CONNECTING
THE DOTS TO
INNOVATION

The Power of ERDC

Support of HA/DR Missions

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U.S. Army Corps of Engineers

SERVICE TO THE NATION SINCE 1775

U.S. Capitol - 1800
Washington Monument - 1884
Lincoln Memorial - 1922

ESSAYONS!

Since 1775

Panama Canal - 1914

Military Construction and Combat

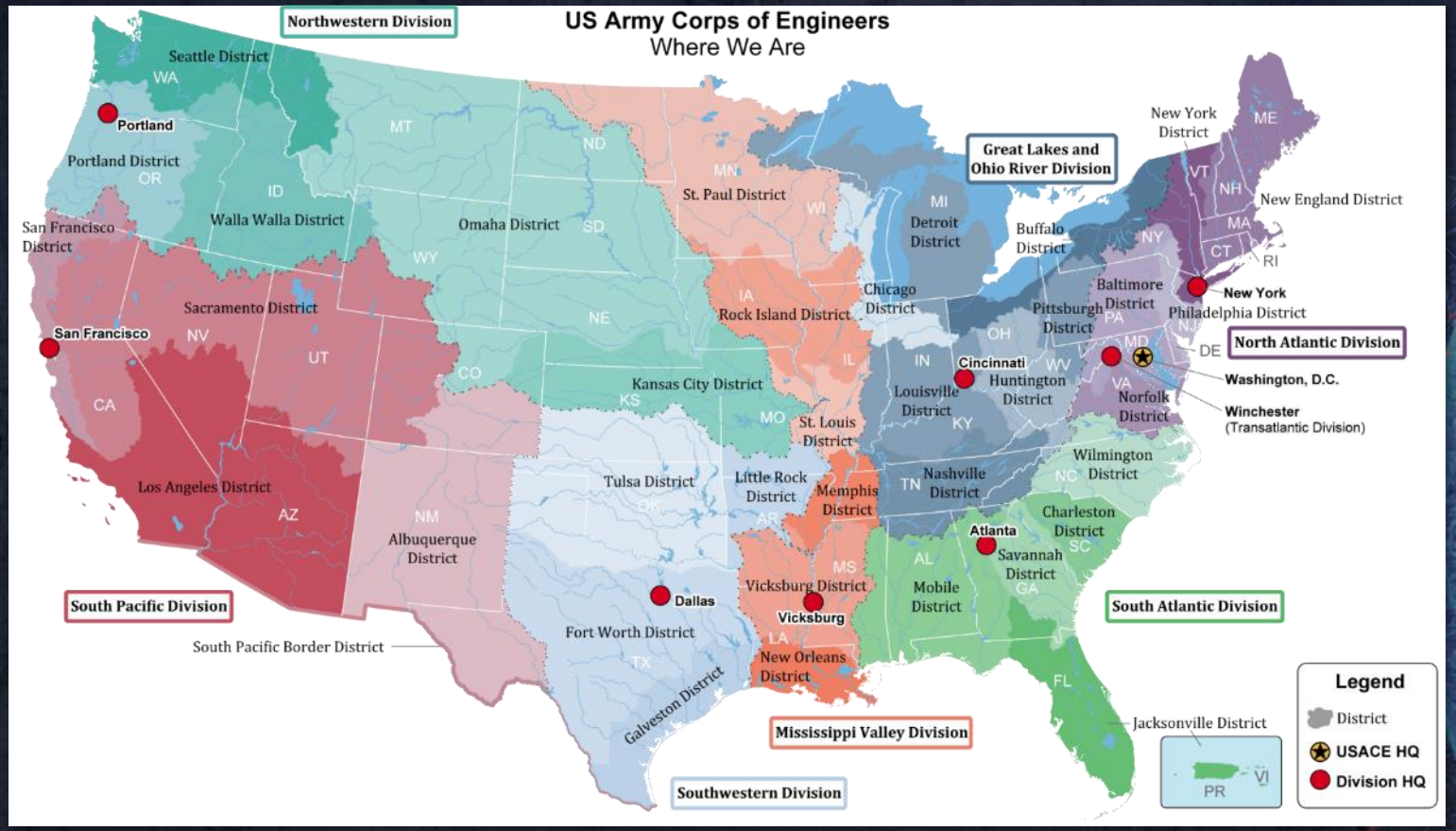
Bonneville Dam - 1937

The Pentagon - 1941

Mississippi River and Tributaries Project – 1928-Present

Kennedy Space Center - 1962

USACE Missions and Organization



ERDC: USACE's Corporate Labs

ERDC SUPPORTS USACE DELIVERING A MASSIVE $91B+ PORTFOLIO OF PROGRAMS, PROJECTS

DA

The Engineer Regiment
90,000 members of the
Total Engineer Force

DA MILCON and Installation Support
$4.9B / **3M** service men and women
/ **287** Installations

Civil Works
$8.343B / ~**1,900** projects
$17.44B Disaster Supp/**$3.3B** Disaster Relief (HR 2157)
$5.7B Emergency Assistance (HR 5305)
$17.1B = Infrastructure Act - IIJA (HR 3684)

Research & Development
$1.87B / **2,000+** projects
Supporting DA, CW, DoD, IIS

DoD

COCOM Support
$5B to COCOMS & Interagency
In 110 countries

Missile Defense Agency
$875M to **5** critical projects
Romania, Poland and Alaska

USAF / USN / DHA / DLA
$10.7B installation infrastructure for
DoD and Sister Services

DOD/AF/Army/EPA/DOE
$2B in national
environmental cleanup

IIS

Natural Disaster Response
$4.5B response to disasters in
CA, TX, FL, PR, USVI, NC, LA

Veterans Affairs Program
$8.7B Design & construct
22 Projects

Foreign Military Sales
$3.7B Design, construction, engineering
services & training
in **35** countries

COVID-19 Response
$1.9B COVID Response (**38** ACFs)
Support to Vaccine Production
Mass Vaccination Centers

The History of ERDC

MAKING THE WORLD BETTER AND SAFER HAS BEEN OUR MISSION FROM YEAR ONE

Flood of 1927 – Origin of CHL

WWII – Portable Airfields– Precursor to GSL 1932

Arctic Research – Origin of CRREL in 1961

Topographical Engineering – Origin of GRL in 1967

Construction Engineering Research – Origin of CERL in 1968

1970s Environmental Research – Origin of EL

1980s First Supercomputer – Origin of ITL

1999 **ERDC established**

Milestone Work

- **2001** ERDC research saves lives during 9/11
- **2005** Post-Katrina Analyses
- **2017** Hurricane Recovery (Harvey, Irma & Michael)
- **2020** COVID-19 Pandemic Response

ERDC Support To The Nation

RESEARCH SUPPORTING THE USACE R&D PRIORITIES

1 Mitigate and Adapt to Climate Change

Forecast-Informed Reservoir Operations (FIRO)

2 Win Future Wars

Blast and Weapons Effects R&D Supporting US Bases Overseas

3 Modernize our Nation's Infrastructure

Structural Health Monitoring

4 Support Resilient Communities

Coastal Hazards Rapid Detection System

5 Enable Smart and Resilient Installations

3D Printing of Concrete Buildings

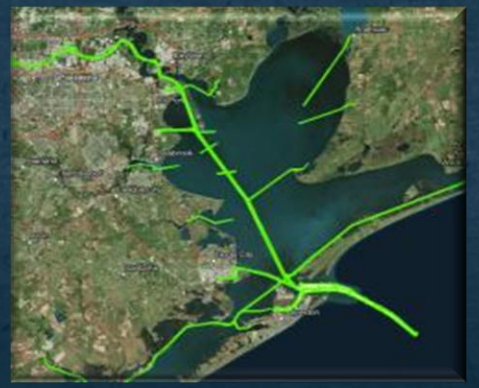
6 Ensure Environmental Sustainability and Resilience

Engineering with Nature® – Lagoon created at Deer Island, Mississippi Sound

7 Secure Reliable Installation Energy

Energy Resilience/Energy Performance Contracts

8 Revolutionize and Accelerate Decision Making



Dredging Optimization

9 Improve Cyber and Physical Security

Cyber City: *First-Generation Virtual Environment that Enables Cyber Vulnerability Research and Testing*

10 Protect and Defend the Arctic

Hydraulic & Hydrology Modeling of Snowpack Thaw and Runoff

ERDC Locations

SEVEN LABORATORIES ACROSS FOUR STATES

ERDC Headquarters
Vicksburg, Mississippi

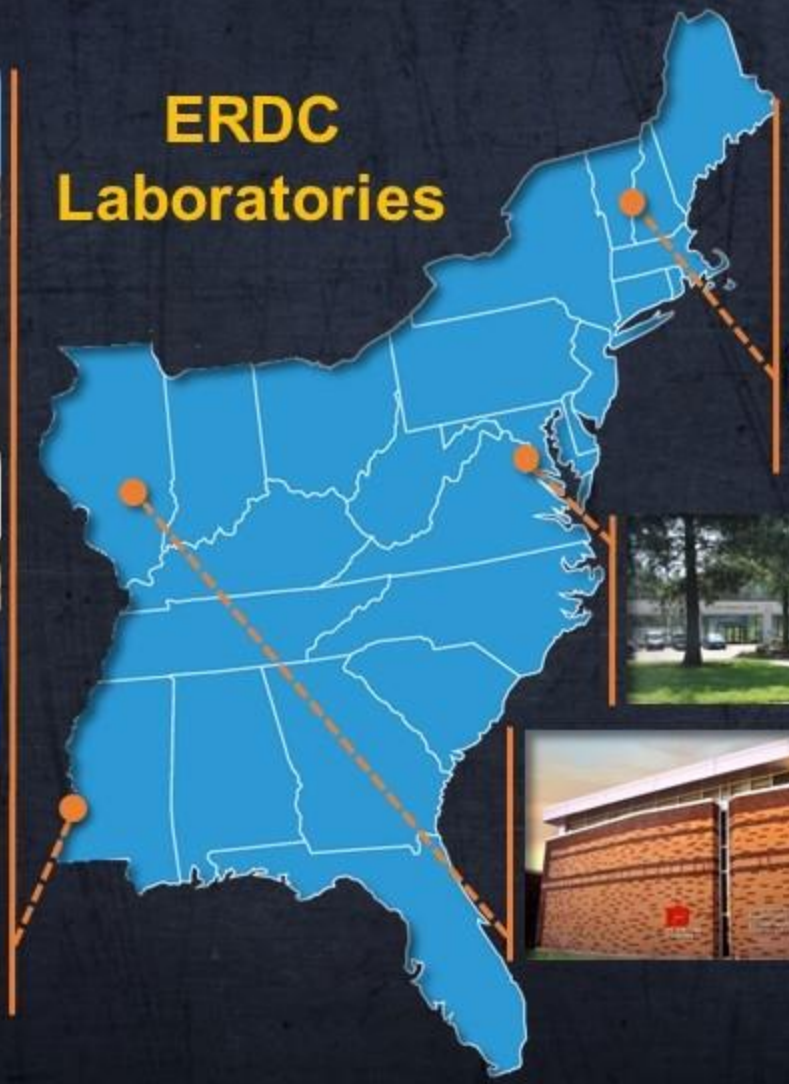
Coastal and Hydraulics Laboratory (CHL)

Environmental Laboratory (EL)

Geotechnical and Structures Laboratory (GSL)

Information Technology Laboratory (ITL)

ERDC Laboratories



Cold Regions Research and Engineering Laboratory (CRREL)
Hanover, New Hampshire

Geospatial Research Laboratory (GRL)
Alexandria, Virginia

Construction Engineering Research Laboratory (CERL)
Champaign, Illinois

Field Offices

Permafrost Tunnel Research Facility
Fox, Alaska

Alaska Research Office
Fairbanks, Alaska

Lewisville Aquatic Ecosystem Research Facility
Lewisville, Texas

Contingency Base Integration Technology Evaluation Center (CBITEC)
Fort Leonard Wood, Missouri

Field Research Facility
Duck, North Carolina

Corbin Field Station
Woodford, Virginia

Extreme Exposure Station
Treat Island, Maine

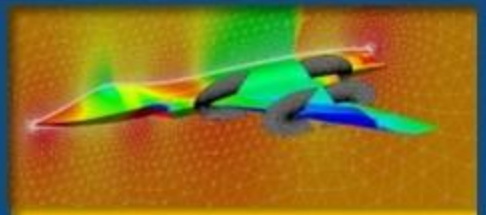
ERDC International Research Office
London, England

ERDC Delivers Innovative Solutions

ERDC'S PROGRAMMATIC APPROACH BACKED BY ITS CORE COMPETENCIES FOR THE ARMY

RESEARCH & DEVELOPMENT AREAS

CIVIL WORKS



ENGINEERED RESILIENT SYSTEMS

GEOSPATIAL RESEARCH & ENGINEERING

INSTALLATION AND OPERATIONAL ENVIRONMENTS

MILITARY ENGINEERING

CORE COMPETENCIES

SPECIALIZED ERDC KNOWLEDGE THAT ENABLES OUR RESEARCH AND DEVELOPMENT AREAS

BATTLESPACE
TERRAIN MAPPING AND CHARACTERIZATION

BLAST AND WEAPONS EFFECTS
ON STRUCTURES AND GEO-MATERIALS

CIVIL AND MILITARY ENGINEERING

COLD REGIONS SCIENCE AND ENGINEERING

COASTAL, RIVER, AND ENVIRONMENTAL ENGINEERING

COMPUTATIONAL PROTOTYPING OF MILITARY PLATFORMS

MILITARY INSTALLATIONS AND INFRASTRUCTURE

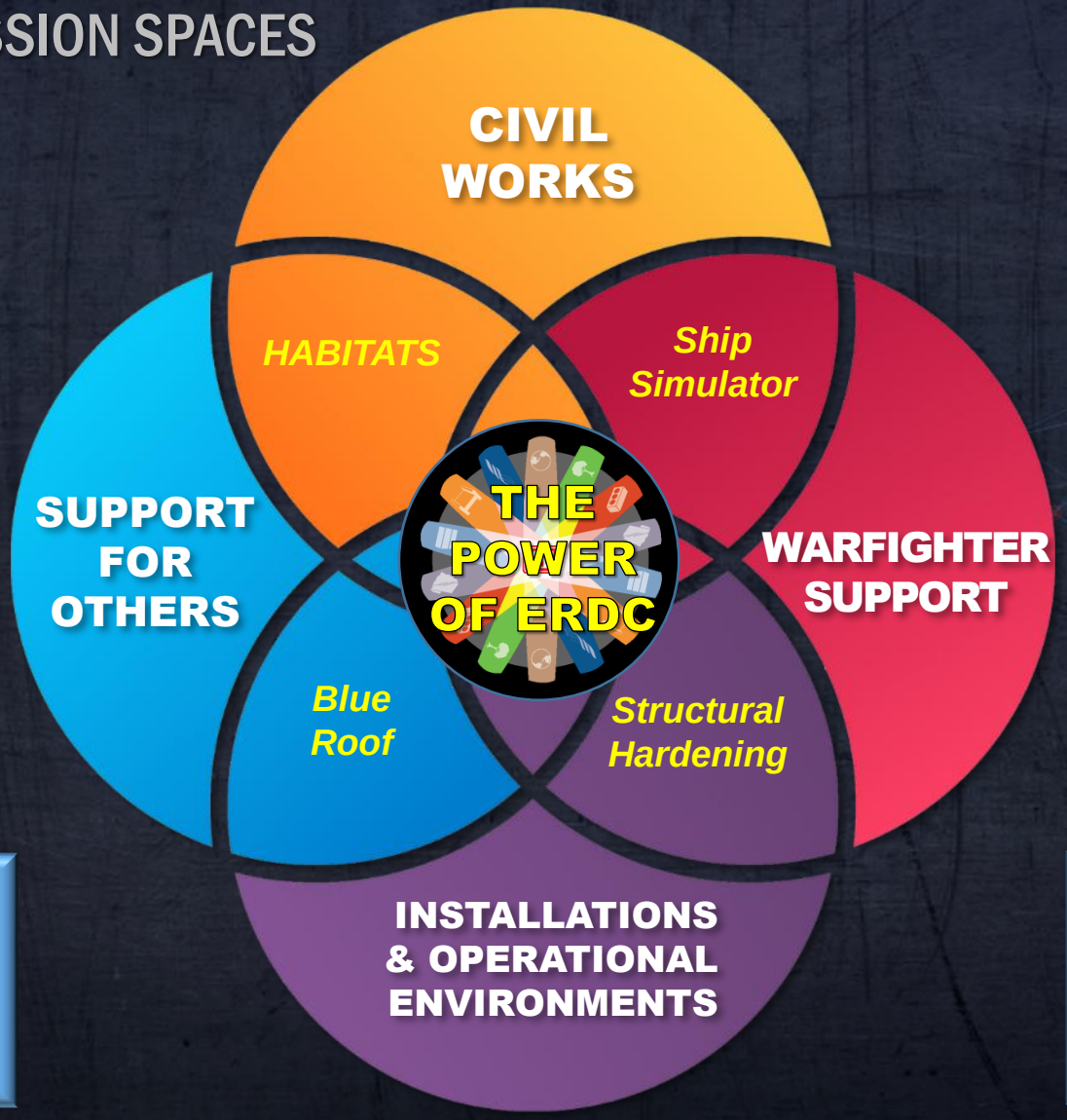
The Power of ERDC

ERDC EXCELS AT CREATING SYNERGIES BETWEEN TECHNICAL SOLUTIONS AND APPROACHES ACROSS VASTLY DIFFERENT MISSION SPACES

Ship Simulator: Civil Works

A civilian pilot practices guiding barges down a river

The same Ship Simulator facility and research team that supports our Navigation mission in Civil Works R&D….



Ship Simulator: Warfighter Support

A Warfighter pilot practices nearshore maneuvers

… also supports our warfighters as they plan logistics-over-the-shore operations overseas.

ERDC Partnerships

ERDC HAS HUNDREDS OF GOVERNMENT, ACADEMIA, INDUSTRY AND INTERNATIONAL PARTNERS

GOVERNMENT PARTNER EXAMPLES

ACADEMIA PARTNER EXAMPLES

Alcorn State University
University of Mississippi
Jackson State University
Mississippi College
Oregon State University
Hinds Community College
University of Southern Mississippi
University of South Alabama
Clemson University
University of Toledo
Virginia Tech
Alabama A&M University
Georgia Tech
Carnegie Mellon University
West Point
LSU
MIT
University of California
Texas A&M
Alabama Crimson Tide
ASU
University of Georgia
UAF University of Alaska Fairbanks
NM State
Oklahoma State University
University of Virginia

INDUSTRY PARTNER EXAMPLES

Applied Research Associates, Inc.
SOL Engineering Services
Hyperion Technology Group
Kenall
Raytheon
EPRI Electric Power Research Institute
Harris
esri
Martin ecosystems
Quantum Signal
Lockheed Martin
BAE Systems
The Nature Conservancy
MWOBS Mount Washington Observatory
Eaton
Alden

INTERNATIONAL PARTNERS

Australia
Canada
Chile
Germany
Israel
Italy
Netherlands
Norway
Sweden
Switzerland
UK

11 Countries
2 Active CRADAs
15 Active DEAs/IEAs
1 Active MOAs/MOUs
4 Active PAs

CONNECT: Mechanisms & Authorities

ERDC WERX

Other Transaction Authority (OTA)

Broad Agency Announcement (BAA) Authority

Cooperative Ecosystem Studies Units (CESU) National Network

USACE Reachback Operations Center (UROC)

24/7 Reachback Operations

Deployable Communications

Recon Tools

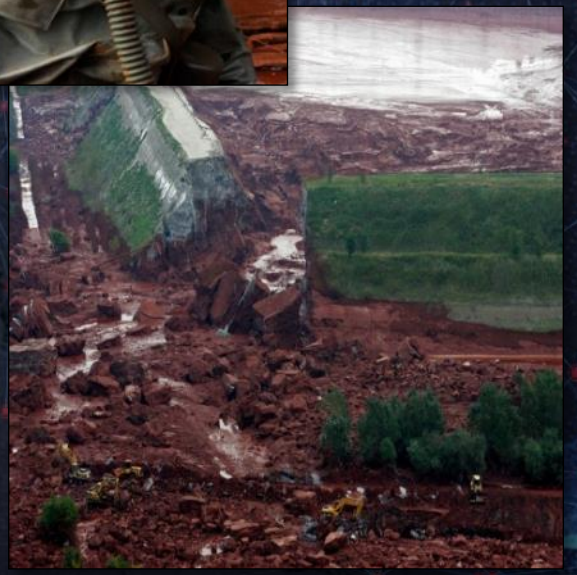
Reachback Engineer Data Integration (REDi)

Providing Relevant Solutions to the Armed Forces and the Nation

Connecting deployed engineers worldwide to Subject Matter Experts via Reachback through the UROC

UROC Humanitarian Assistance / Disaster Relief Support

- Indian Ocean Tsunami – 2004
- Hurricanes Katrina and Rita – 2005
- Hurricanes Gustav and Ike – 2008
- Haiti Earthquake – 2010
- Pakistan Flooding – 2010
- Hungary Toxic Sludge – 2010
- Japan Earthquake – 2011
- MS Valley Spring Flooding – 2011
- Hurricane Sandy – 2012
- Super Typhoon Haiyan -2013
- Afghanistan Landslides – 2014
- Hurricane Harvey – 2017
- Hurricanes Irma and Maria – 2017
- Hurricane Michael – 2018
- Hurricane Ian – 2022



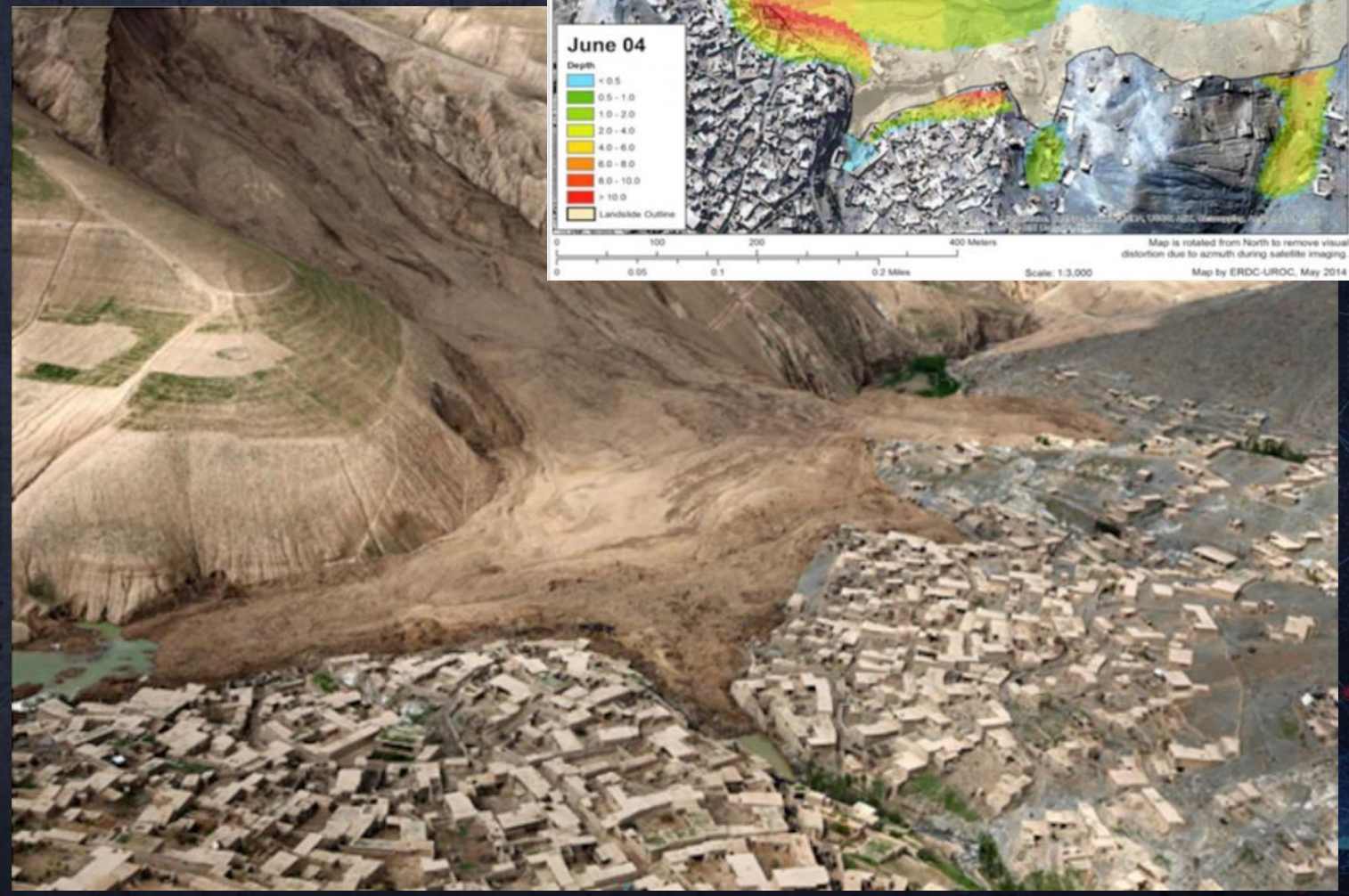
Tsunami Support – Sumatra

- Transportation infrastructure severely damaged making ground reconnaissance nearly impossible. UROC recon system used to conduct aerial survey of over 220 km of roadway in ~2.5 hours.

- UROC facilitated structural engineers on the ground evaluating damage.

Landslide Support – Afghanistan

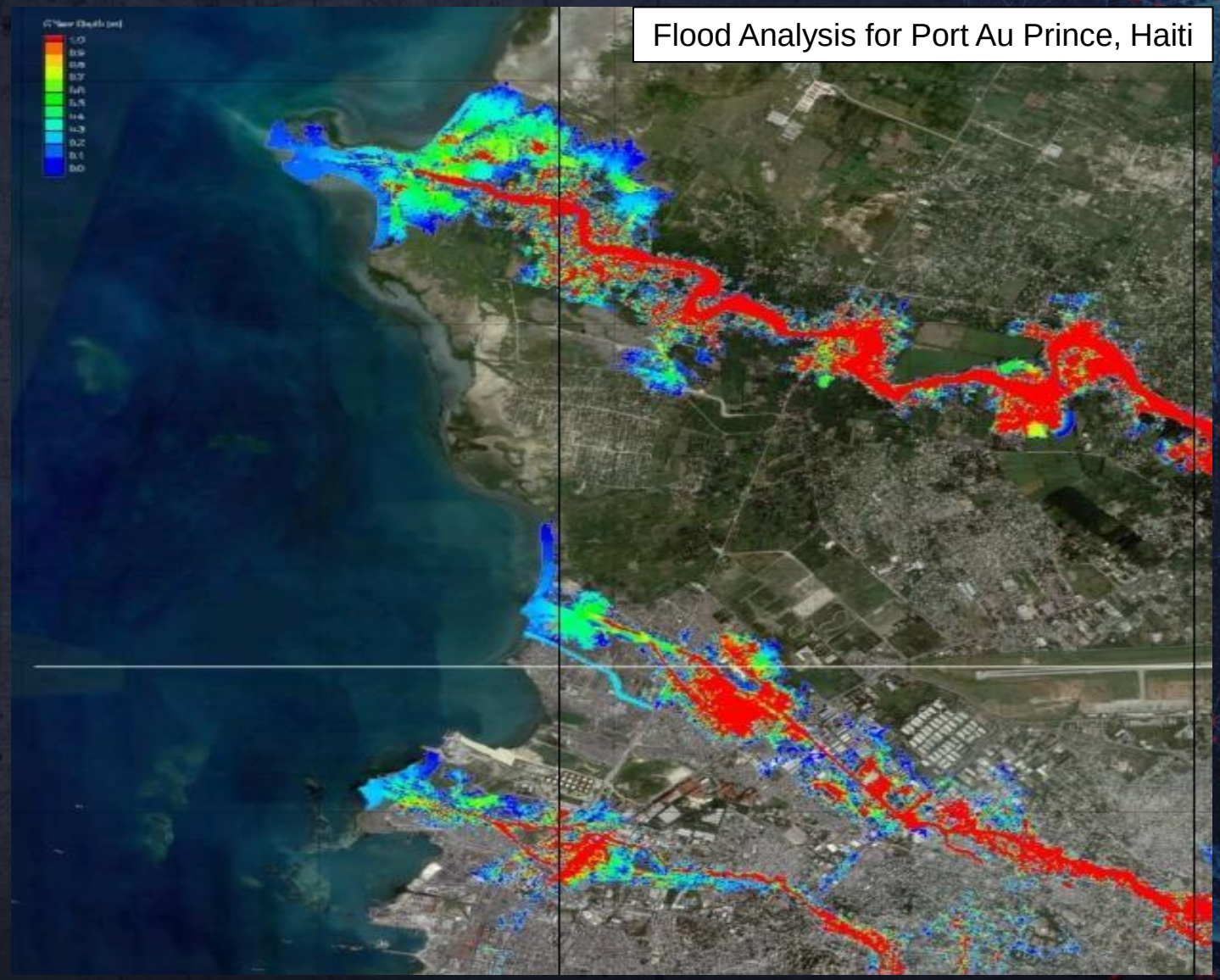
- Landslide blocked river creating artificial dam and localized flooding, in addition to devastating local village.
- Within days, ERDC hydraulic and geotechnical engineers evaluated the potential extent of flooding as the river backed up behind the new dam and the risk of catastrophic failure of the dam.
- Findings indicated low risk of significant flooding and low risk of catastrophic dam failure, and solutions were provided to reduce risk even further.



Earthquake Support – Haiti

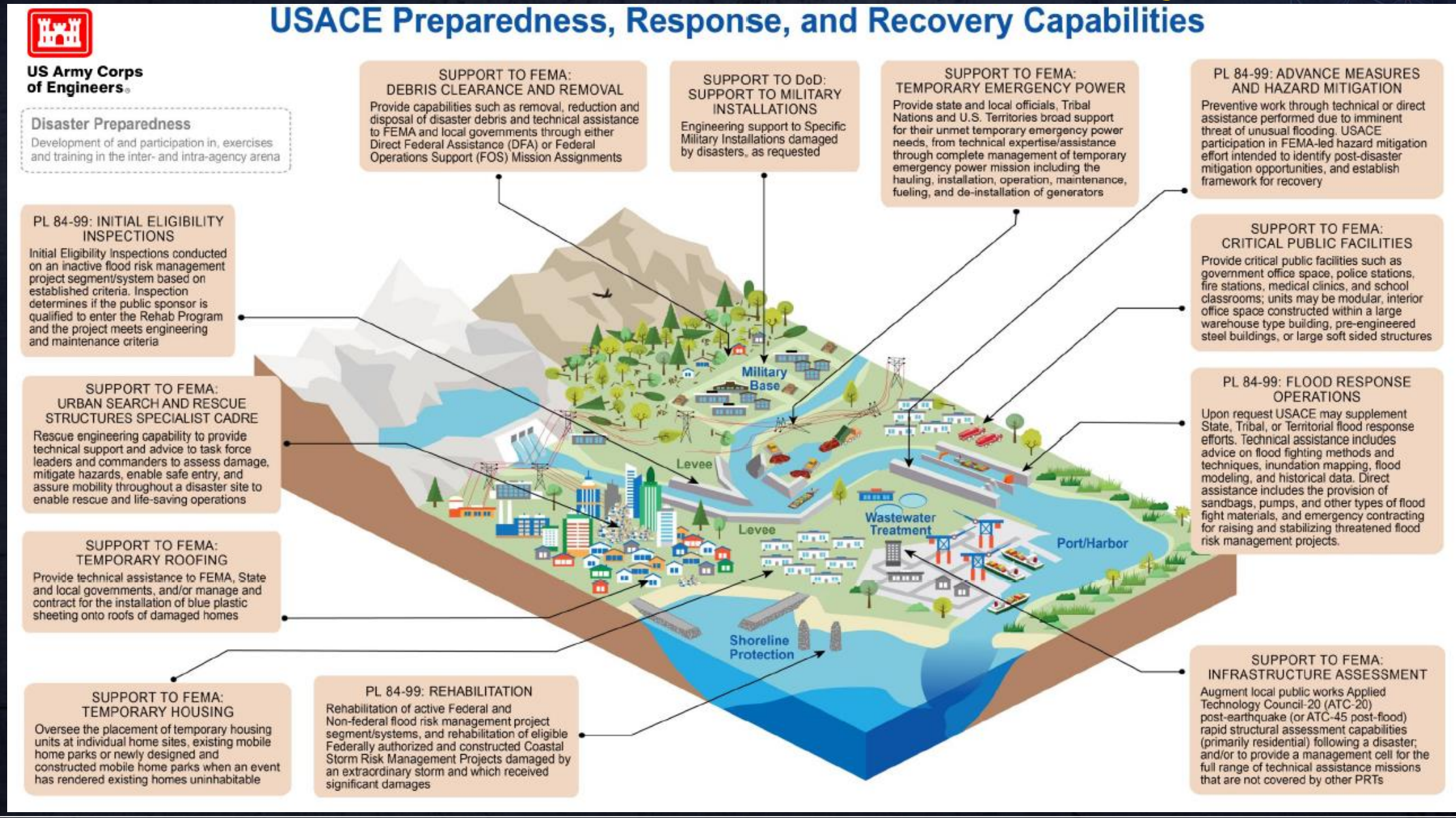
- In the aftermath of the earthquake, locations for logistical support and humanitarian assistance relief were being selected in areas at risk of flooding due to heavy rainfall.

- ERDC engineers conducted flood modeling and provided guidance to help minimize risk to local citizens and relief workers during the response operations.



Flood Analysis for Port Au Prince, Haiti

USACE Preparedness, Response, and Recovery Capabilities

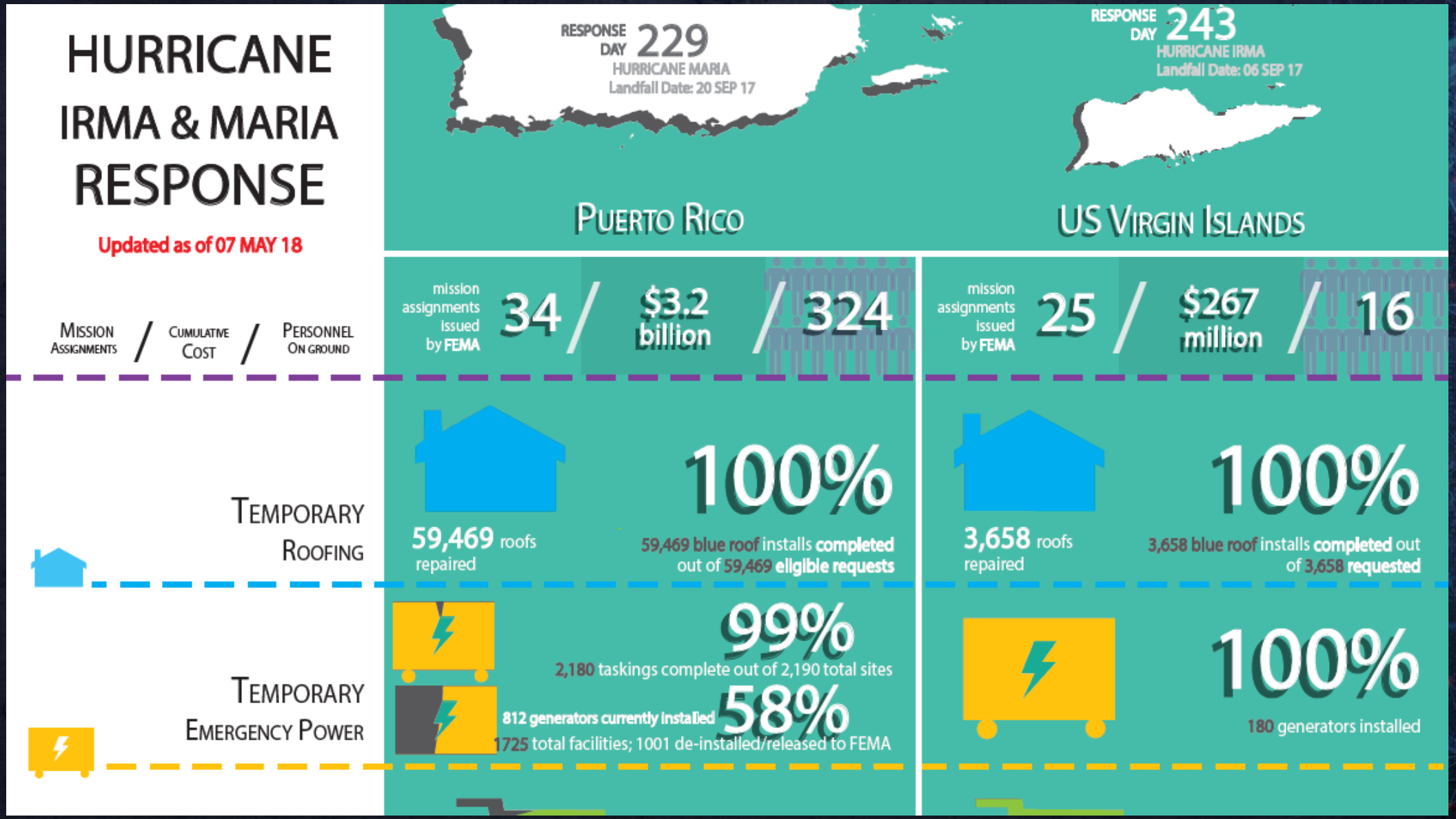


USACE Temporary Roofing Program in Support of FEMA

ERDC Support to Temporary Roofing Program

- In 2010 ERDC began development of a fully digital data collection and data management system called the Field Management System (FMS) to support the Temporary Roofing program and replace the carbon copy paper form process.
- The FMS was first used in 2017 after hurricanes Irma and Marie, and it has since evolved into the current Blue Roof Management System (BRMS).
- The FMS and BRMS have greatly improved the efficiency of the Temporary Roofing program and have been used to assist well over 100,000 homeowners.
- Similar digital data collection and management tools are being integrated for other missions that USACE supports such as temporary housing, debris removal and clearance, and infrastructure assessment.

Hurricanes Irma and Marie – 2017



Hurricane Ian – 2022

U.S. ARMY CORPS OF ENGINEERS

HURRICANE IAN

LANDFALL: SEPTEMBER 28, 2022

FEMA MISSION ASSIGNMENTS
12 OPEN 9 CLOSED

FUNDING TO DATE
$213.3M FEMA $4.9M FCCE

PERSONNEL DEPLOYED
150 CIVILIAN 1 MILITARY 203 CONTRACTORS

54
RESPONSE DAY
(22-SEP-2022)

TEMPORARY ROOFING | BLUE ROOF INSTALLS

RIGHTS OF ENTRY REQUESTS: 36,916

100%

% COMPLETE FOR BLUE ROOF INSTALLS | ASSESSMENT START DATE: 04 OCT 2022 | INSTALLATION START DATE: 08 OCT 2022

20,125
ROOFS INSTALLED

VALIDATED RIGHTS OF ENTRY: 20,115
COMPLETED ASSESSMENTS: 20,201
READY FOR CONTRACTOR: 20,125

INFRASTRUCTURE | ASSESSMENTS

100%

% ASSESSMENTS COMPLETE

ASSESSMENTS REQUESTED: 347
ASSESSMENTS CANCELLED: 0
ASSESSMENT TO BE COMPLETED: 0

347
ASSESSMENTS COMPLETE

ATC-45 | SAFETY EVALUATIONS

100%

% ASSESSMENTS COMPLETE

EVALUATIONS REQUESTED: 9,566
EVALUATIONS COMPLETED: 9,566

TEMPORARY EMERGENCY POWER | GENERATOR ASSESSMENTS/INSTALLS

100%

% COMPLETE FOR ASSESSMENTS

100%

% COMPLETE FOR GENERATOR INSTALLS

ASSESSMENTS REQUESTED: 331
ASSESSMENTS CANCELLED: 71
INSTALLS REQUESTED: 12

ASSESSMENTS COMPLETE 260
INSTALLS COMPLETE 12

PORT | STATUS

13
OPEN

FCCE FUNDED MISSIONS (PL 84-99)

FLOOD RESPONSE | EFFORTS

12
PUMPS PROVIDED

181,000
GALLONS/MIN PUMPING CAPACITY

BEACH | ASSESSMENTS

28
ASSESSED

U.S. ARMY

U.S. Army Corps of Engineers®

BUILDING STRONG®

OPERATION BLUE ROOF: 888-ROOF-BLU (766-3258)
TEMPORARY EMERGENCY POWER GENERATOR HOTLINE: 877-214-9112

FINAL (AS OF: 14-NOV 1200)

USACE Aviation / UAS Cadre

Our Mission Providing planning support, guidance, coordination, and execution of aviation assets necessary to all USACE elements conducting/supporting emergency response and contingency operations requiring aviation reconnaissance, airlifting of supplies, and travel during an USACE All-Hazard response.

Supporting USACE leaders to include aviation early in their planning efforts to save time and money

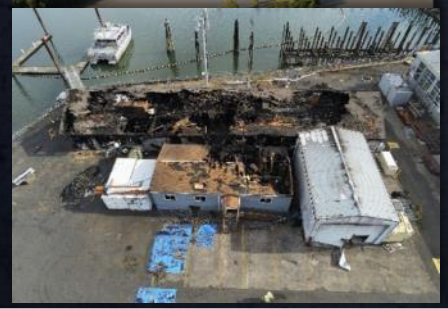
78 National Cadre Volunteers

Blue Team East Coast
Red Team Central US
Green Team West Coast

41 USACE Districts, Labs & Centers with aviation assets

164 Unmanned Aerial Systems (UAS)

16 Manned Aircraft

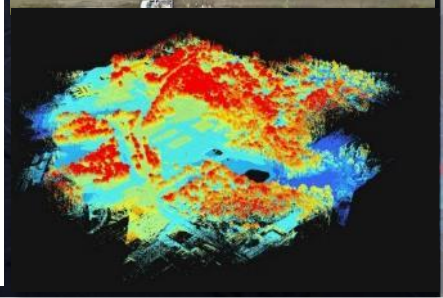


Ready for Deployment

- From its creation in 2017, the USACE Aviation Cadre has matured into a **ready-to-deploy**, standardized emergency response asset.
- Aviation Cadre are **trained and qualified teams** of Aviation SMEs and Remote Pilots available to provide mission support.
- Activated and deployed for **Blue Roof missions** following Hurricanes Michael, Laura, Delta, and Ida for up to 3 months.
- Deployed Aviation Cadre to Florida after **Hurricane Ian** for 15 days and conducted more than 100 flights, collecting more than 70,000 images covering 23,000 acres.

UAS Capabilities

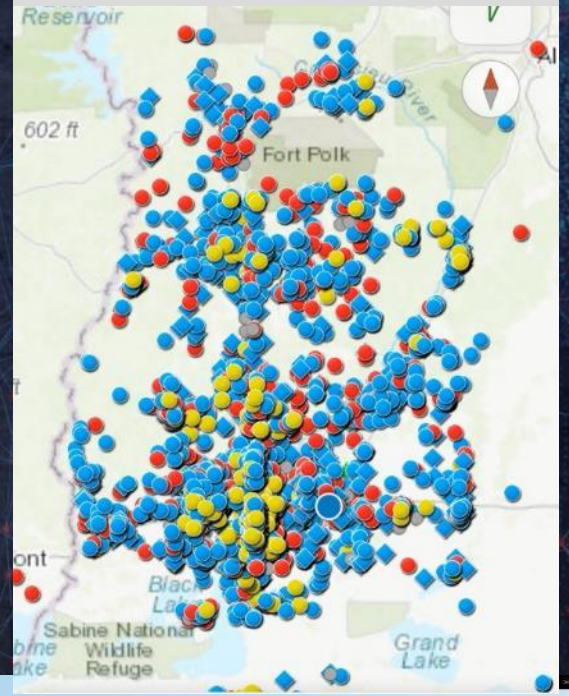
- **Mission planning, tracking, and archiving** through the Management Information System for Aviation & Remote Systems (MARS).
- Utilizing UAS to conduct final **Quality Control/ Quality Assessments inspections of homes with blue roofs** during restoration efforts and supporting public affairs.
- **Digital elevation & surface models** for improved measures of shoreline erosion, waterway trafficability assessments & volume estimates to support restoration efforts.
- **3D terrain modeling** to facilitate surveys and debris identification & removal.
- Thermal Cameras and Light Detection and Ranging (LiDAR) sensors provide **advanced data collection capabilities.**



Utilizing UAS for Temporary Roofing Inspections

- **The Temporary Roofing program traditionally required USACE staff to conduct on-site roof inspections to initially assess the extent of damage and then to conduct final QC inspections of completed work.**
- **The use of UAS to conduct these inspections reduces manpower requirements, can reduce the amount of time that homeowners are displaced from their homes, and improves the overall efficiency of the program.**

Possible AOI Request
Over 9,900 Homes in LA



Pre/Post Storm UAS Data used to Train USACE Temporary Roofing Staff

Purpose: UAS pilots collected aerial imagery of homes that were equipped with temporary blue roofing material to train incoming QA/QCs on roof assessments.

Impact: Utilizing UAS to conduct final inspections of homes with blue roof decreased the need for personnel to climb on top of homes to conduct inspections which in turn decreased time on the site, personnel in the field, and safety of personnel.

Products: High-quality imagery and videos that could be used for multiple purposes for in-coming trainees for Blue Roof.

Utilizing UAS for Broader Disaster Relief Missions

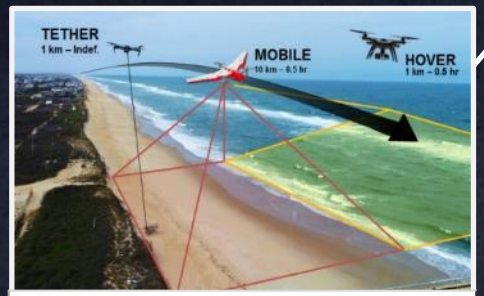
Purpose: Provides a force multiplier in disaster response.

Impact: Utilizing UAS to collect aerial imagery and videos of neighborhoods, to assist with individual roof inspections and to provide information supporting USACE PAO.

Products: High quality imagery and videos that could be used for multiple purposes for in coming trainees for Blue Roof, Temporary Housing, Debris Removal and

Outcomes: After Hurricane Laura, teams were being trained with imagery for the upcoming disaster response for Hurricane Delta. Providing awareness of UAS availability and capabilities to USACE, FEMA and other Emergency Support Functions groups can decrease manpower requirements, enhance the safety of personnel, and provide immediate visual feedback from the field to support mission requirements and decision makers.

Other UAS Applications



Multimodal Environments

Terrain Sensing
- Survey grade remote sensing
- Hazard identification
- Seamless beach topography & bathymetry
- Field Force Engineering/EnVST/ Blue Roof

Situational Awareness
- Object Detection and Avoidance
- Teaming compatible
- Autonomous aerial imagery
- Route Reconnaissance

Mobility in Complex Urban Environments

High Resolution
- Image
- Installations of the Future
- Geospatial Models

3D Models/ Digital Twin

Unmanned Aircraft System

Modular
- Payload agonistic
  - Thermal
  - Infrared
  - Multispectral
  - LiDAR
  - High Resolution RGB

Environmental Monitoring

Site Characterization
- Change detection
- UXO detection/ID
- Multimodal environmental characterization

Adaptable
- Active/passive systems
- Coastal Mapping
- Innovative Sensor Technology

Data Collection and Processing

Installations, Operations, and Environment
OTD POC: Elizabeth.a.ferguson@usace.army.mil
Tech POC: Jennifer.G.Laird@usace.army.mil

Civil Works
OTD POC: jennifer.m.seiter-moser@usace.army.mil
Tech POC: Jennifer.G.Laird@usace.army.mil

ERDC

ENGINEER RESEARCH & DEVELOPMENT CENTER

DISCOVER • DEVELOP • DELIVER

New ways to make the world safer and better

Jeffrey D. Jorgeson, PhD, PE

Research Engineer
USACE Reachback Operations Center
U.S. Army Engineer Research and Development Center
U.S. Army Corps of Engineers

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