Infrastructure Projects – As-Built Subsurface Infrastructure

TR – 0449 (Rev. 06/2025)

In addition to the attached Encroachment Permit General Provisions (TR-0045), the following special provisions are also applicable to projects that construct subsurface infrastructure:

1. **GENERAL:** The California Department of Transportation is responsible for operating, maintaining and constructing the State Highway System which requires accurate information about subsurface utility infrastructure for both Caltrans and any third-party infrastructure located within the state highway right-of-way. Government Code section 4216.3 (Senate Bill 865, approved by the Governor on September 29, 2020), requires network operators to maintain records of the locations of subsurface installations. "Subsurface installation" means any underground pipeline, conduit, duct, wire, or other structure, except non-pressurized sewer lines, non-pressurized storm drains, or other non-pressurized drain lines. Starting January 1, 2023, all new subsurface installations are to be mapped using a geographic information system (GIS) and maintain permanent records by the network operator. The legislation did not specify the accuracy of the as-builts submitted for newly installed facilities. For accuracy of as-builts and consistency of all as-builts received, Caltrans has adopted the national standard developed by the American Society of Civil Engineers under ASCE/UESI/CI 38-22 Standard Guideline for Investigating and Documenting Existing Utilities.

2. **APPLICABILITY:** These provisions apply to projects that construct subsurface infrastructure within the Caltrans state highway right-of-way. The following requirements for collecting information, analyzing, and documenting new underground infrastructure apply to all underground infrastructure and meet the requirements of Government Code section 4216.3 for utilities.

3. **DEFINITIONS:**

   excavation: Any operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means of tools, equipment, or explosives in grading, trenching, digging, ditching, drilling, augering, tunneling, scraping, cable or pipe plowing and driving, or any other way.

global navigation satellite system (GNSS): Satellite system used to pinpoint the geographic location of a user's receiver anywhere in the world. Two GNSS systems are in operation: the US GPS and the Russian Federation's GLONASS. Each of the GNSS systems uses a constellation of orbiting satellites working in conjunction with a network of ground stations.

GNSS base station: Single ground-based system consisting of a GNSS receiver, antenna, and telemetry equipment that provides differential GNSS correction signals to other GNSS receivers or rovers. Multiple base stations can be combined into a GNSS network.

GNSS correction service subscription: Subscription service to receive differential GNSS correction signals for higher accuracy GNSS positioning without the need of a GNSS base station. Signals are normally received via cellular wireless data services.

GNSS rover: Portable GNSS antenna, receiver, rod, and data collector with telemetry equipment for real-time point measurements.

network real time kinematic (Network RTK): System that uses multiple bases in real-time to provide high-accuracy GNSS positioning within the coverage area that is generally larger than that covered by a single GNSS base station.

Project Survey Datum: The Project Survey Datum is a type of reference Metadata. It is necessary to document what datum was used to collect, process, and deliver the geodatabase. The Project Survey Datum used should be consistent for the topographic and base mapping, design and as-builts. Project Survey Datum Metadata may include the name of a standard national or state coordinate reference system or of the individual parameters required to define the system, such as origin, projection system, scale factors, and grid versus ground factors, benchmarks, or control points. Benchmarks or control points are a type of reference Metadata. It is necessary to document what benchmarks or control points were used, what was the source of the X, Y, and Z (i.e., surveyors' control report), and what errors may be associated with survey accuracy.

real time kinematic global positioning system (RTK-GNSS): System based on the use of carrier phase measurements of the available GNSS signals where a single GNSS base station or RTK network provides the corrections to achieve centimeter-level accuracy in real time.

site calibration or localization: Process that establishes the relationship between the observed control point coordinates and the site coordinate system, which is usually grid. The term applies to both GNSS and robotic total station equipment.

subsurface utility engineering: The specialty practice of civil engineering's utility engineering branch that includes the investigation, analysis, judgment, and documentation of existing Utility networks.

utility quality level A: Value assigned to that portion (x-, y-, and z-geometry) of a utility segment or subsurface utility feature that is directly exposed and measured and whose location and dimensions are tied to the project survey datum. The utility segment or subsurface utility feature must be tied to the project survey datum with an accuracy of 0.1-foot (30 mm) vertical and to 0.2-foot (60 mm) horizontal for the measurements of the outside limits of the utility feature or utility segment that is exposed.

utility quality level B: Value assigned to a utility segment or subsurface utility feature whose existence and horizontal position is based on geophysical methods combined with professional judgment and whose location is tied to the project survey datum.

4. SUBMITTALS:

Submit the name and qualifications of the licensed land surveyor in the State of California, in responsible charge for the data collection of underground infrastructure, five (5) business days before starting data collection.

Submit site calibration or localization results within one (1) business day of the calibration or localization testing. Allow three (3) business days for the review of the results.

Submit a digital copy and hard copy of the new subsurface infrastructure report.

5. QUALITY CONTROL:

General

Horizontal Northing (Y) and Easting (X) coordinates must be referenced to horizontal survey datum North American Datum of 1983 (NAD 83) or the North American Terrestrial Reference Frame of 2022 (NATRF2022), or the Pacific Terrestrial Reference Frame of 2022 (PATRF2022) and have a 0.2-foot (60 mm) horizontal accuracy.

Elevations (Z) must be referenced to the North American Vertical Datum of 1988 (NAVD 88) or the North American-Pacific Geopotential Datum of 2022 (NAPGD2022) and have a 0.1-foot (30 mm) vertical accuracy.

Coordinates and elevations must be in decimal format and have two significant figures after the decimal point.

Project Survey Datum

All GNSS devices for the project must be set to the same state plane survey datum, coordinate system, and CCS83 zone per California Coordinate System of 1983 (CCS83) as defined in Public Resource Codes §§ 8801, 8850 through 8860, and site calibration or localization.

GNSS Site Calibration or Localization

Perform GNSS site calibration or Localization using Caltrans control point information or when Caltrans control points are not available within the project limits, other control points maybe used but must be converted to the datums specified above.

Check each survey control point for accuracy per Caltrans Surveys Manual Chapters 4, 5, 6, 7, 8 and 9.

GNSS Check Test

Check GNSS equipment, including rovers to ensure equipment is setup correctly. Measure a known control point and verify the GNSS equipment achieves accuracies within 0.1-foot for vertical elevations and 0.2-foot for horizontal coordinates.

6. INFRASTRUCTURE DATA COLLECTION:

General

Perform locating of new underground infrastructure. Comply with the analysis, and documentation requirements for subsurface utility engineering quality level A under ASCE/UESI/CI 38-22 Standard Guideline for Investigating and Documenting Existing Utilities.

Use GNSS real time kinematic from one of the following:

1. Network RTK
2. RTK-GNSS

A different high precision position system that meets or exceeds the precision requirements may be used when authorized.

Perform GNSS site calibration or localization at least five (5) business days before starting underground infrastructure data collection.

Perform GNSS check test before starting underground infrastructure data collection and at the end of each workday. Maintain a log of check test measurements.

Collecting Data

Collect location data for new underground infrastructure, including any underground pipeline, sewer lines, storm drains, drain lines, conduit, duct, wire, or other structure.

Measure the coordinates that define the horizontal and vertical location of underground infrastructure relative to a preestablished datum (X-Y-Z) at the center of above ground facility features including, manholes, handholds, storm drains, pull boxes, vaults, and above ground equipment enclosures.

For trenching installation, measure the X-Y-Z values on top of each distinct linear infrastructure at:

1. Horizontal bends
2. Vertical bends
3. Points of deflection
4. Maximum 50-foot intervals

Measurement of X-Y-Z values in trench installation must be by direct survey while the infrastructure is exposed and before backfilling; or by establishing reference tie points with known horizontal and vertical offsets while the infrastructure is exposed, followed by a post-backfill survey. This ensures the licensed surveyor can accurately depict the infrastructure's location to meet Quality Level A standards.

For trenchless installation, measure the X-Y-Z values of each distinct linear infrastructure at:

1. The entrance and exit of the borehole and at all required test pit verification points.
2. Maximum 50-foot intervals between the entrance and exit of the bore hole. Use the installation equipment bore logs or geophysical equipment for indirect locating.

3. The last observed entrance and exit locations where the linear infrastructure passes below a structure or body of water, or the infrastructure is too deep to be detected.

When using geophysical methods for trenchless installation, use at least two geophysical methods for collecting locating data to comply with Utility Quality Level B.

7. **SUBSURFACE INFRASTRUCTURE REPORTS:** New subsurface infrastructure report includes data collected for new subsurface infrastructure, for compliance with subsurface utility engineering quality levels A and B.

   Subsurface infrastructure report includes:

   1. A file geodatabase using Caltrans' as-built GIS schema.
   2. Files with data collected as points. For linear features, lines must be created from the points collected and the points must remain in the file. All data must be collected using the latest as-built feature code library (fxl). Data files must be compatible with Trimble Business Center, TBC.
   3 Information for datum tag and epochs, geoid models, benchmarks, and reference stations used for the collection of horizontal and vertical values.
   4 Information and qualifications of the licensed land surveyor who certifies the accuracy and nature of the collected subsurface utility data.

   Adhere to the standardized field names, domain values, and depicted geometries shown in Table 2-2 through Table 2-7 of ASCE 75-22 Standard Guideline for Recording and Exchanging Utility Infrastructure Data, include depth information from original ground to located utility, and as provided in the Middle Mile Broadband As-built feature code library (fxl).

   The Caltrans survey templates for as-built GIS schema and feature code library are available at:

   https://misc-external.dot.ca.gov/cadd/index.htm.

   Responsible charge statements per California Code of Regulations (CCR) §§404.1 and 404.2 are required by the both the licensed civil engineer and the licensed land surveyor to ensure the subsurface infrastructure report is valid. A signed, sealed and dated report is required per §411(g)(1)(2)(3)(h) by the both the licensed civil engineer and the licensed land surveyor for their portion of responsible charge.