California Underground Safety Board

July 14-15, 2025

Agenda Item No. 23 (Information Item) – Staff Report

Draft Regulatory Language to Implement the Geographic Information System (GIS) Mapping Law

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SUMMARY
At the April 2025 Board meeting, staff presented regulatory considerations to implement the GIS mapping law. Previously, the Board directed staff to develop draft regulatory language defining the term "new subsurface installation." This staff report provides draft language for GIS regulations and recommends gathering stakeholder feedback, starting with a public-comment period.

STRATEGIC PLAN
2020 Strategic Plan Objective: Improve Accessibility of Buried Infrastructure Location Knowledge and Understanding

> 2024 Strategic Activity: Determine What New Facilities Need to be Incorporated into Utility Operator Geographic Information Systems

BACKGROUND
Government Code subsection 4216.3(a)(5)[1] states, "Commencing January 1, 2023, all new subsurface installations shall be mapped using a geographic information system and maintained as permanent records of the operator…"

The Board has received many stakeholders' opinions through written comments,[2] survey

[1] Gov. Code § 4216.3 (a)(5) was added to the Dig Safe Act by SB 865 (Hill, Ch. 307, Stats. 2020). It provides an exemption for oil and gas flowlines three inches or less in diameter that are located within the administrative boundaries of an oil field as designated by the Geologic Energy Management Division of the California Department of Conservation.

[2] CARCGA proposed the following definition of "new subsurface installation": "Mapping will occur when a facility is installed where one did not previously exist [and when there are physical additions, changes, rehabilitations, repairs, replacements and/or improvements to existing infrastructure." Item 10: Idea Register Submission September, November 7-8, 2022. Also see Item 12: Clarifying the GIS Mapping Statute in Regulations, Staff Report entitled "*Clarifying the GIS Mapping Statute in Regulations*," Attachment 4, July 8-9, 2024 and Public Comment Regarding GIS, December 6, 2024.

responses[3], and public comments at Board meetings and a GIS Committee workshop about how to enact the GIS statute. Stakeholders' questions and advice suggested the need for regulations which define "new subsurface installation" and set minimum requirements for map accuracy and GIS records.

In July 2024, staff presented a report to the Board (hereafter referred to as the *July 2024 GIS Staff Report*[4]) with findings and recommendations on how to define "new subsurface installation." The Board then directed staff to draft a regulation defining that term.

At the April 2025 Board meeting, staff presented regulatory considerations for improving GIS map accuracy and keeping records of specific information. Public comments at that meeting supported these considerations. The Board then directed staff to draft a regulation for each consideration.

DISCUSSION

Staff have drafted language for regulations regarding:

- Definition of New Subsurface Installation
- Definition of Geospatial Coordinates
- Accuracy of Geospatial Coordinates
- Component and Attribute Records
- Geospatial-Coordinate Metadata Records

Definition of New Subsurface Installation

The definition of "new subsurface installation" clarifies which types of installation projects must have GIS records. It is based upon a definition provided by CARCGA but excludes minor repairs.

> **New subsurface installation** means an underground facility installed where one did not previously exist or installed as a replacement, relocation, rehabilitation, major modification or major repair of an existing underground facility. A minor repair performed during routine inspection or routine maintenance is not a new subsurface installation.

Below are brief explanations and examples of the terms used in this definition.

Where one did not previously exist
A "new subsurface installation" is one installed where one did not previously exist. The installation is new because of *where* it was placed in the earth. Its *location* is new. Examples of

[3] See outreach survey results in Item 41: Geographic Information System (GIS) Development Update, Staff Report entitled "*Geographic Information System (GIS) Development Update: Outreach Survey Results,"* presented at the Board Meeting held on November 13-14, 2023
[4] Item 12: Clarifying the GIS Mapping Statute in Regulations, Staff Report entitled "*Clarifying the GIS Mapping Statute in Regulations*," July 8-9, 2024.

these additions include utility line extensions and new utility infrastructure to serve a new residential subdivision or commercial development.

Replacement
A replacement occurs when an existing buried utility has reached the end of its useful life, is creating a bottleneck, or is no longer cost effective to repair and new components are installed. A "new subsurface installation" replaces what was installed in that location previously. For example, a water utility may replace a broken pipeline segment with a new one of the same diameter, but the installation project might become a *capacity expansion* if the replacement pipeline has a larger diameter.

Relocation
A subsurface installation that is moved and reinstalled *elsewhere* is "new" because its *location* is new. For example, operators must relocate their subsurface installations to avoid conflicts with proposed highway projects.[5] Moving existing overhead electrical and communication facilities below ground are also relocations.[6]

Rehabilitation
A rehabilitation of an existing subsurface installation is a new subsurface installation because the operator is rebuilding or replacing key components. An example of a rehabilitation is a pipe-relining project.[7]

Major Modification
Major modifications are capital improvement projects that alter an existing facility's functionality, design, or structural integrity.

Major Repair, not Minor Repair
CARCGA's proposed definition included the word "repairs" without the qualifier "major." Its definition, therefore, implied that all repairs are new subsurface installations, even those performed during routine inspections or routine maintenance. "Major repairs" are capital improvement projects that restore or replace key components of an existing subsurface installation.

The draft definition excludes minor repairs performed during routine inspections or routine maintenance. For example, minor repairs might be performed on valves to "assure reliability…"[8] following a valve-exercising inspection.

[5] See https://dot.ca.gov/programs/right-of-way/utility-relocations.
[6] "City of Redwood City Middlefield Road Underground Utility Relocation Project Phase 1", https://www.4leafinc.com/project/city-of-redwood-city-middlefield-road-underground-utility-relocation-project-phase-1/.
[7] https://swefc.unm.edu/iamf/life-cycle-costing-life-cycle-phases-rehabilitation/
[8] For example, see "Valve Exercising Program," Lakehaven Water and Sewer District.

Definition of Geospatial Coordinates

Previous staff reports used the term "geospatial data"[9] when discussing regulatory considerations for GIS map accuracy and metadata requirements. The more precise term for referring to location records of an installation is "geospatial coordinates."

> **Geospatial coordinates** are the latitude and longitude coordinates in decimal degrees identifying a physical location referenced to the current official horizontal datum of the National Spatial Reference System, or its successor.
>
> Geospatial coordinates must be in decimal format and have two significant figures after the decimal point.

This draft regulatory language is based on another California regulation defining "geospatial coordinates," but it references the *current official horizontal datum* rather than specifies the North American Datum of 1983 (NAD 83).[10] The National Geodetic Survey will be replacing NAD 83, so this regulatory language seeks to prevent the definition from becoming outdated.[11]

The draft regulation's required format uses the format specified in the California Department of Transportation encroachment permit special provisions for as-builts for installation projects that construct subsurface infrastructure.[12]

Accuracy of Geospatial Coordinates

The statute requires operators to create and store permanent records of each new subsurface installation using GIS[13]. As discussed in the *July 2024 GIS Staff Report*, the term "new subsurface installation" can sometimes refer to an individual component or to an entire installation project.

Operators documenting a new subsurface installation collect geospatial coordinates for each component location they want to display (as a point or a line) in a GIS map. Linear components of an installation, for example a pipeline, are recorded in GIS as segments. The geospatial data for each pipeline segment will have a minimum of two sets of geospatial coordinates to show

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[9] Office of Management and Budget Circular A-16 defined geospatial data as "information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth." The Geospatial Data Act of 2018 defines geospatial data as "information that is tied to a location on Earth, including by identifying the geographic location and characteristics of natural or constructed features and boundaries on the Earth..." Under both these definitions, attribute records are geospatial data.

[10] California Code of Regulations, Title 17, § 93402(a) Definitions

[11] The National Geodetic Survey explained, "Adopting the modernized NSRS is critical, as it finally aligns the NSRS with both international standards, as well as aligning with all Global Navigation Satellite Systems (GNSS), which naturally orbit about, and provide positions relative to, the center of the Earth." https://geodesy.noaa.gov/datums/newdatums/index.shtml.

[12] "As-Builts for Encroachment Permit Projects with Subsurface Infrastructure TR – 0449 (Revised 06/2025)," California Department of Transportation, Page 4.

[13] Gov. Code § 4216.3 (a)(5)

the starting and ending points of that segment. If the pipeline segment is lengthy, geospatial coordinates might be captured every 50 feet or at every bend or change in elevation and its GIS record will be a string or sequence of these coordinates.

The following draft regulation would apply to both trenched and trenchless installations:

> For all new subsurface installations, operators must collect geospatial coordinates in the field as the components of the new subsurface installation are installed.
>
> The horizontal positional accuracy of these field-collected geospatial coordinates must have a horizontal positional accuracy of 100 mm.
>
> Operators must record horizontal positional accuracy either as an attribute of the new subsurface installation or as metadata.[14]

Collecting geospatial data at the construction site while the new subsurface installation is visible has been recommended as a best practice by damage-prevention experts. Philip J. Meis, Chair for *ASCE/CI/UESI 75 Standard Guideline for Recording and Exchanging Utility Infrastructure Data*, explained the recommendation was developed to ensure that accurate and consistent information about the location and nature of new underground utility infrastructure is *captured at the time of installation* and available for future project development. Dr. Geoff Zeiss, an internationally recognized expert on underground utilities in the construction process, said, "…the most accurate, high-fidelity data [is collected] at the most opportune time *during construction*, not afterwards where you're mapping a scar."[15] California's Department of Transportation requires geospatial data of new subsurface installations be collected "while the infrastructure is exposed and before backfilling…" when trenching was the installation method.[16]

The draft accuracy tolerance is from the Facilities Working Group of the Federal Geographic Data Committee. That group published Geospatial Positioning Accuracy Standards for as-built maps of subsurface utility projects in 2002.[17]

The draft regulatory language does not specify equipment or mapping software. Currently

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[14] This draft regulation does not state a vertical positional accuracy requirement because the Dig Safe Act states "locate and mark" does not require an indication of depth (Gov. Code §4216(n)(2)).

[15] "Real time reality capture during construction is key to digitizing the entire construction workflow," Geoff Zeiss, Between the Poles, July 22, 2022, https://geospatial.blogs.com/geospatial/2022/07/real-time-reality-capture-during-construction-key-to-digitizing-the-entire-construction-workflow.html.

[16] California Department of Transportation, Encroachment Permit Special Provisions, As-Builts for Encroachment Permit Projects with Subsurface Infrastructure, TR – 0449, June 2025, Page 5.

[17] https://www.fgdc.gov/standards/projects/accuracy/part4/FGDC-endorsed-standard. See PART 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management, FGDC-STD-007.4-2002, APPENDIX A Recommended A/E/C Surveying and Mapping Standards, Table A-3. RECOMMENDED ACCURACIES AND TOLERANCES: ENGINEERING, CONSTRUCTION, AND FACILITY MANAGEMENT PROJECTS, As-Built Maps: Military Installation Surface/Subsurface Utilities (Fuel, Gas, Electricity, Communications, Cable, Stormwater, Sanitary, Water Supply, Treatment Facilities, Meters, etc.).

available equipment to collect geospatial coordinates with centimeter accuracy includes global navigation satellite system (GNSS) receivers with real time kinematics (RTK) data correction technology and traditional survey instruments, such as total stations and inertial measurement units. Depending on the site conditions, more than one type of equipment might be necessary.

Component and Attribute Records

This draft language addresses which records must be collected.

> For all new subsurface installations, operators must:
> a. Create and maintain geospatial coordinate records for all of the following components if they are present:
> 1) Locations of above-ground access points to tracer wire or tracer tape,
> 2) Marker balls,
> 3) Radio Frequency Identification (RFID) devices and the frequencies they emit,
> 4) Locations of stubs.
>
> b. Record the presence of any pipe wrap, warning tape, coating, or insulation in the attribute records for new pipeline installations.
>
> c. Record the presence of a "high priority subsurface installation" designation as an attribute record for "high priority subsurface installations."[18]

Geospatial-Coordinate Metadata Records

GIS can store geospatial records from a variety of sources, from field-collected geospatial coordinates, aerial and cellphone photographs, and digitized old paper maps. The metadata for a geospatial coordinate will document and describe the origin of that data. Stakeholders have urged the Board to require metadata for geospatial coordinates, including the coordinate system and epoch (collectively referred to as the geodetic datum[19]), the equipment used, and the conditions during data collection.[20] Although metadata can be recorded for attribute records, the following draft regulatory language applies only to metadata for geospatial

[18] High Priority Subsurface Installation" is defined in Gov. Code Section 4216(j) as "high-pressure natural gas pipelines with normal operating pressures greater than 415kPA gauge (60psig), petroleum pipelines, pressurized sewage pipelines, high-voltage electric supply lines, conductors, or cables that have a potential to ground of greater than or equal to 60kv, or hazardous materials pipelines that are potentially hazardous to workers or the public if damaged."

[19] The National Geodetic Survey with the National Oceanic and Atmospheric Administration defines "geodetic datum" as an "abstract coordinate system with a reference surface (such as sea level) that serves to provide known locations to begin surveys and create maps."

[20] Protecting Underground Infrastructure through GIS, SB 865, and ASCE 75-22," by Micah Paulk, April 14, 2023, https://www.linkedin.com/pulse/protecting-underground-infrastructure-through-gis-sb-865-micah-paulk/ and public comment on GIS entitled, "California Regulation for Mapping Underground Utilities Using GIS and GPS Technology," by Brett Clarke, December 6, 2024.

coordinates.

> For all new subsurface installations, operators must maintain all of the following metadata for geospatial-coordinate records:
> 1) Geodetic datum,
> 2) Manufacturer name and model name of the equipment used to collect geospatial coordinates,
> 3) Date when geospatial coordinates were collected,
> 4) Name of the organization responsible for creating the geospatial coordinates.

An operator's initial metadata for a new subsurface installation will describe *when, how and in which datum* the original location records were collected. This draft regulation, however, requires operators to *maintain* this metadata by keeping it updated.

Recommendation

Staff recommends gathering stakeholder feedback on these draft regulations, starting with a public-comment period. A variety of outreach strategies should be used to achieve responses from a mix of small and large operators.

Attachment 1

Draft Language for GIS Regulations

New definitions to be added in Cal. Code Reg., title 19, section §4000

> **Geospatial coordinates** are the latitude and longitude coordinates in decimal degrees identifying a physical location referenced to current official horizontal datum of the National Spatial Reference System, or its successor.
>
> Geospatial coordinates must be in decimal format and have two significant figures after the decimal point.
>
> **New subsurface installation** means an underground facility installed where one did not previously exist or installed as a replacement, relocation, rehabilitation, major modification, or major repair of an existing underground facility. A minor repair performed during routine inspection or routine maintenance is not a new subsurface installation.

Additional Regulations

1. **Accuracy of Geospatial Coordinates**

For all new subsurface installations, operators must collect geospatial coordinates in the field as the components of a new subsurface installation are installed.

The horizontal positional accuracy of these field-collected geospatial coordinates must have a horizontal positional accuracy of 100 mm.

Operators must record horizontal positional accuracy either as an attribute of the new subsurface installation or as metadata.

2. Component and Attribute Records

For all new subsurface installations, operators must:

a. Create and maintain geospatial coordinate records for all of the following components if they are present:
1) Locations of above-ground access points to tracer wire or tracer tape,
2) Marker balls,
3) Radio Frequency Identification (RFID) devices and the frequencies they emit,
4) Locations of stubs.

b. Record the presence of any pipe wrap, warning tape, coating, or insulation in the attribute records for new pipeline installations.

c. Record the presence of a “high priority subsurface installation” designation as an attribute record for high priority subsurface installations.

3. Geospatial-Coordinate Metadata Records

For all new subsurface installations, operators must maintain the following metadata for geospatial coordinate records:
1) Geodetic datum,
2) Manufacturer name and model name of the equipment used to collect geospatial coordinates,
3) Date when geospatial coordinates were collected,
4) Name of the organization responsible for creating the geospatial coordinates records.