

City of Portland | Oregon

Bureau of Planning & Sustainability

20 Minute Neighborhood Concept Analysis

ArcGIS 9.3 | Network Analyst | Spatial Analyst

Poster and Analysis created entirely in ArcGIS 9.3 on Windows XP platform. Plotted on Hewlett Packard Design Jet 1055CM



Introduction:
The 20-minute neighborhood concept emerged from local citizens' interest in having a more robust analysis of "walkability"—access by walking—in Portland than what was currently published or available online. Inspired by Walk Score (www.walkscore.com), the 20-minute neighborhood concept represents the range of accessibility by walking in different parts of the city. The concept was developed to take into account additional factors beyond proximity to amenities. It takes into account barriers to walking like topography (steep grades), rivers, freeways and difficult street connections. The analysis also considers factors that enhance the walking experience, i.e., the presence of sidewalks, variety of pathways or connections (using intersection density as a proxy), proximity to high-quality frequent transit, and the proximity to clusters of amenities.

Fundamentally, the 20-minute neighborhood concept is another way to describe walkable environments, vibrant neighborhoods, complete communities—highly integrated and diverse places.

Portlanders have shown strong interest in cultivating "20-minute neighborhoods"—places where people can safely walk relatively short distances from home to most destinations and services they use every day.

Purpose:
As part of the public planning process of the City's comprehensive plan update, the City prepared a detailed study to assess the quality of the walking environment and accessibility in different parts of Portland.

The resultant map gives the City and its residents a tool to have deeper dialogue about appropriate strategies to improve accessibility in different parts of the city.

Overall, the 20-minute neighborhood concept is intended to help people unite their knowledge about the necessary, but often disparately considered, elements of complete communities.

Methodology:
This map represents the latest generation of the 20 minute neighborhood concept "hotspot" mapping analysis. It was created in ArcMap 9.3 using available ArcToolbox tools, Network Analyst and Spatial Analyst extensions. This analysis was created entirely with "out of the box" ArcGIS and did not require any custom programming.

Walking distance isochrons of $\frac{1}{4}$ mile, $\frac{1}{2}$ mile, and 1 mile for selected amenities were prepared in Network Analyst. Concentration/density was measured using a 2640' x 2640' ($\frac{1}{4}$ mile square) grid cell for the remaining amenities by summing the number of occurrences per cell. Data was collected for an area up to 1 mile (the max walking distance scored) outside the city boundary to insure quality of input/output at the City's edges.

Data/Amenities:
Data/amenities for which walking distance networks were created are as follows: full service grocery stores, both chain and independent; convenience stores, beer, wine & liquor stores (grouped as commercial type 1); frequent service transit stops, defined as service every 15 minute or less; public elementary schools; parks access points.

Data/amenities for which concentration/density was determined are as follows: sidewalks (percent of total area); number of intersections (proxy for connectivity); number of restaurants, bars, specialty grocery stores, brewpubs, bakeries, health & personal care, dry cleaning & laundry (grouped as commercial type 2).

The Street Network:
The street centerline dataset used to create the walking distance isochrons in Network Analyst was edited to remove all "unwalkable" streets. "Unwalkable" was defined as freeways, on-ramps and any street segment with a slope greater than 20%. The street centerline dataset was intersected with LiDAR derived slope data to determine which steep sections to remove. The result was a realistic walking network.

Quarter Mile Grid dataset:
The grid was rotated to approximately 45 degrees to reduce artifact occurring primarily with commercial type 2 points. Portland Streets are primarily north-south/east-west in alignment, the grid edges tended to align with streets – the result was one grid cell along one side of a street got all the commercial values, the neighboring cell on the opposite side, none; this created a false distribution. Using a rotated grid cell, gave a more realistic distribution of commercial type 2 amenities per grid cell. Sidewalk coverage and intersection density were largely unaffected by orientation.

Spatial Analyst:
To keep inputs consistent, datasets had values ranging from 0 to 3.
For the walking distance network isochrons, the values were given as follows: $\frac{1}{4}$ mile = 3, $\frac{1}{2}$ mile = 2, 1 mile = 1, greater than 1 mile = 0.
For the grid cell datasets which calculated concentration/density, the same 0 to 3 values were assigned.
Using the "Quantities" category in Layer Properties > Symbology tab, 3 classes were chosen. Groupings were assigned letting the system use the Natural Breaks "Jenks" method. This was done to avoid unintentionally manipulating the input data. Values were given as follows: 3 to the highest category, 2 to the middle, and 1 to the lowest category. Grid cell values of 0 received a 0 value.

The network and grid cell datasets were then converted to raster datasets in preparation for use of Spatial Analyst > Overlay > Weighted Sum tool.
Output raster cell size chosen as 200' x 200'. The logic: Portland city block is 200' x 200'. The initial output raster dataset was run through the Neighborhood Statistics tool in Spatial Analyst for smoothing.

Result:
Both a varied weight input and equal weight input were performed. The equal weight input result is the version currently preferred by staff. It is the most objective result. The weighted input result is used for magnifying the effects of the various inputs based on relative perceived importance of input to "20 minute-ness". Effort was made to create a dataset that would accurately reflect the 20 minute neighborhoods in Portland.

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