

# MetroGIS Tile Scheme Recommendation

*A Best Practices recommendation to the MetroGIS Coordinating Committee from the MetroGIS Imagery Tiling Workgroup: Version 1.0*

**Adopted by the MetroGIS Coordinating Committee on October 13, 2016**

## Purpose

The MetroGIS Coordinating Committee created a *MetroGIS Imagery Tiling Work Group* at its March 24, 2016 meeting. As directed by the Coordinating Committee, the purpose of this workgroup is “to present the Coordinating Committee with a recommendation for a tiling scheme.” The purpose of this document is to provide a best practice for agencies and interests standing up tiling services so other agencies can more easily and readily consume their information.

## Recommendation

The workgroup recommends that MetroGIS members who publish basemaps and imagery web services for consumption by other MetroGIS members, the public and third party consultants, contractors and other developers use tiled cached service. The recommended format for this tiled cache service is the de facto standard web mapping tiling scheme in use by ArcGIS Online, Google, OpenStreetMap, Bing and others. The workgroup refers to this as the “Web Mercator Tiling Scheme”. This scheme is defined in Attachment A.

Workgroup Members:

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## Background

**Current Landscape.** All 7 counties and the Metropolitan Council currently serve basemaps and/or imagery as tiled caches. There are multiple tiling schemes in use, with only a couple of Counties sharing the same exact tiling schemes. In the past few years, there has been some movement (Carver, Washington, and Dakota counties as well as the Metropolitan Council) towards using Web Mercator.

## Business Needs

The workgroup identified these business needs:

**High Resolution:** Having a tiling scheme with large-scale options (down to 240);

**Compatible with neighbors:** For emergency response across divisional boundaries, and for Metro area maps that can be assembled from multiple sources, it would be beneficial for neighboring agencies to share a common tiling scheme;

**Works well for online mapping:** The choice of tiling scheme should not practically limit options or increase costs of development. Developing web maps in Web Mercator is widely supported by web frameworks and web developers in the mainstream web development community;

Other coordinate systems, which may have been in place for years in the relatively small GIS community, such as county coordinate systems or UTM, may seem arcane and confusing when working with web developers without rigorous mapping backgrounds. This increases development time and costs. It will also limit the choice of development framework, and the choice of alternative basemaps.

## Risk

The Web Mercator coordinate system has well documented issues with measuring distance and area. The [National Geospatial-intelligence Agency issued a Web Mercator advisory](#) and others have written extensively about it. This web map demonstrates the following error:  
<http://servicesbeta.esri.com/demos/compareMeasurements.html>

Most online APIs and mapping frameworks account for this measuring issue. For example, ArcGIS online, when using a web Mercator basemap, uses a different coordinate system when measuring area, and gives accurate measurements.

Other custom developed applications, and desktop systems like ArcGIS Desktop, may not provide a correction. Use caution when implementing this recommendation so that internal workflows requiring high accuracy measurements are not disrupted.

## Conclusion

Due to the widespread adoption of the Web Mercator projection in web mapping applications, this workgroup recommends that the MetroGIS Coordinating Committee adopt the attached Web Map tiling scheme as a best practice for imagery and basemap web services.

There are many benefits of sharing a tiling scheme with neighbors and compatibility with other basemaps, web mapping APIs and web app development frameworks such as ArcGIS Online, Leaflet, Map Box, Open StreetMap, Bing and Google.

These benefits include:

Well documented tiling scheme that goes up to a scale of 1:70;

Ability to assemble tiles from multiple agencies for local and portable offline use

Can develop web applications using neighboring agencies' basemaps for Emergency Response or other cross-border activities;

Reduce complexity of development while increasing platform options when hiring 3<sup>rd</sup> party developers

These benefits outweigh the one drawback concerning the measuring issues. However, Web Mercator remains unsuitable for official engineering and surveying work;

**Further reading and references, please search for the following terms:**

- [Web Mercator Non-Conformal Non-Mercator](#)
- [EPSG 3857](#)
- [Open Street Map Slippy Map Tile Names](#)
- [Bing Maps Scales](#)
- [OpenGIS Web Map Tile Service Implementation Standard](#)

**Questions or comments:**

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## Appendix A: Web Mercator Tile Scheme Definition

### Definitions

There is no single definition of the Web Mercator tiling scheme. Due to the uncertain origins of the projection and the complicated mathematics of measuring the earth, each implementation is slightly different. However, in practice, tiles produced in different systems are compatible. We recommend you use the definition most appropriate for your software ecosystem. Below are three.

#### **Slippy map tile names:**

This is the definition of the tile scheme in use by the Open Street Map Slippy Map Application. The definition document identifies map scales and ground resolution down to level 18. Many popular APIs and other supporting applications expect or use this tile scheme.

[http://wiki.openstreetmap.org/wiki/Slippy\\_map\\_tilenames](http://wiki.openstreetmap.org/wiki/Slippy_map_tilenames)

#### **ESRI:**

ESRI documents the tile scheme specification in each cached/tiled web service description. The ESRI hosted World Topo Map is an example of the Web Mercator Tile Scheme down to level 23. Examples of using the Slippy map tile names in the ESRI API or using ESRI tiles in other APIs exist.

[http://services.arcgisonline.com/ArcGIS/rest/services/World\\_Topo\\_Map/MapServer](http://services.arcgisonline.com/ArcGIS/rest/services/World_Topo_Map/MapServer)

#### **Open GIS:**

Open GIS defines the Web Mercator Tile Scheme in the Web Map Tile Service Implementation Standard, document #07-057r7 Annex E.4, "GoogleMapsCompatible"

The standard identifies scales down to level 18.

<http://www.opengeospatial.org/standards/wmts>