

All Roads Transportation Safety (ARTS) Hot Spot Program

ODOT Region 5 Kick-Off Meeting
March 17, 2015

Agenda

- Introductions
- Purpose of the Meeting
- Project Background
- Hot Spot Analysis Process
- Supplemental Application Process
- Next Steps





Project Background



All Roads Transportation Safety

ARTS Background

- ODOT met with representatives from League of Oregon Cities (LOC) and Association of Oregon Counties (AOC)
 - ✓ Need for developing a safety program for all public roads
 - ✓ Memorandum of understanding between ODOT, AOC, and LOC
- Agreed to All Roads Transportation Safety (ARTS) program

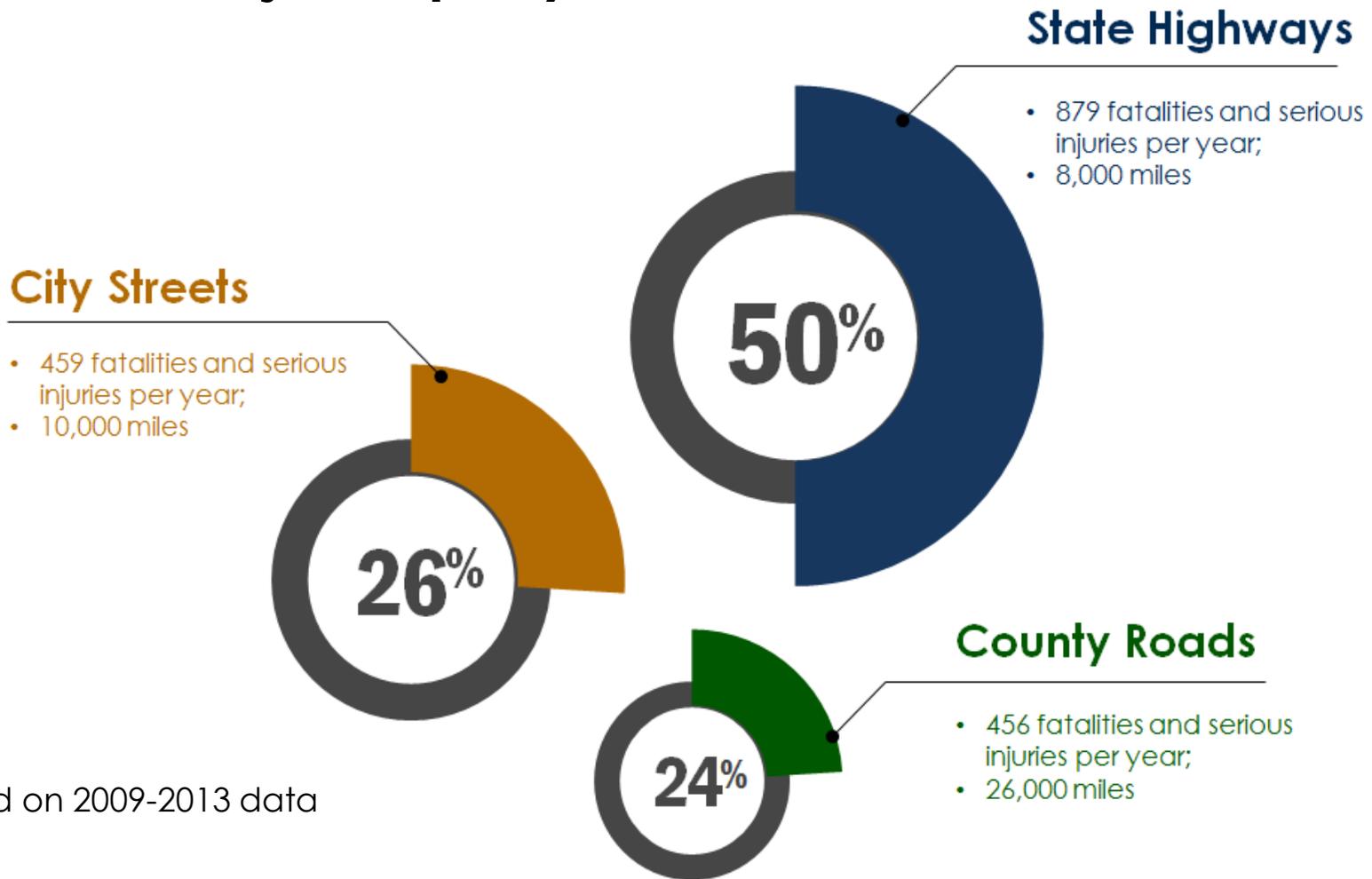


All Roads Transportation Safety



HSIP funding was traditionally only spent on State Highways, but 50% of our Fatal and Serious Injury crashes occur on local agency roads

Oregon averages 1,800 fatalities and serious injuries per year



Based on 2009-2013 data



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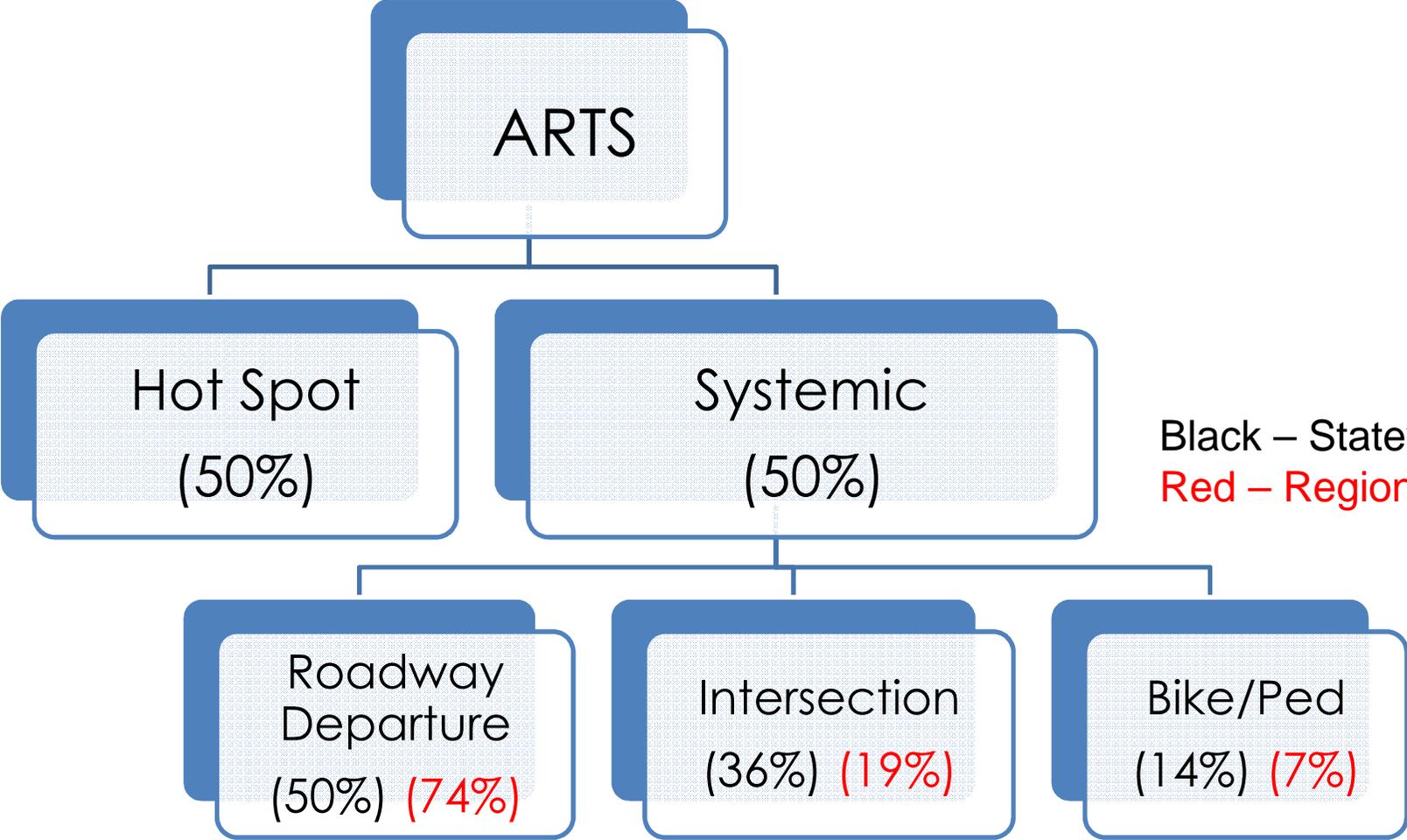
ARTS Program Goals

- Select the best projects to reduce fatalities and serious injuries
- Address safety on all roads
- Data-driven and blind to jurisdiction



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ARTS Program



Black – Statewide
Red – Region 5

Numbers in () represent approximate funding split



ARTS Hot Spot Funding (2017-2021)

- Funding will be allocated to ODOT Regions based on Fatal & Serious Injury crashes
- Required 7.78% Local Agency match

| Region | 2017 | 2018 | 2019 | 2020 | 2021 | 5-Yr Total |
|--------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 1 | \$6,064,985 | \$6,064,985 | \$5,084,683 | \$5,084,683 | \$5,084,683 | \$27,384,019 |
| 2 | \$6,323,450 | \$6,323,450 | \$5,197,753 | \$5,197,753 | \$5,197,753 | \$28,240,159 |
| 3 | \$2,746,225 | \$2,746,225 | \$2,461,453 | \$2,461,453 | \$2,461,453 | \$12,876,808 |
| 4 | \$2,130,150 | \$2,130,150 | \$1,605,598 | \$1,605,598 | \$1,605,598 | \$9,077,093 |
| 5 | \$1,196,690 | \$1,196,690 | \$1,073,298 | \$1,073,298 | \$1,073,298 | \$5,613,273 |
| Total | \$18,461,500 | \$18,461,500 | \$15,422,784 | \$15,422,784 | \$15,422,784 | \$83,191,352 |



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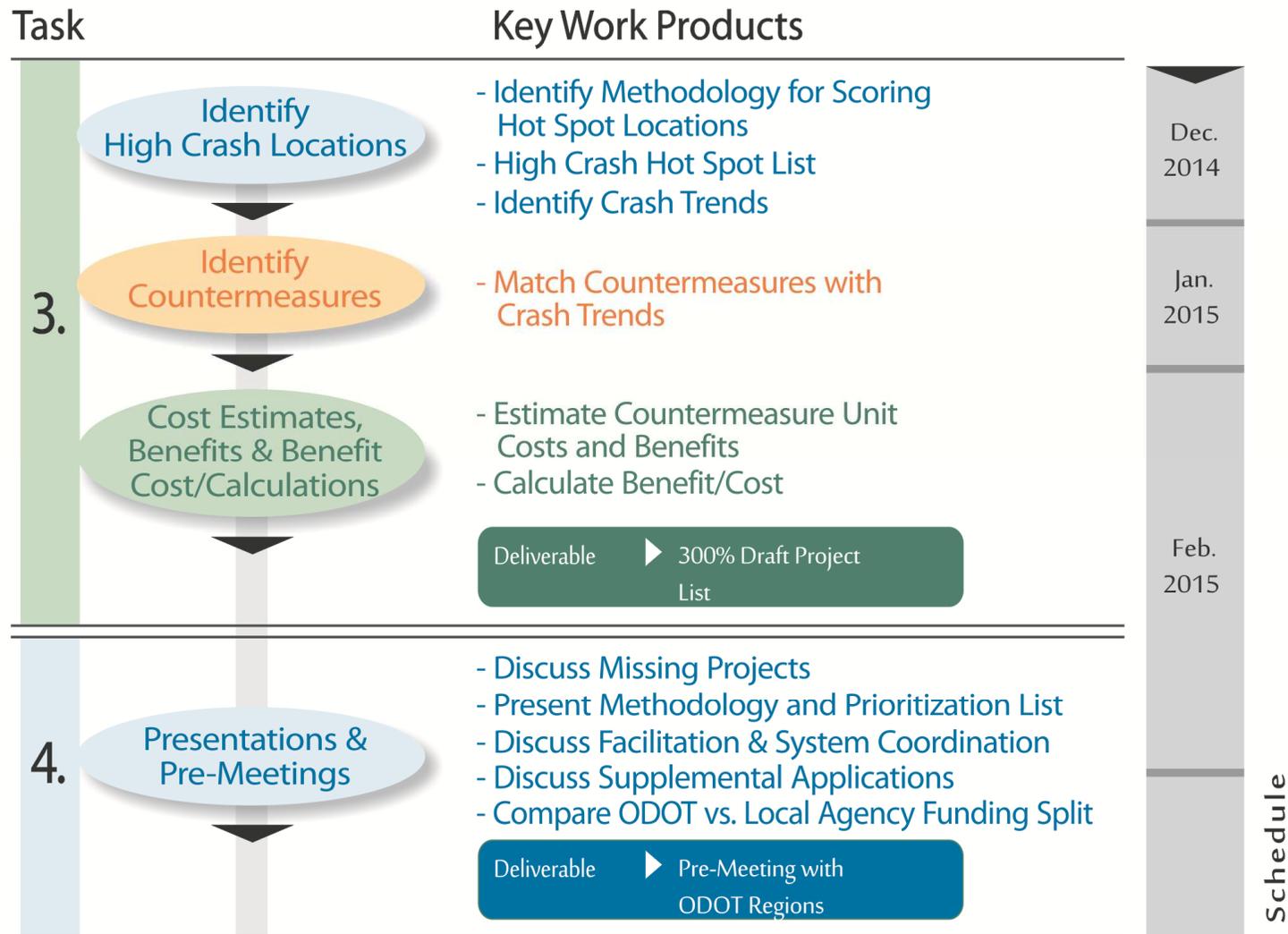


Hot Spot Analysis Process



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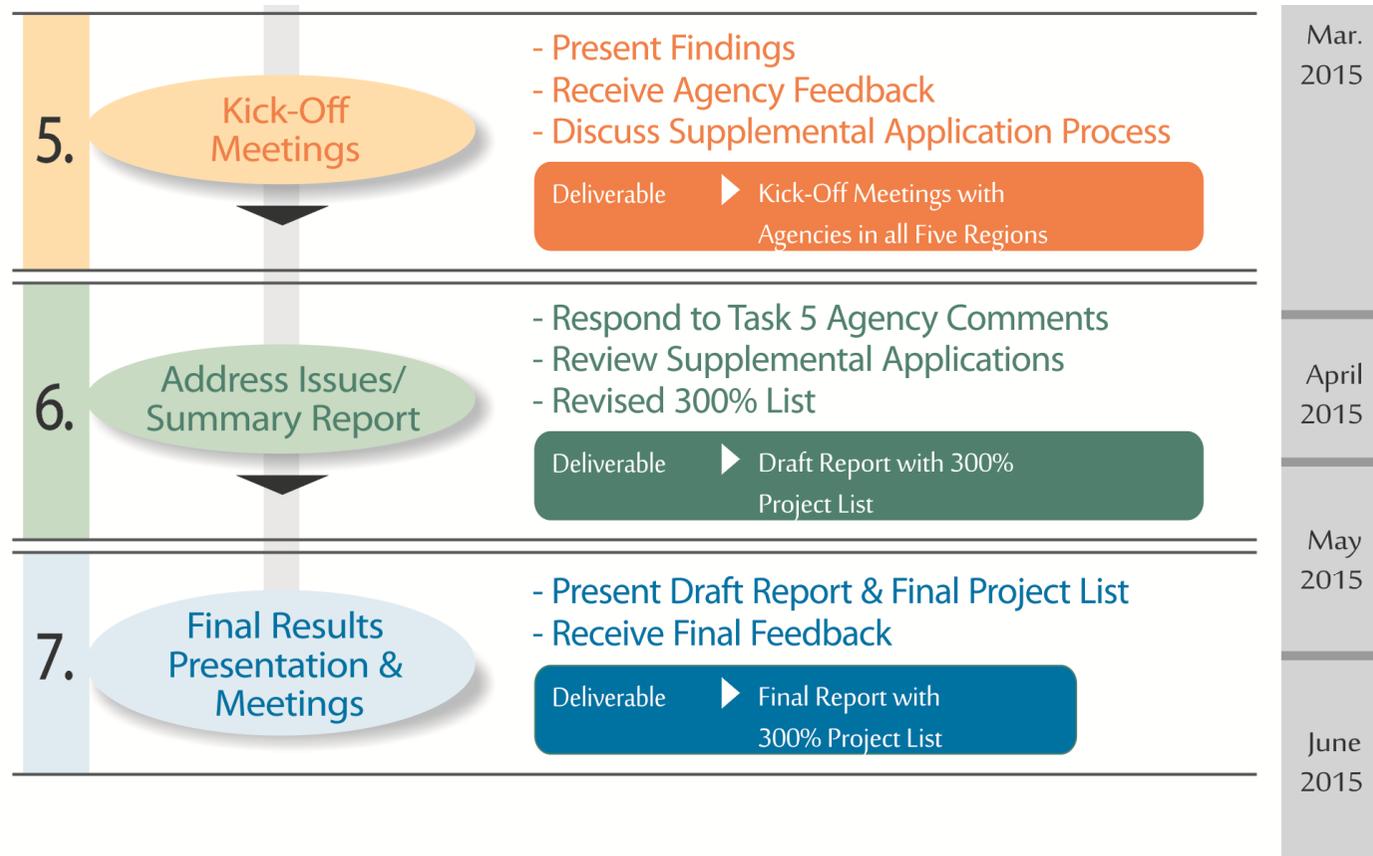
ARTS Process and Timeline



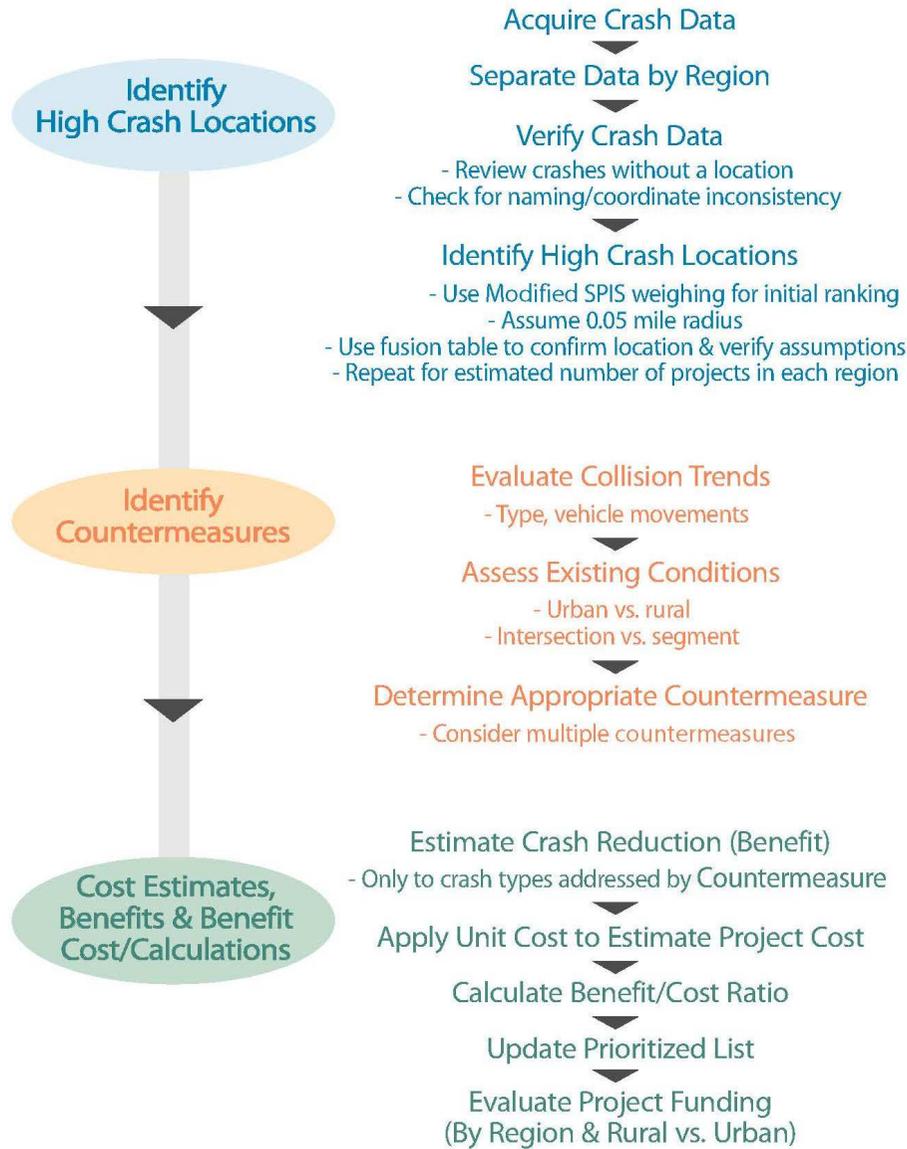
Schedule



ARTS Process and Timeline



ARTS Process



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ODOT Crash Data

- ARTS Hot Spot analysis based on ODOT Collision Records
- 5 Years of crash Data (2009 – 2013)
- ODOT data unbiased and consistent
- No additional collision data considered for hot spot analysis

| Crash ID | Crash Year | Street Number | Nearest Intersecting Street Number | Collision Type | Crash Severity | Weather Condition | Road Surface Condition | Light Condition |
|----------|------------|---------------|------------------------------------|----------------|----------------|-------------------|------------------------|-----------------|
| 1355116 | 2009 | 810 | 5209 | 3 | 5 | 2 | 2 | 1 |
| 1399940 | 2010 | 810 | 5209 | 9 | 5 | 1 | 4 | 2 |
| 1374464 | 2010 | 810 | 933 | 1 | 4 | 1 | 1 | 1 |
| 1403260 | 2011 | 810 | 5185 | 3 | 4 | 1 | 1 | 2 |
| 1421960 | 2011 | 810 | 5185 | 3 | 5 | 1 | 1 | 1 |
| 1309863 | 2008 | 810 | 5209 | 6 | 5 | 6 | 3 | 1 |
| 1231845 | 2007 | 810 | 933 | 3 | 5 | 1 | 1 | 1 |
| 1233602 | 2007 | 810 | 933 | 3 | 5 | 1 | 1 | 1 |



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Hot Spot Identification

- Only considered locations with at least one Fatal or Injury A crash
- Used 250' radius in urban setting and 500' radius in Rural setting
- Created initial ranking based on ODOT SPIS severity calculation

Severity Scoring Assumptions

- 100 points for Fatal or Injury A
- 10 points for Injury B or Injury C
- 1 point for Property Damage Only



Countermeasures

- Used ODOT's Approved Crash Reduction Factor List
- Countermeasures split into 4 categories:
 - Hot Spot
 - Intersection Systemic
 - Bike/Pedestrian Systemic
 - Roadway Departure Systemic

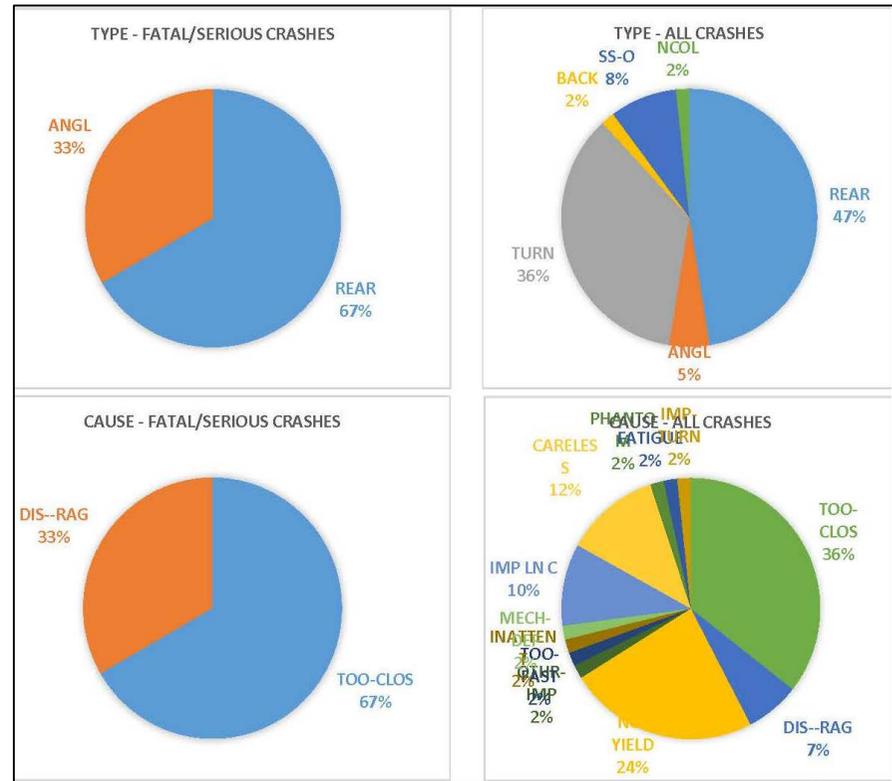


| Systemic or Hotspot | Consider for Hotspot | Countermeasure Number | Countermeasure | Crash Type | Injury, PDO or All | Service Life (Yea) | Existing Intersection Traffic Control | Urban or Rural | CRF % |
|---------------------|----------------------|-----------------------|--|------------|--------------------|--------------------|---------------------------------------|----------------|-------|
| Hotspot | NA | H1 | Median U-Turn Intersection Treatment | All | All Injury | 20 | Signal or Non Signal | Either | 30 |
| Hotspot | NA | H4 | Right Turn Lane on Single Major Road Approaches: Signalized Intersection (3- or 4-leg) | All | All | 20 | Signal | Either | 4 |
| | NA | H5 | Right Turn Lane on Both Major Road Approaches: Signalized Intersection (3- or 4-leg) | All | All | 20 | Signal | Either | 8 |
| Hotspot | NA | H6 | Channelized Right Turn Lane with Raised Median | All | All | 20 | Signal or Non Signal | Either | 35 |
| Hotspot | NA | H11 | Left Turn Lane on Single Major Road Approach: Urban, Signalized Intersection (3-leg) | All | All | 20 | Signal | Urban | 7 |
| | NA | H12 | Left Turn Lane on Both Major Road Approaches: Urban, Signalized Intersection (4-leg) | All | All | 20 | Signal | Urban | 19 |



Countermeasure Identification

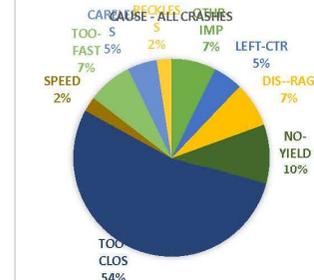
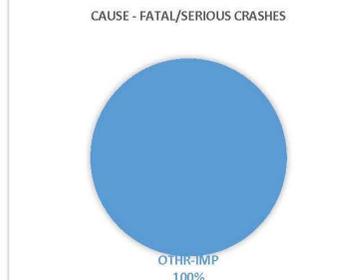
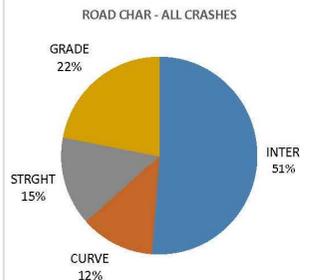
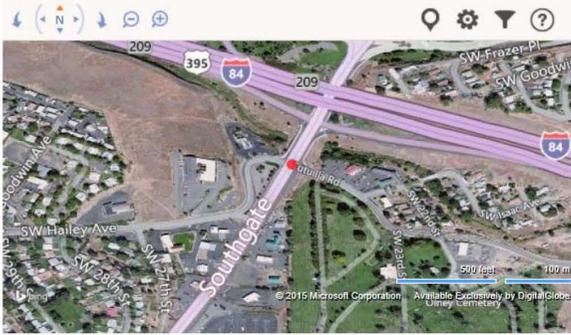
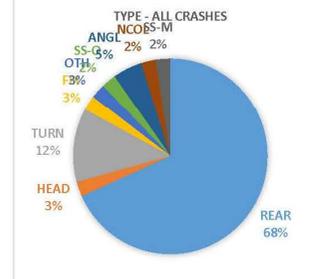
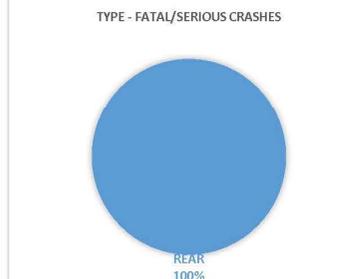
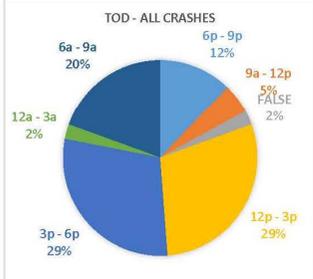
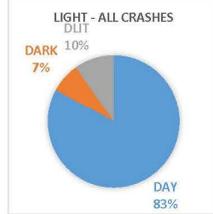
- Evaluated crash trends at each location to determine appropriate countermeasures



ARTS - Region 5

Draft Hot Spot Cut Sheet

Location ID 4
 Road Control URBAN HWY SYSTEM
 County Umatilla
 City Pendleton
 Urban Area PENDLTN UA
 Route Name US 395
 Route M.P. 1.769999981
 Street Name SW HAILEY AVE
 Intersecting Street SOUTHGATE
 Number of Crashes 41 (1 F&A)



| Crash | Severity | Type - Event | Pave | Weather | Light | Cause | V1 Mvnt | V1 From | V1 To | V2 Mvnt | V2 From | V2 To | Ped Inv? | Bike Inv? | SPD/ALC/DRG | Date | ToD | Road Char |
|---------|----------|--------------|------|---------|-------|----------|---------|---------|-------|---------|---------|-------|----------|-----------|-------------|----------|---------|-----------|
| 1522989 | Inj A | REAR | DRY | CLR | DAY | OTHR-IMP | STRGHT | NE | SW | STOP | NE | SW | 0 | 0 | 0 / 0 / 1 | 8/1/2013 | 6p - 9p | INTER |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

| ID | Description | Notes | Project Group # | Estimated Benefit | Estimated Cost | Estimated B/C Ratio | Other Notes |
|----|---|--|-----------------|-------------------|----------------|---------------------|-------------|
| i9 | Install Actuated/Coordinated Flashing Beacons as Advance Warning for Signalized Intersections | High proportion of rear-end collisions, including severe crash | 1 | \$ 1,311,000.00 | \$ 155,000.00 | 8.5 | |
| i2 | Improve Signal Hardware: Lenses, ReflectORIZED Back plates, Size, and Number | Increase visibility of signal heads | 1 | \$ 1,850,000.00 | \$ 42,000.00 | 44.0 | |
| H4 | Right Turn Lane on Single Major Road Approaches: Signalized Intersection (3- or 4-leg) | NB right turn lane would also help reduce rear-end collisions. | 1 | \$ 296,000.00 | \$ 322,000.00 | 0.9 | |
| | | | | | | | |
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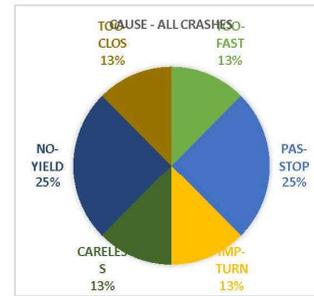
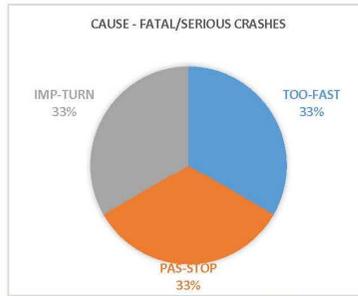
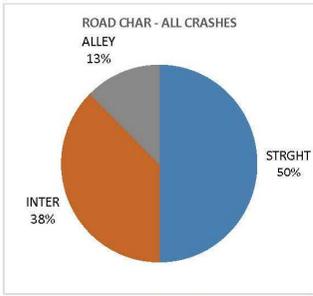
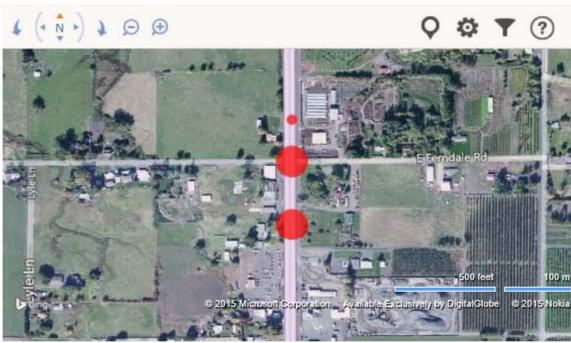
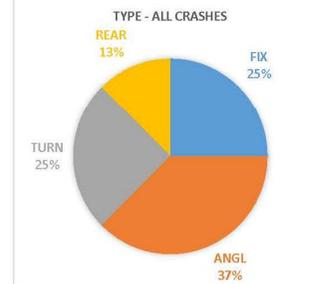
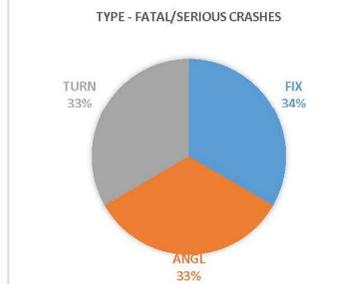
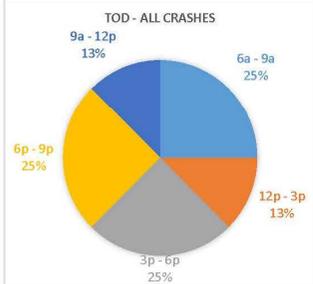
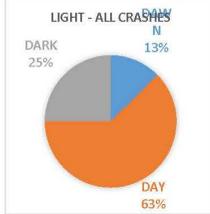


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ARTS - Region 5

Draft Hot Spot Cut Sheet

Location ID 3
 Road Control RURAL HWY SYSTEM
 County Umatilla
 City 0
 Urban Area 0
 Route Name OR 11
 Route M.P. 33.81999969
 Street Name 0
 Intersecting Street 0
 Number of Crashes 8 (3 F&A)



Severe Crash Characteristics

| Crash | Severity | Type - Event | Pave | Weather | Light | Cause | V1 Mvnt | V1 From | V1 To | V2 Mvnt | V2 From | V2 To | Ped Inv? | Bike Inv? | SPD/ALC/DRG | Date | ToD | Road Char |
|---------|----------|--------------|------|---------|-------|----------|---------|---------|-------|---------|---------|-------|----------|-----------|-------------|------------|----------|-----------|
| 1457474 | Fatal | FIX (CURB) | ICE | SNOW | DAWN | TOO-FAST | STRGHT | N | S | | | | 0 | 0 | 1 / 0 / 0 | 2/27/2012 | 6a - 9a | STRGHT |
| 1490446 | Fatal | ANGL | WET | CLD | DAY | PAS-STOP | STRGHT | S | N | STRGHT | W | E | 0 | 0 | 0 / 0 / 0 | 12/26/2012 | 12p - 3p | INTER |
| 1542439 | Inj A | TURN | DRY | CLD | DAY | IMP-TURN | STRGHT | S | N | U-TURN | S | S | 0 | 0 | 0 / 0 / 0 | 12/23/2013 | 3p - 6p | STRGHT |

Countermeasures

| ID | Description | Notes | Project Group # | Estimated Benefit | Estimated Cost | Estimated B/C Ratio | Other Notes |
|-----|---|--|-----------------|-------------------|----------------|---------------------|--|
| H35 | Provide a Raised Median, Rural Multi-Lane Road | Would eliminate illegal u-turn | 1 | \$ 1,605,000.00 | \$ 216,000.00 | 7.4 | 2013 SPIS Site: Install advance warning signs or signalize |
| I12 | Improve Intersection Warning: Stop Ahead Pavement Markings, Stop Ahead Signs, Larger Signs, Additional Stop Signs and/or Other Intersection Warning or Regulatory Signs | Provide better warning about upcoming intersection | 1 | \$ 2,079,000.00 | \$ 14,000.00 | 148.5 | |
| RD1 | Increase Distance to Rural Roadside Obstacle from 3 ft. (1 m) to 16 ft. (5 m) | One serious crash hit a fixed object. It appears that many signs/poles could be moved further from roadway | 1 | \$ 2,953,000.00 | \$ 56,000.00 | 52.7 | |
| | | | | | | | |
| | | | | | | | |



All Roads Transportation Safety

Cost Estimates

- Develop standard cost for each countermeasure, including:
 - 66% Markup for Design, Contingency and Temporary Traffic Control
 - 30% Markup for HAZMAT Mitigation (countermeasures that involve earthwork)
- Adjusted cost based on specific location characteristics that are not included in standards cost estimate

| ID | Name | Unit | Traffic Cost | Civil Cost | Markup | R/W | HAZMAT | Total |
|-----|---|--------------------|--------------|------------|------------|------------|------------|-----------------|
| H1 | Median U-Turn Intersection Treatment | EA | | \$ 275,000 | \$ 181,500 | \$ 20,000 | \$ 82,500 | \$ 559,000.00 |
| H2 | Right turn lane for single major road approach, unsignalized | EA | \$ 2,000 | \$ 87,000 | \$ 58,740 | \$ 17,186 | \$ 26,100 | \$ 192,000.00 |
| H3 | Right turn lane for both major road approach, unsignalized | INT (2 approaches) | \$ 4,000 | \$ 174,000 | \$ 117,480 | \$ 34,373 | \$ 52,200 | \$ 383,000.00 |
| H4 | Right turn lane on single major road approach, signalized | EA | \$ 84,000 | \$ 81,000 | \$ 108,900 | \$ 23,008 | \$ 24,300 | \$ 322,000.00 |
| H5 | Right turn lane on both major road approach, signalized | INT (2 approaches) | \$ 168,000 | \$ 162,000 | \$ 217,800 | \$ 46,015 | \$ 48,600 | \$ 643,000.00 |
| H6 | Channelized right turn lane w/raised median | EA | \$ 104,000 | \$ 436,000 | \$ 356,400 | \$ 53,325 | \$ 130,800 | \$ 1,081,000.00 |
| H7 | Left turn lane on single major road approach, urban, unsignalized | EA | \$ 2,000 | \$ 321,000 | \$ 213,180 | \$ 117,740 | \$ 96,300 | \$ 751,000.00 |
| H8 | Left turn lane on both major road approach, urban, unsignalized | INT (2 approaches) | \$ 4,000 | \$ 642,000 | \$ 426,360 | \$ 235,480 | \$ 192,600 | \$ 1,501,000.00 |
| H9 | Left turn lane on single major road approach, rural, unsignalized | EA | \$ 2,000 | \$ 410,000 | \$ 271,920 | \$ 89,816 | \$ 123,000 | \$ 897,000.00 |
| H10 | Left turn lane on both major road approach, rural, unsignalized | INT (2 approaches) | \$ 4,000 | \$ 667,000 | \$ 442,860 | \$ 179,632 | \$ 200,100 | \$ 1,494,000.00 |
| H11 | Left turn lane on single major road approach, urban, signalized | EA | \$ 150,000 | \$ 321,000 | \$ 310,860 | \$ 117,740 | \$ 96,300 | \$ 996,000.00 |



Benefit/Cost Ranking

- Utilized ODOT's Benefit/Cost Calculation Spreadsheet (see ARTS website)
- Projects Ranked Based on Benefit/Cost Ratio
- Combined Benefit/Cost Ratio when Multiple Countermeasures Proposed

| | | | | | | | |
|---|--|----------------|--|---------------------------|----------------------|-----|----------------------|
|  | OREGON DEPARTMENT OF TRANSPORTATION HIGHWAY SAFETY PROJECTS BENEFIT/COST ANALYSIS WORKSHEET | | | | | | |
| Project Name: | <input type="text"/> | Region: | <input type="text"/> | Date: | <input type="text"/> | | |
| <i>Project on Local Agency Facility</i> | | | | | | | |
| Route Number: | <input type="text"/> | Street Name: | <input type="text"/> | MP Range or Cross Street: | <input type="text"/> | | |
| <i>Project on State Highway</i> | | | | | | | |
| Route Number: | <input type="text"/> | Hwy Name: | <input type="text"/> | MP From: | <input type="text"/> | To: | <input type="text"/> |
| Road Character: | <input type="text" value="URBAN"/> | Facility Type: | <input type="text" value="OTHER STATE HIGHWAY"/> | | | | |
| County: | <input type="text" value="BAKER"/> | City: | <input type="text"/> | Crash Data From: | <input type="text"/> | To: | <input type="text"/> |



All Roads Transportation Safety

Benefit/Cost Calculation

| Countermeasure | | Fatal Crash Reduction Factor | Injury Crash Reduction Factor | PDO Crash Reduction Factor |
|------------------|-----|------------------------------|-------------------------------|----------------------------|
| Countermeasure 1 | I12 | 25% | 25% | 25% |
| Countermeasure 2 | I10 | 48% | 48% | |
| Countermeasure 3 | | | | |
| | | 61% | 61% | 25% |

Do not enter a CRF value for PDO Crashes if a countermeasure targets "All Injury" crashes only.

| | Number of Crashes | Number of Preventable | Economic Value per | Total Economic Value |
|------------------------------------|-------------------|-----------------------|--------------------|----------------------|
| Fatal Crashes | 1 | 0.6 | \$1,680,000 | = \$ 1,025,000 |
| Severe (Injury A) Injury Crashes | 1 | 0.6 | \$1,680,000 | = \$ 1,025,000 |
| Moderate (Injury B) Injury Crashes | 1 | 0.6 | \$81,900 | = \$ 50,000 |
| Minor (Injury C) Injury Crashes | 4 | 2.4 | \$81,900 | = \$ 200,000 |
| PDO Crashes | 8 | 2.0 | \$19,400 | = \$ 39,000 |

| Comprehensive Economic Value per Crash | | |
|--|-------------|-------------|
| Highway Type | Urban | Rural |
| PDO ³ | | |
| All facilities | \$19,400 | \$19,400 |
| Moderate (Injury B) and Minor (Injury C) Injury ⁴ | | |
| Interstate | \$69,300 | \$79,200 |
| Other State Highway | \$70,600 | \$81,900 |
| Off System | \$72,400 | \$83,900 |
| Fatal and Severe (Injury A) Injury ⁴ | | |
| Interstate | \$1,150,000 | \$2,330,000 |
| Other State Highway | \$1,170,000 | \$1,680,000 |
| Off System | \$870,000 | \$1,670,000 |

| Uniform Series Present Worth Factor (5%) | | |
|--|----------|----------|
| 5 years | 10 years | 20 years |
| 4.33 | 7.72 | 12.46 |

Total Crash Value for 60 Months = \$ 2,339,000

Annual Benefits = $\frac{\text{Total Crash Value}}{\text{Total Months} / 12} = \text{\$ 468,000}$

Estimated Project Cost = \$ 400,000

B/C Ratio = $\frac{\text{Annual Benefits} \times \text{Present Worth Factor (10 or 20 years)}}{\text{Estimated Project Cost}}$

B/C Ratio = $\frac{\text{\$ 468,000} \times 7.72}{\text{\$ 400,000}} = \text{9.03}$





Supplemental Applications and Next Steps



All Roads Transportation Safety

Supplemental Application Process

- Requirements:
 - ✓ ODOT approved screening method using ODOT reported crashes only
 - ✓ Locations shall have **at least** one Fatal or Serious Injury crash from 2009 to 2013
 - ✓ Countermeasures from ODOT CRF List
 - ✓ Use ARTS Hot Spot Cost Estimates
 - ✓ Prioritized/categorized based on B/C Ratio (using ODOT method)



Supplemental Application Form Online

[Print Form](#) [Reset Form](#) [Save As](#)



Oregon Department of Transportation
All Roads Transportation Safety (ARTS) Program
Hotspot Supplemental Application

Date:
Agency: ODOT Region:
City: County:

Contact Information

Name: Title:
Address:
Email: Phone:

Project Location

Hwy/Street Name: Hwy No.:
Intersecting Street/MP:

Crash Information (From ODOT Database)

The proposed location must have at least one Fatal or Serious Injury Crash between 2009 and 2013.

Number of Crashes between 01/01/2009 and 12/31/2013:

Fatal and Injury A: Weight: 0.0
Injury B and Injury C: (This value will be calculated automatically)
Property Damage Only:

Provide a brief description of crash pattern:

Proposed Countermeasure(s) (Refer to [ODOT CRF List](#))

Countermeasure No. 1:
Countermeasure No. 2:
Countermeasure No. 3:

Benefit Cost Analysis (Attach ODOT [Benefit/Cost Analysis Worksheet](#))

Total Expected Benefit for the Project:
Total Project Cost:
Benefit/Cost Ratio of the Project:



Next Steps

- Supplemental Applications Due Apr 7th (3 weeks)
- Hot Spot Countermeasure Comments Due Apr 7th (3 weeks)
- Draft Report and Project List in (May)
- Final Region Meetings with Local Agencies (May-June)
- Final Report and Project List (June)



Questions? and Hot Spot Break out



<http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/Pages/ARTS.aspx>