

BEAU B. WHITNEY, Ph.D., P.G.

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*Quaternary Geology and Geomorphology
Paleoseismology and Neotectonics
Seismic Hazard Assessments
Engineering Geology*

Education

Ph.D., Paleoseismology and Neotectonics, 2015

The University of Western Australia, Perth, WA

Thesis title: "Neotectonic deformation in the Western Australia Shear Zone"

M.Sc. Quaternary Geology, 2009

Humboldt State University, Arcata, CA, USA

B.Sc. Environmental Systems and Geology (with double major in Geography), 2001

University of Mary Washington, Fredericksburg, VA, USA

Professional Registration

Registered Geologist, California (2007) and Oregon (2008), (PG #8364, RG #2202)

Profile

Dr. Whitney is a research fellow at the Centre for Energy Geoscience at the University of Western Australia and an independent consulting geologist specializing in geohazard recognition and characterization for critical infrastructure projects. Dr. Whitney has over fifteen years of consulting experience working on myriad geohazard and engineering geology projects. He currently is engaged in geohazard projects in central and southeast Asia, Australia, and Europe for industry clientele and is actively involved in intraplate geohazards research in Australia (paleoseismology and tsunami studies).

His university research is currently focused on intraplate seismic hazards in Western Australia. A portion of his work has revealed an active fault and fold belt that extends at least 2000 km from the northern Australian Plate boundary into the western margin of the continental interior. The recognition of this system of intraplate faults that are structurally connected to the deformation front at the plate boundary provides a new framework from which to view earthquake processes in Stable Continental Region (SCR) settings and is critical to the accurate assessment of seismic hazards along the economically vital and environmentally sensitive North West Shelf (NWS) of Australia.

Dr. Whitney has authored over one hundred consulting reports, published in peer-reviewed journals, and has given presentations at professional conferences and industry meetings around the world. He is a licensed professional geologist in the United States (California and Oregon) and has conducted geological fieldwork on four continents.

Affiliations

Secretary, International Quaternary Association (INQUA), International Focus Group on Earthquake Geology and Seismic Hazards

Adjunct Professor, Department of Geology, Humboldt State University, Arcata, California, USA

Centre for Energy Geoscience, The University of Western Australia, Perth, Western Australia

Professional Memberships

American Geophysical Union (AGU)

Australian Earthquake Engineering Society (AEES)

Australian Geomechanics Society (AGS)

Geological Society of America (GSA)

Seismological Society of America (SSA)

Employment History

- Research Fellow, The Centre for Energy Geoscience, The University of Western Australia, Perth, AU. 2015-present

Research Projects

- Passive seismic deployments at the South West Hub site for Carbon Capture and Storage (CCS), Australian Geophysical Observing System, AuScope, The University of Melbourne. Developing earthquake magnitude-frequency curves to conduct seismic array sensitivity analyses for monitoring natural micro-seismicity.
<http://www.dmp.wa.gov.au/South-West-Hub-CCS-1489.aspx>
 - Seismic source characterization of recently identified offshore faults on Australia's North West Shelf (NWS). Utilizing 2D and 3D geophysical datasets to develop fault slip rate and recurrence parameters for use in PSHA.
 - Paleo-tsunami investigation along Australia's northwest coastline to provide inputs for Probabilistic Tsunami Hazard Assessment (PTHA). Developing a field-based research programme to gather geological data on paleo-tsunamis for use in calibration and validation of PTHA inputs and outputs.
 - The Western Australian Seismic Modelling Project, UWA Reservoir Monitoring Consortium WAMo. Developing a 3D geological model using geophysical and geological data from Australia's North West Shelf with a focus on the Cenozoic section to determine how Cenozoic stratigraphy (carbonate and clastic sequences) influences seismic data quality at the reservoir level using seismic stratigraphy, seismic geomorphology, well logs, bio- and lithostratigraphy.
- Independent Consulting Geologist, 2012-present
- #### Project Experience
- *Probabilistic Seismic Hazard Assessment (PSHA) Review for offshore oil platform relicensing.* Wandoo-B Offshore PSHA, Vermillion Energy, Inc., Lloyd's Register International, Carnarvon Basin, North West Shelf, Australia. Conducted third party expert review of project PSHA for platform and associated infrastructure.
<http://www.vermillionenergy.com/operations/australia/australiabackground.cfm>
 - *Seismic hazard assessment for proposed offshore oil and gas platform development.* Browse Deep Water Development, URS and Woodside, North West Shelf, Australia. Desktop-based fault mapping and characterization using 2D and 3D seismic datasets to provide inputs for probabilistic seismic hazard analysis for offshore developments.
<http://www.woodside.com.au/Our-Business/Developing/Browse/Pages/Browse.aspx#.VoM-KUp97mE>
 - *Fault rupture hazard investigation for proposed ~1850 km long natural gas pipeline.* Trans-Anatolian Pipeline (TANAP), BP (Turkey). Completed paleoseismological investigations for pipeline fault crossings in the northern Anatolian fault system to provide inputs for both deterministic and probabilistic fault displacement hazard analyses.
<http://www.tanap.com/tanap-project/why-tanap/>
 - *Fault study for geological hazard re-assessment for existing ~1800 km long oil pipeline.* Baku-Tbilisi-Ceyhan (BTC) Pipeline, BP (Anatolia, Turkey). Completed paleoseismological investigations for pipeline fault crossings in the eastern Anatolian fault system to support engineering analyses of fault crossing designs.
http://www.bp.com/en_az/caspian/operationsprojects/pipelines/BTC.html
 - *Seismic hazard assessment for proposed offshore oil and gas platform development.*

Ichthys Field, INPEX (Browse Basin, North West Shelf, Australia). Completed offshore geohazard assessment for infield developments. Data were developed to support probabilistic seismic hazard analyses.

<http://www.inpex.com.au/our-projects/ichthys-Ing-project/ichthys-in-detail/project-overview/>

- *Seismic source development for existing oil field infrastructure.*
Tengiz Field, Chevron (Caspian Sea, Kazakhstan). Assisted in development of seismic source model to support probabilistic seismic hazard analysis of a facility in a stable continental region.
<http://www.chevron.com/news/currentissues/tengiz/>
- *Seismic source model review for LNG expansion project.*
Gorgon Expansion Project (Exmouth Plateau, Australia). Reviewed seismic source model for a PSHA on Australia's North West Shelf.
<http://www.chevronaustralia.com/our-businesses/gorgon>
- *Seismic source model review for proposed offshore oil and gas project.*
Sunrise Project (Timor Sea). Reviewed seismic source model for a PSHA along the Northern Australian plate boundary.
<http://www.conocophillips.com.au/our-business-activities/our-projects/Pages/GreaterSunrise.aspx>
- *Probabilistic Seismic Hazard Assessment (PSHA) for the Nurek Dam, Tajikistan.* Tractabel Engineering. Desktop-based fault mapping and seismic source characterization and model development to update and revise seismic hazard analysis for the Nurek Dam.
- *Probabilistic Fault Displacement Hazard Assessment (PFDHA) for the Elk-Antelope field development, Papua New Guinea.* TOTAL. Technical review and fault model parameterization to develop a PFDHA for onshore oil field infrastructure development and an onshore and offshore export pipeline.
- *Deterministic Seismic Hazard evaluation (DSHA) for the Mong Hsat, Hydropower Project, Myanmar,* Trectebel Engineering. Fault model development for DSHA.
- *Probabilistic Seismic Hazard Assessment (PSHA) for Middle Yeywa Hydropower Project, Myanmar.* Tractabel Engineering. Desktop-based fault mapping and seismic source characterization and model development for probabilistic seismic hazard analysis.
- *Probabilistic Seismic Hazard Assessment (PSHA) for the Four Cascade Hydropower Projects on the River Nam Lwe, Myanmar.* PowerChina. Seismic source characterization and seismic hazard model development for four HPP in central Myanmar.
- *Probabilistic Seismic Hazard Assessment (PSHA) for the Tibar Bay Port Project, Timor Leste.* Tractabel Engineering. Seismic source characterization and seismic hazard model development for port facilities development on Timor Leste.

➤ **Geological Researcher, Chevron ABU, Perth, WA, AU. 2012-2014**

Project Experience

- Gorgon CO₂ Subsurface (North West Shelf, Australia). Completed a geomorphological assessment of surface fault rupture hazards on Barrow Island.
- Gorgon CO₂ Subsurface (North West Shelf, Australia). Neotectonic characterization of site area to support engineering analyses for carbon capture and storage (CCS) geosequestration injection project.

<http://www.dmp.wa.gov.au/Petroleum/Gorgon-CO2-injection-project-1600.aspx>

- Senior Geologist, Advanced Geomechanics Pty Ltd (AG), Perth, WA, AU. 2010-2012
Project Experience
 - Gendalo and Gehem Fields, IntecSea (Makassar Strait, Indonesia). Carried out geohazards assessment for flow lines, export lines, and infield facilities for offshore gas development.
<http://investor.chevron.com/phoenix.zhtml?c=130102&p=irol-newsArticle&ID=1502894>
 - Wheatstone Field, Chevron (Carnarvon Basin, North West Shelf, Australia). Performed geological and geotechnical assessment for subsea gas export lines.
<https://www.chevronaustralia.com/our-businesses/wheatstone>
 - Gladstone LNG, Santos (Queensland, Australia). Fault identification for seismic hazard analysis for proposed LNG processing and export facility.
<http://www.santoslng.com/the-project.aspx>
- Visiting Researcher, Centre for Offshore Foundation Systems, The University of Western Australia, Perth, WA. 2010. An Australian Research Council Centre of Excellence for Geotechnical Science and Engineering.
Duties: Develop proposal to investigate seismic hazards in the 'Stable Continental Region' of Western Australia [Grant awarded].
- Professional Geologist, Busch Geotechnical Consultants (BGC); Arcata, CA, USA. 2007-2010
- Staff Engineering Geologist, Busch Geotechnical Consultants (BGC); Arcata, CA, USA, 2004-2007
- Staff Geologist, Busch Geotechnical Consultants (BGC); Arcata, CA, USA, 2001-2004
Collective BGC Duties: Participate in all project aspects of a small engineering geology and geotechnical consulting firm. Develop project scopes of work, budgets, schedules, field programmes, sampling and testing regimens, conduct soils laboratory analyses, write reports and recommendations, manage team personnel and subcontractors, present results to clients and at public forums. Projects were wide ranging and varied and included landslide and slope stability evaluations and monitoring, site geotechnical and geohazard assessments, foundation soils investigations, and Alquist-Priolo fault studies. Clients included residential and commercial developers, utility companies, municipalities, tribes, and state agencies.

Grants / Awards

Chevron Australia Business Unit (Project PDEP AES 12-P1ABU-82)	\$141,656
Project title: Recent tectonic deformation and seismic hazards in the Carnarvon Basin, Western Australia. Principal Researchers: James Hengesh and Beau Whitney	
	Total project budget \$364,502
Scholarship for International Research Fees and University International Stipend, The University of Western Australia, 2010-2014	\$66,000/year

University Teaching Experience

- Lecturer, The University of Western Australia, 2012
 - Engineering Geology (Civil2121), Year 2
Duties: Developed course curriculum and presented two 50-minute lectures per week for a fourteen-week semester to 285 enrolled second year civil engineering students. Maintained regular office hours, personally marked all exams, and provided written feedback on research papers.
- Teaching Assistant, The University of Western Australia, 2011-2012
 - Geomorphology, Year 2
 - Geomorphology, Year 3
 - Soils and Geomorphology, Year 3

Duties: Managed lab exercises and fielded students' questions. Marked and provided feedback on lab assignments. Participated in leading multiple field trips and assisted with field instruction of basic geological data collection techniques.

➤ Teaching Assistant, Humboldt State University, 2005-2009

- Field methods, Quaternary field trips
- Six-week Geology Field Camp. Mazourka Canyon, Inyo Mountains, California

Duties: Assisted students with understanding basic geological field techniques in both classroom and field settings and helped them integrate and apply the knowledge gained throughout their undergraduate coursework in a field-based capstone experience.

List of Publications and Presentations

Hengesh, J.V., **Whitney, B.B.** 2016. Transcurrent Reactivation of Australia's Western Passive Margin: a mechanism for Fragmentation of the Indo-Australian Plate. *Tectonics*. 21pp.
doi:10.1002/2015TC004103

Whitney, B.B., Hengesh, J.V., Gillam, D. 2016. Styles of fault reactivation within a formerly extended continental margin, North West Shelf, Australia. *Tectonophysics*, 686, 1-18.
doi:10.1016/j.tecto.2016.06.008

Whitney, B.B., Clark, D.J., Hengesh, J.V. 2015. Paleoseismology of the Mt. Narryer fault zone, west central Western Australia: a multi-segment intraplate fault system. *Geological Society of America Bulletin*, 21 pp. doi:10.1130/B31313.1.

Hengesh, J.V., **Whitney, B.B.** 2015. Characterization of seismic sources within western Australia's newly reactivated transform margin. Australian earthquake engineering society and the New Zealand society for earthquake engineering, Tenth Pacific Conference on earthquake engineering, Sydney. No. 83, 8 pp.

Whitney, B.B., Hengesh, J.V. 2015. A new model for active intraplate tectonics in western Australia. Australian earthquake engineering society and the New Zealand society for earthquake engineering, Tenth Pacific Conference on earthquake engineering, Sydney. No. 82, 9 pp.

Whitney, B.B., Hengesh, J.V., 2015. Geomorphological evidence for late Quaternary tectonic deformation in the Cape Region, coastal west central western Australia. *Geomorphology* 241, 160-174 10.1016/j.geomorph.2015.04.010

Whitney, B.B., Hengesh, J.V. 2015. Geomorphological evidence of neotectonic deformation in the Carnarvon Basin, Western Australia. *Geomorphology* 228, 579-596.

Whitney, B.B., Hengesh, J.V. Clark, D., 2014. The Western Australia Shear zone. INQUA Focus Group on Paleoseismology and Active Tectonics, 5th INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology (PATA), 21-27 September 2014, Korea. 162-165.

Hengesh, J.V., **Whitney, B.B.** 2014. Quaternary Reactivation of Australia's Western Passive Margin: Inception of a New Plate Boundary? INQUA Focus Group on Paleoseismology and Active Tectonics, 5th INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology (PATA), 21-27 September 2014, Korea. 207-210.

- McPherson, A., Clark, D., **Whitney, B.** 2013. Neotectonic evidence for a crustal strain gradient on the central-west Western Australian margin. Western Australia Basin Symposium, Perth. 16 pp.
- Whitney, B.B.**, Hengesh, J.V. 2013. Geological constraints on Mmax values from Western Australia: Implications for seismic hazard assessments. Australian Geomechanics Society Journal. Western Australian Geotechnics. Vol. 48, no 2. p. 15-26.
- Guha, I., **Whitney, B.**, Flores-Berrones, R. Barsainya, A., Arya, G. 2013. Earthquakes and the Indian pipeline industry. Journal of Pipeline Engineering, 12, 335-344.
- Keep, M., Hengesh, J., **Whitney, B.** 2012. Natural seismicity and tectonic geomorphology reveal regional transpressive strain in northwestern Australia. Australian Journal of Earth Sciences. 59, 341-354.
- Melody, A. D., **Whitney, B.B.**, Slack, C.G. 2012. Late Pleistocene and Holocene faulting in the Western Truckee Basin North of Truckee, California, USA. Bulletin of the Seismological Society of America 102, 2219-2224.
- Guha, I., **Whitney, B.** 2012. The seismic vulnerability of the Australian pipeline industry—an overview. Conference Proceedings, ANZ: Ground engineering in a changing world. Melbourne, Australia, July 15-18. 9 pp.
- Whitney, B.B.**, Hengesh, J.V. 2011. Tectonic geomorphology of the “Stable Continental Region” of central Western Australia. Australia-New Zealand Geomorphology Group (ANZGG). Oamaru, NZ. January 30-February 4.
- Hengesh, J.V., **Whitney, B.B.**, Rovere, A., 2011. A tectonic influence on seafloor stability along Australia’s North West Shelf, Conference Proceedings, International Society for Offshore and Polar Engineers (ISOPE), Maui. 9 pp.
- Hengesh, J.V., Wyrwoll, K.H., **Whitney, B.B.**, 2010. Neotectonic deformation of northwestern Australia and implications for oil and gas development. Proc. 2nd International Symposium on Frontiers in Offshore Geotechnics (ISFOG), Perth, Western Australia, Ed. Gourvenec & White, Taylor & Francis.
- Whitney, B.B.**, Hengesh, J.V. 2010. Quaternary tectonic deformation of the stable continental region of central Western Australia. Geological Society of America, National meeting, Denver, CO, Poster presentation. Session 34. October 31.
- Hengesh, J., **Whitney, B.** 2010. The Mt Narryer fault: the Source of Australia’s Largest Earthquake? Seismological Society of America, Annual meeting, Portland, Oregon, Oral presentation.
- Carver, G., Sauber, J., Lettis, Wm., Witter, R., **Whitney, B.**, 2008. Active Faults on Northeastern Kodiak Island, Alaska, *in* American Geophysical Union Monograph "Active Tectonics and Seismic Potential of Alaska." Jeffrey T. Freymueller, Peter J. Haeussler, Robert L. Wesson, Göran Ekström, (Editors). p 167-184.