Grids & Datums

REPUBLIC OF AZERBAIJAN

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"In the ninth century *B.C.*, the seminomadic Scythians settled in areas of what is now Azerbaijan. A century later, the Medes, who were related ethnically to the Persians, established an empire that included southernmost Azerbaijan. In the sixth century *B.C.*, the Archaemenid Persians, under Cyrus the Great, took over the western part of Azerbaijan when they subdued the Assyrian Empire to the west. In 330 *B.C.*, Alexander the Great absorbed the entire Archaemenid Empire into his holdings, leaving Persian satraps to govern as they advanced eastward. Between the first and third centuries *A.D.*, the Romans conquered the Scythians and Seleucids, who were among the successor groups to the fragmented empire of Alexander. The Romans annexed the region of present-day Azerbaijan and called the area Albania. As Roman control weakened, the Sasanid Dynasty reestablished Persian control. Between the seventh and eleventh centuries, Arabs controlled Azerbaijan, bringing with them the precepts of Islam. In the mid-eleventh century, Turkic-speaking groups, including the Oghuz tribes and their Seljuk Turkish dynasty, ended Arab control by invading Azerbaijan from Central Asia and asserting political domination. The Seljuks brought with them the Turkish language and Turkish customs. By the thirteenth century, the basic characteristics of the Azerbaijani nation had been established. Beginning in the early eighteenth century, Russia slowly asserted political domination over the northern part of Azerbaijan,

of flattening $1/f = 299.1528128$. As was common with all of the satellite countries of the former U.S.S.R., the local datums and coordinate systems were replaced by the unified "System 42" with origin at the Pulkovo Observatory where: $\Phi_o = 59°\ 46'\ 18.55"$ North, $\Lambda_o = 30°\ 19'\ 42.09"$ East of Greenwich. The defining azimuth at the point of origin to Signal A is: $\alpha_o = 317°\ 02'\ 50.62"$, and the ellipsoid of reference is the Krassovsky 1940 where $a = 6,378,\ 245$ meters, and $1/f = 298.3$. The "Russia Belts" Grid System is used with the System 42 Datum; identical to UTM except that the scale factor at origin is unity. According to Roger Lott, Chief Surveyor of BP in his document, (*Azerbaijan Coordinate Systems, 27 February 1997*), the local Grid designation of the North component is the X axis, and the X' or Y axis is East. Furthermore, it is referred to as Coordinate System 42 or "CS42." Lott goes on to explain that Zone 8 is used for onshore areas west of 48°E and Zone 9 is used for onshore east of 48°E and the offshore areas of the Caspian Sea. An interesting quirk of this grid is that the zone number is used as the digit in the millions place of the False Easting, quite unlike what is used for UTM.

A secondary coordinate system used in Azerbaijan is referred to as the Coordinate System of 1963 (CS63) and is comprised of 3° wide belts rather than the standard military 6° wide Russia Belts. "Onshore Azerbaijan falls within the Transcaucasian block designated A. Official zone nomenclature

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while Persia retained control of southern Azerbaijan. In the nineteenth century, the division between Russian and Persian Azerbaijan was largely determined by two treaties concluded after wars between the two countries. After the Bolshevik Revolution, a mainly Russian and Armenian grouping of Baku Bolsheviks declared a Marxist republic in Azerbaijan. Azerbaijan was strongly affected by the autonomy that spread to most parts of the Soviet Union under Gorbachev's liberalized regime in the late 1980s. After independence was achieved in 1991, conflict with Armenia became chronic, and political stability eluded Azerbaijan in the early years of the 1990s" (*Library of Congress Country Study, 1994*).

Slightly smaller than Maine, Azerbaijan is bordered by Armenia (566 km), Georgia (322 km), Iran (432 km), Russia (284 km), and by Turkey (9 km) (*PE&RS*, September 2005). The lowest point is the Caspian Sea (–28 m), and the highest point is Bazardüzü Daği (4,485). "The terrain is large, *Kür-Araz Ovalığı* (Kura-Araks Lowland) (much of it below sea level) with Great Caucasus Mountains to the north, *Qarabağ Yaylası* (Karabakh Upland) in west; Baku lies on *Abşeron Yasaqlığı* (Apsheron Peninsula) that juts into Caspian Sea" (*World Factbook, 2010 and NGA Quick Geonames Search, 2010*).

The earliest geodetic position for Baku (*Baki*), Azerbaijan is the Khan's Palace Minaret at $\Phi_o = 40°\ 21'\ 57.90"$ N, $\Lambda_o = 49°\ 50'\ 27.57"$ E and is a 1927 Astro position, courtesy of John W. Hager. The likely reference ellipsoid is the Bessel 1841 where: $a = 6,377,397\ 155$ meters and the reciprocal

within block A is unknown at the time of writing. However the zone covering eastern Azerbaijan has easting (Y) values prefixed by 4. If practice is consistent with that used in CS42, this would be designated CS63 zone A-4 with the zone adjacent to the west designated zone A-3" (*ibid., Lott, 1997*). According to Lott, the transformation in this region **from** System 42 Datum **to** WGS84 Datum can be approximated to an accuracy of 0.5 m to 1.0 m as: $\Delta X = -18$ m, $\Delta Y = +125$ m, and $\Delta Z = +83$ m. A test point is provided from System 42: $\varphi = 39°\ 59'\ 59.998"$ N, $\lambda = 49°\ 05'\ 59.991"$ E to WGS84: $\varphi = 39°\ 59'\ 59.746"$ N, $\lambda = 49°\ 05'\ 59.967"$ E. A final note is that because of uncertainty in the geoid surface over Azerbaijan, errors in ellipsoid height of ±20 meters result from using the above transformation parameters. It is advised that the parameters are not used for 3 dimensional transformations.