



**Idaho State  
University**

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**Disaster Response  
Complex**

**College of Science and Engineering**

**Department of Civil and Environmental Engineering**

**IGEM20-001**

**A Disaster Response Complex for Emergency Responders in Idaho  
2<sup>nd</sup> Year Annual Report**

**July 1, 2020 – June 30, 2021**

**June 30, 2021**

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## **1.0 Basic Project Information**

### **Funding Agency**

Higher Education Research Council - Idaho Global Entrepreneurial Mission Program

### **Awarded Institution**

Idaho State University, College of Science and Engineering, Department of Civil and Environmental Engineering

### **Grant Number**

IGEM20-001

### **Project Title**

A Disaster Response Complex for Emergency Responders in Idaho

### **Principal Investigator**

Mustafa Mashal, Ph.D., P.E., Associate Professor

### **Co-Principal Investigator**

Bruce Savage, Ph.D., P.E., Professor and Department Chair

### **Report Type**

2<sup>nd</sup> Year Annual Report: July 1, 2020 – June 30, 2021

## 2.0 Executive Summary

In the post 9/11 years, the national demand for training of emergency responders from the military and law enforcement branches has grown rapidly. There is a higher demand for training of emergency responders than the current facilities can support. In 2019, researchers at Idaho State University were awarded funding from the State of Idaho under the HERC-IGEM Grant. The focus of the project is the development of a Disaster Response Complex (DRC) for research, certification, and training of emergency responders in collaboration with the Directorate of National & Homeland Security at the Idaho National Laboratory (INL), and the Center for Advanced Energy Studies (CAES). The DRC has three pillars: 1) research, 2) curriculum and certification, and 3) training. All three pillars include the development of new indoor and outdoor complexes with training lanes/simulations to be used in both research, teaching, and training of emergency responders and the instrumentation of a collapsed structure. The training lanes will be used in combination with Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) surrogates/markers, the use of robots/small Unmanned Aerial Vehicle (sUAV), Virtual Reality (VR), Augmented Reality (AR), Geographic Information System (GIS), Light Detection and Ranging (LiDAR), and Radio-Frequency Identification (RFID). The curriculum pillar includes offering courses in topics such as emergency response, gamma/chem spectroscopy, and safety protocols. For the training pillar, the facility can be used to host events for clients such as the Department of Defense (DoD) CBRNE Response Enterprise (CRE), military personnel, Idaho National Guard, and law enforcement agencies/fire departments from Idaho and the region. It is expected that the DRC will be a comprehensive facility that will incorporate natural (earthquakes, hurricanes, flooding) and man-made hazards in the training of emergency responders.

## 3.0 Summary of Project Accomplishments (2<sup>nd</sup> Year)

This is the annual report for the second year of the project. The second-year budget for the project was \$271,400, which included a \$4,000 budget cut due to the developments with COVID-19. The project personnel would like to thank the State Board of Education for offering a no-cost extension for the first year of the project. This certainly assisted in making more progress during a pandemic. Despite the ongoing global pandemic, the project personnel made substantial progress in the second year toward all three pillars of the DRC as described below.

While still under construction, the DRC started its training on October 31, 2020. Since then 350 individuals including instructors and role players have participated in exercises and trainings offered through the DRC. From these, about 180 were civilian responders (ISU EMT and other programs, ISU Public Safety, Idaho State Police, Pocatello Police, Fire departments, and local search and rescue units) and approximately 170 were military responders, primarily Civil Support Teams from the National Guard representing about 20 states. An additional 150 or more members of the National Guard from across the country are expected to train at the DRC by Fall 2021. ISU is collaborating with INL on the training of the National Guard units. Dozens of civilian responders are also expected to use the DRC for their training in the remaining half of 2021.

Most of the National Guard units are training at a former Armory building in Pocatello. The Armory was originally planned to be excessed by ISU, however, after a proposal by the DRC team, it was assigned to the DRC project to serve as an indoor year-round training facility. The space inside the Armory was cleaned out and new classrooms, offices, and meeting rooms, equipped with all facilities were established. New state-of-the-art training lanes were designed and constructed inside the Armory building. ISU and the state of Idaho have a lot to be proud of for having the National Guard back training in the former Armory building after half a century. The DRC has been expanding its collaboration with local, regional, and national stakeholders. Tours and discussions were held for potential partners from the Federal Bureau of Investigation (FBI), Southeast Idaho Health District, counties, and Local Emergency Planning Committees (LEPCs) in Southeast Idaho and other partners from the public/private industry.

Additional research funds were obtained from ISU and CAES to engage more students and researchers on the DRC project. Students and researchers participated in scholarly activities in disaster response, such as submission of peer-reviewed journals, presentation of the project in the 2021 American Society of Civil Engineers (ASCE) Southern Idaho Section Civil Engineering Conference.

Many tours of the DRC were provided for the stakeholders and potential partners on the project. Several media articles were published to promote and spread the word about the DRC. In line with ISU's branding, logos and white pages for the DRC were created. A website has also been launched (<https://isu.edu/cee/research-facilities/drc/>). In 2021, the project personnel initiated more marketing/promotion efforts, development work, alumni engagement, and business plans to make the DRC sustainable after the end of the project (e.g. June 2022).

#### **A. Research Pillar**

Efforts in the research pillar were primarily focused on the use of robotics, AR, VR, GIS, LiDAR, and Radio-Frequency Identification (RFID). Other research areas such as electronic simulations of markers/surrogates for CBRNE training were also initiated with researchers from INL and ISU. Updates in each area of the research pillar are outlined as follows.

- Robotics:
  - An ISU graduate student has been working on the robotic aspects of the project in collaboration with ISU and INL researchers. The student successfully passed his qualifier exam for a doctorate degree at ISU and is making progress toward his dissertation focused on the use of robotics in disaster response.
- AR/VR:
  - Three to four students from ISU have been working under the supervision of the INL researchers on the AR/VR aspect of the project. The researchers from ISU and INL have been holding regular weekly/biweekly meetings to identify further research opportunities in this area. The AR/VR is an emerging area of research interest to many public and private institutions, especially during a pandemic when travel is limited. The project personnel discussed the use of AR/VR for the training of emergency responders with both private and public entities.
  - ISU partnered with INL researchers and developed a concept paper for the use of new technologies in disaster response and training. CAES provided \$24,700 in funding for INL researchers to develop the concept paper in collaboration with ISU researchers.
  - In December 2020, Dr. Mashal was awarded \$20,000 for research in AR/VR through Idaho State University – Center for Advanced Energy Studies (ISU-CAES) funding. The project aims to develop AR/VR templates (e.g. exercises) for responders from both military and civil sectors. ISU is collaborating with researchers from INL on this project.
  - A new Visualization laboratory was established to assist with AR/VR research at ISU. Funding (\$16,000) for the laboratory was provided through ISU-CAES. The new “Visualization Laboratory” is equipped with two pro-grade virtual reality (VR) headsets with eye-tracking; one Vive Cosmo and one Oculus Quest headsets that allow users to visualize information in a 3D immersive virtual environment. Additional equipment includes one Dell Alienware laptop and two Alienware desktops to develop VR environments, an iPad pro with built in Light Detection and Ranging (LiDAR) scanner for augmented reality (AR), four monitors and other accessories, and MS HoloLens 2. Three students from Mechanical Engineering have already started using the Visualization Laboratory for research as part of the DRC project.



- ISU-CAES provided additional \$5,000 in 2021 for purchase of equipment such as high-speed camera and other accessories in the visualization laboratory.
- ISU-CAES provided approximately \$10,800 to engage ISU students in the DRC project; the students are co-supervised by INL researchers. This funding provided the student's hourly pay to work on the research pillar of the project.
- GIS and LiDAR:
  - The outdoor collapsed structure was surveyed and shot using LiDAR during different construction stages. Results will be used for the AR/VR aspect of the project.
- Radio-Frequency Identification (RFID):
  - A faculty with expertise in Electrical and Computer Engineering at ISU has been collaborating with the project personnel on the use of RFID in civil engineering applications. Although the project focuses on applications of RFID for moving of precast concrete elements, there is potential for using this technology in monitoring the movement of concrete rubble as part of the post-disaster response and monitoring. The researchers at ISU have discussed applications of RFID technology in disaster response with INL and are looking for potential opportunities for funding and collaboration.
- Chemical, Biological, Radiological, Nuclear, and High Yield Explosives (CBRNE) Simulation:
  - Numerous meetings were held between ISU and INL researchers to discuss electronic simulations of CBRNE training. ISU and INL are also exploring collaboration with some private companies that offer such capabilities.
  - In 2021, CAES funded \$50,000 for program development for a Radiological Dispersal Device (RDD) Training using electronic simulations. While the principal investigator for the project is an INL employee, majority of the funding (e.g. \$43,000) have been allocated to ISU to support a graduate student from health physics to participate in this project. The project has three phases and will continue until May 2022.
- Other Technologies:
  - Other technologies such as the use of sUAV have also been considered for applications in disaster response. INL has good capabilities in sUAV. In addition, the project personnel have discussed collaborating with the College of Technology at ISU, which has several sUAVs; some equipped with LiDAR. INL has loaned a unique training resource (e.g. vehicle) for the DRC to ISU. sUAV was used for the preparation of this resource before it was shipped to ISU in early 2021. The training resource has already been used in the training of emergency responders at ISU and is unique in the Pacific Northwest.
- Scholarly Activities:
  - A journal paper titled "A Disaster Response Complex for Training of First Responders in Idaho" was submitted to "Countering WMD Journal" which is published by the United States Army Nuclear and Countering WMD Agency. The journal is currently under review.
  - Another journal paper titled "Virtual and Augmented Reality in Disaster Management: A Literature Review of the Past 10 Years" was submitted to 2021 IEEE International Symposium on Mixed and Augmented Reality (ISMAR). After receiving the peer-reviews, the project personnel have been working to refine the paper and submit it again in a peer-reviewed journal/conference.
  - A 50-minute presentation on "A Disaster Response Complex (DRC) for the training of Emergency Responders in Idaho" was made during the 2021 American Society of Civil



Engineers (ASCE) Southern Idaho Section Civil Engineering Conference. The presentation was selected from many other submissions. Participants received Professional Development Units (PDUs) from the ISU presentation.

- A master's level student has been writing his MS project on the DRC. The MS project will include civil engineering design, construction, as well as the state-of-the-art technologies for disaster response.
- Another master's student has been working toward his thesis in electronic simulation of HazMat in disaster training.
- Outreach and New Collaboration/Partnership:
  - Numerous meetings and tours of the DRC were held to discuss research collaboration with INL, CAES, ISU, law enforcement, office of emergency management, local fire departments, and private companies.
  - Tours of the DRC were held for dignitaries from the Department of Energy, INL, and ISU.
  - ISU has signed Memos/Master Agreements with public and private firms that are partnering on the DRC project.
  - The DRC participated in discussions for a proposal by ISU's Kasiska Division of Health Sciences (KDHS) to Federal Emergency Management Agency (FEMA).

## **B. Curriculum and Certification Pillar**

- On the curriculum side, the project personnel and INL researchers/instructors have been holding regular weekly meetings to develop new curriculum in disaster response that uses the indoor and outdoor DRC facilities.
- The project personnel are collaborating with ISU's KDHS to develop and offer a unique curriculum focused on earthquake response in the fall of 2021.
- In partnership with Battelle Energy Alliance (BEA) and CAES, Idaho State University offered the Laboratory Operations Supervisor Academy (LOSA) at no cost to 30 participating faculty, staff, and students in August 2020. LOSA is a prestigious training program developed by BEA, the operating contractor for INL and several other national labs for the Department of Energy. This half-day training discussed principles for the Safe Conduct of Research (SCoR) and utilized simulations and scenarios to demonstrate and build a culture of lab safety. The Project PI (Dr. Mashal) and Project Manager (Jared Cantrell) offered this training at ISU. The LOSA Pilot training was sponsored by BEA for nearly \$14,000. The project personnel have plans to expand LOSA for other faculty, staff, and students at ISU and make it a class under the DRC for the upcoming semesters.
- ISU, INL, and a non-profit entity pursued funding to develop a pandemic-focused version of LOSA. The training was titled LOSA-COVID-19 and targeted employees of the lab, ISU, and other state entities. Initiatives such as "Train-the-Trainer" were part of this plan. ISU submitted a \$428,000 proposal to CAES on the LOSA-COVID-19 initiative. The proposal was not successful.
- ISU has completed a Master Agreement with a private company in Idaho to offer curriculum for the DRC. Thirty-eight courses have been shortlisted and discussed for this initiative.
- The project personnel have had discussions and tours of the outdoor DRC with potential instructors/partners from local fire departments and the private industry to develop curriculum for emergency responders in the military, law enforcement, emergency management, and fire departments.



- The project personnel followed up with ISU's College of Technology's Continuing Education/Workforce Training and private industry to explore the initiative of getting Continuing Education Units (CEUs) for the responders taking curriculum at ISU.
- Dr. Mashal and Dean Snyder presented the DRC project at the ISU Alumni Association Town Hall on January 20, 2021.
- Dr. Mashal made an online presentation during the December 3, 2020 meeting of the Eastern Idaho Fire Chiefs Association and shared information about the DRC. The project personnel reached out to local fire departments to consider collaborating with ISU on the curriculum/certification and training/exercise pillars of the DRC.
- Dr. Mashal and Jared Cantrell (DRC manager) presented to Caribou County Local Emergency Planning Committees (LEPCs) on seismic vulnerability in Southeast Idaho and the DRC project on June 16, 2021.

### **C. Training and Exercise Pillar**

In the second year, despite the COVID-19 and lockdown restriction, the project personnel were able to start the training at the DRC while it has been still under construction. More than 350 individuals including instructors and role players have participated in exercises and trainings offered through the DRC since October 31, 2020. From these individuals, about 180 were civilian responders (ISU EMT and other programs, ISU Public Safety, Idaho State Police, Pocatello Police, Fire departments, and local search and rescue units) and approximately 170 were military responders, primarily Civil Support Teams from the National Guard representing about 20 states.

- Other updates from the second year of the project includes, but not limited to:
  - Purchased and transferred multiple conex boxes and various materials and supplies that will be used for the construction of outdoor and indoor training lanes.
  - Finalized design and drawings for the three basic lanes.
  - Completed construction of a complex subterranean lane (Figure 1).
  - Completed construction of a shoring lane inside a conex box.
  - Hosted visits and open houses during construction of the facility to gather more feedback from the potential users which included Public Safety, Emergency Management from ISU, Idaho State Police, Idaho Falls Fire Department, Pocatello Fire Department, Office of Emergency Management, Pocatello Police Department, INL, Department of Energy, Idaho National Guard, Idaho Civil Support Team, INL Oversight Program, and many others from public/private entities (Figure 2).
  - The project personnel worked with ISU's Facilities and were granted the Old Armory Building (Figure 3) for research and academic use. This selection was based on the feedback from INL, Idaho National Guard, and other clients. The Armory building is an ideal place for smaller-scale training and offering special focused courses. The Armory building was built in 1939 and originally housed the National Guard Armory. It was subsequently used by ISU for the Diesel Technology program. With the move of the Diesel Technology program in August 2020 to another location on campus, the Armory building was re-purposed to be used toward serving the National Guard units again. The building has a high-bay area. It also includes spaces that can be used for offices and classrooms. Together with the outdoor facility, the Armory building provides substantial support for all three pillars of the DRC. The project personnel prepared extensive designs and drawings



for the indoor facility, which houses a mock-city block (Figure 4) for indoor training scenarios. Construction for the main part of the mock-city (e.g. storefront and roadway) have been completed (Figures 5 & 6). Furthermore, several classrooms, offices, meeting rooms were painted and set up to support all three pillars of the DRC (Figure 7).



**Figure 1.** Completed Subterranean Lane





**Figure 2.** DRC Open House in Fall 2020

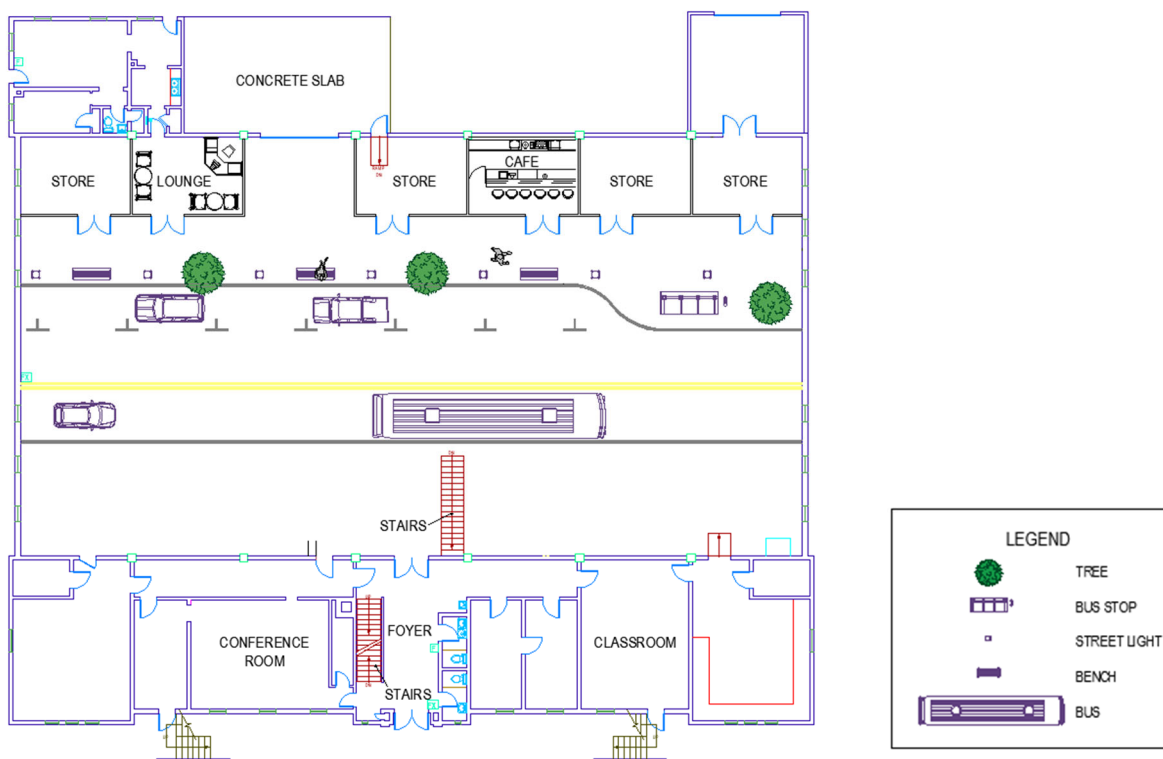


(a) Front View



(b) Parking Lot on the West Side

**Figure 3.** Armory Building at ISU

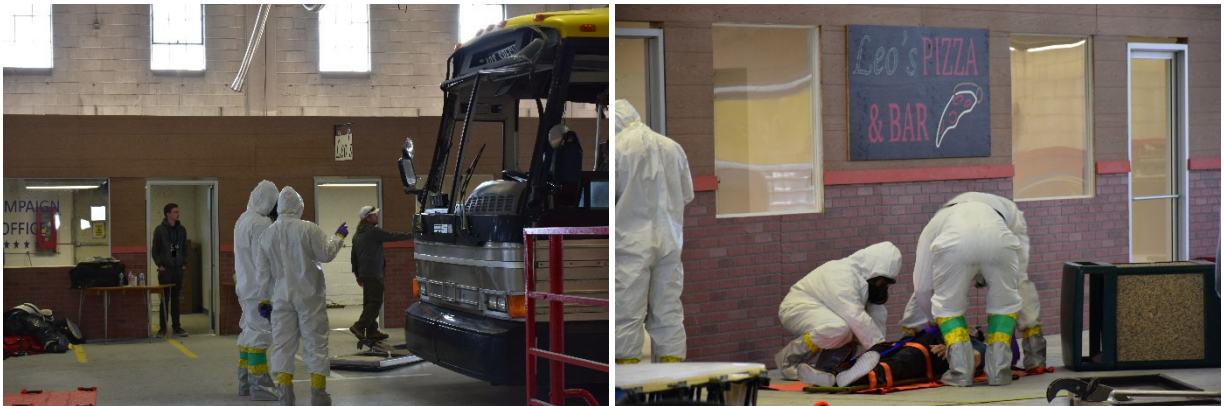


**Figure 4.** Mock-City Layout at the Armory Building at ISU





**Figure 5.** Construction of Mock-City Block in the indoor DRC



**Figure 6.** Completed Mock-City Block with National Guard conducting a training in June of 2021



**Figure 7.** Typical refurbished space in the Armory that serves as a classroom, shown in the photo was a joint exercise by the National Guard and local responders from Idaho

- ISU Research Office as part of the Higher Education Research Council’s Research Infrastructure provided \$225,000 in funding toward materials and supplies, and building infrastructure in the Department of Civil and Environmental Engineering. A part of this funding (approximately \$30,000) was spent toward the construction of the DRC outdoor training campus and installation of a perimeter fence around the site.
- Sample Training Events:
  - In October 2020, twenty students and six instructors in the Idaho State University College of Technology’s Emergency Medical Technician program utilized the outdoor DRC for a real-world training. This training was highlighted in the media (Idaho State Journal and ISU website), refer to Appendix 1. Several other training events for the ISU’s EMTs were held since October 2020.
  - In November 2020, twenty-five members of the Pocatello Fire Department’s Urban Search and Rescue team used the outdoor DRC facility to conduct a special operation exercise that included structural collapse training (Figure 8). The newly constructed subterranean lane was utilized for the training. The event received coverage on Local News 8 as well as Idaho State Journal, refer to Appendix 1. [Devin Christensen, a captain with the fire department who heads the special team, had to travel to Texas A&M University in College Station, Texas, with another member of the department the last time he participated in structural collapse training. “We can train 25 guys here today for the money it takes to send two to a class in Texas,” Christensen said].



**Figure 8.** Training by the Pocatello Fire Department’s Urban Search and Rescue team

- On January 16, 2021, a training in the indoor DRC was hosted for the Snake River Search and Rescue Inc. The training included 10 K9 trainers, 12 K9’s, 4 student/faculty participants for live finds (Figure 9).





**Figure 9.** K9s and their handlers training at the indoor DRC

- On February 11, 2021, the Radiological Control Fundamentals Exercise was hosted at the outdoor DRC. This was organized by ISU's College of Technology. ISU Students practiced measuring background radiation levels at the outdoor DRC site; 18 students and 2 instructors participated in the exercise.
- On March 11, 2021, the DRC hosted a "Confined Space" Exercise for the Idaho Falls Fire Department (IFFD) at its outdoor facility. 20 trainees and 4 instructors participated. IFFD practiced confined space maneuvers while practicing use of oxygen and monitoring oxygen levels. The participants also performed tripod extractions and lifts (Figure 10).







**Figure 10.** Confined Space exercise by the Idaho Falls Fire Department

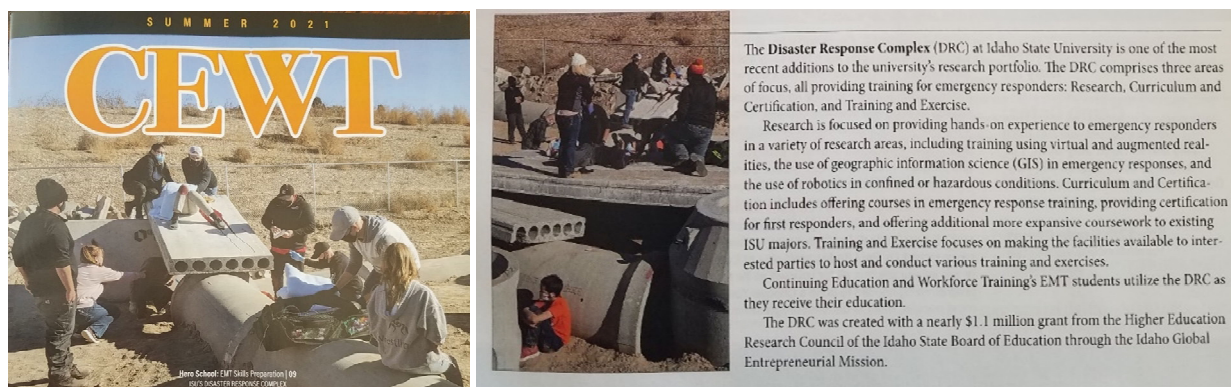
- On April 3, 2021, ISU's Emergency Medical Technician (EMT) Workshop was held simulating mass casualty response at outdoor DRC site. The training also included landing of an air medical services helicopter at the DRC outdoor site. The event was part of the ISU's Continuing Education and Workforce Training (CEWT). Thirty-six participants including role-players, students, and instructors were part of the workshop (Figure 11). The DRC is collaborating with the CEWT and was featured on the cover page of CEWT's Summer 2021 magazine (Figure 12).







**Figure 11.** ISU EMT students training at the DRC



**Figure 12.** ISU's CEWT magazine featured the DRC on its front page

- Between April – June 30, 2021, six training events were held for the Civil Support Teams from the National Guard. Some of the training events offered the opportunity for the local responders from the ISU Public Safety, ISU State Police, and other entities to participate in the exercise with the military free of charge. An article highlighting the National Guard training at ISU was published in the media, refer to Appendix 1.

## 4.0 Plans for the Upcoming Reporting Period

Plans for each pillar of the DRC project are discussed below.

### A. Research Pillar

- Continuing collaboration with ISU and INL researchers and developing the templates for a trench rescue and radiological training using AR/VR for civilian and military responders, respectively.
- Exploring funding opportunities in different areas such as AR/VR, instrumentation, and new technologies for disaster response.
- Publishing peer-reviewed papers from the research work.



## B. Curriculum and Certification Pillar

- Developing curriculum for the indoor and outdoor DRC in collaboration with INL, KDHS in ISU, and other partners.
- Obtaining input from stakeholders.

## C. Training and Exercise Pillar

- Completing construction of the basic training lanes for the outdoor DRC.
- Adding more details to the mock-city for the indoor DRC.
- An estimated 150 members of the National Guard from across the country are expected to train at the DRC by Fall 2021. ISU is collaborating with INL on training of the National Guard units.
- Multiple events have been scheduled at the DRC for local and regional responders. Dozens of civilian responders are expected to use the DRC for their training in the remaining half of 2021.
- ISU will be co-hosting a HazMat Training for the Idaho Office of Emergency Management in the summer of 2021.

## D. Promotion, Marketing, Development Work

- The project personnel are working with colleagues at ISU on the following initiatives:
  - Develop marketing details (e.g. brochures)
  - Host outreach efforts
  - Present and attend regional conferences in disaster response
  - Arrange tours for state legislators, members of the U.S. Congress, leadership from the National Guard units, and other stakeholders to the DRC
  - Develop a business plan for the DRC to be sustainable after the end of the IGEM-HERC project in June of 2022

## 5.0 Expenditure Report

The project expenditure until June 23, 2021 is presented in Table 1. The project spent all its allocated budget of \$271,400 for the second year. There was a rollover of \$32,947 from FY20 (total of \$304,347 for the 2<sup>nd</sup> year of the project) which has been spent as well. Appendix 3 includes a breakdown of the budget and expenditure report.

**Table 1.** Summary of Budget Expenditures

Salaries & Fringes already posted June 23, 2021 (faculty, graduate students, research engineer)	\$159,424
Travel	\$925
Capital Expense	\$64,292
Services and Supplies	\$52,547
Tuition Remission (graduate student)	\$9,926
Salary & Fringes to be posted through June 30, 2021 (faculty, graduate students, research engineer)	\$17,233
<b>Total</b>	<b>\$304,347</b>

## 6.0 Partnerships

The project personnel have had discussions with the interested individuals and entities listed in Table 2 on this project with one or more pillars of the DRC project. The impact of the partnership with some of the entities named in Table 2 has created opportunities for students and faculty at ISU as well as the collaborators.

A full-time Research Engineer/Lab Manager position was created for this project. The position was filled and the Research Engineer/Lab Manager started on November 4, 2019. The Research Engineer/Manager helps with all three pillars of the DRC project as well as supervising several students.

**Table 2.** Entities that have toured/visited/briefed/or collaborated on the DRC project

No	Entity Name
1	Idaho National Laboratory <ul style="list-style-type: none"> <li>• National and Homeland Security Directorate</li> <li>• Energy and Environment Science and Technology</li> <li>• Nuclear Science and Technology</li> </ul>
2	The Center for Advanced Energy Studies
3	Department of Energy <ul style="list-style-type: none"> <li>• Idaho Operations Office</li> </ul>
4	Idaho Department of Environmental Quality <ul style="list-style-type: none"> <li>• INL Oversight Program</li> </ul>
5	Idaho Office of Emergency Management <ul style="list-style-type: none"> <li>• Southeast Idaho</li> <li>• East Idaho</li> <li>• Boise Area</li> </ul>
6	Idaho National Guard <ul style="list-style-type: none"> <li>• Homeland Response Force</li> <li>• Civil Support Team</li> </ul>
7	Idaho Falls Fire Department
8	Pocatello Fire Department
9	Pocatello Police Department
10	Idaho State Police
11	Qal-Tek Associates, LLC
12	Technical Resources Group, Inc.
13	Snake River Search and Rescue, Inc.
14	Argon Electronics
15	Preparedness Innovations
16	Eastern Idaho Fire Chiefs Association
17	Eastern Idaho Safety Consultants
18	Bannock County Emergency Services
20	Caribou County Public Safety and LEPC
21	Idaho State University <ul style="list-style-type: none"> <li>• College of Technology</li> </ul>



- Nuclear Operations Technology
- Continuing Education/Workforce Training)
- Kasiska Division of Health Sciences
  - Institute of Emergency Management
  - Department of Community and Public Health
- College of Science and Engineering
  - Department of Mechanical Engineering
  - Department of Computer Science
  - Health Physics
  - Physics
  - Department of Chemistry
  - Electrical and Computer Engineering
  - Environmental Monitoring Laboratory
- Department of Public Safety
- Emergency Management
- GIS Center
- Idaho Accelerator Center

## 7.0 Economic Impact

Excluding the research and curriculum pillars, and considering only the training & exercise pillar for the DRC, as of June 30, 2021, more than 350 individuals from across the United States have used the DRC for the world-class and unique training. If a regional multiplier<sup>1</sup> 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) =  $350 \times \$500 \times 1.48 = \$259,000$

Regional Economy Impact (Jobs) =  $350 \times \$500 \times 1.12 = \$196,000$

Regional Economy Impact (Earnings) =  $350 \times \$500 \times 1.31 = \$229,250$

## 8.0 Faculty and Student Participation

Through June 30, 2021, the numbers of faculty, students, and other researchers who participated in one or more areas on the DRC project at ISU are listed in Table 3. Appendix 2 provides sample student activities for some of the students working on the project.

<sup>1</sup>A multiplier model uses an approach to measure how important one industry is to other industries in the region. For instance, a multiplier of 1.5 means that for every dollar spent on that industry, the regional economy will be affected by 1.5 times of the original investment.

**Table 3.** Participating Researchers

Position	Numbers
Faculty	7 (including the PIs)
Graduate Students	7
Undergraduate Students	10
Researchers	6
<b>Total</b>	<b>30</b>

## 9.0 Metrics for Establishing Project Success and Economic Impact

Table 4 presents a summary of the metrics for establishing project success and economic impact for the second year of the project.

**Table 4.** Summary of the Criteria for Measuring Success for Year 2

Criteria	Pillars of the Disaster Response Complex		
	Research	Curriculum & Certification	Training & Exercise
<b>Original Proposal (Jul 2020 – Jun 2021)</b>	1. Detailed design/construction of the Phase II rubble pile, addition of new training lanes. 2. Publication of 3-4 papers. 3. Hiring two additional graduate students.	1. Development of two additional classes in emergency training in collaboration with INL/CAES. 2. Obtaining certification. 3. Offering training courses to 100 students/first responders.	1. Training of 400 DoD CRE customers/Idaho National Guard personnel. 2. Expanded customer base offering CBRN training.
<b>Actual Performance (Jul 2020 – Jun 2021)</b>	1. Detail design and construction of the rubble pile was completed. A city-mock for the indoor DRC has been developed and construction is complete. 2. Logos were created, a website was launched. 3. A journal paper was submitted; another journal paper is currently under revision; a concept paper was prepared by INL researchers. 4. Five graduates and multiple undergraduates were hired to work on the DRC project under the supervision of ISU/INL researchers. 5. One PhD student is currently working on his dissertation on the use of	1. Course description and topics were developed for a class in gamma spectroscopy. Unfortunately, this class will not go through after receiving instructions from the government. 2. A training for building safety culture (LOSA) was piloted to 30 students/faculty/staff at no-cost under a contract with BEA. LOSA is part of the curriculum under the DRC. 3. Thirty-eight classes have been shortlisted and discussed between ISU and a private company. Materials for the classes are ready. ISU is planning to work with the collaborators to advertise some of these classes under the DRC in 2021.	1. More than 350 individuals have used the DRC for their training events between October 31 <sup>st</sup> , 2020 – June 30 <sup>th</sup> , 2021. This number included emergency responders from the military (e.g. 170) and civilian (e.g. 180) sectors. 2. Multiple training events were scheduled at ISU under the DRC project in 2020. The number of emergency responders in these training events was projected to be more than 100. Unfortunately, the pandemic, lockdown, and travel/gathering restrictions did not allow for holding training events. This was beyond the control of the project personnel or ISU.

	<p>robotics in disaster response.</p> <p>6. A master's student is writing his MS Project on the DRC project.</p> <p>7. Another master's student is working toward his thesis on the use of electronic simulations for HazMat in disaster training.</p>	<p>4. ISU is collaborating with KDHS on an earthquake-response curriculum and training that will be hosted at the DRC in the fall of 2021.</p> <p>5. The project personnel are actively looking for certification and continuing education unit opportunities for the classes offered through the DRC.</p>	
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## 10.0 Future Plans

Multiple training and exercise events at the DRC are planned for 2021. In addition, work is on-going to develop the curriculum and certification, and the research pillars. The intent of the DRC was originally to be a self-sustaining entity by the end of the three years of funding. The pandemic and lockdown put limitations on hosting training events in Pocatello and at ISU between February 2020 – May 2021. Several planned training events for 2020 had to be canceled. DRC will need more than three years from the start of the project in August 2019 to become self-sustaining. Additional funding and opportunities are actively being explored to make the DRC a long-term resource for the training of emergency responders from Idaho and the region.

Future improvements and renovations of the Armory building such as: adding new training lanes in the indoor/outdoor facility, partnerships with the private and public industry, hiring new researchers and students to work on different pillars of the project, training more emergency responders, arranging tours for potential partners and stakeholders, and spreading the word about the DRC in Idaho and the Pacific Northwest. Funding opportunities are actively being pursued to further develop the facilities for project continuation and expansion.

## 11.0 Commercialization Revenue

Nothing to report for the period July 2020 – June 2021. The Project has potential for developing intellectual property.

## Appendix 1. Media Articles



### Idaho State EMT program partners with the Disaster Response Complex for 'real-world' training

Article Link (ISU): <https://www.isu.edu/news/2020-fall/idaho-state-emt-program-partners-with-the-disaster-response-complex-for-real-world-training.html>

Article Link (Idaho State Journal): [https://www.idahostatejournal.com/community/isu-s-emt-program-partners-with-the-disaster-response-complex-for-training/article\\_335920c3-04c2-5f15-b8c8-26de999f3acd.html](https://www.idahostatejournal.com/community/isu-s-emt-program-partners-with-the-disaster-response-complex-for-training/article_335920c3-04c2-5f15-b8c8-26de999f3acd.html)

By Miriam Dance, COSE Director of Public Relations | November 5, 2020

POCATELLO – Twenty students and six instructors in the Idaho State University College of Technology’s Emergency Medical Technician program received real-world emergency response training at the new ISU Disaster Response Complex, which is run by the Department of Civil and Environmental Engineering.

Training scenarios were constructed to simulate emergency situations. The simulated scenario training is a typical component of the EMT program, which is part of the College of Technology’s Continuing Education and Workforce Training programs. However, conducting the training at the Disaster Response Complex allowed for the development of new mass casualty and individual injury incidents of an industrial nature that were not possible before, including extractions from buildings that may have collapsed or dark tunnels that may have flooded. “We were thrilled to be able to conduct training at the new DRC facility,” said RaeLyn Price, health programs coordinator for Continuing Education and Workforce Training. “The training exercise on Saturday went as well as anyone could ever expect. Students and instructors all enjoyed the experience.”





During the Halloween Day training, trainees worked together to assess the situation and then determine how to enter the scene to safely assist and treat injured individuals. Once rescued, trainees prepared the injured for transport to appropriate medical facilities. Each training scenario required the students to work as a team to safely rescue the mock victims.



To set the stage for the emergency scenarios, victims were dressed in full moulage, which involves creating realistic-looking mock injuries on volunteer ‘victims.’ Using moulage created a new element for the trainees since they hadn’t yet experienced anything as true to life while in the course. One challenge participants faced was getting past the realistic appearance of victims and using the skills they learned in the course to address the situation.

“It was awesome to watch the students seriously take on their roles and work together to provide appropriate treatments and rescue,” Price said. “We look forward to utilizing the DRC for more training opportunities in the future.”

The Idaho State Disaster Response Complex is a unique facility recently added to the university’s research portfolio. It was created with a nearly \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education through the Idaho Global Entrepreneurial Mission.

“The DRC is a unique facility in the Northwestern United States,” said Mustafa Mashal, associate professor in the Department of Civil and Environmental Engineering and

Principal Investigator for the Disaster Response Complex project. “We have capabilities to simulate various scenarios for training emergency responders. There are numerous collaborators, faculty, and students working on the DRC project. The ultimate goal of the project is to save lives during an emergency scenario, through efficient and effective responses.”

The DRC has three focus areas: research, curriculum and certification, and training and exercise. The training and exercise focus area encourages local and regional emergency responders to use the DRC for real-world simulations of natural and man-made disasters. Search-and-rescue scenarios can be structured in several ways using precast concrete elements to create situations that require navigating training lanes such as collapsed structures, confined spaces, and vehicle rescue.

“From the perspective of an educational institution, the project benefits our students through a wide variety of learning and research processes,” Mashal said. “From a community perspective, this project benefits Idahoans and beyond by helping ensure the emergency responders have an exceptional facility to conduct training and exercise events.”

The DRC outdoor facility is still under construction and more training lanes are planned to be added in the upcoming months. The EMT program is the first group to use the DRC’s outdoor facility.

“We welcome emergency responders from our community, region, and nation to use the DRC for their training and exercise events,” Mashal said. “The doors of the DRC are open for anyone who wants to explore collaboration with ISU on disaster response. The DRC is a long-term resource for our emergency responders and we are very glad to have this facility here in Pocatello.”

To learn more about the DRC, please visit <https://www.isu.edu/cee/research-facilities/drc/>.

## Local first responders train at ISU's new Disaster Response Complex

Article Link (Local News 8): <https://localnews8.com/isu/2020/11/17/local-first-responders-train-at-isu-new-disaster-response-complex/>

By Emma Iannacone



POCATELLO, Idaho (KIFI/KIDK) - Local first responders trained at Idaho State University's new Disaster Response Complex on Tuesday.

Members of the Pocatello Fire Department's search and rescue team spent hours in a simulated building collapse, trying to rescue a mannequin. In light of the many recent earthquakes in our area, PFD felt it was a good time to brush up on their rescue skills.

The training is one of the first of its kind at the Disaster Response Complex. The Complex was created with a nearly \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education.

ISU's Department of Civil and Environmental Engineering associate professor Mustafa Mashal was the principal investigator for the project.

"When we started this project, we noticed there is no facility of this kind in the Northwestern United States," Mashal said.

Mashal's team successfully applied for a grant in 2019, opening the door to create a curriculum in emergency response at ISU.

The structural collapse training is the second to take place at the Disaster Response Center near Alvin Ricken Road in Pocatello.

"We're just really excited to have the facility ISU has provided here. We normally would have to go out of town, as far as Texas, to get a facility like this," said Captain Devin Christensen, with PFD.



The Disaster Response Complex offers more than just training for our first responders. It also offers technological research opportunities for ISU students and faculty.

Engineering students were tasked with creating the simulated building collapse.

"It's kind of a real-life exercise," said Bruce Savage, department chair of Civil and Environmental Engineering. "They get to evaluate the different forces and different scenarios the training teams want to partake in, and then evaluate what's going to make this safe but still allow them a realistic opportunity to test their skills."

The Disaster Response Complex is available to first responders all over the region. New scenarios will be created by engineering students.

## 'Saving lives': Pocatello firefighters practice rescuing victims from collapsed structures at new ISU facility

**Article Link (Idaho State Journal):** [https://www.idahostatejournal.com/news/local/saving-lives-pocatello-firefighters-practice-rescuing-victims-from-collapsed-structures-at-new-isu-facility/article\\_c5924635-e7cd-5f79-9703-21df08dff407.html](https://www.idahostatejournal.com/news/local/saving-lives-pocatello-firefighters-practice-rescuing-victims-from-collapsed-structures-at-new-isu-facility/article_c5924635-e7cd-5f79-9703-21df08dff407.html)

By JOHN O'CONNELL/IDAHO STATE JOURNAL

POCATELLO — One group of Pocatello firefighters cut through structural steel with a blowtorch Tuesday morning while others sawed into a slab of concrete, making certain no debris would fall on the dummy trapped below.



Members of the Pocatello Fire Department's Urban Search and Rescue team practice rescuing trapped victims from collapsed concrete structures at a new research and training facility opened by Idaho State University

Members of the department's Urban Search and Rescue team got to simulate tactics to rescue survivors from a collapsed concrete structure at Idaho State University's new Disaster Response Complex.

The facility, located east of campus in a spacious, fenced area above the Idaho Accelerator Center, is unique in the Pacific Northwest. It's primary purpose is university research, but it should also provide an invaluable training and certification resource for several ISU departments, local and regional emergency responders and even soldiers with the Idaho National Guard.

Devin Christensen, a captain with the fire department who heads the special team, had to travel to Texas A&M University in College Station, Texas, with another member of the department the last time he participated in structural collapse training. He anticipates the team will now train locally at least twice per year, at a considerable savings to local taxpayers.

“We can train 25 guys here today for the money it takes to send two to a class in Texas,” Christensen said.

The training grounds include several concrete culverts arranged in a winding tunnel, piles of debris and steel supports and concrete slabs that can be cut during rescue training and replaced afterwards.

Christensen explained the training could prepare his team to rescue victims trapped under a collapsed highway bridge, or covered beneath rubble after a bombing or an earthquake.

“I think the main thing is it’s a great opportunity to work with ISU and to bring departments from the region together,” Christensen said.

ISU engineering students designed the facility. It was funded with a \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education through the Idaho Global Entrepreneurial Mission.

Mustafa Mashal is an associate professor in the Department of Environmental Engineering and the principal investigator for the Disaster Response Complex project. He said additional lanes at the facility will include an area to simulate vehicle rescues and a structure that simulates roof collapses.

ISU engineering students are designing the facilities. Mashal said they’re also using the facility to test robotic and virtual reality technology they’re developing for use in rescues. Some students, for example, are writing a Ph.D. dissertation on adding capabilities to a rescue robot enabling it to navigate through confined spaces. The new collapsed structure facility will enable them to conduct a full-scale validation of those capabilities, he said.

Mashal said the facility will also be useful in develop curriculum and obtaining certifications.

Mashal witnessed the need for such research and training during the aftermath of the 2011 earthquake while in Christchurch, New Zealand.

“Saving lives is the ultimate goal of this project,” Mashal said.

Jared Cantrell, project manager of the Disaster Response Complex, said ISU’s College of Technology recently used the facility to conduct mass casualty training for future emergency medical technicians. He said the university’s GIS program is also interested in using the facility.

Cantrell expects the facility will be self-sustaining with funding from users throughout the community who take advantage of training opportunities.

He hopes to conduct one to two small trainings per week and a couple of larger trainings per month at the facility, with the goal of keeping the cost to users as affordable as possible.

“We’re trying to make this as open and available as possible to serve the community,” Cantrell said.

## Idaho State University Disaster Response Complex Hosts Training Events for Emergency Responders

Article Link (ISU website): <https://isu.edu/news/2021-spring/idaho-state-university-disaster-response-complex-hosts-training-events-for-emergency-responders.html>

April 20, 2021



Taking COVID-19 pandemic challenges in stride, the Idaho State University Disaster Response Center (DRC) is preparing to host multiple training events in the coming months to assist with the readiness and skill development of emergency responders.

The DRC is currently working with local, regional, and state entities to host training events at its facilities on ISU campus in Pocatello.

Training scenarios for emergency responders include subterranean, breaching, and HAZMAT response. One of the emergency responder communities that the DRC will be hosting includes the Civil Support Teams (CSTs). CSTs are part of the United States National Guard which supports civil authorities during domestic natural or human-made disasters that may result in catastrophic loss of life or property. There are 57 federally sustained but state-controlled CSTs throughout the United States and its territories that are on standby for emergencies 24 hours a day, year-round. The Idaho National Guard's CST is based in Boise and consists of 22 soldiers and airmen.

Local first responders, like firefighters and law enforcement agencies, are also able to utilize the DRC training facilities to practice efficient and effective responses to natural and human-made disaster situations.

“This training facility will not only better lives, but it will save lives,” President Kevin Satterlee said. “The complex simulates real-world training exercises for first responders. It is unique for our region, and the knowledge gained will be used to address disaster and emergency situations that may impact our state, our region, and our entire nation.”

The DRC is a unique training facility in the Northwestern United States. Training events hosted at the DRC simulate real-world emergency and search-and-rescue scenarios and have the potential to improve and maintain life-saving skills used by responders during disaster remediation. Training scenarios can be customized and structured in several ways. For instance, precast concrete elements are used to create situations that require navigating training lanes that simulate collapsed structures, confined spaces and vehicle rescues.

The principal investigator on the DRC project is ISU’s Associate Professor Mustafa Mashal, the co-principal investigator is Professor and Chair Bruce Savage, both from the Department of Civil and Environmental Engineering.

“The DRC’s ultimate goal is saving lives when a catastrophe hits. As a citizen of the United States, I am truly honored that our DRC project supports the community of emergency responders in various ways,” Mashal said.

While construction on the core DRC facilities is complete, projects to expand facility capabilities are planned to continue this year. As the DRC broadens its offerings, customizable training can focus on issues beyond cleaning up the aftermath of disasters to the protection of national security.

The DRC opened for training events in 2020 and has already hosted more than 100 first responders. The DRC kicked off 2021 by hosting a K-9 training event for the Snake River Search, Inc. in January. Ten K-9 trainers, 12 K-9’s, and four ISU students and faculty participated in the exercise.

“It is also exciting to see how far we have come with the DRC project,” Mashal said. “In August of 2019, we started this project from nothing. Today we have a nearly 3-acre outdoor facility that has already started hosting training events for the emergency responders, and has created opportunities for numerous engineering students at ISU to work in different areas of the project, including research, design, construction, curriculum, and training events. The credit for the DRC goes to our hard-working engineering students at ISU who despite all the odds imposed by the global pandemic have done a fantastic job.”

Recently the DRC hosted a training for the Idaho Falls Fire Department where 20 trainees and four instructors participated in a confined space exercise.

The DRC has also been an advantageous resource for ISU students, faculty, and staff who have utilized the DRC for practical training on several occasions. One such example is ISU’s College of Technology’s Emergency Medical Technician program that has been utilizing DRC to provide hands-on and realistic training to the participants.

The DRC has three focus areas: research, curriculum and certification, and training and exercise. The training and exercise focus area encourages local and regional emergency responders to use the DRC for real-world simulations of natural and man-made disasters. The development of the DRC was made possible by funding from the Idaho State Board of Education under the Higher Education Research Council – Idaho Global Entrepreneurial Mission (HERC-IGEM). 18 engineering students from ISU have been working on different pillars of the DRC. The facility is managed by ISU's Department of Civil and Environmental Engineering.

To learn more about the DRC, please visit <https://www.isu.edu/cee/research-facilities/drc/>.

## Appendix 2: Sample Student Activities

Dates	Daniel Garz	Katie Hogarth	Uma Shankar Medasetti
July, 2020		DRC precast inventory Conex lane 1 drawings White page development Journal completion	Finalize purchases for Viz lab Setup lab in ERC Tested/setup lab equipment
August, 2020	Open House Cityscape roof design Journal summaries	Open House Began conex lane fabrication Began 3D conex drawing Finalize journal	Open House Funding proposals
September, 2020	Presidents visit GIS drone flight	Presidents visit Conex lane fabrication	Presidents visit Develop concept paper
October, 2020	Armory layout Finalize cityscape layout	Finished conex lane fabrication relocated conex and other materials to DRC	Develop concept paper
November, 2020	Construction staking for conex tower Cityscape framing	Continue conex drawings	Finalize concept paper
December, 2020	Cityscape framing Walls, sheeting, drywall	Place conex footings Transfer materials	
January, 2021	Writing MS project on the DRC	Research for Taping and Mudding Taping and Mudding of indoor DRC Volunteer for Dog training	Journal work with Shisir
February, 2021			3MT Event Prep Argon Meeting Alineware Backpack/Hololens work
March, 2021		Aid in set up for Idaho Falls Fire Department	AR/VR Development Branch Review Paper

**April, 2021**

Set-up and assisted with INL Event  
Selection of images and framing for armory

Digital Forum Terrorism meeting

**May, 2021**

Hang Framed photos for armory  
Begin Signage and Furnishing of Indoor DRC

Review Paper  
Oculus Quest work

**June, 2021**

Preparing for MS project defense



<b>Dates</b>	<b>Mahesh Acharya</b>	<b>Mahesh Mahat</b>
<b>July, 2020</b>	Outdoor DRC rubble pile construction	Outdoor DRC rubble pile construction
<b>August, 2020</b>	Open House	Open House Inventory of incoming materials for DRC Footings construction
<b>September, 2020</b>	Presidents visit	Presidents visit Continue inventory Footings construction Clean and empty armory
<b>October, 2020</b>		Finish footing construction Clean armory
<b>November, 2020</b>	Set lane for PFD training	Set lane for PFD training Cityscape framing
<b>December, 2020</b>	Cityscape framing Walls, sheeting, drywall	Cityscape framing Walls, sheeting, drywall
<b>January, 2021</b>	Planning for Trench Design for Outdoor Facility Weeley Meetings	Mudding the drywall gaps Painting the indoor facilities
<b>February, 2021</b>	College of Tech. tour of DRC Indoor and Outdoor Facility Trench Design Literature	Painting the indoor facilities
<b>March, 2021</b>	Dr. Karen tour of DRC Indoor and Outdoor Facility Trench Design Calculations	Painting the indoor facilities

<b>April, 2021</b>	Continue work on detailing and design of trench Help on training of the first responders at the facility	Removing the old furnitures from armory offices Setting up new furnitures Wood panel installation in the interior facilities Training at Stephan's Blinds installation
<b>May, 2021</b>	Drawings and details of the trench Work to obtain quotes from precast yards	Lights installation Window frame/ pixie glass/ wall baseboard installation Bench installation for classroom/ Batching for hollowcore
<b>June, 2021</b>		Painting the classroom

<b>Dates</b>	<b>Samantha Kerr</b>	<b>Rachel Brownell</b>
<b>July, 2020</b>	Indoor drawing development Outdoor DRC rubble pile construction	White page development Garage structure drawings Material lists
<b>August, 2020</b>	Open House Continue indoor development	Open House Journal summaries for writing Assit with conex lane fabrication
<b>September, 2020</b>	Presidents visit Begin trench deveopment Determine materials for indoor cityscape Determine final cityscape layout Create cut sheets for construction	Presidents visit Conex lane fabrication DRC materials inventory Review journal Began handling DRC website DRC tower drawing
<b>October, 2020</b>	Develop budget and pricing of materials Search for cheap options for cityscape Finalize drawings and cutsheets for cityscape	Finish conex lane fabrication CMS website training Continue website work
<b>November, 2020</b>	Lead indoor cityscape framing Continue searching for materials	Website maintenance
<b>December, 2020</b>	Cityscape framing Continue searching for materials	Website maintenance
<b>January, 2021</b>	Left Project	Left Project
<b>February, 2021</b>		
<b>March, 2021</b>		

<b>Dates</b>	<b>Zachary Free</b>
<b>July, 2020</b>	Setup lab and equipment Test equipment
<b>August, 2020</b>	Open House Funding proposals
<b>September, 2020</b>	Presidents visit Develop concept paper
<b>October, 2020</b>	Develop concept paper
<b>November, 2020</b>	Finalize concept paper
<b>December, 2020</b>	
<b>January, 2021</b>	
<b>February, 2021</b>	VR Discussion with INL Began work on Radiological Response training in VR with Uma Shankar and Jack Dunkar VR environment set-up (Stephens Performing Arts Center as setting) Weekly meeting for PAC Training
<b>March, 2021</b>	

**April, 2021**

Participated in the Rad-response training at Holt Arena  
Character controls in VR environment

**May, 2021**

**June, 2021**

<b>Dates</b>	<b>Jack Dunker</b>
<b>July, 2020</b>	
<b>August, 2020</b>	
<b>September, 2020</b>	
<b>October, 2020</b>	
<b>November, 2020</b>	
<b>December, 2020</b>	
<b>January, 2021</b>	Joined Project
<b>February, 2021</b>	Setup demo project. Joined Project VR project Meeting Researched translation of c++ function for Unreal to C# for Unity. DRC meeting VR project Meeting Setup repository for project. DRC meeting VR project Meeting Setup initial instance of Stevens Performing Arts Center in engine. DRC meeting VR project Meeting
<b>March, 2021</b>	Setup landscape actor in Unity VR project Meeting Added concrete and asphalt materials to landscape. Cleaned up excess assets. DRC meeting VR project Meeting Increased landscape resolution. Started on player avatar. DRC meeting VR project Meeting

<b>April, 2021</b>	Setup basic movement controls for avatar. DRC meeting VR project Meeting VR project Meeting DRC Meeting Started translating c++ code from demo project to c# for radiation simulation. VR project Meeting Setup user interface readout to display dose rate. DRC Meeting VR project Meeting
<b>May, 2021</b>	Disaster Response roleplay. Connected user interface to radiation simulation VR project Meeting VR project Meeting DRC Meeting Started translating c++ code from demo project to c# for radiation simulation. VR project Meeting Setup user interface readout to display dose rate. DRC Meeting VR project Meeting Disaster Response roleplay. Connected user interface to radiation simulation VR project Meeting
<b>June, 2021</b>	Fixing and updating environment to be more accurate to Stevens PAC area. VR project Meeting

Appendix 3: Expenditure Report

Data_Description			Accounted Budget	Year-to-Date												Encumbrances		Reservations	Total by ROWS	
Fiscal_Month (As of June 29, 2021)			Temporary Budget	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Subtotal	YTD	YTD	Amount	
Index Only	Account		Amount	Value	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	
AHRC48_APPR IGEM	Labor																			
Response Complex for Eme			0.00																	
		610_Salaries	0.00	(2,153.85)	(5,384.62)	(5,384.62)	(8,076.93)	(5,384.62)	(5,115.39)	(5,071.64)	(6,265.73)	(6,318.71)	(9,483.12)	(5,763.36)	(5,303.86)	(69,706.45)	0.00	0.00	(69,706.45)	
		620_Irregular Help	0.00	(429.84)	(7,583.31)	(6,749.49)	(3,908.13)	(2,481.63)	(2,323.11)	(4,095.50)	(2,551.96)	(2,473.86)	(3,715.03)	(9,831.92)	(17,560.66)	(63,704.44)	(0.00)	0.00	(63,704.44)	
		630_Fringe Benefits	0.00	(125.68)	(2,126.31)	(2,322.52)	(2,935.62)	(1,928.71)	(1,859.76)	(1,940.25)	(2,254.47)	(2,272.23)	(3,410.15)	(2,258.77)	(2,577.88)	(26,012.35)	(0.00)	0.00	(26,012.35)	
	Direct Expenditures																			
		700_Travel	0.00	0.00	0.00	(924.69)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(924.69)	0.00	0.00	(924.69)	
		720_Services	304,347.00																304,347.00	
		722_General Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(14.50)	(35.50)	(50.00)	0.00	0.00	(50.00)	
		724_Professional Services	0.00	0.00	(540.50)	(165.28)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(1,153.46)	(163.84)	(2,023.08)	0.00	0.00	(2,023.08)
		727_Administrative Services	0.00	0.00	0.00	(1,509.00)	(1,864.70)	(250.00)	0.00	(23.45)	0.00	(129.00)	(164.60)	0.00	0.00	(3,940.75)	0.00	0.00	(3,940.75)	
		728_Computer/Tech Services	0.00	0.00	(88.88)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(88.88)	0.00	0.00	(88.88)	
		729_Repair and Maintenance Services	0.00	0.00	(839.68)	0.00	0.00	(109.99)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(949.67)	0.00	0.00	(949.67)	
		741_Rentals and Operating Leases	0.00	0.00	0.00	0.00	(466.20)	0.00	(132.50)	0.00	0.00	0.00	(93.50)	0.00	(535.20)	(4,668.50)	(5,895.90)	0.00	0.00	(5,895.90)
	730_Supplies																			
		731_Administrative Supplies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(480.46)	(2,198.95)	(2,431.73)	(5,271.69)	(10,382.83)	0.00	0.00	(10,382.83)	
		732_Fuel and Lubricants	0.00	0.00	(46.16)	0.00	(23.24)	(57.20)	(54.88)	(51.74)	(58.77)	(55.02)	(84.42)	0.00	(145.16)	(576.59)	0.00	0.00	(576.59)	
		733_Computer Supplies	0.00	0.00	(125.96)	(64.98)	(131.87)	(55.07)	0.00	0.00	(69.98)	0.00	0.00	0.00	(341.96)	0.00	(789.82)	0.00	0.00	(789.82)
		734_Repair and Maintenance Supplies	0.00	(560.95)	0.00	(2.95)	(24.38)	(2,034.84)	32.00	0.00	(172.00)	(43.07)	(289.88)	(31.94)	(56.82)	(3,184.83)	0.00	0.00	(3,184.83)	
		736_Institutional/Specific Use	0.00	(537.94)	(1,461.61)	(517.60)	(1,135.64)	(1,374.77)	(5,438.77)	(575.51)	(2,216.16)	(7,075.29)	(1,271.93)	(6,861.32)	(884.61)	(29,351.15)	0.00	0.00	(29,351.15)	
	800_Capital Expense																			
		820_Buildings and Improvements	0.00	0.00	0.00	(10,000.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5,267.42)	0.00	(15,267.42)	0.00	0.00	(15,267.42)
		830_Computer Equipment	0.00	0.00	(7,545.25)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(7,545.25)	0.00	0.00	(7,545.25)	
		835_Educational Materials and Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(1,996.00)	0.00	0.00	0.00	(1,996.00)	0.00	0.00	(1,996.00)	
		840_Motorized Equipment	0.00	0.00	0.00	0.00	0.00	(3,659.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(3,659.00)	0.00	0.00	(3,659.00)	
		840C > \$5K Motorized Equipment	0.00	0.00	0.00	0.00	0.00	(15,045.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(15,045.00)	0.00	0.00	(15,045.00)	
		845_Office Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(7,461.12)	(989.97)	(7,037.14)	(15,488.23)	0.00	(0.00)	(15,488.23)	
		850_Specific Use Equipment	0.00	0.00	0.00	0.00	0.00	(1,762.75)	0.00	0.00	(2,012.94)	(1,515.77)	0.00	0.00	0.00	(5,291.46)	0.00	0.00	(5,291.46)	
	870_Educational and Training Assistance																			
		871_Educational and Training Assistance	0.00	0.00	(4,962.98)	0.00	0.00	0.00	0.00	(4,962.98)	0.00	0.00	0.00	0.00	0.00	(9,925.96)	0.00	0.00	(9,925.96)	
	Subtotal																			
Total by COLUMNS			304,347.00	(3,808.26)	(30,705.26)	(27,641.13)	(18,566.71)	(34,143.58)	(14,892.41)	(16,721.07)	(15,602.01)	(22,452.91)	(28,079.20)	(35,481.55)	(43,705.66)	(291,799.75)	(0.00)	(0.00)	12,547.25	

Note: All project budget for the second year (\$304,347) will be spent by June 30, 2021. There are some expenses that have not been posted in this spreadsheet.