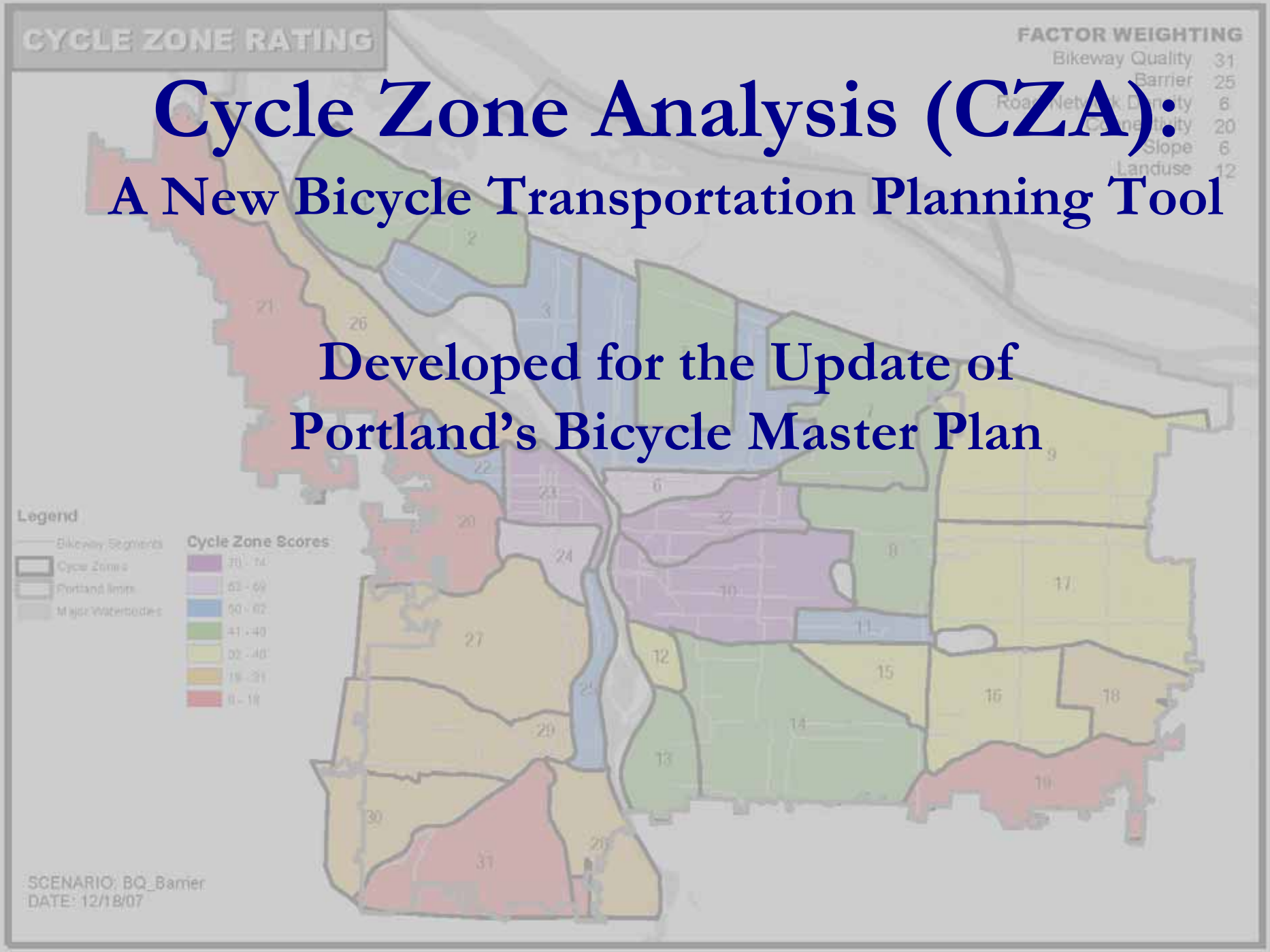
Cycle Zone Analysis (CZA):

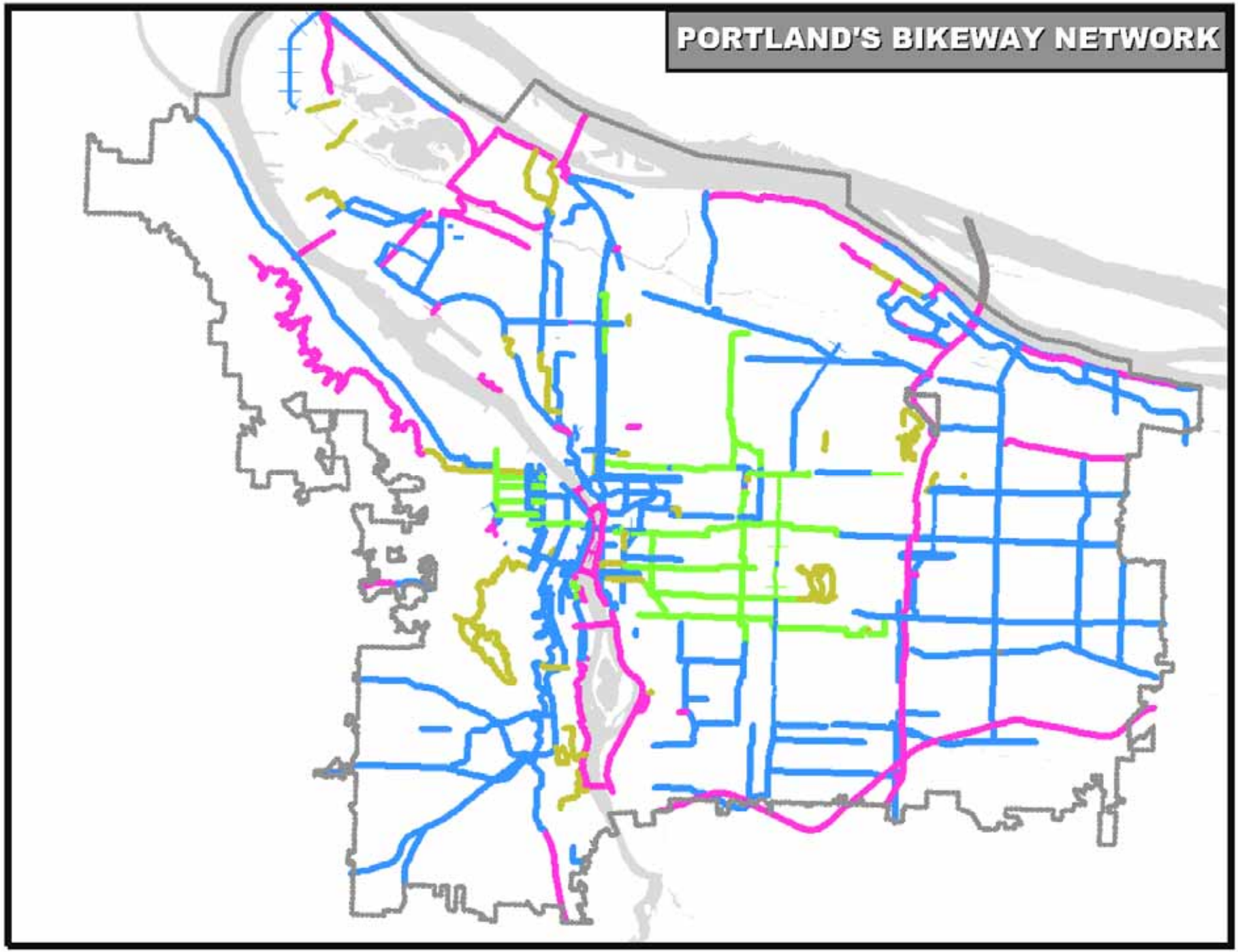
A New Bicycle Transportation Planning Tool

Developed for the Update of Portland's Bicycle Master Plan



Cycle Zone Analysis

- Develop a more fine-grained understanding of how cycling conditions differ across Portland
- Create divisions that allow us to better tailor treatments to improve conditions
- Understand where conditions offer the highest potential to create world class cycling conditions
- Create an organizing principle that allows for more nuanced discussion about conditions for bicycling

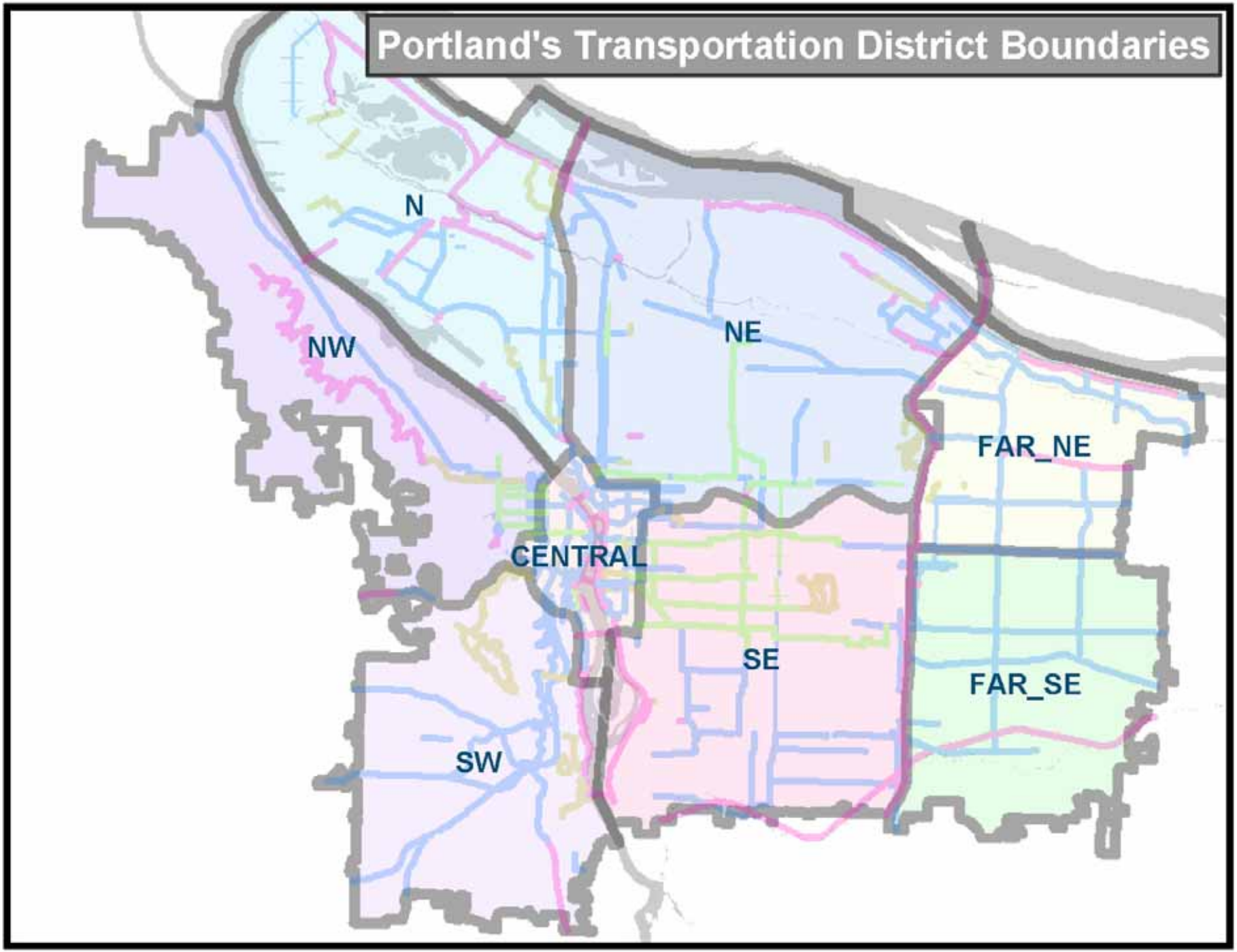

PORTLAND'S BIKEWAY NETWORK

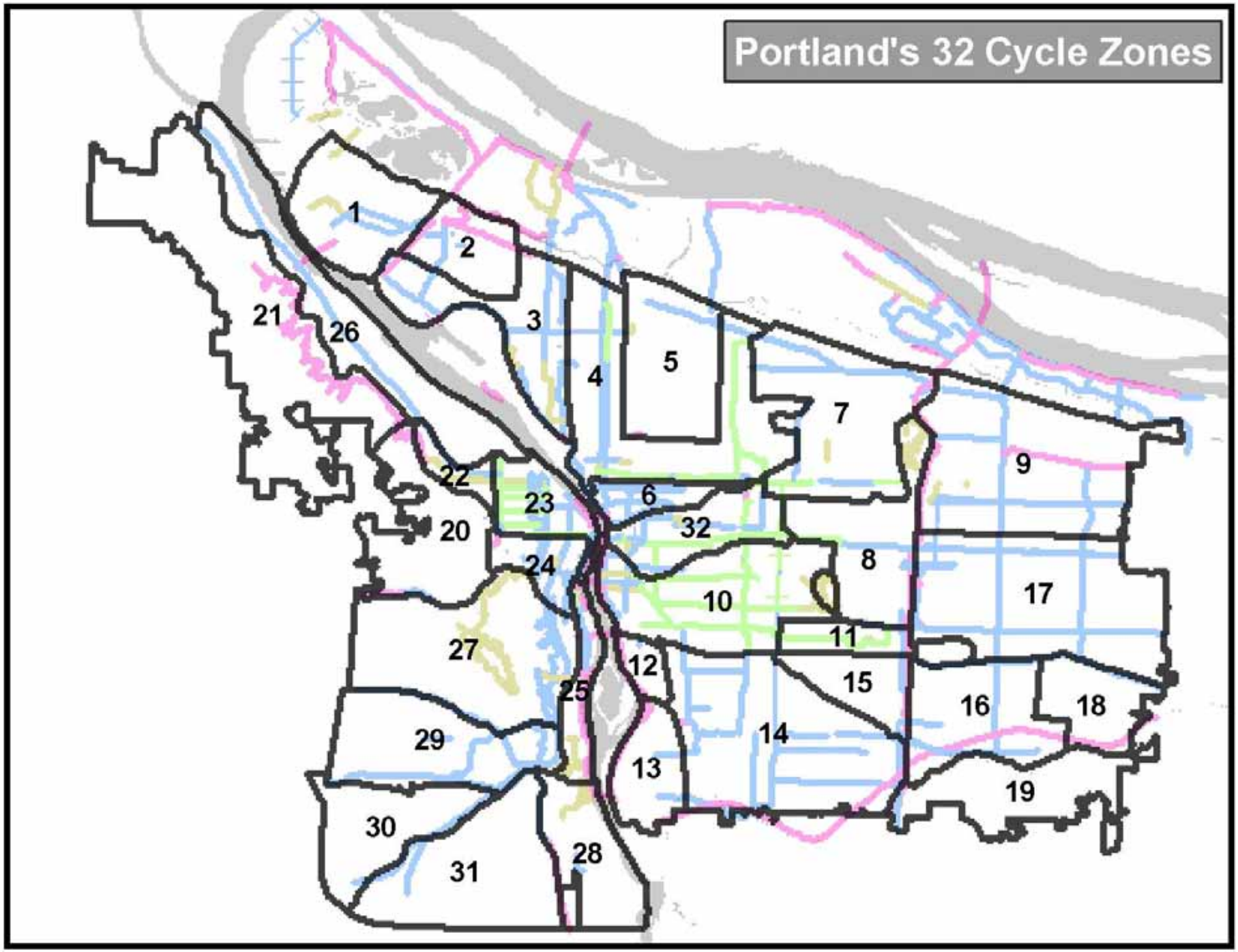
Bicycle Boulevards

A Bicycle Boulevard is a local street with:

(conditions where people feel safe and comfortable on superb facilities)

- Low Traffic Volumes
  - **diversion**
- Low Speeds
  - **traffic calming**
- Easy Crossing of Arterial Streets
  - **signalization**
  - **curb extensions**
  - **median refuges**
- Way-Finding
  - **signs, markings**
- Priority for People on Bicycles
  - **impediments to motor vehicles**
  - **bike boxes**
  - **prominent markings**


Portland's Transportation District Boundaries
N
NW
NE
FAR_NE
CENTRAL
SE
FAR_SE
SW


Portland's 32 Cycle Zones
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
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24
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26
27
28
29
30
31
32

Drawing Cycle Zone Lines

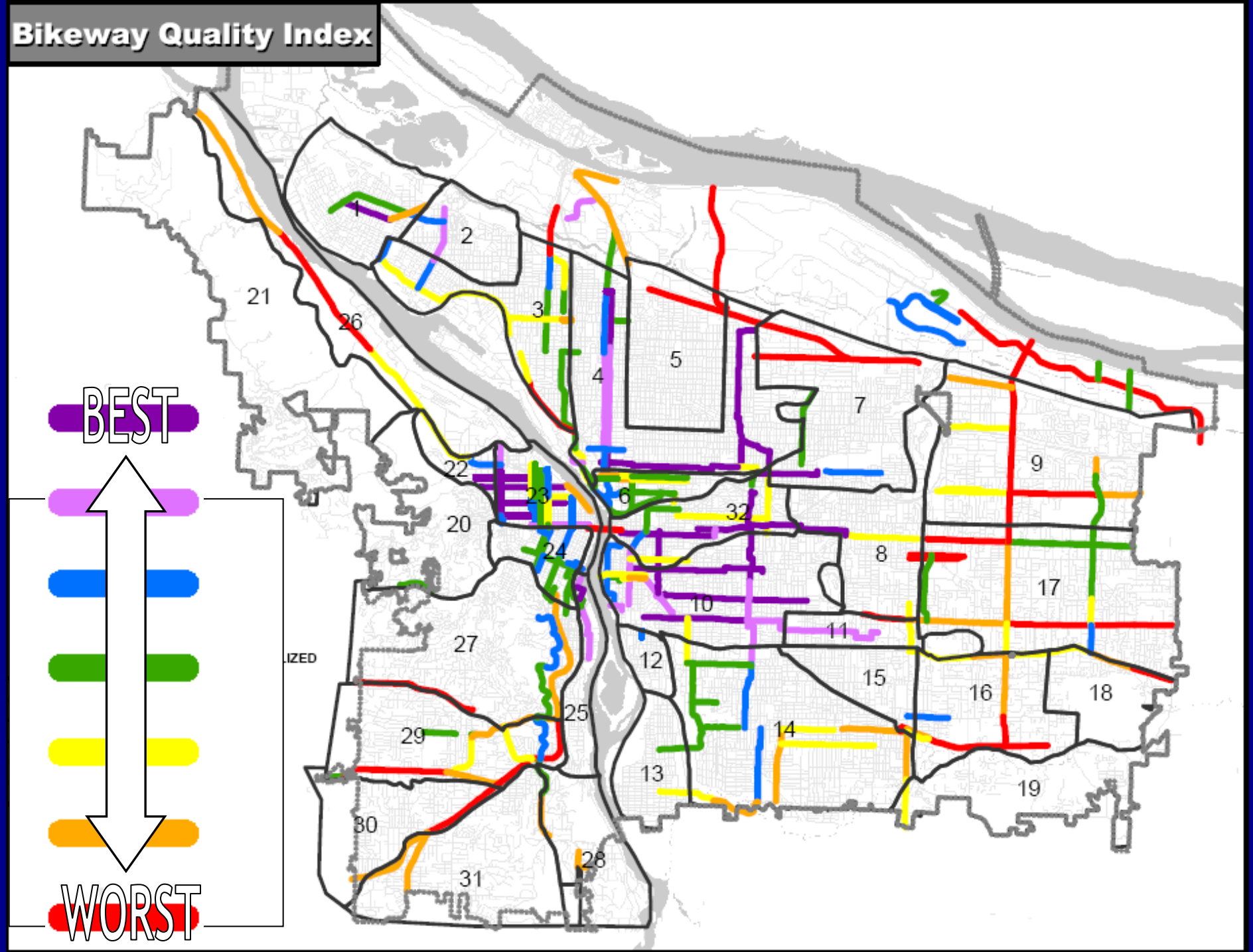
- **First Cut: local professional expertise (in-house)**
  - Where does cycling feel similar?
  - Where does cycling feel different?
  - What barriers are difficult to cross?
- **Second Cut: advocate expertise**
  - Review by City's Bicycle Advisory Committee with emphasis on local knowledge by area
- **Third Cut: public input**
  - Maps and Crayons

Factors Used to Analyze Cycle Zones

- Quality of the Bikeway Network
- Difficulty of the Barriers
- Density of Roadway Network
- Connectivity of Roadway Network
- Severity of Slope
- Land Use (as proxy for trip distance)

Bikeway Quality Index

- **A means to assess relative quality of existing bikeways based upon:**
  - Automobile speeds
  - Automobile volumes
  - Dropped bicycle lanes
  - Difficult transitions
  - Number of travel lanes
  - Width of bicycle lanes
  - Jogs in route
  - Quality of pavement
  - Quality of intersection crossings
  - Number of stops


Bikeway Quality Index
BEST
WORST
1
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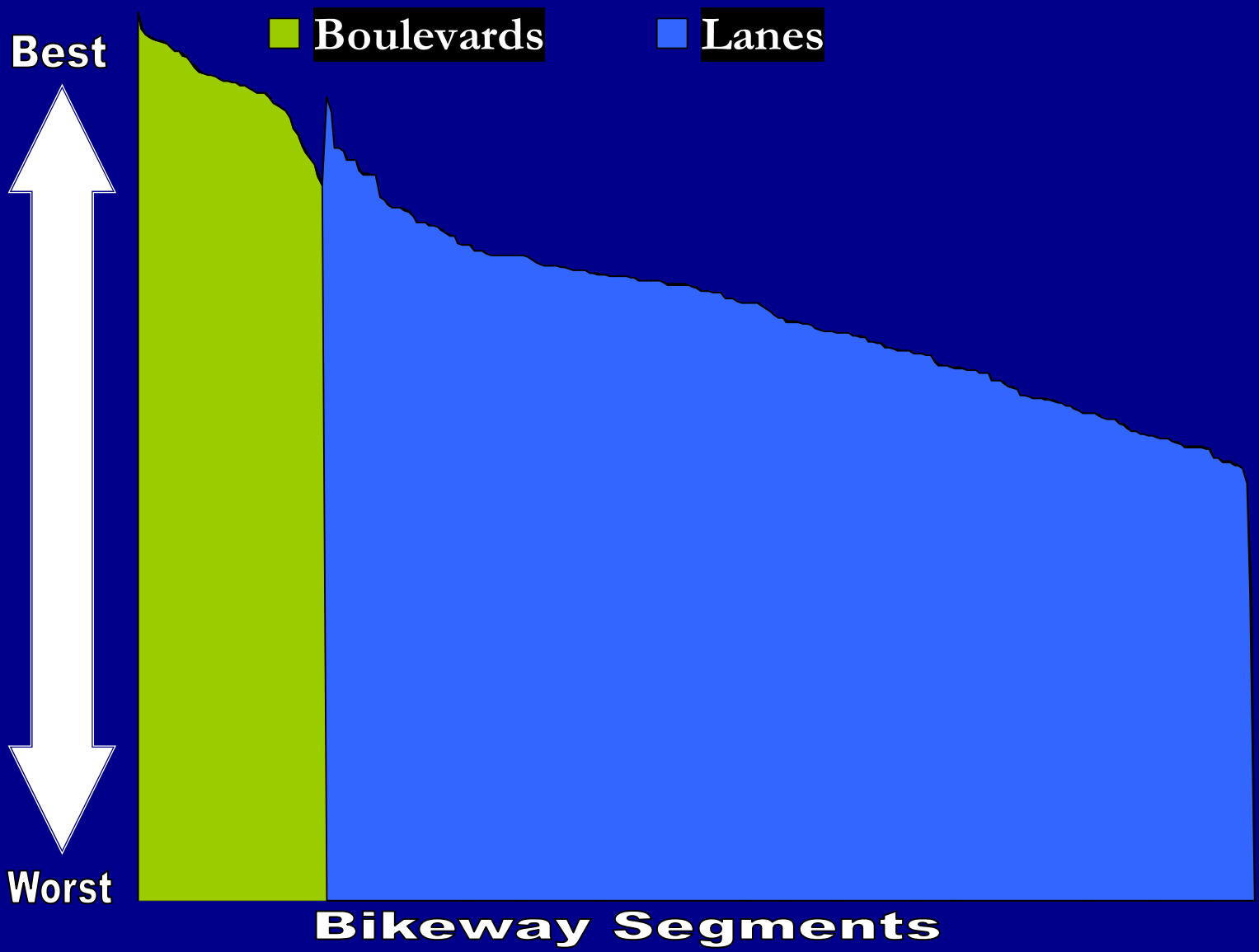
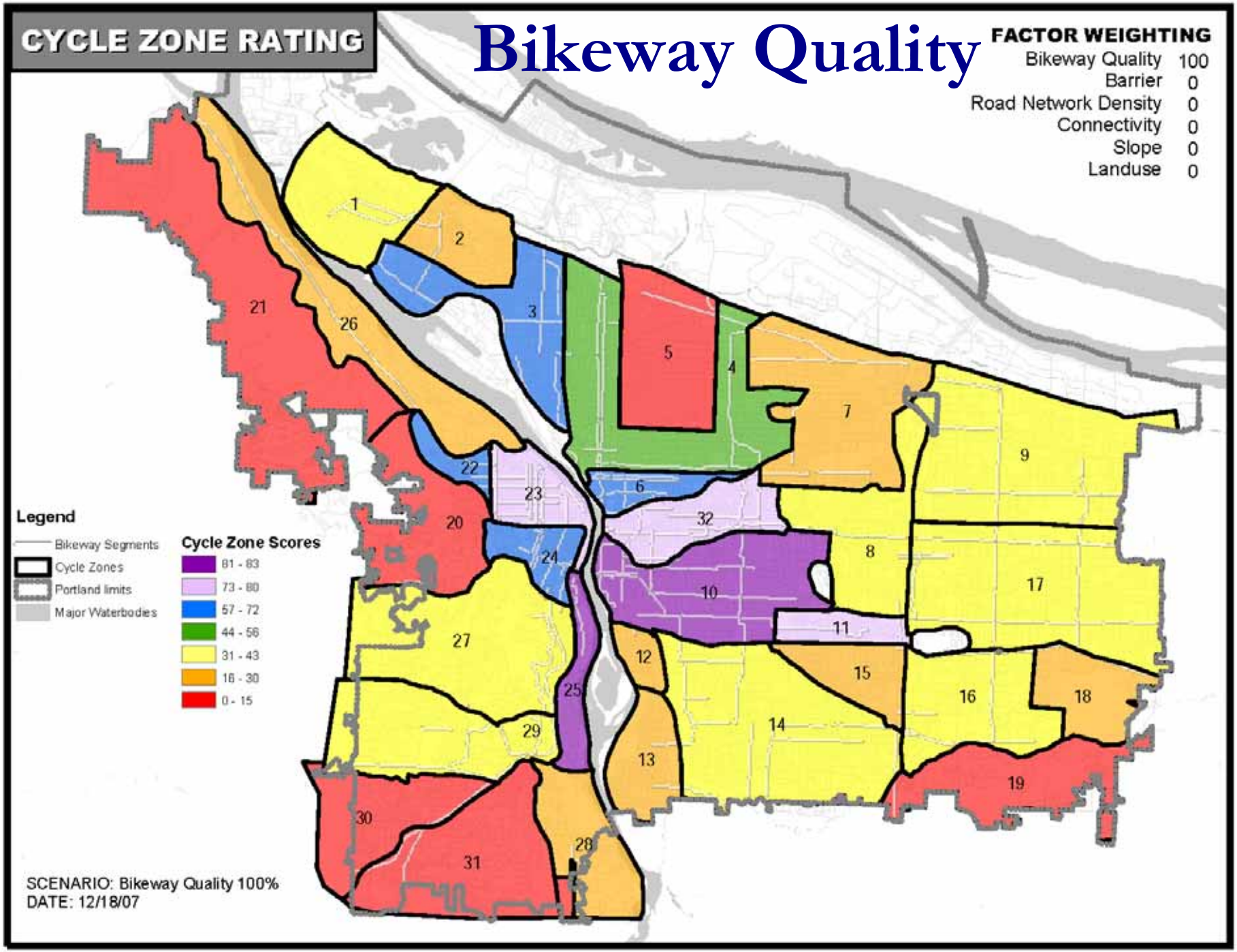
32

Ranking of Bikeway Segments




CYCLE ZONE RATING
Bikeway Quality
FACTOR WEIGHTING
Bikeway Quality 100
Barrier 0
Road Network Density 0
Connectivity 0
Slope 0
Landuse 0
Legend
Bikeway Segments
Cycle Zones
Portland limits
Major Waterbodies
Cycle Zone Scores
81 - 83
73 - 80
57 - 72
44 - 56
31 - 43
16 - 30
0 - 15
1
2
3
4
5
6
7
8
9
10
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14
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19
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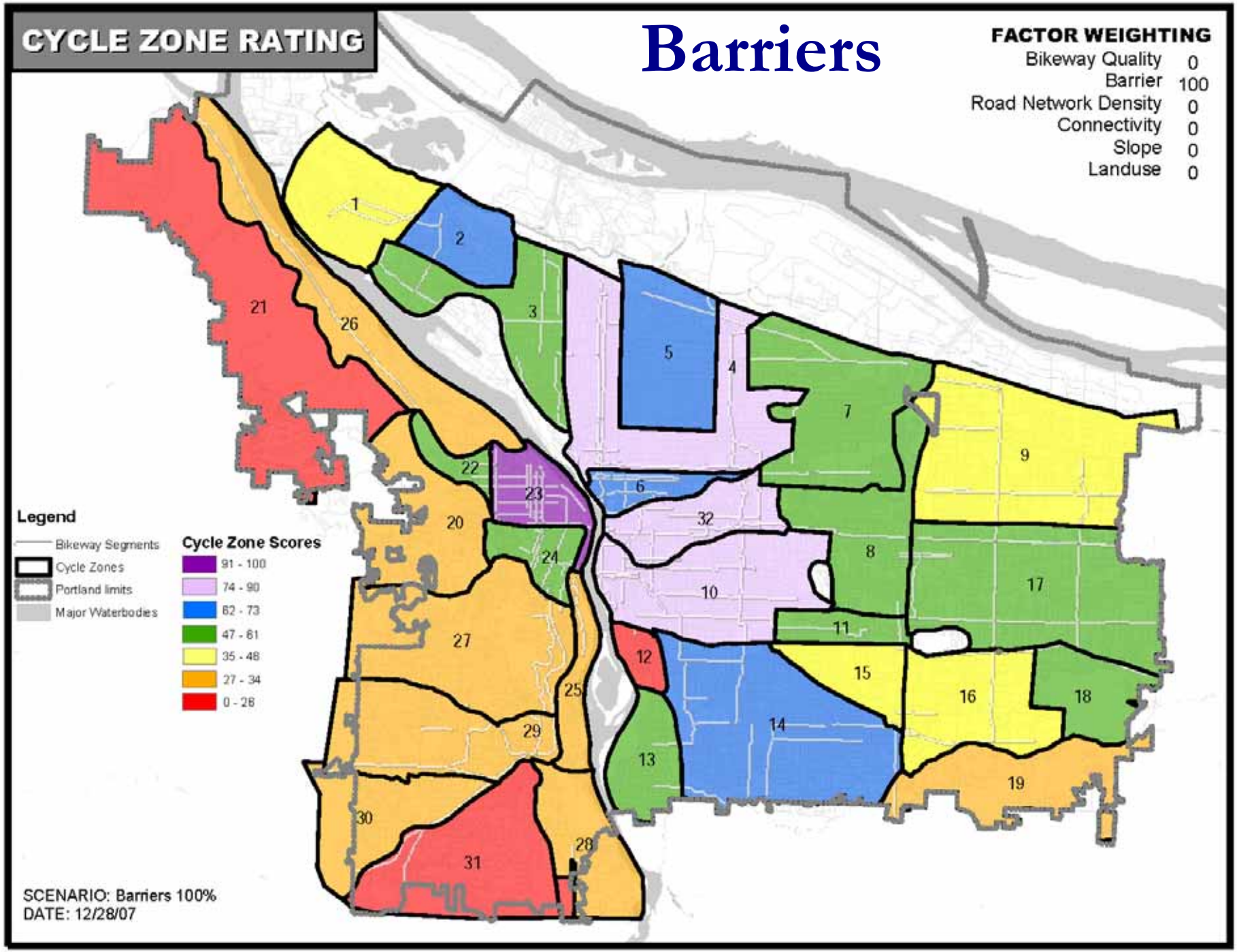
32
SCENARIO: Bikeway Quality 100%
DATE: 12/18/07


CYCLE ZONE RATING
Barriers
FACTOR WEIGHTING
Bikeway Quality 0
Barrier 100
Road Network Density 0
Connectivity 0
Slope 0
Landuse 0
Legend
Bikeway Segments
Cycle Zones
Portland limits
Major Waterbodies
Cycle Zone Scores
91 - 100
74 - 90
62 - 73
47 - 61
35 - 46
27 - 34
0 - 26
1
2
3
4
5
6
7
8
9
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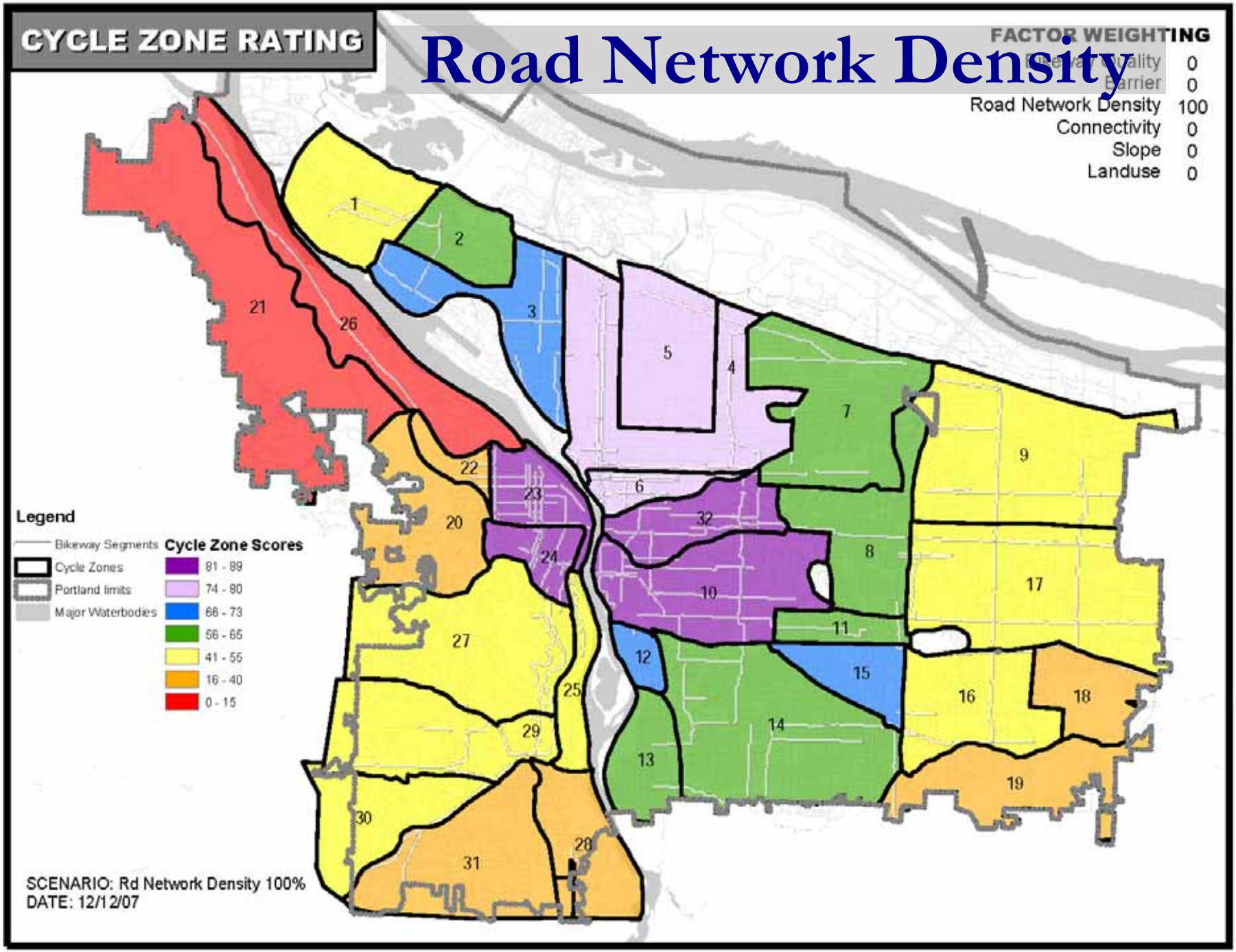
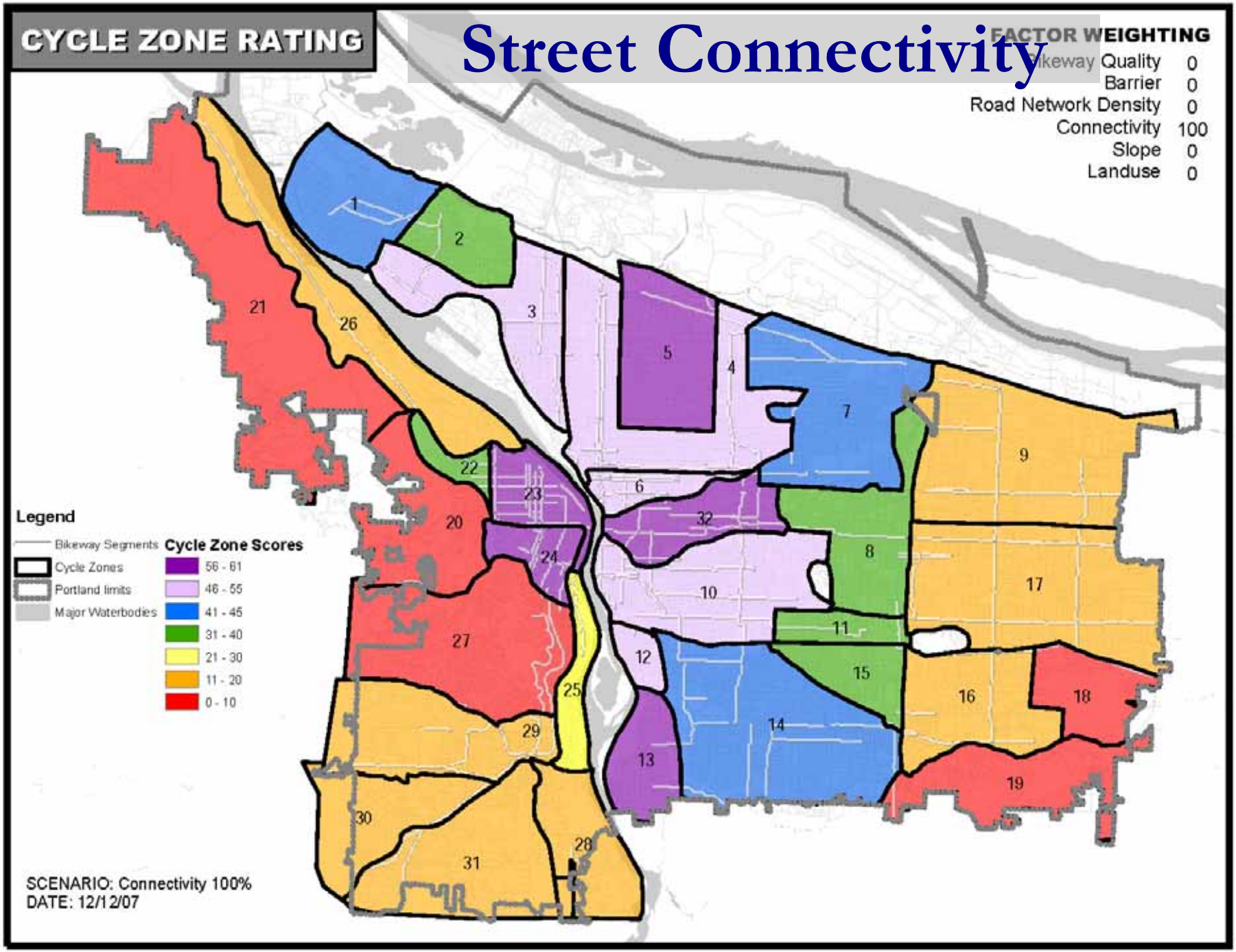
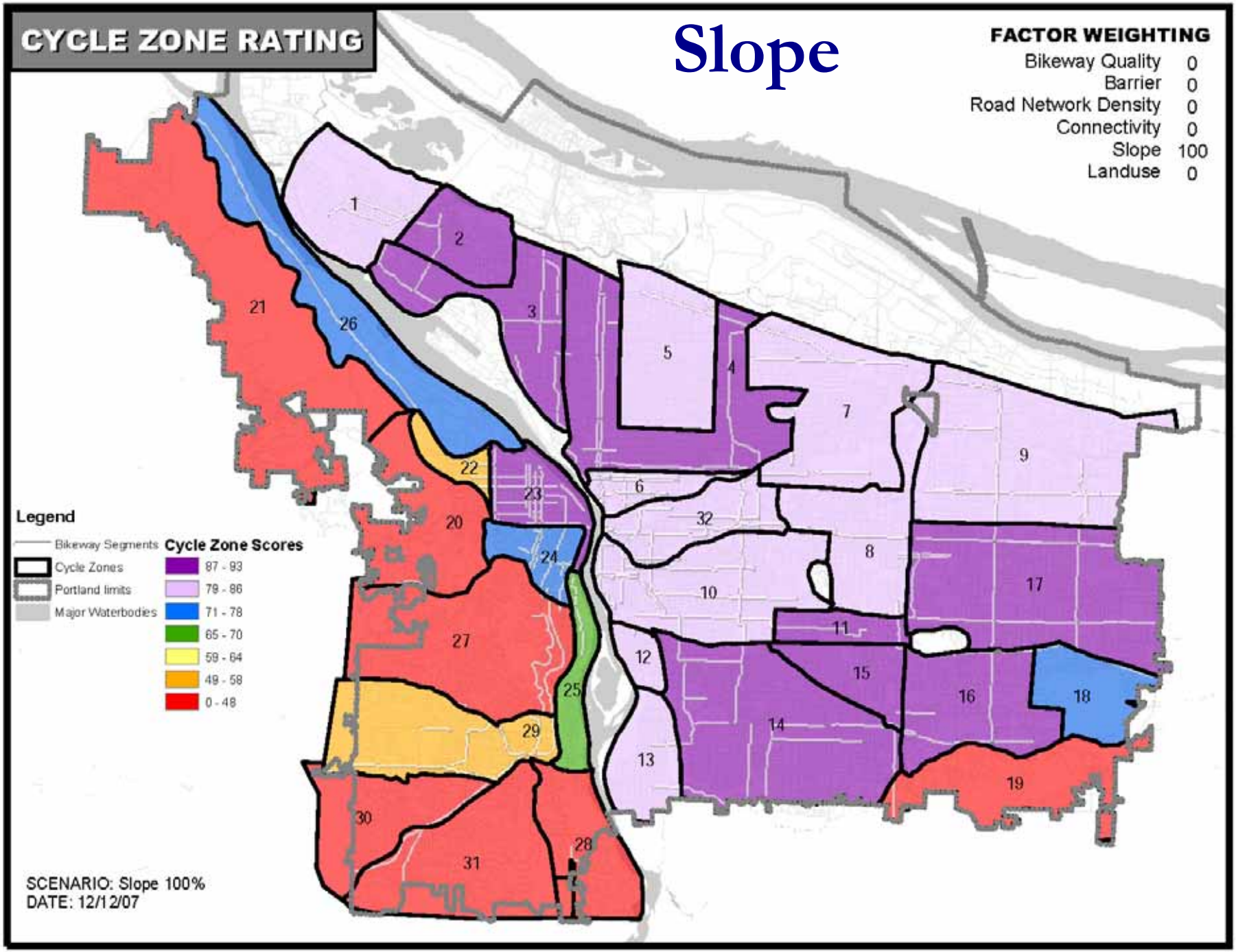
32
SCENARIO: Barriers 100%
DATE: 12/28/07

Road Network Density



Street Connectivity




CYCLE ZONE RATING
Slope
FACTOR WEIGHTING
Bikeway Quality 0
Barrier 0
Road Network Density 0
Connectivity 0
Slope 100
Landuse 0
Legend
Bikeway Segments
Cycle Zones
Portland limits
Major Waterbodies
Cycle Zone Scores
87 - 93
79 - 86
71 - 78
65 - 70
59 - 64
49 - 58
0 - 48
1
2
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5
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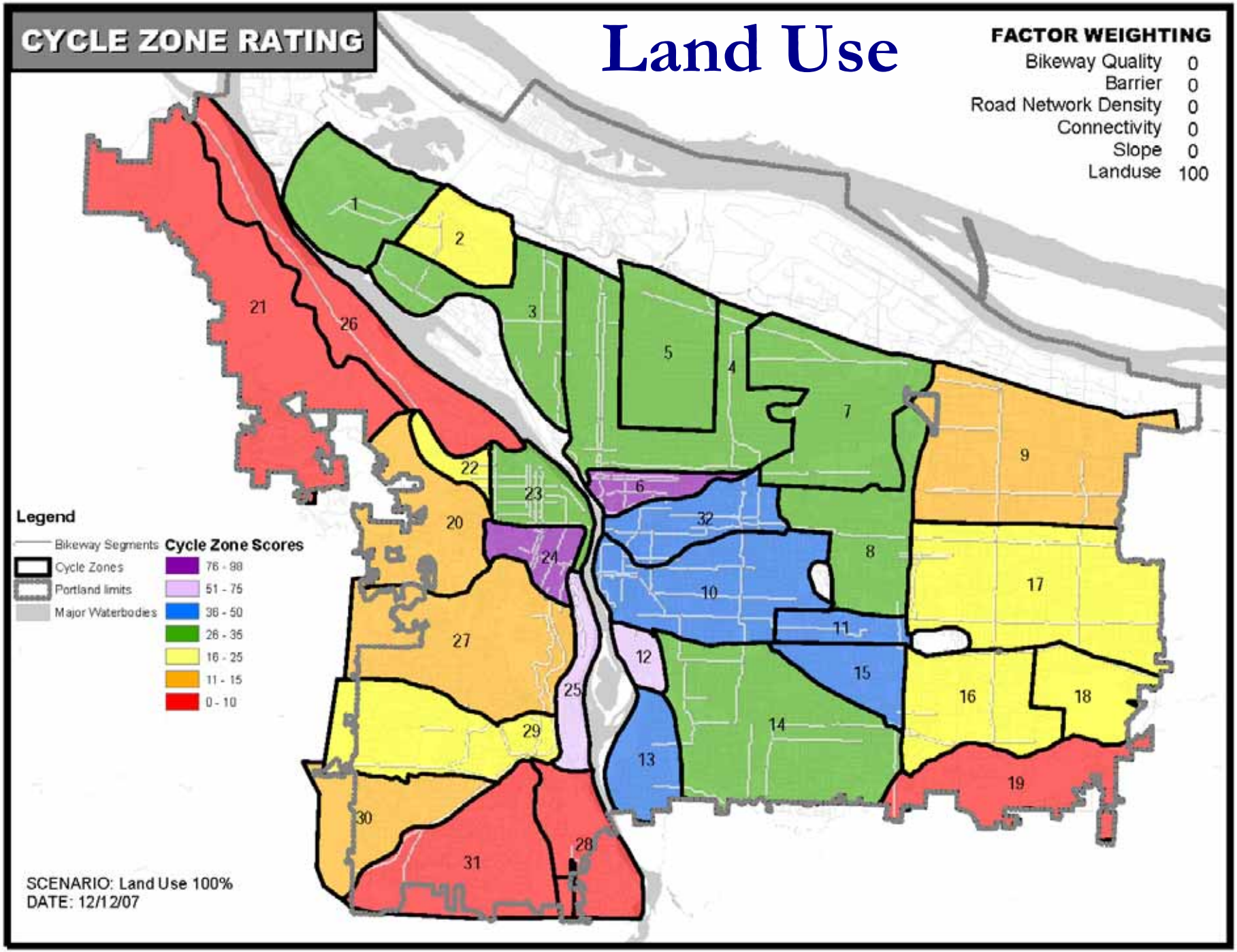
SCENARIO: Slope 100%
DATE: 12/12/07


CYCLE ZONE RATING
Land Use
FACTOR WEIGHTING
Bikeway Quality 0
Barrier 0
Road Network Density 0
Connectivity 0
Slope 0
Landuse 100
Legend
Bikeway Segments
Cycle Zones
Portland limits
Major Waterbodies
Cycle Zone Scores
76 - 88
51 - 75
36 - 50
26 - 35
16 - 25
11 - 15
0 - 10
1
2
3
4
5
6
7
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9
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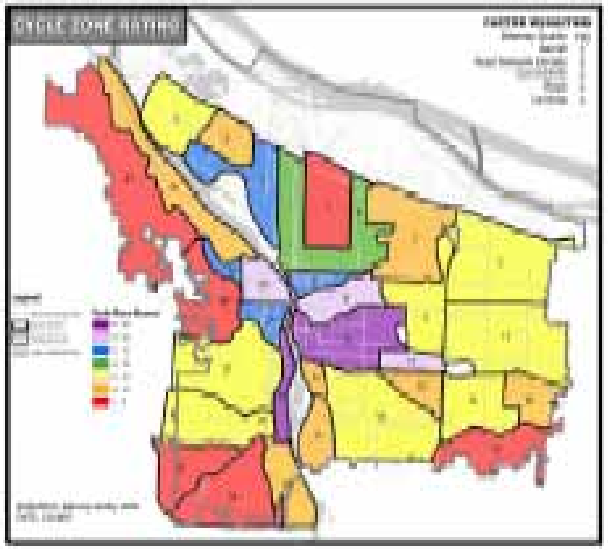
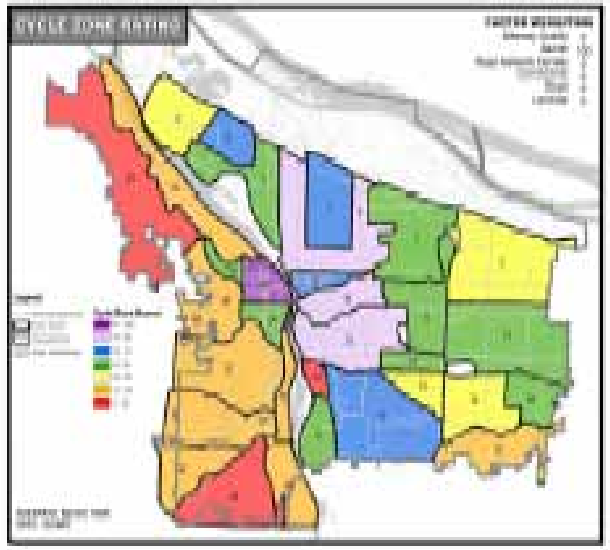
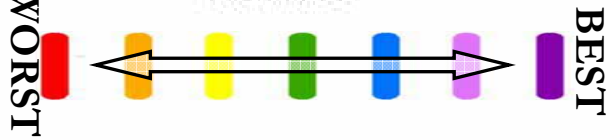
SCENARIO: Land Use 100%
DATE: 12/12/07

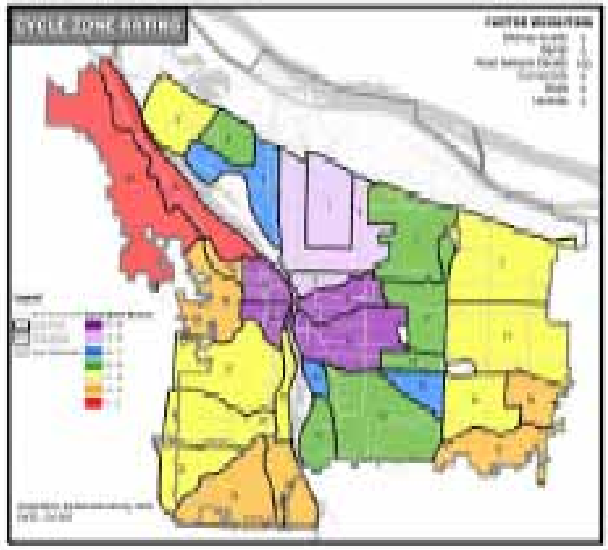


Bikeway Quality

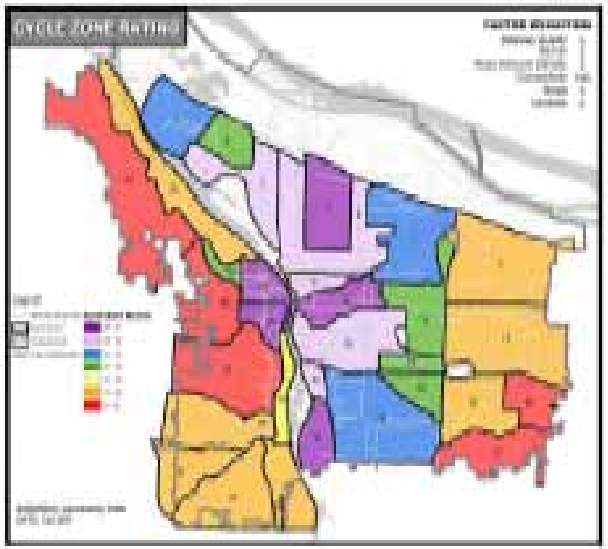


Barrier

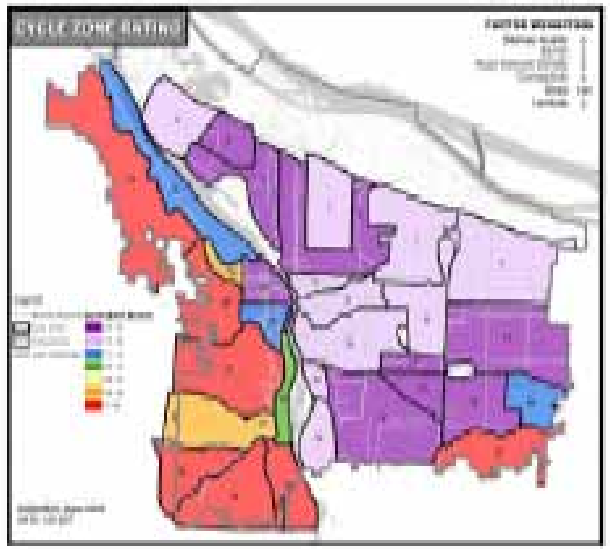




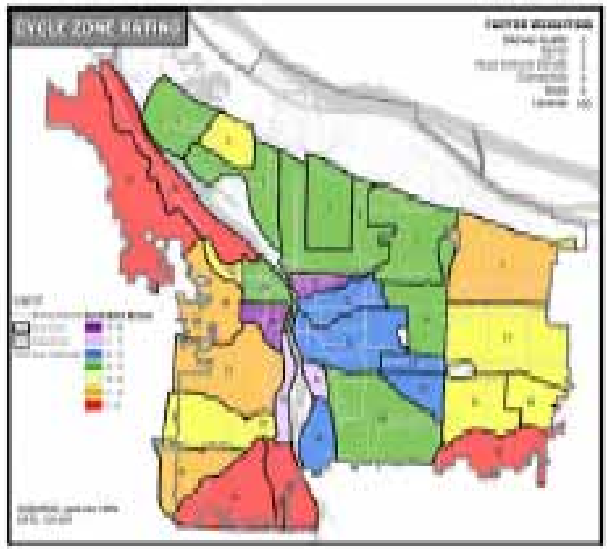
Road Network Density



Roadway Connectivity

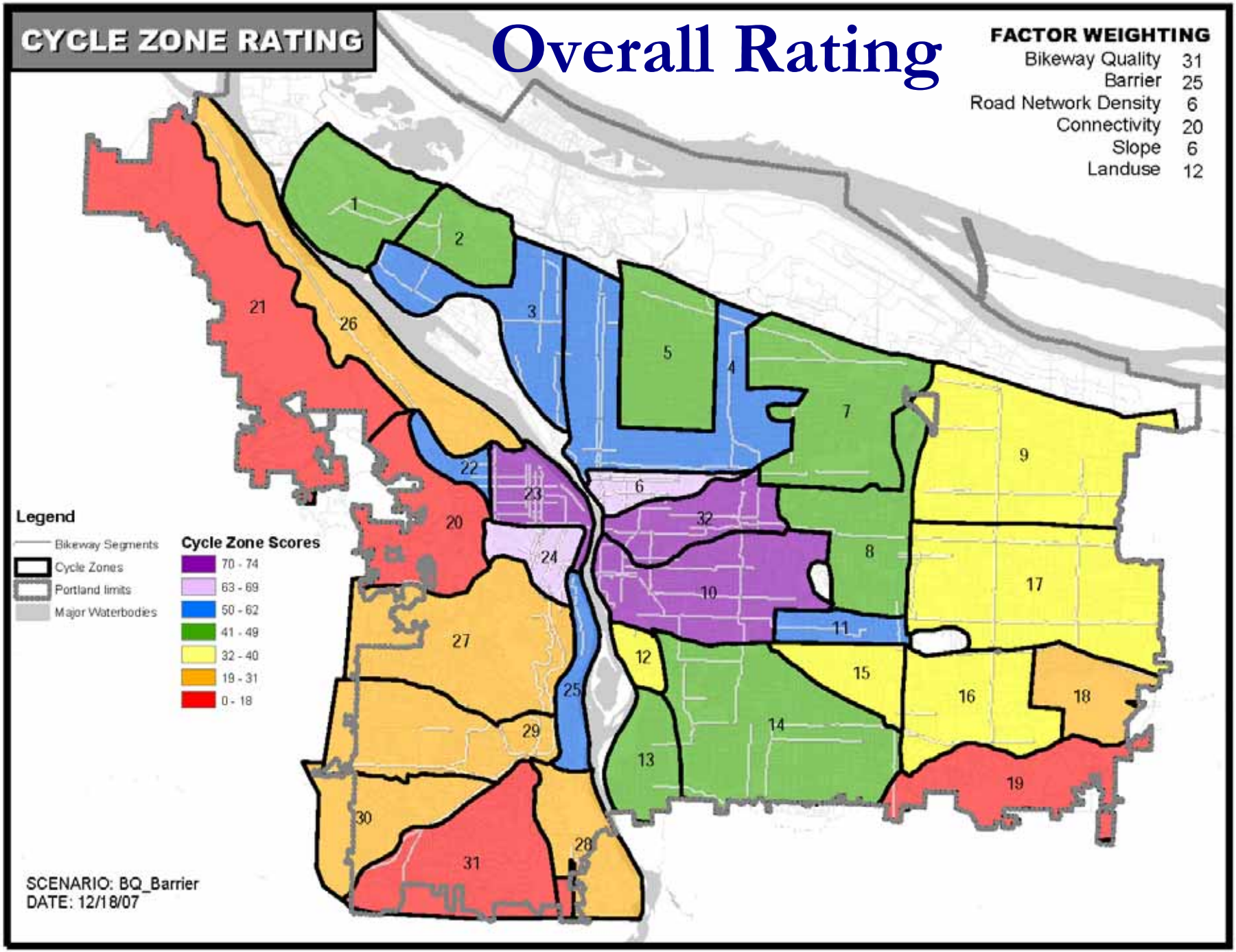


Slope



Land Use

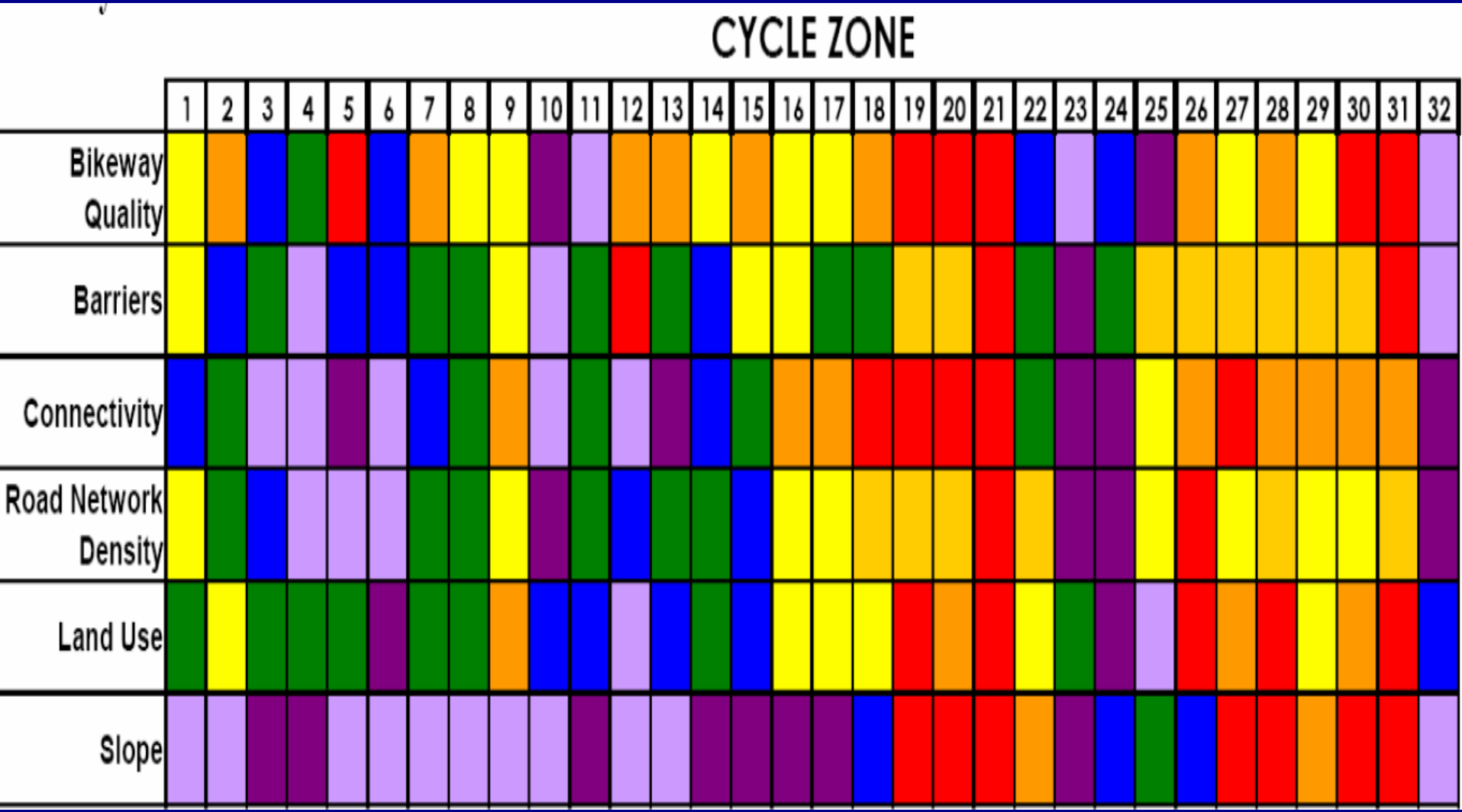
Overall Rating



Using the Cycle Zone Analysis (CZA)

1. **Clearly understanding weaknesses/strengths in each area of the city**

Matrix of Conditions by Zone



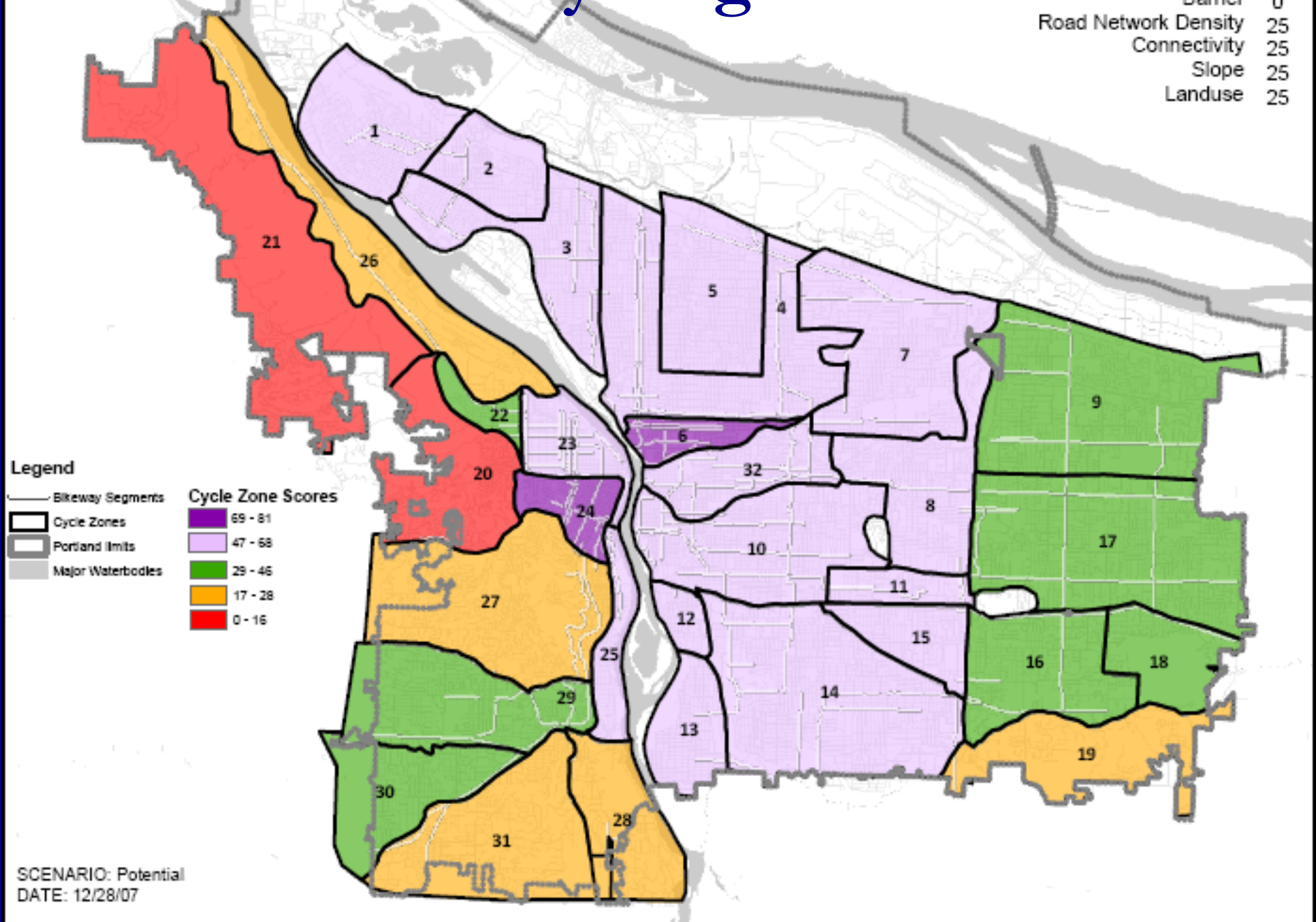
2. Identifying Areas of Highest Potential for Bicycling

CYCLE ZONE RATING

Bicycling Potential

FACTOR WEIGHTING

Bikeway Quality	0
Barrier	0
Road Network Density	25
Connectivity	25
Slope	25
Landuse	25

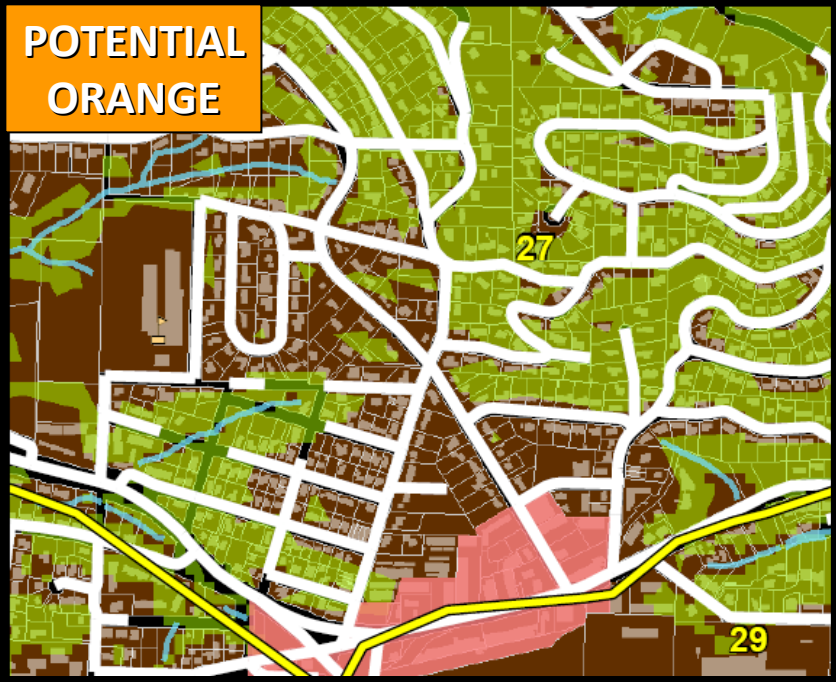


SCENARIO: Potential
DATE: 12/28/07

POTENTIALS COMPARED

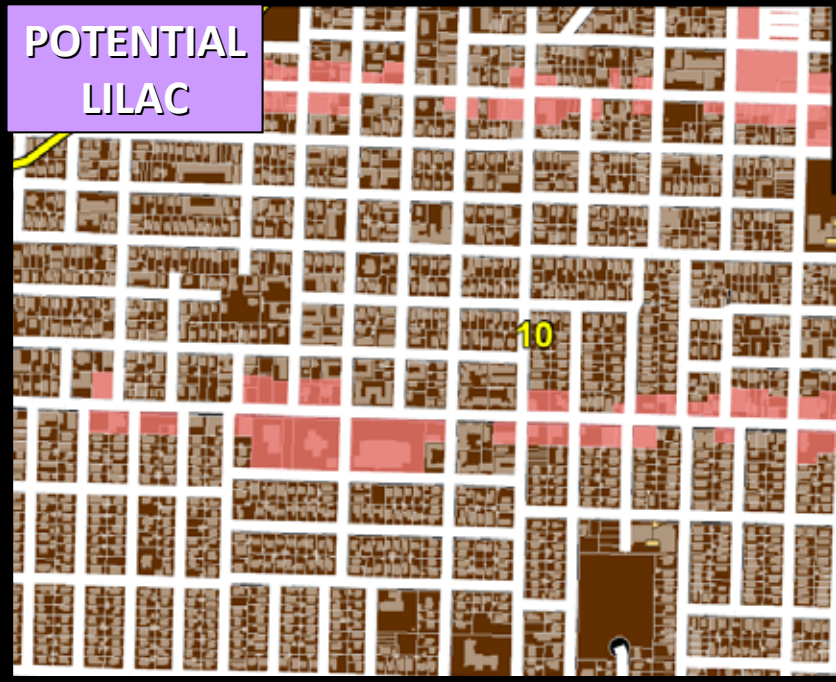
CYCLE ZONE 27 - SOUTHWEST

POTENTIAL ORANGE



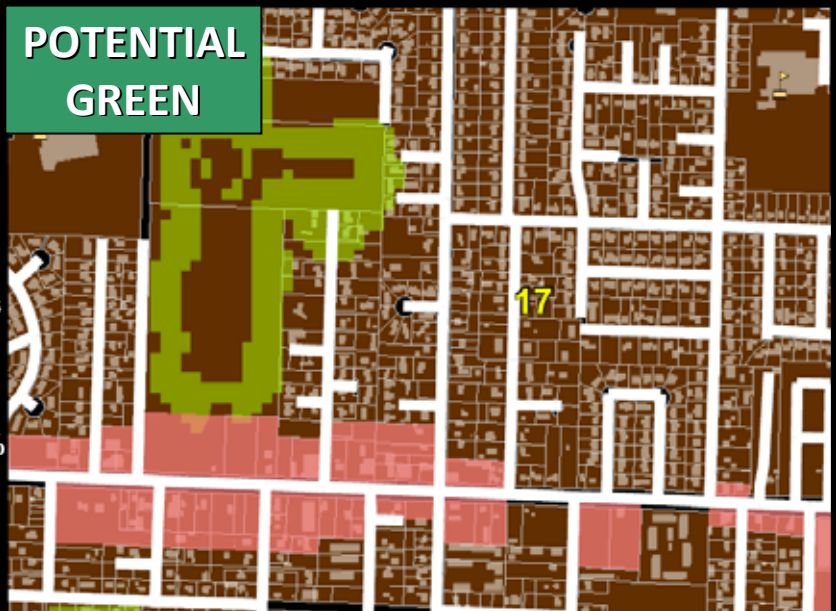
CYCLE ZONE 10 - INNER EAST

POTENTIAL LILAC



CYCLE ZONE 17 - OUTER EAST

POTENTIAL GREEN



CYCLE ZONE 24 - CITY CENTER

POTENTIAL PURPLE

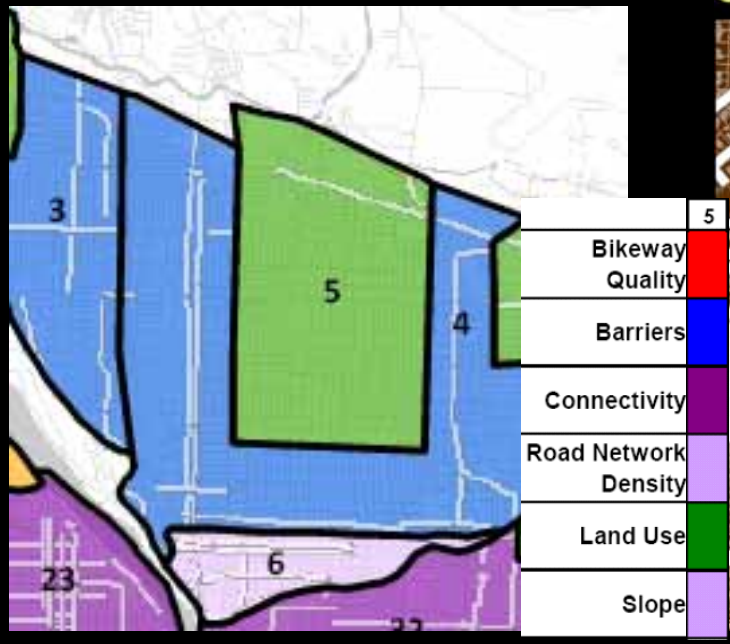
Legend

- Cycle Zones
- Streets
- Commercial
- Slope > 20%
- Stream
- Schools

Scale 1:5,660

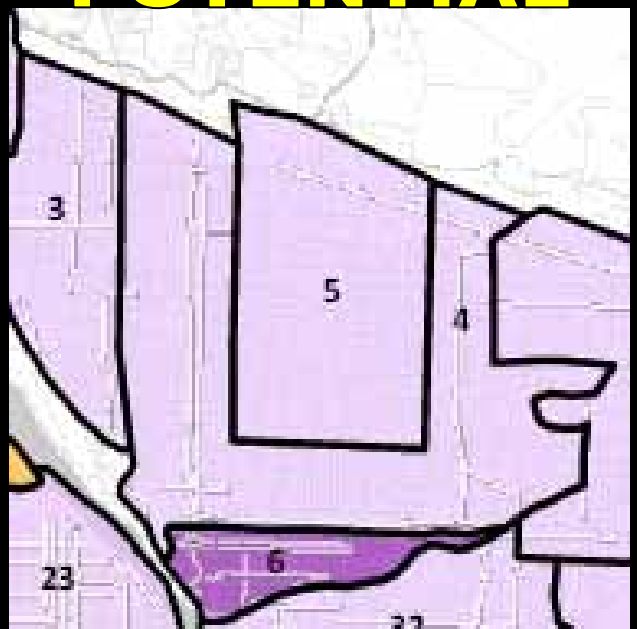
EXISTING VS. POTENTIAL RATING

OVERALL RATING



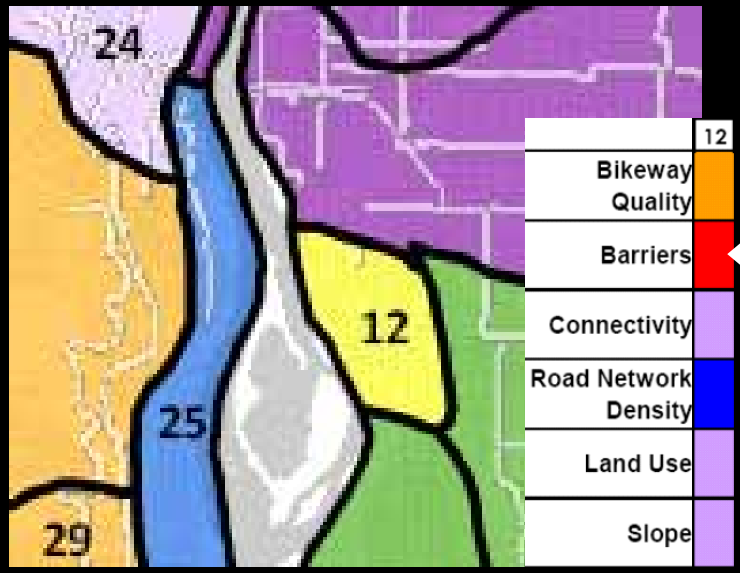
	5
Bikeway Quality	
Barriers	
Connectivity	
Road Network Density	
Land Use	
Slope	

POTENTIAL

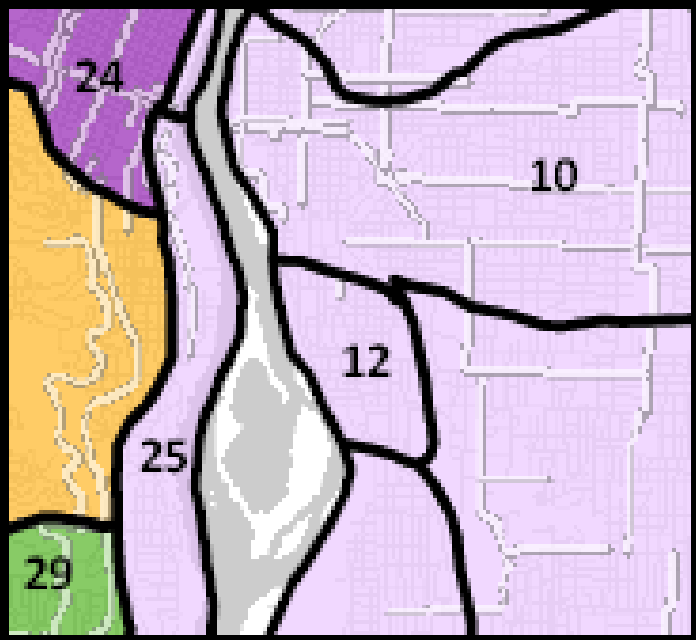


EXISTING VS. POTENTIAL RATING

OVERALL RATING



POTENTIAL



3. Tailoring Solutions that permit nuanced considerations

CYCLE ZONE GROUPINGS

characteristics → strategy

GROUPS	Group 1 NW	Group 2 Inner SW	Group 3 Outer SW	Group 4 Central West	Group 5 Outer North	Group 6 Inner N-NE	Group 7 Central East	Group 8 Inner East	Group 9 Outer East	Group 10 Far SE
Cycle Zones	20,21,26	27,29	30,31,28	22,23, 24,25	1,2	3,4,5	6,10,12,32	7,8,11, 13,14,15	9,16,17	18,19
Road Network Density	WORST	POOR	POOR	BEST	MOD	GOOD	BEST	GOOD	POOR	POOR
Connectivity	WORST	POOR	POOR	GOOD	MOD	GOOD	BEST	MOD-GOOD	POOR	WORST
Land Use	WORST	POOR	WORST	BEST	MOD	MOD	GOOD	MOD-GOOD	POOR	WORST
Slope	WORST	POOR	WORST	GOOD	GOOD	BEST	GOOD	BEST	GOOD	WORST
POTENTIAL	LOWEST	MED	LOW	HIGH-TOP	HIGH	HIGH	HIGH- TOP	HIGH	MED	LOW
STRATEGY	•Access to Transit •Direct Thru Routes w/ Wide Bike Lanes	•Access to Retail •Access to Transit •Safe Crossings •Connect Gaps •Direct Thru Routes w/ Wide Bike Lanes	•Access to Transit •Direct Thru Routes w/ Wide Bike Lanes	•Bicycle Districts •All Streets Access •Comfort in Mixed Traffic	•Access to Retail •Access to Transit •Safe Crossings •Direct Thru Routes w/ Wide Bike Lanes	•Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial	•Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial	•Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial	•Access to Transit •Connect Gaps •Direct Thru Routes w/ Wide Bike Lanes	•Direct Thru Routes w/ Wide Bike Lanes

Cycle Zone Groupings

characteristics → strategy

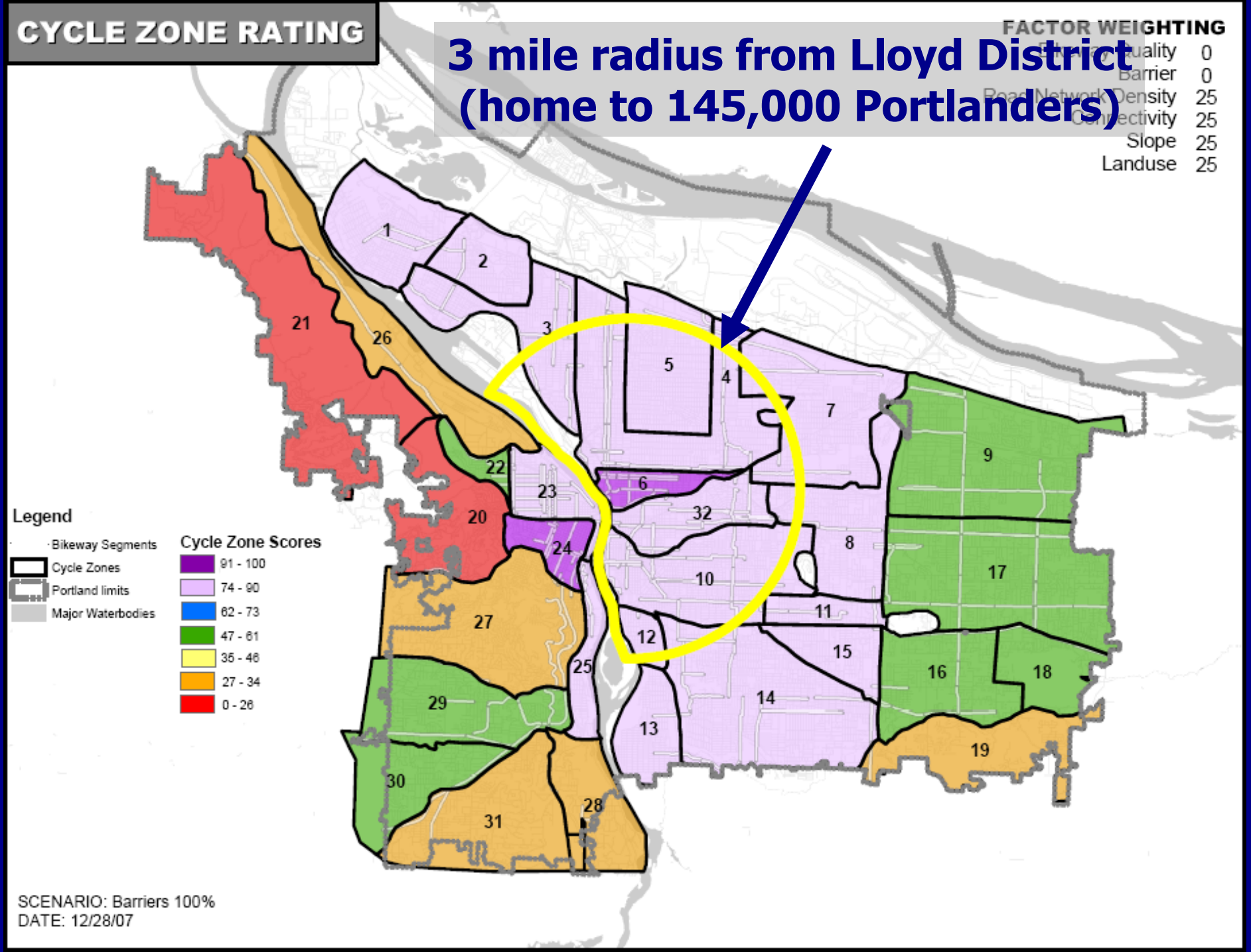
COLOR	▶	RANK
Red	▶	Worst
Orange & Yellow	▶	Poor
Green	▶	Moderate
Blue & Indigo	▶	Good
Violet	▶	Best

CZ GROUP FINDINGS	▶	STRATEGY/FOCUS
Highest Rd Net. Density, Land Use Mix & Connectivity	▶	Bicycle Districts
↑ Land Use Mix	▶	Maximize Proximity to Retail
↑ Rd Network Density ↑ Land Use Mix	▶	Fine Bikeway Mesh Low Traffic Bike Priority Streets
Land Use Mix = Poor	▶	Access to Commercial/Centers
↓ Rd Network Density ↓ Connectivity	▶	Direct Routes w/ Wide Bike Lanes
↑ Degree of Slope ↓ Outside CC Buffer (5mi)	▶	Access to Transit
↓ Connectivity ↑ Degree of Steep Slope	▶	Connect Network Gaps

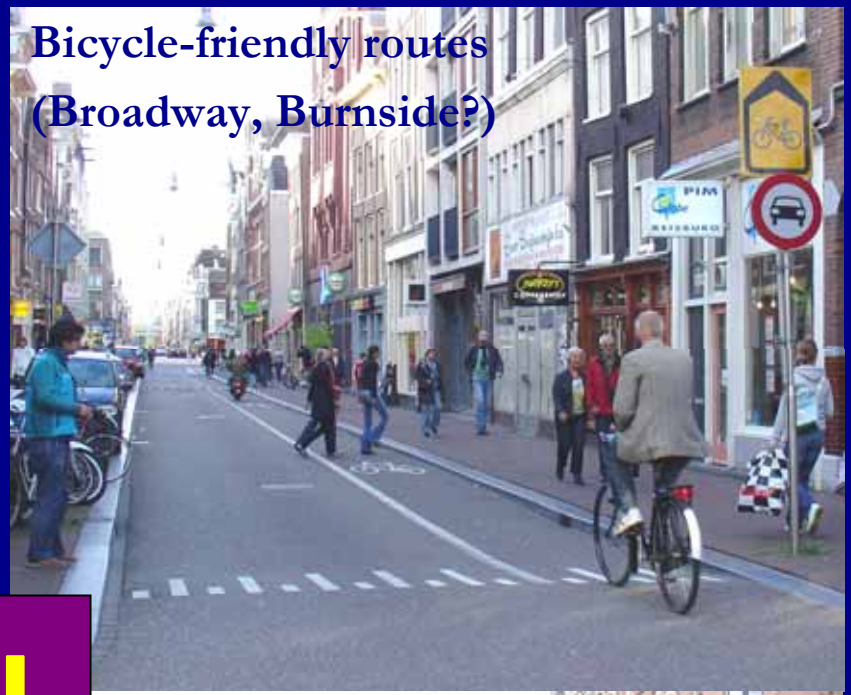
4. Promoting highest potential areas to business interests.

CYCLE ZONE RATING

3 mile radius from Lloyd District (home to 145,000 Portlanders)



Imagine Downtown / Lloyd District

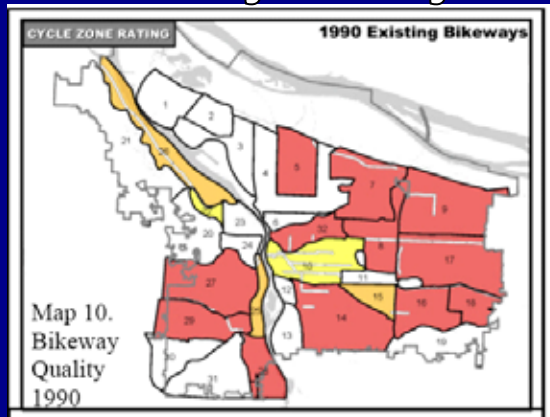
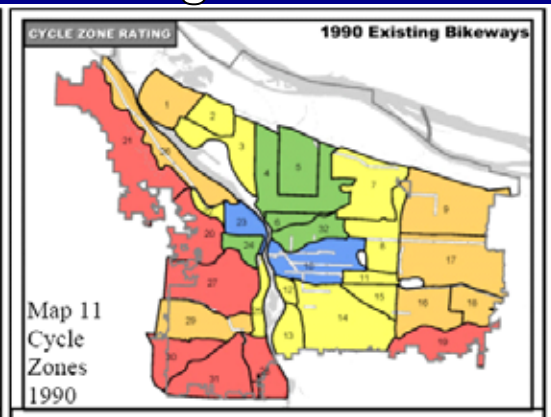
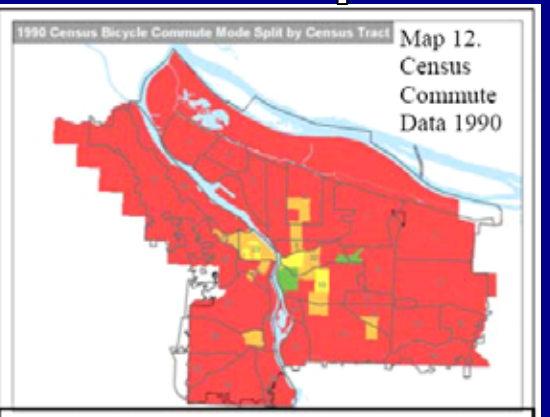
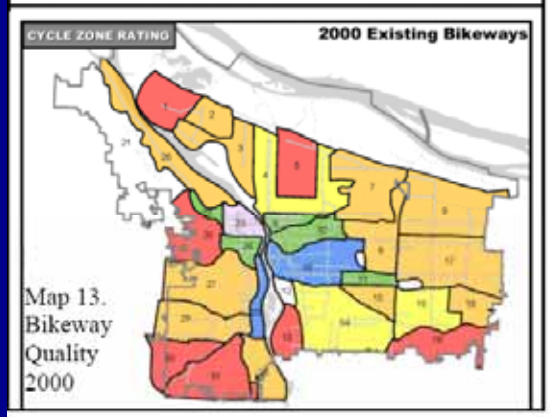
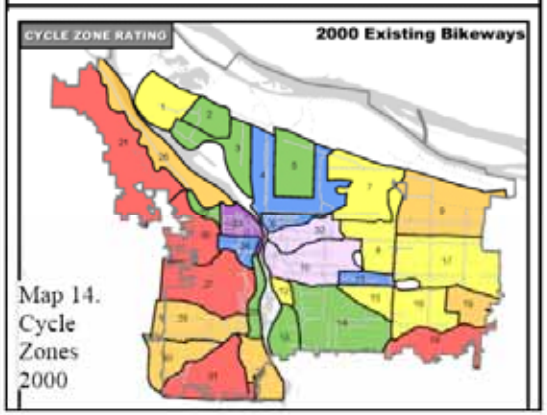
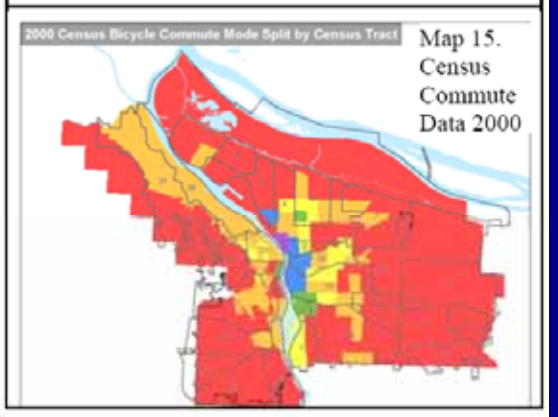
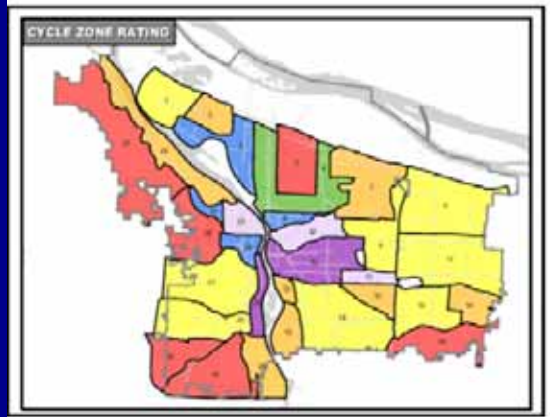
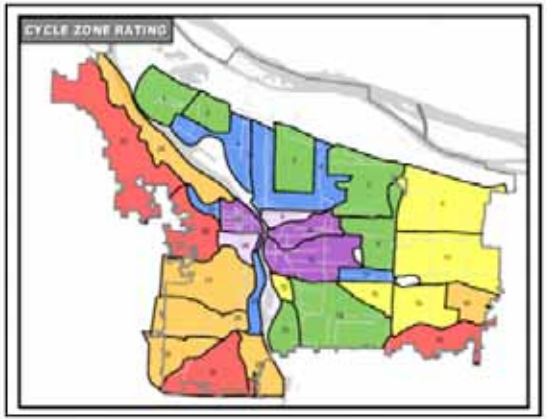
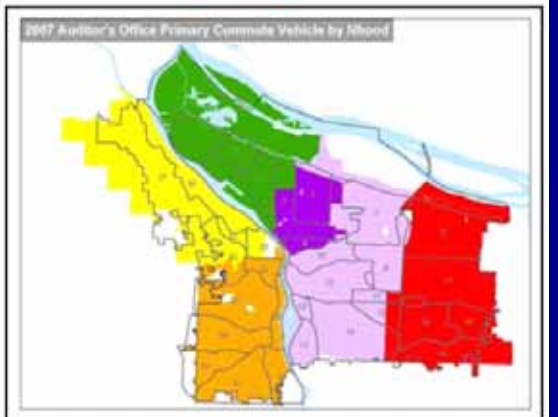


Potential Purple

5. **Showing Relationship Between Bikeway Quality, Cycle Zone Quality and Ridership**

(i.e., validating efforts to improve cycling and/or "build it and they will come" approach)

Cycle Zones and Ridership 1990-2008

Bikeway Quality	Biking Conditions	Ridership	YR
 Map 10. Bikeway Quality 1990	 Map 11 Cycle Zones 1990	 Map 12. Census Commute Data 1990	1990
 Map 13. Bikeway Quality 2000	 Map 14. Cycle Zones 2000	 Map 15. Census Commute Data 2000	2000
			2007

Lessons Learned

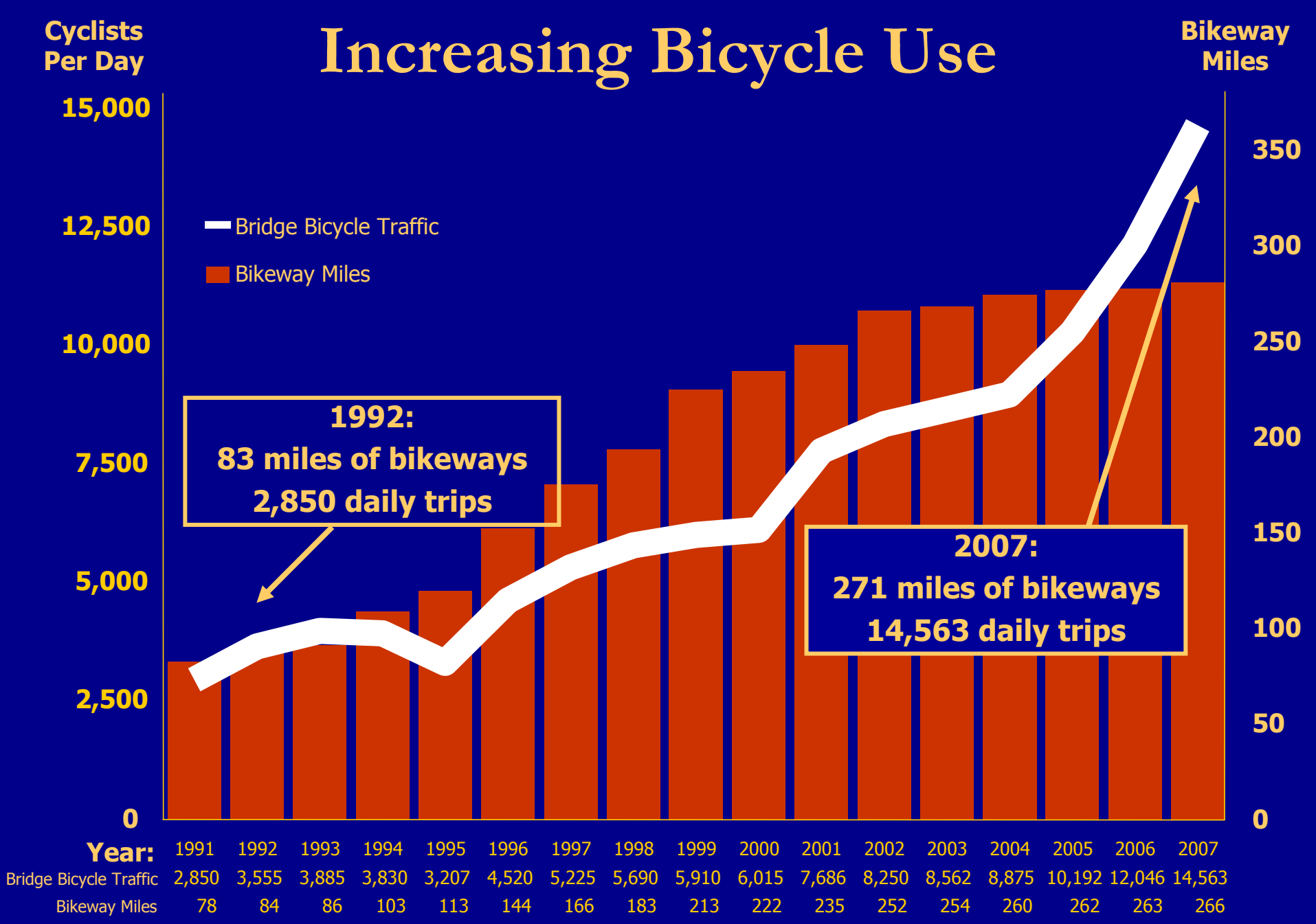
- Weighting the different conditions is critical
- There are nuanced factors that result in different considerations and treatments for each cycle zone
- This tool is only a companion to local knowledge and is simply a means to best organize and present local knowledge
- Like all models: data-intensive!
- The Bicycle Quality Index is transferable only when there exists a decent bikeway network

Next Steps

- Develop a better interface between mapping tool (ArcMap) and analysis tool (Excel)
- Determine "correct" (universal?) weighting
- Develop more detailed proxy for trip distance
- Incorporate local streets and off-street paths
- Incorporate Bicycle Intersection Safety Index (BISI)

4 Types of Transportation Cyclists

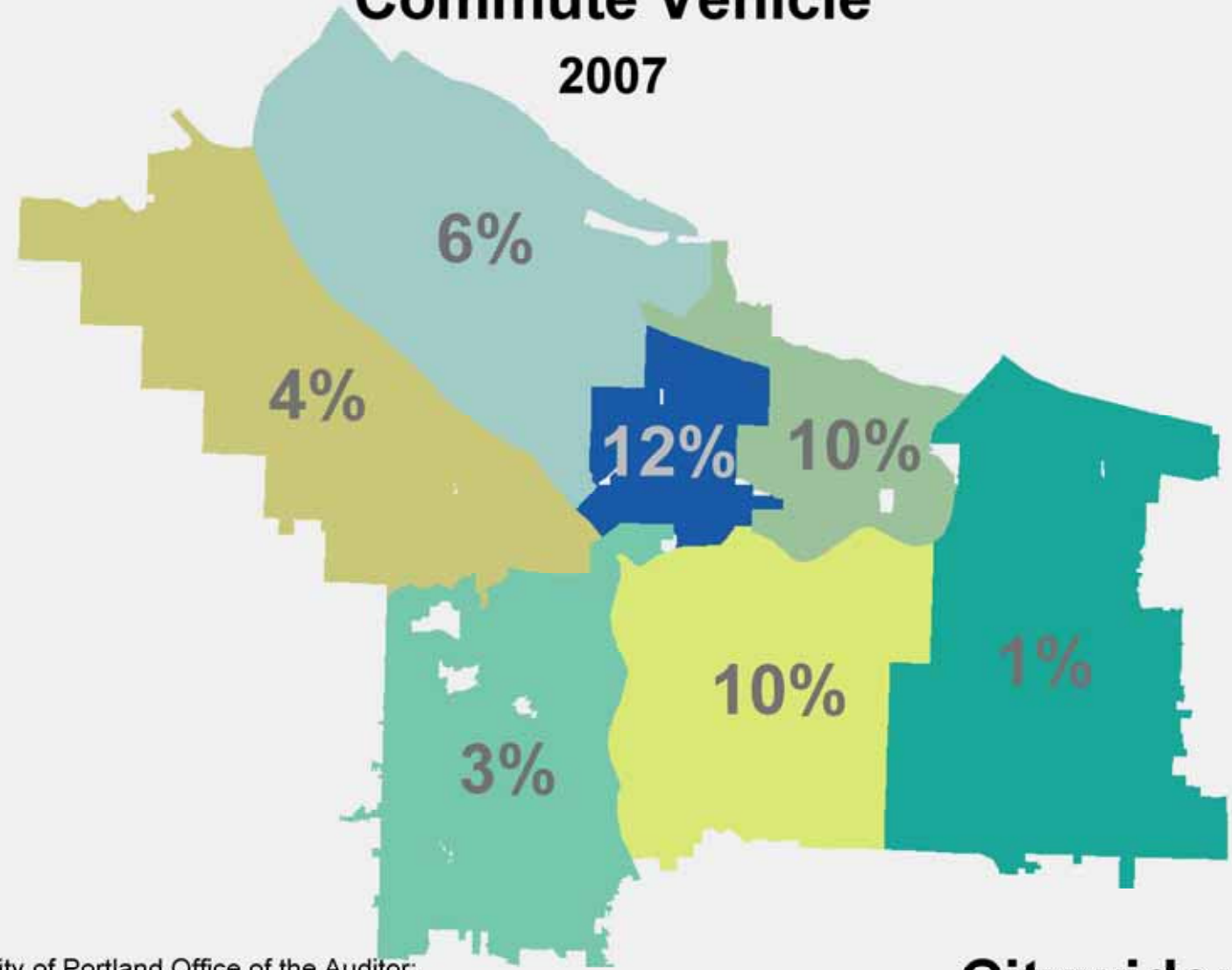
Increasing Bicycle Use



Year:	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bridge Bicycle Traffic	2,850	3,555	3,885	3,830	3,207	4,520	5,225	5,690	5,910	6,015	7,686	8,250	8,562	8,875	10,192	12,046	14,563
Bikeway Miles	78	84	86	103	113	144	166	183	213	222	235	252	254	260	262	263	266

People Reporting the Bicycle as their Primary Commute Vehicle

2007

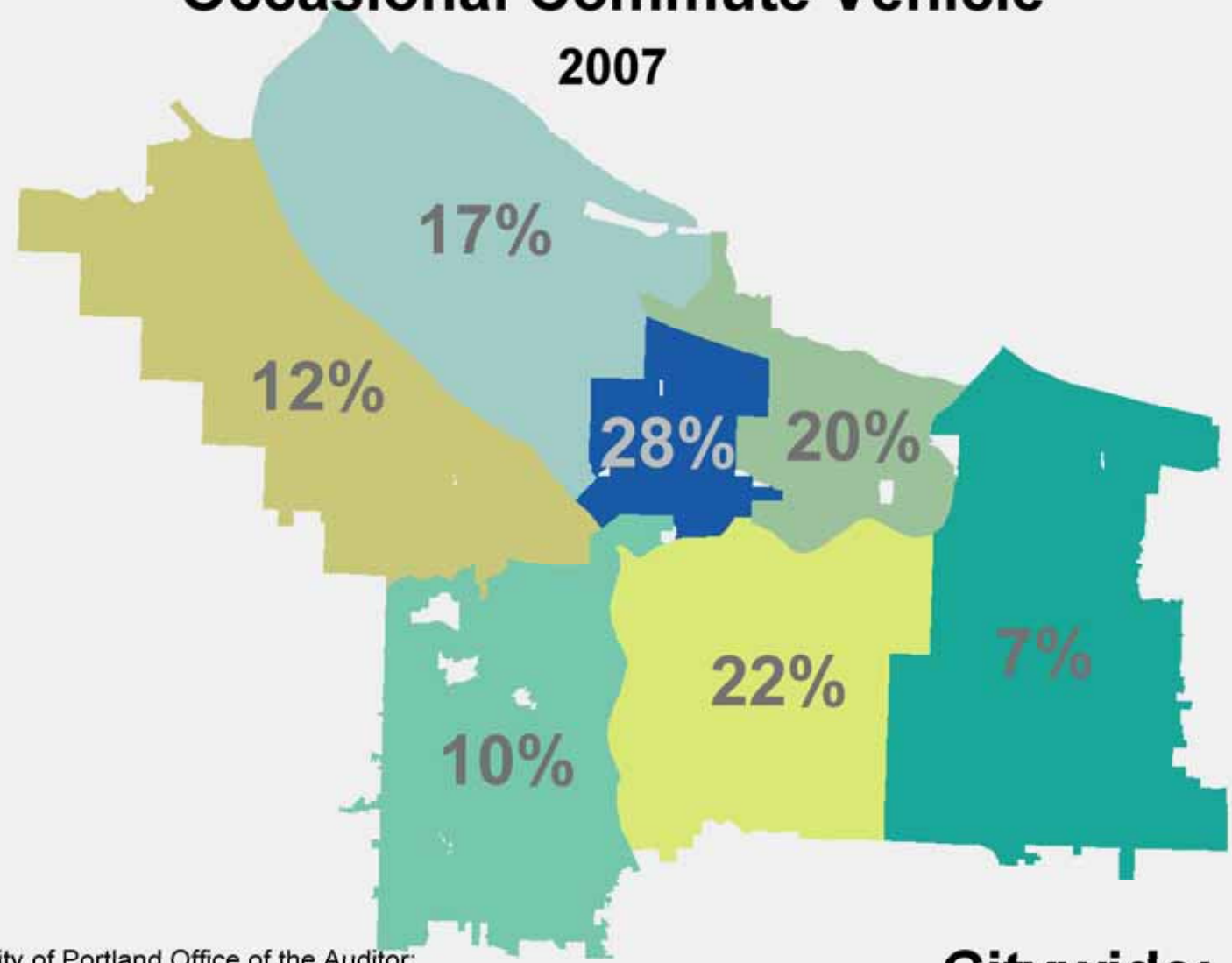


Source: City of Portland Office of the Auditor:
Service Efforts & Accomplishments Report 2006-07

Citywide: 6%

People Reporting the Bicycle as at least an Occasional Commute Vehicle

2007

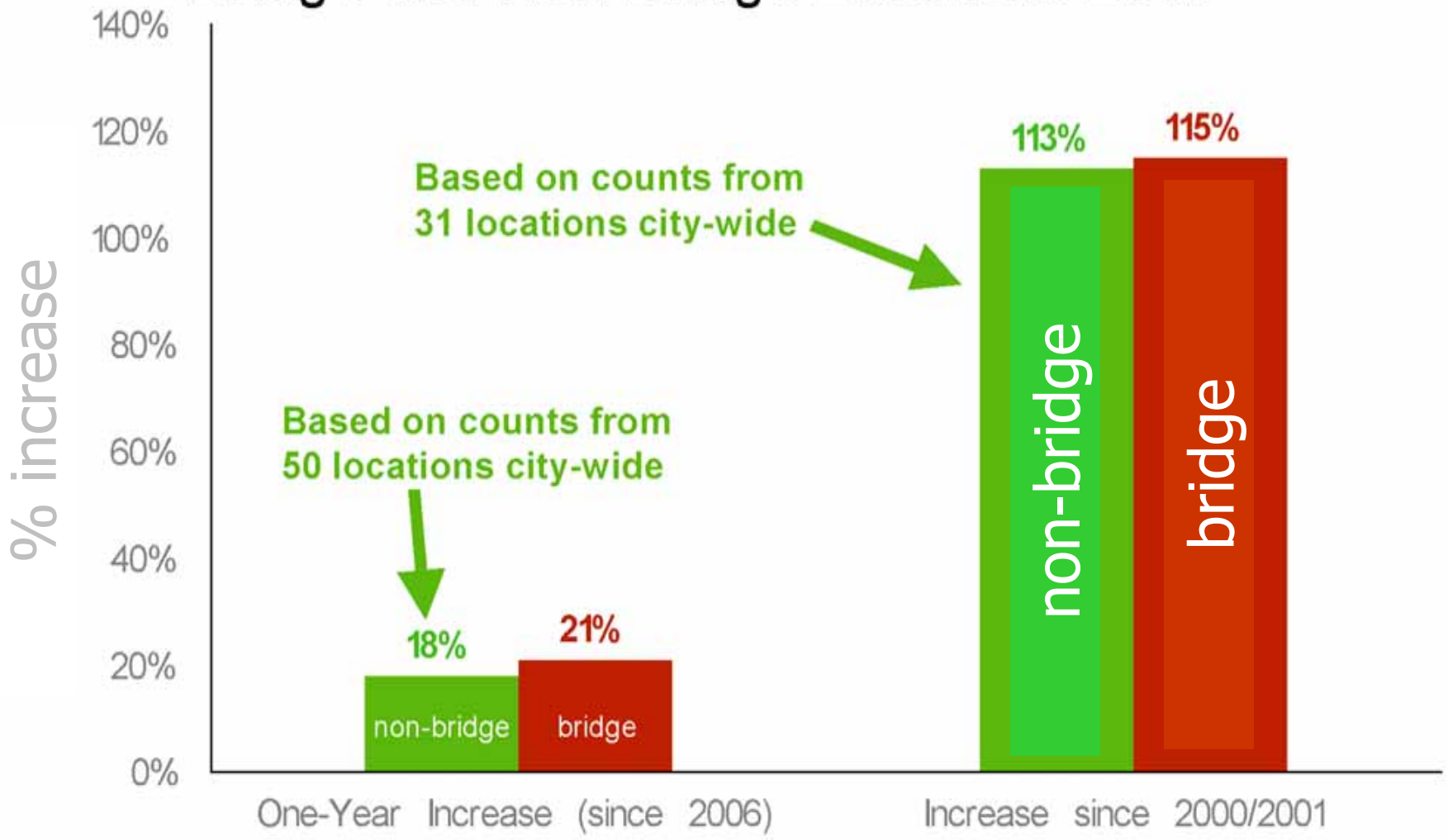


Source: City of Portland Office of the Auditor:
Service Efforts & Accomplishments Report 2006-07

Citywide: 16%

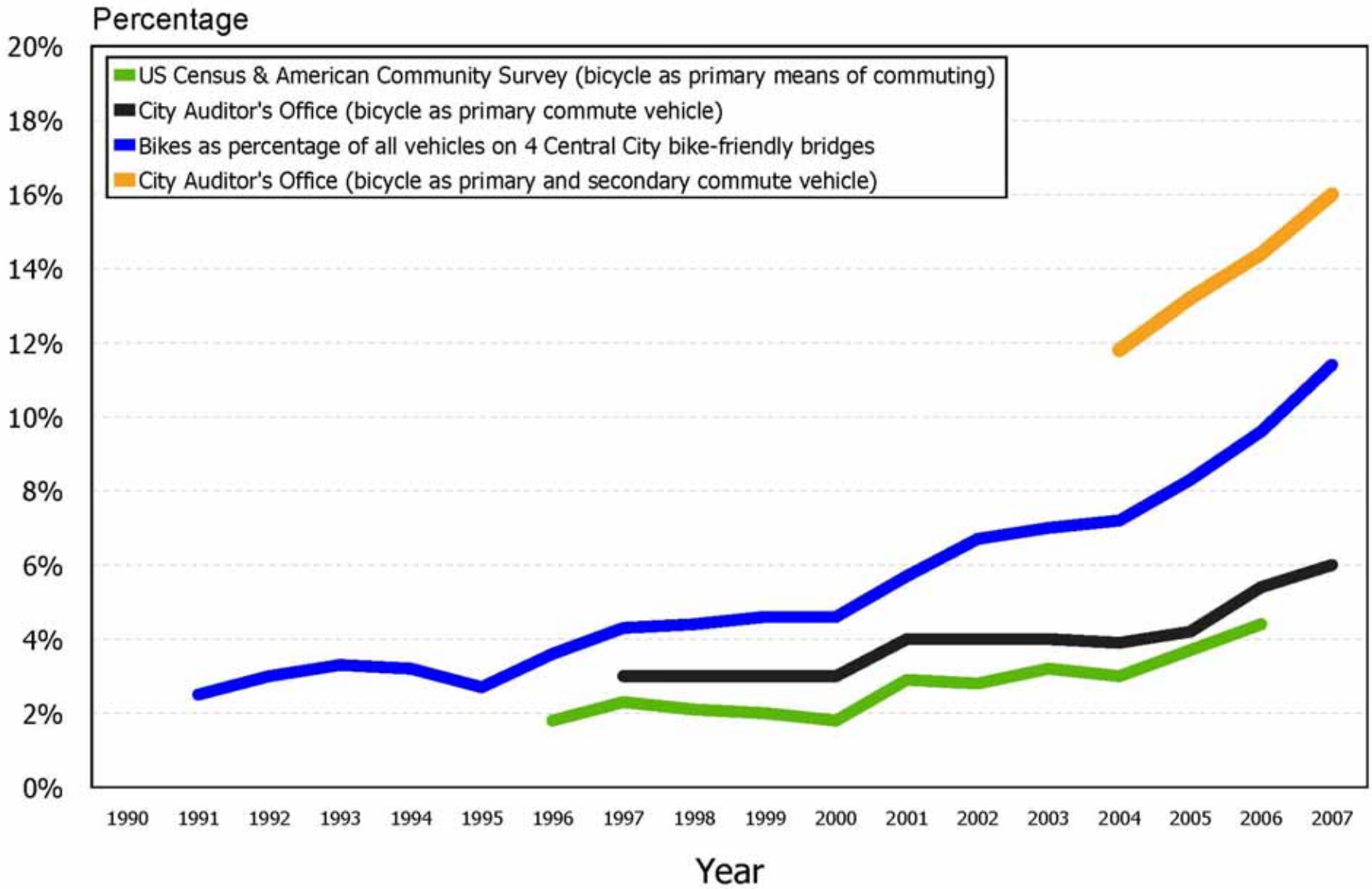
Increase in Bicycle Traffic

Bridge and Non-Bridge Locations 2007

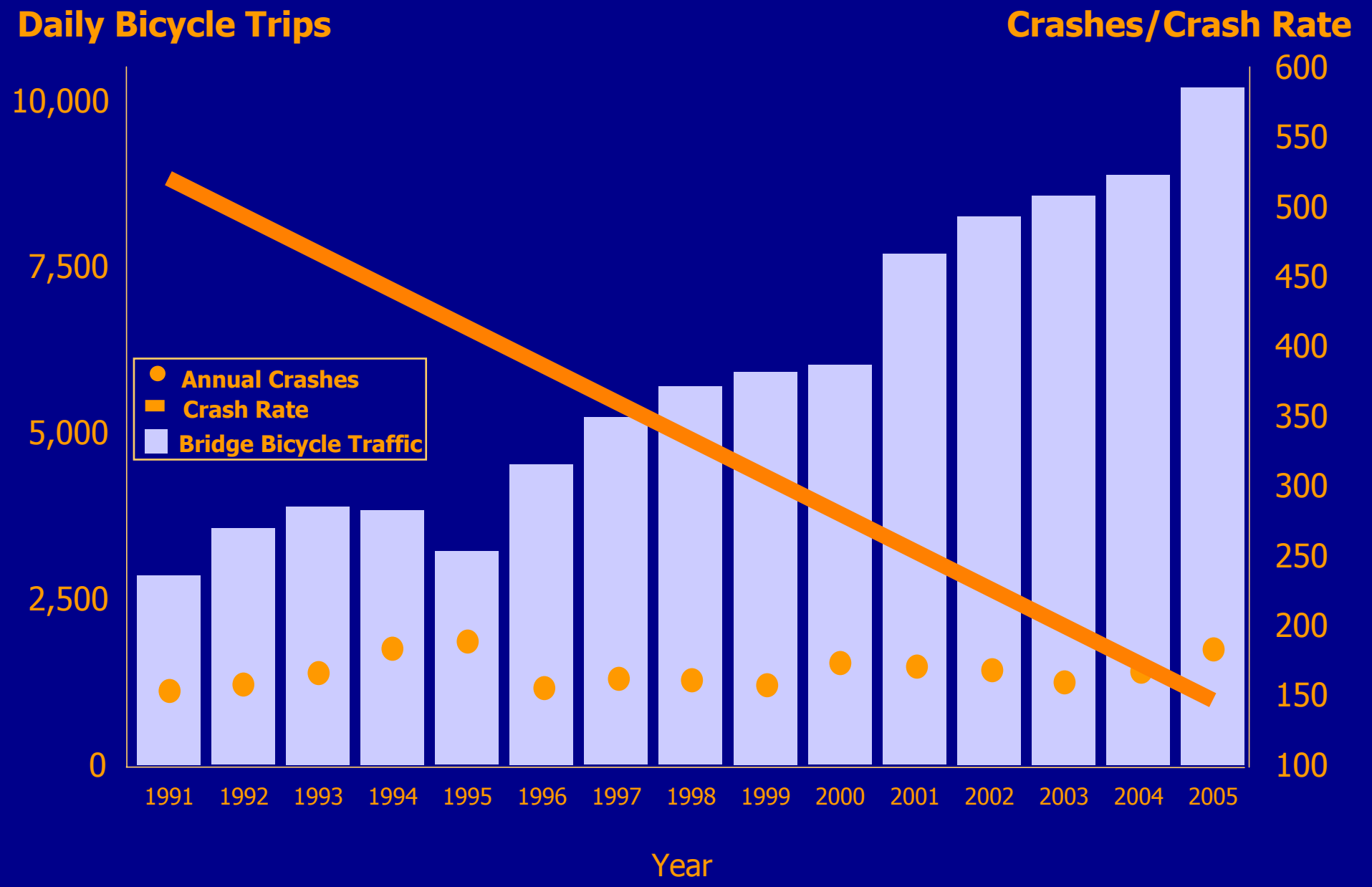


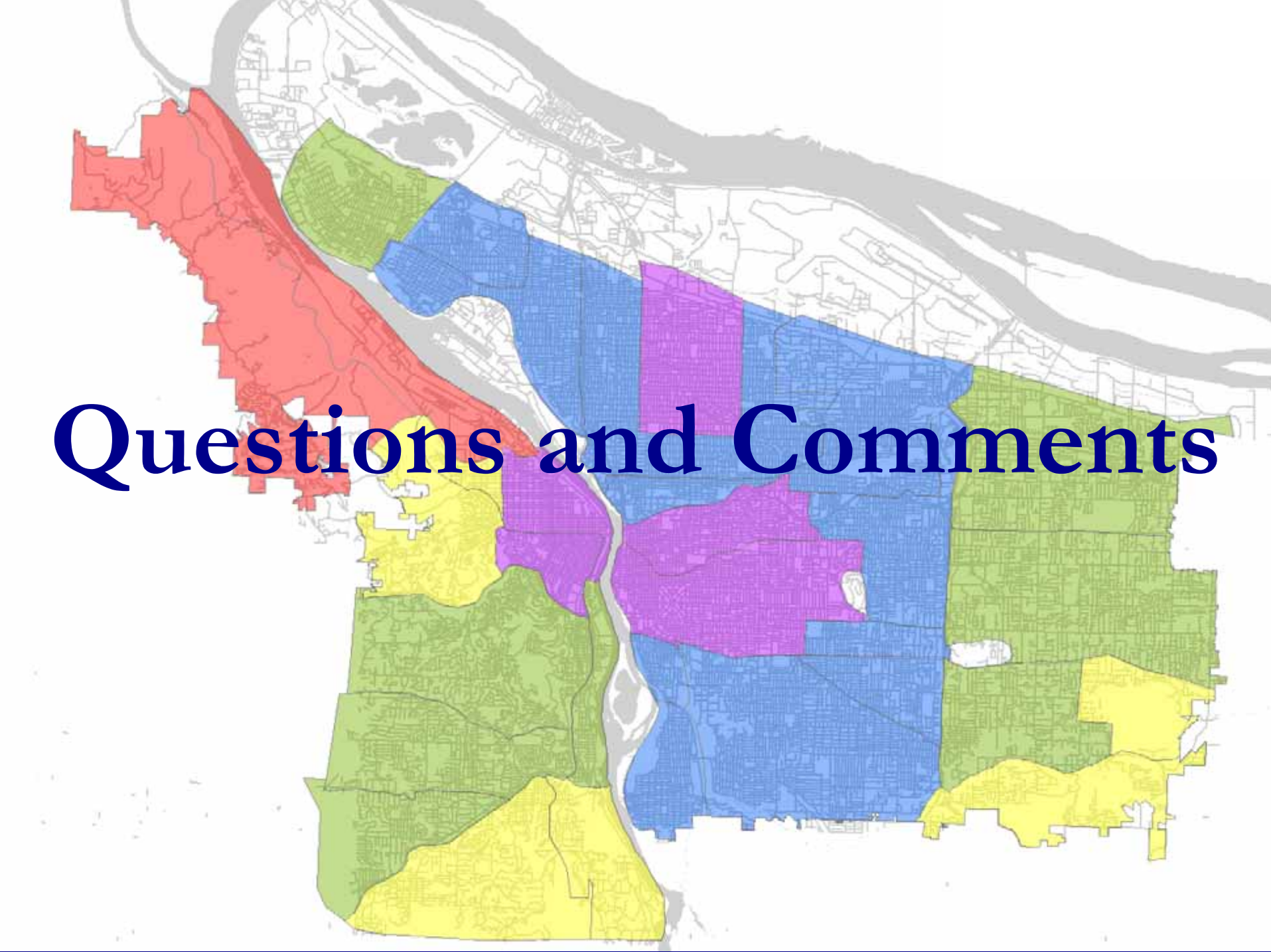
Based on manual and automated bicycle counts

Rising Bicycle Use in Portland
Bridge Counts, US Census, City Auditor's Reports



Decreasing Crash Rate




Questions and Comments