12. RIGHT OF WAY (ROW) MAPPING SURVEYS
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12.1 INTRODUCTION

The purpose of this chapter is to set standards and provide guidance for ROW Mapping Survey procedures and policies as they relate to locating field and record evidence that could be used in the determination of existing property line and highway boundary locations.

The objectives of the chapter are to provide Department employees, consultant surveyors, and designers with a standardized format to follow when locating property line and highway boundary field evidence that could be used to determine the locations of property lines and highway boundaries.

Existing ROW and Property Line Field Evidence shall be collected from a secondary project control baseline using radial surveying techniques. Coordinates for all existing evidence collected by survey shall be consistent with the project coordinate system and datum.

ROW Mapping survey data may be collected in the same data collection process as the terrain data survey.

ROW Mapping Survey data should be collected using automated data collection procedures, incorporating automated mapping control coding and NYSDOT feature coding. The ROW features shall be collected in the same survey data collection process using standard feature naming stated in the CADD Standards and Procedure Manual. Mapping control coding shall control automatic 3d line generation.

When situations not addressed in this chapter arise or if an interpretation of the various procedures is needed contact NYSDOT’s Regional Land Surveyor for assistance.

12.2 MINIMUM STANDARDS

All property line and highway boundary field evidence for ROW Surveys shall be located directly from secondary project control using a Total Station Positioning System (TPS) and radial surveying techniques. An exception being field evidence that is in a location not visible from the secondary project control, in these instances an alternative method will need to be chosen to locate the field evidence. These various methods are described in Section 12.4.2.3 below.

12.2.1 Point Feature Accuracy Standards

Point feature accuracies are dependent upon how definable the evidence is and vary depending upon the type of evidence. For example the location of a real property marker is more definitive than the center of stone wall or fence line. Expected linear feature accuracies are shown in Appendix 17.2.

12.2.2 Linear Feature Accuracy Standards

Linear feature alignments are created by the surveyor using mapping control coding. Linear feature alignment accuracies are not only dependent upon point feature accuracies, but also point feature spacing/frequency, and alignment type (curve or linear). Expected linear feature accuracies are shown in Appendix 17.2.
12.3 FIELD RESEARCH

After the written evidence has been researched, reading through the title reference will be helpful. Mark on the relative Tax Maps the locations of any noted property evidence for use in locating the property evidence during the field research. Information obtained should be verified on the ground. Ground checks are made for possible gaps, overlaps and discrepancies in the survey data that would have an effect on the ROW. A diligent search shall be made to find all private property monuments and ROW monuments that fall within, abut or impact the area of highway construction or reconstruction. The inclusion of all necessary land corners for legal land ties is of utmost importance. It is helpful to have aerial photography, quadrangle maps, and labeled tax maps, as described above, to assist with the field research.

12.3.1 Verification of Record Evidence

The first phase of field research should be the location of known monuments that do exist. Such monuments are based on records that they do exist subject to local changes that might indicate that the monument has been destroyed, e.g., deep road excavation after the date the record evidence was collected. The following steps should be taken:

a. Check of reference ties: If there are reference ties on record for the land corners, they should be checked. Any major difference in distance for these ties to a monument should be noted. It is important that no new ties be added to the same trees, poles, etc. that are already being used for a reference tie as this may lead to confusion at a later date.

b. Magnetic locator: The magnetic locator affords a very quick and efficient means of locating ferrous metallic monuments. For example, one tie could be used in combination with the locator and the point found. At this time the other existing ties should be checked.

c. Excavation. If not readily visible, the monument marking the land corner or ROW may have been covered by dirt or by a roadway. In this case, you should search an area large enough, and within 3 ft. (a meter) of the surface of the ground, that leaves no doubt that a monument is existing. Existing construction plans of the area should be researched to determine if the area is in a “cut” or “fill” area. In looking for a monument it will suffice most of the time to excavate with a shovel. In developed areas, neatly replace the sod when finished.
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12.3.2 Interviews of Property Owners & Local Residents

Before any interview with a property owner or local resident is attempted, the interviewer should become knowledgeable in the extent of the project and the approximate dates of various phases of the planned construction. The interviewer should also understand the limits on information he/she can give. In cases regarding specific questions relative to areas outside of surveying, the interviewer should indicate whom the question should be referred to. The following steps are a guide to establish a business format for the interview.

a. Prepare a comprehensive list of questions before the date of the interview. The following are samples of frequently asked questions:

1. How many years have you lived in the area?
2. How many years have you owned or occupied this property?
3. How long has a specific improvement (road, fence, building) existed?
4. Did the improvement in Item 3 replace a previous improvement? If so, when?
5. Was either, old or present, improvement placed by a survey? If yes, find out by whom and when. Ask if you could see any survey map they might have.
6. Do you have knowledge of your property corners? Would you help me locate the monuments?
7. Have there been property disputes, feuds, or legal proceedings over property boundaries in the vicinity?
8. Do you have knowledge of the location of any ROW monuments in the area?
9. Where are the locations of any wells (used or unused) within 20 ft. of the ROW?

b. Introduce yourself: Give your name, title and office location. Have employee identification visible.

c. Inform the interviewee of:

1. The project you are working on.
2. The nature of the project.
3. The information needed.
4. Arrange for a convenient time to return if more information is needed.

d. Interview:

During the interview make short written notes of names, dates and significant facts. Upon completion of the interview write neat and complete notes.

12.3.3 Search for Unrecorded Monuments

a. Magnetic Locator: A search should be made at road intersections, fence intersections, etc. for possible monuments even if there is no record evidence available. When such monuments are found they may have registration numbers or other identifiable characteristics that may lead to their origin.
b. Excavation. No excavation should be done at random. If a reading registers on a magnetic locator some digging should be done. If extensive excavation is involved it should be done after all evidence has been analyzed.
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12.3.4 Monument Perpetuation

Where the highway ROW takes partial lots or tracts, the position of the old corner monuments is crucial to private surveyors for future location of property lines. The block and lot corner monuments of subdivision plats may be the only evidence by which the correct corner monument can be reestablished. A record of all monuments found shall be kept in the survey report as to the type, size, and registration number of the surveyor who set the monument if known. All found monuments shall have their position perpetuated by making ties to the control survey. Include the date of recovery and the coordinates of the monuments in the survey report for future reference.

12.3.5 Analysis

Reconstructing boundary corner locations from written, survey, parole, and physical evidence requires considerable care and judgment. Generally the analysis should result in a reconstruction of the original survey or a “following in the footsteps of the original surveyor”. NYSDOT does not certify that found monuments mark the correct location of private boundary corners.

12.4 FIELD PROCEDURES

12.4.1 Point Feature Location Procedures

All point features for ROW surveys should be located directly from secondary project control using TPS and radial surveying techniques.

Shots should represent the top center of the survey monument (unless noted otherwise) and are usually not considered representative of the ground surface.

The total station used will be at least a five second least-reading instrument. The total station used should have a minimum DIN accuracy of five seconds (angle) and 0.010 ft. (2 mm) +2ppm (distance).

Automated data collection is typically required.

An example of the procedures typically used with automated data collection by NYSDOT is described below.

12.4.1.1 Set-up

Instrument is setup over an angle point in the project control line.

Atmospheric refraction corrections are set on the instrument.

Prism offset is accounted for in all distance measurements on the instrument.

The height of the backsight target and height of Instrument are measured and recorded.

The instrument is pointed at the backsight and the horizontal angle, the zenith angle and slope distance are recorded by the data collector.

The height of the reflector on the range pole is measured and entered. It is important to measure the actual target (rod) height and not rely on graduation marks.
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12.4.1.2  Operation

With the prism/target mounted on top, the rod-person sets the rod on the point to be measured and holds the rod plumb.

The instrument operator sights the pole-mounted prism/target with the total station.

On command, the total station measures the slope distance and horizontal and zenith angles to the point and sends the data to the data collector.

The operator enters mapping control coding, feature coding and attribute information.

This measurement operation continues until all relevant features have been mapped.

12.4.2  Radial Surveying Techniques

12.4.2.1  Existing Feature (well defined)

When locating well defined features such as Highway Boundary and Property Line evidence, care should be used in order to achieve the positional accuracies specified above.

Highway boundary and property line evidence shall be located from a secondary project control traverse using radial surveying methods. Location of government and private survey monuments and Real Property Monuments should be located using some form of redundant measurements either by location from two different secondary project control stations or by collecting multiple observation sets.

A properly adjusted Prism Pole Rod with target shall be used. A bipod can be used.

12.4.2.2  Existing Feature (marginally defined)

When locating marginally defined features such as, Bent Iron Pipes, Stone Walls, Fence Lines, Tree Lines...ect. a standard of care should be used in order to achieve the positional accuracies specified above.

A properly adjusted Prism Pole Rod with target shall be used. Care should be taken so that the prism pole is positioned in order to meet positional accuracy standards.
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12.4.2.3 Side Traverses

When property line evidence and topography is obscured from the secondary project control traverse, there may be a need to establish a side traverse to be able to locate the evidence.

Effort should be made to close side traverses on another secondary project control station using secondary project control standards and procedures, if practical. Otherwise, side traverses should be minimized to no more than two stations and some form of redundancy should be incorporated into the traverse such as locating common points from multiple traverse stations and/or collecting multiple observation sets from each station.

From an angle point in the side traverse you could locate such features as back corners of property lines (if needed), fence lines, tree lines, stone walls, wells, septic systems, structures… etc.

The procedure for creating a side traverse is as follows:

Observe temperature and atmospheric pressure and enter this data into the total station to correct the slope distance for atmospheric affects.

Account for prism offset in all distance measurements in the instrument settings.

A backsight of known azimuth should be used. Backsight and foresight targets should be tripod mounted.

Measure horizontal angles two times in sets of direct and reverse attitudes (2 D&R). The suggested procedure is to:

1. sight the backsight with telescope direct
2. turn the angle right to the foresight
3. plunge the telescope and re-sight the foresight with the scope reversed
4. turn the angle right to the backsight

This is one D&R.

The sum of the direct and reversed horizontal angles of a single set of angles should not deviate from 360° by more than 5.0 seconds. Re-observe, rejecting sets, until the two sets agree within this tolerance.

For total station instruments that include the capability, the vertical indexing initialization procedure should be checked at the beginning of each day.

Measure zenith angles used to reduce slope distance to its horizontal component in both the direct and reversed attitudes.

The sum of the direct and reversed zenith angles of a single set of angles should not deviate from 360° by more than 10.0 seconds. Observe, once again, the rejected sets until the two sets agree within this tolerance.

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Measure all baseline distances electronically from both ends of each line.

The slope distances (between adjacent control points) from forward and backward measurements should not differ by more than the amount that the precision of the EDM device predicts.

For locating points from the side traverse set up the total station on an angle point in the side traverse and follow the procedures describes in Sections 12.4.1.1 and 12.4.1.2 above.

12.4.3 Linear Feature Location Procedures

Linear features shall be created from Point features for all existing linear features. Surveyors should use mapping control coding in order to store point features into an alignment definition. Sufficient point density should be gathered in order to meet the positional accuracy standards as specified above in section 12.2.2

12.5 SURVEY RECORDS

12.5.1 Research Records

Any reference materials such as deeds, map computations, survey notes, and base plots of property deeds, used for the ROW survey, shall be provided to the Regional ROW Mapping group. The material to be presented could include the following:

A. A booklet or file containing deeds, cited easements, survey maps, and highway boundary and property line information necessary for the project. The booklet or files will have a separate section for each property owner and organized according to the tax map number. The booklet will include:

- A Table of Contents itemizing material in the booklet or file.
- Copies of all relevant Tax Maps
- Sections containing the following information:
  1. appropriate deeds and cited easements
  2. copies of any available survey maps related to the property
- list of coordinates corresponding to all the point numbers used on the project plan to show ROW monuments, iron pins and other property line documentation.

B. A Tax Map showing the location and point numbers used for ROW monuments, iron pipes, and other property line documentation.
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12.5.2 Field Notes
Field notes including raw observations, feature coding, control coding, and attribute information shall be submitted to the Regional Land Surveyor for each ROW Mapping survey in ascii.txt format.

12.6 REFERENCES
NYSDOT ROW Mapping Procedure Manual