



By Joel Leininger, LS

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Prioritizing Coordinates

Of the various title elements presenting themselves to the retracement surveyor, coordinates are the least understood by non-surveyors.

Perhaps this is because coordinates are relative newcomers to the retracement party, their use not having become widespread in published surveying writings (and thus in title documents) until the 20th century. Nevertheless, they are here to stay, for reasons discussed below, and their proper role in retracement deserves consideration. I don't know of any case law anywhere directly addressing the proper position of coordinates in the Order of Priority, but given some analysis we can deduce where they fit into that list. Here's the executive summary: they belong at the bottom.

That may come as a surprise to some. Coordinates are, after all, the language by which most new technology speaks with respect to spatial relationships. All computer-based mapping systems use coordinates to specify the position of the elements mapped. All surveyors use either assumed coordinate systems or governmentally-established coordinate systems for their internal use on projects of any size, and recognize the utility provided by them. (This probably accounts for the readiness of some surveyors to adopt them while retracing boundary lines.) To determine the legal weight of coordinates, however, one must consider their certainty as compared with the certainty of the other elements in the list. Let's do that.

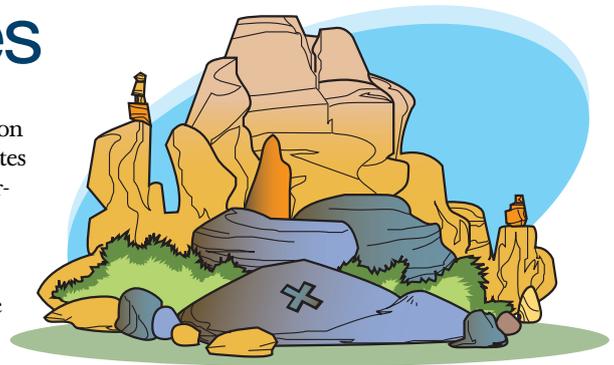
Original Surveys

At the outset it is necessary to reiterate that any analysis of coordinates in this discussion must be restricted to coordinates mentioned in the original survey

(heretofore most frequently on subdivision plats). Coordinates derived from subsequent surveys cannot control earlier surveyed lines for reasons discussed at length in previous issues. Although it is the widespread practice of surveyors to publish coordinates on resurveyed property corners when an established coordinate system is available to the surveyor, should the values published conflict with properly-evaluated evidence of the earlier survey, the coordinates must be rejected and the earlier survey honored. This situation manifests itself most commonly on subdivision plats where coordinate values are noted for the subdivision outline. Unless that outline is being created by that plat, those lines are controlled by earlier title, not by anything specified on the plat.

Coordinates are derived both from courses and distances and from an established Cartesian system having two perpendicular axes. Since courses and distances comprise a necessary component thereof, the reliability problems identified with them must manifest themselves in coordinates. In other words, the product of the two components cannot transcend the individual reliability of those components; it must be susceptible to the same ailments. Therefore, *coordinates cannot but be equal to or below courses and distances in the order of preference.*

One could argue, of course, that courses and distances are not the imprecise wrecks they once were and that they should be promoted to higher in the Order (maybe even to the top, GIS folks?). Indeed, with the precise instrumentation available to all surveyors at, frankly, trivial cost, there is little excuse today for conducting imprecise work. But



that does not alter the fundamental problem: courses and distances are measurements. And all measurements suffer from error. And the courts know that.

It Gets Worse

Coordinates have problems of their own. Since no perfect measurements exist, most surveyors attempt to identify and eliminate by adjustment the errors found in their field work. Several methods by which this can be accomplished are available to the surveyor—each based upon a different assumption and each using a different algorithm for adjustment. The same raw field data for a particular location, then, can result in different coordinate values for the location, depending on which algorithm the surveyor selected for adjustment. Coordinate systems that cover a large area complicate the situation. The intricacies of correctly computing state plane coordinates are not consistently applied from surveyor to surveyor. Plane, rectangular systems that cover areas of any size—states for example—can only approximate the actual ground positions because of the curvature of the earth.

Although nearly all surveyors recognize this, few surveyors apply the necessary corrections to their field measurements to portray coordinated positions accurately. So, the published values that appear to be referred to a particular coordinate system may, in fact, only approximate the actual

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position. Finally, coordinates derived from a state-wide or county-wide system depend partly upon the definition of the axes. Unfortunately, the surveys defining the axes are not perfect and are occasionally adjusted (read: changed) and thus change the coordinates of every survey dependent upon them. We have already lived through a couple of mass revaluations of official coordinate systems. How many more can we expect? I wouldn't hazard a guess, but perhaps one way to cope with them is to remember that property lines do not depend on them anyway.

Area

Would coordinates be superior to area? I don't think so. Although area has suffered as the whipping boy of the Order of Priority for centuries now—and for good reason, historically—the problems associated with it have since diminished to the point of obscurity. With the arrival of inexpensive, reliable hardware and software to assume most of the drudgery of survey computations, differences in area calculations from surveyor to surveyor have been reduced to near non-existence. The mathematics of area computations have been perfected for centuries and now are generally flawlessly carried out in even the cheapest COGO software packages. Given identical angles and distances for a certain figure, nearly every surveyor will now report an identical area. Is there more likelihood that two surveyors would arrive at a different area of a parcel than of different coordinates at each corner? Not if the surveyors both arrived at the same exact angles and distances for the outline (which would only be part of the prerequisite for identical coordinates). Therefore area must be considered more certain evidence than coordinates and the latter must assume the position at the bottom of the order of preference.

Clearly, the use of coordinates does not eliminate retracement problems, although in practice some surveyors rely almost exclusively upon published coordinate values for the reestablishment of property corners. Like the depth of research conducted by the surveyor, this has less to do with law than with economics. Reliance on published coordinates eliminates nearly all analysis time from the retracement, which, in difficult retracements, can approximate the total time spent in the field. Using coordinates exclusively can be *much* less expensive—and wrong. *AS*