Landscape Institute Technical Information Note

Visual Representation of Development Proposals: Earth Curvature

Technical Information Note 09/19

17 September 2019

This one-page Technical Information Note explains the effects of Earth curvature on visual representation and includes a reference table for corrections.

This Note is intended to be read in conjunction with LI TGN 06/19: Visual Representation of Development Proposals

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Earth Curvature

With the exception of dedicated windfarm software, 3D software depicts the earth (model space) as a flat projection, and does not reproject distant parts of the model in response to earth curvature.

A photograph necessarily shows real-world curvature of the earth and the effect of refraction through the atmosphere. Whilst at distances of less than 1km this is barely perceptible, at distances above 1km these effects become more important.

The effects are notable on, for example, tall structures near or beyond the visual horizon, being particularly relevant for tall buildings, wind turbines and similar structures viewed at distance.

Earth curvature also affects situations where distant features are used as a reference for nearer subjects. For example, if a site was located in the middle-ground of an expansive view, but distant hills were used as a vertical reference, the distant hills would be lower in the photo (due to curvature) than in a 'flat' 3D model. Therefore, if the model was aligned to the hills, the nearer part of 3D model would be placed too low. In this instance, vertical alignment should reference objects close to the site.

Examples of the visual effects of earth curvature:

- When stood at sea level on the beach the maximum distance to the horizon would be less than 4km
- The Shard Tower in London would not be visible, from a point near sea level, 68 km away.

It should also be noted that, for elevated viewing positions (for example, standing on the cliffs at Dover) it is possible to see greater distances than at sea level. Therefore, the visualisation methodology should be aware of and demonstrate that it takes account of earth curvature, where relevant.

SNH 'Visual Representation of Windfarms 2006' provided a useful reference table: 'Annex F: Earth Curvature and Refraction of Light, Table 19: Height corrections for earth curvature and refraction'. This is reproduced here (with the kind permission of SNH) purely to indicate the magnitude of the figures involved.

Distance	Vertical correction for Earth curvature and atmospheric refraction
5 km	1.7m
10 km	6.7m
15 km	15.0m
20 km	26.7m
25 km	41.7m
30 km	60.1m
35 km	81.8 m
40 km	106.8 m
45 km	135.2 m
50 km	166.9 m
55 km	201.9 m
60 km	240.3 m

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