# 1 INTRODUCTION

The objective of this report is to provide a single resource for recent ground motion prediction equations (GMPEs) for various tectonic settings and/or regions of the world. Included herein are GMPEs for peak and spectral ground motion values for: (chapter 2) shallow active tectonic regimes; (3) shallow stable continental tectonic regimes; (4) subduction zones; and (5) specific geographical regions of the world. At the beginning of each of these sections, tables are provided showing a summary of the input and output parameters used in each model and a figure graphically describing the fault geometry parameters used. Also included in this report are relationships for Arias intensity, strong ground motion duration, equivalent number of stress and strain cycles, characteristic periods, and response spectra damping correction factors. The GMPEs in this report are presented using consistent format (e.g., consistent units and symbols), and thus they may differ slightly in form from the equations as originally published.

For each GMPE, citations of the original publications in which the GMPE appeared, as well as any additional relevant sources, are listed first. Then, a brief abstract describes the applicability and limitations of the GMPE. Next, the input parameters needed for the model are listed, followed by the model itself and tables containing the regression coefficients. Calibration plots are provided so that the user can verify codes of the GMPEs. If available, plots are shown of the magnitude and site-to-source distances of the ground motion database used to develop the model. Finally, MATLAB scripts are provided for each GMPE. The scripts can be copy-pasted directly into an .m file with the same name as the function given in the code (e.g., use "AS_1997.m" for GMPE 2.1). Also, Microsoft Excel spreadsheets are provided for each GMPE. Both the MATLAB scripts and the Excel spreadsheets are written in consistent format for all models to facilitate their use.

The authors spent significant effort verifying the GMPE MATLAB scripts and Excel spreadsheets that are in this report. (Note, the authors are using the word "verify" to mean that the models are coded/implemented as intended by the developer. This is in contrast to "validating" the models, which means that the models actually yield valid ground motion predictions; validation of the models is left to the developers and/or users.) Towards the verification end, the authors attempted to replicate every plot in the papers/reports in which the GMPEs were proposed. If discrepancies were found, which was quite often, the authors first scrutinized their coding of the model and modified it accordingly. If the discrepancies still existed, which again was quite often, the authors then contacted the GMPE developers for input. For the most part, the discrepancies were the result of: insufficient/incorrect information given in the GMPE paper/report to replicate a plot, ambiguity in the description of the models in the GMPE papers/reports, and typographical errors in the GMPE papers/reports, as well as errors in the authors coding. The compilation of verified codes of GMPEs is the most significant valuable of this report. However, as of May 27, 2011 the following issues still remain with a few of the GMPEs:

- Abrahamson and Silva (1997): Vertical component high at large periods compared to original publication (cannot duplicate Figures 10 and 11 in A&S97).
- Chiou and Youngs (2008): Cannot duplicate Figure 21 in C&Y08.

- Grazier and Kalkan (2009): Cannot duplicate basin effect curves in Figure 11a in G&K09.
- McVerry et al. (2006): Cannot duplicate PGA plots for both crustal and subduction zone models.
- Somerville et al. (2009): Cannot duplicate plots in the original publication.

The authors will continue to try to resolve these issues.

Finally, this report is intended to be a "living" document; new models will be added periodically. Accordingly, if you find any errors in the coding or presentation of the GMPEs, please let the authors know and they will make the needed corrections. The authors hope that this report provides a useful resource and would appreciate any comments or suggestions that you may have to improve it.