

SAN DIEGO ASSOCIATION OF GEOLOGISTS

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SDAG MEETING ANNOUNCEMENT

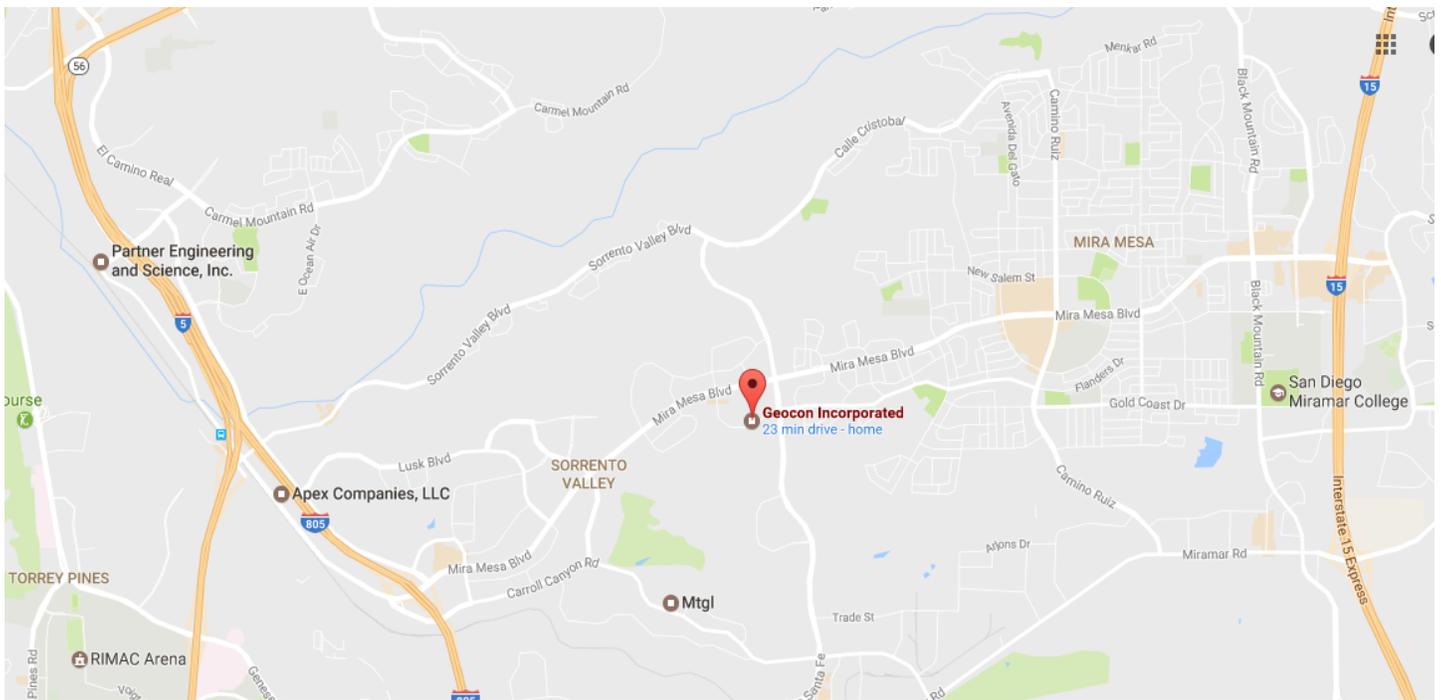
Wednesday, May 17, 2017

Inadequate Characterization and Subsequent Inappropriate Landslide Repair Leads to Complex Massive Destabilization of a Residential Hillside in Santa Barbara, CA: How Can This Happen in This Day and Age and How Do You Fix It?

Presented by: **John Wallace & Pat Shires**

- Where:** **Geocon, Inc. — Upstairs Lounge**
6960 Flanders Drive, San Diego, CA 92121 (See Map)
- When:** 5:30 pm - Social Hour
6:15 pm - Dinner
7:00 pm - Program
- Dinner:** Mexican Buffett (The Tacoman), Walawender Tavern (Beer & Wine)
Geocon will be checking all student ID's. No alcohol can be served to anyone under the age of 21
- Cost:** \$35 per person, \$5 discount for members, STUDENTS: \$15. Add \$5 if you did not make a reservation.
- Reservations:** Make your reservation **online** at www.sandiegogeologists.org **no later than noon, Monday May 15th**. Reservations cannot be guaranteed after Monday at noon; but are always preferred over walk ins. **EARLY reservations well before the deadline are MUCH appreciated!**
- Directions:** FROM INTERSTATE 805: Take the Mira Mesa Blvd (Exit 27) exit. Head east on Mira Mesa Blvd for roughly 2 miles. Turn right onto Flanders Drive and Geocon will be on your left in about 0.4 miles.
- FROM HIGHWAY 15: Take the Mira Mesa Blvd (Exit 16) exit. Head west on Mira Mesa Blvd for roughly 3.3 miles. Turn left on Camino Santa Fe and then turn right on Flanders Drive. Geocon will be on your right in about 0.2 miles.

Map:



ABSTRACT

Inadequate Characterization and Subsequent Inappropriate Landslide Repair Leads to Complex Massive Destabilization of a Residential Hillside in Santa Barbara, CA: How Can This Happen in This Day and Age and How Do You Fix It?

WALLACE, John M. and SHIRES, Patrick O., Cotton, Shires and Associates, Inc., 330 Village Lane, Los Gatos, 95030, wallace@cottonshires.com and cottonshires@me.com

In the winter of 1998, a relatively small, slow-moving landslide mobilized near the base of a residential hillside in Santa Barbara California, and by the summer of 1999, it had destroyed one home and threatened closure of a state highway. The landslide was approximately 350 feet in length, 250 feet in width, and averaged approximately 40 feet in depth. A very limited investigation of the landslide was undertaken by a state agency and slope mitigation was completed by 2001, which consisted of removing nearly 130,000 cubic yards of earth material from the base of the hillside. The landslide investigation included no geologic mapping, no survey control of the topographic surface, only two small-diameter borings within the landslide, no piezometers, and no laboratory testing of the basal slide surface. Two inclinometers were installed in the landslide, both showing discrete shear offsets; however, only one of the offsets was utilized for controlling the basal slide geometry. Back-calculated strengths of the assumed slide surface were generated, which included a significant component of cohesion. These erroneous strengths were then applied to a forward analysis of the proposed graded slope repair. The forward analysis was performed using circular searches for the weakest basal surfaces, even though the entire hillside is composed of tertiary bedrock materials, not soil, and the searches were limited only to the area of the graded repair. These analyses still did not achieve factors of safety of 1.5. Furthermore, the as-built graded landslide repair resulted in steeper slopes than those that were analyzed.

During the landslide repair grading operations, signs of earth movement were apparent immediately, as cracks were observed on the freshly graded slope. Seven inclinometers and piezometers were then installed

following the slope mitigation (nearly double the number installed for characterization of the landslide), but were not monitored for nearly 1.5 years after their installation, despite the early signs of slope movement. When the inclinometers were finally monitored in late 2002, several inches of movement could be seen in the inclinometer plots; however, in at least one case, the technician responsible for collecting the readings misinterpreted the data and performed bias corrections on the data set, effectively eliminating the early warning signs of impending movement. By the spring of 2005, an approximately 800-foot long by 450-foot wide, and up to 100-foot deep rock block slide was evident, and began accelerating to several inches per day. An active toppling zone in the upper portion of the slide was failing along near-vertical bedding of the Rincon Shale and into the void left by the block slide, resulting in an enlarging zone of instability.

By the fall of 2005, three multi-million dollar homes were destroyed along this hillside, 4 others were severely distressed, a state highway was closed, and access was still threatened to nearly 70 other homes. Systematic procedural, technical and communication breakdowns characterize just about every phase of this investigation, with the outcome directly responsible for tens of millions of dollars in damages: prompting the question: how can this happen in this day and age?

Mitigation of this huge and complex slope failure was no easy task. After obtaining funding through settlement of litigation, and comprehensive investigation and careful analyses, it was decided to effect a “top down” mitigation effort whereby the upper reaches where homes were immediately threatened was stabilized first with subsequent mitigation efforts marching down the hillside until the entire hillside was stabilized. The cost of the landslide stabilization effort exceeded \$50,000,000 and took several years to implement.

BIOS

John Wallace is a Principle Engineering Geologist with Cotton, Shires and Associates, Inc. (CSA), a full-service geotechnical engineering and engineering geologic consulting firm recognized nationally and internationally for its landslide expertise, having specialized in the identification, characterization, analysis and mitigation of slope instability for over 35 years. John Wallace is a Certified Engineering Geologist in California with 29 years of professional experience. Mr. Wallace has a Bachelor of Science degree in Geology from the University of Southern California and a Master of Science Degree in Geology from San Jose State University. Mr. Wallace’s primary responsibilities with respect to landslide investigations are to accurately identify and characterize the landslide type, three-dimensional limits, and earth material characteristics, and to work closely with the geotechnical and civil engineers in the design of mitigation elements. Mr. Wallace recently participated in, and presented technical papers at, the 13th International Conference and Field Trip on Landslides in Japan, the 1st and 2nd North American Landslide Conferences in Vail Colorado and Banff, Alberta, Canada in 2007 and 2012, and the American Rock Mechanics Association, 47th and 49th U.S. Rock Mechanics Symposia in San Francisco.

In his spare time, Mr. Wallace enjoys water skiing, snow skiing and snowboarding, is the father of twin 14-year olds, and is also an avid windsurfer and racquetball player.



BIOS (cntd)

Patrick Shires is a Principal Civil and Geotechnical Engineer and Geophysicist with Cotton, Shires and Associates, Inc. (CSA), a full-service geotechnical engineering and engineering geologic consulting firm recognized nationally and internationally for its landslide expertise, having specialized in the identification, characterization, analysis and mitigation of slope instability for over 43 years. Patrick Shires is a Registered Civil Engineer, Geotechnical Engineer and Geophysicist in California with over 45 years of professional experience in California, the United States and internationally. Mr. Shires has Bachelor of Science and Master of Science degrees in Civil Engineering, specializing in geotechnical engineering and geophysics, from Stanford University. Mr. Shires' primary responsibilities with respect to landslide investigations are to analyze slope stability and to formulate mitigation designs, and to work closely with engineering geologists in the design of appropriate mitigation elements. Mr. Shires was retained by the Peoples Republic of China to study landslides impacted by the Three Gorges Dam project in China and has participated in and presented at international field workshops on landslides in Japan (twice), Australia, New Zealand, Switzerland (twice), Austria, Italy, Czech Republic, Slovak Republic, Spain, England and Norway. He has designed hundreds of landslide repair projects from small-scale projects to repairs exceeding \$50,000,000 in construction costs and has testified as an expert witness in over 88 trials.

In his spare time, Mr. Shires enjoys cattle ranching, tending vineyards, hiking, fixing things (old cars, tractors, trailers, etc.) and building things (barn, tiny house and outdoor furniture).



UPCOMING MEETINGS

Meetings are usually held on the 3rd Wednesday of the month but may change to accommodate the speaker and meeting place schedules. Check the SDAG web site for updates.

June 21, 2017	Jorge Ledesma <u>ISLA CORONADOS, THE CARBONATE MODEL AND DARWIN'S FIRST SCIENTIFIC STUDY</u>
July 19, 2017	Joint Meeting with South Coast and AEG Mike Reda—Group Delta
August 9, 2017 *2nd Wednesday*	Society of Military Engineers

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SDAG PRESIDENT'S CORNER

Presidents Corner, May 2017

Greetings SDAG members!

The April meeting was another success...thank you to all who attended and of course, thank you to John Minch for sharing his experiences and observations from Kobe, Japan after the earthquake. We also had two excellent OSW's in April, one led by Mike Hart to look at the San Ysidro landslide complex, and one led by Matt Love of Geocon who briefed a group of SDSU students on ground improvement techniques and the installation of stone columns. Thank you to all those who participated!

For this month we are trying something new....the inaugural SDAG meeting at Geocon! The meeting will held be upstairs in our presentation lounge, with food cooked onsite and brought upstairs for your enjoyment. Beer will be available on tap and wine will be available for the non-beer drinkers – drink donations will go to the Walawender Fund as usual. The speakers, John Wallace and Pat Shires of Cotton, Shires and Associates, Inc. will be flying down from the Bay area to present some of their work on the Sycamore Ranchito Landslide in Santa Barbara. This will be an excellent talk, so please sign up early!

As always, please feel free to contact me at adams@geoconinc.com if you have questions, suggestions etc. regarding all matters SDAG related.

I look forward to seeing everyone again on the 17th at the 'Con'!

Regards,



Rupert Adams PG, CEG | *Sr. Project Geologist/SDAG President*

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ANNOUNCEMENTS

Call for Papers, Speakers, and Spectators

SDAG Fall 2017 Fieldtrip October 14th and 15th 2017. Optional Night on the 13th.

San Diego is a county with abundant points of interest. There is active faulting, landslides, great weather, and mountains that over look majestic landscapes. Julian, California encompasses all of these traits and more! The 2017 fieldtrip will focus on points of interest in the region, including gold mining and faulting; however the trip is in the early stages of planning and is subject to change in direction and core focus. Thus, submit your abstracts, articles, and ideas early!

A big thank you to Mike Hart for leading the OSW to the San Ysidro Landslide and to Monte Marshall for including his insight as well.



Photo by Rob Hawk

A big thank you to Matt Love and Rupert Adams of Geocon for hosting a OSW to their Stone Column jobsite!



Photo by Rob Hawk

NEW Interactive Fault Map for San Diego

As part of the update for the San Diego-Tijuana Earthquake Planning Scenario, Working Group No. 1's "Fault Map Subcommittee" has completed the first publicly available bi-national active and potentially active fault map. This interactive GIS map includes the first publicly available active and potentially active fault map locations from the City of San Diego. The City of San Diego fault locations and activity of faults are based chiefly on interpretation of information contained in geologic reports by private consultants. The City of San Diego identifies active faults as Holocene ($\leq 11,000$ yr) and potentially active as Quaternary (up to 1.6my). City of San Diego fault investigations are ongoing that may require future revision of this map. This map is not a substitute for a site specific fault investigation. The map also includes an updated fault map layer from the State CGS. CGS suggests users defer to the City of San Diego fault data, where marked, for increased accuracy. The map also integrated the faults south of the border for a bi-national cross border view. You can expand the map legend on the left side to see the fault ages and sources for each layer that can be turned on or off for the map view. You can select from 1 of 12 base maps. You can click on the fault line on the map to see the meta-data source. This map includes the yellow dashed SURFACE FAULT RUPTURE location layer that will be used for the infrastructure, social, and economic impacts and emergency response for the update to the Earthquake Scenario. In addition, active and potentially active fault investigation locations from private companies are planned to be added to this map as a resource. This map is an on-going project and resource as our knowledge increases about local active and potentially active faults.

The link is available at: http://www.sandiegogeologists.org/Faults_map.html

I would like to thank Carolyn Glockhoff for her endless GIS work, Jim Quinn and the City for providing their data and time, Jerry Treiman with CGS for his time preparing the Surface Rupture and providing their new State fault data layer, and Luis Mendoza at CICESE for providing the faults south of the border. Please contact Diane Murbach (dianemurbach@gmail.com), Chair for the SD-TJ Earthquake Scenario Working Group #1 - Earth Science, if you have any questions, or see any errors on this new fault map.

Diane Murbach (619) 865-4333

Engineering Geologist, C.E.G.

www.murbachgeotech.com

CALL FOR ARTICLES

SDAG invites members to submit articles on their current research or an interesting project they are working on for publication in the monthly newsletter. The article should be no more than 1 page in length. Photos are welcomed; too. Please submit articles to the SDAG secretary via email.

PHOTO OF THE MONTH

Thanks Mike Hart for the picture! If you have a photo you would like to share with SDAG, send them to secretary@sandiegogeologists.org and we'll get them put into the newsletter!



Micro-thrust fault in Ardath Shale south of the Country club fault on Mt. Soledad. Sense of slip is indicated by offset of white siltstone bed and drag folding at arrows. The fault dies out down along a bedding plane. In a more limited exposure, this type of structure could be mistaken for evidence of landsliding.

SDAG RESEARCH TOOL

SDAG RESEARCH TOOL - A comprehensive listing of all papers published by SDAG, whether as annual field trip guidebooks or special publications, is now available on our website. Entries are sorted by primary author, or chronologically by date of publication, from our first guidebook in 1972, up the San Luis Rey River in 2013, from Coast to Cactus in 2014, and finally over the edge to the Coyote Mountains in 2015. These can be accessed or downloaded as .pdf files. They are fully searchable in Adobe Reader or Acrobat, so if you are researching a topic, "tsunami" for example, you can search for that keyword. This listing will be updated as new books are published. Thanks to Greg Peterson and Hargis + Associates, Inc., for making this possible. See the links below:

http://www.sandiegoeologists.org/SDAG_Pubs_authors.pdf

http://www.sandiegoeologists.org/SDAG_Pubs_chronological.pdf

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On behalf of the San Diego Geological Society, Inc. (SDGS), a public benefit 501(c)3 nonprofit educational corporation, we would like to request tax deductible Donations for our San Diego Association of Geologists (SDAG) group. The list of paid Sponsors and the forms to become a Sponsor are located on the SDAG web site at: <http://www.sandiegoeologists.org/Sponsors.html>.

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Contact: **Dave Bloom**



Contact: **Rupert Adams, CEG**

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