

# East Metro Connections Project



## Transportation Safety and Operations Analysis



Technical Advisory Committee, February 8, 2012



Metro | *Making a great place*

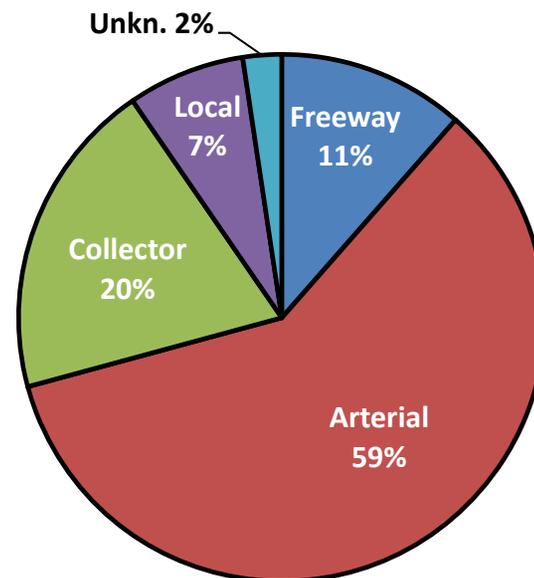
# East Metro Safety Data

- High rate of Fatal/Serious Injury crashes per VMT (2007 – 2009 data)

	Population (2010)	Annual VMT	Fatals and Serious Injuries	Fatal and Serious Injuries per Million residents	Fatals and Serious Injuries per 100M VMT
East Multnomah	136,130	0.65 B	45	333.0	6.9
Metro	1,481,118	14.3 B	532	359.0	3.7

# East Metro Safety Data

- 59% of Fataals/Serious Injuries occur on arterials (Metro region)



- Arterials are the primary transportation safety problem in East Metro

# East Metro Safety Data

- 72 arterial segments in study area ranked by number and severity of crashes

All Crashes - by Segment

2007 - 2008 - 2009 Data



Rank	Corridor	Segment or Intersection	Miles	SPIS-based Relative Score
1	Division	Burnside Hogan	0.17	1,862
2	182nd/181st	Burnside Stark	0.20	1,779
3	Powell	Burnside 257th	0.35	1,450
4	257th/Kane	I-84 Halsey	0.25	1,361
5	182nd/181st	I-84 Halsey	0.41	1,350
6	182nd/181st	Glisan Burnside	0.30	1,346
7	Stark	181st Burnside	0.47	1,279
8	238th/242nd/Hogan	I-84 ramp Halsey	0.16	1,235
9	Division	174th 182nd	0.44	1,113
10	238th/242nd/Hogan	Division Burnside	0.22	963
11	Division	Hogan 257th	0.68	959
12	182nd/181st	Halsey Glisan	0.57	752
13	Stark	Hogan 257th	0.68	719
14	Division	162nd 174th	0.58	706
15	238th/242nd/Hogan	Stark Division	1.01	662
16	Burnside	Powell Palmquist	0.57	652
17	Stark	162nd 181st	0.75	616
18	Division	148th 162nd	0.68	604
19	Stark	148th 162nd	0.69	565
20	Halsey	148th 161st	0.65	555
21	Halsey	161st 181st	0.90	542
22	Burnside	Eastman Division	0.92	500
23	Powell	223rd Hogan	1.19	496
24	223rd/Eastman	Stark Burnside	0.65	494
25	Burnside	Hogan Powell	0.69	481

Ped/Bike Crashes - by Segment

2007 - 2008 - 2009 Data

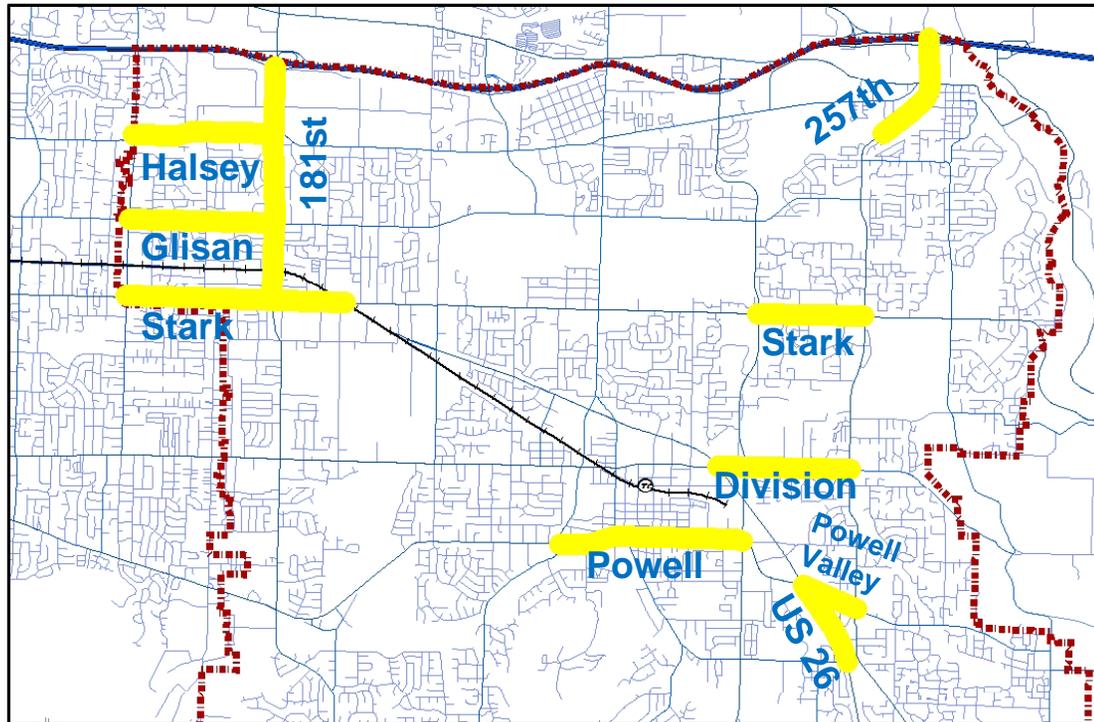


Rank	Corridor	Segment or Intersection	Miles	Ped-Bike Score
1	182nd/181st	Burnside Stark	0.20	1,118
2	182nd/181st	Glisan Burnside	0.30	755
3	Stark	181st Burnside	0.47	661
4	Division	Hogan 257th	0.68	620
5	238th/242nd/Hogan	I-84 ramp Halsey	0.16	618
6	Division	148th 162nd	0.68	457
7	Division	162nd 174th	0.58	379
8	Powell	Burnside 257th	0.35	313
9	182nd/181st	I-84 Halsey	0.41	265
10	Division	174th 182nd	0.44	250
11	Burnside	181st Stark	0.52	233
12	Stark	162nd 181st	0.75	214
13	Burnside	Powell Palmquist	0.57	194
14	Powell	223rd Hogan	1.19	193
15	Powell	182nd Birdsdale	1.19	168
16	Burnside	162nd 181st	0.75	161
17	Halsey	148th 161st	0.65	154
18	Glisan	Hogan 257th	0.72	152
19	257th/Kane	Glisan Stark	0.75	146
20	257th/Kane	Division Powell	0.91	132
21	257th/Kane	Stark Division	1.00	131
22	Burnside	Eastman Division	0.92	119
23	257th/Kane	Halsey Glisan	0.94	117
24	238th/242nd/Hogan	Stark Division	1.01	99
25	Stark	223rd Hogan	1.04	97



# East Metro Safety Data

- High-crash arterial segments were selected for HSM analysis:



# HSM analysis

- The Highway Safety Manual is a predictive tool that allows us to estimate the effect of proposed designs on the number of crashes, and ensure that a safe design is selected. Conditions affecting Safety analysis:
  - Traffic volume and speed limit
  - Number and width of lanes
  - Presence of on-street parking
  - Number of street trees
  - Number and type of driveways
  - Type of median
  - Land use type
  - Presence of lighting
  - Presence of automatic speed enforcement
  - Number of roadside fixed objects
  - Number of intersections
  - Intersecting traffic volume
  - Left and right turn lanes
  - Signal phasing
  - Red light cameras
  - Intersection pedestrian volumes
  - Number of lanes to cross for pedestrians
  - Number of nearby bus stops
  - Presence of nearby school
  - Number of nearby alcohol sales loc'ns
  - Right turns on red allowed

# HSM analysis

- HSM Example:

**Table 6 Forecast Crash Frequency**

Intersection/ Segment <sup>1</sup>	2035 Forecast Crash Frequency (Crashes/Year)								
	No-Build			Alternative 1 (Mix 3- and 5-Lane)			Alternative 2 (5-Lane)		
	Facility	AADT <sup>2</sup>	Crashes/Year	Facility	AADT <sup>2</sup>	Crashes/Year	Facility	AADT <sup>2</sup>	Crashes/Year
Int: Main & Oak	Stop	35,730/ 3,650	3.26	Roundabout	35,730/ 3,650	1.67	Signal	39,080/ 5,280	6.93
Seg: Oak to 3rd St.	3-Lane	34,580	8.30	3-Lane	34,580	5.74	5-Lane	38,150	9.32
Int: Main & 3rd	Signal	33,910/ 25,790	6.63	Roundabout	33,910/ 25,790	3.43	Roundabout	36,900/ 29,400	3.86
Seg: 3rd to 5th	5-Lane	33,270	5.05	5-Lane	33,270	1.51	5-Lane	37,310	1.74
Int: Main & 5th	Signal	33,200/ 5,940	6.40	Roundabout	33,200/ 5,940	3.32	Roundabout	37,860/ 7,230	3.99
<b>Total Prediction</b>	29.6 crashes/year			15.7 crashes/year			25.8 crashes/year		
<b>Change Relative to No-Build</b>				47% Decrease			13% Decrease <sup>3</sup>		

<sup>1</sup> For the purposes of presenting the results, crashes estimated for minor street intersections along the two segments (Oak St. to 3rd St. and 3rd St. to 5th St.) were added into the segment crash totals.

<sup>2</sup> Major Street AADT/Minor Street AADT for intersections.

<sup>3</sup> Under the 5-lane scenario, the corridor has more capacity; therefore more regional traffic is drawn to this corridor. The decrease shown is for overall crashes, so a normalized analysis would show a slightly greater decrease.

**Results (see Table 6):**

- Changes in crash frequencies are quantified and compared to the no-build scenario. The resulting forecast crash frequencies for Alternatives 1 and 2, 15.7 and 25.8 crashes respectively, are compared to the no-build crash frequency, 29.6. The difference is quantified as a percentage.
- The change in crash frequency can now be considered as one of the trade-offs similar to traffic operations, environmental impacts and pedestrian and bicycle mobility.

# HSM Crash Reduction Testing

- What measures reduce crashes on arterials?
  - Reduction in traffic volume
  - Medians instead of two-way left-turn lanes
  - Road Diets
  - Reduced number of driveways
  - Prohibit Right Turns on Red
  - Protected left-turn phasing – *already there*
  - Roundabouts
  - Automated speed enforcement – *not legal in OR*

# HSM Crash Reduction Testing

Corridor	Proposed Changes	Annual Change in		
		crashes	Fat/ Inj crashes	# Fat/Inj crashes
Division: Burnside – 257 <sup>th</sup>	Add median – entire length	-30%	-39%	-6
181 <sup>st</sup> : I-84 – Stark	Add median – entire length, No RTOR at MAX stop	-30%	-35%	-17
Stark: 162 <sup>nd</sup> – Burnside	Add median – entire length	-42%	-46%	-18
Halsey: 162 <sup>nd</sup> – 192 <sup>nd</sup>	Road diet Halsey east of 162 <sup>nd</sup> to 3 lanes, add a median and a roundabout at 162 <sup>nd</sup>	-63%	-85%	-16
Glisan & 162 <sup>nd</sup>	Convert to a roundabout	-48%	-78%	-2
Burnside & Powell Valley	Add medians on Burnside and Powell Valley, protected lefts	-34%	-40%	-7
TOTAL	5.4-miles of arterials total		reduced 60 - 70	

# HSM Crash Reduction Testing

- Some changes are more effective than others
  - Roundabouts reduce F/Inj by 75-80%
  - Medians reduce F/Inj by 35-45%
  - Road Diets (5-to-3) reduce F/Inj by 50%+
  - Reduced driveways, No RTOR, auto speed enforcement less effective (but still better)
  - We estimated 60 – 70 reduced F/Inj crashes by working with 5.4 miles of arterials
  - There are more than 50 miles of arterials in East Metro

# East Metro Safety projects

Corridor	Proposed Changes	Annual Change in Fat/Inj crashes
Division: 175 <sup>th</sup> – 257 <sup>th</sup> (#99135)	Add median – entire length	25 – 30
181 <sup>st</sup> /Stark – I-84 to Rockwood (#99136)	Add medians on 181 <sup>st</sup> , Stark. No RTOR at MAX stop	30 – 40
Halsey/Glisan: 162 <sup>nd</sup> – 192 <sup>nd</sup> (#99137)	Road diet Halsey east of 162 <sup>nd</sup> to 3 lanes, add a median. Add roundabouts on 162 <sup>nd</sup> at Halsey and Glisan	15 – 20
Cherry Park/257 <sup>th</sup> (#99139)	Has not been defined – medians?	???
Hogan/Burnside/Powell (#99139)	Add medians on Hogan, Burnside and Powell Valley, protected lefts	5 – 10
<b>TOTAL</b>	Reduce Fatal/Injury crashes by 85 – 100 per year	

# East Metro Safety projects

*Safety projects are not easy to implement!*

- Medians require coordination with property owners
- Road diets are not well understood by the public
- Roundabouts are not well understood by the public
- Traditional planning inertia pushes the less-safe alternative: 5-lane roads with traffic signals



Less safe: 5 lanes  
with signals



More safe: 4 lane divided  
with roundabouts

# East Metro Safety strategies

- All future widening beyond 3 lanes should include medians rather than turn lanes (i.e. Hogan, 190<sup>th</sup>)
- New corridors should evaluate roundabouts for intersections where feasible (i.e. 190<sup>th</sup>)
- Consider lower-traffic corridors for road diets and roundabouts where feasible while preserving wider right-of-way (i.e. Halsey, 162<sup>nd</sup>, Glisan)
- Retrofit higher-traffic high-crash corridors with medians (i.e. 181<sup>st</sup>, 242<sup>nd</sup>, Stark, Division, Powell, Burnside)
- Spot safety treatments at high-crash locations for all modes
- Give people alternatives to driving alone

# Evaluation Criteria - Safety

- Criteria 15, 16, 17
- Projects which include elements that HSM predicts will result in reduced crashes

# East Metro Traffic Analysis

- Traffic model – “macro” analysis of entire study area (Tim)
- Traffic analysis – “micro” analysis of focus intersections (Anthony)
- Evaluation criteria for both (criteria 1, 2, 3, 4)

# East Metro Traffic Analysis

- 50 Intersections analyzed
- 2011, 2035 No-Build, and 2035 with projects
- “Special” project: 207<sup>th</sup> and 242<sup>nd</sup> extensions
- 2035 Bottlenecks identified
  - Defined as >110% of capacity
  - System management where demand is 100-110%

# System Management

- Where demand is 100-110%
- Adaptive Signal systems
  - Signals self-adjust to demand
  - Assumed 10% capacity boost
- Recommended on major corridors
  - #99141 181<sup>st</sup>; #99142 207<sup>th</sup>-Glisan-223<sup>rd</sup>; #99143 Hogan; #99144 Kane; #99145 Burnside; #99147 Powell



# 2035 System Bottlenecks

- 223<sup>rd</sup> & Stark Severe
- 242<sup>nd</sup> & Burnside, Powell Severe
- 242<sup>nd</sup> & Glisan, Stark Moderate
- Powell & 174<sup>th</sup> , Eastman Moderate
- Highland/190<sup>th</sup> Corridor Severe
- Following slides are candidate capacity solutions  
(not recommendations)

# 2035 System Bottlenecks

Severe

## 223<sup>rd</sup> & Stark

- At 118-124% of capacity in 2035
- Alt 1: Widen intersection (#10473)
  - EBRT lane, dual lefts all 4 approaches
- Alt 2: 207<sup>th</sup> Extension (#99131)
  - Reduces but does not eliminate bottleneck
  - Still need EBRT lane, dual SB/WB lefts



# 2035 System Bottlenecks

Severe

## 242<sup>nd</sup> & Burnside/Powell

- At 160%+ of capacity in 2035
- Widen Hogan to 4 lanes plus median (#10512)
- Widen Burnside intersection
  - EBRT lane, dual NB/SB lefts
- Widen Powell intersection
  - RT lanes and dual lefts all 4 approaches
- Traffic model may be over-allocating traffic here



# 2035 System Bottlenecks

Moderate

## 242<sup>nd</sup> & Glisan, Stark

- At 110-120% of capacity in 2035
- Widen Glisan intersection
  - 4 lanes thru intersection, EBRT lane
- Widen Stark intersection (#10511)
  - Dual NB/SB lefts



# 2035 System Bottlenecks

Moderate

## Powell & 174<sup>th</sup>, Eastman

- At 118-123% of capacity in 2035
- Widen Powell through 174th
  - Convert EBRT lane to thru/right, merge after intersection
- Widen Eastman intersection
  - Dual SB lefts
- Not included as candidate projects, but possible future needs

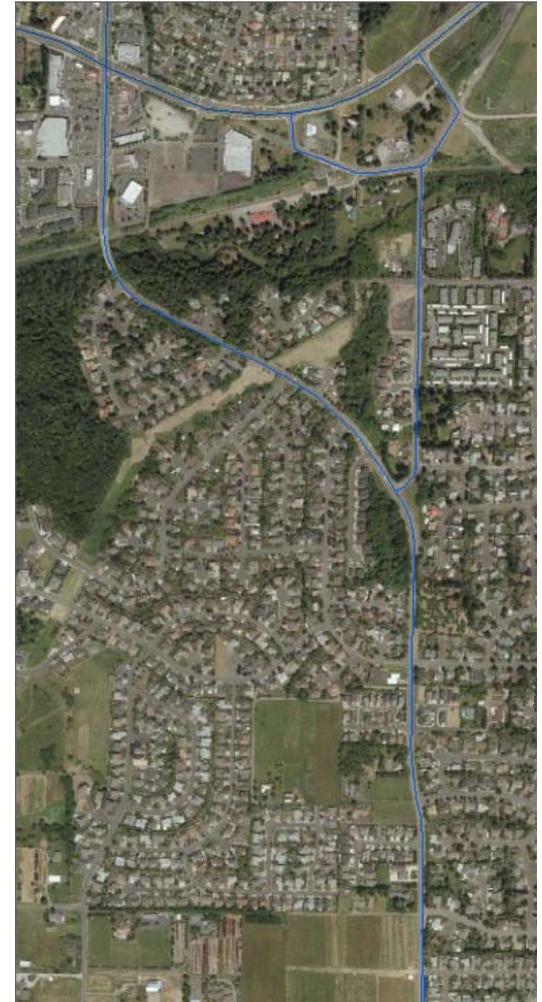


# 2035 System Bottlenecks

Severe

## Highland/190<sup>th</sup> Corridor

- At 200% of capacity in 2035
- Widening of 172<sup>nd</sup> in Clackamas leaves 2-lane gap south of Powell
- Widen to 4 lanes with median between Powell and County Line
- Evaluate roundabout feasibility at Butler, Richey, Cheldelin, others
- RTP Projects #10431, 10859



# Candidate Projects

## 207<sup>th</sup> Extension (#99131)

- RTP Connectivity Policy
- Reduces but does not eliminate bottleneck at 223<sup>rd</sup> & Stark
- Absorbs demand from 202<sup>nd</sup>, 212<sup>th</sup>, 223<sup>rd</sup>, and 242<sup>nd</sup>
- Works as 2-lane collector road



# Candidate Projects

## 242<sup>nd</sup> Extension (#99133)

- Capacity difference is negligible
- Travel time, no-build:

Route	Northbound	Southbound
via 238 <sup>th</sup>	3:39	3:36

- Travel time with extension:

Route	Northbound	Southbound
via 242 <sup>nd</sup> Extension and Halsey	3:39	4:00
via 238 <sup>th</sup>	4:23	3:56

