THE PARTNERSHIP
FOR RESILIENT COMMUNITIES

Montecito Debris-Flow Risk

BGC Site Reconnaissance Summary

What happened?

A series of debris flows impacted the community of Montecito, Santa Barbara County, California on January 9, 2018, **resulting in 23 fatalities, damage to more than 400 homes, and extensive economic loss**. The Partnership for Resilient Communities (TPRC) invited BGC to complete a reconnaissance-level site visit to Montecito and adjacent watersheds from July 25 to July 27, 2018.

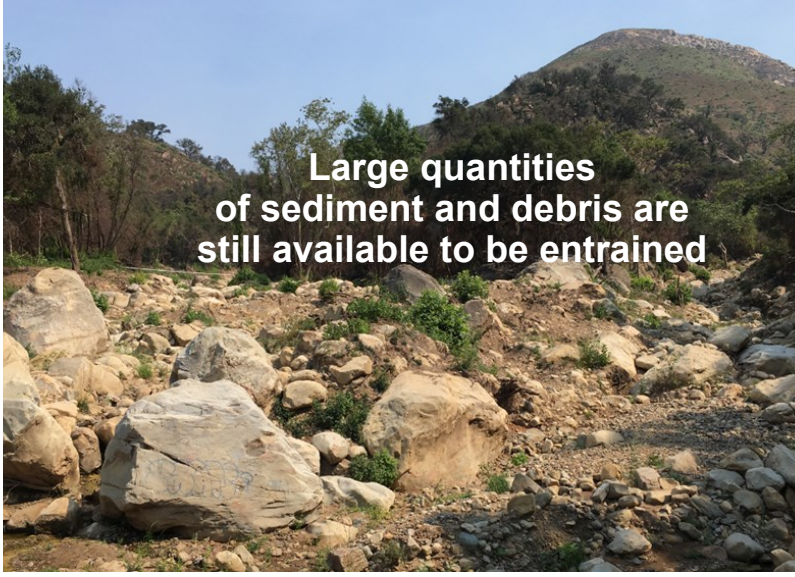
Who is BGC?

BGC Engineering Inc. (BGC) is a consulting firm providing specialist services in applied earth sciences since 1990, with specific expertise in geohazard risk management. BGC has completed hundreds of debris-flow assessments at individual creeks as well as several regional debris-flow and debris-flood risk prioritization studies. BGC staff have authored key publications on the subject of debris flows.

Field Observations

- The January 2018 debris flows destroyed homes across the entire length of the alluvial fan, from the mouth of canyons to the ocean.
- Some houses close to the fan apex collapsed and were carried away by the flows. **Rapidly flowing mud, large boulders, and woody debris all contributed to damaging and destroying homes.**
- Flow depths of the January 2018 debris flows at the mouth of some Montecito Watershed canyons ranged between 16 and 20 ft.
- The width affected by each flow was commonly between 300 ft to 1,000 ft, while the previously defined creek channels through the community are typically on the order of 16 ft to 32 ft wide.
- Evidence of previous debris flows has been reported and observed, including an anecdote of a swimming pool that filled with mud near San Ysidro creek several times in the previous decades, and landforms on the upper fan area interpreted to be debris flow levees.
- **Large quantities of fine-grained sediment, boulders, and woody debris are still abundantly available to be entrained in flows.**

A destroyed home on San Ysidro Creek.



Interpretation

- The community of Montecito was built on geologic landforms called 'debris-flow fans' that were created by sediment deposited during repeated historical debris flows and floods. **These landforms and other field evidence indicate that debris flows have occurred in the past, and debris flows will occur in the future.**
- The existing sediment basins and channels in Montecito are designed to manage flows that are substantially less than the January 2018 debris flows.
- The January 2018 debris flows appear to have scoured more than 3 ft of material from the channels near the mouth of the canyons. However, **an abundant supply of sediment and debris remains**, including loose sediment on the watershed slopes, loose sediment concentrated in watershed channels, and erodible sediment exposed in channel banks.
- Occurrence and magnitude of near-future (i.e., next 1 to 5 years) debris flows will be controlled more by the intensity of rainfall runoff rather than the abundant availability of sediment. Intensity of runoff is controlled by rainfall intensity, and vegetation cover (which intercepts rainfall and slows runoff). Vegetation cover is currently substantially less than the pre-fire condition.
- **Recovery of vegetation** on watershed slopes will eventually reduce debris flow hazard over time, but vegetation **will not eliminate debris flow hazard.**

Risk Management

- **Implementation of risk management measures is urgent**, as the rainy season begins in November, and NOAA predicts a 70% chance of El Niño in Winter 2019, which increases likelihood of severe rainfall in California.
- The currently proposed debris flow nets should help reduce, but will not eliminate, the debris flow hazard. Additional risk management strategies need to be developed in parallel with the debris flow net design to reduce debris-flow risk to levels deemed tolerable by TPRC, local regulators, and the community of Montecito.
- Debris-flow risk management measures include development of a system for early warning and evacuation, and installation of debris flow nets in the short-term, followed by improvements to physical protection that could include upgrades to debris basins and installation of check dams and conveyance channels.

The January 2018 debris flows were exceptional in historical times in terms of their degree of destruction; however, this does not preclude similar-sized or larger debris flows from occurring in the future. In the absence of adequate risk management, **the consequence of future debris flows could meet or exceed the exceptional consequences of the January 2018 debris flows.**

THIS DOCUMENT IS AN EXCERPT FROM BGC'S LETTER TITLED "MONTECITO DEBRIS-FLOW RISK—SITE RECONNAISSANCE SUMMARY (DRAFT)" DATED AUGUST 1, 2018. OBSERVATIONS THAT SUPPORT THE INTERPRETATIONS PRESENTED HERE ARE PROVIDED IN THAT LETTER.

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