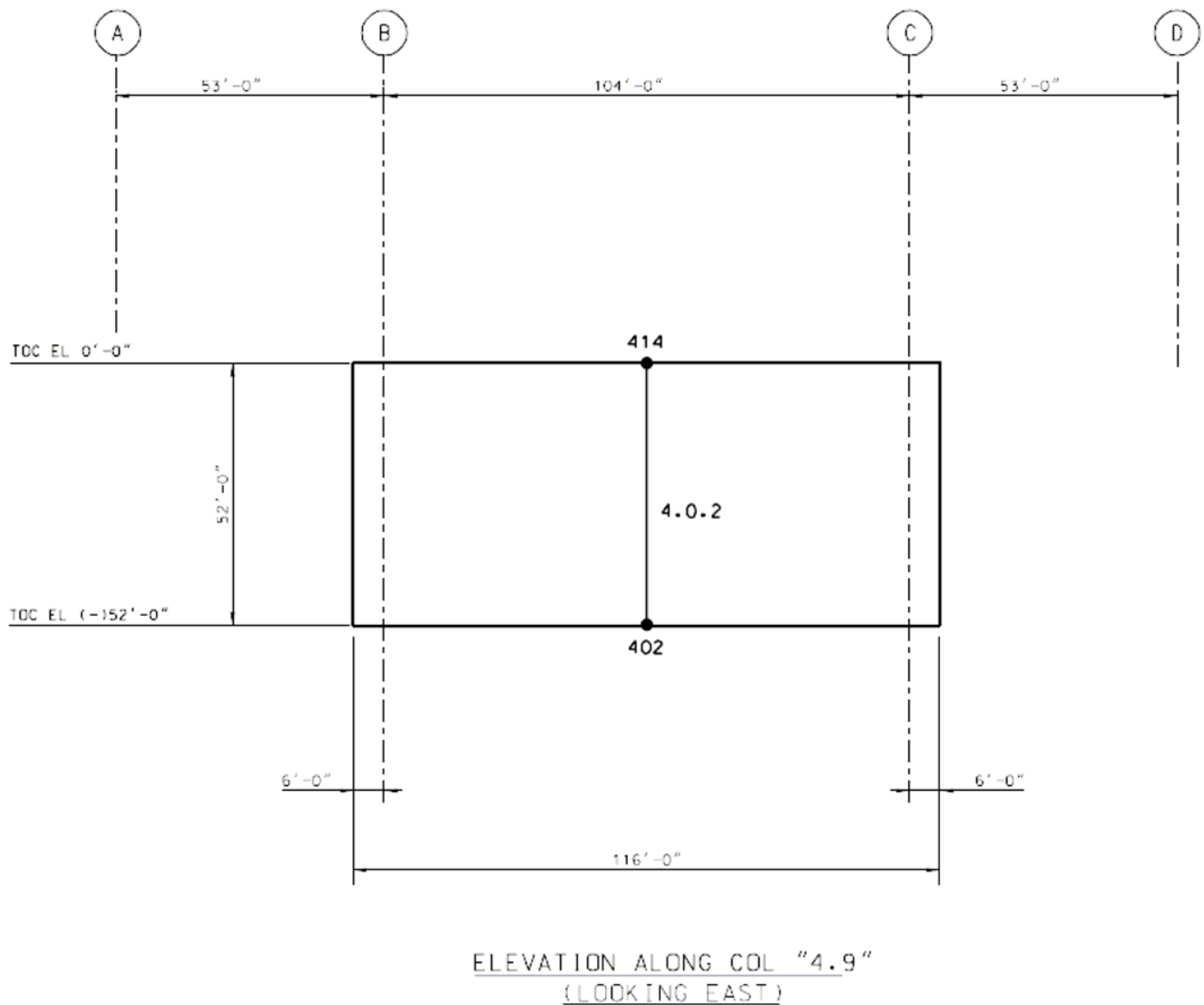

A
B
C
D
53'-0"
104'-0"
53'-0"
TOC EL 0'-0"
414
52'-0"
4.0.2
TOC EL (-)52'-0"
402
6'-0"
6'-0"
116'-0"
ELEVATION ALONG COL "4.9"
(LOOKING EAST)

Figure A8

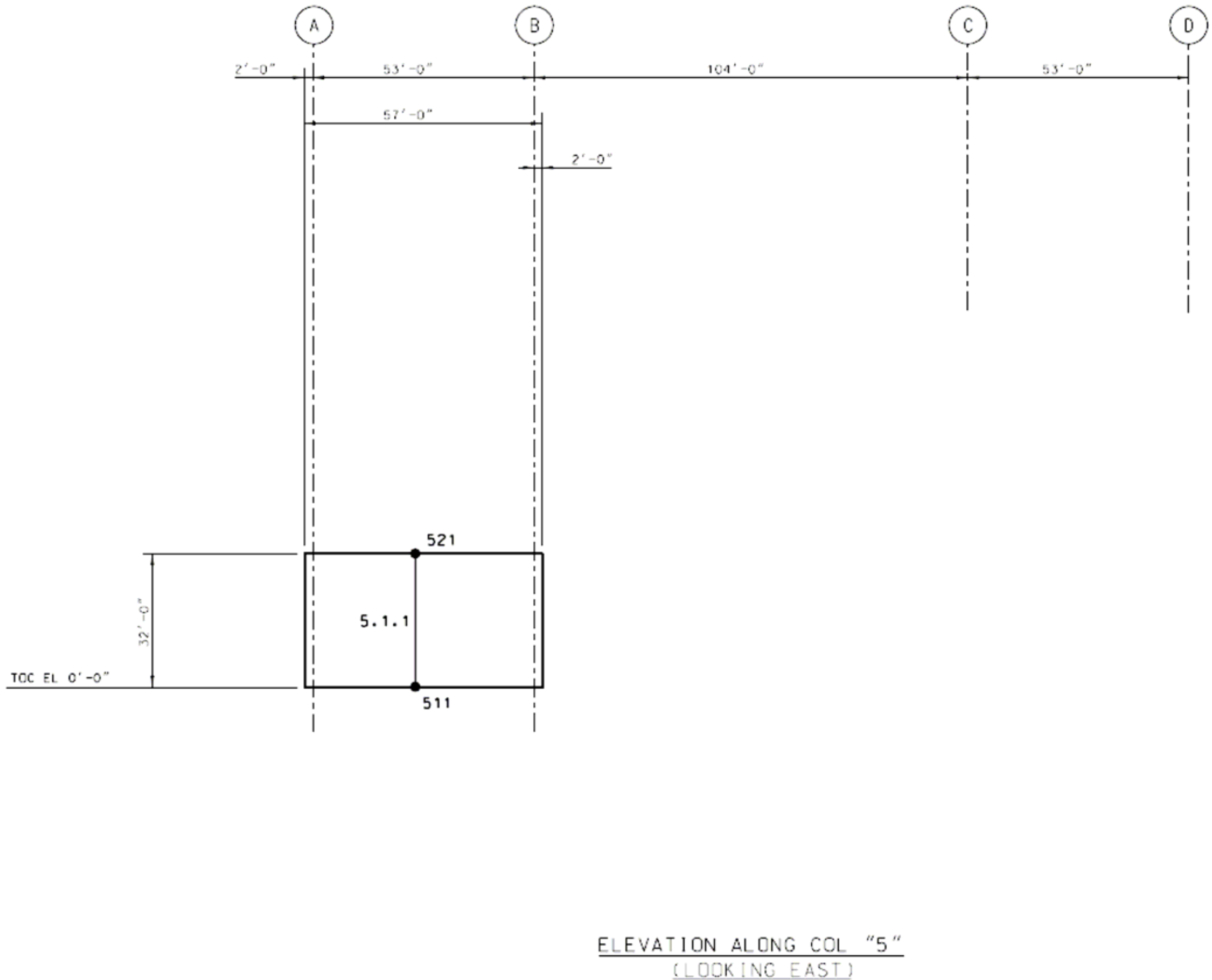

A
B
C
D
2'-0"
53'-0"
104'-0"
53'-0"
57'-0"
2'-0"
521
5.1.1
511
32'-0"
TOC EL 0'-0"
ELEVATION ALONG COL "5"
(LOOKING EAST)

Figure A9

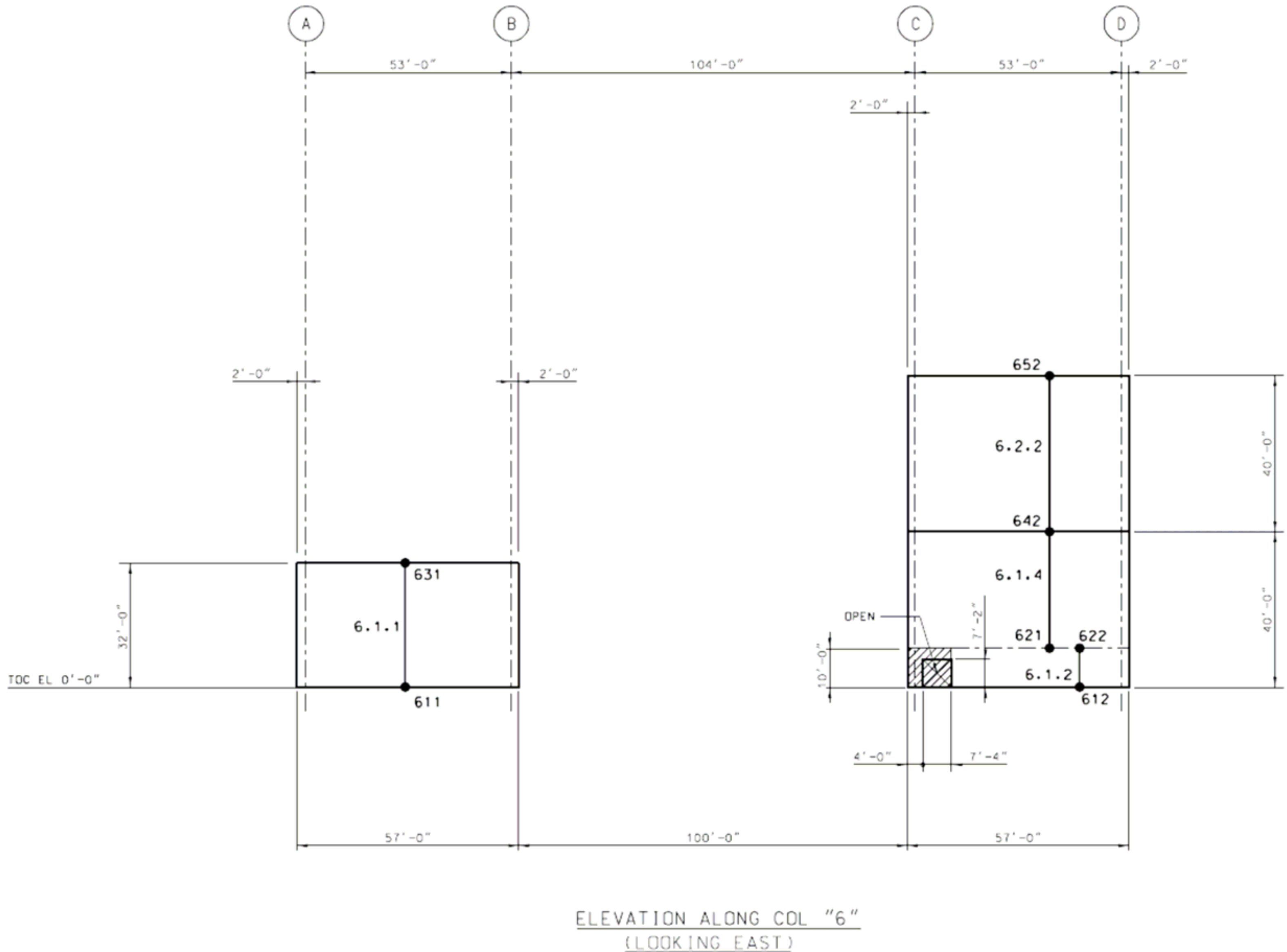

A
B
C
D
53'-0"
104'-0"
53'-0"
2'-0"
2'-0"
2'-0"
2'-0"
652
6.2.2
642
6.1.4
631
6.1.1
611
32'-0"
TOC EL 0'-0"
OPEN
7'-2"
621
622
6.1.2
612
10'-0"
40'-0"
40'-0"
4'-0"
7'-4"
57'-0"
100'-0"
57'-0"
ELEVATION ALONG COL "6"
(LOOKING EAST)

Figure A10

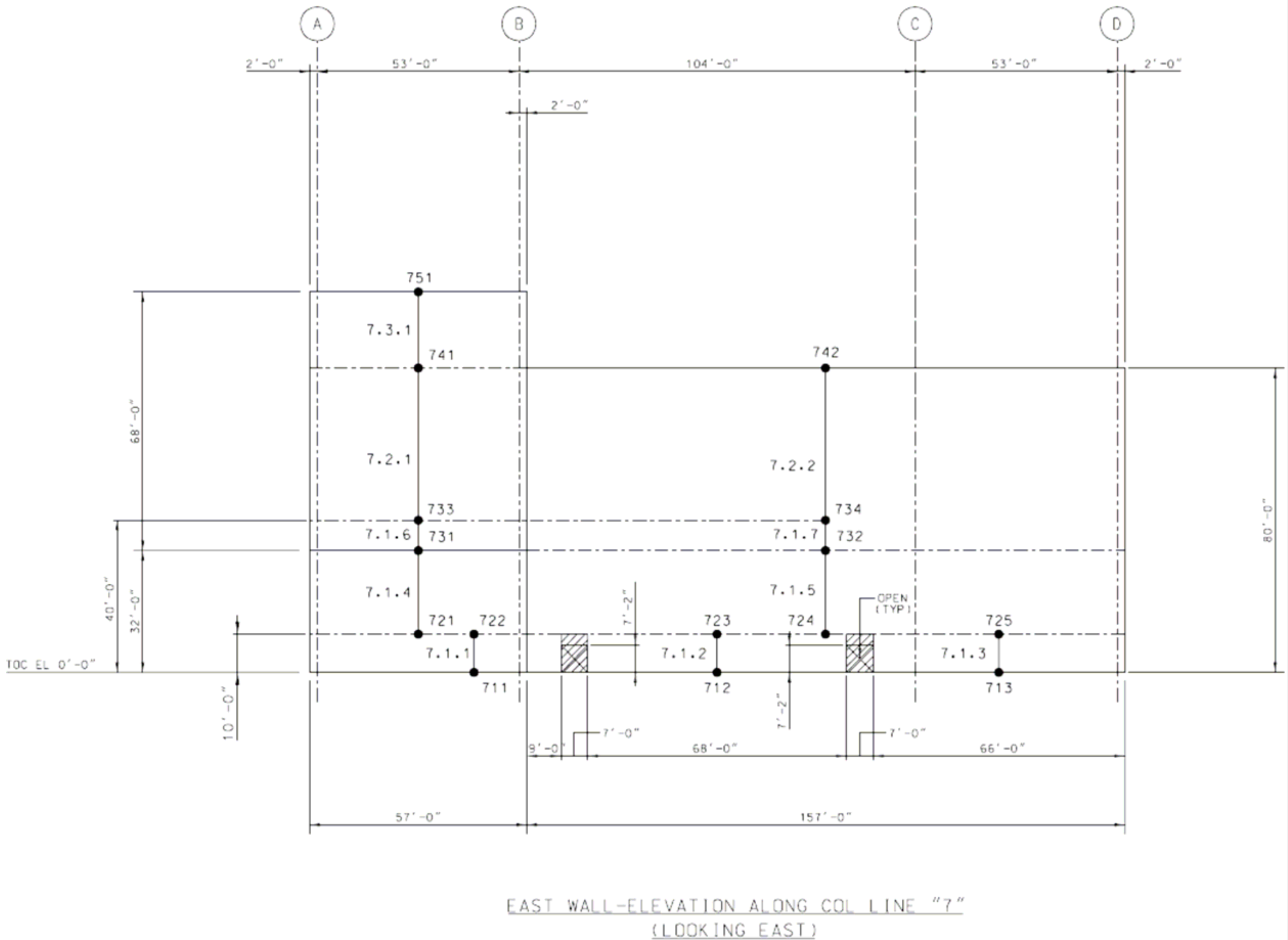
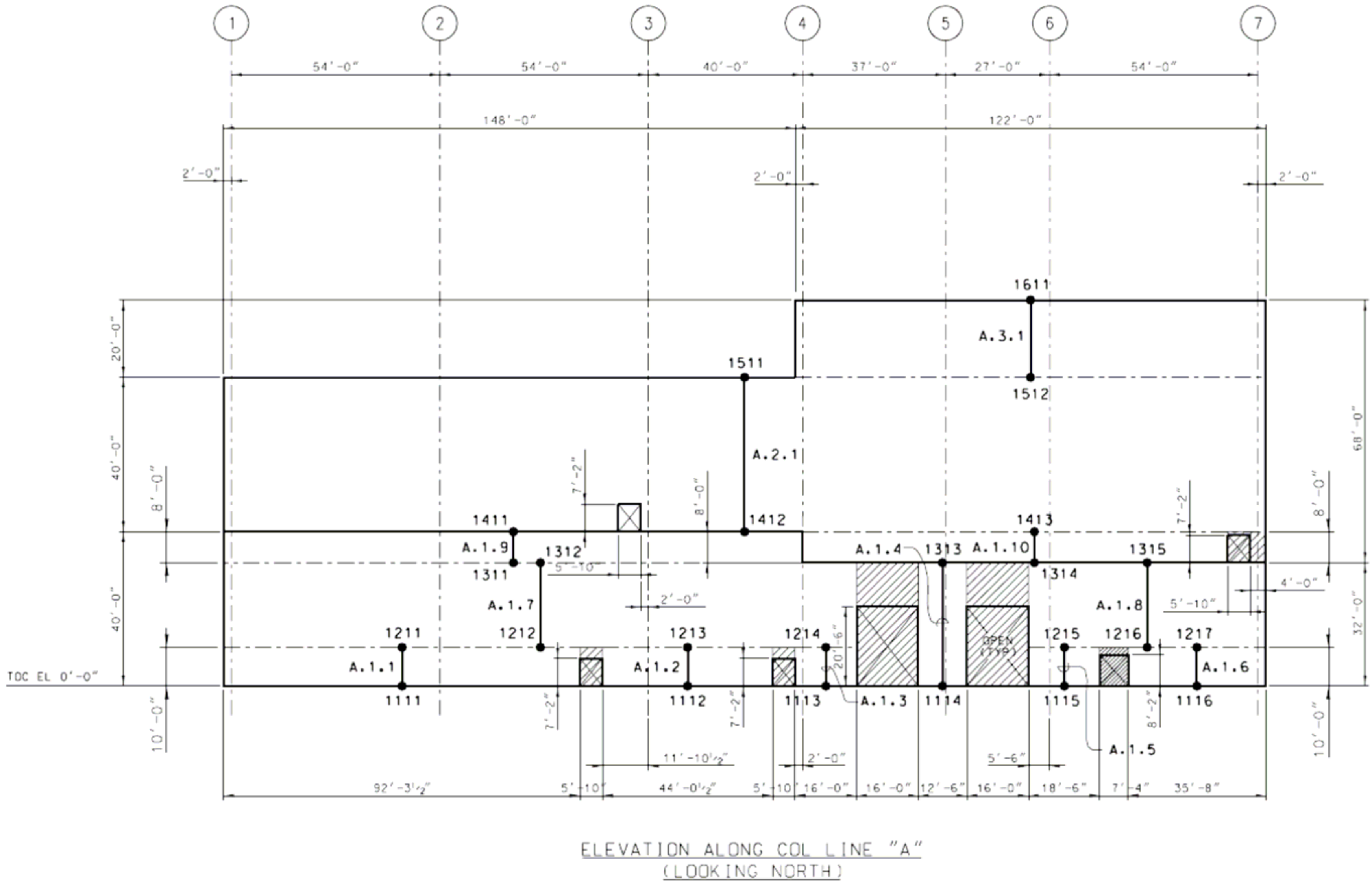
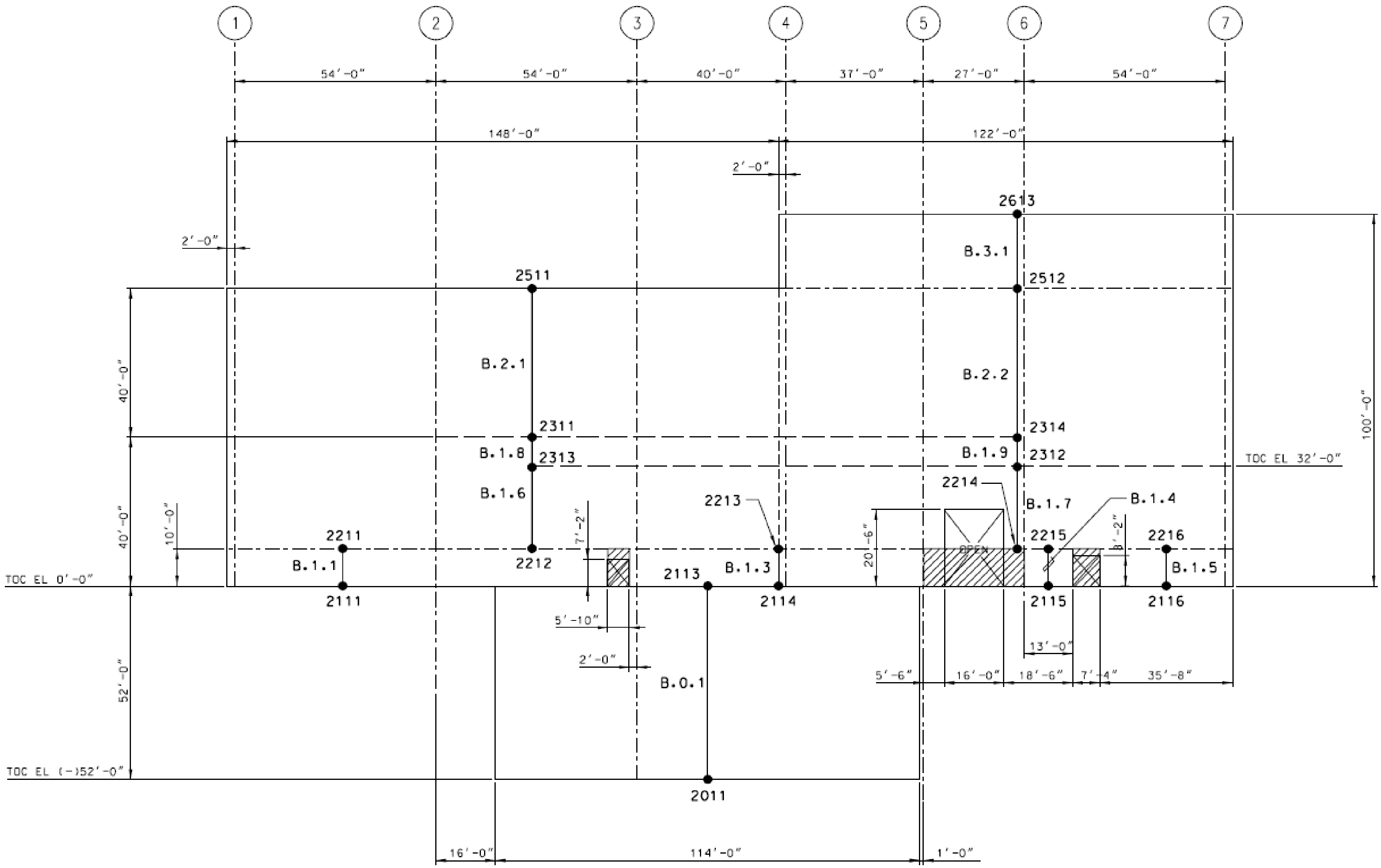

A
B
C
D
2'-0"
53'-0"
104'-0"
53'-0"
2'-0"
2'-0"
751
7.3.1
741
742
68'-0"
7.2.1
7.2.2
80'-0"
733
734
7.1.6
731
7.1.7
732
40'-0"
32'-0"
7.1.4
7.1.5
7'-2"
OPEN (TYP)
721
722
723
724
725
TOC EL 0'-0"
7.1.1
7.1.2
7.1.3
711
712
713
10'-0"
7'-2"
7'-0"
7'-0"
9'-0"
68'-0"
66'-0"
57'-0"
157'-0"
EAST WALL-ELEVATION ALONG COL LINE "7"
(LOOKING EAST)

Figure A11



1
2
3
4
5
6
7
54'-0"
54'-0"
40'-0"
37'-0"
27'-0"
54'-0"
148'-0"
122'-0"
2'-0"
1611
A.3.1
1511
1512
A.2.1
1411
1412
1413
A.1.9
1312
1311
A.1.4
1313
A.1.10
1314
1315
A.1.7
A.1.8
1211
1212
1213
1214
1215
1216
1217
A.1.1
A.1.2
A.1.3
A.1.5
A.1.6
1111
1112
1113
1114
1115
1116
OPEN (TYP)
TOC EL 0'-0"
20'-0"
40'-0"
40'-0"
10'-0"
8'-0"
7'-2"
68'-0"
32'-0"
4'-0"
5'-10"
11'-10½"
5'-6"
8'-2"
92'-3½"
44'-0½"
16'-0"
12'-6"
18'-6"
7'-4"
35'-8"
ELEVATION ALONG COL LINE "A"
(LOOKING NORTH)

Figure A12



ELEVATION ALONG COL "B"
(LOOKING NORTH)

Figure A13

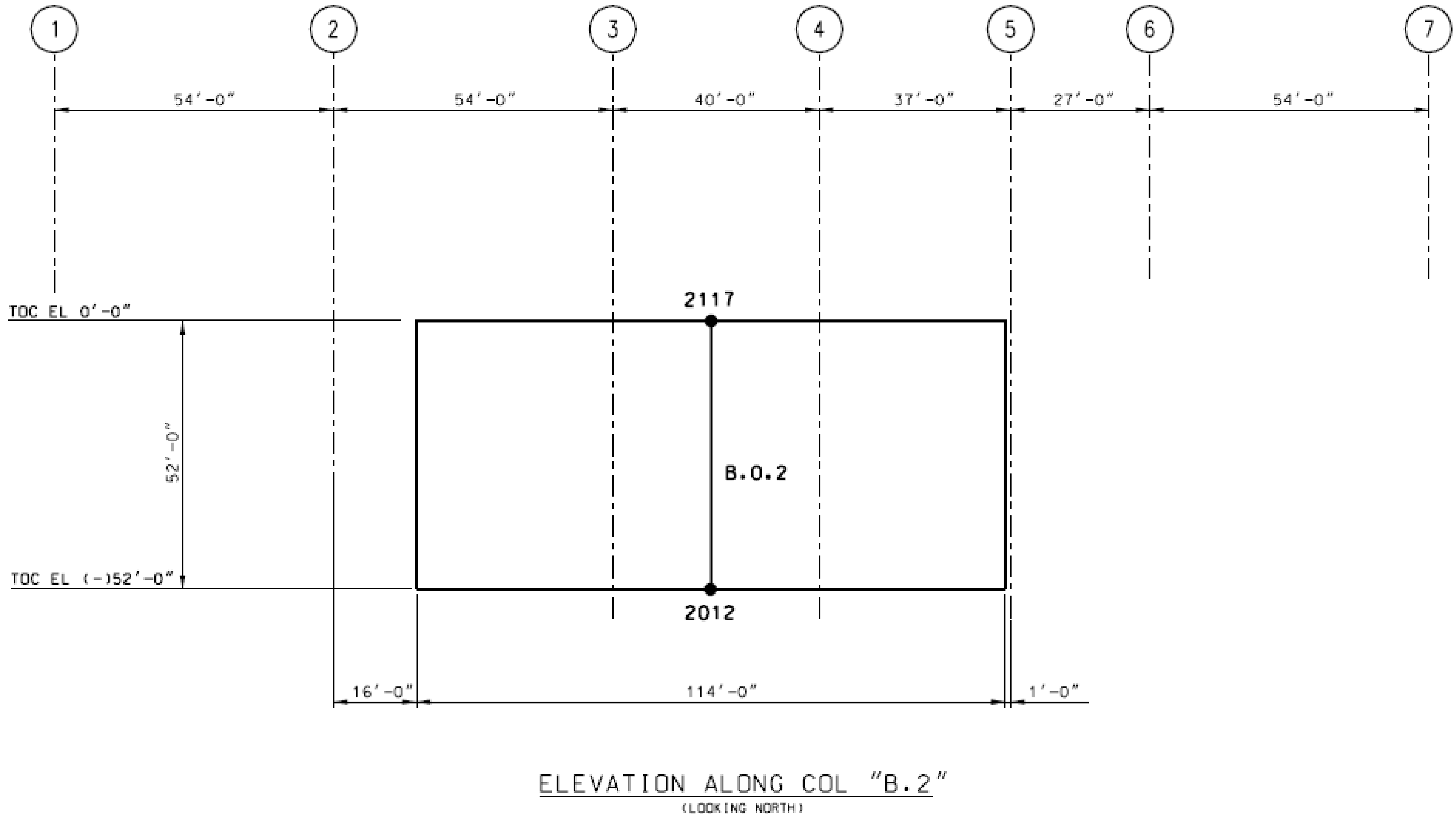

1
2
3
4
5
6
7
54'-0"
54'-0"
40'-0"
37'-0"
27'-0"
54'-0"
TOC EL 0'-0"
TOC EL (-)52'-0"
52'-0"
2117
B.0.2
2012
16'-0"
114'-0"
1'-0"
ELEVATION ALONG COL "B.2"
(LOOKING NORTH)

Figure A14

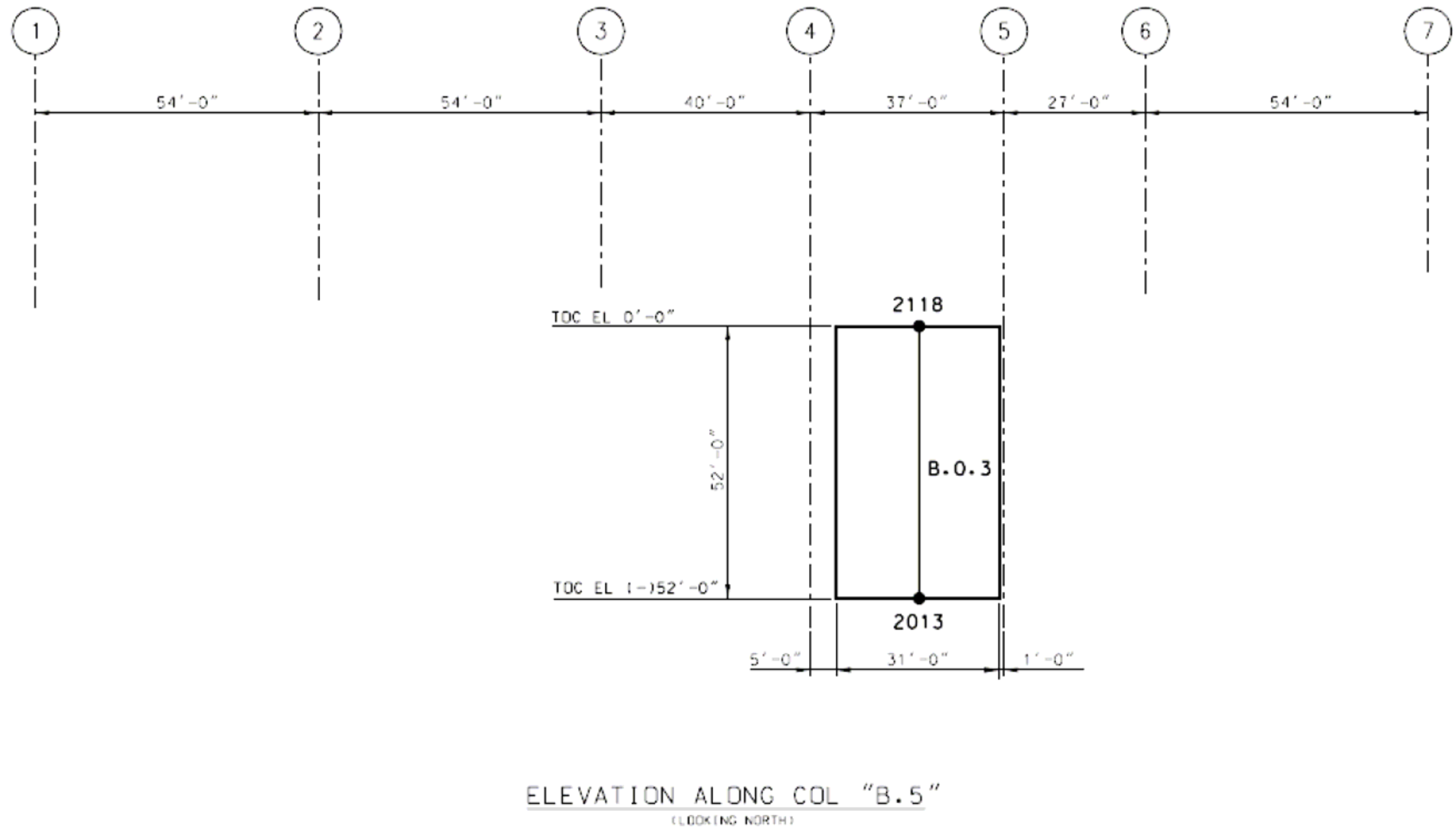

1
2
3
4
5
6
7
54'-0"
54'-0"
40'-0"
37'-0"
27'-0"
54'-0"
TOC EL 0'-0"
TOC EL (-)52'-0"
52'-0"
2118
B.0.3
2013
5'-0"
31'-0"
1'-0"
ELEVATION ALONG COL "B.5"
(LOOKING NORTH)

Figure A15

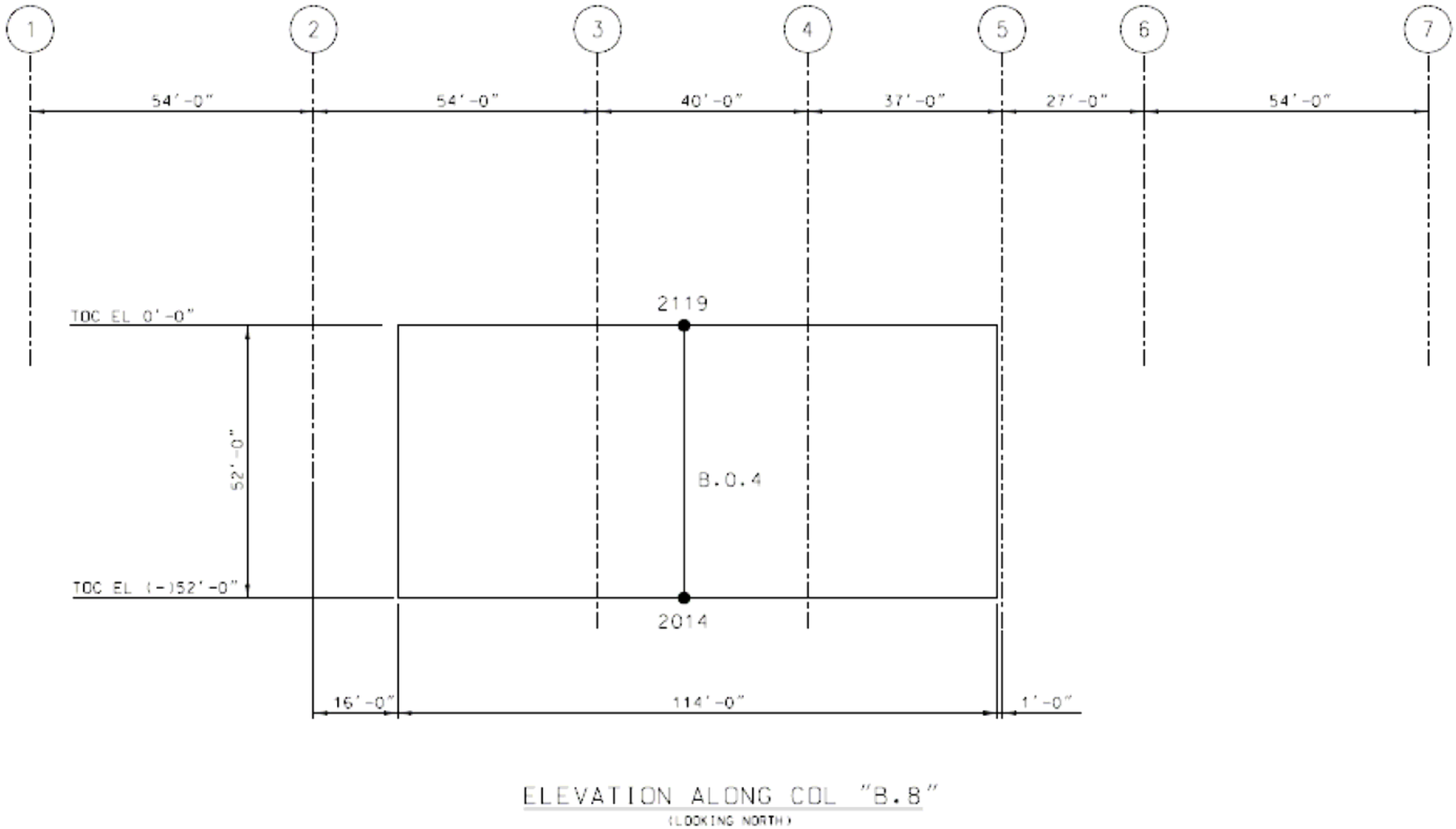
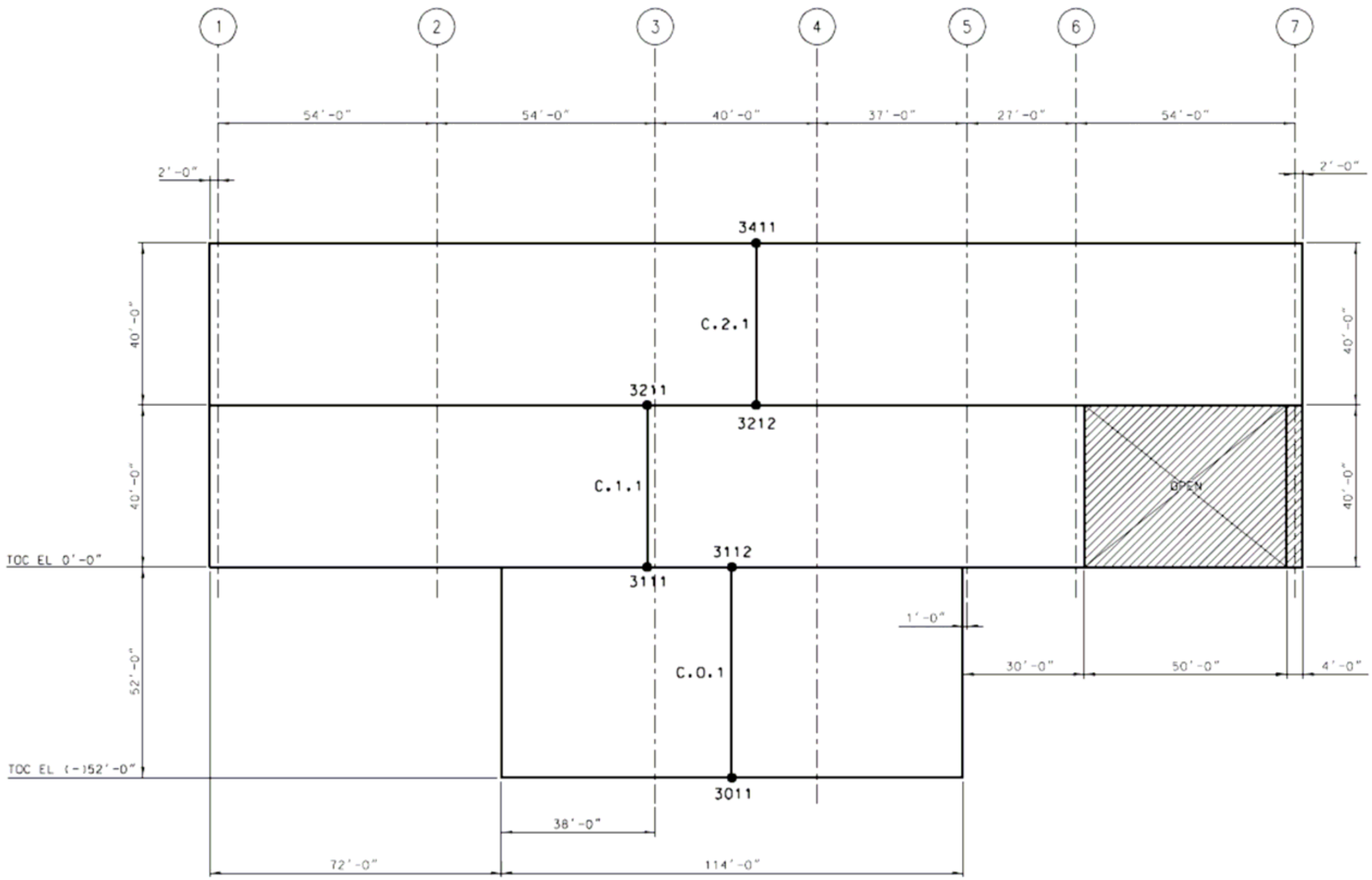
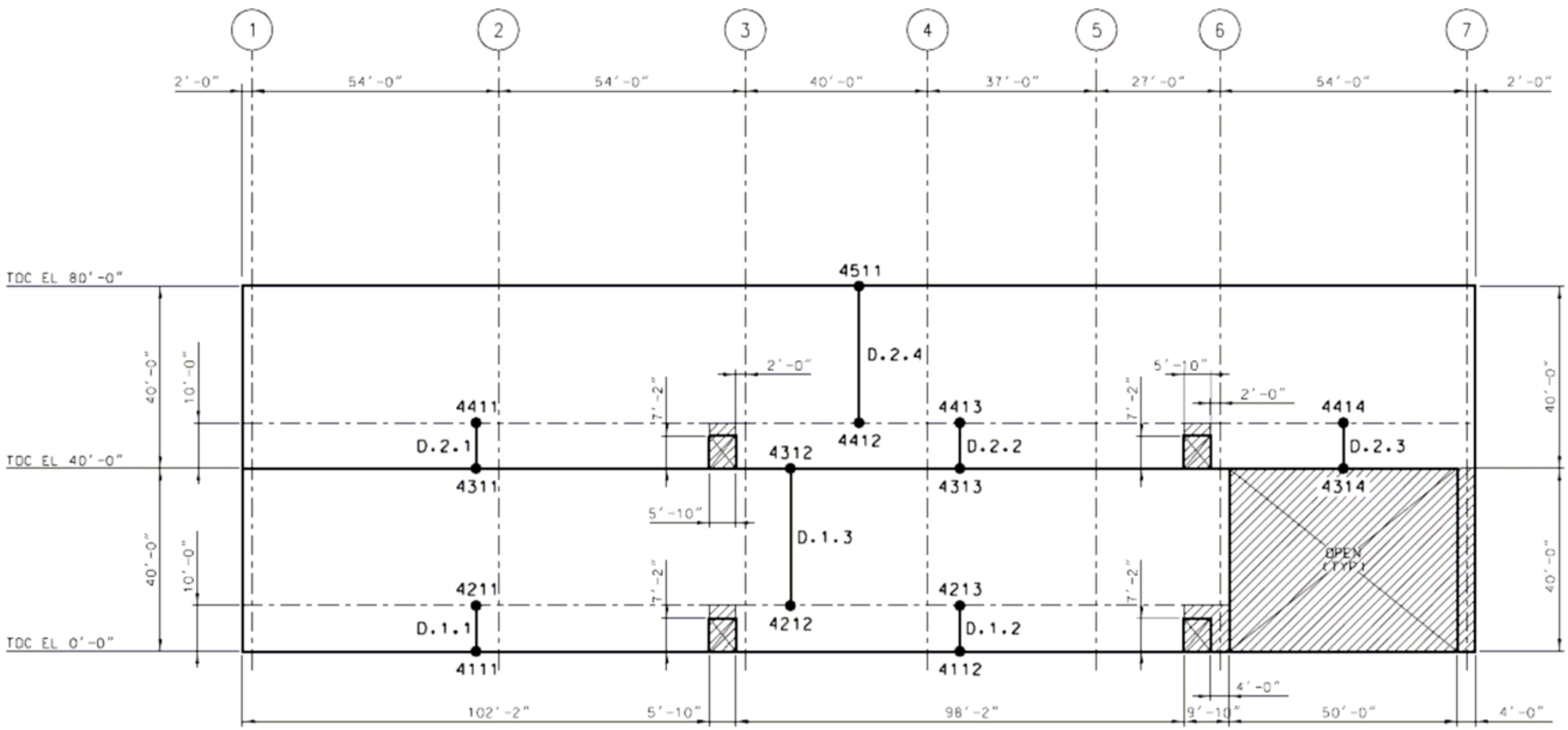

1
2
3
4
5
6
7
54'-0"
54'-0"
40'-0"
37'-0"
27'-0"
54'-0"
TOC EL 0'-0"
2119
52'-0"
B.0.4
TOC EL (-)52'-0"
2014
16'-0"
114'-0"
1'-0"
ELEVATION ALONG COL "B.8"
(LOOKING NORTH)

Figure A16



ELEVATION ALONG COL "C"
(LOOKING NORTH)

Figure A17



SOUTH WALL-ELEVATION ALONG COL LINE "D"
(LOOKING NORTH)

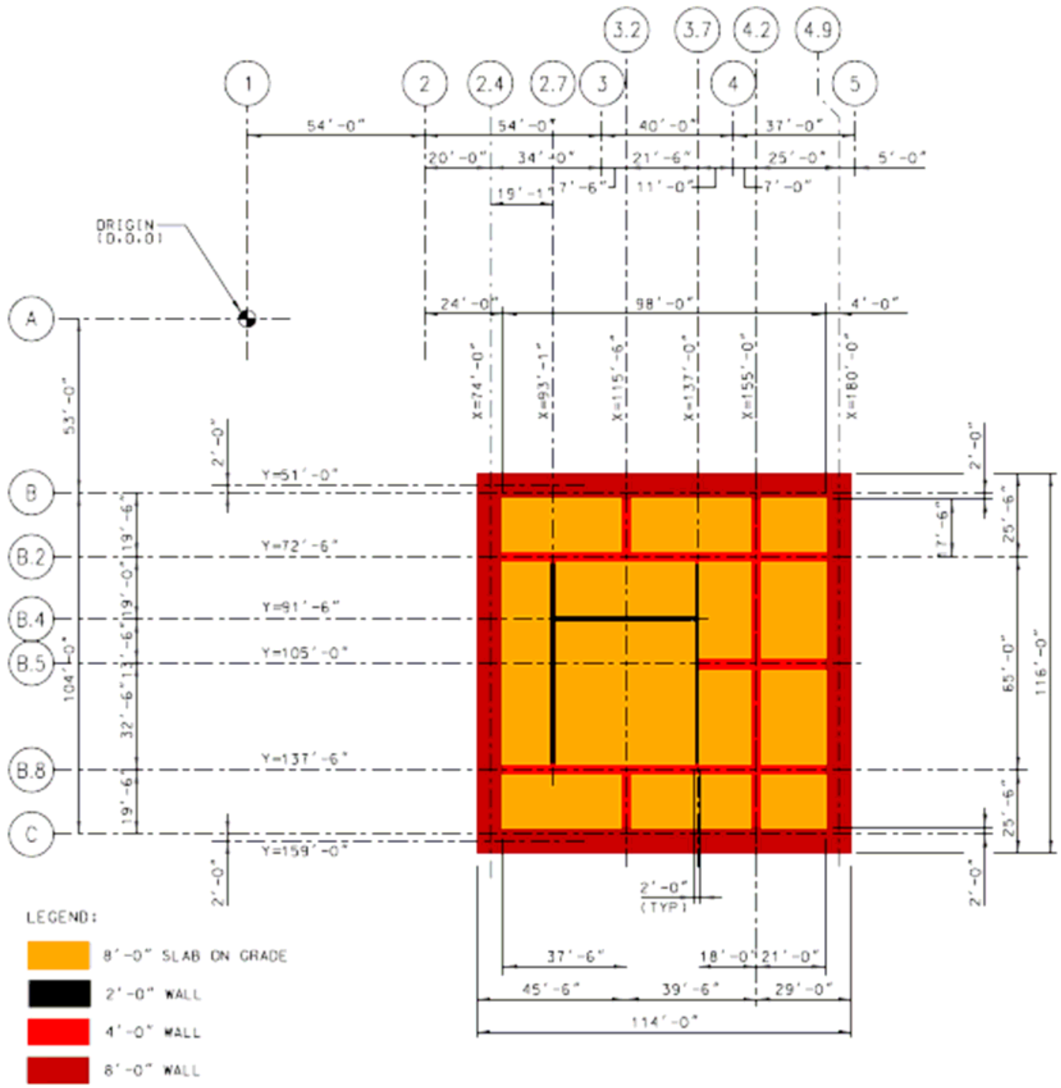
Figure A18

ATTACHMENT B

(Ref. 2.2.9, Attachment B)

Plans Showing Wall and Slab Thicknesses

FIGURES



BASEMENT FLOOR PLAN AT EL (-)152'-0"

Figure B1

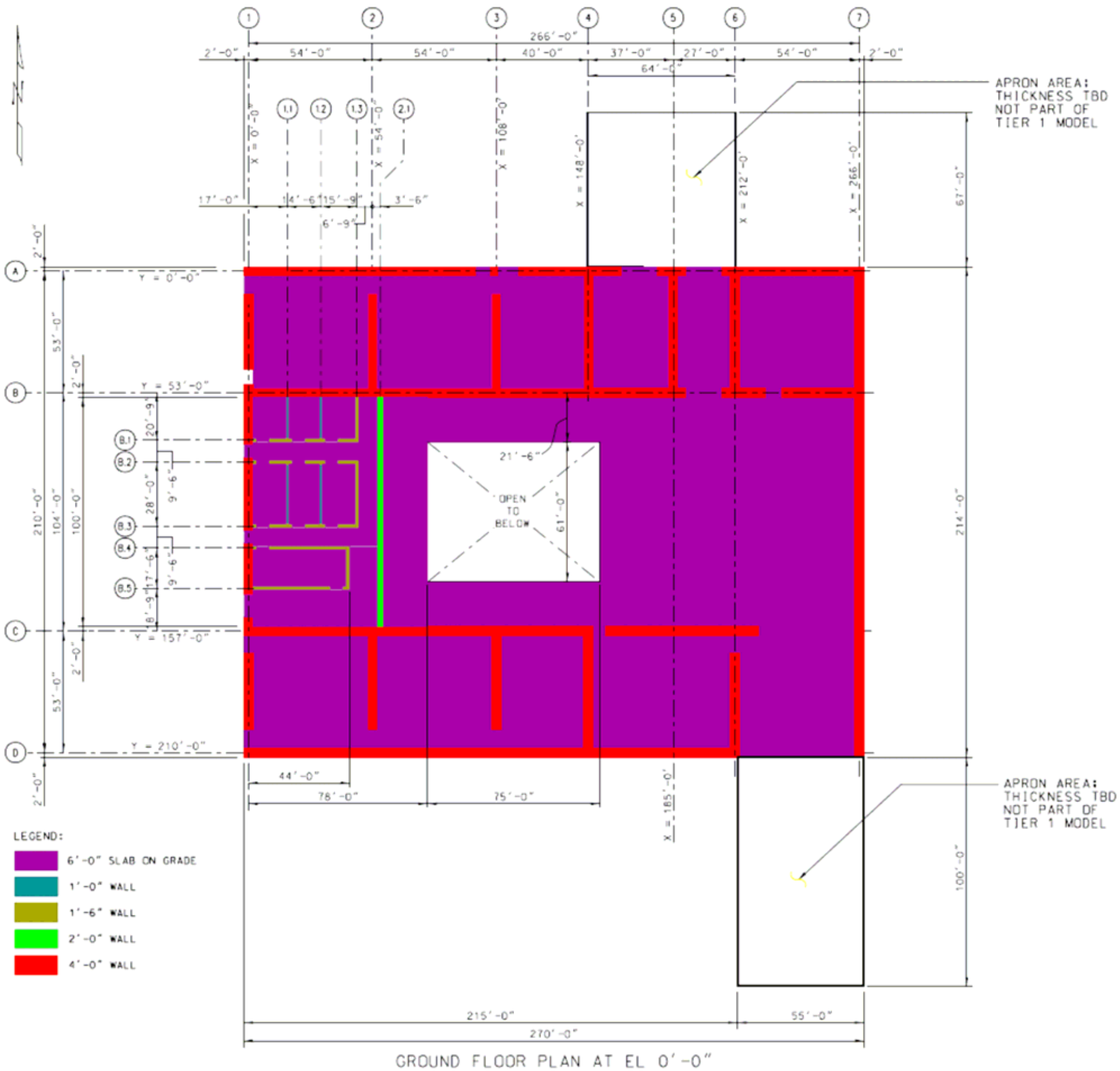
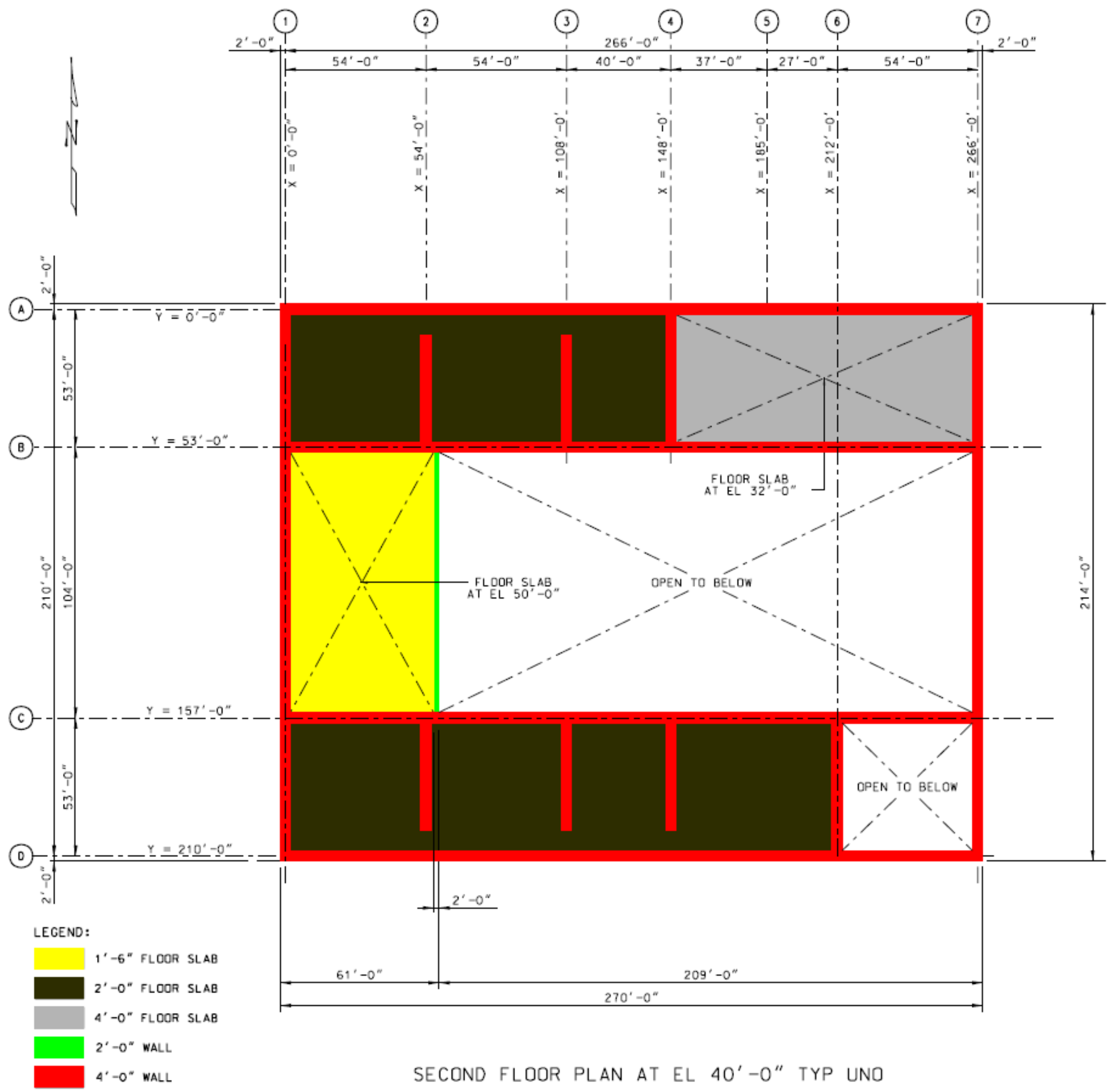

APRON AREA:
THICKNESS TBD
NOT PART OF
TIER 1 MODEL
OPEN
TO
BELOW
LEGEND:
6'-0" SLAB ON GRADE
1'-0" WALL
1'-6" WALL
2'-0" WALL
4'-0" WALL
GROUND FLOOR PLAN AT EL 0'-0"

Figure B2



1
2
3
4
5
6
7
A
B
C
D
2'-0"
266'-0"
54'-0"
54'-0"
40'-0"
37'-0"
27'-0"
54'-0"
X = 0'-0"
X = 54'-0"
X = 108'-0'
X = 148'-0'
X = 185'-0'
X = 212'-0'
X = 266'-0'
Y = 0'-0"
Y = 53'-0"
Y = 157'-0"
Y = 210'-0"
53'-0"
104'-0"
210'-0"
214'-0"
FLOOR SLAB AT EL 32'-0"
FLOOR SLAB AT EL 50'-0"
OPEN TO BELOW
OPEN TO BELOW
61'-0"
209'-0"
270'-0"
LEGEND:
1'-6" FLOOR SLAB
2'-0" FLOOR SLAB
4'-0" FLOOR SLAB
2'-0" WALL
4'-0" WALL
SECOND FLOOR PLAN AT EL 40'-0" TYP UNO

Figure B3

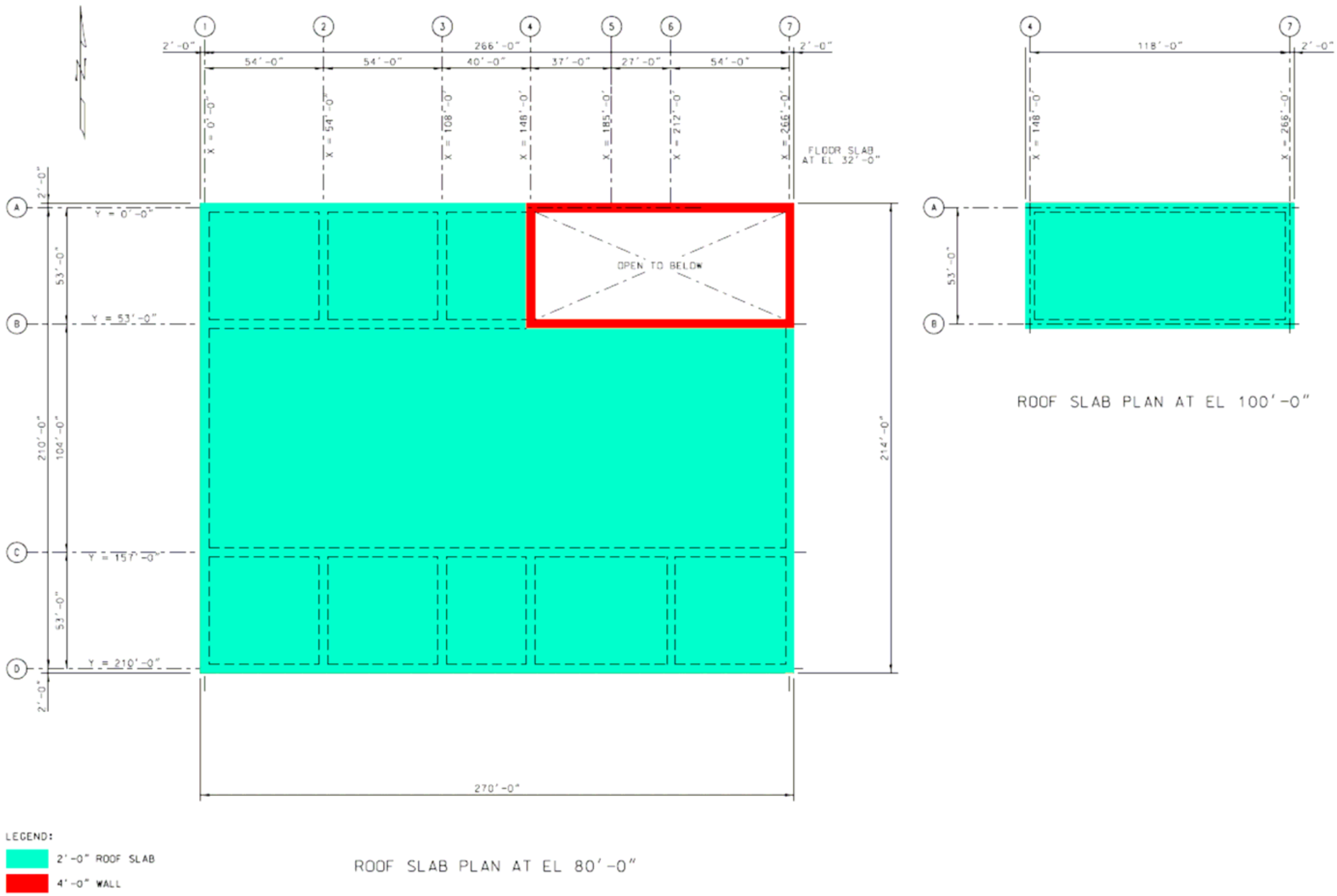

266'-0"
2'-0"
54'-0"
40'-0"
37'-0"
27'-0"
X = 0'-0"
X = 54'-0"
X = 108'-0"
X = 148'-0"
X = 185'-0"
X = 212'-0"
X = 266'-0"
FLOOR SLAB AT EL 32'-0"
Y = 0'-0"
Y = 53'-0"
Y = 157'-0"
Y = 210'-0"
53'-0"
104'-0"
210'-0"
214'-0"
270'-0"
OPEN TO BELOW
ROOF SLAB PLAN AT EL 80'-0"
118'-0"
ROOF SLAB PLAN AT EL 100'-0"
LEGEND:
2'-0" ROOF SLAB
4'-0" WALL

Figure B4

ATTACHMENT C

SAP2000 Stick Model Input

Source: Attachment C of Ref. 2.2.9, and soil spring of Ref 2.2.2

Company Name	Bechtel SAIC Company
Client Name	DOE
Project Name	Yucca Mountain Project
Project Number	
Model Name	WHF SAP 2000
Model Description	Stick Model
Revision Number	00A
Frame Type	
Engineer	ShuiFang Chou
Checker	Prithvi Gandhi
Supervisor	Michael Ruben
Issue Code	
Design Code	

SAP2000	9.1.4	Kip, ft, F

5KSI_CONC	Isotropic	None	1E-11	1E-09	617760	0.17

E = Modulus of Elasticity (2)
U = Poisson's Ratio (2)

(1) The concrete weights and mass are included in Wet Handling Facility (WHF) Mass Properties calculation, (mass and weight from Ref. 2.2.9), therefore a very small value of unit weight is assigned to the 5ksi_conc material.
(2) From Project Design Criteria Document, section 4.2.11.6.6 (Ref. 2.2.1)
Ec = 4.29×10^6 psi (for fc' = 5000 psi) = 617760 kip/ft^2
U = 0.17

Origin Location
Intersection of Column Lines "A" & "1"

WHF Seismic Analysis Coordinates (Ref. 2.2.9)						
		Center of Mass (ft.)			Mass	Weight Vertical
	Node	x	z	y	kip-sec^2/ft	Kip
		126.5	104.3	-52	1625.5	52341.1
Same		130.5	104.2	0	3150.2	101438
Mass		209.1	25.2	32	476.2	15333.5
as		88.3	118.9	40	1385.6	44617
Ref. 2.2.9		132.6	113.3	80	1493.8	48100.7
		212.0	20.2	100	244.2	7861.7

WHF Seismic Analysis Coordinates							
		Center of Mass (ft.)			Mass	Weight Vertical	Weight Horiz.
	Node	x	y	z	kip-sec^2/ft	Kip	Kip
	1099	126.50	104.30	-52	1625.5	52341	46072
To	2099	130.50	104.20	0	3150.2	101438	107707
SAP2000	3099	209.10	25.20	32	476.2	15334	15334
	4099	88.30	118.90	40	1385.6	44617	44617
	5099	132.60	113.30	80	1493.8	48101	48101
	6099	212.00	20.20	100	244.2	7862	7862
	Total				8376	269693	269693

Weight of Water Distribution:

Weight of Water = 12538 kip (Ref. 2.2.9)

50% weight lumped at -52' in Horizontal direction: Weight in Horizontal direction = 52341 - (12538) + (12538/2) = 46072 Kip

50% weight lumped at 0' in Horizontal direction: Weight in Horizontal direction = 101438 + (12538/2) = 107707 Kip

Joint	CoordSys	CoordType	XorR	Y	T	Z	SpecialJt
Text	Text	Text	ft	ft	Degrees	ft	Yes/No
111	GLOBAL	Cartesian	0.00	26.50		0.00	Yes
112	GLOBAL	Cartesian	0.00	55.00		0.00	Yes
113	GLOBAL	Cartesian	0.00	109.09		0.00	Yes
114	GLOBAL	Cartesian	0.00	183.17		0.00	Yes
121	GLOBAL	Cartesian	0.00	26.50		10.00	Yes
122	GLOBAL	Cartesian	0.00	55.00		10.00	Yes
123	GLOBAL	Cartesian	0.00	105.00		10.00	Yes
124	GLOBAL	Cartesian	0.00	109.09		10.00	Yes
125	GLOBAL	Cartesian	0.00	183.17		10.00	Yes
131	GLOBAL	Cartesian	0.00	26.50		40.00	Yes
132	GLOBAL	Cartesian	0.00	105.00		40.00	Yes
134	GLOBAL	Cartesian	0.00	183.16		40.00	Yes
141	GLOBAL	Cartesian	0.00	26.50		50.00	Yes
142	GLOBAL	Cartesian	0.00	105.00		50.00	Yes
144	GLOBAL	Cartesian	0.00	183.16		50.00	Yes
151	GLOBAL	Cartesian	0.00	105.00		80.00	Yes
201	GLOBAL	Cartesian	74.00	105.00		-52.00	Yes
211	GLOBAL	Cartesian	54.00	32.50		0.00	Yes
212	GLOBAL	Cartesian	54.00	105.00		0.00	Yes
213	GLOBAL	Cartesian	54.00	177.50		0.00	Yes
214	GLOBAL	Cartesian	74.00	105.00		0.00	Yes
221	GLOBAL	Cartesian	54.00	26.50		10.00	Yes
222	GLOBAL	Cartesian	54.00	32.50		10.00	Yes
223	GLOBAL	Cartesian	54.00	177.50		10.00	Yes
224	GLOBAL	Cartesian	54.00	183.50		10.00	Yes
231	GLOBAL	Cartesian	54.00	26.50		40.00	Yes
232	GLOBAL	Cartesian	54.00	32.50		40.00	Yes
233	GLOBAL	Cartesian	54.00	105.00		40.00	Yes
234	GLOBAL	Cartesian	54.00	177.50		40.00	Yes
235	GLOBAL	Cartesian	54.00	183.50		40.00	Yes
241	GLOBAL	Cartesian	54.00	26.50		50.00	Yes
242	GLOBAL	Cartesian	54.00	32.50		50.00	Yes
243	GLOBAL	Cartesian	54.00	177.50		50.00	Yes
244	GLOBAL	Cartesian	54.00	183.50		50.00	Yes
251	GLOBAL	Cartesian	54.00	26.50		80.00	Yes
252	GLOBAL	Cartesian	54.00	183.50		80.00	Yes
301	GLOBAL	Cartesian	115.50	60.75		-52.00	Yes
302	GLOBAL	Cartesian	115.50	149.25		-52.00	Yes
311	GLOBAL	Cartesian	108.00	32.50		0.00	Yes
312	GLOBAL	Cartesian	108.00	177.50		0.00	Yes
313	GLOBAL	Cartesian	115.50	60.75		0.00	Yes
314	GLOBAL	Cartesian	115.50	149.25		0.00	Yes
321	GLOBAL	Cartesian	108.00	26.50		10.00	Yes
322	GLOBAL	Cartesian	108.00	32.50		10.00	Yes
323	GLOBAL	Cartesian	108.00	177.50		10.00	Yes

324	GLOBAL	Cartesian	108.00	183.50		10.00	Yes

of Ref. 2.2.9)							
Joint	**CoordSys**	**CoordType**	**XorR**	**Y**	**T**	**Z**	**SpecialJt**
Text	Text	Text	ft	ft	Degrees	ft	Yes/No
331	GLOBAL	Cartesian	108.00	26.50		40.00	Yes
332	GLOBAL	Cartesian	108.00	32.50		40.00	Yes
333	GLOBAL	Cartesian	108.00	177.50		40.00	Yes
334	GLOBAL	Cartesian	108.00	183.50		40.00	Yes
341	GLOBAL	Cartesian	108.00	26.50		50.00	Yes
342	GLOBAL	Cartesian	108.00	32.50		50.00	Yes
343	GLOBAL	Cartesian	108.00	177.50		50.00	Yes
344	GLOBAL	Cartesian	108.00	183.50		50.00	Yes
351	GLOBAL	Cartesian	108.00	26.50		80.00	Yes
352	GLOBAL	Cartesian	108.00	183.50		80.00	Yes
401	GLOBAL	Cartesian	155.00	105.00		-52.00	Yes
402	GLOBAL	Cartesian	180.00	105.00		-52.00	Yes
411	GLOBAL	Cartesian	148.00	26.50		0.00	Yes
412	GLOBAL	Cartesian	148.00	183.50		0.00	Yes
413	GLOBAL	Cartesian	155.00	105.00		0.00	Yes
414	GLOBAL	Cartesian	180.00	105.00		0.00	Yes
421	GLOBAL	Cartesian	148.00	26.50		32.00	Yes
431	GLOBAL	Cartesian	148.00	26.50		40.00	Yes
432	GLOBAL	Cartesian	148.00	177.50		40.00	Yes
433	GLOBAL	Cartesian	148.00	183.50		40.00	Yes
441	GLOBAL	Cartesian	148.00	177.50		50.00	Yes
442	GLOBAL	Cartesian	148.00	183.50		50.00	Yes
451	GLOBAL	Cartesian	148.00	26.50		80.00	Yes
452	GLOBAL	Cartesian	148.00	183.50		80.00	Yes
461	GLOBAL	Cartesian	148.00	26.50		100.00	Yes
511	GLOBAL	Cartesian	185.00	26.50		0.00	Yes
521	GLOBAL	Cartesian	185.00	26.50		32.00	Yes
611	GLOBAL	Cartesian	212.00	26.50		0.00	Yes
612	GLOBAL	Cartesian	212.00	189.17		0.00	Yes
621	GLOBAL	Cartesian	212.00	183.50		10.00	Yes
622	GLOBAL	Cartesian	212.00	189.17		10.00	Yes
631	GLOBAL	Cartesian	212.00	26.50		32.00	Yes
642	GLOBAL	Cartesian	212.00	183.50		40.00	Yes
652	GLOBAL	Cartesian	212.00	183.50		80.00	Yes
711	GLOBAL	Cartesian	266.00	31.00		0.00	Yes
712	GLOBAL	Cartesian	266.00	105.00		0.00	Yes
713	GLOBAL	Cartesian	266.00	179.00		0.00	Yes
721	GLOBAL	Cartesian	266.00	26.50		10.00	Yes
722	GLOBAL	Cartesian	266.00	31.00		10.00	Yes
723	GLOBAL	Cartesian	266.00	105.00		10.00	Yes
724	GLOBAL	Cartesian	266.00	133.50		10.00	Yes
725	GLOBAL	Cartesian	266.00	179.00		10.00	Yes
731	GLOBAL	Cartesian	266.00	26.50		32.00	Yes
732	GLOBAL	Cartesian	266.00	133.50		32.00	Yes
733	GLOBAL	Cartesian	266.00	26.50		40.00	Yes

734	GLOBAL	Cartesian	266.00	133.50		40.00	Yes
741	GLOBAL	Cartesian	266.00	26.50		80.00	Yes

TABLE: C4 Joint Coordinates (See attachment C of Ref. 2.2.9)							
Joint	CoordSys	CoordType	XorR	Y	T	Z	SpecialJt
Text	Text	Text	ft	ft	Degrees	ft	Yes/No
742	GLOBAL	Cartesian	266.00	133.50		80.00	Yes
751	GLOBAL	Cartesian	266.00	26.50		100.00	Yes
1111	GLOBAL	Cartesian	44.13	0.00		0.00	Yes
1112	GLOBAL	Cartesian	118.00	0.00		0.00	Yes
1113	GLOBAL	Cartesian	154.00	0.00		0.00	Yes
1114	GLOBAL	Cartesian	184.25	0.00		0.00	Yes
1115	GLOBAL	Cartesian	215.75	0.00		0.00	Yes
1116	GLOBAL	Cartesian	250.17	0.00		0.00	Yes
1211	GLOBAL	Cartesian	44.13	0.00		10.00	Yes
1212	GLOBAL	Cartesian	80.00	0.00		10.00	Yes
1213	GLOBAL	Cartesian	118.00	0.00		10.00	Yes
1214	GLOBAL	Cartesian	154.00	0.00		10.00	Yes
1215	GLOBAL	Cartesian	215.75	0.00		10.00	Yes
1216	GLOBAL	Cartesian	237.25	0.00		10.00	Yes
1217	GLOBAL	Cartesian	250.17	0.00		10.00	Yes
1311	GLOBAL	Cartesian	73.00	0.00		32.00	Yes
1312	GLOBAL	Cartesian	80.00	0.00		32.00	Yes
1313	GLOBAL	Cartesian	184.25	0.00		32.00	Yes
1314	GLOBAL	Cartesian	203.00	0.00		32.00	Yes
1315	GLOBAL	Cartesian	237.25	0.00		32.00	Yes
1411	GLOBAL	Cartesian	73.00	0.00		40.00	Yes
1412	GLOBAL	Cartesian	133.00	0.00		40.00	Yes
1413	GLOBAL	Cartesian	203.00	0.00		40.00	Yes
1511	GLOBAL	Cartesian	133.00	0.00		80.00	Yes
1512	GLOBAL	Cartesian	207.00	0.00		80.00	Yes
1611	GLOBAL	Cartesian	207.00	0.00		100.00	Yes
2011	GLOBAL	Cartesian	127.00	53.00		-52.00	Yes
2012	GLOBAL	Cartesian	127.00	72.50		-52.00	Yes
2013	GLOBAL	Cartesian	168.50	105.00		-52.00	Yes
2014	GLOBAL	Cartesian	127.00	137.50		-52.00	Yes
2111	GLOBAL	Cartesian	26.00	53.00		0.00	Yes
2113	GLOBAL	Cartesian	127.00	53.00		0.00	Yes
2114	GLOBAL	Cartesian	145.50	53.00		0.00	Yes
2115	GLOBAL	Cartesian	218.50	53.00		0.00	Yes
2116	GLOBAL	Cartesian	250.17	53.00		0.00	Yes
2117	GLOBAL	Cartesian	127.00	72.50		0.00	Yes
2118	GLOBAL	Cartesian	168.50	105.00		0.00	Yes
2119	GLOBAL	Cartesian	127.00	137.50		0.00	Yes
2211	GLOBAL	Cartesian	26.00	53.00		10.00	Yes
2212	GLOBAL	Cartesian	72.00	53.00		10.00	Yes
2213	GLOBAL	Cartesian	145.50	53.00		10.00	Yes
2214	GLOBAL	Cartesian	207.00	53.00		10.00	Yes

2215	GLOBAL	Cartesian	218.50	53.00		10.00	Yes
2216	GLOBAL	Cartesian	250.17	53.00		10.00	Yes
2311	GLOBAL	Cartesian	72.00	53.00		40.00	Yes
2312	GLOBAL	Cartesian	207.00	53.00		32.00	Yes
2313	GLOBAL	Cartesian	72.00	53.00		32.00	Yes

TABLE: C4 Joint Coordinates (See attachment C of Ref. 2.2.9)							
Joint	CoordSys	CoordType	XorR	Y	T	Z	SpecialJt
Text	Text	Text	ft	ft	Degrees	ft	Yes/No
2513	GLOBAL	Cartesian	207.00	53.00		80.00	Yes
2613	GLOBAL	Cartesian	207.00	53.00		100.00	Yes
3011	GLOBAL	Cartesian	127.00	157.00		-52.00	Yes
3111	GLOBAL	Cartesian	106.00	157.00		0.00	Yes
3112	GLOBAL	Cartesian	127.00	157.00		0.00	Yes
3211	GLOBAL	Cartesian	106.00	157.00		40.00	Yes
3212	GLOBAL	Cartesian	133.00	157.00		40.00	Yes
3411	GLOBAL	Cartesian	133.00	157.00		80.00	Yes
4111	GLOBAL	Cartesian	49.09	210.00		0.00	Yes
4112	GLOBAL	Cartesian	155.09	210.00		0.00	Yes
4211	GLOBAL	Cartesian	49.09	210.00		10.00	Yes
4212	GLOBAL	Cartesian	106.00	210.00		10.00	Yes
4213	GLOBAL	Cartesian	155.09	210.00		10.00	Yes
4311	GLOBAL	Cartesian	49.09	210.00		40.00	Yes
4312	GLOBAL	Cartesian	106.00	210.00		40.00	Yes
4313	GLOBAL	Cartesian	155.09	210.00		40.00	Yes
4314	GLOBAL	Cartesian	239.00	210.00		40.00	Yes
4411	GLOBAL	Cartesian	49.09	210.00		50.00	Yes
4412	GLOBAL	Cartesian	133.00	210.00		50.00	Yes
4413	GLOBAL	Cartesian	155.09	210.00		50.00	Yes
4414	GLOBAL	Cartesian	239.00	210.00		50.00	Yes
4511	GLOBAL	Cartesian	133.00	210.00		80.00	Yes
1099	GLOBAL	Cartesian	126.50	104.30		-52.00	Yes
2099	GLOBAL	Cartesian	130.50	104.20		0.00	Yes
3099	GLOBAL	Cartesian	209.10	25.20		32.00	Yes
4099	GLOBAL	Cartesian	88.30	118.90		40.00	Yes
5099	GLOBAL	Cartesian	132.60	113.30		80.00	Yes
6099	GLOBAL	Cartesian	212.00	20.20		100.00	Yes

1.1.1	111	121	No
1.1.2	112	122	No
1.1.3	113	124	No
1.1.4	114	125	No
1.1.5	123	132	No
1.2.1	131	141	No
1.2.2	132	142	No
1.2.3	134	144	No
1.2.4	142	151	No
2.1.1	211	222	No
2.1.2	213	223	No
2.1.3	221	231	No
2.1.4	212	233	No
2.1.5	224	235	No
2.2.1	232	242	No
2.2.2	234	243	No
2.2.3	241	251	No
2.2.4	244	252	No
2.0.1	201	214	No
3.1.1	311	322	No
3.1.2	312	323	No
3.1.3	321	331	No
3.1.4	324	334	No
3.2.1	332	342	No
3.2.2	333	343	No
3.2.3	341	351	No
3.2.4	344	352	No
3.0.1	301	313	No
3.0.2	302	314	No
4.1.1	411	421	No
4.1.2	412	433	No
4.1.3	421	431	No
4.2.1	431	451	No
4.2.2	432	441	No
4.2.3	442	452	No
4.3.1	451	461	No
4.0.1	401	413	No
4.0.2	402	414	No
5.1.1	511	521	No
6.1.1	611	631	No
6.1.2	612	622	No
6.1.4	621	642	No
6.2.2	642	652	No
7.1.1	711	722	No
7.1.2	712	723	No
7.1.3	713	725	No

7.1.4	721	731	No

Frame	JointI	JointJ	IsCurved
Text	Text	Text	Yes/No
7.1.5	724	732	No
7.1.6	731	733	No
7.1.7	732	734	No
7.2.1	733	741	No
7.2.2	734	742	No
7.3.1	741	751	No
A.1.1	1111	1211	No
A.1.2	1112	1213	No
A.1.3	1113	1214	No
A.1.4	1114	1313	No
A.1.5	1115	1215	No
A.1.6	1116	1217	No
A.1.7	1212	1312	No
A.1.8	1216	1315	No
A.1.9	1311	1411	No
A.1.10	1314	1413	No
A.2.1	1412	1511	No
A.3.1	1512	1611	No
B.0.1	2011	2113	No
B.1.1	2111	2211	No
B.1.3	2114	2213	No
B.1.4	2115	2215	No
B.1.5	2116	2216	No
B.1.6	2212	2313	No
B.1.7	2214	2312	No
B.1.8	2313	2311	No
B.1.9	2312	2314	No
B.2.1	2311	2511	No
B.2.2	2314	2512	No
B.3.1	2513	2613	No
B.0.2	2012	2117	No
B.0.3	2013	2118	No
B.0.4	2014	2119	No
C.0.1	3011	3112	No
C.1.1	3111	3211	No
C.2.1	3212	3411	No
D.1.1	4111	4211	No
D.1.2	4112	4213	No
D.1.3	4212	4312	No
D.2.1	4311	4411	No
D.2.2	4313	4413	No
D.2.3	4314	4414	No
D.2.4	4412	4511	No

Frame	Angle	MirrorAbt2	MirrorAbt3
Text	Degrees	Yes/No	Yes/No
1.1.1	90	No	No
1.1.2	90	No	No
1.1.3	90	No	No
1.1.4	90	No	No
1.1.5	90	No	No
1.2.1	90	No	No
1.2.2	90	No	No
1.2.3	90	No	No
1.2.4	90	No	No
2.1.1	90	No	No
2.1.2	90	No	No
2.1.3	90	No	No
2.1.4	90	No	No
2.1.5	90	No	No
2.2.1	90	No	No
2.2.2	90	No	No
2.2.3	90	No	No
2.2.4	90	No	No
2.0.1	90	No	No
3.1.1	90	No	No
3.1.2	90	No	No
3.1.3	90	No	No
3.1.4	90	No	No
3.2.1	90	No	No
3.2.2	90	No	No
3.2.3	90	No	No
3.2.4	90	No	No
3.0.1	90	No	No
3.0.2	90	No	No
4.1.1	90	No	No
4.1.2	90	No	No
4.1.3	90	No	No
4.2.1	90	No	No
4.2.2	90	No	No
4.2.3	90	No	No
4.3.1	90	No	No
4.0.1	90	No	No
4.0.2	90	No	No
5.1.1	90	No	No
6.1.1	90	No	No
6.1.2	90	No	No
6.1.4	90	No	No
6.2.2	90	No	No

Frame	Angle	MirrorAbt2	MirrorAbt3
Text	Degrees	Yes/No	Yes/No
7.1.1	90	No	No
7.1.2	90	No	No
7.1.3	90	No	No
7.1.4	90	No	No
7.1.5	90	No	No
7.2.1	90	No	No
7.2.2	90	No	No
7.1.6	90	No	No
7.1.7	90	No	No
7.3.1	90	No	No

Frame	AutoSelect	AnalSect	MatProp
Text	Text	Text	Text
1.1.1	N.A.	1.1.1	5KSI_CONC
1.1.2	N.A.	1.1.2	5KSI_CONC
1.1.3	N.A.	1.1.3	5KSI_CONC
1.1.4	N.A.	1.1.4	5KSI_CONC
1.1.5	N.A.	1.1.5	5KSI_CONC
1.2.1	N.A.	1.2.1	5KSI_CONC
1.2.2	N.A.	1.2.2	5KSI_CONC
1.2.3	N.A.	1.2.3	5KSI_CONC
1.2.4	N.A.	1.2.4	5KSI_CONC
2.0.1	N.A.	2.0.1	5KSI_CONC
2.1.1	N.A.	2.1.1	5KSI_CONC
2.1.2	N.A.	2.1.2	5KSI_CONC
2.1.3	N.A.	2.1.3	5KSI_CONC
2.1.4	N.A.	2.1.4	5KSI_CONC
2.1.5	N.A.	2.1.5	5KSI_CONC
2.2.1	N.A.	2.2.1	5KSI_CONC
2.2.2	N.A.	2.2.2	5KSI_CONC
2.2.3	N.A.	2.2.3	5KSI_CONC
2.2.4	N.A.	2.2.4	5KSI_CONC
3.0.1	N.A.	3.0.1	5KSI_CONC
3.0.2	N.A.	3.0.2	5KSI_CONC
3.1.1	N.A.	3.1.1	5KSI_CONC
3.1.2	N.A.	3.1.2	5KSI_CONC
3.1.3	N.A.	3.1.3	5KSI_CONC
3.1.4	N.A.	3.1.4	5KSI_CONC
3.2.1	N.A.	3.2.1	5KSI_CONC
3.2.2	N.A.	3.2.2	5KSI_CONC
3.2.3	N.A.	3.2.3	5KSI_CONC
3.2.4	N.A.	3.2.4	5KSI_CONC
4.0.1	N.A.	4.0.1	5KSI_CONC
4.0.2	N.A.	4.0.2	5KSI_CONC
4.1.1	N.A.	4.1.1	5KSI_CONC
4.1.2	N.A.	4.1.2	5KSI_CONC
4.1.3	N.A.	4.1.3	5KSI_CONC
4.2.1	N.A.	4.2.1	5KSI_CONC
4.2.2	N.A.	4.2.2	5KSI_CONC
4.2.3	N.A.	4.2.3	5KSI_CONC
4.3.1	N.A.	4.3.1	5KSI_CONC
5.1.1	N.A.	5.1.1	5KSI_CONC
6.1.1	N.A.	6.1.1	5KSI_CONC
6.1.2	N.A.	6.1.2	5KSI_CONC
6.1.4	N.A.	6.1.4	5KSI_CONC
6.2.2	N.A.	6.2.2	5KSI_CONC

Frame	AutoSelect	AnalSect	MatProp
Text	Text	Text	Text
7.1.1	N.A.	7.1.1	5KSI_CONC
7.1.2	N.A.	7.1.2	5KSI_CONC
7.1.3	N.A.	7.1.3	5KSI_CONC
7.1.4	N.A.	7.1.4	5KSI_CONC
7.1.5	N.A.	7.1.5	5KSI_CONC
7.1.6	N.A.	7.1.6	5KSI_CONC
7.1.7	N.A.	7.1.7	5KSI_CONC
7.2.1	N.A.	7.2.1	5KSI_CONC
7.2.2	N.A.	7.2.2	5KSI_CONC
7.3.1	N.A.	7.3.1	5KSI_CONC
A.1.1	N.A.	A.1.1	5KSI_CONC
A.1.2	N.A.	A.1.2	5KSI_CONC
A.1.3	N.A.	A.1.3	5KSI_CONC
A.1.4	N.A.	A.1.4	5KSI_CONC
A.1.5	N.A.	A.1.5	5KSI_CONC
A.1.6	N.A.	A.1.6	5KSI_CONC
A.1.7	N.A.	A.1.7	5KSI_CONC
A.1.8	N.A.	A.1.8	5KSI_CONC
A.1.9	N.A.	A.1.9	5KSI_CONC
A.2.1	N.A.	A.2.1	5KSI_CONC
A.3.1	N.A.	A.3.1	5KSI_CONC
B.0.1	N.A.	B.0.1	5KSI_CONC
B.0.2	N.A.	B.0.2	5KSI_CONC
B.0.3	N.A.	B.0.3	5KSI_CONC
B.0.4	N.A.	B.0.4	5KSI_CONC
B.1.1	N.A.	B.1.1	5KSI_CONC
B.1.3	N.A.	B.1.3	5KSI_CONC
B.1.4	N.A.	B.1.4	5KSI_CONC
B.1.5	N.A.	B.1.5	5KSI_CONC
B.1.6	N.A.	B.1.6	5KSI_CONC
B.1.7	N.A.	B.1.7	5KSI_CONC
B.1.8	N.A.	B.1.8	5KSI_CONC
B.1.9	N.A.	B.1.9	5KSI_CONC
B.2.1	N.A.	B.2.1	5KSI_CONC
B.2.2	N.A.	B.2.2	5KSI_CONC
B.3.1	N.A.	B.3.1	5KSI_CONC
C.0.1	N.A.	C.0.1	5KSI_CONC
C.1.1	N.A.	C.1.1	5KSI_CONC
C.2.1	N.A.	C.2.1	5KSI_CONC
D.1.1	N.A.	D.1.1	5KSI_CONC
D.1.2	N.A.	D.1.2	5KSI_CONC
D.1.3	N.A.	D.1.3	5KSI_CONC
D.2.1	N.A.	D.2.1	5KSI_CONC
D.2.2	N.A.	D.2.2	5KSI_CONC
D.2.3	N.A.	D.2.3	5KSI_CONC

D.2.4	N.A.	D.2.4	5KSI_CONC
A.1.10	N.A.	A.1.10	5KSI_CONC

Of Ref. 2.2.9: C8 Frame Section Properties 01 - General (see Table 1 of Ref. 2.2.9)							
SectionName	**Material**	**Area**	**TorsConst**	**I33**	**I22**	**AS2**	**AS3**
Text	Text	ft2	ft4	ft4	ft4	ft2	ft2
1.1.1	5KSI_CONC	132.00	704.00	11,979.00	176.00	110.00	0.001
1.1.2	5KSI_CONC	32.00	170.67	170.67	42.67	26.67	0.001
1.1.3	5KSI_CONC	320.68	1,710.29	171,756.98	427.57	267.23	0.001
1.1.4	5KSI_CONC	134.68	718.29	12,723.54	179.57	112.23	0.001
1.1.5	5KSI_CONC	856.00	4,565.33	3,266,781.33	1,141.33	713.33	0.001
1.2.1	5KSI_CONC	132.00	704.00	11,979.00	176.00	110.00	0.001
1.2.2	5KSI_CONC	353.32	1,884.37	229,722.45	471.09	294.43	0.001
1.2.3	5KSI_CONC	134.68	718.29	12,723.54	179.57	112.23	0.001
1.2.4	5KSI_CONC	856.00	4,565.33	3,266,781.33	1,141.33	713.33	0.001
2.1.1	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
2.1.2	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
2.1.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
2.1.4	5KSI_CONC	200.00	266.67	166,666.67	66.67	166.67	0.001
2.1.5	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
2.2.1	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
2.2.2	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
2.2.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
2.2.4	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
2.0.1	5KSI_CONC	928.00	19,797.33	1,040,597.33	4,949.33	773.33	0.001
3.1.1	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
3.1.2	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
3.1.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
3.1.4	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
3.2.1	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
3.2.2	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
3.2.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
3.2.4	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
3.0.1	5KSI_CONC	110.00	586.67	6,932.29	146.67	91.67	0.001
3.0.2	5KSI_CONC	110.00	586.67	6,932.29	146.67	91.67	0.001
4.1.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.1.2	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.1.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.2.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.2.2	5KSI_CONC	180.00	960.00	30,375.00	240.00	150.00	0.001
4.2.3	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.3.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
4.0.1	5KSI_CONC	464.00	2,474.67	520,298.67	618.67	386.67	0.001
4.0.2	5KSI_CONC	928.00	19,797.33	1,040,597.33	4,949.33	773.33	0.001
5.1.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
6.1.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
6.1.2	5KSI_CONC	182.68	974.29	31,752.05	243.57	152.23	0.001
6.1.4	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
6.2.2	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001

TABLE: C8 Frame Section Properties 01 - General (see Table 1 of Ref. 2.2.9)

SectionName	Material	Area	TorsConst	I33	I22	AS2	AS3
Text	Text	ft2	ft4	ft4	ft4	ft2	ft2
7.1.1	5KSI_CONC	264.00	1,408.00	95,832.00	352.00	220.00	0.001
7.1.2	5KSI_CONC	272.00	1,450.67	104,810.67	362.67	226.67	0.001
7.1.3	5KSI_CONC	264.00	1,408.00	95,832.00	352.00	220.00	0.001
7.1.4	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
7.1.5	5KSI_CONC	628.00	3,349.33	1,289,964.33	837.33	523.33	0.001
7.1.6	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
7.1.7	5KSI_CONC	628.00	3,349.32	1,289,964.33	837.33	523.33	0.001
7.2.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
7.2.2	5KSI_CONC	628.00	3,349.33	1,289,964.33	837.33	523.33	0.001
7.3.1	5KSI_CONC	228.00	1,216.00	61,731.00	304.00	190.00	0.001
A.1.1	5KSI_CONC	369.00	1,968.00	261,684.42	492.00	307.50	0.001
A.1.2	5KSI_CONC	176.00	938.67	28,394.67	234.67	146.67	0.001
A.1.3	5KSI_CONC	64.00	341.33	1,365.33	85.33	53.33	0.001
A.1.4	5KSI_CONC	50.00	266.67	651.04	66.67	41.67	0.001
A.1.5	5KSI_CONC	74.00	394.67	2,110.54	98.67	61.67	0.001
A.1.6	5KSI_CONC	142.68	760.96	15,128.23	190.24	118.90	0.001
A.1.7	5KSI_CONC	656.00	3,498.67	1,470,314.67	874.67	546.67	0.001
A.1.8	5KSI_CONC	246.00	1,312.00	77,536.13	328.00	205.00	0.001
A.1.9	5KSI_CONC	600.00	3,200.00	1,125,000.00	800.00	500.00	0.001
A.1.10	5KSI_CONC	440.00	2,346.67	443,666.67	586.67	366.67	0.001
A.2.1	5KSI_CONC	1,080.00	5,760.00	6,561,000.00	1,440.00	900.00	0.001
A.3.1	5KSI_CONC	488.00	2,602.67	605,282.67	650.67	406.67	0.001
B.0.1	5KSI_CONC	912.00	19,456.00	987,696.00	4,864.00	760.00	0.001
B.1.1	5KSI_CONC	408.68	2,179.63	355,507.63	544.91	340.57	0.001
B.1.3	5KSI_CONC	316.00	1,685.33	164,346.33	421.33	263.33	0.001
B.1.4	5KSI_CONC	52.00	277.33	732.33	69.33	43.33	0.001
B.1.5	5KSI_CONC	142.68	760.96	15,128.23	190.24	118.90	0.001
B.1.6	5KSI_CONC	592.00	3,157.33	1,080,597.33	789.33	493.33	0.001
B.1.7	5KSI_CONC	488.00	2,602.67	605,282.67	650.67	406.67	0.001
B.1.8	5KSI_CONC	592.00	3,157.32	1,080,597.33	789.33	493.33	0.001
B.1.9	5KSI_CONC	488.00	2,602.68	605,282.67	650.67	406.67	0.001
B.2.1	5KSI_CONC	592.00	3,157.33	1,080,597.33	789.33	493.33	0.001
B.2.2	5KSI_CONC	488.00	2,602.67	605,282.67	650.67	406.67	0.001
B.3.1	5KSI_CONC	488.00	2,602.67	605,282.67	650.67	406.67	0.001
B.0.2	5KSI_CONC	456.00	2,432.00	493,848.00	608.00	380.00	0.001
B.0.3	5KSI_CONC	124.00	661.33	9,930.33	165.33	103.33	0.001
B.0.4	5KSI_CONC	456.00	2,432.00	493,848.00	608.00	380.00	0.001
C.0.1	5KSI_CONC	912.00	19,456.00	987,696.00	4,864.00	760.00	0.001
C.1.1	5KSI_CONC	864.00	4,608.00	3,359,232.00	1,152.00	720.00	0.001
C.2.1	5KSI_CONC	1,080.00	5,760.00	6,561,000.00	1,440.00	900.00	0.001
D.1.1	5KSI_CONC	408.68	2,179.63	355,507.63	544.91	340.57	0.001
D.1.2	5KSI_CONC	392.68	2,094.29	315,366.18	523.57	327.23	0.001
D.1.3	5KSI_CONC	864.00	4,608.00	3,359,232.00	1,152.00	720.00	0.001
D.2.1	5KSI_CONC	408.68	2,179.63	355,507.63	544.91	340.57	0.001
D.2.2	5KSI_CONC	392.68	2,094.29	315,366.18	523.57	327.23	0.001

D.2.3	5KSI_CONC	232.00	1,237.33	65,037.33	309.33	193.33	0.001
D.2.4	5KSI_CONC	1,080.00	5,760.00	6,561,000.00	1,440.00	900.00	0.001

Joint	Constraint	Type
Text	Text	Text
111	1000	Body
112	1000	Body
113	1000	Body
114	1000	Body
121	10	Body
122	10	Body
123	10	Body
124	10	Body
125	10	Body
131	3000	Body
132	3000	Body
134	3000	Body
141	110	Body
142	110	Body
144	110	Body
151	4000	Body
201	100	Body
211	1000	Body
212	1000	Body
213	1000	Body
214	1000	Body
221	20	Body
222	20	Body
223	25	Body
224	25	Body
231	3000	Body
232	3000	Body
233	3000	Body
234	3000	Body
235	3000	Body
241	120	Body
242	120	Body
243	125	Body
244	125	Body
251	4000	Body
252	4000	Body
301	100	Body
302	100	Body
311	1000	Body
312	1000	Body
313	1000	Body
314	1000	Body
321	30	Body

2.2.9)		
Joint	**Constraint**	**Type**
Text	Text	Text
322	30	Body
323	35	Body
324	35	Body
331	3000	Body
332	3000	Body
333	3000	Body
334	3000	Body
341	130	Body
342	130	Body
343	135	Body
344	135	Body
351	4000	Body
352	4000	Body
401	100	Body
402	100	Body
411	1000	Body
412	1000	Body
413	1000	Body
414	1000	Body
421	2000	Body
431	3000	Body
432	3000	Body
433	3000	Body
441	140	Body
442	140	Body
451	4000	Body
452	4000	Body
461	5000	Body
511	1000	Body
521	2000	Body
611	1000	Body
612	1000	Body
621	40	Body
622	40	Body
631	2000	Body
642	3000	Body
652	4000	Body
711	1000	Body
712	1000	Body
713	1000	Body
721	50	Body
722	50	Body
723	50	Body
724	50	Body
725	50	Body

2.2.9)

Joint	Constraint	Type
Text	Text	Text
731	2000	Body
732	2000	Body
733	3000	Body
734	3000	Body
741	4000	Body
742	4000	Body
751	5000	Body
1111	1000	Body
1112	1000	Body
1113	1000	Body
1114	1000	Body
1115	1000	Body
1116	1000	Body
1211	60	Body
1212	60	Body
1213	60	Body
1214	60	Body
1215	65	Body
1216	65	Body
1217	65	Body
1311	2000	Body
1312	2000	Body
1313	2000	Body
1314	2000	Body
1315	2000	Body
1411	3000	Body
1412	3000	Body
1413	3000	Body
1511	4000	Body
1512	4000	Body
1611	5000	Body
2011	100	Body
2012	100	Body
2013	100	Body
2014	100	Body
2111	1000	Body
2113	1000	Body
2114	1000	Body
2115	1000	Body
2116	1000	Body
2117	1000	Body
2118	1000	Body

2119	1000	Body
2211	70	Body
2212	70	Body

2.2.9)		
Joint	**Constraint**	**Type**
Text	Text	Text
2213	70	Body
2214	70	Body
2215	70	Body
2216	70	Body
2311	3000	Body
2312	2000	Body
2313	2000	Body
2314	3000	Body
2511	4000	Body
2512	4000	Body
2513	4000	Body
2613	5000	Body
3011	100	Body
3111	1000	Body
3112	1000	Body
3211	3000	Body
3212	3000	Body
3411	4000	Body
4111	1000	Body
4112	1000	Body
4211	80	Body
4212	80	Body
4213	80	Body
4311	3000	Body
4312	3000	Body
4313	3000	Body
4314	3000	Body
4411	150	Body
4412	150	Body
4413	150	Body
4414	150	Body
4511	4000	Body
1099	100	Body
2099	1000	Body
3099	2000	Body
4099	3000	Body
5099	4000	Body
6099	5000	Body

Name	CoordSys	UX	UY	UZ	RX	RY	RZ
Text	Text	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
111	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
112	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
113	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
114	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
201	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
211	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
212	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
213	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
301	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
302	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
311	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
312	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
401	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
402	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
411	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
412	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
511	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
611	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
612	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
711	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
712	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
713	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1099	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1111	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1112	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1113	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1114	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1115	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
1116	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2011	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2012	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2013	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2014	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2111	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2115	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2116	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
3011	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
4111	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
4112	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes

Name	CoordSys	UX	UY	UZ	RX	RY	RZ
Text	Text	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
1000	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
100	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
2000	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
3000	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
4000	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
5000	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
10	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
20	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
25	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
30	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
35	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
40	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
50	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
60	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
65	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
70	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
80	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
85	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
110	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
120	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
125	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
130	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
135	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
140	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes
150	GLOBAL	Yes	Yes	Yes	Yes	Yes	Yes

Joint	CoordSys	U1	U2	U3	R1	R2	R3		
Text	Text	Kip/ft	Kip/ft	Kip/ft	Kip-ft/rad	Kip-ft/rad	Kip-ft/rad		
30' alluvium	**lower**	8.962E+06	8.871E+06	1.068E+07	3.446E+10	3.321E+10	4.677E+10	DBGM-2 (5E-4)	At Pool Basemat
30' alluvium	**median**	1.345E+07	1.331E+07	1.602E+07	5.169E+10	4.983E+10	7.017E+10	DBGM-2 (5E-4)	At Pool Basemat
30' alluvium	**upper**	2.017E+07	1.997E+07	2.404E+07	7.755E+10	7.475E+10	1.053E+11	DBGM-2 (5E-4)	At Pool Basemat
30' alluvium	**lower**	3.414E+06	3.586E+06	4.252E+06	8.883E+10	1.281E+11	1.407E+11	DBGM-2 (5E-4)	At Grade Basemat
30' alluvium	**median**	6.146E+06	6.456E+06	7.653E+06	1.599E+11	2.306E+11	2.533E+11	DBGM-2 (5E-4)	At Grade Basemat
30' alluvium	**upper**	1.085E+07	1.140E+07	1.352E+07	2.824E+11	4.074E+11	4.474E+11	DBGM-2 (5E-4)	At Grade Basemat
100' alluvium	**lower**	5.319E+06	5.265E+06	6.373E+06	2.056E+10	1.982E+10	2.757E+10	DBGM-2 (5E-4)	At Pool Basemat
100' alluvium	**median**	9.248E+06	9.154E+06	1.108E+07	3.575E+10	3.446E+10	4.794E+10	DBGM-2 (5E-4)	At Pool Basemat
100' alluvium	**upper**	1.582E+07	1.566E+07	1.896E+07	6.116E+10	5.895E+10	8.201E+10	DBGM-2 (5E-4)	At Pool Basemat
100' alluvium	**lower**	2.381E+06	2.501E+06	2.988E+06	6.244E+10	9.006E+10	9.725E+10	DBGM-2 (5E-4)	At Grade Basemat
100' alluvium	**median**	4.539E+06	4.768E+06	5.696E+06	1.190E+11	1.717E+11	1.854E+11	DBGM-2 (5E-4)	At Grade Basemat
100' alluvium	**upper**	8.557E+06	8.989E+06	1.074E+07	2.244E+11	3.236E+11	3.495E+11	DBGM-2 (5E-4)	At Grade Basemat
30' alluvium	**lower**	8.751E+06	8.662E+06	1.048E+07	3.380E+10	3.258E+10	4.540E+10	BDBGM (10E-4)	At Pool Basemat
30' alluvium	**median**	1.316E+07	1.302E+07	1.575E+07	5.082E+10	4.898E+10	6.826E+10	BDBGM (10E-4)	At Pool Basemat
30' alluvium	**upper**	1.978E+07	1.958E+07	2.368E+07	7.640E+10	7.364E+10	1.026E+11	BDBGM (10E-4)	At Pool Basemat
30' alluvium	**lower**	2.556E+06	2.685E+06	3.201E+06	6.688E+10	9.647E+10	1.047E+11	BDBGM (10E-4)	At Grade Basemat
30' alluvium	**median**	4.717E+06	4.955E+06	5.906E+06	1.234E+11	1.780E+11	1.931E+11	BDBGM (10E-4)	At Grade Basemat
30' alluvium	**upper**	8.558E+06	8.990E+06	1.072E+07	2.239E+11	3.230E+11	3.504E+11	BDBGM (10E-4)	At Grade Basemat
100' alluvium	**lower**	4.000E+06	3.959E+06	4.828E+06	1.558E+10	1.501E+10	2.056E+10	BDBGM (10E-4)	At Pool Basemat
100' alluvium	**median**	7.321E+06	7.246E+06	8.835E+06	2.851E+10	2.748E+10	3.762E+10	BDBGM (10E-4)	At Pool Basemat
100' alluvium	**upper**	1.316E+07	1.303E+07	1.589E+07	5.125E+10	4.940E+10	6.765E+10	BDBGM (10E-4)	At Pool Basemat
100' alluvium	**lower**	1.632E+06	1.714E+06	2.067E+06	4.318E+10	6.228E+10	6.599E+10	BDBGM (10E-4)	
100' alluvium	**median**	3.170E+06	3.330E+06	4.014E+06	8.387E+10	1.210E+11	1.282E+11	BDBGM (10E-4)	
100' alluvium	**upper**	6.123E+06	6.432E+06	7.752E+06	1.620E+11	2.336E+11	2.476E+11	BDBGM (10E-4)	

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