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City of Seattle Contract Surveying Standards

Revised 1-05-18

1. GENERAL

1.1. **City of Seattle Survey Contracts – Applicability.** Work consisting of the Practice of Land Surveying performed under contract to Seattle Public Utilities (SPU), Seattle City Light (SCL), Seattle Parks & Recreation (SPR) or the Seattle Department of Transportation (SDOT) shall comply with all standards in this document.

1.2. **Supervision and Responsible Charge.** Work consisting of the Practice of Land Surveying performed for the City of Seattle shall be done by or under the direction of a Surveyor licensed to practice in the State of Washington, and shall conform to all Revised Code of Washington Statutes and Washington Administrative Codes pertaining to surveying and engineering.

1.3. Horizontal and Vertical Datum

1.3.1. **Horizontal Datum.** All survey work (including but not limited to, mapping, platting, planning, design, right-of-way surveys, and construction surveys) shall be NAD83 as officially adjusted and published by the National Geodetic Survey of the United States Department of Commerce or as established in accordance with chapter [58.20 RCW](#). The datum tag and coordinate epoch date shall be reported on all documents prepared, which show local geodetic control. See National Geodetic Survey ([NGS](#)) website for most current datum. Units shall be in U.S. Survey Foot.

1.3.2. **Vertical Datum.** All survey work (including but not limited to mapping, platting, planning design, right-of-way surveys, and construction surveys) shall use the most current NGS North American datum. See [NGS](#) website for most current datum.

1.4. **Monuments Disturbed, Destroyed, Removed or Replaced.** The Consultant shall be responsible for referencing and replacing all monuments that may be disturbed, destroyed or removed by the project, and shall file an application for permit to remove or destroy a survey monument with the Washington State Department of Natural Resources, pursuant to [58.24.040\(8\) RCW](#). A copy of the approved permit and the subsequently approved completion report will be sent to the Chief Surveyor of SPU. For work performed for SPR, copies should be sent to the Chief Surveyor for SPR.

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1.5. **Review.** The Seattle Public Utilities Survey Section may, at their discretion, have ten working days to review all information submitted for conformance to this attachment before awarding payment of the contract.

2. SURVEY STANDARDS

- 2.1. **Accuracy Standards.** The maximum linear error of closure for all traverses shall be 1:10,000, with a maximum angular error in seconds of $10\sigma N$, where N = number of angles in the closed traverse for conventional traverse. All terrestrial traverses shall be closed or start and end on two points with known coordinates. For GPS control networks, the Federal Geographic Data Committee [STD-007.2-1998](#) guidelines shall be followed meeting 2-centimeter accuracy.
- 2.2. **Horizontal Control.** GPS control networks, and traverses utilized to establish project control shall use the [Washington State Reference Network \(WSRN\)](#). A statement of accuracy shall be placed on the plans.
- 2.3. **Vertical Control.** Project site benchmarks shall be established by measurement from *two local benchmarks* that are listed at [Washington Geodetic Survey \(GSOW\)](#)
- 2.4. **Procedural Requirements.**
- 2.4.1. **Third Order procedural requirements,** as specified by the Geospatial Positioning Accuracy Standards by the Federal Geographic Data Committee (www.fgdc.gov) shall be followed for Project Control, Supplemental Control, Photo Control, Construction Surveying Control, Topographic Surveying Control, and Major Structural Points.
- 2.4.2. **Second Order procedural requirements,** as specified by the Geospatial Positioning Accuracy Standards by the Federal Geographic Data Committee (www.fgdc.gov) shall be followed for extending vertical control and for establishing and maintaining vertical control.
- 2.5. **Codified Standards and Requirements.** All standards or requirements concerning survey practices not covered in this document shall follow the Revised Code of Washington and the Washington Administrative Code.

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3. SURVEY REQUIREMENTS

3.1. Field Notes.

3.1.1. **Field Books.** All survey notes for the project shall be taken on hardbound surveyor's field book(s). Digital copies (pdf or equivalent) of survey notes pertaining to the job shall be delivered to the City of Seattle as part of the overall project closeout.

3.1.2. **General Notations.** Pages shall be numbered consecutively, beginning with the number 1 (one) on the fourth page. The title showing the location and limits (i.e. street name and cross streets), and the type of the work being done (i.e., topography, traverse, levels, etc.) shall be placed at the top of the left-hand page at each new location and/or phase of the project. The date, weather (temperature, barometric pressure, humidity), the name of the persons performing the work and the instrument used shall be placed on the top of the right-hand page.

3.1.3. **Horizontal Control Notations.** Horizontal control shall be noted in the field books provided. Horizontal control notes will include a drawing showing the location of the control, a north arrow, and the designation of the control points. All monuments, corners and other control points, found or set, shall be described in detail in the notes. Horizontal angles, vertical or zenith angles, slope distances, height of target and the instrument height shall be recorded in the field books. A minimum of one direct and one indirect angle shall be measured to each control point when terrestrial methods are used.

3.1.4. **Control Designation Convention** (see Section 4)

3.2. **Project Control.** At least two benchmarks will be set on the site and shown on the survey. For surveys along streets, benchmarks will be placed at a minimum of one every 1,500 feet, with a minimum of two benchmarks set on site. For site surveys, at least one benchmark shall be set on site for every 5 acres, with a minimum of two benchmarks set on the site.

3.3. **Vertical Control Work.** The unadjusted rod readings, the raw elevations, the closing error and the adjusted elevations of any level run or level loop shall be provided either electronically or in the field books provided. All benchmarks set by the Consultant shall be listed and described in the field book. The description, elevation, point designation, name, and City of Seattle source, e.g., field book, database, etc., shall be identified for all benchmarks used.

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For GPS derived heights, see “Converting GPS Height into NAVD88 Elevations with the GEOID96 Geoid Height Model” found at the [NGS](#) website.

3.4. Information and Files Submission. All available survey information and files pertaining to the project shall be submitted to the Seattle Public Utilities Survey Section prior to design or at the 30% design review. All files pertaining to SPU\SDOT\SCL projects shall be turned over to the Survey Manager or Chief Surveyor of Seattle Public Utilities on a USB Flash Drive, or equivalent, before the final payment of the contract is made.

For SPR projects, data shall be turned over to the Chief Surveyor of Seattle Parks & Recreation.

3.4.1. Surveyor’s Notes

3.4.1.1. **Horizontal Control Ties.** The horizontal control to establish ties to the datum shall be shown on the plans and in the surveyor’s notes.

3.4.1.2. **Vertical Control Ties.** The benchmarks used to establish ties to the datum shall be shown on the plans and in the surveyor’s notes.

3.4.2. **Digital File Submissions.** The Consultant shall provide digital copies of all data collection files (original and edited) as well as coordinate files used on the project.

3.4.3. **Deliverables.** The Consultant shall include with their deliverables, a paper copy of the final survey, map or legal description, with an original wet stamp and signature from the land surveyor of record for the project.

3.4.4. **Adjustment Reports.** Traverse Adjustments Reports, Digital Level Run Reports, and GPS Network Adjustment Reports will be submitted with other data.

3.4.5. **Points File.** An electronic, comma delimited coordinate text file of all points shall be provided in the following format:
point number, northing, easting, elevation, descriptor

3.4.6. **GPS Data Files.** The raw GPS data used for the project shall be submitted in either Trimble GPS format or Rinex export format.

3.4.7. **CAD Files.** The consultant shall provide drawing files in the most current SPU/SDOT/SCL/SPR approved format.

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3.4.7.1. **CAD Standards.** All drawings must comply with City of Seattle CAD Requirements. The City of Seattle CAD Requirements may be obtained on the City of Seattle Web site:

http://www.seattle.gov/util/Engineering/CAD_Resources/

3.4.7.2. **Control Table.** The survey drawing shall contain a Vertical and Horizontal Control table listing the point number, elevation, description and location of all site benchmarks.

3.5. **Descriptor & Line Work Codes.** The descriptor codes and figure prefix library for all surveyed points and lines shall follow the City of Seattle standard for symbols and line work, which can be obtained from the City of Seattle Web site:

http://www.seattle.gov/util/Engineering/CAD_Resources/

3.6. **Survey Control Plan Drawing Requirements.** The Consultant shall show all monuments, the geometry of, and the references used to establish the right-of-way, lines referencing the right-of-way, property lines, easements and any rights in real property shown. Survey control and boundary information shall be shown independently of other plan, design or topographic information (on a separate sheet), and shall contain the surveyor's original stamp, wet signature, contact information and the date.

4. CONTROL DESIGNATION CONVENTION FOR FIELD NOTES ON CITY OF SEATTLE PROJECTS

Designations for control monuments and references to control in notes provided to the City of Seattle will follow the following convention:

4.1. **Designations in Field Books.** All designations will reference the field book number and page in the following format: Nnnn-pg-pt#, where the first number represents the field book number, a hyphen, then the page number (e.g. 3674-03-01, 2567AA-22-03)

4.2. **Multiple entries on a page.** Where more than one monument is noted on a page, the next chronological number will be added to the designation for each (e.g. 3674-01-01, 3674-01-02, 3674-01-03).

4.3. **Existing control references.** When referencing control from an existing City field book, the same convention will be followed as for a new control designation.

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4.4. **New values on existing control.** When new horizontal and/or vertical values are being established for an existing monument, a new designation will be created with a reference to the existing record. (e.g., 3674-03-02 (ref 2675BB-34))

4.5. **Stamping.** Designations stamped on monuments will be noted in the field notes in quotes following the designation. (e.g. 3674-01-01 "3674-01-01") Existing stamped designations will follow the same convention (e.g. 3677-34-02 "AB067"). Also note the city/county/agency/firm name (if known) in the description.

4.6. **Electronic point file references.** If a reference to an electronic point number is made in the field book, add this in light pencil after the designation and circle the number. The electronic point number will not be used as a primary monument designation. An electronic point file number serves only as a supplement to a noted designation as outlined above.

4.7. Examples

3674-03-01 (ref 2765-31) "TC03" 316
Found 2-1/2" brass cap in Seattle Water Department Case...etc *In this example a city monument was found from a description in book 2765 that was stamped with a project designation of "TC03". A new NAVD88 elevation was established in the current survey by differential leveling. The survey point file number is 316.*

3677-11-03 "3677-11A" 121
Set 2" brass cap in conc. sidewalk...etc
In this example a new monument was set for a project primary control and stamped accordingly, the point file number is 121.

3677-11-02
Set HTK...etc
A hub and tack set for the same project as topo control noted on the same page as the preceding example.