Path and Site Surveys

The initial step in the design of a microwave radio link or the planning of a microwave relocation project is the path survey. The purpose of the path survey is to accurately identify and locate all critical points and potential obstructions between the two sites and to determine the antenna centerlines that are required to meet the established path clearance criteria. Microwave Networks has a staff of transmission engineers and survey crews to conduct path surveys.

Prior to beginning the physical path survey, computer analysis is conducted for the proposed path. Preliminary site coordinates are entered and preliminary path profiles are generated from USGS 1/3 arc second Digital Elevation Models (DEMs). This data is then used to calculate preliminary antenna centerlines and critical elevation points which require investigation and confirmation during the actual survey.

During the physical survey, the path is traversed and the horizontal and vertical positions of the proposed radio sites, critical elevation points, and potential obstructions are accurately identified using a differential global positioning system (DGPS) and a laser range finder. This information is digitally recorded on a path survey data collector.

To prepare the path survey report, the surveyed coordinates are scaled and plotted on USGS 7.5 minute (1:24,000) quadrangle maps. A line is drawn connecting the radio sites and all critical points or potential obstructions are indicated as determined by the survey. Based upon the as-surveyed path profile, antenna centerlines are selected to satisfy two sets of clearance criteria: F1 @ K=4/3 and 0.3F1 @ K=2/3. An analysis is also performed to determine if potential path reflections might interfere with path performance. Path reliability for a two-way link will be at least 99.9995%.

All of the relevant information gathered during the survey, the path profiles, and the proposed antenna centerlines are compiled into a path survey report. The entire report includes each path for which a survey was conducted and will be delivered within 1 to 2 weeks after the completion of the survey.

In parallel with, or shortly after the path survey, Microwave Networks will conduct site surveys. The purpose of the site survey is to perform a visual inspection of the site and collect information that will be used to finalize the detailed site design and to accurately assess the scope and plan for installation.

Within one week of the completion of the survey, Microwave Networks will deliver the site survey report which details the findings and recommendations.

a. Path Survey SOW

1. Acquire site coordinates and proposed path design from customer.
   a. Create preliminary path profiles (Using NED 1-Arc Second or better terrain data)
   b. Estimate tree heights for the general area for preliminary antenna heights
   c. Determine preliminary antenna sizes based on proposed equipment

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d. Cross check site data with FCC Antenna Structure Registration (If Available)

2. Perform physical path survey
   a. Site Information
      i. Acquire accurate latitude and longitude of site using DGPS or PPGPS
         1. (Accurate to one meter horizontally)
      ii. Acquire accurate ground elevation using Surveyors Reference Maps
         1. (Accurate to 2' elevation AMSL)
      iii. Measure tower data using a surveyors transit and laser measuring devices
         1. (Accurate to 1' vertical AGL)
      iv. Acquire digital photographs;
         1. General Site Pictures

3. Report and Design
   a. Determine desired path design criteria from customer.
   b. Create path profile from measured data.
   c. Determine antenna heights based on provided or agreed upon clearance criteria.
   d. Determine if antenna structures provide for the proposed antenna heights
   e. Adjust antenna heights based on information provided on the structures.
   f. Compile report to include the following data;
      i. General Report
         1. Elevation grid map of the system
         2. Hwy map and atlas of the system
         3. Site antenna heights, transmission line lengths, and frequency summary
         4. DGPS or PPGPS readings and UTM conversions
         5. General scope of work
         6. Proposed equipment summary
         7. Method of survey
         8. Path design criteria
         9. Specific path and site data over-view
         10. Conclusions and contact information
      ii. Path Data
         1. Path profile
         2. Path calculations and reliability worksheets
         3. Antenna clearance report – clearance above terrain obstructions.
         4. Antenna orientation report – up-tilt, azimuths, etc.
   g. Create soft-copy of report with all data used to compile the report and provide link to customer to access and download report.

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