

5GA4251
An Archaeoastronomy Site
in Middle Park, CO

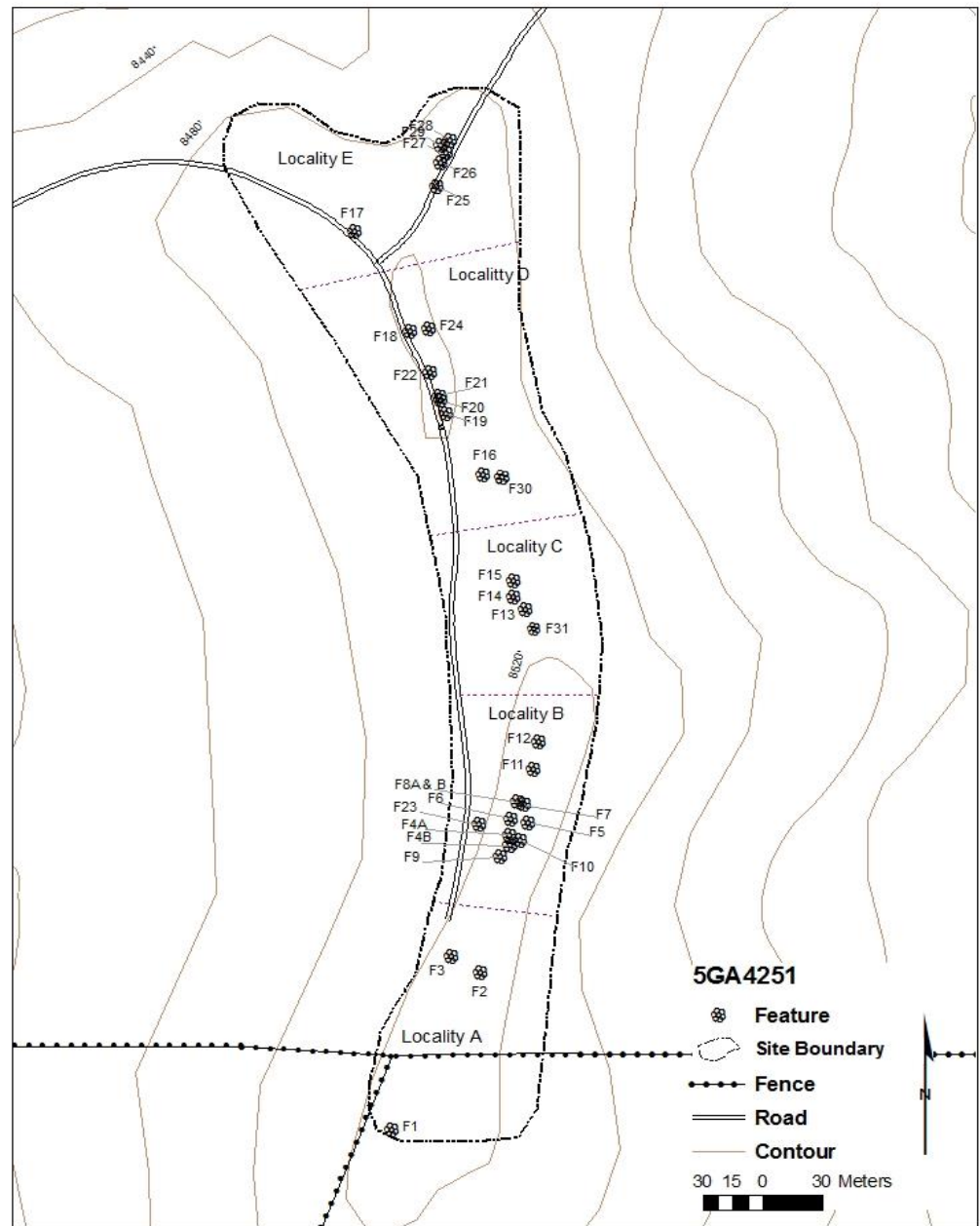


Dominquez Archaeological Research Group

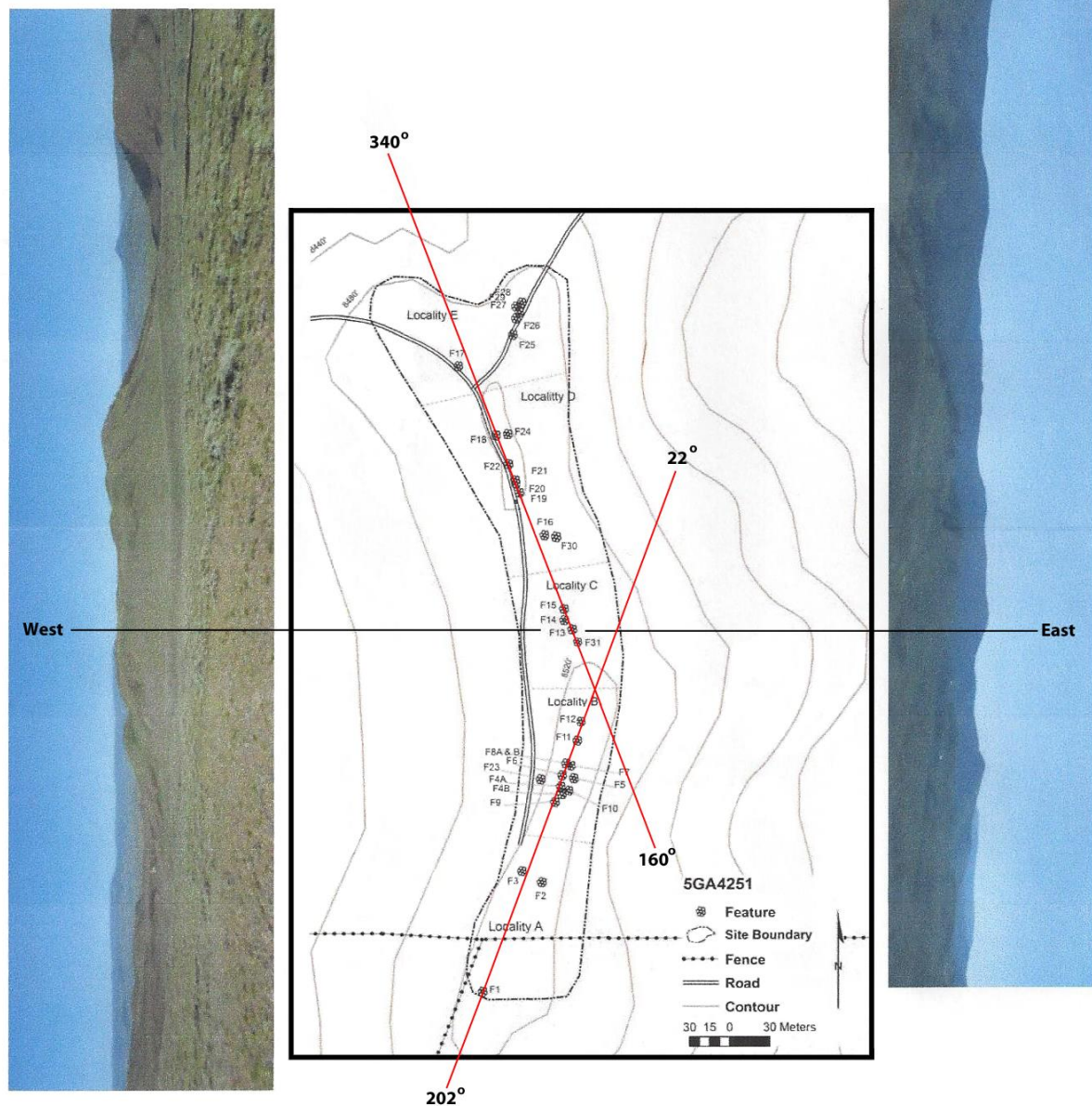
Brian O'Neil
Cheryl Harrison
Holly Shelton

5GA4251

Five localities,
A through E,
with 30 stone
features.



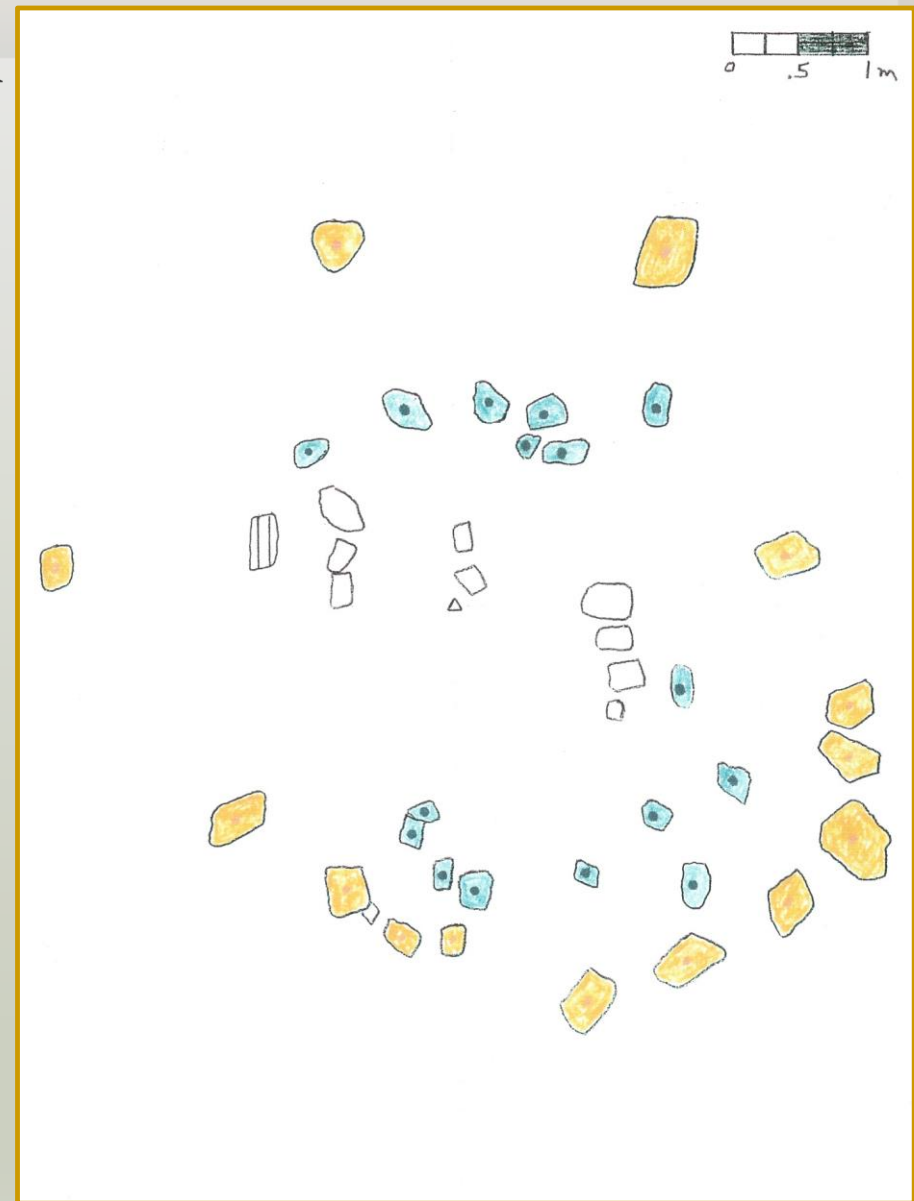
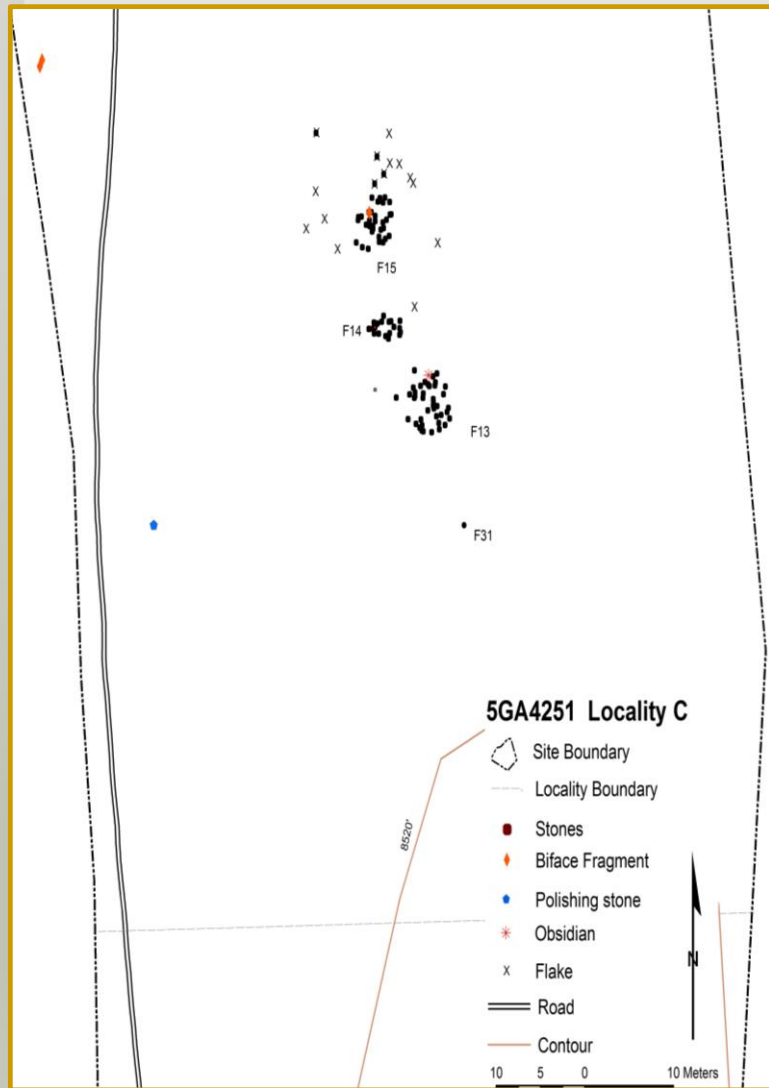
Site Plan Map with East and West Horizons



Methodology

- Features were mapped using a Trimble Geo X-H GPS unit set to NAD 1983 with an accuracy of $\pm 20\text{cm}$, data was processed in ArcMap 10.3. Feature 13 was also mapped using transit and tape.
- Alignments had to have an:
 - initial observation point -- paired or grouped cobbles (cairn) -- within or adjacent to peripheral feature outline;
 - composed of 3 or more cobbles over a minimal distance of 1.5m.
- Azimuth and Axis Orientation was generated from the feature maps using a straight edge across the potential cobble alignment;
 - protractor azimuths were corrected for declination using the UTM grid (north $0^{\circ}51'$ west of TN);
 - fractional azimuths were rounded to the nearest degree for both fore and back sights;
- Alignment relationships to the surrounding terrain were to determine if they represented:
 - Cardinal/intercardinal, Astronomical, or Geonavigational
 - Variable geographical to celestial – Solar horizon transits i.e., equinox/solstice rise/set.
- Alignments were checked against the U. S. Naval Observatory, Astronomical Applications database at 40° latitude with an assumed error of $\pm 2^{\circ}$ of horizontal arc.
- Bilateral symmetry was assumed in pattern recognition of feature outline shape to determined long and cross axis.
 - Long axis is the maximum length with approximately equal areas on each side.
 - Cross axis was measured at 90° from the long axis mid-point.

Site Plan Map of Locality C with Features 13, 14, 15 and 31.

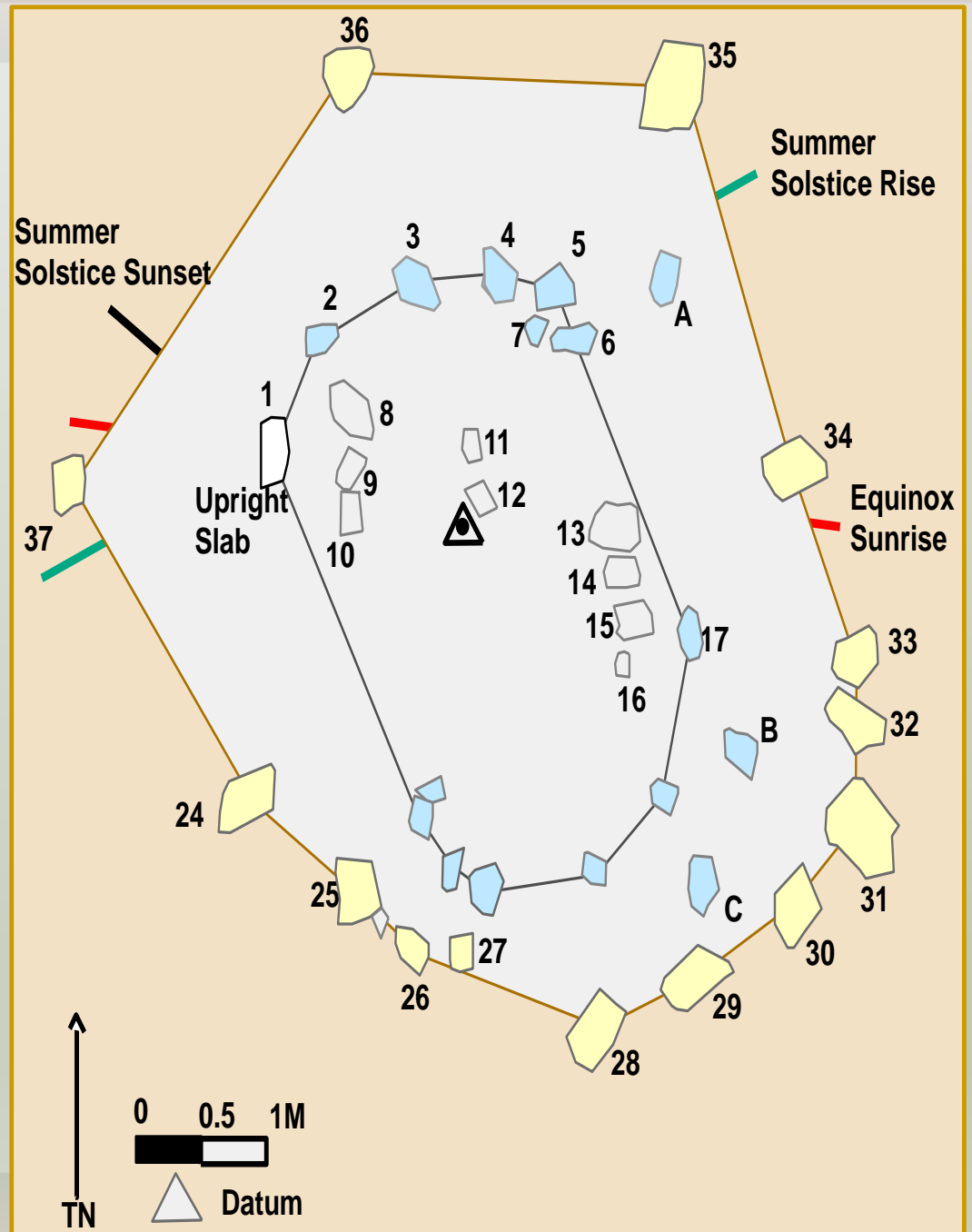


Plan map of Feature 13.

5GA4251 Feature 13

Hypothesized Equinox
Sunrise/Sunset
Alignments.

Actual Sunrise at 93° and
Sunset at 270° .





Predicted Equinox Sunrise looking east across Feature 13.

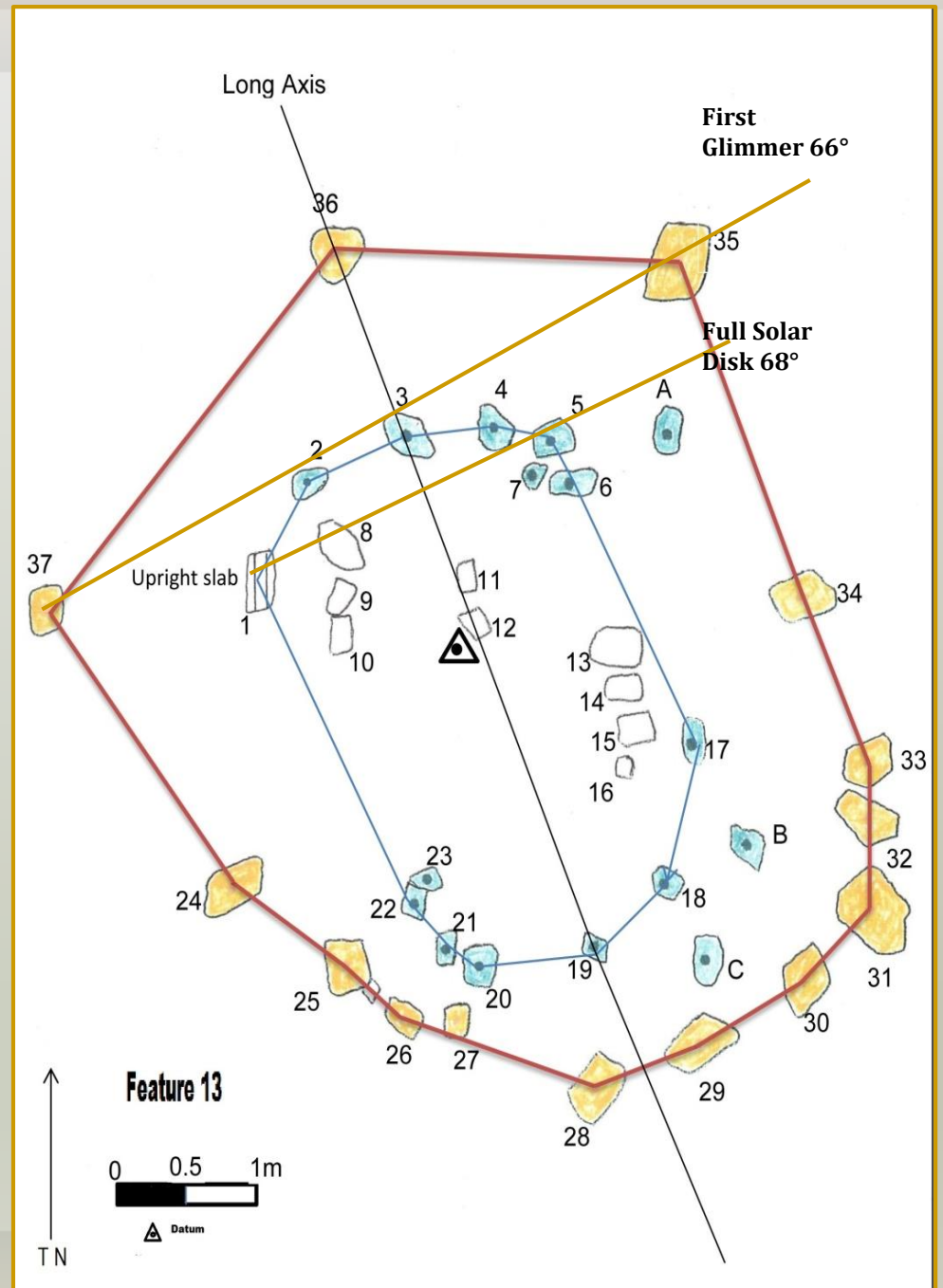
Predicted Equinox Sunset



Western Horizon view from Feature 13.

Feature 13 Cobble Sets for Summer Solstice Sunrise.

Results indicate an “Observer’s Choice” between First Glimmer (66°) and Full Disk (68°).



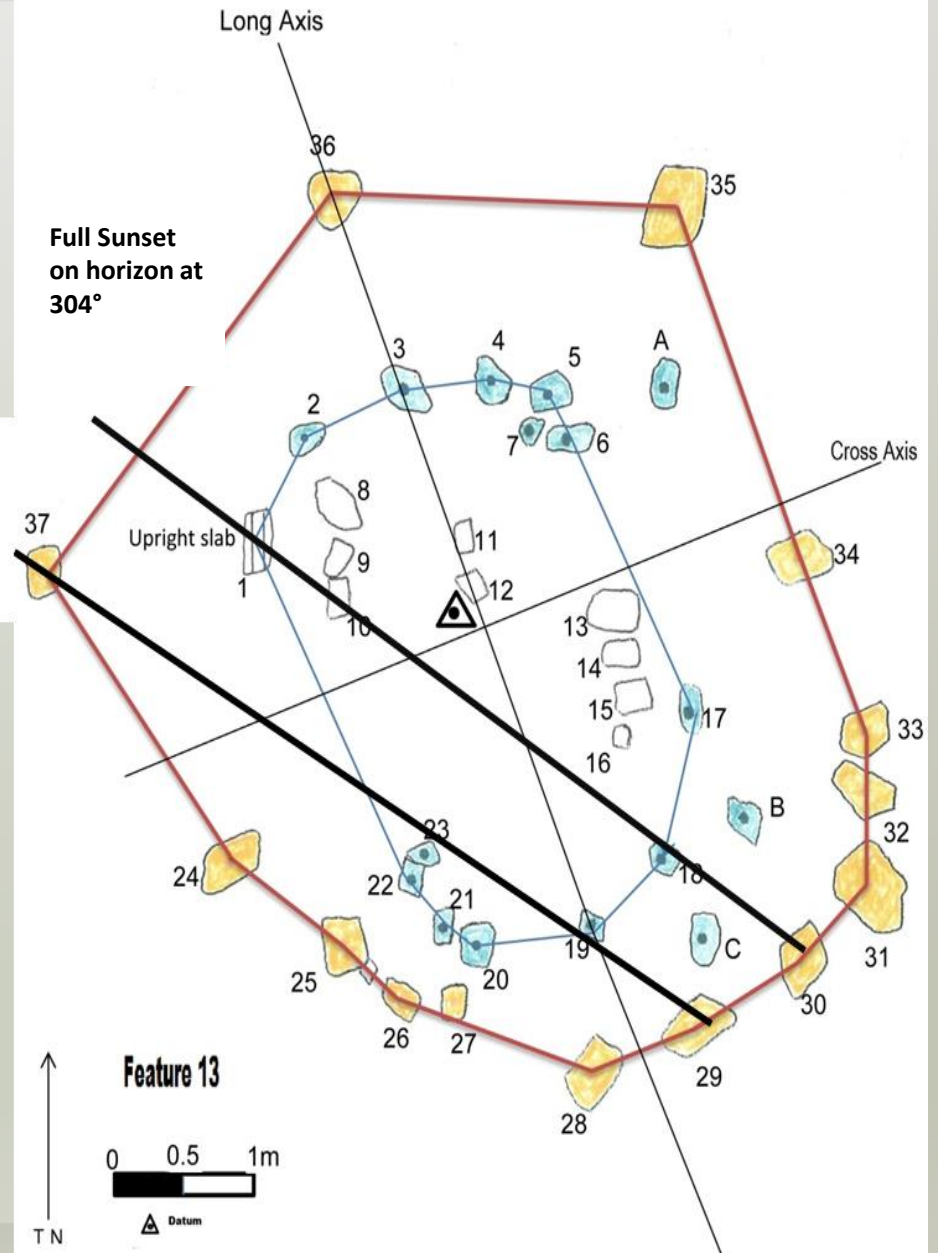


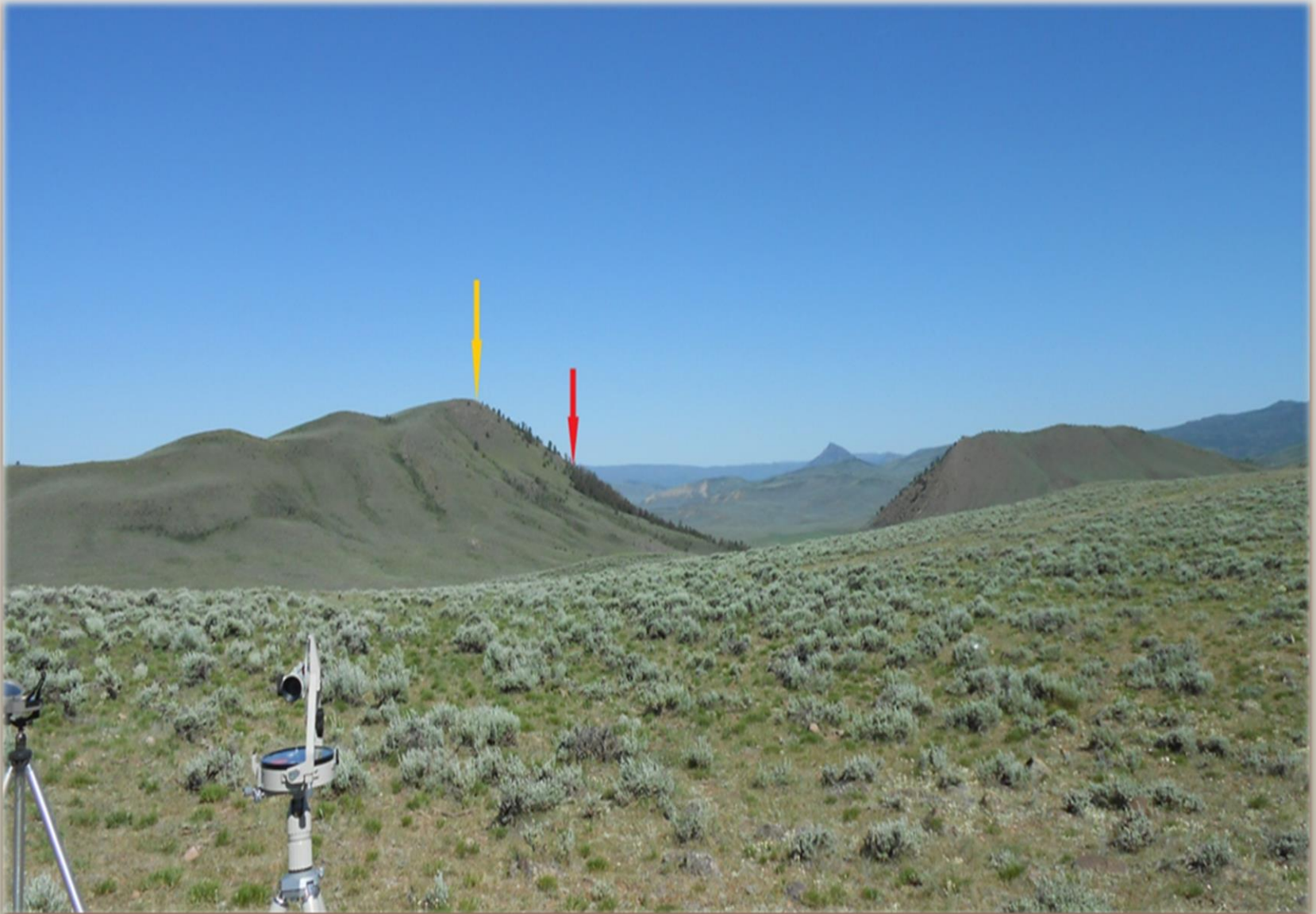
Feature 13 Predicted Summer Solstice Sunrise

Feature 13 Cobble Sets for Summer Solstice Sunset.

Predicted and Actual
Alignments.
Another “Observer’s
Choice” ?

First
contact
with
horizon
at 302°

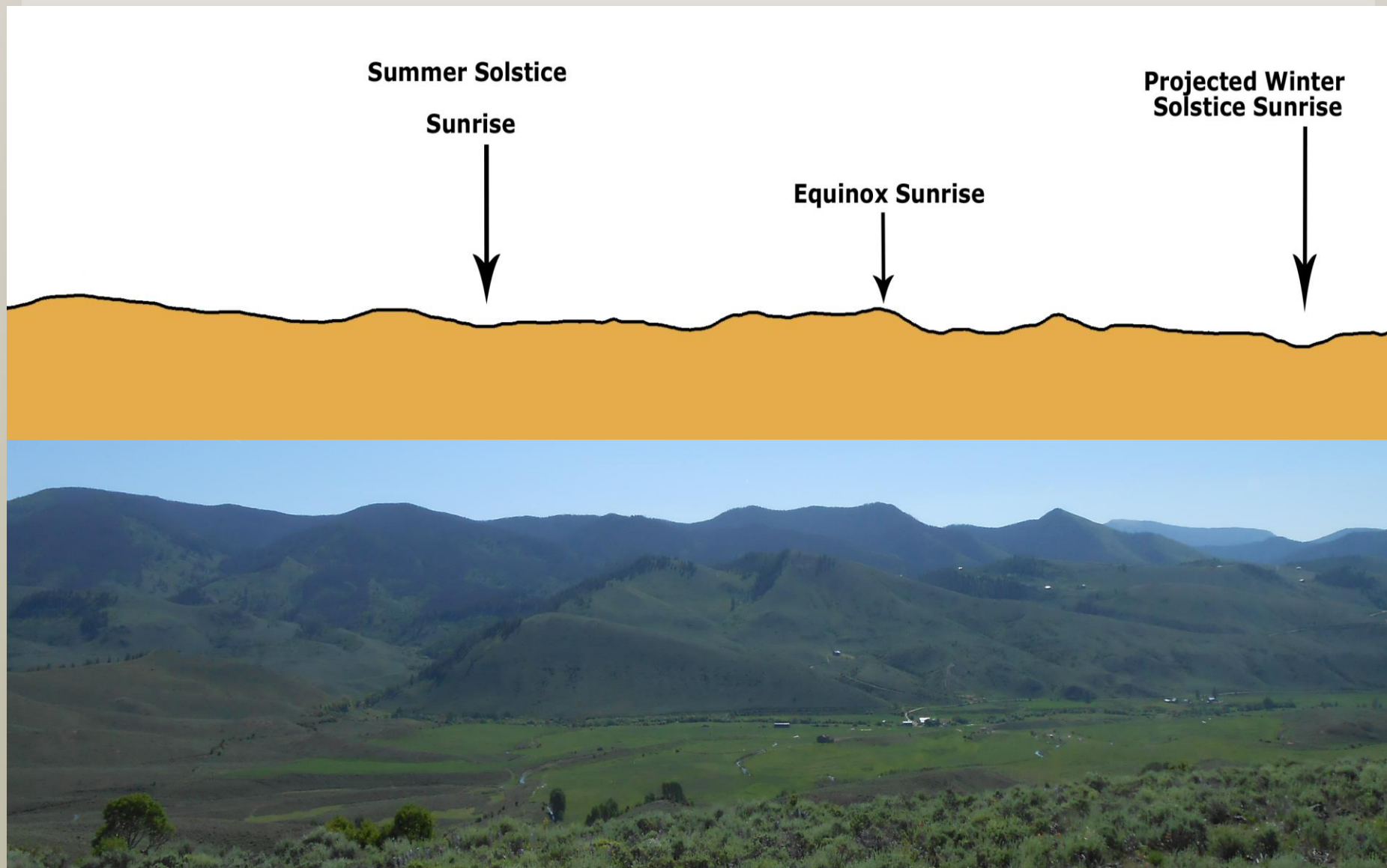




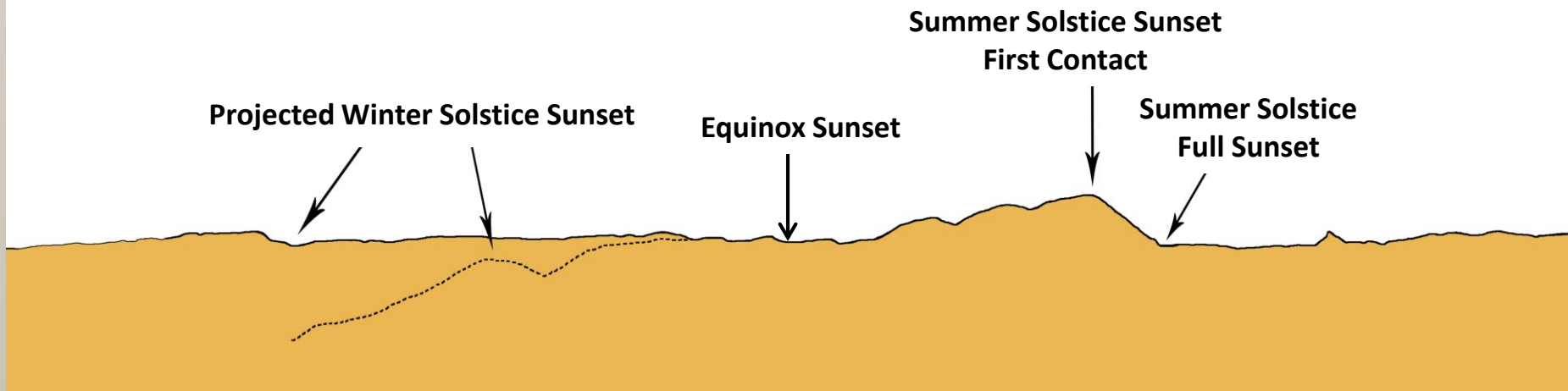
Western Horizon Summer Solstice Sunset
Predictions from Feature 13.

Analysis and Results
Based upon
Direct Observations at Feature 13.



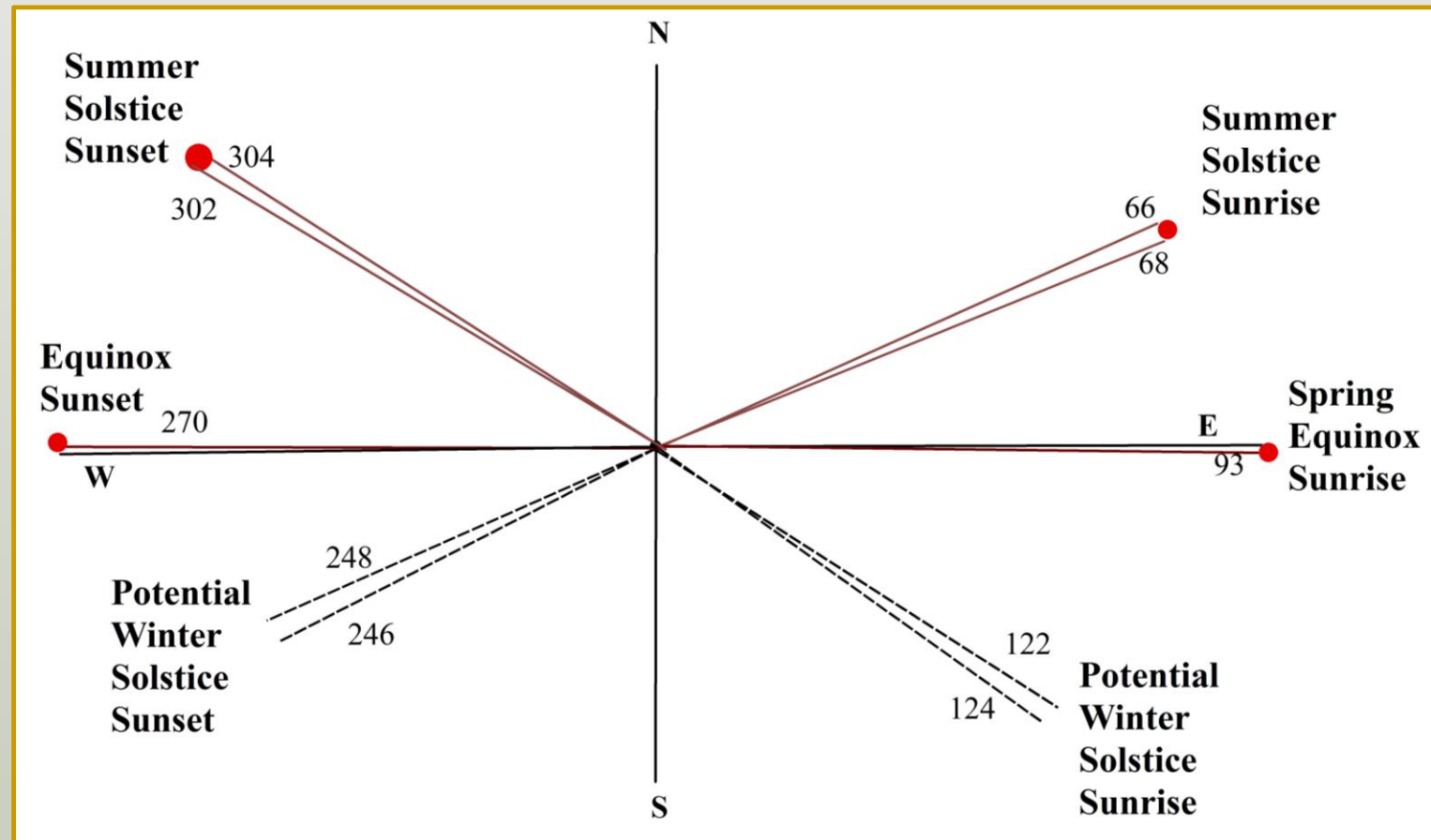


Eastern Horizon from Feature 13 showing horizon calendar.



Western Horizon from Feature 13 showing horizon calendar.

Preliminary Predictive Model for Astronomical Events for Feature 13.

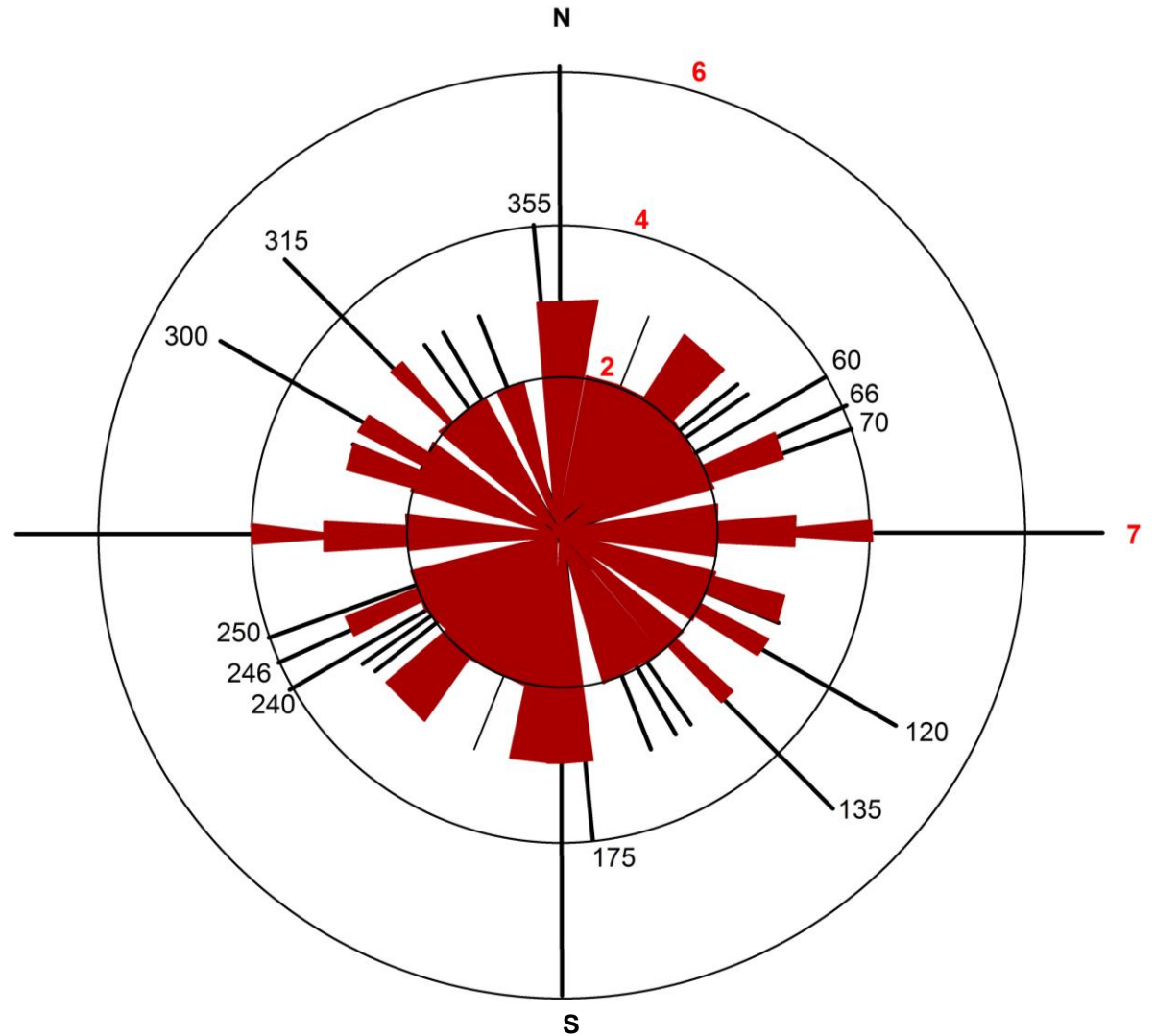


Red dots indicate confirmed field tested events.

Frequency Diagram of Analyzed Azimuths on Cobble Alignments from 23 Stone Features.

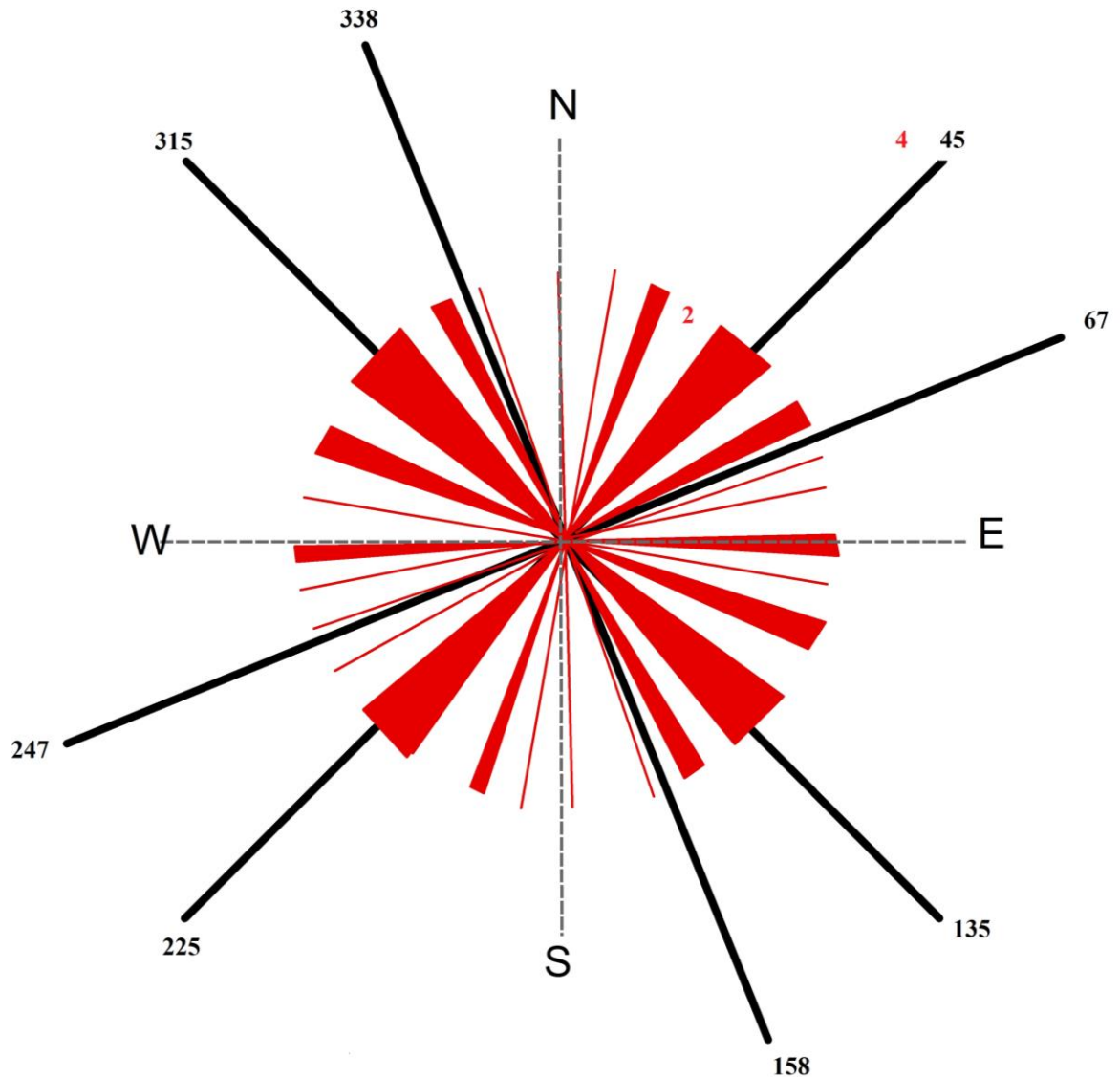
Features: 2, 3, 4A, 4B, 5, 6, 7, 8A, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 22, 23, 24, 29, and 31.

Number of azimuths analyzed = 444



Features: 3, 5, 6, 7, 8A,
9, 10, 11, 13, 14, 16, 17,
18, 22, and 31.

Number of azimuths
analyzed = 72.



Unique features from
5GA4251 which may
represent constellations
or parts thereof.

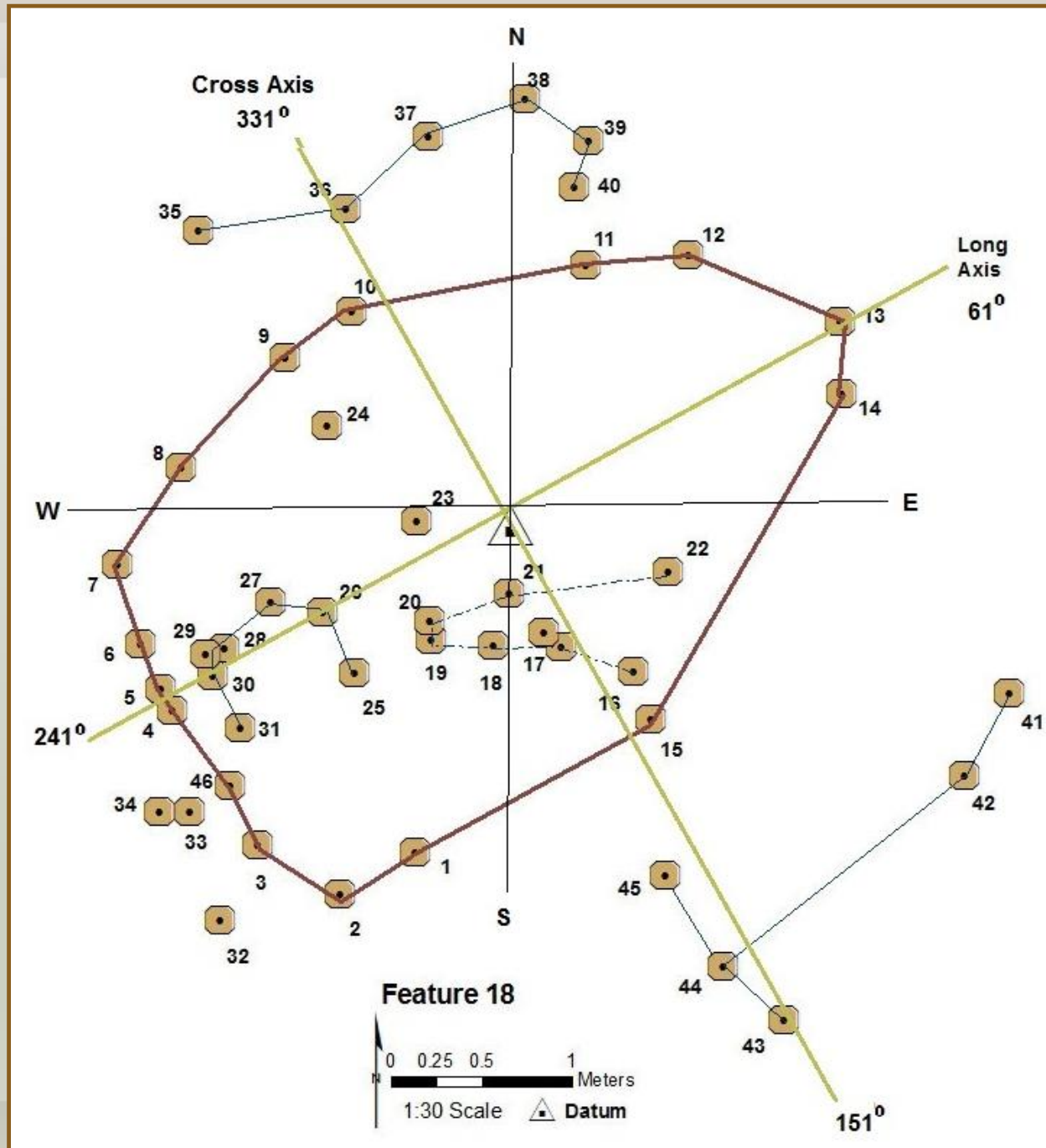
For example at Feature
18 we may have:

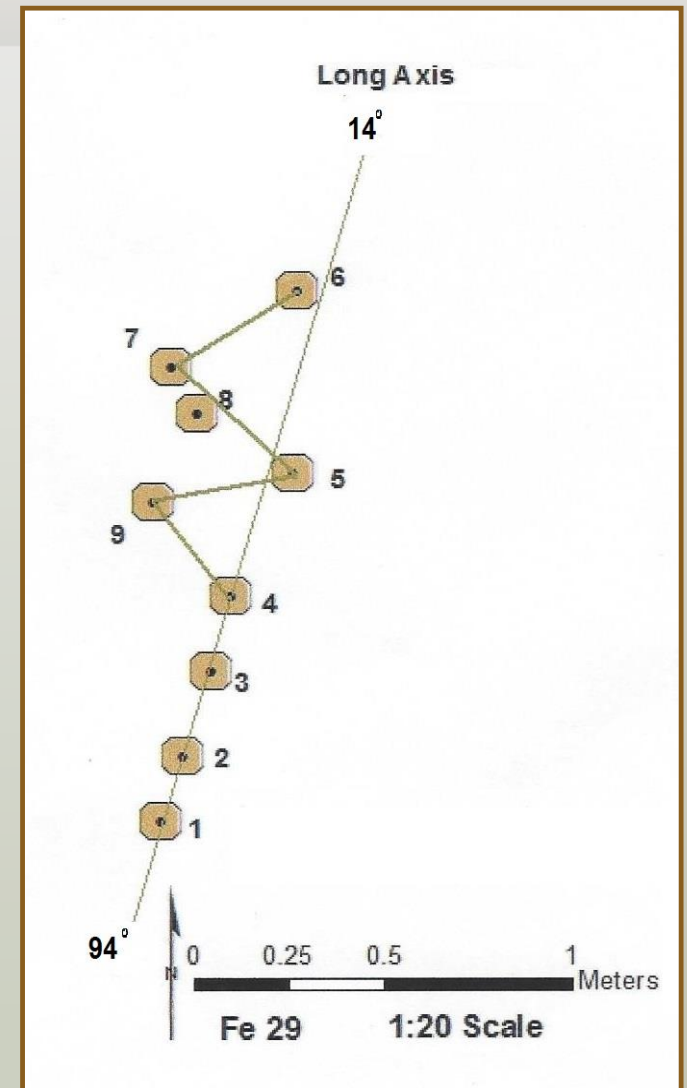
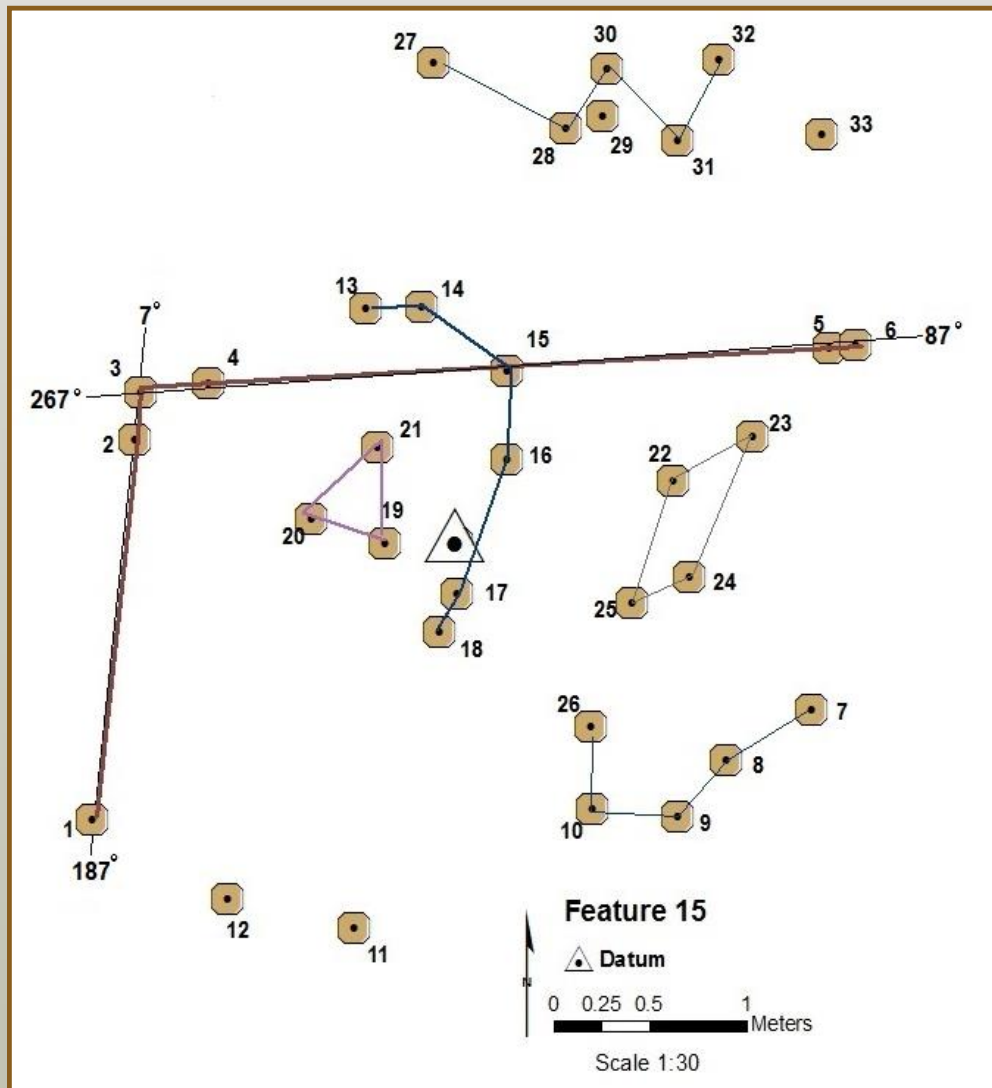
Scorpius

Draco

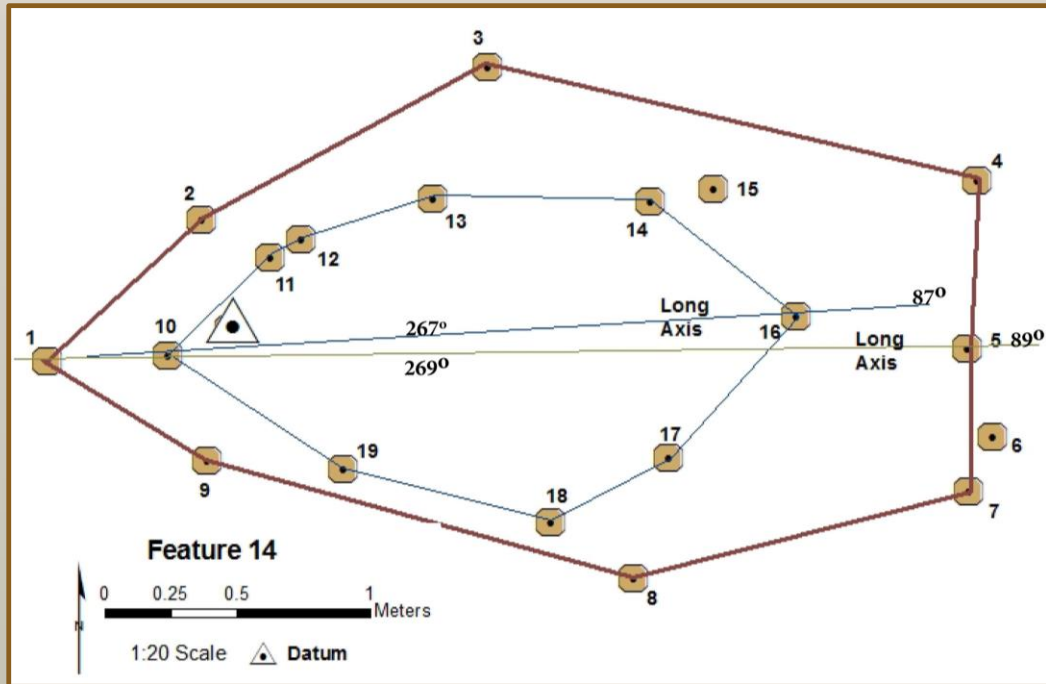
Corona Borealis

Perseus



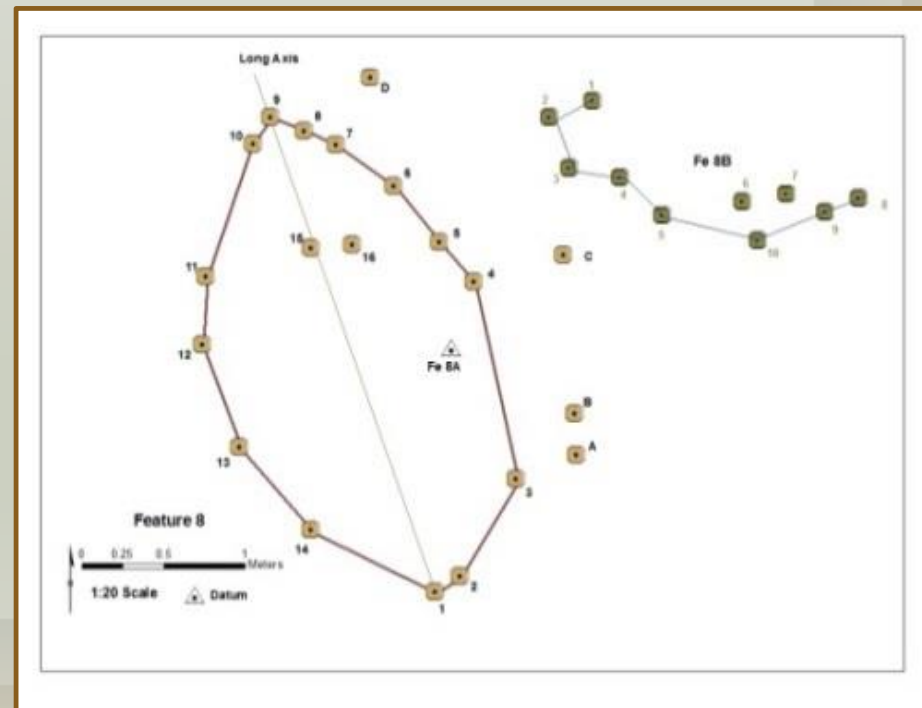


Cassiopeia is suggested in both Features 15 and 29 as are parts of Draco and a Dipper shape in Feature 15.



Feature 14 is suggestive of the constellation Cepheus.

Feature 8 is suggestive of a dipper, possibly Ursa Minor.



Summary and Conclusions

Site location was specifically chosen for its fore-shortened horizon landmarks with mirrored East and West horizons.

- 30+ cobble features arranged in a bi-directional linear fashion across the site rather than the typical clustered domestic groupings.
- 18 identified outline shapes consist of: 5 egg-shapes, 3 ovals, 3 circular, 4 L-shaped, 2 biconvex, and 1 J-shaped.

Feature 13 has an exterior egg-shape and an interior oval arrangement with an upright slab.

- The alignments matched the US Naval Observatory Astronomical Applications database for fall equinox and summer solstice sun rise/set positions.

An “observers’ choice” between first glimmer and full solar disk was noted for sunrise, first horizon contact, and last glimmer sunset. Frequency of azimuth occurrence from all investigated feature alignments (n=444) indicate:

- Strong tendency toward cardinal and inter-cardinal directions, especially E-W which is associated with equinoxes;
- Secondary tendency toward summer solstice sunset and probable winter solstice sunrise;
- Followed by a focus on the summer solstice sunrise and probable winter sunset.

Long and cross axis alignments (n=15) analysis indicate:

- Strong tendency for inter-cardinal directions;
- Low tendency for cardinal directions;
- Equal tendency for long axis azimuth at 338/158° with a cross axis of 68/248° matching full disk summer solstice sunrise data and probable winter solstice sunset.

Acknowledgements

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