



DEPARTMENT *of* ENVIRONMENTAL SCIENCE, POLICY, AND MANAGEMENT



People

Thomas Azwell

Environmental Scientist

Research Interests / Specializations:

Remediation and restoration, oil spill response, biomimicry, biodiversity, dissemination of innovation, cognitive development, sustainable agriculture, industrial ecology, corporate sustainability

Research Description:

Precision Agriculture

Precision Agriculture is a farming practice which utilizes advanced technologies to increase yields, reduce inputs, and better manage environmental impacts. The adoption of remote sensing technologies, such as multispectral sensors, and unmanned aerial vehicles (drones) are examples of how new technologies can be used to collect real-time data to quickly respond to crop needs. Sensors provide valuable data related to plant health, water quality, and soil moisture, which would otherwise not be available to the farmer without exhaustive ground truthing. We are currently working on the development of a high-value organic fertilizer. Our technology utilizes biology to facilitate the production of an organic nitrogen compound. This innovation helps to close the yield gap with conventional farming by providing organic farmers an equivalent tool with the option for direct injection of a high ammoniacal fertilizer into their drip irrigation system.

Bioremediation and Restoration

Design systems which remediate and transform pollution, such as crude oil impacted soils. These systems rely on the ability of microbes and their constituents, both naturally occurring and introduced, to support natural attenuation of the environment. The goal is to develop low-cost processes that have the potential for replication and dissemination across both ecological and economic borders.

My current research includes the development of technologies for use during oil spill response and the restoration of the environment. The focus is on creating more efficient oil recovery equipment, such as better oil skimming ([Aasco \(http://www.aasco.com\)](http://www.aasco.com)) and oil-water separation equipment ([Water Planet Engineering \(http://www.waterlanet.com\)](http://www.waterlanet.com)), and innovative approaches to habitat restoration, such as the use of locally-adapted diverse genotypes of native plants and native fibers to support revegetation.

Press Releases:

[UC Berkeley \(http://ourenvironment.berkeley.edu/2012/02/gruate-student-thomas-azwells-research-surrender-gulf-oil-spill/\)](http://ourenvironment.berkeley.edu/2012/02/gruate-student-thomas-azwells-research-surrender-gulf-oil-spill/)

[Grande Reportagem SIC \(http://www.youtube.com/watch?v=JJN_3nDlo5o\)](http://www.youtube.com/watch?v=JJN_3nDlo5o)

[Universidade Lusófona \(http://youtu.be/1EFox8_9v9Y\)](http://youtu.be/1EFox8_9v9Y)

[Distillations \(http://www.rx.org/ieces/52128-microbes-and-worms-turn-oil-into-compost\)](http://www.rx.org/ieces/52128-microbes-and-worms-turn-oil-into-compost)

[ABC 7 \(http://a-local.go.com/kgg/story?section=resources/lifestyle_community/green&id=7475792&title="\)](http://a-local.go.com/kgg/story?section=resources/lifestyle_community/green&id=7475792&title=)

Industrial Ecology

Industrial ecology is the study of the physical, chemical, and biological interactions and interrelationships both within and between industrial and ecological systems. My research helps to identify the energy flows through commercial industrial systems, such as those closely linked to agriculture. Using principles of industrial metabolism, we can identify the way these materials flow through an industrial system and are transformed or transferred, including the portion that is misused or as 'waste'.

For example, many retailers generate large volumes of organic waste as a function of their normal sales activity. A significant portion of this organic matter ends up in the municipal solid waste stream as "D & D" (damage and destroy). Green-waste diversion programs, such as the one developed for Costco Wholesale, have the potential to capture 100% of the organic waste, transport it away from the landfill to local composting facilities, where it is thermophilically composted and turned into a valuable end product.

[Costco \(http://soil-cycle.com\)](http://soil-cycle.com)

Select Publications

Remediation and restoration of northern Gulf of Mexico coastal ecosystems following the Deepwater Horizon event. In P. Somasundaran, P. Patra, K. Pappaioanou, R.S. Farinato (Eds.) Meeting Oil Spill Challenges. Hoboken, New Jersey, John Wiley & Sons. (<http://ourenvironment.berkeley.edu/w-content/uploads/2011/07/Ch3.pdf>).

Bioremediation for the Degradation of Petroleum Hydrocarbons in the Presence of Heavy Metals in Mangrove Sediments, 2016. Ícaro T. A. Moreira, Olívia M. C. Oliveira, Thomas Azwell, Jorge A. Triguís, Antonio F.S. Queiroz, Sérgio L. C. Ferreira, Maria C. L. F. Trindade, & Cintia M. S. Martins. CLEAN-Soil, Air, Water. Wiley. (<http://onlinelibrary.wiley.com/doi/10.1002/clen.201300939/abstract>).

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling - December 2010 Report (http://ccrm.berkeley.edu/files/assets/files/DHSG_Thir_ProgressReportFinal.pdf)

Brennan, L.C. & Azwell, T. (2013) Gulf Oil Spill (History's Greatest Disasters). Minneapolis, MN, ABDO Publishing Company.

Wang, A. & Azwell, T. (2014) The Science of an Oil Spill. Ann Arbor, Michigan, Cherry Lake Publishing.

Honors and Awards

Environmental Representative - California Organic Product Advisory Board - 2011 to 2016

Environmental Science Leader - Deepwater Horizon Study Group - 2010

Strategic Research Grant - Chevron Energy Technology Company - 2010

Commissioner - Alameda County Recycling Board - 2009

William Carroll Smith Fellowship - ESPM - 2009

Best of the East Bay - Most Promising Graduate Student - East Bay Express - 2008

Schweitzer Fellow - The Albert Schweitzer Fellowship - 2008

Eva Alexis Bansner Fund for Sustainable Development - CA League of Women Voters - 2008

Green Crusader - National Greening Association - 2006, 2007

Recent Teaching:

Econ 141 - Corporate Sustainability (CB)

178A - Environmental Education (CB)

102D - Resource Policy (CB)

ENVS600 - Environmental Problems and Solutions (SFS)



(/eo.le/thomas-azwell).

Contact details

Thomas Azwell

E-mail:
azwell@erkeley.e u

Office Address

450 Sutar ja Dai Hall

We site(s):

[Thomas Azwell \(http://thomasazwell.com\)](http://thomasazwell.com).

Berkeley Mechanical Engineering

Michael Gollner

Assistant Professor of Mechanical Engineering

6135 Etcheverry Hall
University of California, Berkeley
Berkeley, CA 94720-1740
mgollner@berkeley.edu
(510) 642-3371

For more information see: [Berkeley Fire Research Lab](https://firelab.berkeley.edu/)

(<https://firelab.berkeley.edu/>).

Dr. Michael Gollner received his B.S. (2008), M.S. (2010) and Ph.D. (2012) in Mechanical Engineering from the University of California, San Diego. He was a faculty member in the Department of Fire Protection Engineering at the University of Maryland, College Park from 2012-2019. He is broadly interested in fire science problems, utilizing experiments and combustion and fluid dynamics theory to solve problems related to fire spread, material flammability, and smoke transport. Much of his work is focused on applications to wildfires, including their spread through vegetation, ignition of structures in the wildland-urban interface (WUI), transport of embers, fire whirls, and emissions from wildfire smoke.

Dr. Gollner is active in professional society leadership, serving as Treasurer and a member of the Board of Directors for the International Association of Wildland Fire (IAWF), Chair of the Research Advisory Board of the National Fire Protection Agency (NFPA) Fire Protection Research Foundation, and as a member of the Management Committee of the International Association for Fire Safety Science. He also serves as Associate Editor for the journal Fire Technology and serves on the boards of the Fire Safety Journal and the International Journal of Wildland Fire. He is a principal member of the NFPA Technical Committees on Spaceports and Wildland and Rural Fire Protection. He is also a recipient of the NSF CAREER award, Proulx Early Career Award in Fire Safety Science, and the Fire Protection Research Foundation Medal.

To view Dr. Gollner's CV, please click [here \(/wp-content/uploads/2020/01/Gollner-CV.pdf\)](/wp-content/uploads/2020/01/Gollner-CV.pdf).

Research Description:

Combustion, Fire Dynamics, Wildland Fire, Fluid Mechanics

Key Publications:

To view a list of Dr. Gollner's publications, please click [here \(https://firelab.berkeley.edu/publications/\)](https://firelab.berkeley.edu/publications/).

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Berkeley Mechanical Engineering

Philip S. Marcus

Professor of Mechanical Engineering

6121 Etcheverry Hall
University of California, Berkeley
Berkeley, CA 94720-1740
pmarcus@me.berkeley.edu
(510) 642-5942

For more information see: [Computational Fluid Dynamics Laboratory](https://cfd.me.berkeley.edu/) (<https://cfd.me.berkeley.edu/>).

[Current Classes Taught](https://classes.berkeley.edu/search/class/?f%5B0%5D=sm_instructors%3APhilip%20S%20Marcus) (https://classes.berkeley.edu/search/class/?f%5B0%5D=sm_instructors%3APhilip%20S%20Marcus).



Research Description:

Algorithms, atmospheric flows, convection, fluid mechanics, nonlinear dynamics, ocean flows, numerical analysis, turbulence.

Key Publications:

2015

“High S/N Keck and Gemini AO imaging of Uranus during 2012–2014: New cloud patterns, increasing activity, and improved wind measurements”, LA Sromovsky, I de Pater, PM Fry, HB Hammel, P Marcus, June 2015, Icarus, vol. 258 pp. 192–223, doi:10.1016/j.icarus.2015.05.029.

“Dramatic Change in Jupiter’s Great Red Spot”, AA Simon, MH Wong, JH Rogers, GS Orton, I de Pater, X Asay-Davis, RW Carlson, PS Marcus, March 2015, Lunar and Planetary Science Conference, vol. 46 pp. 1010. — [PDF](http://cfd.me.berkeley.edu/wp-content/uploads/2015/07/Dramatic-Change-in-Jupiter%E2%80%99s-Great-Red-Spot.pdf) (<http://cfd.me.berkeley.edu/wp-content/uploads/2015/07/Dramatic-Change-in-Jupiter%E2%80%99s-Great-Red-Spot.pdf>).

To view a complete list of Professor Marcus’ publications from previous years, please visit the [Computational Fluid Dynamics Laboratory website](http://cfd.me.berkeley.edu/list-of-publications/) (<http://cfd.me.berkeley.edu/list-of-publications/>).

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Exhibit 2

PAUL HASTINGS

1(213) 683-6109
michaelbradford@paulhastings.com

July 14, 2020

Katherine Philipppakis, Esq.
Farella, Braun, Martel, LP

Via E-mail: KP@fbm.com

Dear Katherine:

You have asked me to describe the fire prevention provisions that will be included in the governing documents for the Mahá Guenoc Valley project ("Project"). These provisions incorporate the defensible zone requirements and wildfire prevention requirements that are currently set forth in the Master Design Guidelines for the Project ("Defensible Zone Requirements").

The Defensible Zone Requirements have been incorporated into the current draft of the Master Declaration of Covenants, Conditions and Restrictions and Grant of Reciprocal Easements for Mahá Guenoc Valley ("Master Declaration"). The Master Declaration will be the primary governing for the entire Project. Its governance will include, among other things, easements, use restrictions, maintenance requirements and permitted uses. The Master Declaration will also establish an owners association ("Master Association") which, among other things, will be responsible for enforcing the provisions of the Master Declaration. All owners of property in the Project will be subject to the Master Declaration, which will be recorded against the land comprising the Project. All owners must comply with the requirements in the Master Declaration or be subject to enforcement actions as further described below.

The Defensible Zone Requirements are set forth in Section 3.7.5 of the Master Declaration. They require all owners, as part of their maintenance obligations under the Master Declaration, to maintain Defensible Zones located on their lots in accordance with the provisions of the Master Design Guidelines as well as any additional requirements required by the Master Association. The Master Association has the right to enforce the provisions of the Master Declaration.

Section 3.7.5 of the Master Declaration provides the Master Association with an easement over, along and across the Defensible Zones to enforce the standards for the Defensible Zones set forth in the Master Design Guidelines. The Master Declaration has the right, after notice and hearing, to enter upon an owner's lot to bring a Defensible Zone into compliance with the Master Design Guidelines, the County's Defensible Zone standards or other applicable laws. However, in an emergency, vegetation or improvements located in the Defensible Zones may be removed by the Master Association without notice to the Owner. All work performed by the Master Association must be reimbursed by the non-compliant owner. The Master Declaration also requires owners to obtain County approvals before construction of any improvement in a Defensible Zone.

In addition to the remedies described above, pursuant to Section 8.6.1 of the Declaration, if an owner fails to maintain a lot in accordance with the requirements of the Master Declaration, the Master Association also has the right to perform the maintenance or contract with another party to perform the maintenance, and to seek any other remedy available at law or in equity, including specific performance or an injunction to enforce the maintenance obligations. Pursuant to Section 4.2.2 of the Master Declaration, the Master

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Association also has the right to impose monetary fines against owners who are in violation of the Master Declaration.

In summary, the Master Declaration will require owners to comply with the Defensible Zone requirements set forth in the Maser Design Guidelines and imposed by the County, other applicable laws or the Master Association. The Master Association has the right to enforce these requirements and to take affirmative action to correct any deficiencies at no cost to the Master Association. Thus, the Defensible Zones will be maintained by the owners or, if not the owners, then the Master Association. If you would like any further information on these requirements and how they are set forth in the Master Declaration, please let me know.

Sincerely,

/s/ Michael B. Bradford
Michael B. Bradford
for PAUL HASTINGS LLP

cc: Kirsty Shelton
Chris Meredith

Exhibit 3



Are You Prepared for WILDFIRE SEASON?

Protect and defend your home and precious memories with **waveGUARD™ patented Exterior Wildfire Defense System** the industry leader in fully autonomous wildfire protection

When you purchase a waveGUARD™ System, you get MORE than a system on your home you get peace of mind

- 2-year Limited Warranty on waveGUARD™ System
- 2-year Warranty on ALL installation materials and labor
- 27/7 365 Monitoring. First year FREE!
- Bi-Annual maintenance by Certified waveGUARD™ Technician: First Year is FREE!

waveGUARD™ patented Exterior Wildfire Defense System is:

Fully Autonomous/Self Contained/Fully Automatic - complete with its own water and power source. There is no need for human intervention – no manning of pumps, hoses or spraying of product on the home. Our system will do all of that for the homeowner. They need not be present to activate the system. The system is self-activating. The system remains completely autonomous if/when power and water is cut to the property. It remains fully operational for up to 2 weeks; indefinitely if you choose the solar panel option. Upon activation, all the water is applied to the roof simultaneously through all the spray heads like a wave of water over your home and a 30' – 40' perimeter of defensible space around the home. There are NO staggered zones waiting to cycle on. waveGUARD™ delivers complete coverage for the home and surrounding area immediately, all at once.

In addition to water coverage - a fire-retardant, Micro Blaze Out™ is injected into the water distribution system. Micro Blaze Out™ is NOT a foam or gel. There is NO expensive messy clean up. This “green” product is a live microbe that remains active for up to 14 days after dispensing upon rewetting with water only. Safe for all plant life as well as all animals wild and domestic. Because the fire-retardant Micro Blaze Out™ is not a foam or gel system, the homeowner is able to experience waveGUARD™ in action and confirm the protective coverage on their home and property. This is NOT possible with foam or gel system and puts homeowners in a position to hope the foam and gel system will work. This product has been approved by UL NFPA 18 and is on the federal EPA National Contingency Plan, and used throughout all 50 states as well as worldwide.

24/7 365 Monitoring - from our headquarters. System can be activated manually if needed from the keypad or emergence switch located on the system cabinet. App for Smart Phone monitoring and activation coming soon. This will allow homeowners to view and activate their system from anywhere in the world their provider has coverage. Like a standard security system, waveGUARD™ monitors each home with the ability to view all system checkpoints functioning.

waveGUARD RoofCool™ - a function that allows the homeowner the option to run the system anytime, day or night, bypassing the fire-retardant injection process. This will result in saturating the home and a 30' – 40' perimeter around the home with water. The 10-minute cycle lowers the ambient temperature as well as raising the level of humidity. When completed, the water tank will refill and the waveGUARD™ system will rearm itself and be ready for its next activation.



HMC 400 Controller – The heart of the system is the HMC 400 Controller. The waveGUARD™ controller allows us to pump water out to all rotors and nozzles at one time, putting a wave of water over the home. The technology in the HMC 400 Controller allows waveGUARD™ to create custom features, such as a remote key pad, meeting the needs of every homeowner individually. The HMC 400 Controller has the capability to run several systems off of a single controller, allowing the homeowner to have multiple systems running at one time. This is especially beneficial when the homeowner has the need to protect multiple structures, as well as in ground perimeter system, or a system running on a fence line. The HMC 400 Controller will also allow waveGUARD™ to provide 24/7 365 monitoring of all faults to the system, including water level in the tank, and status of all IR detectors, provided the property has “Always On” internet connection AIC reporting to the technical personnel at waveGUARD™ Headquarters of any alarms or faults the system may have encountered.

Exhibit 4

4.0 Mitigation Monitoring and Reporting Plan

PROJECT DESIGN FEATURES	Timing and Implementation	Implementing Party	Monitoring Party
<p>3.18 Existing overhead PG&E infrastructure will be placed underground and all new electrical and propane infrastructure will be installed via trenching and underground.</p>	<p>At the time of the recording of the last final map for each of the five subdivision groups (Bohn Ridge Subdivision, Equestrian Subdivision, Maha Farms Subdivision, Denniston Golf Estates Subdivision, and Trout Flat Subdivision), the full electrical network serving that subdivision within the project site boundaries shall be relocated underground or shall be installed where site conditions permit.</p>	<p>Project Applicant.</p>	<p>Community Development Department</p>
<p>3.19 File an application for Firewise certification and, upon receipt, maintain it for the life of the project</p>	<p>Within 6 months of the earliest opportunity to do so (i.e., upon completion of sufficient construction to enable an application to be filed).</p>	<p>Project Applicant</p>	<p>Community Development Department</p>