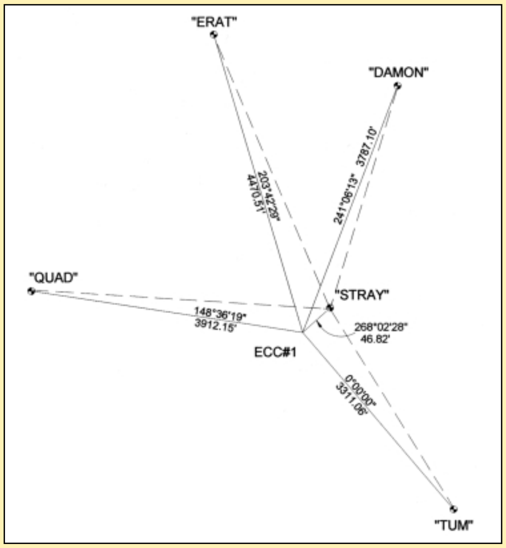
Solution to Problem Number 11



The quick solution is to assume a coordinate for ECC#1 and calculate coordinates for the five stations with the given directions and distances. Then inverse from "STRAY" to the other four points and rotate the answers to make "TUM" the initial, or 0°00'00": with ECC#1 equal to north 5000, east 5000: "QUAD" = N 1660.594, E 7037.960, "ERAT" = N 906.774, E 3202.513,
"DAMON" = N 3169.970, E 1684.413, "STRAY" = N 4998.400, E 4953.207, AND "TUM" = N 8311.060, E 5000.
"STRAY" to "QUAD" = 148°00'42" 3935.37', "STRAY" to "ERAT" = 203°09'53" 4450.43',

"STRAY" to "DAMON" = 240°45'45" 3745.42', and "STRAY" to "TUM" = 0°48'33" 3312.99'

A rotation of 0°48'33" counterclockwise yields 147°12'09", 202°21'20", 239°58'12", and 0°00'00" respectively. The distances do not change.

Alternate Solution to Problem Number 11

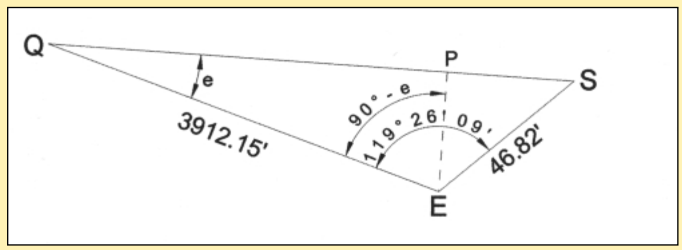
EP = 46.82 cos [119°26'09' – (90° – e)] = QE sin e

46.82[(cos 29°26'09")(cos e) – (sin 29°26'09")(sin e)] = QE sin e

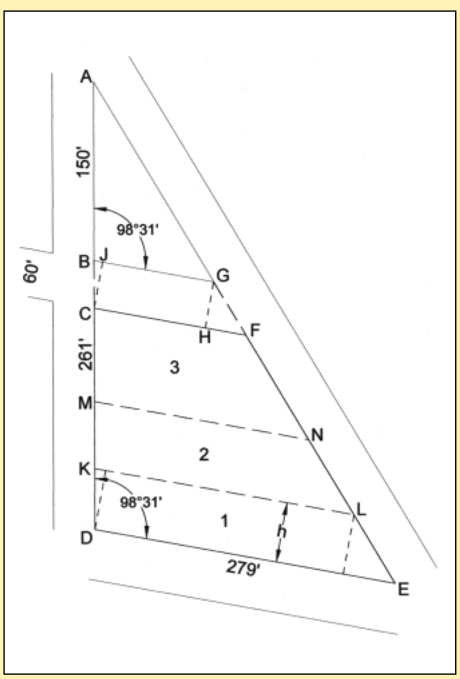
(cos 29°26'09")(cos e) = sin e (sin 29°26'09" + 83.55724)

Dividing the right side by the left side and rearranging, tan e = 0.01036193 and e = 0°35'37"

(This solution shown for "QUAD"-"STRAY"-ECC#1 is valid for "ERAT"-"STRAY"-ECC#1 and "TUM"-"STRAY"-ECC#1) for "DAMON"-"STRAY"-ECC#1:
A point perpendicular to "STRAY" on the line between "ECC#1" and "DAMON" yields an offset of 21.21' at a point 41.74' from "ECC#1" directly from the measured data. The eccentric angle is 0°19'28".



Solution to Problem Number 12



Calculate BC = 60 divided by cos 8°31' = 60.669'
Calculate AE = 582.487' and angle DAE = 28°16'29" and angle DEA = 53°12'31" by Law of Cosines and Law of Sines
Solve for BG = 88.728' by Law of Sines
Calculate CF = BG – BJ + HF = 88.728' – 60 tan 8°31' + 60 tan 36°47'29" = 124.615'
The total area in the block is that of a trapezoid with parallel bases of 124.615' and 279' and a height of 261 cos 8°31' = 258.122', or 52,090.96 square feet, a third of which is 17,363.653 square feet, the area for each lot.
The area of Lot 1 is a trapezoid of height h, with parallel bases of 279' and (279' + h tan 8°31' – h tan 36°47'29") 17,363.653 =

$$\frac{(279 + 279 + h \tan 8°31' - h \tan 36°47'29")\, h}{2}$$

Expanding and rearranging yields: $0.598112803\, h^2 - 558\, h + 34{,}727.306 = 0$
From which h = 67.055', DK = 67.802', EL = 83.733' and KL = 238.893'

Now Lot 2 is also a trapezoid of height h2 and parallel bases of 238.893 and 238.893 + h2 tan 8°31 – h2 tan 36°4729")

$$17{,}363.653 = \frac{(238.893 + 238.893 + h2 \tan 8°31' - h2 \tan 36°47'29")\, h2}{2}$$

from which h2 = 80.871', KM = 81.773, LN = 100.985' and MN = 190.523'.