

10 Right of Way Survey Specifications

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10 Right of Way Surveys

Right of Way (R/W) surveys are performed to gather data on existing property lines, areas where unwritten rights may exist, and any other evidence that makes up the land-net for use in conjunction with existing land records and right of way requirements to determine, delineate, appraise, acquire, demarcate, monument, and map the Department's rights of way.

The R/W surveys specifications in this chapter are to be used for all Department-involved transportation improvement projects, including special-funded projects. All Department employees and consultants performing R/W surveying tasks shall use them. It is the Department employees' and consultant's responsibility to adhere to all relevant processes, workflows, and specifications stated in this chapter. Questions about this chapter should be directed to the Surveys Manager, the Project Surveyor, and/or the Contract Manager. Any deviation from this model requires advance written approval from the Surveys Manager.

This chapter provides policies, general information, and procedures regarding the R/W surveys process. It describes a statewide model of responsibilities and workflow.

For the purposes of this chapter, some of the office surveying activities associated with the Department's R/W will be described as the responsibility of "R/W Engineering".

10.1 General Policy

The Department's policy regarding R/W surveys, as defined by this chapter, is to provide, in a timely manner, complete and accurate R/W survey information.

It is also the Department's policy that all R/W surveys shall be based upon and conform to the other requirements in the rest of the Department's Surveys Manual. Additionally, it is the Department's policy to adhere to all laws pertaining to land surveying.

The California laws can be found at:
<http://www.leginfo.ca.gov/calaw.html>

These laws are included in, but are not limited to:

- The Business and Professions Code (The PLS Act)
- The Public Resources Code
- The Civil Code
- The Government Code
- The Code of Civil Procedure,
- The Streets and Highways Code
- The Harbors and Navigation Code
- California Code of Regulations: The Board Rules for Professional Engineers and Land Surveyors (the Board Rules)

10.2 General Information

R/W surveys are used to help define and demarcate, the boundaries of the Department's R/W in relation to existing property boundaries. R/W surveys are not intended to monument boundaries of the adjoining property owners, other than the common boundary between the Department's R/W and the adjoining property, however, there may be situations where it is necessary to define the adjoining owners' property line for internal purposes. This may happen when determining the intersection of the adjoiner's property line with existing R/W, establishing boundaries for the purpose of preparing legal descriptions, or determining the area of property.

The primary purpose of a R/W survey is to provide sufficient survey data necessary for the proper retracement of the land net.

The retracement of the land net may be used for the following:

- Creation of appraisal maps
- Legal descriptions and deed preparation
- Negotiation purposes
- Condemnation purposes
- R/W flagging and R/W staking
- Monumentation
- Land net and control-net perpetuation
- Encroachment and trespass resolution
- Help establish project limits
- Tort cases

R/W surveys are an integral element of the Department's acquisition and disposal of property rights.

These property rights may include:

- Parcels and/or interest in parcels acquired for the Department's transportation facilities
- Street or highway operating R/W to be relinquished
- Superceded R/W to be vacated
- Lands that have been declared "excess" (no longer needed by the Department)

10.3 Responsibilities

Teamwork is vital for a successful R/W survey project and requires close cooperation between the Project Manager, the Design Engineer, Land Surveys (Surveys and Right of Way Engineering), the Project Surveyor, the Party Chief, Right of Way, and the Contract Manager. It is the responsibility of all involved in a R/W Survey project to adhere to all relevant laws.

The responsibilities listed below pertain to activities/products associated with a R/W survey.

- Project Manager
- Project Engineer
- Surveys
- Right of Way Engineering
- Project Surveyor
- Party Chief
- Right of Way
- Contract Manager

10.3-1 Project Manager

The Project Manager assembles and leads the Project Development Team (PDT) and is responsible for overall project planning and completion.

It is the responsibility of the Project Manager to:

- Facilitate communication between all parties involved in a project.

- Ensure cooperative agreement and encroachment permit documents define the R/W survey requirements.
- Ensure that the freeway or controlled access agreement is updated to reflect the proposed project area.
- Establish and communicate the priority of the project to the PDT.
- Coordinate with the Survey Manager to ensure timely delivery of R/W survey products.
- Ensure that the project R/W requirements are communicated in a timely manner.
- Monitor the progress of the project.
- Notify the Project Surveyor of any changes on the project that may affect the scope, schedule, or resourcing of the R/W survey activities and products.
- Control changes that impact project quality, scope, schedule and cost.
- Ensures problems are resolved.
- Ensures all aspects of the project are complete.

10.3-2 Project Engineer

The Project Engineer is in "responsible charge" of preparation of appropriate project development documents (PSR, Project Report, etc.) and the project design effort.

It is the responsibility of the Project Engineer to:

- Confer with the Project Surveyor regarding project requirements.
- When needed, request a R/W Survey by submitting a Survey Request form to Land Surveys. Note: An example of a Survey Request form can be found in Chapter 11, "Engineering Surveys".
- Provide both preliminary and final R/W requirements to R/W Engineering in a timely manner so that the R/W survey effort can be completed on schedule.
- Notify the Project Manager and PDT members of any changes in project design.
- Identify monuments on the contract plans to be replaced.

10.3-3 Land Surveys

The Department's Land Surveys function is divided into two main areas; Surveys, whose key function is to support and perform the field surveying activities and to process the resultant field data for use by Design, Construction, and R/W Engineering; and R/W Engineering, whose key function is to produce products related to the Department's R/W. For this chapter, the responsibilities of Land Surveys will be described in separate sections for Surveys and R/W Engineering.

Surveys

A Surveys Manager manages the Surveys function. The Surveys Manager may assign or delegate any of the responsibilities described below. This chapter will use "Surveys" to encompass the Surveys Manager and all delegates.

It is the responsibility of Surveys:

- Assign appropriate Surveys staff to participate on the PDT.
- Work with R/W Engineering to assist the Project Surveyor.
- Assign qualified staff to perform R/W survey work.
- Review, discuss and forward recommendations on R/W survey activities contained in the work plan to the Project Manager and PDT.
- Negotiate and commit to the scope, schedule and resource estimates for the R/W survey activities contained in the work plan.
- Communicate R/W survey project problems, issues, conflicts, or changes to the Project Manager, Design Engineer, PDT, Project Surveyor and R/W Engineering.
- Confer with the Project Surveyor on monuments that will likely be destroyed.

Right of Way Engineering

A Surveys Manager manages R/W Engineering. For this chapter, the terms R/W Engineering and R/W Engineer are interchangeable. The Surveys Manager may assign or delegate any of the responsibilities described below to staff. This chapter will use "R/W Engineering" to encompass anyone who has any of the responsibilities.

It is the responsibility of R/W Engineering:

- Assign appropriate R/W Engineering staff to participate on the PDT.
- Assign a Project Surveyor.
- Assign qualified staff to perform R/W engineering work • Receive R/W requirements from the Design Engineer.
- Work with Design to improve the R/W requirements.
- Review, discuss and forward recommendations on R/W survey activities contained in the work plan to the Project Manager and PDT.
- Negotiate and commit to the scope, schedule and resource estimates for the R/W survey activities contained in the work plan.
- Communicate R/W survey project problems, issues, conflicts, or changes to the Project Manager, Design Engineer, PDT, Project Surveyor, and Surveys.

10.3-4 Project Surveyor

R/W Engineering will assign a Project Surveyor(s) to the R/W survey project. The Surveys Manager may delegate some or all of these responsibilities to other staff.

It is the responsibility of the Project Surveyor to:

- Create and maintain a R/W survey project file that will contain all data related to a R/W survey.
- Identify properties that are likely to be affected based on approximate R/W requirements obtained from the Design Engineer.
- Perform or oversee a record data search that will adequately cover the extent of R/W required for the project.
- Prepare search maps and search coordinates for land net monuments.
- Submit survey requests to Surveys for R/W survey fieldwork.
- Schedule a meeting prior to the fieldwork with Surveys and the Party Chief to discuss the field survey activities.
- Coordinate with other functional units as necessary.
- Ensures, in conjunction with R/W and the Party Chief, that 'Survey Notification Cards' have been mailed to landowners.
- Review the R/W survey data for completeness.
- To identify to the Design Engineer the appropriate monuments that will be destroyed for inclusion in the contract plans.

- Perform boundary analysis to reconcile field data with the record data for final land-net values.
- Prepare and submit to the County Surveyor, in the counties in which the project lies, final monumentation records. Whenever possible, the final monumentation records shall be in the form of a Record of Survey.

10.3-5 Party Chief

The Party Chief is assigned by Surveys and directs the work of a survey field crew.

It is the responsibility of the Party Chief to:

- Maintain communication with the Project Surveyor and Surveys.
- Recover, describe, document and locate land-net monuments.
- Ensure that the accuracy standards stated in Chapter 5, “Accuracy Classifications and Standards” for R/W surveys are met.
- Reduce, adjust, and analyze R/W survey field data.
- Maintain digital survey files and prepare survey field notes for documentation of the R/W survey work. The documentation shall be of sufficient quality for use in court, if necessary.
- Flag the Department’s rights of way for viewing purposes, if requested.
- Perpetuate monuments that may be destroyed during construction or other activities.
- Monument the Department’s final R/W.

10.3-6 Right of Way

Right of Way is the term for the many functions including Appraisals, Acquisitions, Utilities, Excess Lands, and others. Right of Way agents interact with Right of Way Engineering to initiate or facilitate R/W Survey activities.

It is the responsibility of Right of Way to:

- Help with the communications between the Department and adjoining land owners on the Department’s R/W Survey activities.
- When needed, request a R/W Survey by submitting a Survey Request form to Land Surveys. Note: An example of a Survey Request form can be found in Chapter 11, “Engineering Surveys” of this manual.
- Initiate R/W flagging activities.

- Provide information related to a R/W Survey that involves utilities, such as the utility owner, the type of facility and the contact persons.

10.3-7 Contract Manager

A Contract Manager manages the Architectural and Engineering consultant contracts or work contracted with local agencies. With respect to R/W Surveys, the Contract Manager is responsible for working directly with the Surveys Manager for the determination of the quality of contract R/W surveys products and services.

It is the responsibility of the Contract Manager to:

- Secure appropriate funding, agreements, and permits to complete the contract R/W Surveys work.
- Ensure the contract scope of work includes all relevant processes, workflows, specifications, and products stated in this chapter. This is to be done in cooperation with the Surveys Manager.
- Manage and administer the contract to ensure complete and acceptable R/W Survey products have been produced in accordance with the contract and the specifications stated in this chapter.
- Ensure that R/W Surveys products are delivered on time and within budget.

10.4 Initiation and Planning of a Right of Way Survey

The initial stage of a R/W survey project is a meeting between the Design Engineer, Surveys, and R/W Engineering. During this meeting, the Design Engineer will communicate the preliminary R/W requirements and will follow up with those requirements in writing. Additionally, the Design Engineer will communicate information about potential future R/W requirements for the project. The information gathered at this meeting will be used to develop a R/W survey work plan for the project.

The work plan for a R/W survey shall contain:

- The R/W survey products required for the project.
- A schedule of R/W survey tasks including critical milestones and product delivery dates.
- The resources needed for the successful completion of the R/W survey project.
- A schedule of meetings/consultations with the Project Manager, Design Engineer, Surveys, Party Chief, R/W Engineering, the PDT and other affected functional units.

Critical factors to consider in the development of a work plan shall include:

- The scope of the R/W requirements for a project.
- The affected parcels.
- The existing Departmental R/W record data.
- Project Datum and units.
- Synchronizing R/W survey activities with other surveying tasks.
- The need for additional corridor or project control.
- The project work plan development schedule.
- The project design and how it may affect property lines and existing streets.
- The work effort in terms of hours per task.

10.5 Research

Thorough research of relevant land and survey records forms the foundation of a R/W survey. Overall survey efficiency and quality of deliverables will in part be determined by the quality of the research. During the planning phase of the project, the Project Surveyor will meet with assigned staff to discuss the overall scope of the project and specific project requirements. Also, the Project Surveyor will coordinate a thorough review of all pertinent land and survey records.

10.5-1 Record Data Search

The record data search is the first action taken in the monument recovery process and provides the necessary survey and land ownership data required for the field survey and for analysis and mapping of the recovered land-net information. The goal of the record data search is to meet three primary objectives:

- Recover control-net information.
- Recover record land-net information.
- Recover all other information necessary for the R/W survey.

Generally, Surveys will search for control-net records and R/W Engineering staff will search for all other land records. The search should begin as early in a R/W survey project as possible.

10.5-2 Sources of Record Data

Land and survey records are available in Caltrans files, other government agencies, utility companies, title companies, and other public/private entities. The research for a R/W survey should be part of the research for the overall transportation improvement project.

10.5-3 Research - Sources of Record Data

Source of Records	Record Type
<i>Federal Agencies:</i> including but not limited to, United States Bureau of Land Management, Bureau of Indian Affairs, United States Forest Service, The National Geodetic Survey, and United States Geological Survey.	Federal land boundaries, current and historical land ownership and transaction records, survey data on patented lands (plat maps and field notes) and control data.
<i>State of California Agencies:</i> including but not limited to, Department of Transportation, State Lands Commission, Department of Water Resources, Department of Parks and Recreation, and Department of Forestry and Fire Protection.	Field-notes / field-ties, aerial photographs, Monumentation Maps, Record of Survey maps, State Highway maps, Relinquishment & Vacation maps, Right of Way Record maps, Survey Control maps, and Control data.
<i>Local Agencies:</i> County, City, other local districts. The County Agencies (County Surveyor's Office, Recorder's Office, etc.) are the official repositories for the majority of land ownership records.	<p><i>County Surveyor's Office:</i> Tract, Parcel and Record of Survey maps, Rancho maps, Certificates of Corrections, Corner Records, Lot Line Adjustments, Control, County Survey tie/alignment notes, private surveyor notes, City/County boundary information and Assessor's maps and rolls, and unrecorded maps.</p> <p><i>Flood and Planning</i> department's records: The County Surveyor's office may also maintain land and survey records from Federal, State and other local agencies, utility companies, railroads, etc., that lie within their boundary.</p> <p><i>County Recorder's Office:</i> - Assessor's maps and rolls, deeds, historical records.</p>
<i>Utilities</i>	<i>Utilities:</i> Maps, deeds, field notes, and franchise agreements.
<i>Private Civil Engineering and Land Surveying Companies</i>	Companies maintain research folders, maps and field notes pertaining to projects done by them. This is a good place to go when you find a tagged monument with no record of it having been set. They may also have records of current and past survey work done by other surveyors.
<i>Title Companies</i>	Maps, deeds and records affecting title and its history. This is another source for deed information other than the county recorder's office.
<i>Railroads</i>	Railroad maps, survey notes and deeds pertaining to railroad right of ways and adjoiners.
<i>Historical Societies</i>	Historical maps and documents pertaining to long past ownerships.

10.5-3 Maintaining Contact Lists

R/W Engineering will maintain an ongoing digital database of contacts for property research efforts. Each record in the database should contain the name of the agency or company, address, phone numbers, e-mail addresses, and the names of the contacts. Each record should also contain the dates of the contacts and information received.

For a specific R/W surveys project, a list of contacts that have been used for obtaining records shall be maintained. This is important not only for gathering records needed at the various stages of a project, but also in those instances where specific documents are needed in a timely manner. This information will be input into the ongoing digital database at the end of a R/W Survey project.

10.6 Field Review

The Project Surveyor will field review the project site in order to have an overview of the project area and to help properly complete a search map. This enables the Project Surveyor to have a clear idea of the potential R/W survey issues for the project. The field review should be conducted with the Party Chief and may be conducted with other staff assigned to the project.

The field review should include:

- Reviewing and visualizing the whole project area.
- Evaluating potential access problems.
- Evaluating potentially affected parcels and easements.
- Evaluating potentially affected utilities.
- Conducting an initial recon (cursory) of land net monuments: record and non-record.
- Evaluating which monuments may be destroyed.
- Determining areas where unwritten rights may exist.
- Evaluating the project for safety concerns.
- Evaluating the project for any factors that may affect the R/W survey.

10.7 Search Maps

After review and careful analysis of the record data, R/W requirements, and the field review of the project site, a search map will be prepared for inclusion in the field package. A search map may be as simple as a copy of a record map indicating the lines and monuments to recover, and the other relevant information as detailed below.

The search map will be labeled in such a manner so as to clearly show the monuments to recover and the lines of basic importance (see Appendix 10A) that are necessary for the proper retracement of the land-net. This information will help the Party Chief to understand the purpose of the survey and the monuments and lines of basic importance that are necessary to re-establish the land-net.

The search map shall include all relevant information from the following:

- Lines of basic importance.
- Record monuments to recover and survey.
- Record references for the monuments to recover (map numbers, corner records numbers, etc.).
- Natural Monuments
- Monument names and assigned point numbers.
- Initial recon information, if any, from the field review.
- Potential areas where unwritten rights may exist from the field review.
- Monuments that may be destroyed by the project.
- Horizontal datum, epoch date, and units of the search coordinates.
- Project control used to calculate the search coordinates.

Additionally, search coordinates for the record monuments should be included with the search map in the field package. Note: these search coordinates may be on a different datum, epoch date, or units from the project and should be provided to the Party Chief in both electronic form and as a hard copy. Also, monument descriptions will be included with the search map.

The following map is an example of a search map:

10.8 Notice of Intent to Survey

A Land Surveyor has the legal right of access and entry upon real property to perform a survey. This right is vested in Section 8774 of The PLS Act and Section 846.5 of the Civil Code.

Section 8774 of the PLS Act reads: (a) The right of entry upon or to real property to investigate and utilize boundary evidence, and to perform surveys, is a right of persons legally authorized to practice land surveying, and it is the responsibility of the owner or tenant who owns or controls property to provide reasonable access without undue delay. The right of entry is not contingent upon the provision of prior notice to the owner or tenant. However, the owner or tenant shall be notified of the proposed time of entry where practicable.

Section 846.5 of the Civil Code reads: (a) The right of entry upon or to real property to investigate and utilize boundary evidence, and to perform surveys, is a right of persons legally authorized to practice land surveying and it shall be the responsibility of the owner or tenant who owns or controls property to provide reasonable access without undue delay. The right of entry is not contingent upon the provision of prior notice to the owner or tenant. However, the owner or tenant shall be notified of the proposed time of entry where practicable.

(b) The requirements of subdivision (a) do not apply to monuments within access-controlled portions of freeways.

(c) When required for a property survey, monuments within a freeway right-of-way shall be referenced to usable points outside the access control line by the agency having jurisdiction over the freeway when requested in writing by the registered civil engineer or licensed land surveyor who is to perform the property survey. The work shall be done within a reasonable time period by the agency in direct cooperation with the engineer or surveyor and at no charge to him.

It is the Department's policy that owners and tenants of property will be notified of the Department's intent to perform a survey. This will be accomplished by mailing Survey Notification Cards and/or by placing Survey Notification Door Hangers on the front door of the main structure on the property. On the following pages are an example of a Survey Notification Card and a Survey Notification Door Hanger:

Survey Notification Card

Dear Property Owner/Occupant:

California Department of Transportation (Caltrans) Land Surveyors may be in this area during the next several days or weeks to collect survey data. Caltrans performs surveys for many reasons not all of which are for new highway projects.

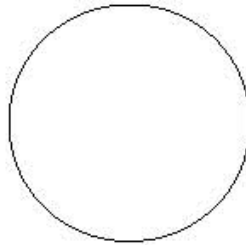
Professional Land Surveyors are allowed to enter onto property for survey related purposes. The property owner and occupants are required to provide reasonable access for these activities per Section 846.5 of the Civil Code and Section 8774 of the Business and Professions Code.

If you have any questions regarding the surveying activities you may call the local Caltrans Public Information Office at:

You may also call for additional information the following numbers:



Survey Notification Door Hanger



Dear Property Owner/Occupant:

California Department of Transportation (Caltrans) Land Surveyors may be in this area during the next several days or weeks to collect survey data. Caltrans performs surveys for many reasons not all of which are for new highway projects.

Professional Land Surveyors are allowed to enter onto property for survey related purposes. The property owner and occupants are required to provide reasonable access for these activities per Section 846.5 of the Civil Code and Section 8774 of the Business and Professions Code.

If you have any questions regarding the surveying activities you may call the local Caltrans Public Information Office at:

You may also call for additional information the following numbers:



10.9 The Field Package

The recovered information and any additional materials will then be assembled into a field package to be placed in the R/W survey job file for use by the Party Chief to successfully complete a R/W survey project. A second, duplicate file should be prepared at the same time for use in the preparation of the necessary maps, deeds, and other R/W Engineering products.

A typical field package for a R/W survey includes:

- Expenditure authorization and appropriate charging codes.
- Copy of the survey request.
- Right of entry information, conditions and permits.
- Survey Notification Cards and Survey Notification Door Hangers.
- Copies of pertinent research materials.
- Record Maps and pertinent deeds.
- Existing monument “to reach” information, monument descriptions, and reference ties.
- Monument Search Map and search coordinates.
- Monument Tie List.
- A listing of alternate corners to recover in case the requested land net corners could not be located.
- Final monumentation information (see section 10.16).

A completed field package should be well organized and arranged in a manner that is most advantageous for use by the Party Chief. It is important that the data and records be clearly labeled and easy to find. The Project Surveyor will perform a thorough review of the field package and determine if it is clear and complete.

10.10 Right of Way Survey Fieldwork

The R/W survey fieldwork should be coordinated with other transportation improvement project surveying activities. These activities include recovering and/or setting the control-net, performing photogrammetry control surveys, performing design surveys, and performing construction surveys.

The practical advantage of coordinating all transportation improvement project activities is to save time by reducing the number of trips to the field and to allow for a simultaneous adjustment of the survey data. Timing R/W survey fieldwork to occur early in the process and synchronizing it with other transportation improvement project survey activities also allows for the early referencing of control-net, land-net corners, and lines of basic importance so that their perpetuation can be assured.

10.10-1 Project Meeting

The Project Surveyor shall meet with the appropriate project staff to review the R/W survey and the field package. The primary objective of this meeting is to acquaint field staff with the overall scope and purpose of the R/W survey. The field package shall be thoroughly reviewed with emphasis placed on specific land-net corners and lines of basic importance to recover and survey. This meeting will also serve to establish the lines of communication for the R/W survey project.

10.10-2 Reconnaissance (recon)

The Party Chief will recon the monuments for the project from the information contained in the field package. This effort shall be performed in a diligent and thorough manner to ensure that if the monuments still exist they will be recovered and that the land-net can be retraced.

The recon effort shall include:

- Evaluating the overall layout of the project site, accessibility concerns, lines of occupation, and contacts with landowners.
- Noting the location and description of physical features that may affect property rights, i.e. fence lines, roads, buildings, utility facilities, etc.
- Marking the location, condition, and description of existing control-net.
- Marking the location, condition, and description of existing land-net monuments.
- Marking the location, condition, and, description of non-record monuments.
- Marking areas where unwritten rights may exist.
- Evaluating the need for supplemental survey control monuments for making field ties and for other survey work associated with the overall transportation improvement project.

- Determining which monuments are at risk of being destroyed by the transportation improvement project and, therefore, would need to be perpetuated as required by the PLS Act.

10.10-3 Marking the Search Map(s)

The Party Chief shall mark the appropriate search map(s) with complete information to show the results of the recon effort including areas where unwritten rights may exist. This information shall be placed on the appropriate map(s) in a clear and legible manner. Note: The search map(s) augment but are not a substitute for the R/W survey field notes.

The following are abbreviations for marking the search map:

BLC Block Corner	PLS PLS Corner, Other
CLH Center Line	PMC Parcel Corner
Monument	PN Pavement Nail
CON Concrete Pin	PRH Project Control
Monument	QC Quarter Corner
DIS Disturbed	REB Rebar
FD Found Monument	REFR Reference Point
FE Fence	RR Rail Road Spike
FLC Flow Line Curb	RW R/W Monument
FRLC Fractional Lot	RWH Redwood Hub
Corner	SC Section Corner
HH Hand Hole	SNF Searched – Not
Monument	Found
IP Iron Pipe	SUH Supplemental
LOT Lot Corner	Control
MC Meander Corner	TC Township Corner
OL Occupation Line	TRC Tract Corner
PKN PK Nail	WC Witness Corner

10.10-4 Right of Way Surveys Methods

The Party Chief will conduct the surveying of the existing land net, recovered R/W monuments, and areas where unwritten rights may exist from the existing and newly established control-net monuments. The Party chief may use total station methods or GPS methods to conduct a R/W Survey. The surveying method shall adhere to the requirements in other chapters of this manual including:

- Chapter 7 “Total Station Survey System (TSSS) Survey Specifications”.
- Chapter 6 “Global Positioning System (GPS) Survey Specifications”.

Total station field ties of the recovered monuments can be made in the form of either a “direct” or “indirect” retracement. (See Figures 10-1 & 10-2 and Appendix 10-A “Glossary”) The direct retracement and indirect retracement methods can both be used in the same total station R/W survey.

GPS field ties of the recovered monuments can be made by using static, fast static, or Real Time Kinematic (RTK) methods as specified in Chapter 6, GPS Survey Specifications.

For R/W Surveys using RTK methods the following additional specifications are required.

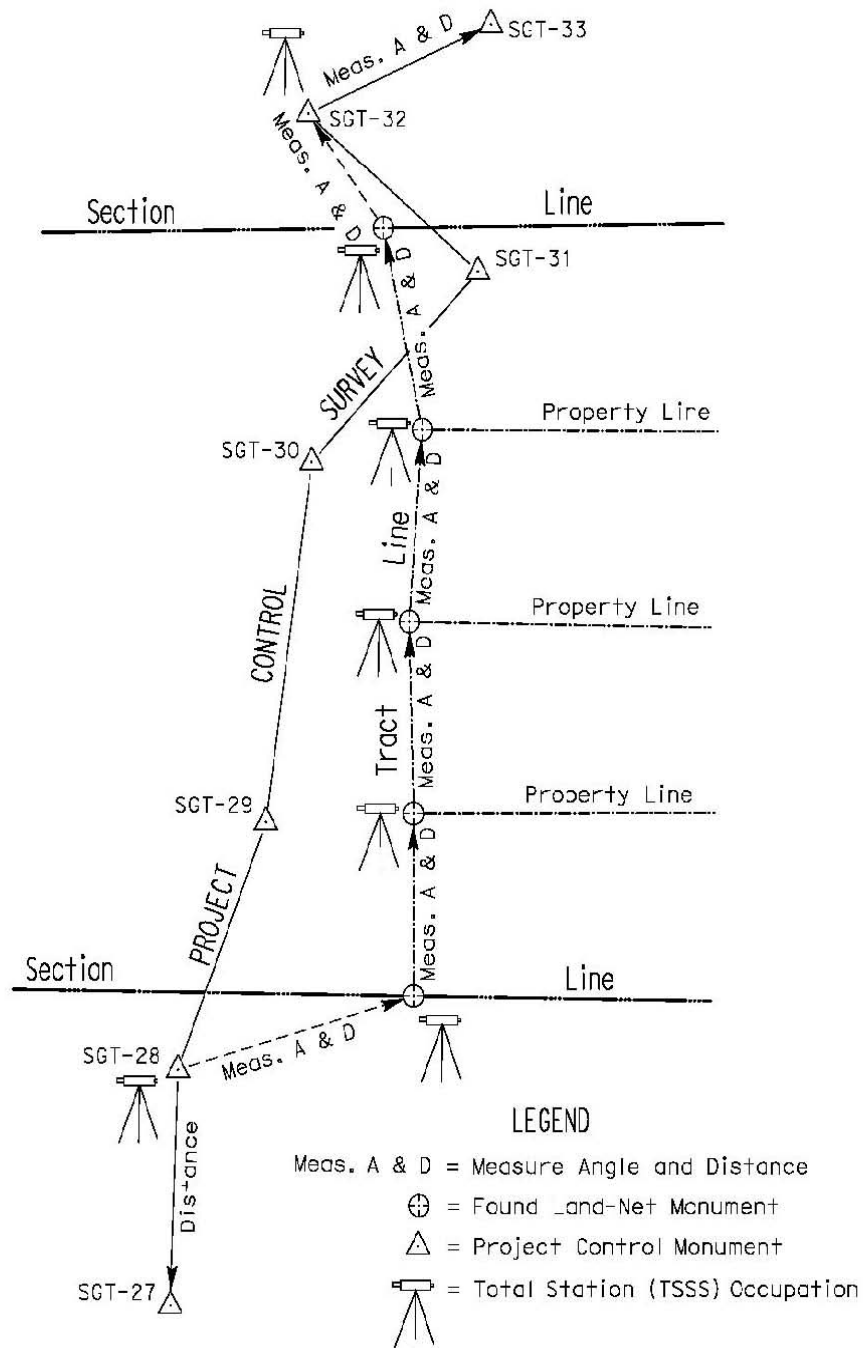
- For adjacent monuments with coordinates produced from RTK methods, the combined positional accuracy of the two monuments shall meet or exceed the Third Order precisional ratio of 1:10,000. In this instance, the precisional ratio is calculated from the positional accuracies of each of the monument’s resultant RTK produced coordinates and the distance between the monuments by the equation:

$$Y = (\text{Distance}) \div \sqrt{(A^2 + B^2)}$$

Where A is the positional accuracy at the first station and B is the positional accuracy at the second station.

1:Y is the resultant precisional ratio, where Y shall be greater than or equal to 10,000.

LAND-NET FIELD-TIES AND DATA REDUCTION



Direct Retracement of the Land-Net by a Closed-Line Traverse

Figure 10-1

LAND-NET FIELD-TIES AND DATA REDUCTION

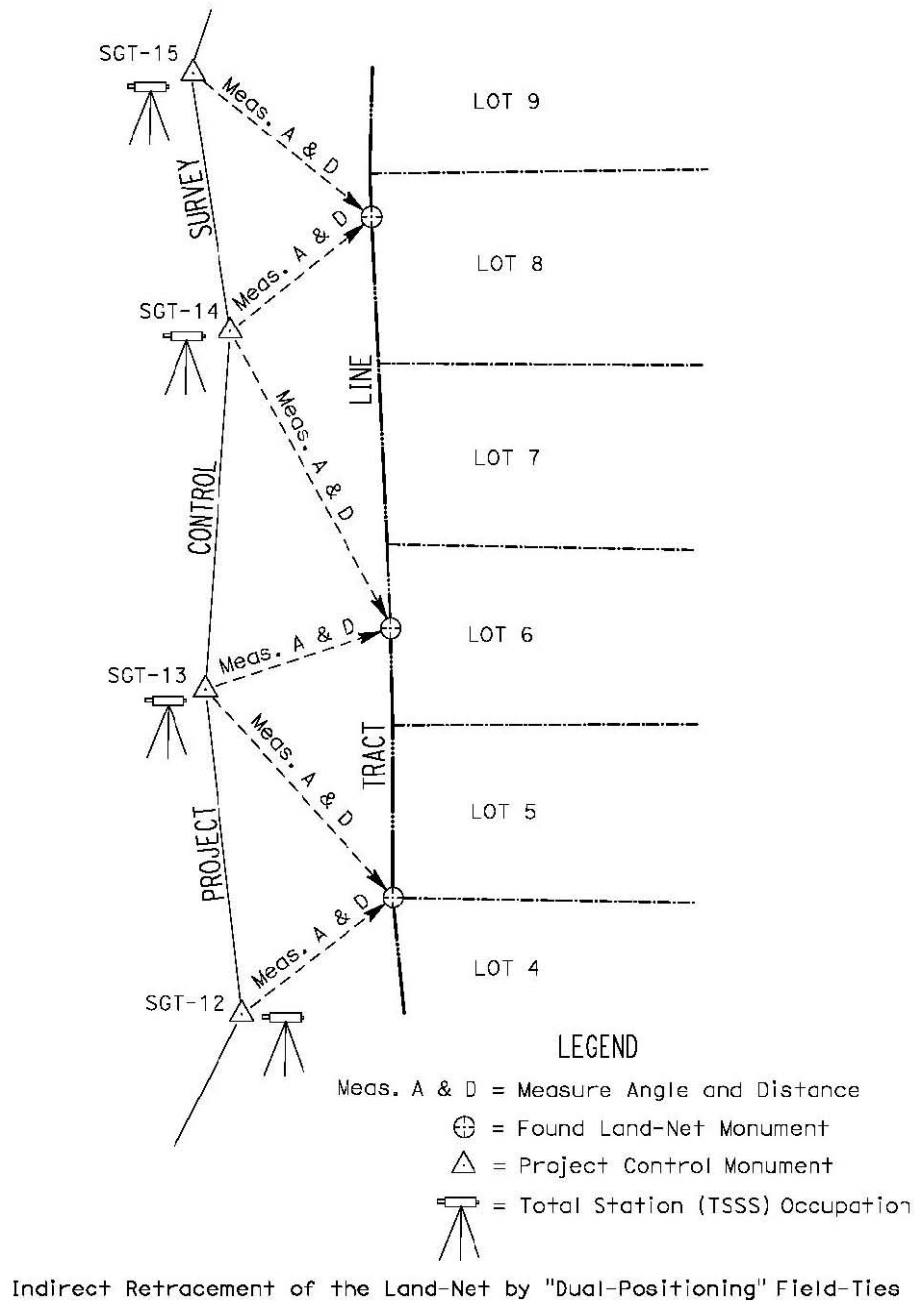


Figure 10-2

10.10-5 Accuracy

The accuracy of the R/W survey shall conform to the requirements stated in Chapter 5, “Accuracy Classifications and Standards” along with the criteria for RTK produced values stated in Section 10.10-4.

Areas where unwritten rights may exist will be surveyed to properly locate conspicuous features and their limits. These areas will be surveyed to General Order standards as defined in Chapter 5 of this manual.

10.10-6 Pre-construction Record(s) of Survey and/or Corner Record(s)

Monuments that may be destroyed during transportation improvement or maintenance projects are legally required to be perpetuated, as defined in Section 8771(b) of the PLS Act. This includes horizontal and vertical control, as well as land net monuments. The monuments shall be perpetuated according to the requirements set forth in The PLS Act, the Board Rules, and any other applicable law.

To perpetuate the monuments, a Record(s) of Survey or Corner Record(s) shall be filed at the County Surveyor’s office in the county where the survey occurred. A Record(s) of Survey may be preferred when a large number of monuments need to be perpetuated for the project.

10.10-7 PS&E Contract Monuments

The Party Chief shall communicate to the Project Surveyor the number and type of monuments that will likely be destroyed during the transportation improvement project. The Project Surveyor will communicate to the Design Engineer this information so that the Design Engineer can include the replacement monumentation in the Plans, Specifications, and Estimates (PS&E). Wherever possible the survey monument should be one of the types described on Standard Plan A74.

10.11 Survey Documentation

Documentation of the R/W Survey is accomplished by proper and timely completion of the R/W survey job file.

The following shall be included in the R/W surveys job file:

- A R/W survey narrative report
- R/W survey field notes
- The marked search map
- All Corner Records and/or Records of Survey
- The adjusted field observations
- The final survey values

10.11-1 Right of Way Survey Narrative Report

The R/W survey narrative report is an overall description of the project and project surveying related issues. It should be written in a manner that will allow for a subsequent surveyor to easily determine the reason for the survey, how the survey was conducted, the control that was held, and any problems encountered.

The Party Chief shall complete a R/W survey narrative.

The R/W survey narrative report shall contain:

- Project name
- Survey limits
- Purpose
- Date
- Datum, epochs, and units
- The control held for the survey
- Personnel
- Equipment used
- The surveying methods used
- Problems encountered
- Signature and Seal of the Party Chief
- Any other pertinent information

10.11-2 Right of Way Survey Field Notes

The Party Chief shall produce field notes that are a combination of electronically recorded measurement data and hand-written or computer generated notes that together represent an accurate, clear, complete, and concise record of everything that occurred during the course of the R/W survey. The final quality of all record maps and documents depends on the quality of the information and data contained in these notes. (The Party Chief should keep in mind that survey field notes are of such vital importance that they are at times called into review by courts.) Field notes should include all evidence even if it may disagree with record data, a recovered monument, or with an analysis of its location.

The field notes shall contain the following:

- A Project Location Sketch that contains the location of the R/W survey site relative to major roadways and/or landmarks and the approximate location of control-net relative to the project site.
- Monument location drawings showing the monuments, the observed and reduced surveying measurements, point names, and point numbers.
- A Recovery List summarizing all monuments found, not found, or set. The list should include point numbers.
- Hard copies of raw survey data.

The field notes will also contain information related to describing the found and searched for but not found monuments. If a found monument appears damaged or disturbed, or its condition or orientation do not agree with record data, the Party Chief shall describe the condition and provide monumentation location drawing and/or a digital photograph.

The description of the found monument shall include but is not limited to the following:

- Monument type and size.
- Monument markings: Rebar and iron rods should be excavated 3 to 6 inches below the top of the monument to determine if a tag has been wired to them.
- Monument condition: New, old, bent, damaged, remains, etc.
- Reference points to the monument.
- All collateral evidence related to the monument.

- Digital photos and/or rubbings of the monument and its accessories, if any.
- Description of any surrounding physical features that may be related to the corner and/or corner location (e.g. fence lines, fence corners, etc.).

The R/W survey field notes shall contain the following information on monuments not found:

- Location, including the coordinate of the center of the area searched, radius of the area searched, and the depth searched.
- Reason, if known, as to why it was not found. For example, it was destroyed by construction, plowed under during farming, etc.
- Effort/Diligence/Extent of search, including the diameter and the depth of the search area, to find the monument.

10.11-3 The Marked Search Map

The Party Chief will place in the R/W survey job file the marked search map. The map shall be clear and legible and show all monuments searched for whether found or not.

10.11-4 Corner Records and/or Records of Survey

All Corner Records and Records of Survey shall be produced in accordance with the PLS Act and the Board Rules, and copies of the recorded documents included in the R/W survey job file.

10.11-5 Adjusted Field Observations and Final Survey Values

All documents produced during the adjustment of the survey observations will be included in the R/W survey job file.

The adjustment documents shall include:

A control file showing the control held for the R/W survey.

- A file showing the weights on the field observations.
- The covariance files.
- A file showing the adjusted observations and the amount that the observations were adjusted.
- A statistics file showing the resultant statistics of the adjustment.

- A document showing the final values of the adjustment and the statistical error of the final values.

10.12 Surveys Deliverables

The final Surveys deliverable to R/W Engineering is the R/W survey job file.

10.12-1 Review of Right of Way Surveys Deliverables

The R/W survey job file should be checked to ensure that it is correct and complete.

The R/W survey job file will be evaluated for following criteria:

- Recovery of sufficient monumentation to retrace the land-net.
- Neat, complete, legible, accurate and uncluttered field notes.
- The original search map marked with clear and legible notations.
- Clear, complete, and accurate found monument descriptions, which may include sketches, rubbings, and digital photos of monuments.
- Field observation adjustment documentation.

After the R/W survey job file is completed, the job file will be delivered to the Project Surveyor.

10.13 Utilities

Right of Way, Design, or others may request that utilities be located with respect to the Department's R/W for the purposes of writing legal descriptions, identifying easements, or for the planning or estimation of the relocation of utility facilities. When utilities need to be located for these purposes, all relevant sections in this chapter will be followed.

Note: Chapter 11, "Engineering Surveys" has additional information on surveying utilities.

10.14 Boundary Analysis and Retracement of the Land-Net

The Project Surveyor shall review the completed R/W survey job file for completeness. The boundary analysis and retracement of the land-net will then be performed in accordance with accepted professional land surveying practices and laws. If it is found that sufficient monumentation was not recovered and/or surveyed to accurately retrace the land-net, then a meeting will be set up with all appropriate personnel to determine if additional R/W survey field work is needed and what that work might entail.

10.15 Right of Way Flagging and Staking

10.15-1 Right of Way Flagging

R/W flagging is a temporary, limited, and usually less accurate substitute for R/W staking. One of its uses is to demarcate, approximate landlines and R/W lines that will be viewed during appraisal, acquisition, disposal of land, or utility relocation planning and estimating. Other uses may be for legal purposes or anytime the Department's R/W needs to be generally viewed for any purpose.

Typically, Right of Way will initiate a R/W flagging request via a survey request form. See Chapter 11, "Engineering Surveys" for an example of a survey request form. R/W Engineering will provide to Surveys the pertinent information related to a R/W flagging request including coordinates of the R/W lines to flag.

The R/W lines that may be requested to be flagged include but are not limited to:

- **Appraisal Lines:** Appraisal lines are flagged for use by appraisers to determine severance damages, or by R/W Utilities for utility relocation planning and estimating activities.
- **Acquisition Lines:** Acquisition lines are flagged for use by R/W Acquisition in reviewing and discussing right-of-way requirements with the landowner, or by R/W Utilities for utility relocation planning and estimating activities.
- **Legal Action Lines:** Legal Action lines are lines described in the survey request and are flagged for legal purposes.

- **Excess Land Lines:** Excess Land lines are flagged for the benefit of both the Department and prospective buyers.
- **Additional Lines:** Other R/W lines may be requested for the Party Chief to flag.

10.15-2 Right of Way Flagging Procedures

The following requirements will be employed for R/W flagging:

Accuracy: See Chapter 5 ,Classification and Accuracy Standards.

Line Points: Markers placed along the requested line witnessed by lath. On the lath mark “Approx. R/W line”. Temporary paint markings are sufficient for areas covered by pavement or concrete.

Spacing of Points: Unless specified otherwise in the survey request, the spacing of R/W flagging points is at the discretion of the Party Chief. R/W flagging points shall be set to reasonably ensure intervisibility between successive points adequate for laypersons to determine the location of R/W lines demarcated by R/W flagging points. At a minimum, R/W flagging points are set at angle points, intersections with improvements, and at abrupt changes in the terrain.

Flagging: White/Yellow flagging to be placed on the lath.

10.15-2 Right of Way Staking

R/W staking is used for demarcation of land division or land use lines. It is usually associated with construction projects and requires a higher order of survey accuracy than R/W flagging.

R/W Engineering will produce the pertinent information related to a R/W staking request.

The R/W lines that may be requested to be staked include but are not limited to:

- **R/W Clearance Lines:** R/W clearance lines are lines that are staked when existing improvements must be severed at the R/W and/or easement lines.
- **Utility Relocation Lines:** Utility relocation lines are staked when utilities are to be relocated.

- Easement Lines: Easement lines are staked to demarcate, the limits of an easement.
- R/W Lines: R/W lines may be staked for use in building fences, slope staking, sound walls, retaining walls, and other construction control.
- Other R/W lines may be requested of the Party Chief to stake.

10.15-4 Right of Way Staking Procedures

The following requirements will be utilized for R/W staking:

Accuracy: Per Chapter 5 ,Classification and Accuracy Standards.

Spacing of Points: Unless specified otherwise in the survey request, R/W staked points are to be set at angle points, beginning of curve points, ending of curve points, and at intersections with improvements. The points should be set to ensure that there is intervisibility between successive points.

Flagging: White/Yellow flagging to be placed on the lath witnessing the points set.

10.16 Right of Way Monumentation

Survey monuments are placed on, within, or near the Department's R/W to locate the limits of the Department's R/W. This effort is documented on monumentation maps (Record of Survey) and/or Corner Records that are filed at the local county offices.

A transportation improvement project is not complete until the Department's R/W is monumented and the appropriate documentation filed. The monumentation effort shall comply with current laws.

The current laws include but may not be limited to:

- The PLS Act, Section 8762-8765.
- The PLS Act, Section 8771.
- The PLS Act, Section 8773.
- Board Rule Section 464.
- Board Rule 465.

10.16-1 Final Monumentation of Right of Way

The final stage of a transportation improvement project for Land Surveys is the monumenting of the Department's new R/W and filing of a Monumentation Map. The Project Surveyor will provide the final coordinates of all angle points, beginning and ending of curve points and radii in the Department's R/W for the R/W survey project. Additionally, the Project Surveyor will provide all information that will affect the Party Chief's decision on what to monument. The Party Chief is responsible for determining what is to be monumented.

The R/W may be monumented by any of the following lines or any combination of them:

- R/W lines: These are to be monumented when possible, however, such factors as accessibility, safety, and practicality for usage, may preclude the monumenting of R/W lines.
- Offset lines to the R/W.

Before deciding which monuments to set, the Party Chief should consider all possible factors that may affect permanence and utility of the monuments, such as the following:

- Safety.
- Restriction to access: When access is restricted or denied to others, the Party Chief should consider first monumenting the R/W lines. (Refer to the "Standard Plans" and Chapter 12, "Construction Surveys" for fence alignment at R/W line corners).
- Planned landscaping: Landscaping contract obligations may destroy monuments. New plantings and growing vegetation may obstruct lines of sight and diminish the usefulness of monuments.
- Sound walls: Sound walls may make monuments along R/W inaccessible and/or block lines of sight.
- Accessibility of monuments.
- Future development of the transportation facility and the surrounding area.
- Routine maintenance of the transportation facility.
- Permission from adjoining owners to set monuments on their land.
- Limitations imposed by natural terrain and/or by the transportation facility.

10.16-2 R/W Monumentation Procedures

The Party Chief will set R/W monuments at the following locations:

- Primary points: R/W monuments set at all angle points, and beginning and end of curves. Note: Monument the State's final boundary along facilities to be relinquished.
- Supplemental points: Additional R/W monuments set along tangents and along curves to assure intervisibility and/or at a maximum of 1000 feet.
- Intersection points: R/W monuments set at the intersections of the Department's R/W with lines of basic importance.
- Monuments set per Section 8771 of the PLS Act.

The Party Chief shall establish durable, permanent monuments that contain markings indicating the Department at the requested locations. However, the Party Chief may set the monuments at a different location if the requested location is not practical, it is impossible to set a monument, or the location has safety considerations. These locations may be set within or near the Department's R/W as practical.

The character of the of monuments may be any of the following:

- A Type "A" concrete monument with metal disk shown on Standard Plan A74. Note: this is the preferred monument.
- 1" galvanized steel pipe 18" to 24" long with a brass tag, cap or a yellow plastic plug.
- 2" galvanized steel pipe 24" to 30" long with a brass disk or tag.
- 5/8" rebar 18" to 24" long with a brass tag or plastic cap.
- Metal disk cemented in rock mass, bridge abutment, sidewalk, or other permanent location with epoxy.

The Party Chief shall survey the R/W monuments to the accuracy described in Chapter 5, Classification and Accuracy Standards.

10.16-3 Monumentation Map (Record of Survey)

Monumentation maps are prepared to legally document the Department's R/W and related monuments. The maps are filed with the County Surveyor and become part of the public record. A project is not considered complete until perpetuation of monuments is accomplished

and a monumentation map is filed. The map shall be filed within 12 months of the contract acceptance date.

Monumentation maps will be prepared and filed as Records of Survey, as defined by The PLS Act Sections 8762 through 8771. Although The PLS Act Section 8765 (a) provides for a map other than a Record of Survey to be filed; however, since the requirements for such a map are identical to a Record of Survey except for the County Recorder's signature, a Record of Survey should be filed whenever possible.

10.16-4 Monument Renewal or Restoration

During a R/W Survey, monuments may be found to be in poor physical condition or they may be obliterated or lost as defined by "The Manual of Surveying Instructions 1973". The definitions in The Manual for obliterated or lost corners shall apply to other monuments of basic importance. When a monument is found to be in poor physical condition it may need to be renewed and when a monument is obliterated or lost it may need to be restored. The Party Chief will determine when a monument needs to be renewed or restored.

The Party Chief shall follow the Department's policy on monument renewal and restoration as stated below.

The Department's policy on monument renewal and restoration is:

- Follow all laws pertaining to monumentation.
- **Renew** deteriorating or missing monuments or their accessories that were established by an original public lands survey or on "grant line" boundaries. In addition, monuments of basic importance, such as monuments for subdivisions.
- **Restore** obliterated monuments.
- **Restore** lost monuments when necessary for property acquisition.

In addition to the above policy for renewal and restoration of monuments, it is also the Department's policy that permanent monuments be set when previously unestablished section corners and quarter corners are surveyed.

The following are examples of renewing a monument:

- Rebuilding rock mounds, in remote areas, where the corner location is still marked by an existing stake, pipe, or by the stones themselves.

- Placing metal or synthetic material posts as protectors and as witness markers.
- Pouring concrete collars around existing pipes.
- Establishing additional accessories to a monument.

The following is information related to restoring a monument:

- Set permanent monuments that are protected, if possible, and well defined as to the exact corner.
- Place monuments in secure locations.
- Accessories: Should be different and distinct from the monument referenced. Examples could be lead and tacks in concrete surfaces referencing centerline pipes.
- Routine restoration of monuments is not required.

10.17 Requests by Adjoiners for Monumentation of the Department's R/W Lines

Occasionally, an adjoining landowner to the Department's land will request the Department to monument the Department's R/W lines. In this circumstance the request is for the monumentation of the Department's R/W and not the intersection of the adjoiner's property line with the Department's R/W. The adjoiner or his agent must file a written request with the Department.

An adjoiner may request action from the Department when:

- The adjoiner has a need for additional identification of R/W lines to facilitate a property survey.
- The adjoiner has plans for improvements on or near the R/W line.
- The adjoiner has concerns about the possible encroachment of a Department facility.
- The adjoiner doubts the Department's limits of ownership.
- The adjoiner is concerned about liability issues.
- The R/W has not been monumented.
- The R/W monumentation is within access-control lines.
- The Department adopted an unmonumented road from a local agency.
- Monumentation has been destroyed by vandalism, construction or by other actions.

10.17-1 Assignment of Cost

The adjoiner may establish a R/W line at no expense to the State. The owner will be responsible for all field and office work, placement of monuments, and preparing and filing all maps and legal descriptions required. The Department may provide any existing maps and documents to relate the position of the Department's R/W lines to local survey monuments of record.

The Department will bear the cost of additional surveying activities related to monumenting the Department's R/W that have been requested by an adjoiner where at least one of the following conditions exist:

1. Sufficient R/W monumentation exists, but is within "access controlled" areas.

Procedure: Adjoiners will be provided reference points outside "access controlled" areas to establish R/W line location.

Accuracy: See Chapter 5, Classification and Accuracy Standards.

2. Project R/W monumentation is incomplete or has been deferred.

Procedure: The Department will complete the deferred R/W monumentation or locate the requested R/W line from local existing monumentation and deed descriptions of record.

Accuracy: Per Chapter 5 of this manual.

The adjoiner will bear the cost for monumentation of the Department's R/W where the following conditions exist:

- Sufficient monumentation exists outside "access controlled areas"
- Sufficient monumentation exists on conventional highways and is within or outside the R/W or fence lines.
- When the Department has adopted a local road and monumentation is insufficient, or records of monumented R/W are not available.
- Where the R/W has been acquired by prescription or by implied dedication.
- Pre-1959 R/W lines that are not readily surveyable.

10.18 Monumentation of the Intersection of an Adjoiner's line with the Department's R/W

This section applies to transportation improvement projects where property rights are acquired from an adjoiner for the project. The monumentation of the intersection of an adjoiner's property line with the Department's R/W will be performed only when the intersection is a R/W monument the Department will set per Section 10.16, "Right of Way Monumentation" or the property line is a line of basic importance.

If in the course of a R/W survey it is discovered that an adjoiner has a lot corner monument that may be destroyed by a transportation improvement project, the Project Surveyor will notify R/W of the situation.

Any request by an adjoiner for the Department to monument the intersection will be handled on a case by case basis by Right of Way in the acquisition process.

Appendix 10A: Glossary

Acquisition - The act of becoming the owner of certain property; the act by which one acquires or procures the property.

Adjoiner - Adjoin means to be in contact with; hence the adjoiner is the land in contact with the subject property, as distinguished from being merely close to or *adjacent*.

Appraisal - Usually a written statement of the market value, or value as defined by the appraiser, of an adequately described parcel of property as of a specific date.

Assessor's Map - A map created for the County Assessor for tax purposes, maps may *not* accurately indicate conveyance rights.

Basis of Bearing - Is the determination for the orientation of angular relationships of lines in a legal description or on a map. A map usually has a note, which states the particular line upon which the bearings have been based.

Condemnation - The process by which property is acquired through legal proceedings under the power of eminent domain.

Control - In general, coordinated and correlated position data forming a framework to which detailed surveys are adjusted, may be horizontal and/or vertical. Should be executed with greater precision and accuracy than is required for dependent surveys.

Control-Net - The control-net is the survey control monuments as described in Chapter 9, "Control Surveys".

Corner - The common end of two survey lines or an angle point made by two boundary lines. This is *not* the same as *monument*, which is the physical evidence of the corner's location on the ground.

Corner Record - An official record of a corner establishment or restoration. Section 8873 of the PLS act defines the requirements for Corner Records.

Deed - An instrument in writing which, when executed and delivered, conveys an estate in real property or interest therein.

Design Engineer - Is responsible for overseeing the design of transportation improvements.

Direct Retracement: A direct retracement is where the recovered land net corners or R/W monuments are tied to the control network in the form of directly measuring the lengths and directions of property lines, landlines, and R/W lines from a beginning and ending azimuth and intermediate ties, where possible. See figure 10-1.

Epoch Date - A particular instant of time from which an event or series of events is calculated.

Horizontal Datum - The position on the spheroid of reference assigned to the horizontal control of an area defined by 1) the position of one selected station in the area, and 2) the azimuth from the selected station to an adjoining station. The horizontal datum prescribed by the Department is the North American Datum of 1983 (NAD83).

Indirect Retracement: An indirect retracement is where the recovered land net corners or R/W monuments are tied to without measuring along the property lines, landlines, or R/W lines. An indirect retracement is characterized by double tying the land net monuments as shown in Figure 10-2.

Land-Net - The land-net is all the evidence that controls the subdivision of land.

Legal Description - A description recognized by law which definitely locates property by reference to government surveys, coordinate systems or recorded maps; a description which is sufficient to locate and identify the property without oral testimony.

Lines of Basic Importance: Lines that define and control Ranchos, public lands, and their subdivisions are usually considered as those of basic importance. In the absence of these basic controlling lines, lines of lesser importance can become the best available evidence. These lines of lesser importance then become lines of basic importance. In some instances, individual lot lines may become lines of basic importance.

Lines of Occupation – Physical features that indicate possession, control, tenure, or use. Where a person exercises physical control over land such as a fence line.

Lines of Secondary Importance: Lines of Secondary Importance are lines that yield to Lines of Basic Importance.

Lost Corner - Is a point of a government survey whose position cannot be determined by the original monument or by acceptable evidence as to where the original monument was.

Monument - A natural or artificial object that is fixed permanently in land and referred to in a legal description or map identifying the land, marking the location of a boundary, corner or other survey point. (See “Corner” for definition.)

Monumentation Map - A Record of Survey depicting all new monuments set.

Monuments of Basic Importance: Monuments of Basic Importance are monuments that control the lines of basic importance and include monuments that mark ranchos, public lands, and their subdivisions

Monuments of Secondary Importance: Monuments of secondary importance are monuments that yield to Monuments of Basic Importance. They may mark individual lot corners in a lot and block subdivision, deed corners, and parcel corners of a parcel map.

Obliterated Corner - Is a corner at whose point there are no remaining traces of the original monument, replacement monument, or its accessories, but whose location may be recovered (a) by competent testimony, (b) by some acceptable record evidence, (c) by improvements built at the time the original position was known, or (d) by a monument proven to be a replacement of an original monument.

Parcel - A single region of land described in a single description in a deed, or as one of a number of lots on a plat, separately owned, either publicly or privately, and transferable separately.

Party Chief - Is assigned by Surveys and oversees the work of a survey field crew.

Perpetuate - To make perpetual or cause to last indefinitely.

Public Land - That portion of the domain (U.S.) to which title is still vested in the Federal Government.

Rancho – In Spanish and Mexican law, formerly prevailing in California, the term signifies a tract of land granted by those governments to individuals. Together with missions and pueblos, these land rights are considered senior to subsequent land divisions.

Record of Survey - An official record of a survey. See the PLS Act for requirements governing Records of Survey.

Relinquish - To abandon, to give up, to surrender, to renounce some right or thing. Used in this chapter to refer to the transfer of a transportation facility from the Department to a local agency.

Retracement – A survey that is made for the purpose of verifying the direction and length of lines, and identifying the monuments and other marks of an established prior survey. (Following in the footsteps of the original or previous surveyor)

Right of Entry - The right to go into another's property for a special purpose without committing trespass.

Right of Way - Sometimes used to describe a right belonging to a party to pass over the land of another, but it is also used to describe that strip of land upon which the Department constructs their roadbed, and, when so used, the term refers to the land itself, not the right of passage over it.

Search Map – A map usually created by office surveyors for field surveyors to help locate monuments and/or corners of interest. It provides an overall picture of the R/W Survey.

The United States Public Land Systems (USPLS)-Net: The USPLS-net are the corners and lines of cadastral surveys that mark the basic “rectangular” system of public lands. Generally, these monuments are Monuments of Basic Importance and the lines are Lines of Basic Importance.

Tract – A lot, piece or parcel of land, of greater or less size, though the term generally refers to a large piece of land.

Witness Monuments – Is a monument placed at a known distance and direction from a property corner or control point.