**Quarterly Report – Public Page**

**Date of Report:** *8th Quarterly Report – September 30, 2025*

**Contract Number:** *693JK32310007POTA*

**Prepared for:** *DOT-PHMSA*

**Project Title:** *An Integrated Knowledge Graph Model for Geohazard Monitoring Data*

**Prepared by:**  *University of Wyoming*

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**For quarterly period ending:** *September 30, 2025*

**1: Items Completed During this Quarterly Period:**

* Completed the design and construction of knowledge graph model

**2: Items Not-Completed During this Quarterly Period:**

* Link external data sources and perform semantic enrichment (On-going)
* Develop the graph neural network model (On-going)
* Perform advanced spatiotemporal analysis (GNN-based)

**Justification:** This quarter we prioritized finalizing the ontology and aligning datasets to the new schema. External linkages, continue as data-use agreements and ETL crosswalks complete. GNN development and spatiotemporal analysis are scheduled to begin after the ontology/data alignment milestones are locked.

**3: Project Financial Tracking During this Quarterly Period:**



**4: Project Technical Status**

* **Design and construction of knowledge graph model:**

DeliveredOntology v1.2 with:

* Indicators module for non-model layers
* Hazard subclasses mapped to modeling approaches
* PHMSA/NPMS mapping
* SKOS code lists
* Basic SHACL
* H3 alignment as a first-class spatial index for observations/joins.
* **Link external data sources & semantic enrichment – Ongoing**
* Maintained provenance (PROV) for all ingested sources; extended ETL to normalize to H3 and Regions
* Continued crosswalks for event catalogs (USGS earthquakes) and administrative geographies (FIPS).
* Began assembling SPARQL templates for county/H3 rollups and hazard-to-segment impact joins.
* **Develop the graph neural network model – Ongoing**
* Finalized feature schema for training data (segment-centric features joined from indicators and hazards).
* Drafted GNN problem framing (risk scoring as node-level prediction; temporal slices at monthly intervals using H3-aggregated indicators).
* Implementation starts next quarter after final data linkage checks.

**Next Steps**

* **Finish schema validation & units**: Add SHACL for all hazard subclasses and PHMSA fields; standardize numeric units with QUDT; finalize deprecations/aliases.
* **Complete data linkage & H3 normalization :** Finish NSHM/faults/FEMA ingests; build H3↔County/HUC-12 bridge tables; assert event→region links at load time.
* **Add pipeline topology (network model):** Model nodes/valves/stations and segment-to-segment adjacency to enable network-aware impact and routing queries.
* **Harden provenance:** Require record-level PROV on all hazards and a standardized ModelRun schema (parameters, versions, run IDs).
* **Deliver analytics & queries:** Train a baseline GNN for segment risk (with calibration/uncertainty) and publish a concise SPARQL template pack.
* **Update visuals:** Regenerate the ontology diagram (including Indicators) with a legend and 3–4 “how-to” query examples.