

Transportation Research Board (TRB)
AKD 70 Standing Committee on Geospatial Data
Acquisition Technologies

2024 Summer Meeting


NCHRP 08-174 Development of a Surveying and
Mapping Guide for Transportation Projects

Research Update

July 31st, 2024

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*Standards are like a
toothbrush.*

*Everyone agrees that we
need them, but no one
wants to use anyone else's.*

NCHRP 08-174 Objective

- The objective of this research is to **create a surveying and mapping guide** for identifying positional accuracies of geospatial data used in transportation projects by state agencies and others that clearly specifies practices consistent with open data standards, the NSRS, and the deprecation of the U.S. survey foot.
- The guide will **help agencies establish an appropriate level of accuracy for a given application** and provide the details of practices that, if widely adopted, could **ensure geospatial data are reliably and efficiently captured, shared, and reused.**

The Geo Hierarchy and the Guide



NCHRP 08-174 Motivation

- The 2021 Infrastructure Investment and Jobs Act (IIJA) requires the U.S. DOT to promote, implement, deploy, demonstrate, showcase, support, and document the application of advanced digital construction management systems (ADCMS) to enhance project execution.
- The National Spatial Reference System (NSRS) modernization (2025)
 - New State Plane Coordinate System
 - New Horizontal Datum (Dynamic).
 - New geopotential (vertical) datum.
- NIST and NGS deprecated use of the U.S. survey foot on December 31, 2022.
 - The international foot has been adopted for all applications throughout the United States, including the modernized NSRS.
 - The U.S. survey foot is currently used by 44 states.



The Game's Afoot
-Shakespeare
-Sherlock

NCHRP 08-174 Motivation

- NGS is modernizing the national spatial reference system - once in a generation opportunity
- From survey to geospatial information provider
- Requires geospatial data management
- Staggering data volumes – IT support
- "Collect Once - Use Many" to support ROI
- Requires trust
- Need unified, integrated 3D transportation data model

Change is hard

Build the interstate highway system

Design & construction to asset managers

2D paper to 3D digital models

Preparing for The Future

- GNSS is only getting better
- Low earth orbit satellites
- Autonomous vehicles
- AI and ML require reliable training data
- Blockchain can support data integrity
- Data is not the driver – people are
- Need engaged champions that want to lead us into the 21st century – organizational change is hard

Research Team



Michael Olsen
*PI, Transportation
Geospatial Data
Applications*



Christopher Parrish
*UAS and
Bathymetric Surveying*



Yelda Turkan
*Construction Technology
Implementation*



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Photogrammetry



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*Transportation
Remote Sensing*



Brian Weaver
*GNSS & Satellite
Geodesy*



Chase Simpson
*Construction Surv.
& Geodetic Control*



Mohsen Arjmand
*Construction
Surveying*



Jenna Borberg
Project Management



Dimitrios Bolkas
*Surveying &
Geodesy*



Hongtao Dang
*Geospatial ROI &
DBE*



Gene Roe
*Digital Innovation
& Standards*

Scope of “The Guide”

- Define a set of **common terminology**;
- **Consistently characterize, document, and report positional accuracy** to maximize interoperability independent of specific manufacturers, vendors, products, or software;
- **Ensure data is captured, shared, and reused** by all stakeholders with confidence, transparency, and efficiency;
- **Support future lifecycle and business uses** such as building information modeling (BIM) for infrastructure, digital twins, and asset performance prediction and modeling;•
- Cont'd.

Scope Cont'd

- Discuss the overall **return on investment (ROI)** of positional accuracy and alignment with the NSRS;
- Present a **ROI methodology** that calculates the benefits and business case for positional accuracy and migration to the modernized NSRS;
- Provide **recommendations for specific applications** appropriate to various phases and business uses in the lifecycle of an asset or project;
- Consider **the benefits and risks of data repurposing** and use of geospatial data throughout the asset lifecycle;
- Include applications that consider both the **spatial and temporal characteristics** of the data; and
- Include a **companion recommendation commentary** to the guide that provides a succinct section-by-section analysis of the background, rationale, importance, and benefit of each recommendation.

Project Plan

	OSU	PSU	WSU	MPN
Phase I- Data Collection & Needs Analysis				
Task 1. Literature Review.	LEAD- Rastiveis	REVIEW	REVIEW	REVIEW
Task 2. Stakeholder Engagement.	SUPPORT	SUPPORT	CO-LEAD- Dang	CO-LEAD- Roe
Task 3. Case Studies.	CO-LEAD- Turkan	CO-LEAD- Bolkas	SUPPORT	SUPPORT
Task 4. Guide Outline.	LEAD- Olsen	SUPPORT	SUPPORT	SUPPORT
Task 5. Interim Report.	LEAD- Che	REVIEW	REVIEW	REVIEW
Phase II - Product Development				
Task 6. Execute Phase II Workplan.	CO-LEAD- Weaver	SUPPORT	CO-LEAD- Dang	SUPPORT
Task 7. Draft Guide.	CO-LEADS- Olsen & Rastiveis	SUPPORT	SUPPORT	SUPPORT
Task 8A. Final Report.	CO-LEADS- Olsen & Che	REVIEW	REVIEW	SUPPORT
Task 8B. Revised Guide.	LEAD- Olsen	SUPPORT	SUPPORT	SUPPORT
Task 8C. Communication Materials.	LEAD- Simpson	SUPPORT	SUPPORT	SUPPORT
Task 8D. Implementation Memo.	SUPPORT	REVIEW	REVIEW	LEAD - Roe

Phase I – Data collection and needs analysis

- *Task 1.* Conduct a **comprehensive literature review** of academic and agency-provided documentation of current terminology and practices, challenges to be met, and industry needs.
- *Task 2.* Plan for and execute **stakeholder engagement** of a diverse array of industry representatives from varying disciplines, business units, and areas of responsibility (including executives, managers, and practitioners) to identify institutional challenges, practices, and needs for the efficient capture, dissemination, and use of reliable geospatial data in and between agencies; how agencies might adapt to the modernized NSRS; and any issues or concerns agencies have about implementing agency adaptations.

Stakeholder Engagement – The Key

- Engagement Activities
 - Two (2) virtual meetings
 - Obtain stakeholder input at the early stage
 - Obtain comments on the draft guide - (2 years in)
 - Five (5) presentations
 - Present our work & disseminate findings -seek input
 - Two (2) focused workshops
 - Obtain stakeholder input at the early stage
 - Obtain comments on the draft guide.
- Need your support and input

Tools: Miro, Mentimeter, etc. to collect inputs

Delphi Methods to get consensus on key topics

SaGES

Three Levels/Tiers of Engagement

TRB Annual Meeting

Two (2) Virtual Meetings

STA Representatives

Federal Agencies

ASCE-UESI

Five (5) Presentations

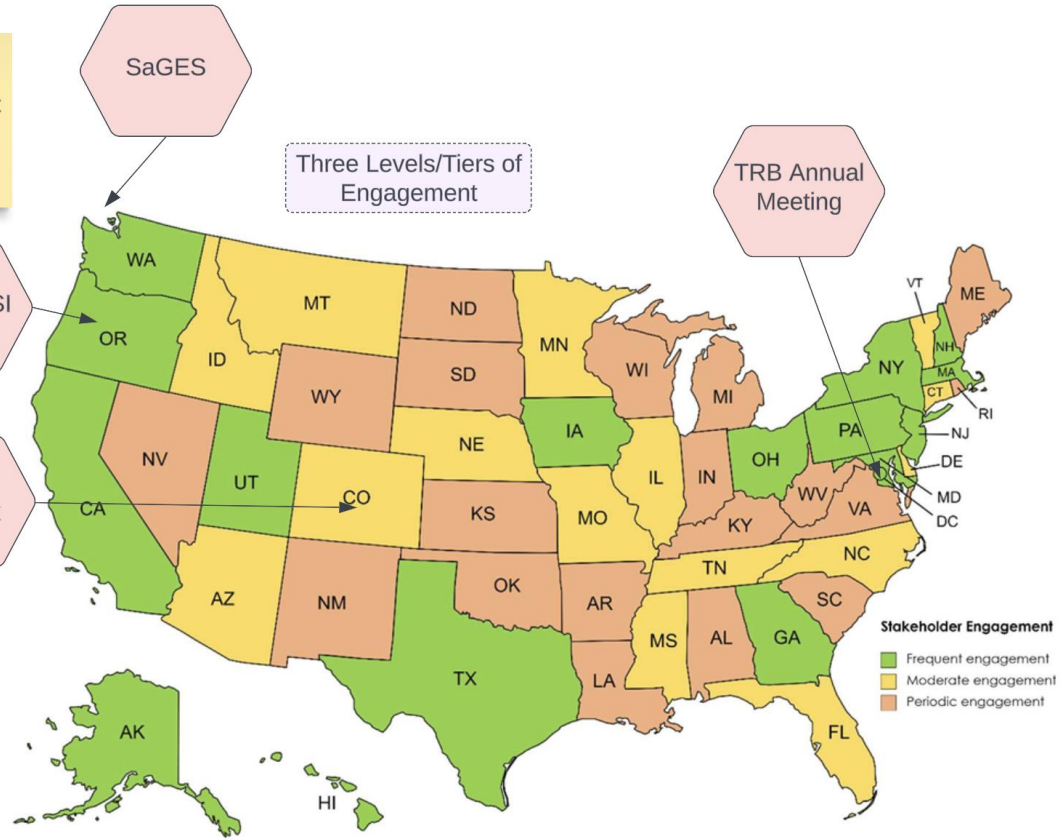
Professional Organizations

Industrial Professionals (DBEs)

ASPRS Geoweek

Two (2) Focused Workshops

International Standard Organizations



Phase I – Data collection and needs analysis – cont'd.

- *Task 3.* Identify at least **10 potential use cases** that illustrate the importance of different application contexts and approaches to geospatial data management currently in use across different business units and disciplines. Select a prioritized list of use cases to include in the guide that illustrates different experiences, strategies, and methodologies used by transportation agencies to address specific challenges in geospatial data collection and use of data in different contexts.
- *Task 4.* Prepare and submit a **detailed outline of the guide and any supplemental products** proposed to support the use of the guide by practitioners.
- *Task 5.* Submit a **Phase I interim report** documenting the process and results of the research conducted to this point and discussing additional research needs or activities that may be required in Phase II to finalize and validate the guide with stakeholders from the practitioner community.
- Following a 1-month review of these deliverables, the research team will meet in person with the NCHRP project panel to discuss the Phase I interim report, Phase II work plan, and guide outline. The contractor shall provide point-by-point responses to the panel's input in writing.

Phase II – Product development

- *Task 6.* Execute the Phase II **research work plan** according to the approved interim report.
- *Task 7.* Produce a **draft of the guide** document for panel review and comment using the outline presented and approved.
- *Task 8.* Prepare final deliverables, including
 - (1) a final report that documents the entire research effort;
 - (2) the revised guide;
 - (3) communication materials describing the research and its products to a practical audience such as in a workshop or webinar; and
 - (4) a stand-alone technical memorandum titled “Implementation of Research Findings and Products”.

Summary

- Unique opportunity – convergence
 - NSRS, IIA, AI, Blockchain, AVs, Satellites, and more
- Technical **and** organizational – “The Team of Two”
- Geospatial data managers - 3D geospatial data model
- Dynamic, flexible, integrated, inclusive
- Need your support and input