

Appendix F: User Needs Workshop

CONTENTS

Workshop Invitation
User Needs Workshop Presentation
Notes from Workshop Poster Sessions
Meeting Minutes

Regional ITS Operations & Implementation Plan for the Bend Metropolitan Area

“Expanded Stakeholder Workshop: User Needs”



Date: Tuesday, October 12, 2004
Time: 9:30 am – 11:30 am
Location: Deschutes Services Center
DeArmond Conference Room
Address: 1300 NW Wall Street
Bend, OR 97701

Please R.S.V.P. by Thursday, October 7, 2004 to Chris Maciejewski at csm@dksassociates.com, or by calling (503) 243-3500.

What Is It All About? The Bend metropolitan area is planning for an intelligent transportation system, or ITS, as a way to deal with increasing congestion problems on the roadway network. These new projects are needed to improve safety and maximize the use of the existing transportation infrastructure. Conceptually, ITS is simple. It includes the use of advanced technologies such as cameras, automatic vehicle detectors, message signs, and coordinated traffic signals to make traffic flow smoothly and safely. In addition, ITS includes real-time information about construction work zones, weather conditions, public transportation and freeway/roadway congestion.

Why Attend? Your input is vital to shaping the future of the regional transportation system. You will have an opportunity to identify transportation system needs in areas such as traffic management, traveler information, emergency management, and public transportation. The result of this project will be a prioritized list of projects based in large part on the transportation system needs identified in this meeting.

Meeting Agenda

- 9:30 am: *Welcome & Introductions*
- 9:35 am: *Presentation by DKS Associates*
- Description of plan process, what ITS is, and why to use ITS
 - Summary of ITS needs we have heard so far
- 10:00 am: *Breakout Session*
- Poster sessions will be set up around the room based on areas of interest and workshop participants will have the opportunity to ask questions and provide input on transportation needs.
- 11:00 am: *Group Discussion*
- Group leaders will summarize poster session input and will lead a group discussion about potential ITS projects to address the needs.
- 11:25 am: *Next Steps*



In Cooperation With:

- **City of Bend**
- **City of Redmond**
- **Deschutes County**
- **Bend MPO**
- **Oregon State Police**
- **Deschutes County 911**



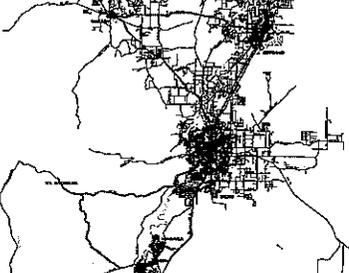
Consultants:

DKS Associates
TRANSPORTATION SOLUTIONS



Bend ITS Plan

(Regional ITS Operations & Implementation Plan for the Bend Metropolitan Area)

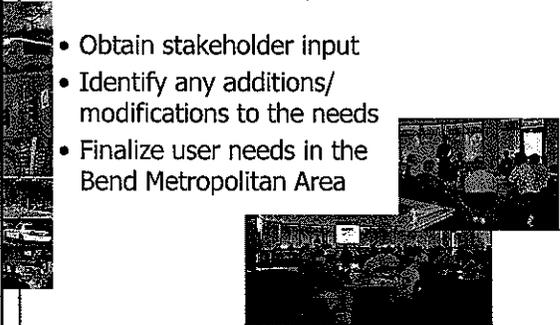


User Needs Workshop

DKS Associates
&
IBI Group
October 12, 2004

Workshop Goals

- Obtain stakeholder input
- Identify any additions/modifications to the needs
- Finalize user needs in the Bend Metropolitan Area



DKS Associates User Needs Workshop October 12, 2004

Meeting Agenda

- 9:30 am Welcome & Introductions
- 9:35 am DKS Associates Presentation
 - ✓ Plan Process/Why ITS?
 - ✓ What is ITS?
 - ✓ Interview Summary: Transportation Needs
- 10:00 am Breakout Session
- 11:00 am Group Discussion
- 11:25 am Next Steps
- 11:30 am ADJOURN



DKS Associates User Needs Workshop October 12, 2004

Bend ITS Plan Expanded Stakeholder Workshop



Plan Process & Why Are We Doing This Plan?

Presented by Peter Coffey

DKS Associates User Needs Workshop October 12, 2004

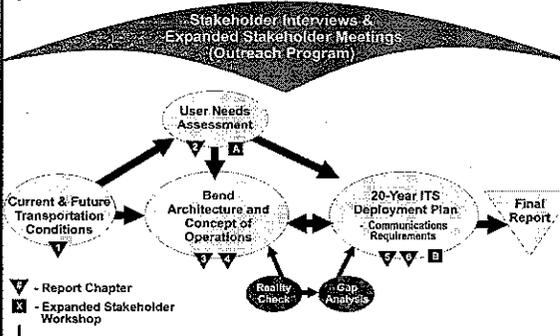
Why Are We Developing This ITS Plan?

- Cannot build our way out of congestion
- Maximize efficiencies and improve safety of existing infrastructure
- Demand from public for better information about congestion
- Required by FHWA to receive federal funding



DKS Associates User Needs Workshop October 12, 2004

Scope of Work



DKS Associates User Needs Workshop October 12, 2004

1: Current & Future Transportation System Conditions

- Map Inventory of Existing and Planned ITS Elements
- Summary of Conditions: Volume-to-Capacity, LOS, Travel Times, Crashes, Freight, Incident Response, Emergency Mgmt
- Summary of Relevant Documents



DKS Associates User Needs Workshop October 12, 2004

2A: Interviews, Needs Assessment, Existing Institutional Framework

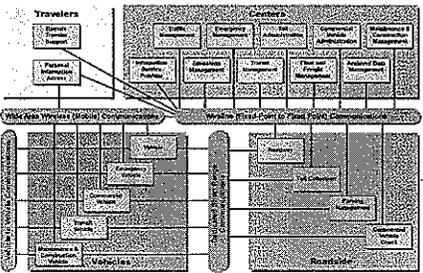
- Project Mission, Goals, and Objectives
- Interview 6 – 8 Key Stakeholders
- Send Questionnaires to Expanded Stakeholders
- Expanded Stakeholder Meeting on User Needs



DKS Associates User Needs Workshop October 12, 2004

Regional Architecture

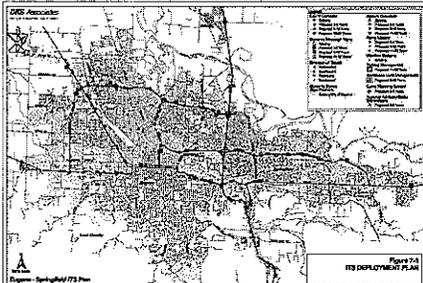
Needs → Market Packages → Architecture



DKS Associates User Needs Workshop October 12, 2004

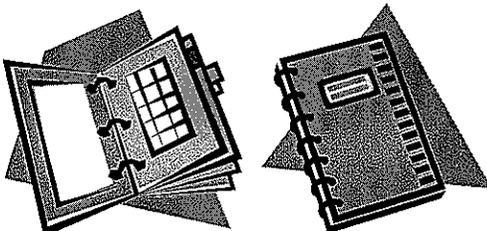
3B: Deployment Plan

- Phased Deployment Plan with Cost Estimates



DKS Associates User Needs Workshop October 12, 2004

4: Executive Summary and Final Report

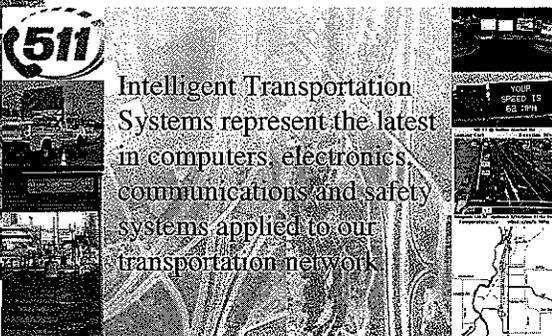


Final Report with Technical Appendices Executive Summary

DKS Associates User Needs Workshop October 12, 2004

What is ITS?

Intelligent Transportation Systems represent the latest in computers, electronics, communications and safety systems applied to our transportation network.



Freeway Management

Goal: Improve safety, relieve congestion, increase reliability



Ramp Meters



Traffic Operations Centers



System Detectors



Dynamic Message Signs



Cameras

DKS Associates User Needs Workshop October 12, 2004

Incident Management

Goal: Reduce response times and incident durations

- Incident Response Vehicles
- Alternate Routes
- Multi-agency Coordination



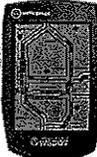


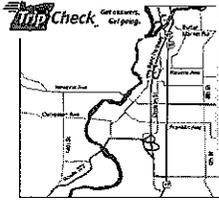
DKS Associates User Needs Workshop October 12, 2004

Traveler Information

Goal: Provide up-to-date real-time information

- Internet: www.TripCheck.com
- Phone: 511
- In-Vehicle
- Personal Digital Assistant




DKS Associates User Needs Workshop October 12, 2004

Transit Management

Goal: Improve transportation services, improve reliability

- Automatic Vehicle Location
- Real-Time Bus Arrival Information
- Transit Priority





DKS Associates User Needs Workshop October 12, 2004

Work Zone Management

Goal: Improve safety, efficiency and productivity

- Dynamic Lane Merging
- Work Zone Intrusion Alarms
- Variable Speed Limits





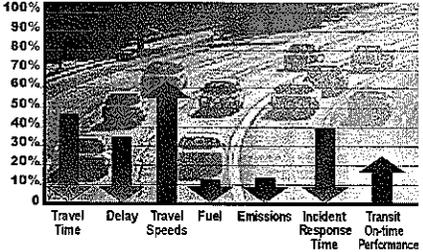
DKS Associates User Needs Workshop October 12, 2004

How are ITS Benefits Measured?

- Safety
- Cost Savings

- Delay/Time
- Environment

- Quality of Life



DKS Associates User Needs Workshop October 12, 2004

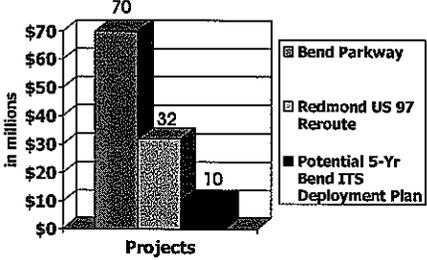
Benefits of ITS

- Coordinated Traffic Signals
 - ✓ 10 to 40 percent reduction in stops
 - ✓ Up to 15 percent reduction in fuel consumption
 - ✓ 5 to 25 percent reduction in travel time
 - ✓ 15 to 45 percent reduction in delay
- Transit Management
 - ✓ 10 percent reduction in travel time




DKS Associates
User Needs Workshop
October 12, 2004

Project Cost Comparison



Project	Cost (in millions)
Bend Parkway	70
Redmond US 97 Reroute	32
Potential 5-Yr Bend ITS Deployment Plan	10

DKS Associates
User Needs Workshop
October 12, 2004

Bend ITS Plan Expanded Stakeholder Workshop

Transportation User Needs Summary to Date



Presented by
Chris Maciejewski

DKS Associates
User Needs Workshop
October 12, 2004

User Needs Interviews Conducted

- ODOT- Region 4
- City of Bend
- Deschutes County
- City of Redmond
- Bend MPO
- Deschutes County 911
- Oregon State Police



DKS Associates
User Needs Workshop
October 12, 2004

Traffic Management Needs

- Real-time traffic conditions information
- Remote continuous access to traffic signals (data, status, control)
- Traffic signal coordination
- Common system software package
- Congestion/incident detection




DKS Associates
User Needs Workshop
October 12, 2004

Incident Management Needs

- Incident detection
- Lack of Highway 97 alternate routes
- Reduce weather related incidents
- Provide advanced information to travelers (Century Drive, Lava Butte)
- Improve safety of incident responders




DKS Associates
User Needs Workshop
October 12, 2004

Traveler Information Needs

- Real-time, accessible traveler information
- DMS signs at decision points
- Camera images
- Weather information
- Central source for construction information



DKS Associates User Needs Workshop October 12, 2004

Public Transportation Management Needs

- Pass November ballot
- Bus equipment - security cameras, GPS, AVL, MDTs, IVR, radios
- Transit signal priority
- Transit arrival information - web based and at stops



DKS Associates User Needs Workshop October 12, 2004

Emergency Management Needs

- Common emergency radio channel
- Real-time information at 911 centers and in vehicles
- Enhance operations during major emergencies (winter weather, floods, fires, etc.)
- Enhance transportation management during evacuations



DKS Associates User Needs Workshop October 12, 2004

Emergency Management Needs

- Preemption by vehicle ID
- Reduce emergency response times (at roundabouts)
- Advanced information about incident conditions



DKS Associates User Needs Workshop October 12, 2004

Information Management Needs

- Automated data collection (volumes, speed, occupancy, vehicle classification, incidents)
- Standardized data format that is GIS-compatible
- Internet-accessible information
- Improved information for transportation planning
- Management/consistency of data between agencies
- GPS recorded collision data



DKS Associates User Needs Workshop October 12, 2004

Maintenance & Construction Management Needs

- In-vehicle geo-coding of maintenance items (potholes, tree-limbs, signs)
- Weather information accessible to maintenance crews
- Central source for construction information
- Construction zone management to improve safety
- Real-time mapping of maintenance/snow plow vehicle locations



DKS Associates User Needs Workshop October 12, 2004

Bend Metropolitan Area ITS Plan Expanded Stakeholder Workshop

Breakout Session:
Transportation
User Needs



DKS Associates User Needs Workshop October 12, 2004

Goals of Breakout Session

- Review Identified User Needs
 - ✓ Identify additions/deletions/modifications
 - ✓ Review for completeness/level of detail
- Focus on the Type of Need to be Addressed (the "WHAT")
- Do Not Focus on Institutional or Technical Issues (the "HOW")

DKS Associates User Needs Workshop October 12, 2004

Poster Sessions

Group	Moderator
1) Traffic Operations & Management, Emergency Management, and Incident Management	Jim Peters & Peter Coffey
2) Traveler Information and Information Management	Jill MacKay
3) Public Transportation Management and Maintenance & Construction Management	Chris Maciejewski

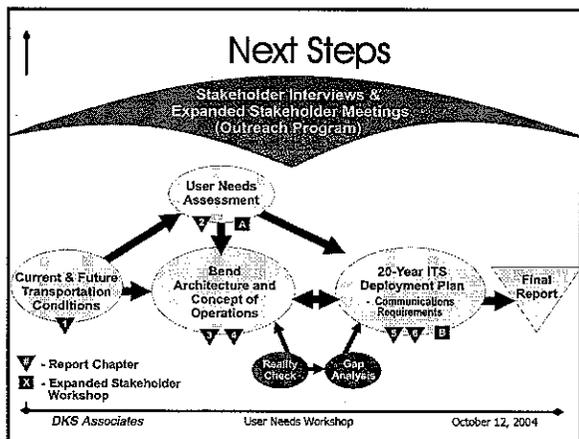
DKS Associates User Needs Workshop October 12, 2004

Bend Metropolitan Area ITS Plan Expanded Stakeholder Workshop

Group Discussion

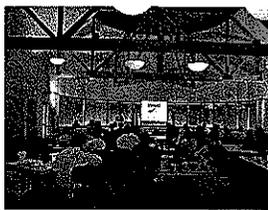


DKS Associates User Needs Workshop October 12, 2004



Next Meeting

Expanded Stakeholder Workshop #2: *Deployment Plan* January 18 2005



DKS Associates User Needs Workshop October 12, 2004

Additional Needs Noted from User Needs Workshop Poster Sessions

Traffic Operations & Management Needs

- Organized dissemination of available data
 - 14-hour counts
 - Peak hour TM counts
 - Link counts
 - Loop counts (data compatibility)
- Centralized online data repository
- GIS-Oregon state plane south projection should be used
- Data compatibility
- New technology must be assessed for compatibility/interoperability with current systems
- Determine data accuracy
 - Metadata
 - Loop/speed accuracy
- Redmond bypass evaluating a Sisters alternate route
- V/C Ratios & Intersections – Need current information
- Adaptive Control – Timing Plans that adapt to street closures, parades, etc. (Special events)
- Turning movement counts – Need current counts
- Downtown: No detection, No interconnect, Old controllers – TBC, No Opticom, No Ped. Push buttons, flash all-red after 9pm.
 - Other corridors – same
- May be able to use Wireless Communications
- Bend - North End Parking Garage Mgmt. System
 - 560 stalls
 - collect T.O.D./ D.O.W. information
 - \$\$ collected, # stalls used
 - Smart Card integrated w/ transit fares & other pkg & TDM.
- Collect 24-hour flow profile for each month of year & day of week
- Data base for volume, V/C, and pre-empt info.
- Concurrency threshold is 1.0 v/c
- Parking management planned for Sisters
- Note: 27th St. Corridor has 6 close signals
- How can we manage adjacent signals transition during & after a RR priority call?

Traveler Information Needs

- Identify safest route: Mount Hood vs. Santiam Pass (provide info on route names and numbers)
- Instant “chains required” information posted
- “On-star” Oregon reservations/yellow page info (gas station info)
- En-route information in winter
- Broadcasts- one station for traveler information and construction updates
- DMS on major corridors

- Bend-Redmond
- Bend-LaPine
- Access to Trip Check at Tourist Locations- parking garage
- Airport info (both airports)
- Local info on 511 (future)

Incident Management Needs

- Defined alternative routes
- Alternative routes communicated to public, emergency responders and media
- 3rd RR undercrossing and Greenwood RR undercrossing, both City of Bend
 - 3rd RR undercrossing floods once a year
 - 3rd RR undercrossing has manual detour developed which could be automated
 - Greenwood RR under crossing and Franklin may flood every other year
 - On both of these, fixed drainage or automatically detect flooding on roadway
- Third RR under crossing has a height restriction problem
- Need over height detection warning system because once a year someone hits it

Maintenance and Construction Needs

- GPS can be used for:
 - Locating utilities/access points
 - Tracking crashes with wildlife
 - Tracking snowplows/cleaners/weed-spray trucks for routing and scheduling
- Install camera and DMS signs at Century/FR 45 with improvement project
 - Monitor road conditions
- Link data to all agencies
 - Coordinate plowing between County/City/State
- Real-time updates on projects and delays
- Central list of construction projects
- Log-in or Central List of tube counter locations for plows, street sweepers, etc.
- Better communication with the public, i.e. in field, www, etc.
- Alternate route signing including pedestrian re-route for sidewalk closures, ADA re-route, & audible messages
- Weather sensor on public vehicles to gather information over a larger area
 - Infrared
 - Transmit w/ AVL data

Public Transportation Management Needs

- Potential for signal priority
- Next bus arrival – on street as well as on www to get to public
- Ridership #s T.O.D./D.O.W.
- Fare Management
- Integrated fare payment with the same card as the parking garage

Emergency Management Needs

- Encoded Opticom
 - Fake users
 - Need transit priority
- Opticom or emergency pre-emption
- Best route information
 - RR crossing occupation (20/day existing, 40/day projected in 20 yrs.)
 - Cooley RR Crossing
 - All at-grade RR crossings (5-10 crossings)
- There are 9 RR crossings in Bend; How many in Redmond?
- Planned Juniper Ridge development (industrial) NE of Cooley
 - Planned OSU campus (10,000 students?) – 1500 acres + housing
- Need traffic system information “Big picture” mapped & integrated w/CAD system.
 - Video, flow maps, construction status.

Meeting Minutes

Regional ITS Operations & Implementation Plan For Bend Metropolitan Area *User Needs Workshop*

Tuesday, October 12, 2004
Deschutes Services Center
Bend, OR
DeArmond Conference Room
9:30 a.m. – 11:30 a.m.

Attendees:

<input checked="" type="checkbox"/> Arleigh Mooney (ODOT)	<input checked="" type="checkbox"/> Nathaniel Price (FHWA)
<input checked="" type="checkbox"/> James Wittenburg (ODOT)	<input checked="" type="checkbox"/> Tim Beuschlein (City of Bend PD)
<input checked="" type="checkbox"/> Joel McCarrol (ODOT)	<input checked="" type="checkbox"/> Jill MacKay (IBI Group)
<input checked="" type="checkbox"/> Bill Hilton (ODOT)	<input checked="" type="checkbox"/> Peters, Jim (DKS Associates)
<input checked="" type="checkbox"/> Gary Peters (Bend Chamber of Commerce)	<input checked="" type="checkbox"/> Spencer, Doug (ODOT)
<input checked="" type="checkbox"/> George Kolb (Deschutes County)	<input checked="" type="checkbox"/> Chris Maciejewski (DKS Associates)
<input checked="" type="checkbox"/> Scott Gillespie (City of Bend)	<input checked="" type="checkbox"/> Peter Coffey (DKS Associates)
<input checked="" type="checkbox"/> Barbara Connell (City of Bend)	<input checked="" type="checkbox"/> Hau Hagedorn (ODOT)
<input checked="" type="checkbox"/> Robert Bussabarger (City of Bend)	<input checked="" type="checkbox"/> Galen McGill (ODOT)
<input checked="" type="checkbox"/> Robin Lewis (City of Bend)	<input checked="" type="checkbox"/> Karyn Kashima (City of Bend)
<input checked="" type="checkbox"/> Dave Foster (ODOT)	<input type="checkbox"/> Gary Judd (Deschutes County)
<input type="checkbox"/> Chris Doty (City of Redmond)	<input type="checkbox"/> Scott Ferguson (Bend MPO)
<input type="checkbox"/> Lavernne Esselstyn (Deschutes County 911)	<input type="checkbox"/> Sgt. Eric Brown (OSP)
<input type="checkbox"/> Wanda Gray (City of Bend)	

PRESENTATION	ACTION ITEMS
<p>DKS Associates began the workshop with a brief presentation covering the following areas:</p> <ul style="list-style-type: none"> • Purpose of the workshop • Review of project scope • Review of ITS (history, types of projects, benefits) • Review of User Needs collected to date • Format of Workshop • Next Steps <p>An Expanded Stakeholder Workshop handout was distributed to the group, including a complete list of the User Needs collected to date.</p>	

POSTER SESSIONS	ACTION ITEMS
<p>The workshop was split up into the following three poster sessions so that attendees could circulate and provide input into each of the needs areas, based on the list of needs in the workshop handout:</p> <ul style="list-style-type: none"> • (1) Traffic Operations & Management, Emergency Management, and Incident Management • (2) Traveler Information and Information Management • (3) Public Transportation Management and Maintenance & Construction Management 	
<p>Project staff collected comments at each of the poster sessions, which are shown on the attached poster summary.</p>	
<p>Following the poster sessions, the moderator for each session presented the collected comments to the group. No additional comments were made.</p>	<p>DKS will add the needs identified into the User Needs Assessment Chapter of the ITS Plan.</p>

NEEDS PRIORITIZATION	ACTION ITEMS
<p>DKS presented a poster listing 15 generalized areas of user needs. Each workshop attendee was given five stickers to use in marking their priorities on the list. A complete list of the scoring results is shown in the attached table. The top five scored areas include:</p> <ul style="list-style-type: none"> • Need ways to improve operations efficiencies. • Lack of transportation information. • Need to maintain/improve emergency response times. • Need improved information for transportation planning. • Improve maintenance efficiencies. 	<p>DKS will incorporate this prioritization while creating the Deployment Plan.</p>

NEXT STEPS	ACTION ITEMS
<p>The User Needs will be used to develop the Architecture, Concept of Operations, and Deployment Plan for the ITS Plan.</p> <p>The second expanded stakeholder workshop will be held on January 18th to review the draft Deployment Plan.</p>	

Additional Needs Noted from User Needs Workshop Poster Sessions

Traffic Operations & Management Needs

- Organized dissemination of available data
 - 14-hour counts
 - Peak hour TM counts
 - Link counts
 - Loop counts (data compatibility)
- Centralized online data repository
- GIS-Oregon state plane south projection should be used
- Data compatibility
- New technology must be assessed for compatibility/interoperability with current systems
- Determine data accuracy
 - Metadata
 - Loop/speed accuracy
- Redmond bypass evaluating a Sisters alternate route
- V/C Ratios & Intersections – Need current information
- Adaptive Control – Timing Plans that adapt to street closures, parades, etc. (Special events)
- Turning movement counts – Need current counts
- Downtown: No detection, No interconnect, Old controllers – TBC, No Opticom, No Ped. Push buttons, flash all-red after 9pm.
 - Other corridors – same
- May be able to use Wireless Communications
- Bend - North End Parking Garage Mgmt. System
 - 560 stalls
 - collect T.O.D./ D.O.W. information
 - \$\$ collected, # stalls used
 - Smart Card integrated w/ transit fares & other pkg & TDM.
- Collect 24-hour flow profile for each month of year & day of week
- Data base for volume, V/C, and pre-empt info.
- Concurrency threshold is 1.0 v/c
- Parking management planned for Sisters
- Note: 27th St. Corridor has 6 close signals
- How can we manage adjacent signals transition during & after a RR priority call?

Traveler Information Needs

- Identify safest route: Mount Hood vs. Santiam Pass (provide info on route names and numbers)
- Instant “chains required” information posted
- “On-star” Oregon reservations/yellow page info (gas station info)
- En-route information in winter
- Broadcasts- one station for traveler information and construction updates
- DMS on major corridors

- Bend-Redmond
- Bend-LaPine
- Access to Trip Check at Tourist Locations- parking garage
- Airport info (both airports)
- Local info on 511 (future)

Incident Management Needs

- Defined alternative routes
- Alternative routes communicated to public, emergency responders and media
- 3rd RR undercrossing and Greenwood RR undercrossing, both City of Bend
 - 3rd RR undercrossing floods once a year
 - 3rd RR undercrossing has manual detour developed which could be automated
 - Greenwood RR under crossing and Franklin may flood every other year
 - On both of these, fixed drainage or automatically detect flooding on roadway
- Third RR under crossing has a height restriction problem
- Need over height detection warning system because once a year someone hits it

Maintenance and Construction Needs

- GPS can be used for:
 - Locating utilities/access points
 - Tracking crashes with wildlife
 - Tracking snowplows/cleaners/weed-spray trucks for routing and scheduling
- Install camera and DMS signs at Century/FR 45 with improvement project
 - Monitor road conditions
- Link data to all agencies
 - Coordinate plowing between County/City/State
- Real-time updates on projects and delays
- Central list of construction projects
- Log-in or Central List of tube counter locations for plows, street sweepers, etc.
- Better communication with the public, i.e. in field, www, etc.
- Alternate route signing including pedestrian re-route for sidewalk closures, ADA re-route, & audible messages
- Weather sensor on public vehicles to gather information over a larger area
 - Infrared
 - Transmit w/ AVL data

Public Transportation Management Needs

- Potential for signal priority
- Next bus arrival – on street as well as on www to get to public
- Ridership #s T.O.D./D.O.W.
- Fare Management
- Integrated fare payment with the same card as the parking garage

Emergency Management Needs

- Encoded Opticom
 - Fake users
 - Need transit priority
- Opticom or emergency pre-emption
- Best route information
 - RR crossing occupation (20/day existing, 40/day projected in 20 yrs.)
 - Cooley RR Crossing
 - All at-grade RR crossings (5-10 crossings)
- There are 9 RR crossings in Bend; How many in Redmond?
- Planned Juniper Ridge development (industrial) NE of Cooley
 - Planned OSU campus (10,000 students?) – 1500 acres + housing
- Need traffic system information “Big picture” mapped & integrated w/CAD system.
 - Video, flow maps, construction status.

Bend Area Transportation Challenges/Needs

Priority	Challenge	Problem Specifics
3	Traffic congestion – resulting from incidents	Lack of pull outs/shoulders on the Parkway Lack of alternate routes north and south of the City of Bend Limited transportation information available at the TOC (incident detection, video).
0	Lack of public transportation	Support special events (Fairgrounds) Need transit ballot to pass for funding
0	Budgetary constraints	Currently chain up signs are changed manually. Consider remote control of chain up signs Automatically identify detector and device failures Automate reporting of maintenance issues (sign replacement, tree trimming, etc.)
2	Transportation during evacuations	Need real-time traffic conditions at EOC Need to provide route information to evacuees
1	Delays for commercial vehicle delays	Congestion on 97
10	Lack of transportation information	Lack of information for operations personnel. ODOT dispatcher sends personnel out to sometimes non-existent problems. ODOT TOC gets calls for traffic signal problems. Operators do not have access to traffic signal status information ODOT TOC gets calls for weather information. Provide to travelers via other sources Need a central source for construction information. OSP and others would find the information valuable Need real-time, accessible traveler information Need system bandwidth to transmit video
2	Traffic crashes, injuries	Problem on 97 bypass with no shoulder Problem on Century Drive (MP10-12). "S" curves near Bachelor that has significant rollovers Danger responding to rollovers for response personnel. Other approaching drivers speeding into the curve. Lack of information provided to responders
8	Need improved information for transportation planning	Data exists in some cases such as traffic counts, but it needs to be in a useable format Vehicle classification information would be useful Data needs to be in a common format for real-time sharing of information and long term access to the information Need better tracking of crashes/incidents. Consider a GPS device to log incident location Need more complete traffic count information (daily, monthly, yearly) Need O-D data from commercial vehicles at weigh stations
14	Need ways to improve operations efficiencies	To check on signal status, upload/download timings, detector counts, etc. requires the user to dial up every intersection separately. Common system software to access remote field devices (NTCIP protocol) Need to institutionalize cooperation/coordination for addressing complaints Need common communication (emergency radio) between agencies

Bend Area Transportation Challenges/Needs

Priority	Challenge	Problem Specifics
5	Need a way to reduce weather related incidents	Conditions on Lava Butte change quickly Speeding problem on Century Drive in the winter Lack of advance traveler information Lack of safety for incident responders
9	Need to maintain/improve emergency response times	Delays caused by traffic congestion Delays caused by other crashes en route Delays caused by road construction Delays caused by Unforeseen exceptions (e.g. RR Crossings blocked) Delays caused by Temporary closures Delays caused by traffic control devices (signal preemption, roundabouts) Need video and MDT in OSP vehicles to increase available response time
3	Ongoing operations/ management issues	Data in same format Keeping information current Managing the huge amounts of data collected Providing easy access to the information (e.g. maintenance personnel access to weather information)
3	Efficient transportation system operations	Need ongoing maintenance and coordinated timing plan development Plan for signal systems and coordination needs Develop Traffic Control Plans for special events
6	Improve maintenance efficiencies	Automate reporting of maintenance issues (sign replacement, tree trimming, etc.) Track maintenance vehicles and routes Provide weather information to maintenance crews
4	Large expected growth	Optimize existing system capacity