Impact Study Comments

**---DESCRIPTION of any other dissemination and marketing efforts related to this project---**

* **IGEM 16-001** Amit Jain BSU Computer Science at Boise State University - An Investment in Idaho's Future
	+ *None*
* **IGEM 16-002** Kurtis Cantley BSU Enhancing Capabilities in Nantechnology and Microfabrication at Boise State
	+ *Industry Forum held in 2017 (described in Final Report)*
* **IGEM 16-003** Eric Burgett ISU Wide Band Gap and Harsh Environment Semiconductor RD&D Capibility
	+ *No data as there was no response from this PI*
* **IGEM 17-001** Larry Stauffer UI Security Management of Cyber Physical Control Systems
	+ *None*
* **IGEM 19-001** Karen Humes UI Sustaining the Competitiveness of the Food Industry in Southern Idaho: Integrated Water, Energy, and Waste Management
	+ *Deyo, B., Coats, E.R. “Return Activated Sludge Rate Impacts to Biological Phosphorus Removal.” PNCWA Annual Conference, Boise, ID. Sept. 2021.*
	+ *Smoot, L., Coats, E.R. “Investigating Nitrogen Removal Strategies to Reduce Carbon Footprint.” PNCWA Annual Conference, Boise, ID. Sept. 2021.*
	+ *Deyo, B., Coats, E.R. PNCWA Nutrients Summit, “Operator Insights on Maintaining and Recovering Biological Phosphorus Removal.” October 28, 2020.*
	+ *Alfaro, M., Coats, E.R. Microbial Metabolomics: From Manure to Bioplastics (Poster Presentation – won Top Poster Award – only awardee from a U.S. university). IWA Microbial Ecology and Water Engineering Specialist Conference, Hiroshima, Japan, Nov. 2019.*
	+ *PI Humes attended the annual meeting of the Food Northwest (trade group for Food and Beverage Processors in ID, WA, OR) in Jan 2019 to learn about workforce and technology needs among members and from organization leadership in sustainability*
* **IGEM 19-002** Will Hughes BSU Nucleic Acid Memory
	+ *1 invited commentary was written for The Conversation.1 invited commentary was written for Nature Materials. 1 news article was written by the National Science Foundation. 1 news article was published by Chemical & Engineering News. 4 dissertations were published. 18 oral and poster presentations were given at national and international conferences.*
* **IGEM 20-001** Mustafa Mashal ISU A Disaster Response Complex for Emergency Responders in Idaho
	+ *Dozens of presentations at entities such as the American Society of Civil Engineers Southern Idaho Section Civil Engineering Conference, CAES NUC Seminars, Annual Energy Policy Research Conference, Eastern Idaho Fire Department Association, Local Fire Departments, Local Emergency Planning Committee, and public/private firms.*
	+ *Publication and distribution of brochures, whitepages, handouts for the DRC.*
	+ *Launch of a webpage for the DRC (https://isu.edu/cee/research-facilities/drc/)*
	+ *More than a dozen news articles relevant to DRC activities, including videos from news channels etc.*
	+ *Outreach to more than 21 public and private entities and arranging tours of the DRC for hundreds of visitors, including leadership from the Department of Energy in Idaho, INL, and CAES.*
	+ *Scheduling tours of the DRC for members of National Guard, congressional members, legislators, and leadership from the 10th Homeland Response Force.*
	+ *Highlighting DRC achievements and activities on social media platform, including Facebook, LinkedIn*
* **IGEM 20 -002** Ken Baker UI Cellulosic 3D Printing of Modular Building Assemblies
	+ *None*

**---DESCRIPTION of any external partnerships developed as part of this project---**

* **IGEM 16-001** Amit Jain BSU Computer Science at Boise State University - An Investment in Idaho's Future
	+ *Not tracked*
* **IGEM 16-002** Kurtis Cantley BSU Enhancing Capabilities in Nantechnology and Microfabrication at Boise State
	+ *There have been many external partnerships and collaborations across several institutions, agencies, and companies. This is evidenced by awarded research grants having dozens of co-PIs from outside Boise State University. Three specific examples include collaborative research with Knowm, Inc. and the Air Force Research Labs (Rome, NY), the DOE Advanced Sensors and Instrumentation Program, and the recently awarded National Science Foundation Industry University Cooperative Research Center (IUCRC led by Penn State) which will heavily leverage IML infrastructure.*
* **IGEM 16-003** Eric Burgette ISU Wide Band Gap and Harsh Environment Semiconductor RD&D Capibility
	+ *No data as there was no response from this PI*
* **IGEM 17-001** Larry Stauffer UI Security Management of Cyber Physical Control Systems
	+ *5-yr research partnership with SEL on inherent cybersecurity*
* **IGEM 19-001** Karen Humes UI Sustaining the Competitiveness of the Food Industry in Southern Idaho: Integrated Water, Energy, and Waste Management
	+ *Strengthened existing partnerships with Idaho Dairy Association, Simplot Corp., Jacobs Engineering (contractor for waste treatment for several Idaho municipalities), City of Boise Public Works, and a crop consulting company.*
	+ *Project allowed team to develop relationships with new department within Boise Public Works working at Twenty Mile South Farm Biosolids facility*
	+ *Strengthened existing partnerships with Idaho STEM Action Center to promote teacher’s summer externship program*
* **IGEM 19-002** Will Hughes BSU Nucleic Acid Memory
	+ *Based on the above listed outcomes, the Nucleic Acid Memory (NAM) Institute at Boise*

*State was invited to join the DNA Data Storage Alliance. The alliance is the first and most*

*extensive bridge between industry and academic organizations that are pioneering DNA*

*data storage. Its mission is to "create and promote an interoperable storage ecosystem*

*based on DNA as a data storage medium". The alliance will recommend the creation of*

*specifications and standards (e.g., encoding, reliability, retention, file systems) which*

*enable end-users to add interoperable DNA-based storage solutions to their existing storage hierarchies. The founders include Illumina, Twist Biosciences, Western Digital, and*

*Microsoft. Member organizations include but are not limited to: Ansa Biotechnologies,*

*Battelle, Catalog, The Cloude Nobs Foundation, DNA Script, EPFL, ETH Zurich,*

*Imagene, IMEC, Iridia, Kioxia, Molecular Assemblies, PFU, Quantitative Scientific*

*Solutions, Quantum, Seagate, Semicondcutor Research Corporation, Spectra Logic,*

*University of Arizona, University of Washington, Digital Preservation, Oligo Archive,*

*Lost Alamos National Laboratory, Cinémathèque Suisse, 21e8, DNAli, and University of*

*Marburg. This network is critical as Boise State attempts to license the NAM intellectual*

*property and/or the research team spins-off companies in the memory/biotechnology arena.*

* + *Beyond the Alliance, the PI has been invited by the Semiconductor Research Corporation to visit Samsung and SK Hynix; both of which have shared interested in NAM.*
* **IGEM 20-001** Mustafa Mashal ISU A Disaster Response Complex for Emergency Responders in Idaho
	+ *Master agreement with Qal-Tek Associates; and MoU with another entity that we cannot share the name for due to confidentiality agreement/terms of MoU.*
	+ *The DRC is currently collaborating with about a dozen researchers from INL (National and Homeland Security, Nuclear Science and Technology) and Center for Advanced Energy Studies. The DRC has active collaboration with many external partners that include, but not limited to: Idaho State Police, Pocatello Fire Department, Idaho Falls Fire Department, North Bannock Fire Department, Southeast Idaho Public Health, Bannock County Emergency Management, Idaho National Guard, Idaho Office of Emergency Management, and many other entities listed under item 6.0 in the second year annual report of the project.*
* **IGEM 20 -002** Ken Baker UI Cellulosic 3D Printing of Modular Building Assemblies
	+ *None*

**---DESCRIPTION of other societal impacts resulting from the project---**

* **IGEM 16-001** Amit Jain BSU Computer Science at Boise State University - An Investment in Idaho's Future
	+ *The impact of 100+ CS graduates per year has been huge for local companies.*
* **IGEM 16-002** Kurtis Cantley BSU Enhancing Capabilities in Nantechnology and Microfabrication at Boise State
	+ *This project had enormous impact on the microelectronics fabrication capabilities at Boise State and the research profile in that area. In addition, it provided extensive educational training for hundreds of students interested in semiconductor material and device metrology, design, fabrication, and processing.*
* **IGEM 16-003** Eric Burgette ISU Wide Band Gap and Harsh Environment Semiconductor RD&D Capibility
	+ *No data as there was no response from this PI*
* **IGEM 17-001** Larry Stauffer UI Security Management of Cyber Physical Control Systems
	+ *Our team has done four or five television/newspaper interviews in the last year that would fall under power systems resilience, as well as a podcast for the university and one for SEL.*
* **IGEM 19-001** Karen Humes UI Sustaining the Competitiveness of the Food Industry in Southern Idaho: Integrated Water, Energy, and Waste Management
	+ *Workforce training in using cutting edge technology (UAS, sensors, etc.)*
	+ *Societal benefits in developing technology to reduce application of pesticides and herbicides and improve runoff water quality*
	+ *Societal benefits in furthering technology for extracting value added products from waste streams from dairies and food processing*
	+ *Societal benefits of this research include: health benefits to citizens, economic benefits to food producers and processors, and economic benefit to municipalities by reducing solid waste and water treatment costs*
* **IGEM 19-002** Will Hughes BSU Nucleic Acid Memory
	+ *The PI on this project helped write the Semiconductor Synthetic Biology (SemiSynBio) Roadmap. The roadmap was heavily informed by his Nature Materials publication written in collaboration with George Church at Harvard, Gurtej Sandhu at Micron, and Victor Zhirnov at the Semiconductor Research Corporation. In response to this publication and the resulting roadmap, a series of national investments from the National Science Foundation, IARPA, and others have been made into DNA data storage; of which the NAM Institute at Boise State was in the first wave of funding. Based on the portfolio of investments, and resulting outcomes, leaders in the field believe that DNA will become a memory material.*
* **IGEM 20-001** Mustafa Mashal ISU A Disaster Response Complex for Emergency Responders in Idaho
	+ *The DRC is the only facility of its kind in the Northwestern United States. The DRC started training of emergency responders on October 31, 2020. Members of the National Guard from about 20 states have trained in the DRC since April 22, 2021.*
	+ *Excluding the research and curriculum pillars, and considering only the training & exercise pillar for the DRC, as of August 27, 2021, more than 500 individuals from across the United States have used the DRC for the world-class and unique training. If a regional multiplier1 model is used to measure the economic impact, and a conservative estimate of $500 per participant who trained at the DRC is used, the regional multipliers for the Southeastern Idaho based on Idaho’s Department of Labor’s most recent data from June 2021 for “Professional and Management Development Training” would be as follows:*
	+ *Sales Multiplier = 1.48*

*Jobs Multiplier = 1.12*

*Earnings Multiplier = 1.31*

*Regional Economy Impact (Sales) = 500 x $500 x 1.48 = $370,000*

*Regional Economy Impact (Jobs) = 500 x $500 x 1.12 = $280,000*

*Regional Economy Impact (Earnings) = 500 x $500 x 1.31 = $327,500*

*Total Regional Economy Impact (Sales/Jobs/Earnings) = $977,500*

* **IGEM 20 -002** Ken Baker UI Cellulosic 3D Printing of Modular Building Assemblies
	+ *None as yet*

**END**