

Control Point List

The Georeference window includes a control point list interface that has been carefully designed to allow you to easily customize the information being presented to suit your changing georeference tasks. At any time you can vary the columns being shown, sort the list in ascending or descending order using values in any column, and set the residual units and the coordinate precision to show. Coordinate values can be edited directly in the list, and groups of point records can be simultaneously selected to be disabled, enabled, or deleted.

Choosing Columns

The control point list always includes a pair of columns showing the object coordinates of each point and a pair of columns showing the reference coordinates. You can show or hide optional columns by choosing *Columns* from the Georeference window Options menu or right-click on any column heading and select *Choose Columns* from the popup menu. You can show secondary reference coordinates, point name, elevation, overall residual, and separate X, Y, and Z residuals.



ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
1	27.60	35.08	687050.429	4538164.438	96.776876 N	40.973221 N	0.76
2	504.20	35.78	688658.668	4538203.444	96.757764 N	40.973202 N	1.00
3	494.18	524.58	688700.178	4536592.931	96.757762 N	40.958695 N	1.21
4	24.10	501.60	687088.190	4536556.453	96.776914 N	40.958738 N	1.31
5	255.60	274.84	688785.172	4537379.446	96.767320 N	40.965965 N	1.33
6	514.36	209.51	688719.471	4537638.784	96.757214 N	40.968105 N	0.61
7	340.95	519.34	688193.475	4536580.428	96.763782 N	40.958700 N	1.06
8	399.31	368.51	688363.159	4537095.421	96.761611 N	40.963296 N	1.02
9	138.75	271.65	687472.656	4537371.937	96.772102 N	40.965990 N	0.96
10	26.79	160.86	687060.681	4537734.490	96.776885 N	40.969348 N	0.74
11	354.46	34.11	688166.796	4538192.765	96.763609 N	40.973219 N	1.01
12	429.23	145.88	688430.598	4537834.921	96.760585 N	40.969357 N	0.48

The names of the mandatory columns in the control point list automatically vary depending on the type of object you are georeferencing and the coordinate reference system (CRS) being used as the reference. The input coordinate columns are named Column and Row for raster objects (as in the example illustrated above) and Object X and Object Y for geometric objects (vector, CAD, shape, and TIN). The reference coordinate columns are named Easting and Northing for projected reference systems (as above) and Longitude and Latitude for geographic coordinates. You can choose to show additional columns as illustrated below.

You choose the Coordinate Reference System (CRS) for the secondary reference coordinates by selecting Secondary CRS from the *Options* menu, which opens the standard Coordinate Reference System window. The default secondary CRS is WGS84 / Geographic. The names of these columns vary depending on the CRS selected.

ID	Name	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)	Residual X (c)	Residual Y (c)
1	Cliffridge Pk 1	1007.02	1204.88	477187.197	3635574.983	117.245817 W	32.858033 N	0.67	0.17	-0.65
2	Cliffridge Pk 2	1218.76	1421.28	477251.042	3635508.321	117.243133 W	32.857453 N	0.77	0.42	-0.64
3	Crosswalk Moonridge	3754.18	1418.52	478010.429	3635508.486	117.235017 W	32.857450 N	1.64	-0.57	1.53

Sorting the Control Point List

By default the control point list is sorted in ascending order downward by the control point IDs. You can sort the list by any column's values (such as Residual or Name) by right-clicking on the column heading and choosing *Sort Ascending* or *Sort Descending*, or simply left-click on the column heading. The column on which the current sort order is based and the sort direction are indicated by a small black arrowhead to the left of the column name. Left-clicking the heading of the current sort column inverts the sort order.

the precision (number of decimal places) to show for all coordinate columns from the Options menu.

Selecting Control Point Entries

The Georeference process allows you to perform various actions on one or more control points selected from the control point list, as described below. To highlight and select any single entry in the control point list, simply left-click on any of its fields. You can select more than one entry by holding down the control key while selecting individual entries or hold down the shift key to select a contiguous range of entries.

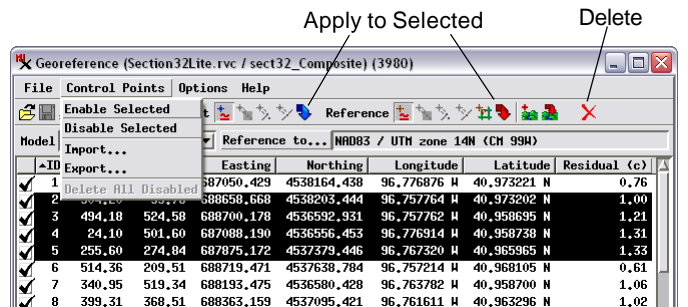
The Control Points menu provides options to enable and disable all selected points (see illustration below). The Delete icon button on the Georeference window's toolbar also applies to all selected records. The Input and Reference toolbars on the Georeference window include controls to estimate coordinates from the model and to snap to elements of a reference geometric object or map grid (see the Technical Guide entitled *Georeference: Snap Control Points to Elements or Reference Grid*); each of these toolbars also has an icon button to apply the selected action to all selected points.

ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
19	255.25	476.59	687902.457	4536703.971	96.767201 N	40.959879 N	1.60
5	255.60	274.84	687875.172	4537379.446	96.767320 N	40.965965 N	1.33
4	24.10	501.60	687088.190	4536556.453	96.776914 N	40.958738 N	1.31
3	494.18	524.58	688700.178	4536592.931	96.757762 N	40.958695 N	1.21
13	497.38	370.29	688689.473	4537104.780	96.757733 N	40.963305 N	1.10
7	340.95	519.34	688193.475	4536580.428	96.763782 N	40.958700 N	1.06
8	399.31	368.51	688363.159	4537095.421	96.761611 N	40.963296 N	1.02
11	354.46	34.11	688166.796	4538192.765	96.763609 N	40.973219 N	1.01

Control point list from the illustration at top right of page but sorted in descending order by Residual column. The small arrowhead next to the column name indicates the current sort field and order.

Units and Precision

The Georeference window's Options menu allows you to choose the units to show in the control point list for elevation (meters or feet) and residuals. Unit options for residuals are object coordinates (cells for image input) or the distance unit associated with the reference CRS (arcsec for a geographic CRS). You can also choose



A range of control point entries selected using the Shift key.

(over)

Editing Values in Coordinate Fields

You can edit control point coordinate values (input and reference) directly in the control point list when you are adding or editing control points. With the desired record selected, left-click again in the coordinate field you wish to edit. A box with no background highlight appears around the active field. You can then left-click within the field to place the cursor, click and drag to select a range of characters to replace, and so on. When you have finished editing the value, select another field to edit or press Enter or Return key. When you have finished editing fields in a particular entry,

ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
1	27.60	35.08	687050.429	4538164.438	96.776876 W	40.973221 N	0.76
2	504.20	35.78	688658.668	4538203.444	96.757752 W	40.973202 N	0.99
3	494.18	524.58	688700.178	4536592.931	96.757762 W	40.958695 N	1.21
4	24.10	501.60	687088.190	4536556.453	96.776914 W	40.958738 N	1.32
5	255.60	274.64	687875.172	4537379.446	96.767320 W	40.965965 N	1.32

To edit the value in a coordinate field, first left-click on the desired control point entry, then left-click on the field and begin editing. After editing the desired fields, press the Apply button to accept the changes.

ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
1	27.60	35.08	687050.429	4538164.438	96.776876 W	40.973221 N	0.76
2	504.20	35.78	688659.668	4538203.444	96.757752 W	40.973202 N	0.99
3	494.18	524.58	688700.178	4536592.931	96.757762 W	40.958695 N	1.21

press the Apply icon button on the Georeference window's toolbar to apply the changes (see illustration below left). Alternatively, simply select another control point entry and you are prompted whether to accept the changes made to the previous entry.

Color Coding of Coordinate Values

Coordinate values in the control point list are automatically color-coded to indicate the source of the value. Black is used for coordinates that you have entered manually or that result from your use of one of the graphical tools (crosshair or tiepoint). Points read from a previously stored georeference subobject are also shown in black. Coordinates estimated using the Estimate from Model mode or one of the snapping modes are shown in color. A description of the coordinate origin appears in a ToolTip when you hover the mouse cursor over a coordinate field, as illustrated below.

ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
2	361.00	0.00	343605.592	162448.720	103.249705 W	42.750133 N	0.19
3	361.00	488.00	343084.325	148550.478	103.249585 W	42.624930 N	0.12
4	0.00	488.00	332803.066	148936.137	103.374999 W	42.624796 N	0.22
5	142.38	205.74	337187.082	156836.921	103.325363 W	42.697420 N	0.87
6	260.05	265.44	340452.296	154992.577	103.284676 W	42.681971 N	0.19

Predicted from Model Solution

ID	Column	Row	Easting	Northing	Longitude	Latitude	Residual (c)
2	361.00	0.00	343605.592	162448.720	103.249705 W	42.750133 N	0.19
3	361.00	488.00	343084.325	148550.478	103.249585 W	42.624930 N	0.12
4	0.00	488.00	332803.066	148936.137	103.374999 W	42.624796 N	0.22
5	142.38	205.74	337187.082	156836.921	103.325363 W	42.697420 N	0.87
6	260.05	265.44	340452.296	154992.577	103.284676 W	42.681971 N	0.19

Predicted from Model Solution; Snapped to Nearest End or Point

Coordinate field values are color-coded by the origin of the value.

