

2021 National Mutual Aid Technology Exercise: After-Action Report

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Table of Contents

- Exercise Overview and Landscape 4**
 - Exercise Goal 4
 - Approach 4
 - Participation..... 4
 - National Mutual Aid Landscape 5
 - Mutual Aid Explained..... 5
 - National Mutual Aid Technology 5
 - Components, Vision, and Objectives..... 6
 - Desired Outcomes 6
- Key Findings 7**
 - Key Finding 1: Outreach, Education, and Technical Support 7
 - Strengths..... 7
 - Opportunities for Improvement 7
 - Key Finding 2: Technology Requirements and Evaluation Findings 8
 - Strengths..... 8
 - Opportunities for Improvement 9
 - Key Finding 3: Guidance for Data Integration and Usage 11
 - Strengths..... 11
 - Opportunities for Improvement 12
- Action Plan..... 14**

Executive Summary

Mutual aid is critical for a unified response to and recovery from emergencies of all types and scales. Effective resource management practices in the preparedness phase and during incident operations enable efficient mutual aid. Resource typing, inventorying, and personnel qualifications and credentialing management ensure that the resources and personnel deployed meet the minimum criteria and qualifications required to perform the duties of their assigned tasks and roles.

To support the whole community in implementing the resource management preparedness process, the Federal Emergency Management Agency (FEMA) provides a suite of web-based resource management tools as part of the National Resource Hub. The National Resource Hub was at the core of the 2021 National Mutual Aid Technology Exercise (NMATE).

NMATE 2021 was conducted to demonstrate and exercise policy and technology interoperability among resource and incident management systems through the seamless exchange of priority information and application among different organizational structures. NMATE was conducted virtually over a six-week period, culminating in an in-person hotwash at FEMA Headquarters on December 1, 2021. The hotwash brought together over 30 leaders representing federal, state, and local agencies; relevant non-governmental organizations (NGOs); and development organizations.

Participants confirmed that the ability to share resource inventory and incident workforce data dynamically in real-time through application programming interface (API) data services makes their resource management information more actionable and operationally relevant. Participants also validated that National Resource Hub tools be designed to support maximum flexibility and scalability for different types of organizational structures. While additional technology capabilities, guidance, outreach, and education are needed, participants confirmed that mutual aid technology is progressing in the correct direction to support the needs of the community.

The purpose of this NMATE After-Action Report is to provide a summary of exercise outcomes and findings, along with priority actions and requirements identified by participating stakeholders.

Exercise Overview and Landscape

The 2021 National Mutual Aid Technology Exercise (NMATE) was co-hosted by FEMA Resilience, the Department of Homeland Security (DHS) Science and Technology Directorate (S&T), and the National Alliance for Public Safety GIS (NAPSG) Foundation. It was designed to maximize the operational viability of the Nation's investments in technology systems used in resource management and mutual aid. NMATE was conducted virtually over a six-week period, culminating in an in-person hotwash at FEMA Headquarters on December 1, 2021. The hotwash brought together over 30 leaders representing federal, state, and local agencies; relevant non-governmental organizations (NGOs); and development organizations.

Exercise Goal

Demonstrate and exercise policy and technology interoperability among resource and incident management systems through the seamless exchange of priority information and application in organizational structures.

Approach

NMATE 2021 was conducted as a hybrid virtual and in-person event to optimize player organizations' time and provide an appropriate pace for exercise conduct. Virtual activity was conducted October 18 - November 30, 2021, with the majority of exercise play being executed asynchronously at the preferred pace of each player organization. The hotwash was conducted in-person with limited virtual attendance on December 1, 2021, at FEMA Headquarters in Washington, DC.

Participation

Members of the following organizations participated as players in either the organizational relationship tabletop exercise or the API test and evaluation drill component of NMATE. NAPSG Foundation, DHS S&T, and FEMA Resilience appreciate the engagement, time investment, and thought leadership provided by individuals of these organizations as we collectively work to advance domestic technology interoperability and information exchange capabilities in the incident management space.

NMATE Player Organizations
All-Hazards Incident Management Teams Association (AHIMTA)
Capital Area Council of Governments (TX)
FEMA Office of Response and Recovery
Los Angeles Multi-agency Coordination System (CA)
National Emergency Management Association (NEMA) / Emergency Management Assistance Compact (EMAC)
State Urban Search and Rescue Alliance (SUSAR)

National Mutual Aid Landscape

Mutual Aid Explained

Mutual aid involves sharing resources and services between organizations and jurisdictions and routinely occurs to meet identified resource needs. For the purpose of this effort and report, the term “resources” refers to personnel, teams, facilities, equipment, and supplies. Assistance across organizations or jurisdictions can include the daily dispatch of law enforcement, emergency medical services (EMS), and fire service resources between local communities, as well as the movement of resources within a state or across state lines when larger-scale incidents occur. Effective resource management encourages the development of mutual aid agreements and the resource management guidance provided through the National Incident Management System (NIMS) serves as the foundation for mutual aid efforts nationwide.

Mutual aid agreements exist in various forms among and between all levels of government and authorize mutual aid among communities, jurisdictions, and states. Agreements can also be with and between private sector entities, NGOs, and other whole-community partners. Maintaining an inventory of resources “owned” by parties in the agreement is a best practice. This inventory should include specifics on capabilities, maintenance requirements, operational status, and deployment information. The inventory may be based on the NIMS Resource Typing Definitions.

Qualifying, certifying, and credentialing are the essential steps that help ensure that personnel deploying through mutual aid agreements have the knowledge, experience, training, and capability to perform the duties of their assigned roles.



National Mutual Aid Technology

To support the whole community in unifying resource management, FEMA provides the National Resource Hub. The National Resource Hub is a suite of web-based tools that supports a consistent approach for the resource

management preparedness process and is a no-cost solution for all state, local, tribal, and territorial government agencies and NGOs. Systems include the Resource Typing Library Tool (RTL), Resource Inventory System (RIS), and OneResponder (a personnel qualifications and credentialing management tool).

An updated version of the National Resource Hub was released in October 2021 that included restricted-access application programming interface (API) and data services from RIS and OneResponder for consumption by select third-party systems. The availability of the National Resource Hub API and data services provides a means for broader usage of the data for multiple preparedness, planning, and operational uses. This restricted access provides a limited set of resource and personnel inventory data from either RIS or OneResponder. The data can be accessed through a one-way push from the National Resource Hub into a third-party environment as a RESTful API or through a data push into an ArcGIS feature service hosted by the third party. Additional details about the APIs are

available in the [National Resource Hub Application Programming Interface and Data Services Guide](#),

Components, Vision, and Objectives

Each player organization in NMATE participated in one of two exercise components—an organization relationship tabletop exercise or an API test and evaluation drill. Both NMATE components culminated in a joint hotwash consisting of all player organizations and observers from various levels of government and other organizations.

The vision and objectives of each NMATE component are as follows:

Component	<i>Organization Relationship Tabletop Exercise</i>	<i>API Test and Evaluation Drill</i>
Vision	Resource inventorying and personnel qualifications/credentialing technology is supported by a common organizational relationship model that promotes flexible, scalable, and appropriate sharing of resource and personnel qualification information.	Regional and national deployment, incident management, and situational awareness systems can readily consume, view, and use the national resource and incident workforce catalog data provided as live API services in open standards-based formats.
Objectives	<ul style="list-style-type: none"> • Conduct a tabletop exercise with select regions to define and develop organizational relationship and hierarchy models for resource inventorying and personnel qualifications/credentialing management. • Identify common patterns in the organizational relationship and hierarchy models that support a flexible and scalable framework for the appropriate roll-up and sharing of resource & personnel qualification information. 	<ul style="list-style-type: none"> • Conduct a simulation with select organizations to test the interoperability and evaluate the functionality of RIS and OneResponder beta API feeds when consumed/integrated by third-party systems. • Define interoperability and data exchange successes and challenges with the API feeds. • Explore how the data from the API feeds can best be incorporated to support resource and incident management workflows. • Identify gaps in resource and personnel qualification information at the attribute level.

Desired Outcomes

The following outcomes were targeted for NMATE:

- 1 Establish a shared understanding of current and emerging policy and technology interoperability between crisis management and mutual aid systems.

- 2 Improve collaboration across mutual aid providers and system owners – decision-makers, operators, and technologists.

- 3 Develop crisis management mutual aid technology guidance for sharing real-time information to support mutual aid resource management, situational awareness, and interoperability.

- 4 Document unmet needs, emerging requirements, corrective actions, and solutions for further exploration.

Key Findings

Exercise participants identified challenges and solutions in three key areas to enable the successful use of technology systems in resource management and mutual aid:

1. Outreach, Education, and Technical Support
2. Technology Requirements and Evaluation Findings
3. Guidance for Data Integration and Usage

Key Finding 1: Outreach, Education, and Technical Support

NMATE participants identified the following strengths and opportunities for improvement in the area of outreach, education, and technical support.

Strengths

The National Resource Hub documentation and website provide sufficient information and links to aid the community in understanding why and how to use the National Resource Hub suite of tools. The National Resource Hub support team provides prompt responses and information to users, as well as consumers of the API and data services. Information shared about the National Resource Hub through NMATE outreach efforts was received positively and was noted as being helpful to participating stakeholders.

Opportunities for Improvement

While guidance and documentation are provided on the National Qualification System (NQS), resource management, and the National Resource Hub, ongoing and increased outreach and education on resource typing and inventorying as well as the National Resource Hub tools are needed nationwide. Additional outreach and educational material may include how-to videos and detailed user documentation. All outreach and education materials need to emphasize the benefits of using the tools at the local level so organizations understand that the processes and systems are primarily for the benefit of the community and are not focused on benefiting the federal government.

A monthly or routine user-group should be established under FEMA's National Integration Center (NIC) Coordination Group (NCG) Technology Sub-group through which users of National Resource Hub tools can convene to hold peer-to-peer conversations on use, provide feedback, and learn of technology updates from FEMA. Organizations would benefit from more methodical opportunities to connect with one another on resource management practices, not only to discuss technology needs but also to learn about others' processes and approaches for resource management.

The need for increased outreach, education, and implementation of standardized resource typing, inventorying, mission ready packaging, and the NQS at the local level was identified as a primary gap during NMATE 2019. This need was reconfirmed in NMATE 2021 and expanded to include the National Resource Hub.

FEMA should educate and empower the states and national organizations to serve as force multipliers in providing outreach and education to organizations and jurisdictions nationwide on the National Resource Hub. Just as FEMA is motivated to help states become self-sufficient, states seek to help their localities take resource management practices and technology use to the next level. While this effort may initially begin as an outreach and education activity, over time these more advanced organizations may benefit from increased permissions in the National Resource Hub to assist in onboarding smaller organizations.

Key Finding 2: Technology Requirements and Evaluation Findings

NMATE participants identified the following strengths and opportunities for improvement in the area of technology requirements and evaluation findings.

Strengths

Authority for Resource Management and Information Sharing

The question of who is responsible for maintaining a resource inventory and who has authority to grant visibility to that inventory is of foundational importance in resource management and mutual aid operations. Each region, jurisdiction, or organization is unique and largely independent, thus the choice to share information and maintain a resource inventory must remain with the authority having jurisdiction (AHJ) that acquires, stores, and manages those resources. Of the organizations playing in NMATE, none had automatic information sharing between agencies and jurisdictions within their region.

Existing memorandums of understanding (MOUs) and mutual aid agreements serve as authoritative sources for determining an acceptable level of information sharing among organizations and jurisdictions. Technology should follow and support the agreements that are in place and must provide flexibility in the way organizational relationships are structured.

Core Information Requirements

Resource and personnel inventory records include a number of pertinent details about a given resource, not all of which are appropriate or useful to be viewed outside the owner's organization. Only limited details are needed to support incident management and facilitate mutual aid. Providing a means of sharing a limited set of actionable information from the National Resource Hub is the most appropriate and effective approach.

The ability to share a subset of data as an essential component of appropriate and safe data sharing relevant to mutual aid operations was identified as a best practice in NMATE 2019. This was reconfirmed in NMATE 2021.

Multiple Organizations for Responders

One ongoing concern when inventorying and managing resources and personnel is the double-counting of assets—thereby generating inaccuracy and an overestimation of available capabilities and their capacity. The OneResponder tool allows responders to be assigned to one primary organization and link to multiple secondary or auxiliary

organizations that they support in one or more assigned positions. This approach of mapping one responder to multiple organizations is one step in ensuring personnel are not double-counted during response and mutual aid operations through being logged in the system multiple times in separate organizations.

Opportunities for Improvement

Refine and Expand National Resource Hub API Fields

While confirming the usefulness of the APIs and the ease of connecting with the National Resource Hub data, player organizations reported some challenges interpreting and properly understanding the data that is provided. Additional attributes and data validation need to be added for the data to be more fully utilized:

- A “last updated” field per record for both the RIS and OneResponder data would provide insight into the currency of the data at the record level. This is critical for when the data is being used in both deliberate and crisis action planning, as it indicates the potential currency of the resource’s status and availability.
- More fields from the resource typing definition or job title/position qualification are needed—specifically the name of the resource, Type (e.g., Type 1, 2, etc.), and the RTL identifier (e.g., 12-509-1355). Currently, the only resource typing information provided is the URL to the definition from RTL, which is not useful and is insufficient.
- The Name field for resources generated confusion. It was unclear whether this field captures the name of the resource provided by the AHJ in the Name field in RIS or whether it captures the resource typing definition name that aligns with RTL.

Implementing a uniform format for fields where viable would allow for improved filtering of the data and subsequent actionability. For example, the state field allows for abbreviations and for the full name, which creates technical difficulties and inconsistencies in filtering data for a single state. The system should also be re-tested to ensure required data fields must be populated and that data is being updated through the ArcGIS feature service data connections at the intervals specified, as some anomalies were detected during the exercise that impacted the usability of the data.

Provide APIs with Near Real-Time Data

During NMATE, data was pushed from the National Resource Hub into select ArcGIS feature services every 12 hours, at noon and midnight Eastern Time, with each push appending the set of records in the feature service. This interval was set to align with each operational period. Some use cases require more real-time data and thus an increased frequency in data pushes. In these cases, a snapshot of data best serves the end-user and would help manage data load and volume. The snapshot of data would also prevent the same record from appearing multiple times in the same view. Additional APIs with increased frequency in data pushes should be provided, as well as a standard snapshot view that does not append the data.

Linking Personnel and Equipment Status to Team/Task Force Rosters

Within resource management, resources include personnel, equipment, supplies, teams, and facilities. Since teams are composed of specific configurations of personnel, equipment,

and supplies, their availability is impacted by the status of their components. The community would benefit if RIS and RTLT were updated to provide a mapping between teams and the individual positions and other resources that are needed to make up those teams. This mapping would provide a means for resource managers to determine their true resource capabilities—as resource readiness and capabilities may be inadvertently and inaccurately inflated if personnel or resources are double-counted due to their assignment on multiple teams.

Identify Nearly-Qualified Trainees

The OneResponder tool currently categorizes personnel status as either qualified or trainee. Allowing managers to identify trainees based on specific qualification gaps (e.g., needed training or experience) would allow them to make informed, strategic decisions to close those gaps for nearly qualified personnel, thereby increasing their capabilities and preparedness.

Provide Additional Indicators for Resources Marked as Requestable and Deployable

Within RIS, resource managers may mark resources and personnel as being able to be requested and deployed outside the home organization. Providing an additional sub-setting to mark the resource as deployable at different levels (i.e., Automatic-Aid Only, Intrastate Mutual Aid, Regional Mutual Aid, Interstate Mutual Aid via EMAC) would allow resource managers to better indicate the extent to which the resource is available, thus providing a better picture of available resources for the different levels of mutual aid. Once available, this attribute should also become available in the RIS API data service since it would directly inform resource management planning.

Provide Means of Review from More Mature Organizations

Organizations, jurisdictions, and agencies vary greatly in their level of resource typing familiarity and maturity as well as the time and resources that may be dedicated to resource management and inventorying. Some organizations may benefit from the ability to pull in support or reviewers from other more mature organizations within RIS and OneResponder to aid them in resource typing, qualification reviews, and other efforts that require some level of training and expertise. Providing this capability within RIS and OneResponder may provide a means of increasing the capacity of technical assistance offerings provided by FEMA Resilience, allowing peers to support peers more easily across the nation as familiarity with resource typing and NQS continues to increase across the whole community.

Key Finding 3: Guidance for Data Integration and Usage

NMATE participants identified the following strengths and opportunities for improvement in the area of guidance for data integration and usage.

Strengths

Utility of National Resource Hub APIs with Actionable Data

All three players in the API Test and Evaluation Drill component of NMATE opted to connect with the National Resource Hub data through an ArcGIS feature service. Data was pushed from the National Resource Hub to the consumer’s ArcGIS feature service using either an API key or a username and password from the target ArcGIS instance for authentication. This proved to be a straightforward means of connecting and interacting with the National Resource Hub data.

Participants noted that FEMA providing organizations with data in multiple ways helps them to justify the use and maintenance of their resource inventories — closing the gap on one of the major needs identified in NMATE 2019.

One of the most useful components of the National Resource Hub is the data itself, making the APIs that allow users to consume information into other environments to be particularly useful. The APIs allow the data to be used for purposes other than those inherent in the National Resource Hub, increasing its flexibility, scalability, and application.

Player organizations expressed clear—and in many cases detailed—use cases for resource inventory and incident workforce data. Most prototyped applications developed by the participants included some means of filtering the data by category or discipline and of viewing the resources geospatially on a map. Data sharing through the National Resource Hub APIs has the potential to help organizations make more informed decisions about resource management both prior to and during an emergency.



Prototype Application Developed by NMATE Player Organization from National Resource Hub Data

Opportunities for Improvement

Champion or Develop a Platform for Data Aggregation and Exchange

At the time of NMATE, one-way APIs were available from the National Resource Hub, allowing data from RIS and OneResponder to be pushed or pulled into third-party consumer environments. However, the National Resource Hub may not be the source of truth in all cases and other systems may need to be integrated. The community needs an environment in which to bring together common resource data from both the National Resource Hub and other inventory and incident management systems. This remains a major need, consistent with the 2019 NMATE finding. Establishing an environment in which authoritative resource information can be brought together from multiple third-party systems is a critical next step in mitigating and reducing the likelihood of double- or triple-counting of resources and personnel.

The needs for a cohesive, nationwide resource management information exchange framework and guidance to support appropriate information sharing was identified as a primary policy gap during NMATE 2019. This need persists and was reconfirmed in NMATE 2021.

FEMA Resilience is uniquely positioned to steward and champion such an environment, thereby establishing a standards-based national resource and incident workforce catalog across platforms and systems. Providing a means of aggregating and exchanging data in a managed, central environment can help address security concerns, as entities may opt for less secure means of data exchange if a secure environment is not provided and supported. Pros and cons must be identified regarding the best environment for this capability, whether that be a government-hosted environment or an environment maintained as a partnership between the government and a neutral, trusted NGO.

Such an environment may also provide the option of integrating other preparedness data with national resource and incident workforce data, including climate change data, critical infrastructure data, the National Risk Index (NRI), and resilience indices, such as the Community Resilience Indicator Analysis (CRIA), which is the underlying indicator analysis in the FEMA Resilience Analysis and Planning Tool (RAPT).

Guide Information Exchange Among Incident Management Systems Nationwide

Organizations and jurisdictions have demonstrated a willingness to collaborate among themselves and share information when properly facilitated and guided.

FEMA Resilience is the authority and a trusted entity for guidance and solutions on resource management, having listened and responded to community needs throughout the development of NIMS doctrine, guidance, and technology solutions thus far.

The National Resource Hub has provided a proof of concept that data may be surfaced through an API in such a way that information is actionable while also reasonably de-identified, protecting responder information. FEMA Resilience may build upon the successes



of the National Resource Hub API to develop a road map for a broader network of systems for all levels of government across the nation that are able to exchange data among trusted parties for a myriad of uses. This is a critical recommendation that has persisted since the 2017 NMATE and remains a major opportunity for improvements and success.

Action Plan

Based on the key findings outlined above, the following actions have been identified to progress the successful use of technology systems in resource management and mutual aid.

Actions and Requirements	Entity
Expand and increase outreach and education on the NQS, resource typing, resource inventorying, and the National Resource Hub. Emphasize benefits to the SLTT community. Equip states and other organizations to educate their constituencies.	FEMA Resilience
Update the National Resource Hub APIs to include the additional attributes identified and address data validation needs.	FEMA Resilience and National Resource Hub development team
Provide additional National Resource Hub APIs with a snapshot view and increased frequency in data pushes, providing near-real-time data.	FEMA Resilience and National Resource Hub development team
Map and link teams to component positions and resources that comprise that team within RIS and RTLT, providing a means to identify impacts to teams and prevent inadvertent overestimation of resource availability or capabilities.	FEMA Resilience and National Resource Hub development team
Provide a feature within OneResponder to allow managers and supervisors to identify trainees based on specific qualification gaps (e.g., needed training or experience).	FEMA Resilience and National Resource Hub development team
Provide an approach and means for less mature or less resourced organizations to opt in to receive support in resource typing, qualifications review, and other processes from more mature organizations.	FEMA Resilience
Codify the approach to data sharing utilized by the National Resource Hub to create guidance and a framework for resource management information sharing for mutual aid operations across software systems.	FEMA Resilience and National Resource Hub development team
Champion or develop a standards-based environment in which to bring together authoritative resource and incident workforce data from multiple third-party system systems. Determine the best environment for this platform (e.g., governmental vs. non-governmental environment).	FEMA Resilience, NCG Technology Sub-Group, technical subject matter experts, and relevant non-governmental organizations, as appropriate

Actions and Requirements	Entity
<p>Develop a unique identifier schema for resources and personnel. Develop workflow, methodology, and technical solutions to apply unique identifiers across multiple systems to prevent multiple counting of resources and personnel as inventories are integrated.</p>	<p>DHS S&T, FEMA Resilience, National Resource Hub development team, NCG Technology Sub-Group, and technical subject matter experts</p>
<p>Establish a National Resource Hub ad-hoc user group within the NCG structure. This group should primarily consist of active RIS and/or OneResponder organizations. The group may also include representatives from organizations using other technology to manage their resource inventories and personnel qualifications.</p> <p>This group would serve as a trusted source of technology needs and requirements.</p>	<p>FEMA Resilience and NIC Coordination Group</p>
<p>Develop and provide comprehensive guidance and resources (such as templates) to support the community in fully implementing the National Resource Hub and applying the data through the APIs.</p>	<p>FEMA Resilience, National Resource Hub development team, NCG Technology Sub-Group, and technical subject matter experts</p>
<p>Continue advancing information sharing and technology innovation through annual exercises such as NMATE and other community-focused research and development forums. Exercises and forums should be hosted by a neutral party that does not directly benefit from development efforts or data insights.</p>	<p>DHS S&T, FEMA Resilience, and appropriate non-governmental organization</p>