ENGEO VIEW

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100-YEAR FLOOD PROTECTION AT THE YUBA GOLDFIELDS

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A SOLUTION TO POST-CONSTRUCTION BMP MONITORING

Think of the last time you went anywhere – to the store to pick up groceries, to the park for a picnic, to visit your friend's new house – you may not realize that you probably went right by a post-construction BMP somewhere along the way.

Government regulations regarding stormwater discharges are becoming increasingly complex and difficult to navigate. Meanwhile, as market trends and investor preferences become more environmentally conscious, we are seeing a dramatic increase in bio-retention basins, grassy swales, stormwater filtration systems, permeable pavements, living roofs, and underground stormwater storage vaults. These improvements are generally referred to as "Post-Construction BMPs."

What is a BMP?

Anything that improves stormwater quality can constitute a "BMP" (Best Management Practice). These improvements are more frequently required in new or redevelopment projects. They are designed to improve quality of stormwater discharges by removing pollutants.

What is the problem?

Like all our public infrastructure – roadways, bridges, sewer and water lines – these improvements don't last forever and require regular maintenance. In fact, those same regulations triggering post-construction BMPs also require monitoring and maintenance. If one wants to avoid the fines and headaches from regulators, as well as costly future damage to properties, it is essential to properly monitor and maintain BMPs. Unfortunately, few know about the regulations and even fewer have a sense of exactly what proper monitoring and maintenance entail. Moreover, each water district, county, and municipality adds additional regulatory layers – compounding the overall confusion.

GIS Application for BMP Monitoring, Maintenance and Reporting

To meet BMP monitoring and maintenance requirements, inspectors and contractors need to be able to efficiently locate BMPs and effectively communicate what type of maintenance is needed in

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POST-CONSTRUCTION BMP MONITORING (continued from pg. 1)

each facility. In large sites with many BMPs, this can be a major challenge if the right processes are not put in place.

GIS (Geographic Information Systems) has allowed ENGEO to develop a seamless monitoring and reporting system that eliminates many of the challenges facing large projects. Similar to using popular road map interfaces, GIS monitoring and reporting assures that no one gets lost. Inspectors, clients, and contractors are all on the same page – in real time – anywhere they choose, on whatever device is most convenient (their smart phone, tablet, laptop, desktop, etc.). Never again do you have to go in endless circles with the contractor regarding which BMPs need maintenance, where they are located, and what exactly needs to be performed; now the locations, the issues (including photos), and solutions are all easily seen and interpreted.

BMP maintenance is only effective when implemented in the correct locations, and regulatory requirements are only met when the proper record keeping is performed. GIS monitoring and reporting has revolutionized the maintenance recommendations process by providing the ability to expedite results and ensure that clients, regulators, and maintenance contractors are all equipped with accurate and timely information.

Our vast experience with water districts and our expertise in the design and maintenance of post-construction BMPs inform our ability to determine what maintenance is actually necessary, including how and when such maintenance should be performed. The GIS interface makes those decisions and recommendations easy to find, see, and interpret for all involved parties.

ESTIMATING DEPTH TO BEDROCK WITHOUT DRILLING

by David Teague, PhD
San Ramon, California

The horizontal-to-vertical spectral ratio (HVSR) method is a type of geophysical testing that is used to identify the fundamental resonant frequency (f0) at a particular location. This information provides a better understanding of bedrock depth and how that location will respond to seismic shaking.

The HVSR method mitigates the need to drill to bedrock in certain situations, which can save a considerable amount of money. Additionally, the HVSR method is instrumental in helping to optimize seismic analyses. These analyses provide more accurate estimates of the seismic demands on structures, leading to more resilient design.

The testing method is extremely innovative. The testing involves placing a small, three-component seismometer at the ground surface to record ambient vibrations (i.e., background noise). In general, an hour of background noise provides sufficient data.

The HVSR method dates back to 1989, but for a long time it was unknown to practitioners and was primarily used in research settings. The publication of numerous

studies that demonstrate the benefits of HVSR testing have recently made this technique more popular. While some geophysical consulting firms perform this testing, it is not widely used by geotechnical engineers. This testing capability allows ENGEO to add value to many projects.

ENGEO applies HVSR testing to non-ergodic seismic hazard analysis projects. Most recently the HVSR method was used to better understand variations in bedrock depth at Treasure Island in San Francisco, California.

MTB SCHOLARSHIP OPENS DOORS FOR YOUTH

by Joanne Lynch
Christchurch, New Zealand

A new race event will raise money towards developing a Riding Scholarship aimed to help young people into the sport of mountain biking (MTB).

The inaugural MTB Fundraiser will take place on March 15, 2019 at the Christchurch Adventure Park (CAP), with proceeds going toward developing a 'Riding Scholarship' for ten youths to try mountain biking. The scholarship will provide access to a bike, lessons, and a lift pass to CAP.

High-school students between ages 12 and 17 years from all over Christchurch will have the opportunity to be nominated, or to nominate themselves, for support to give mountain biking a crack. From the program, those who show the greatest promise and enthusiasm will be selected for a full-year scholarship, to get a solid start on the sport.

"We love what the Christchurch Adventure Park offers, but we know that not everyone has the ability to access the gear and take advantage of this awesome facility. That's where the idea for this fundraising event came along – we thought, wouldn't it be wonderful if we could remove the socio-economic barriers and help a few more kids give this sport a go," ENGEO Managing Director Greg Martin said.

Christchurch Adventure Park General Manager, Anne Newman, said it was clear from the start that ENGEO shared the same vision as CAP for getting more youths on mountain bikes. "This partnership with the ENGEO Dream Trust works so well because we have a common purpose and share the same drive to achieve it. We can't wait to meet these young people and get them going on our trails. And the bonus is that we get to run this fantastic new race event in the process, which will be an awesome day out for riders and a fun way to contribute to a great cause."

ENGEO NAMED AS FINALIST IN TWO CATEGORIES OF 2018 WESTPAC CHAMPION CANTERBURY BUSINESS AWARDS

In August 2018 ENGEO was announced as a finalist in two categories for the 2018 Westpac Champion Business Awards in Christchurch. With more than 150 entries submitted across 13 categories, making it through to the final 39 is a huge achievement.

Greg Martin was announced as one of three finalists in the MYOB Champion Emerging Leader category, and ENGEO was named finalist in the Bayley's' Champion Service Delivery.

ENGEO celebrated at the Business Awards black-tie event along with 1,200 others in Christchurch on September 19, 2018. The Westpac Champion Business Awards are widely recognized as one of the largest and most prestigious awards ceremony of its type in New Zealand. The awards are not only about recognizing and

celebrating the excellence, innovation and success of Canterbury Business but are also about celebrating the continuous growth of the Canterbury Region.

BMIS SOFTWARE TAKES TWO AWARDS

Building Materials Information System (BMIS) is a unique, subscription-based product designed to create asbestos management plans. Created by ENGEO's new technology company, Entuitive, BMIS was developed after recognizing a lack of suitable software on the market. BMIS not only develops asbestos management plans that comply with regulations, but also assists in managing additional regulatory requirements. Visit www.bmis.nz

HIGHLY COMMENDED AT 2018 NEW ZEALAND BUILDING INDUSTRY AWARDS

In August, Tom Davies and Reuben Williams attended the 2018 New Zealand Building Industry Awards in Auckland. BMIS Building Materials Information System, an asbestos management software, was entered in the Innovation category and was awarded a Highly Commended.

The NZIOB's Awards program began in 1994, with the initial emphasis being on recognizing the achievements of project managers running commercial construction projects.

ACENZ INNOVATE MERIT AWARD FOR BMIS ASBESTOS MANAGEMENT SOFTWARE

ENGEO celebrated being recognized with a merit achievement at the 2018 ACENZ Innovate Awards of Excellence Gala Dinner, held in Hamilton on Friday, August 3, 2018. This is the second year ENGEO has been recognized at the esteemed event; this year's award was for a new software product for asbestos management.

WATERFRONT STABILIZATION AT BLU HARBOR MAKES REDEVELOPMENT POSSIBLE

by Janet Kan, GE, CEG, LEED AP
San Jose, California

The Blu Harbor residential development is a 12.5-acre site located in Redwood City. Surrounded by water on three sides, this former private marina is also located in a seismically active region of California. Major faults, including San Andreas, Monte Vista-Shannon, Hayward, and San Gregorio are located within 25 miles of the site.

The redevelopment project goal is to provide much-needed residential housing in San Mateo County. In addition, the project includes a public kayak launching ramp and a waterfront boardwalk. ENGEO utilized a deep soil mixing (DSM) technology brought from Japan to the US and designed a stabilization system for the high-density waterfront development. Waterfront stabilization was necessary to protect proposed structures and improvements from seismically induced lateral deformation.

Until the site was reclaimed in the late 1950s, the area was a former marshland with a slough flowing through the center of the site. Under the reclamation fill, compressible young bay mud and potentially liquefiable sands are present. The waterfront slope was susceptible to spreading and slumping under a large seismic event.

To mitigate seismic shoreline deformation, waterfront edge containment systems such as installation of steel sheet pile bulkheads, installation of closely spaced auger-cast pin piles, and interlocking deep soil mixing were considered.

With 3,500 linear feet of waterfront shoreline that had to be protected and the high steel price at the time of project design, steel sheet piles were considered less economical than auger-cast pin piles and DSM. Construction time for an auger-cast, pin-pile system was considered too long for the project schedule, especially considering downtime due to hole caving and casing installation. As a result, an interlocking DSM approach was selected as the preferred alternative.

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WATERFRONT SLOPE STABILIZATION AT BLU HARBOR (continued from pg. 5)

A waterfront edge containment system of DSM columns provided the following benefits to this project:

- Raised site grades by 5 feet to combat potential sea-level rise in the next 50 years. DSM spoils generated were used as engineered fill, which lowered total construction costs by reducing the amount of expensive import soil.
- Interlocked DSM columns and panels that acted as a below-grade gravity wall to resist potential seismic lateral forces. This allowed shallow foundations with higher bearing capacity to be used near the waterfront, reducing foundation construction costs.
- Reduced potential lateral deformations to tolerable amounts for the structures and improvements planned within the project site.

ENGEO received two awards for this project achievement, including the ASCE 2018 Geotechnical Project of the Year Award and the 2018 CalGeo Outstanding Project of the Year Award. Project Manager Janet Kan received both awards on behalf of ENGEO.

ENGEO OPENS OFFICE IN AUSTRALIA

ENGEO has chosen the Sunshine Coast as the home of its first office in Australia. ENGEO officially opened its Maroochydore premises on June 7, 2018, after opting for the Sunshine Coast ahead of opportunities elsewhere. Plans call for eight full-time staff on the Sunshine Coast over the next two years and up to three new Australia offices in the next five years.


Sunshine Coast Daily

pwc

JUST IN NEWS SPORT LIFESTYLE COMMUNITY JOBS MOTORING

BUSINESS

Company voted among best places to work opens Coast office

AN AWARD-winning international firm has chosen the

ENGEO Australia Director, Guy Cassidy, explained that there were a number of excellent reasons why ENGEO chose the Sunshine Coast as the first location for the firm to touch down in Australia.

"We could see the growth potential and opportunities that exist when we made our visits to the Sunshine Coast, and that really cemented the decision," said Guy. "There's a market demand there for the responsive geotechnical and environmental engineering services that we provide. ENGEO has completed all types and sizes of projects in multiple market sectors and it's exciting for us to get under way on the Sunshine Coast. We look forward to assisting local companies in every phase of project development from the due diligence for land acquisition and planning through entitlement, permitting, construction and project build-out. Over the past 47 years, we've built a reputation for finding solutions instead of problems and embracing project challenges as opportunities to serve and innovate."

DREDGE TAILINGS MEET FLOOD CONTROL CHALLENGE

by Paul Cottingham, CEG
Rocklin, California

The approximately 6,700-acre Yuba Goldfields, located along the south side of the Yuba River at the northeastern end of Reclamation District No. 784 (RD 784) in Yuba County, California, is a unique site with a tremendous history of mining.

Located at the northern terminus of the State Plan of Flood Control, the Yuba Goldfields was long considered "high ground." But in 2010, a rigorous hydraulic evaluation revealed that the southern embankment of the Yuba River was susceptible to overtopping and breaching during a 100-year flood event. Flood waters entering the Goldfields from a tailings mound breach could potentially overtop the internal waterway crossings, allowing flood waters to potentially exit the Goldfields and flood the RD 784 basin to the south.

The Three Rivers Levee Improvement Authority (TRLIA), formed in 2004 as a joint powers authority by the County of Yuba and RD 784, is responsible for the flood protection of the RD 784 basin. Having already invested over $400 million in flood protection, TRLIA was now faced with the potential for flood waters to circumvent the already-completed flood control projects.

While much of the ground surface within the Goldfields lies above the predicted 100-year water surface elevations of the adjacent Yuba River, the irregular surface topography left behind from over 100 years of dredging and surface mining operations created a complex labyrinth of waterways and dredge tailing mounds. Additionally, recent dredging activities altered interior waterways within the Goldfields, further complicating the potential flood risk.

The TRLIA team was tasked with developing a 100-year flood risk solution that involved complex site conditions, environmental constraints, and numerous stakeholders. The stakeholders included DWR, USACE, BLM, FEMA, three different mining companies, Yuba County Water Agency, CVFPB, and the State Mining and Geology

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YUBA GOLDFIELDS (continued from pg. 7)

Board, among others. The focus of the design team and TRLIA was to determine and implement a 100-year flood protection solution that fit within the regulatory setting, thereby keeping the RD 784 basin out of the 100-year flood zone. The TRLIA team needed to gain cooperation from the stakeholders while limiting impacts to aggregate mining and gold dredging operations in the Goldfields.

Through research and technical evaluations, the team developed a safe and stable 100-year embankment that could be constructed from the local dredge tailings. The dredge tailings are typically a granular mixture of cobble, gravel, sand, and some fines. By reshaping the tailings, a linear feature could be constructed to form a barrier for 100-year flood protection.

The layout of the 100-year embankment was complicated by the presence of sensitive habitat, existing reclamation plans, future gold mining plans, and the complex and highly variable tailings mounds and interior waterways. The final solution involved a combination of a 100-year embankment constructed of local dredge tailings and a monitoring program for tailings mounds along the Yuba River. An approximately 10,000-lineal-foot continuous embankment within the Goldfields was constructed by moving 260,000 cubic yards of existing dredge tailing materials. The project also included small earthwork modifications to Crossing 21, a small embankment within the central portion of the Yuba Goldfields. The layout of the 100-year embankment was selected to avoid sensitive habitat and reduce impacts to future mining plans.

Ultimately the cost of the 100-year embankment was relatively small compared to traditional levee improvements in California and the approval process was greatly accelerated. Avoidance of sensitive habitat and waters of the U.S., cooperation of the mining companies, and creative engineering led to a low-cost and timely solution to the 100-year flood risk problem.

The Goldfields 100-year project was a creative solution in a very dynamic environment within an active mining area. TRLIA used local funds to take action and complete the project in a timely manner, negotiating

Left to Right: Abram Magel (ENGEO), Mark Gilbert (ENGEO), Larry Dacus (MBK), Adam Killinger (ASCE), Paul Brunner (TRLIA), Ric Reinhardt (MBK), Paul Cottingham (ENGEO)

agreements with the mining companies to allow the construction of the project on their property. The embankment, constructed with dredge tailings, was designed and optimized using geotechnical seepage and stability analyses based on subsurface data collected in various locations throughout the Goldfields. The embankment alignment was optimized to reduce impacts to future mining, reduce earthwork quantities, and avoid environmental impacts. These efforts resulted in a very low cost project that could be constructed quickly to protect the RD 784 community.

The project received the ASCE 2017 Outstanding Small Project of the Year.

SOFTWARE LICENSING TECHNOLOGY IMPROVES EFFICIENCY

by Cat McGuire
San Ramon, California

ENGEO has been using Cetrus Process Meter™ (CPM), an application management platform. It provides Plug-ins that track application use down to the second, allowing ENGEO to make the best business decisions and increase operational efficiency.

Licensing methods are complicated, and companies don't know what software they own or how many application licenses they need. IT Managers and Financial Officers must believe what software providers tell them, and trust their employees when told what licenses they have installed and need to purchase. When under-licensed, employees get frustrated and project progress slows down. If over-licensed, one wastes valuable resources and profitability drops. With the growing cost of software, firms need data to maximize licenses and ways to recoup costs and increase profits.

Equipped with CPM data, companies can optimize their licenses, maximize efficiency, and increase profitability. After analyzing several months of use data, ENGEO reduced our metered AutoCAD licenses by 30%, and eliminated 50% of another application's licenses.

Uri Eliahu, ENGEO's President and CEO, says, "Cetrus technology has allowed us to gain a much more accurate understanding of our software use and needs, thus further increasing our organizational efficiencies. I highly recommend this service for organizations that use engineering-related software on a regular basis."

ENGEO enthusiastically recommends this technology for better management of software expenditures and license use.

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