Virtual Training:
Applying USNG for Decision Support in Search and Rescue

January 21, 2016

NAPSG Foundation in partnership with National Association for Search & Rescue
Paul J. Doherty
Search and Rescue GIS
National Alliance for Public Safety GIS Foundation

Bryan Enberg
Director of Education
National Association for Search And Rescue
NASAR: Who We Are

http://www.nasar.org/
Our Vision - A Nation of emergency responders and leaders equipped with the knowledge and skills in applying technology and data to change the outcome for survivors.

Our Mission - To equip emergency management & public safety with the knowledge, skills, and resources to apply decision support technology and data in enhancing preparedness and building a more resilient nation.
501 (c) (3) Not-for-Profit Organization
Board of Directors are public safety practitioners
NAPSG formed in 2005 as informal alliance of national associations
Evolved to a formal organization to better serve public safety
Provide awareness level training on how to use the US National Grid (USNG) to support search & rescue missions.

- Hands-on skills for using the USNG as a point and area reference system that provides actionable location information in a uniform format
- Highlight best practices and lessons learned from the field
- Achieve consistent situational awareness across SAR teams and multiple agencies during an incident
Learn how to apply USNG-enabled decision support tools to enhance coordination during SAR operations

Gain insights from real-world incidents where USNG was successfully used to support SAR operations

Explore the use of USNG and GIS in Search & Rescue operation workflows

Learn about the suite of existing USNG and GIS decision support tools already available
Key Terminology

- **US National Grid (USNG):** A common location area and point reference language for ground and ground/air operations.

- **Geographic Information Systems (GIS):** A system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.

- **Search & Rescue (SAR):** The search for and provision of aid to people who are in distress or imminent danger.

Recording & slides will be made available. Type Questions into the Q&A, we will review at the end.
Why use US National Grid (USNG)?

Learn how to apply USNG
  - Point Reference
  - Area Reference
  - Decision Support
Search and Rescue (SAR), whether Urban or Wildland, is an inherently spatial problem…
What went wrong?

“Decimal degree coordinates may have been entered into a software interface box for degree minute seconds…”

http://arcg.is/1O7clZJ
Solution

- Use the US National Grid for all operations and trainings
- Engage with local GIS Specialists* to help you with day-to-day operations
  - Invite them to a training event or meeting?
  - Build hasty mapping tools and map books responders can use
  - Setup a Memorandum of Understanding (MoU) for disaster response *before* the next local disaster

*NAPSG Foundation Regional Leadership Teams
http://www.napsgfoundation.org/about/regional-leadership-teams/
The USNG:

- Provides a **UNIFIED** language for defining Areas of Interest, reporting & planning and navigation.
- Transforms data to **ACTIONABLE** information in a **UNIFORM** format.
- Provides a **CONSISTENT** situational awareness across jurisdictions, disciplines & all levels of operations.
- **INTEROPERABILITY** in both connected and disconnected environments.
FEMA Urban Search and Rescue (NE TF1) team members search house to house for survivors in tornado devastated neighborhood in Moore, Oklahoma. Andrea Booher/FEMA
The 2013 Colorado Floods demanded the coordination of diverse Search & Rescue resources. Sgt. Joseph K. VonNida / USDOD

Why Use USNG?
Nearly every after action report, post any large scale or regional disaster clearly indicates the need for a common grid.

- Haiti
- Japan
- Joplin
- Irene
- Sandy
- Colorado Floods
- Capstone 2014
It is a Standard
- Land SAR Addendum
- FEMA 092-5
How do we communicate and find point coordinates?

USNG for Point Reference
Maryland State Police Special Operations Division

Uses US National Grid for Law Enforcement, SAR, and Fire
A search team that needs to direct a rescue team into an unfamiliar area or an area that has no street signs.
Implementing USNG is not hard
- Especially if you are already using Universal Transverse Mercator
- IT IS EASY TO USE!! Military has been using it since 1949. +65 yrs of history (Military Grid Reference System).

The Hampstead Volunteer Fire Department Map Book is US National Grid enabled.
The Three Components of USNG Coordinates

- **Grid Zone Designation (GZD)**
  - 6° x 8° longitude zone / latitude band
- **100,000-m Square Identification**
- **Grid Coordinates**
Grid Zone Designation (GZD)

6° x 8° longitude zone / latitude band

Zone 1
Starts at 180 West Longitude

Latitude Band C
Starts at 80 South Latitude
The World is divided into 6-degree wide longitudinal zones designated by a number and 8-degree latitudinal bands designated by a letter.

United States is within Zones 10 thru 19 and Latitude bands of R thru U.
Each GZD is further broken into 100,000-meter squares where a two-letter designator that identifies each square.

18SUJ – Identifies a specific 100,000-meter square in the specified GZD
100,000 Meter Square Identification

The Power of Truncated USNG Values

Jefferson Pier, Washington, DC
Grid: UJ23370651

Each 2 letter/8 digit USNG value (10-m posting) in the outlined area is unique.
Grid Reference Box (Printed On Map)

Methods for depicting Grid Zone Designations and USNG 100,000-meter square identifications for a map within a Grid Reference Box.

This map sheet covers two 100,000 meter square designations- TJ & UJ within 18S.

This map sheet coverage is over two Grid Zone Designations (GZD) – 18T & 18S.
Coordinates are always given as an even number of digits (e.g. 23370651)

Separate coordinates in half (2337 0651) into the easting and northing components.

Example: 1,000m grid map
- **2337 0651**
- **Read right** to grid line 23.
- **Then measure right** another 370 meters. (Think 23.37)
2337 0651

Read up to grid line 06.

Then measure up another 510 meters. (Think 06.51)
The 10,000 and 1,000 meter values in UTM coordinates are known as the principal digits in USNG coordinates.
The standard datum for USNG coordinates is North American Datum 1983 (NAD 83) or its international equivalent, World Geodetic System 1984 (WGS 84)
Missing Person Report
Dispatcher gives you the address of 419 S. Houcksville Rd.
But they can also give you –
18S UJ 39225 80497
1. What is the Grid Zone Designation and 100,000m square?

Access the PDF
2. Read Right
39225 80497

BOX: 2-1
2. Read Right
39225 80497
2. Read Right
39225 80497
3. Read Up

39225 80497
3. Read Up
39225 80497

BOX: 2-1
3. Read Up
39225 80497
4. Estimate
39225 80497
Plot with a GPS or Smartphone
Plot with a Web Mapping Application

Plot with a Web Mapping Application

www.sartopo.com
Plot with a Web Mapping Application

Where Are You?
http://usngapp.org/
Responders should be able to access a quick USNG ready map as soon as they have incident information!*
How do we communicate area?

USNG for Area Reference
Jared Doke

- Kansas GIS Response Team
- Structural Firefighter, EMT, Wildland Fire, Urban SAR, WiSAR
- Thesis: Analysis of Search Incidents and Lost Person Behavior in Yosemite National Park
An Incident Commander needing to break a large incident perimeter into manageable parts so that operational areas can be clearly defined and communicated easily across multiple disciplines and jurisdictions.
A point within the 100,000-meter square is given by the UTM grid coordinates of Easting (E) and Northing (N).

The number of digits used will depend on the precision desired in position referencing. An equal & even number of digits is always be used for E and N.

Examples:
18SUJ20 - Locates a point with a precision of 10 km
18SUJ2306 - Locates a point with a precision of 1 km / 1000m
18SUJ234064 - Locates a point with a precision of 100 meters
18SUJ23480647 - Locates a point with a precision of 10 meters
18SUJ2348306479 - Locates a point with a precision of 1 meter
For many operations in SAR – 100m is a more appropriate tactical area for assigning resources.
Assignments are not always a grid
- Rivers, walls, hazards, etc.
Adapt accordingly
Not mutually exclusive
Ideas?

Map created using IGT4SAR / MapSAR by Don Ferguson.
At 2132 hours on Saturday, May 21st, 2016 Manhattan, KS took a direct hit from an EF5 tornado. Incident resources from the South are meeting near City Park.

1. What is our 100,000m GZD for this tornado?
2. What are our 10,000m grid areas?
3. What is our 1,000m grid for City Park?

Practice 2
At 2132 hours on Saturday, May 21st, 2016 Manhattan, KS took a direct hit from an EF5 tornado. Incident resources from the South are meeting near City Park.

1. What is our 100,000m GZD for this tornado? 14SQJ
2. What are our 10,000m grid areas? ~14SQJ 04, 03,14
3. What is our 1,000m grid for City Park?
   14SQJ 0939
How can it help us make decisions?

USNG for Decision Support
Determine mission based required resources and pre-script missions based on USNG analysis

- Overlay base and incident data layers with USNG
  - Demographics
  - Community lifelines (transportation, communications, energy)
  - Critical Facilities (Police, Fire, Medical, Schools)
  - Incident data/forecasts (Hurricane track, path of tornado, tsunami inundation)

Before the incident or exercise occurs
# USNG For Decision Support

## Health Care for USNG 17S NJ 8651

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Emer_Funct</th>
<th>Name</th>
<th>Address1</th>
<th>City</th>
<th>County</th>
<th>Zip</th>
<th>USNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSPITAL</td>
<td>ES</td>
<td>SOUTH BEACH COMMUNITY HOSPITAL</td>
<td>630 ALTON ROAD</td>
<td>MIAMI BEACH</td>
<td>86</td>
<td>33139</td>
<td>17R NJ 86141 51133</td>
</tr>
<tr>
<td>CLINICAL LABORATORY</td>
<td>ES</td>
<td>MIAMI BEACH COMMUNITY HEALTH CENTER</td>
<td>710 ALTON ROAD</td>
<td>MIAMI BEACH</td>
<td>86</td>
<td>33139</td>
<td>17R NJ 86136 51302</td>
</tr>
<tr>
<td>CLINICAL LABORATORY</td>
<td>ES</td>
<td>MIAMI Dade County Health Dept / Lab Serv</td>
<td>615 COLLINS AVENUE</td>
<td>MIAMI</td>
<td>86</td>
<td>33139</td>
<td>17R NJ 86966 51150</td>
</tr>
<tr>
<td>RESIDENTIAL TREATMENT FACILITY</td>
<td>ES</td>
<td>DOUGLAS GARDENS C.M.H.C./CRISIS RESIDEN</td>
<td>629 LENOX AVENUE</td>
<td>MIAMI BEACH</td>
<td>86</td>
<td>33139</td>
<td>17R NJ 86264 51191</td>
</tr>
<tr>
<td>SKILLED NURSING FACILITY</td>
<td>ES</td>
<td>OCEANSIDE EXTENDED CARE CENTER</td>
<td>550 9TH STREET</td>
<td>MIAMI BEACH</td>
<td>86</td>
<td>33139</td>
<td>17R NJ 86953 51538</td>
</tr>
</tbody>
</table>

## Emergency Services for USNG 17S NJ 8651

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Emer_Funct</th>
<th>Name</th>
<th>Address1</th>
<th>City</th>
<th>County</th>
<th>Zip</th>
<th>USNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE STATIONS</td>
<td>ES</td>
<td>MIAMI BEACH FD ST 1</td>
<td>1051 JEFFERSON AVE</td>
<td>MIAMI BEACH</td>
<td>086</td>
<td>33139</td>
<td>17R NJ 86520 51740</td>
</tr>
<tr>
<td>LAW ENFORCEMENT</td>
<td>ES</td>
<td>MIAMI BEACH POLICE DEPT</td>
<td>1100 WASHINGTON AVE</td>
<td>MIAMI BEACH</td>
<td>086</td>
<td>33139</td>
<td>17R NJ 86945 51875</td>
</tr>
<tr>
<td>CALL CENTER</td>
<td>ES</td>
<td>MIAMI BEACH POLICE DEPT</td>
<td>1100 WASHINGTON AVE</td>
<td>MIAMI BEACH</td>
<td>086</td>
<td>33139</td>
<td>17R NJ 86945 51875</td>
</tr>
</tbody>
</table>
For more information – see the handout

Structures along the center of the path incurred incredible damage. Facilities impacted include, but not limited to, countless single family residences, multi-unit student housing complexes, Kansas State University, Via Christi Hospital, several public schools, and a Fire Station. Local emergency resources have become overwhelmed and multiple Kansas USAR Task Forces have been deployed to assist in search and rescue operations.
How many people live in our impact area?

How do we prioritize tactical areas? Where would you send resources first?
How many people live in our strategic planning area?
31,000 people, 13,000 Housing Units, 368 Mobile Homes, 728 Businesses

How do we prioritize tactical areas? Where would you send resources first? High density, Mobile Homes, Vulnerable Populations
The USNG:

- Provides a **UNIFIED** language for defining Areas of Interest, reporting & planning and navigation.
- Transforms data to **ACTIONABLE** information in a **UNIFORM** format.
- Provides a **CONSISTENT** situational awareness across jurisdictions, disciplines & all levels of operations.
- **INTEROPERABILITY** in both connected and disconnected environments.
Solution

- Use the US National Grid for all operations and trainings
- Engage with local GIS Specialists* to help you with day-to-day operations
  - Invite them to a training event or meeting?
  - Build hasty mapping tools any responder can use
  - Setup a Memorandum of Understanding (MoU) for disaster response *before* the next local disaster

*NAPSG Foundation Regional Leadership Teams
http://www.napsgfoundation.org/about/regional-leadership-teams/
NPS Training (Unit 12 – Land Nav.) http://bit.ly/J9Tmg0
Training Materials Gallery http://arcg.is/1O76OIS
<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole Brown</td>
<td>Maryland State SAR</td>
<td>MD</td>
</tr>
<tr>
<td>Jared Doke</td>
<td>Kansas GIS Response</td>
<td>KS</td>
</tr>
<tr>
<td>David Hansen</td>
<td>GiSCorps</td>
<td>CA</td>
</tr>
<tr>
<td>Don Ferguson</td>
<td>Appalachian Search and Rescue Conference</td>
<td>WV</td>
</tr>
<tr>
<td>Vanessa Glynn-Linaris</td>
<td>National Park Service</td>
<td>CA</td>
</tr>
<tr>
<td>Richard Laing</td>
<td>Ridge Meadows SAR (Canada)</td>
<td>BC</td>
</tr>
<tr>
<td>Eric Menendez</td>
<td>Appalachian Search and Rescue Conference</td>
<td>PA</td>
</tr>
<tr>
<td>George Durkee</td>
<td>National Park Service</td>
<td>CA</td>
</tr>
<tr>
<td>Lori Peltz-Lewis</td>
<td>US Forest Service</td>
<td>CA</td>
</tr>
<tr>
<td>David Kovar</td>
<td>National Association for Search and Rescue</td>
<td>NJ</td>
</tr>
</tbody>
</table>
Thank You for Content & Support

- Rand Napoli
- Carla Boyce
- Ken Phillips
- Cole Brown
- Jared Doke
- National Search and Rescue Committee
- National Association for Search and Rescue

http://usngcenter.org/
NAPSG Contact - Paul Doherty: pdoherty@publicsafetygis.org
NASAR Contact - Bryan Enberg: bryan.Enberg@gmail.com


Thank You!