



# **Advanced Traveller Information and Traffic Management Systems for Highway 2**

**Project Overview & Summary of  
Recommendations**

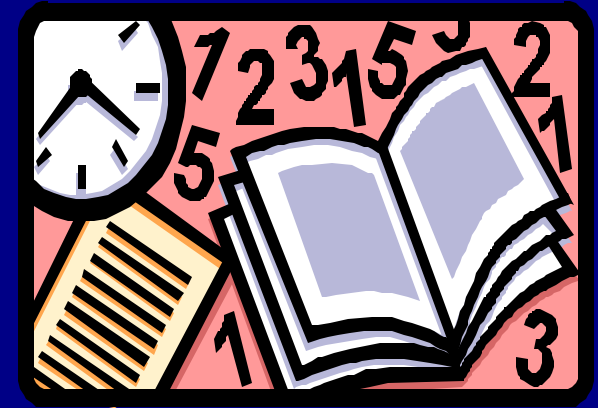
**January 16, 2004**

---

---

# Outline of Workshop

- Introductory Remarks
  - Allan Lo, Alberta Transportation
- What is ITS ?
  - Tim Schnarr, Delcan Corporation
- Summary of Needs
  - Alf Guebert, Earth Tech, Canada
- ITS Blueprint for Highway 2
  - Tim Schnarr, Delcan Corporation
- RWIS Program
  - Mark Pinet, M.F. Pinet & Assoc.
- Summary
  - Tim Schnarr, Delcan Corporation

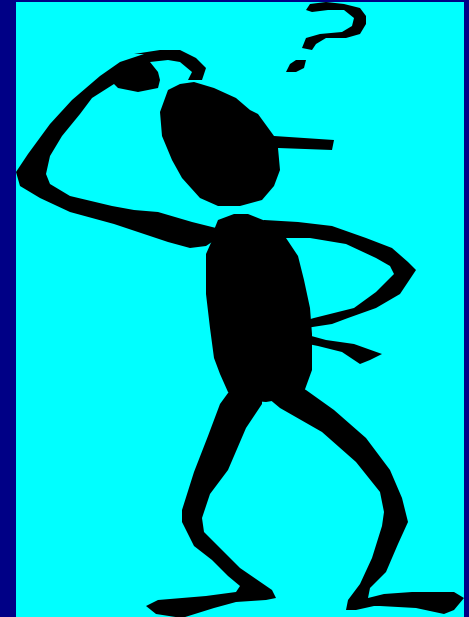


# Intelligent Transportation Systems

---

**Tim Schnarr**

**Delcan Corporation**



# What is ITS?

---

ITS can be defined as:

- “**ITS: the application of advanced technologies** (computers, sensors, control, communications, and electronic devices) in **transportation** to save **lives, time, money, energy and the environment**”
  - *ITS Canada*
- A **tool** to help us do our jobs better !
- Not an end in itself !



# Why do we need ITS?

---



- **Safety**
- **Mobility**
- **Efficiency**
- **Energy**
- **Environment**
- **Productivity**



# What can ITS do?

---

## Major Areas of ITS

- Traffic management
- Incident management
- Public transport
- Traveller information
- Electronic payment
- Road weather information
- Commercial vehicles
- Emergency management
- Vehicle control & safety
- Information warehousing

# Traffic Management



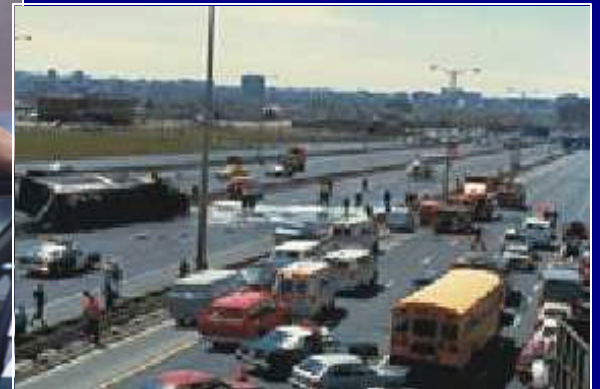
- Traffic Signals
- Vehicle Detection
- Dynamic Message Signs
- Ramp Metering



# Incident Management



- CCTV
- Vehicle Detection
- Dynamic Message Signs
- Animal Detection





# Road Weather Information

- CCTV
- Pavement Sensors
- Atmospheric Sensors



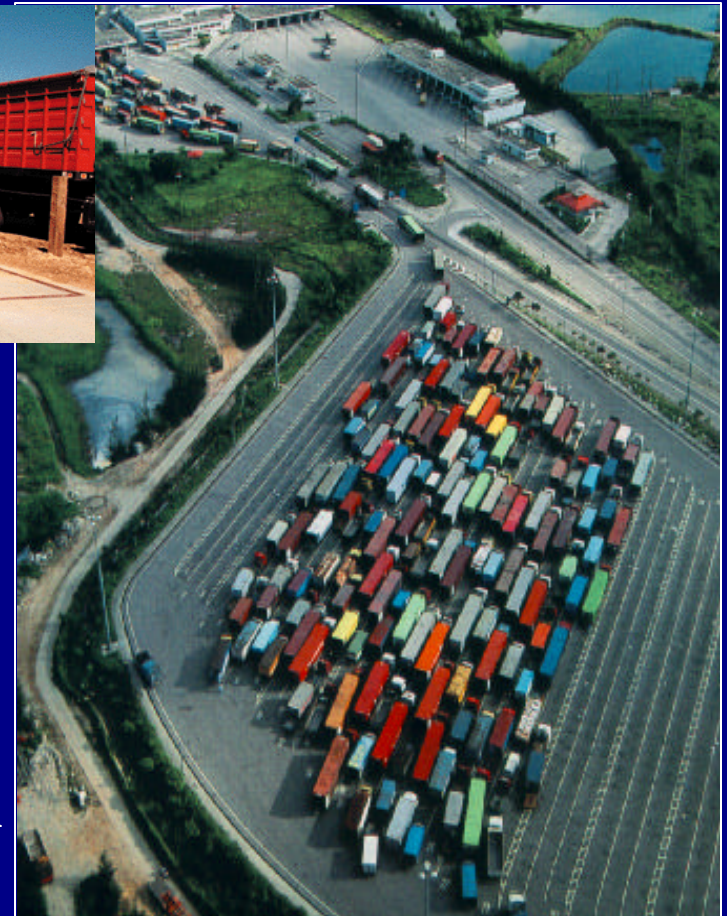
# Traveller Information



- Dynamic Message Signs
- Website
- Media
- Personal Devices
- In-Vehicle Devices



# Commercial Vehicle Operations



- **Weigh-In-Motion**
- **Automatic Vehicle Identification**
- **Commercial Vehicle Electronic Clearance**
- **Automated Roadside Safety Inspection**
- **Commercial Vehicle Admin. Processes**



# Information Warehousing

---

- Data Archiving
- Data Fusion

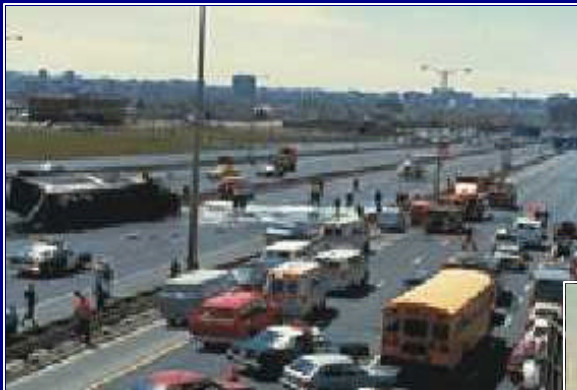




# BENEFITS OF ITS TO USERS

---

- Reduce Collisions and their Severity



# BENEFITS OF ITS TO USERS

---

- ◆ Alleviate Traffic Congestion/Driver Frustration



# BENEFITS OF ITS TO USERS

---

- Enable Environmental Monitoring and Protection



# BENEFITS OF ITS TO USERS

---

- Enhance Productivity and Operational Efficiency



# BENEFITS OF ITS TO USERS

---

- Provide Comfort, Convenience and Security



# Who Benefits?

- Travelling public
- Business / Industry
- Government
- Transportation practitioners
- Environment



# Benefits

ITS Area	Typical Benefit-Cost Ratio
Traveller Information	2:1
Traffic Management	7:1
Incident Management	6:1
<b>Road Weather Information</b>	<b>5:1</b>
Commercial Vehicle Operations	6:1

# Highway 2

ITS Blueprint

---

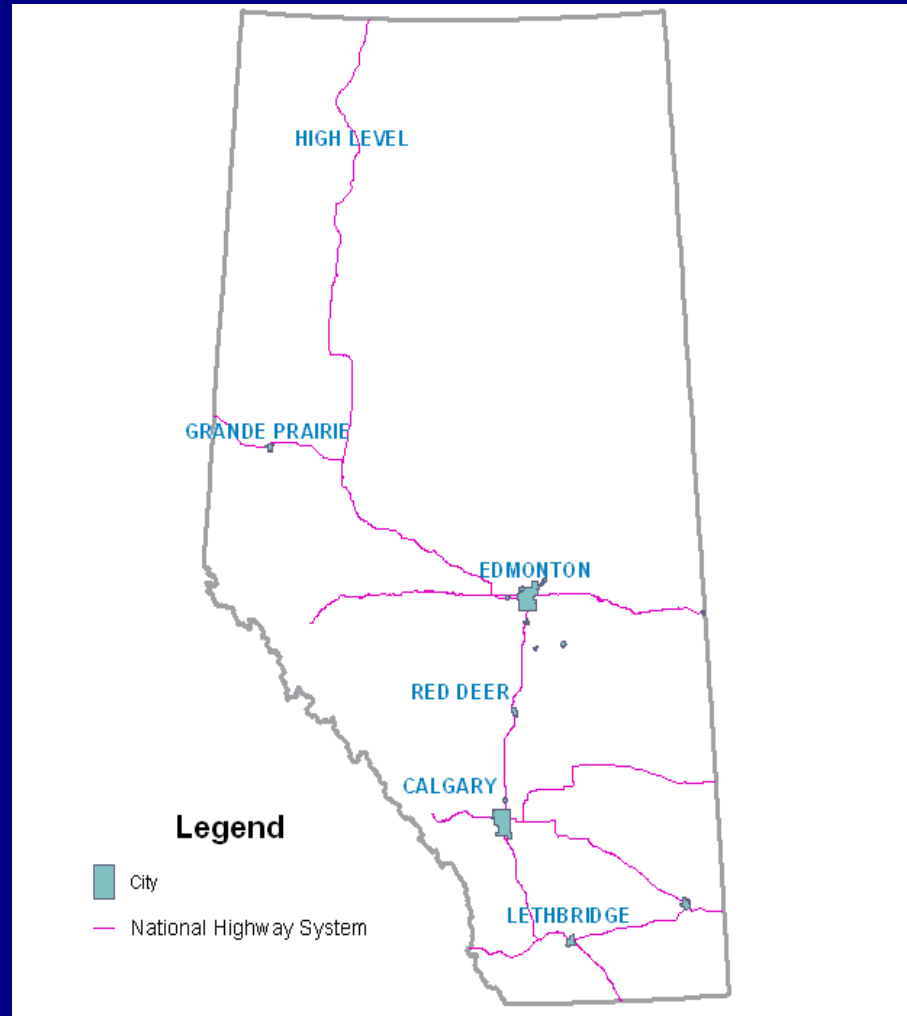
---



# Study Area – Highway 2



# Study Area – National Highway System

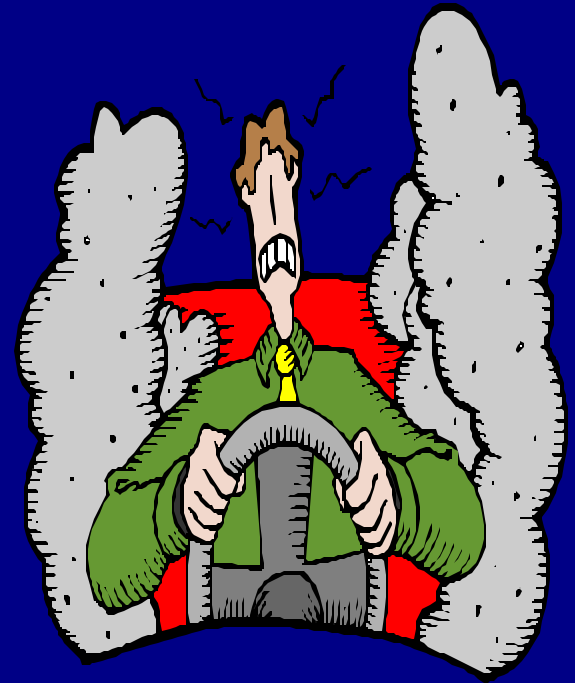


# Summary of Needs

---

**Alf Guebert**

**Earth Tech Canada**



# Stakeholder Interviews

---

- One to one interviews at project outset
- Discussion of needs
- Approximately 50 interviews with 45 agencies
- Other informal discussions
- Stakeholders contacted exceeds 90 individuals

# Common Themes

---

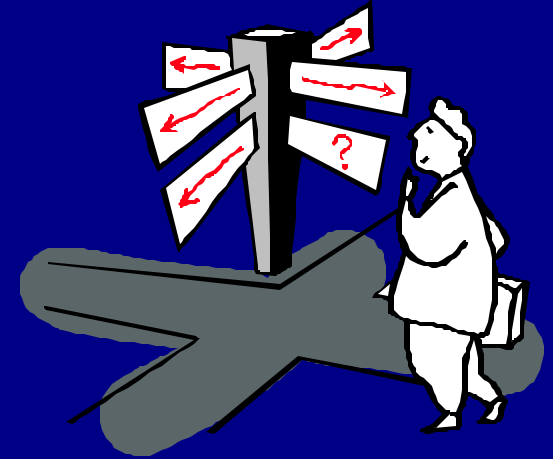
- Road Condition & Traffic Information
- Incident Management
- Road Weather Information Systems
- Traffic Control & Management
- Work Zone Safety
- Commercial Vehicle Operations
- Inter-Agency Coordination
- Data Collection/Management



# Road Condition & Traffic Information

---

- More accurate and timely information
- Wider dissemination and easier access to information
- Improve sharing of information and data



# Incident Management

---

- Timely detection & verification (location)
- Coordination, control and monitoring of lane closures
- Highway closure capabilities
- Protection of site & personnel
- Hazardous materials

# Road Weather Information Systems

---

- Existing atmospheric and road conditions
- Ability to forecast atmospheric and pavement conditions

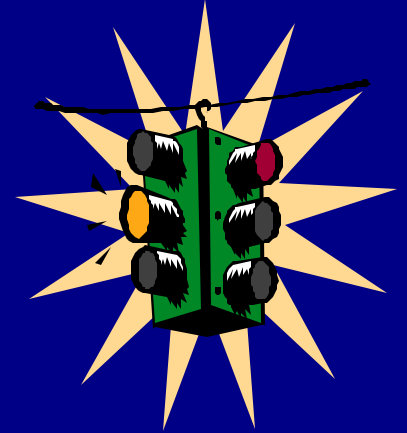




# Traffic Control & Management

---

- Improve safety
- Maximize capacity of existing infrastructure
- Minimize impacts of recurrent congestion
- Minimize stops and reduce travel time in major corridors



# Work Zone Safety

---

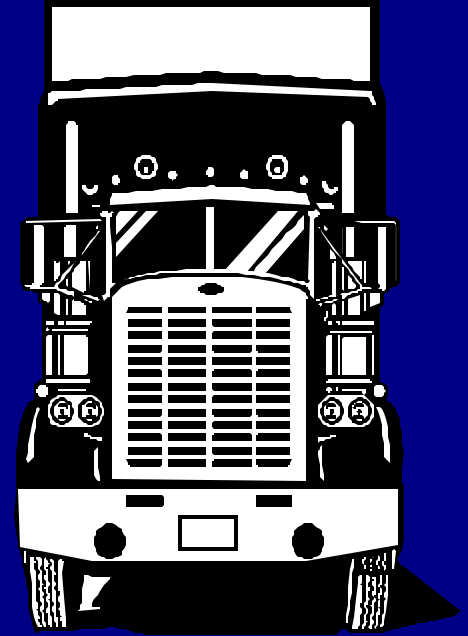
- Protection and safety of site personnel
- Improve traveller information



# Commercial Vehicle Operations

---

- Minimize infrastructure damage due to over height and overweight loads
- Minimize delays at vehicle inspection stations
- Compatibility with other provinces and states



# Inter-Agency Coordination

---

- Coordination, control and monitoring of lane closures
- Improve sharing of traveller information and data



# Data Collection/Management

---

- Maximize use of existing equipment and systems
- Maximize access to information and data (electronic sharing)
- Develop partnerships



# Summary of Stakeholder Needs

---

- Accurate and timely road, weather and traffic information
- Scheduled events, incidents, highway closures
- Wider dissemination and easier access to the information
- Minimize impacts of recurrent congestion
- Data management and sharing (agencies)

# ITS Blueprint for Highway 2

---

**Tim Schnarr**

**Delcan Corporation**



# What Is the ITS Blueprint ?

---

- Blueprint for Future Action
- Identifies Potential ITS Actions / Deployments
- Identifies Priority Sections





# What Is the ITS Blueprint ?



What Can We Do to Address the  
Needs ?

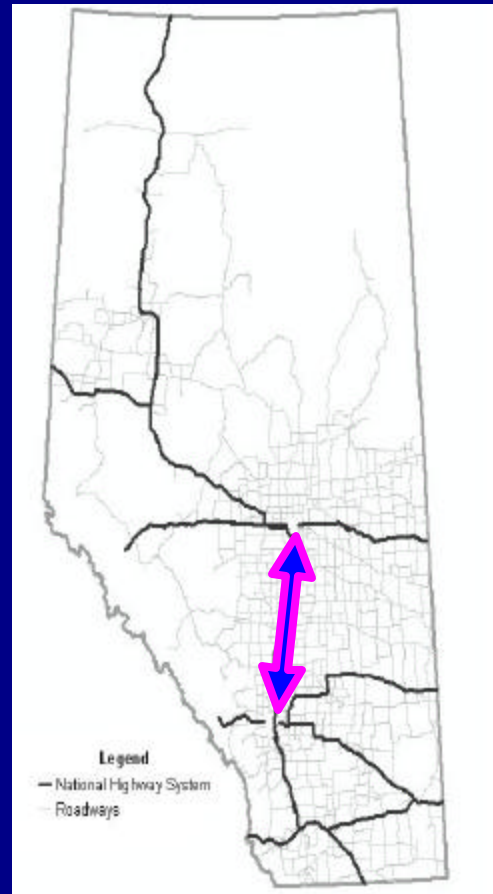


# Highway 2 Blueprint



Anthony Henday Drive

## Rural Section



## Deerfoot Trail

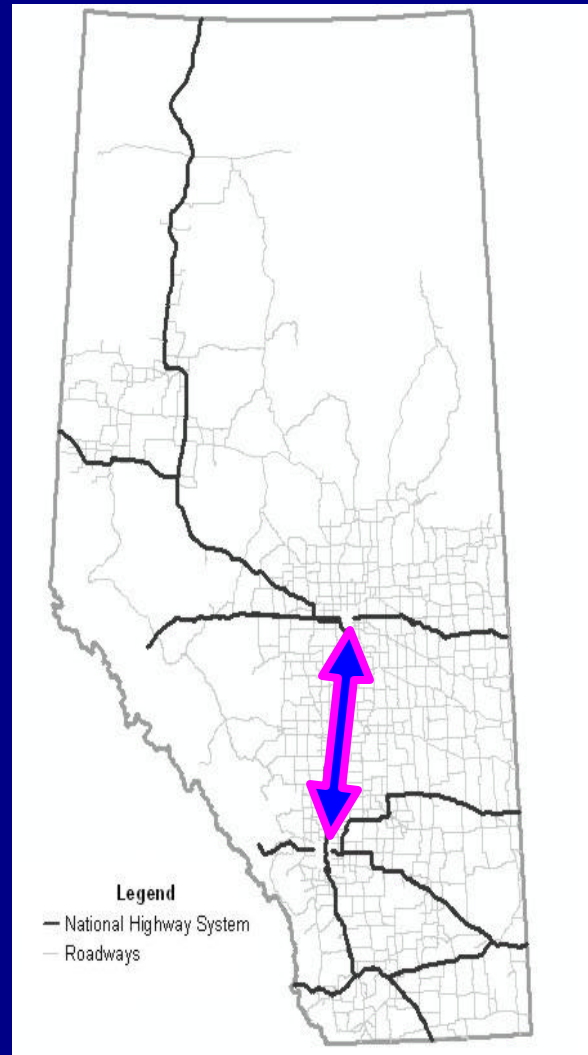


# Preliminary Blueprint Outline

---

- Broken down into three identifiable highway sections:
  - Rural
  - Deerfoot Trail (Urban)
  - Anthony Henday Drive (Urban-Rural)
- Broken down by three timeframe periods:
  - Immediate (0-2 years)
  - Short (3-5 years)
  - Long (6-10 years)

# Rural Section



# Rural Section

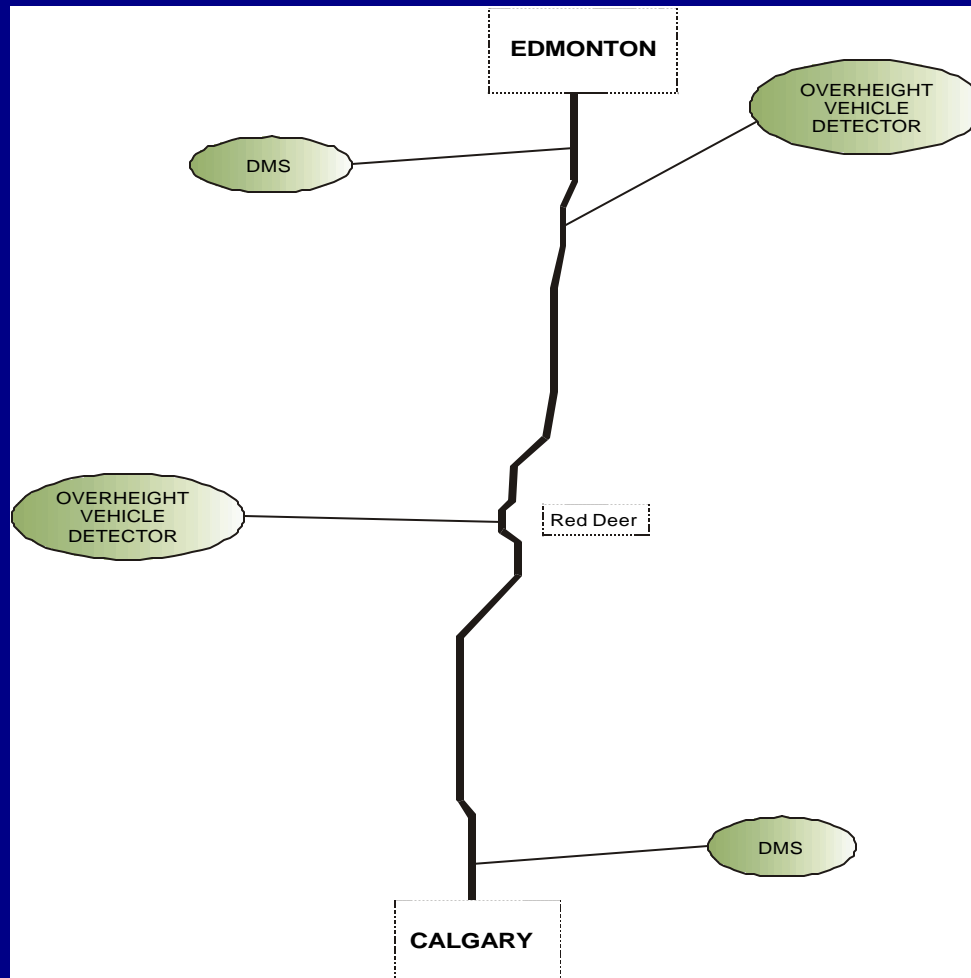
## CHARACTERISTICS

- Low Volume
  - Level of Service A/B
  - AADT's 15,000 to 30,000 (50,000 in some sections)
- Safety (800 Collisions Annually)
  - 40% Single Vehicle Collisions
  - 25% Animal Hits
  - 25% Weather Related\*



\* Road surface or weather is a contributing factor and RWIS may mitigate

# Rural Section – Existing Systems

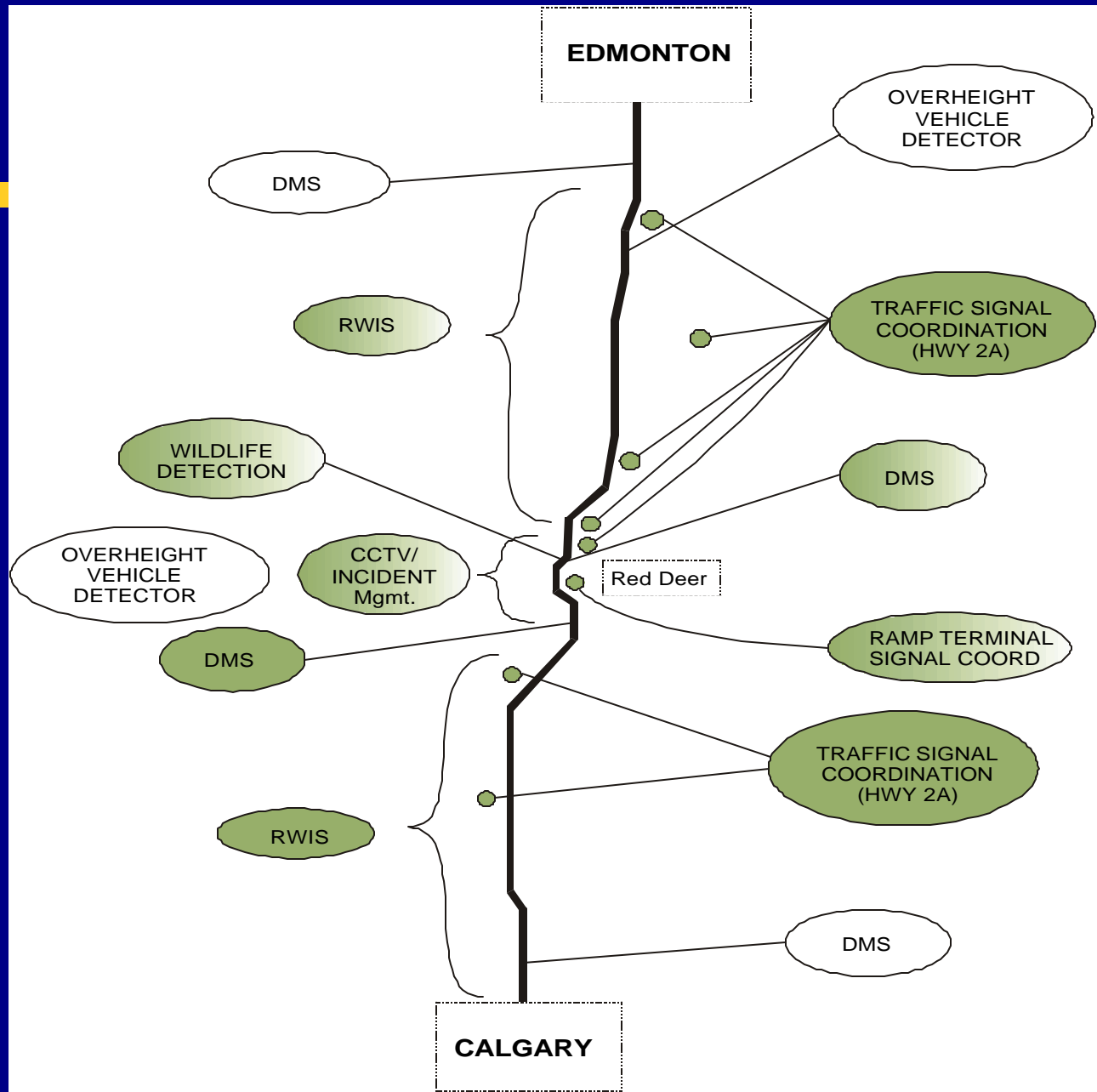


# Rural Section ITS Program

## SHORT TERM (0 to 5 years)

- Traveller Information Database
- Traveller Information Dissemination
  - Website
  - Dynamic Message Signs (Permanent & Portable)
  - Commercial Broadcast Radio
- RWIS (National Highway System)
- Incident Management (Red Deer)
- Animal Detection (Pilot Test)





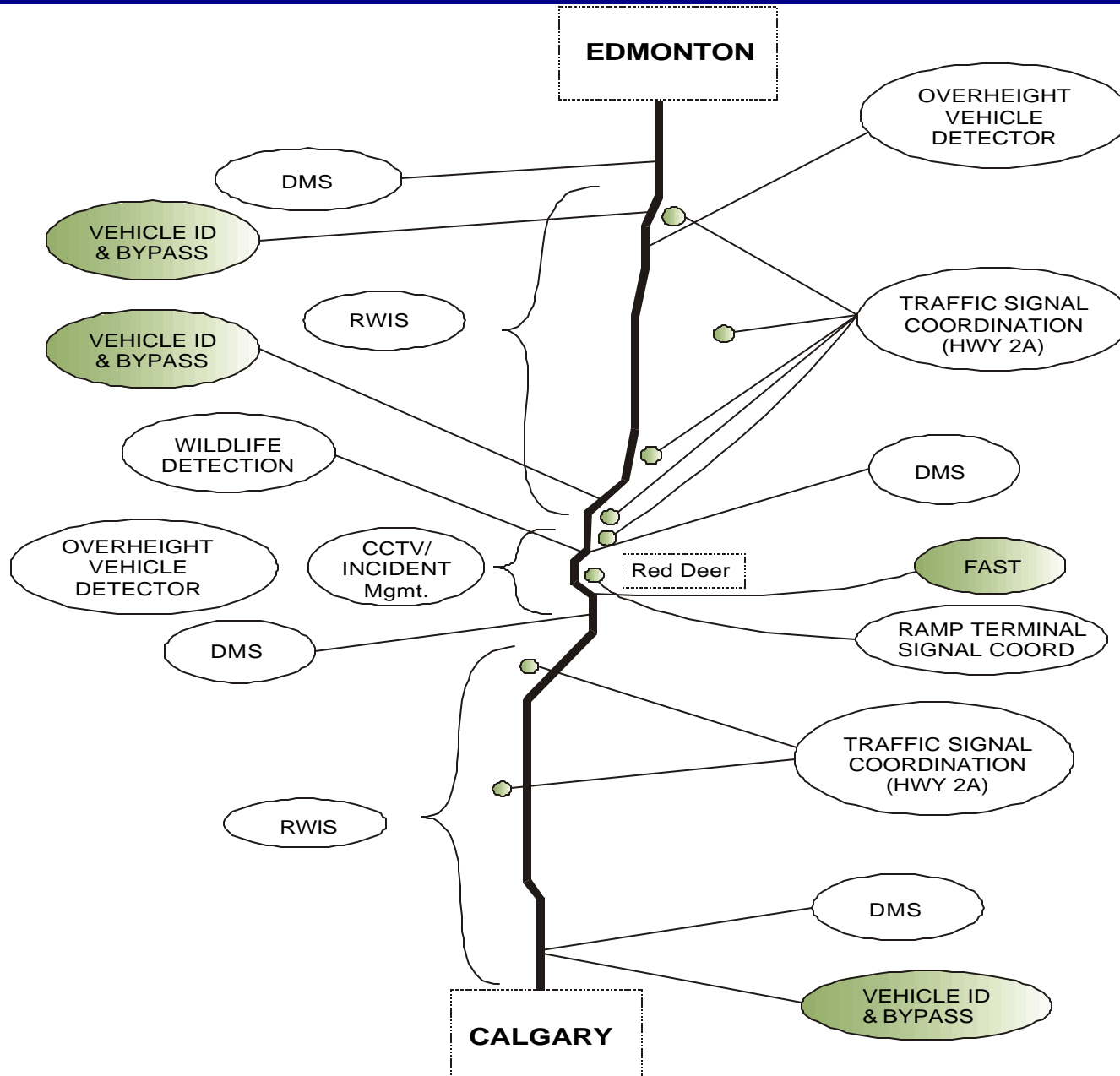


# Rural Section ITS Program

## LONG TERM (6 to 10 years)

- RWIS
  - Automated Surface Condition Reporting
  - Maintenance Decision Support System
  - FAST (Red Deer River Bridge)
- Commercial Vehicle
  - Central Carrier Database
  - Electronic Sorter & Bypass System
  - Weigh-in-Motion





# Deerfoot Trail



# Deerfoot Trail

## CHARACTERISTICS

- High Volumes
  - LOS D
  - AADT's of 50,000 to 140,000
- Safety
  - 560 collisions annually
  - 70% congestion related (50% rear ends, 20% side swipe)
  - 30% weather related\*



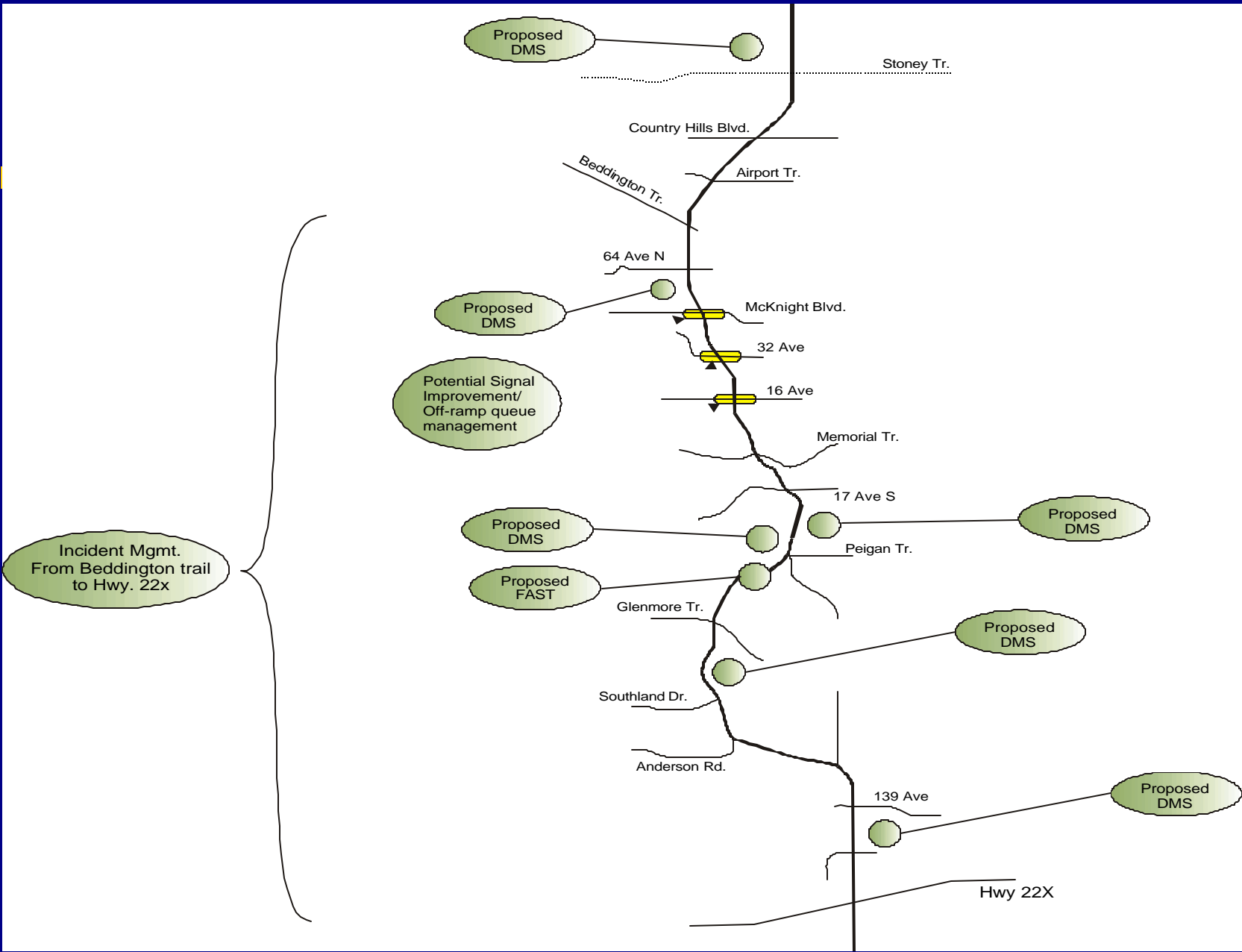
\* Road surface or weather is a contributing factor and RWIS may mitigate

# Deerfoot Trail ITS Program

## SHORT TERM (0 TO 5 YEARS)

- Ramp Terminal Operations
- Incident Management
  - CCTV cameras
  - Collaborative TMC
- Traveller Information
  - Database
  - DMS (Permanent & Portable)
  - Website
  - Commercial Broadcast Radio
- Fixed Automated Spray Technology (FAST)
  - Calf Robe Bridge





Incident Mgmt.  
From Beddington trail  
to Hwy. 22x

Proposed DMS

Stoney Tr.

Country Hills Blvd.

Beddington Tr.

Airport Tr.

64 Ave N

Proposed DMS

McKnight Blvd.

Potential Signal Improvement/  
Off-ramp queue management

32 Ave

16 Ave

Memorial Tr.

17 Ave S

Proposed DMS

Peigan Tr.

Proposed DMS

Proposed FAST

Glenmore Tr.

Proposed DMS

Southland Dr.

Anderson Rd.

139 Ave

Proposed DMS

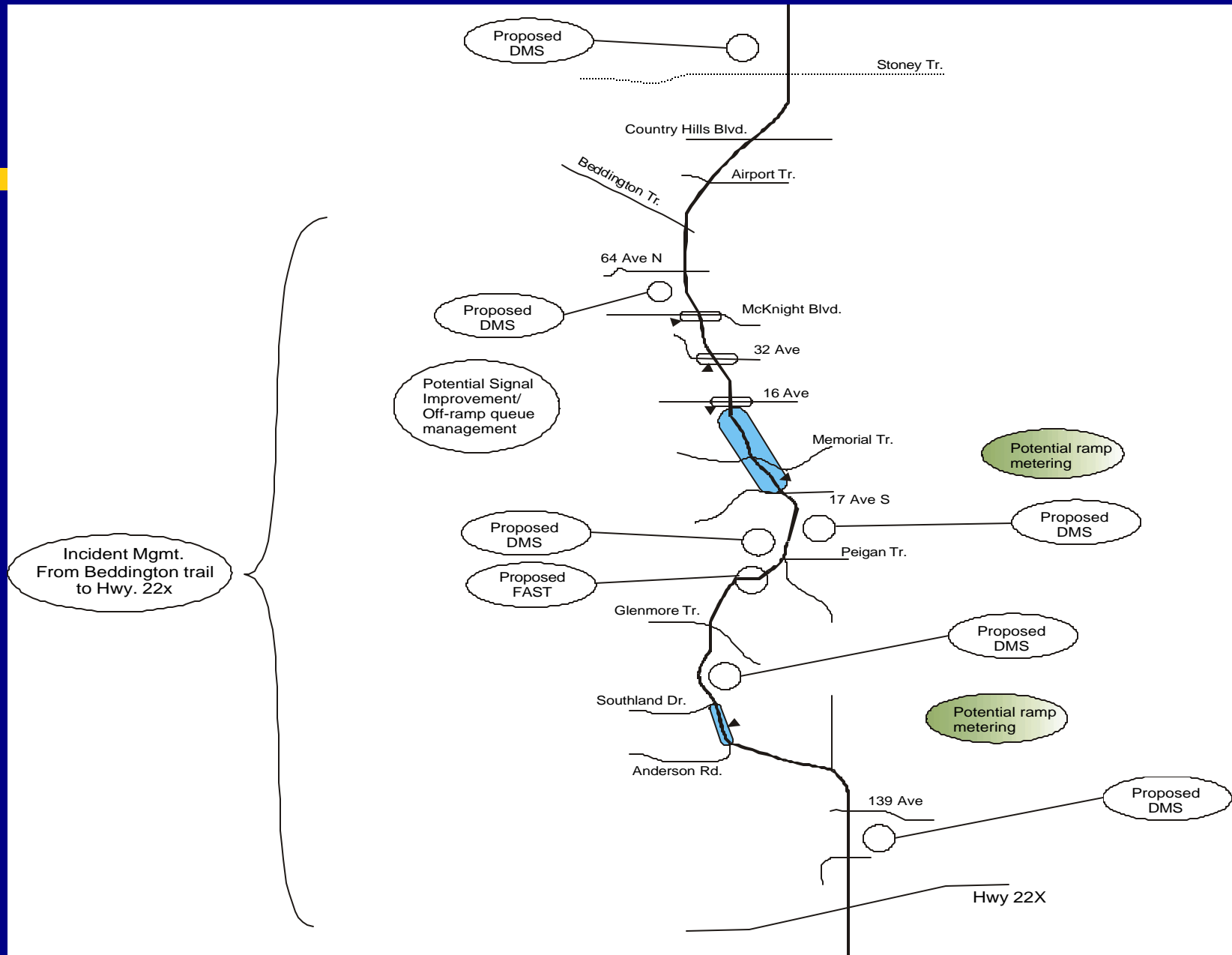
Hwy 22X

# Deerfoot Trail ITS Program

## LONG TERM (6 to 10 years)

- Incident Management
  - Additional CCTV cameras & DMS
  - Implement Automated Incident Detection
- RWIS
  - Automated Surface Condition Reporting
  - Maintenance Decision Support System
- Ramp Metering







# Anthony Henday Drive (AHD)



# Anthony Henday Drive

---

## CHARACTERISTICS

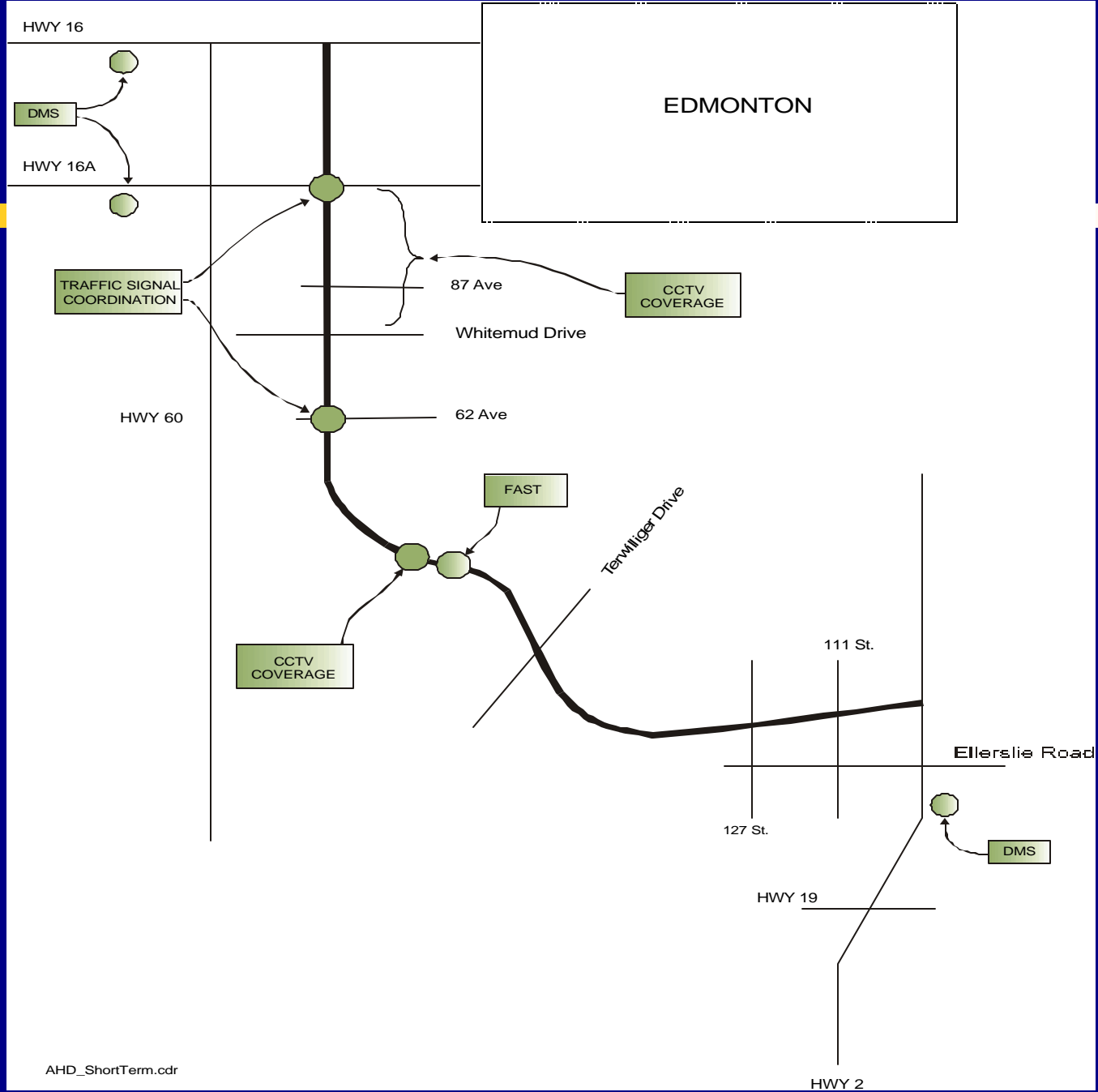
- Moderate Volumes
  - LOS B/C
  - forecast AADT's of 30,000 to 70,000

# Anthony Henday Drive ITS Program

---

## SHORT TERM (0 TO 5 YEARS)

- Integrate Traffic Signals with the City's
- Traveller Information
  - ATIS Database
  - Website
  - DMS
- RWIS & FAST on River Crossing
- Incident Management
  - CCTV at Select Locations
  - Call-In Centre



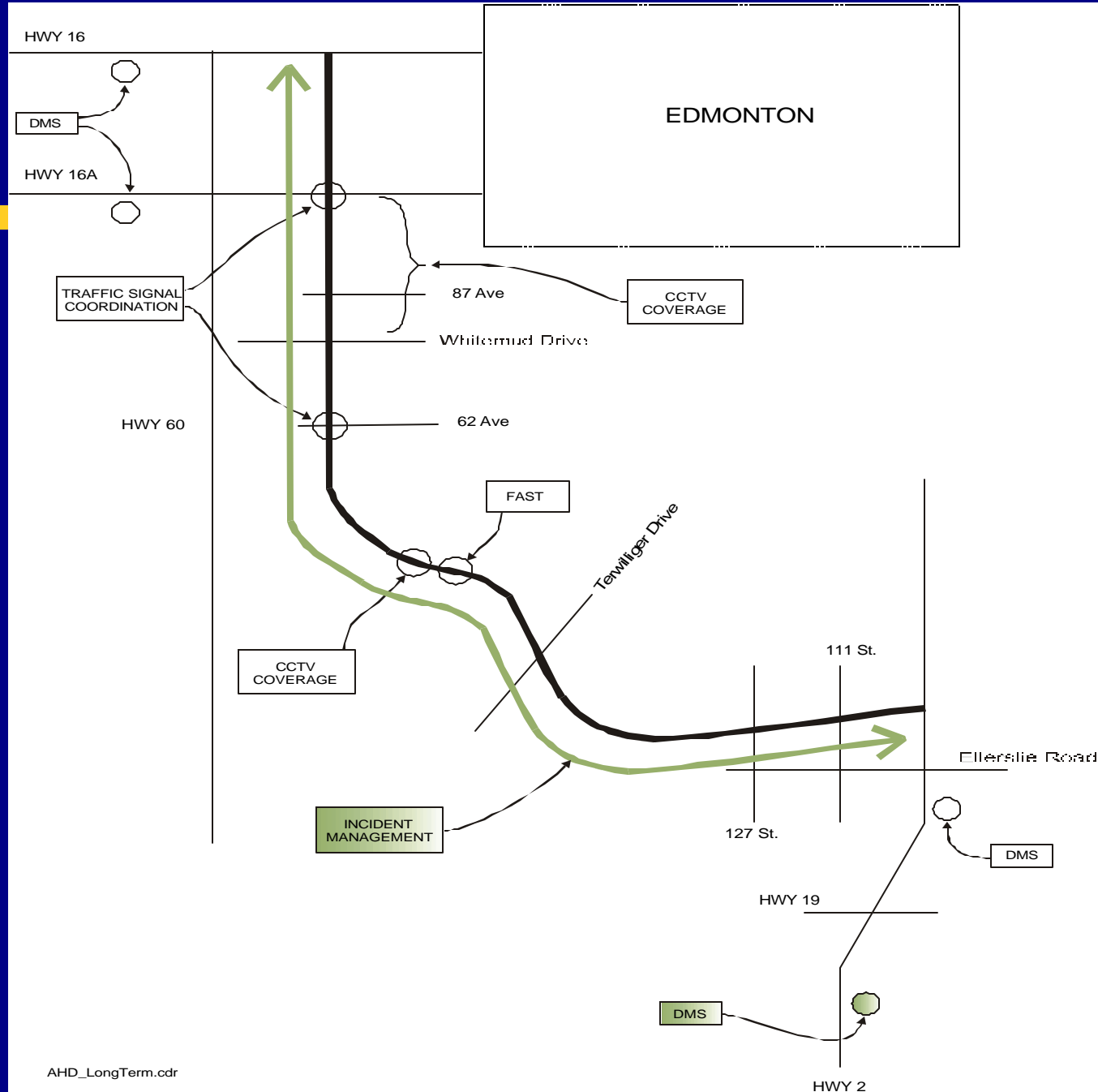
AHD\_ShortTerm.cdr

# Anthony Henday Drive ITS Program

---

## LONG TERM (6 to 10 years)

- Incident Management
  - 100% CCTV coverage
  - Automated Incident Detection
  - Add DMS
- RWIS
  - Automated Surface Condition Reporting
  - Maintenance Decision Support System



AHD\_LongTerm.cdr

# Early Winners

---

- ATIS Database
- DMS
- Incident Management
  - CCTV along Deerfoot Trail
  - Collaborative TMC
- RWIS
  - Stations
  - FAST



# Capital Costs

---

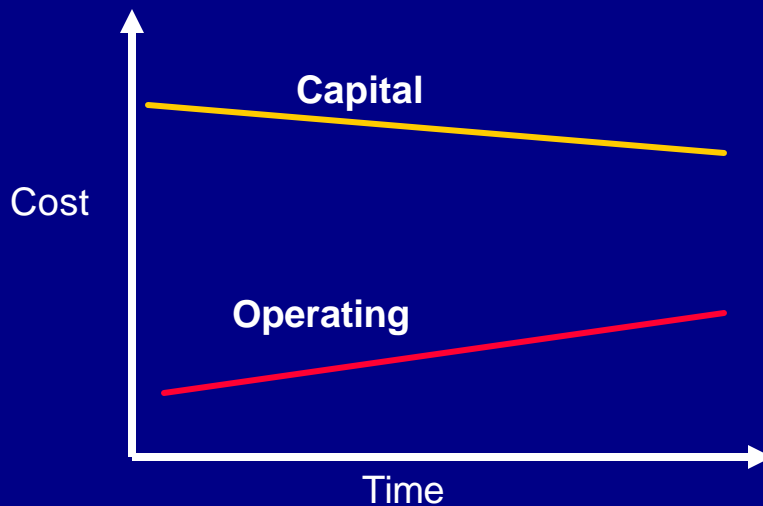
- Approximately \$ 21 Million over 5 years
- Distribution
  - 40% Deerfoot Trail
  - 30% RWIS
  - 15% Anthony Henday Drive
  - 15% Rural





# Operating & Maintenance Costs

- Estimated \$ 1 Million to \$ 2.5 Million Annual
- Combined Capital & Operating of approx. \$ 5 Million Annually



# Potential Benefits

---

- Quantified
  - Reduction in Vehicle Delays
  - Reduction in Number of Collisions
  - Reflects Impact of Incident Management, RWIS, etc.
- Qualitative
  - Driver Frustration
  - Customer Satisfaction
  - Environmental
  - Reflects Impact of ATIS, RWIS, etc.



# Projected Benefit/Cost Ratios

---

- ATMS/ATIS
  - Deerfoot Trail 7:1
  - Rural Section 3:1
  - Anthony Henday Drive 2:1
- Road Weather Information
  - Rural Section 5:1
- FAST
  - Deerfoot Trail 3:1
  - Anthony Henday Drive 3:1

# Where Do We End Up ?

- Road & Traffic Condition Information
  - Real-Time
  - DMS & Web-Based (Media)
- Road Weather Information
  - Improved surface conditions
  - Efficiency/management of maintenance operations
- Incident Management
  - Deerfoot Trail
  - Anthony Henday Drive
  - Rural
- Technology Integration & Teamwork

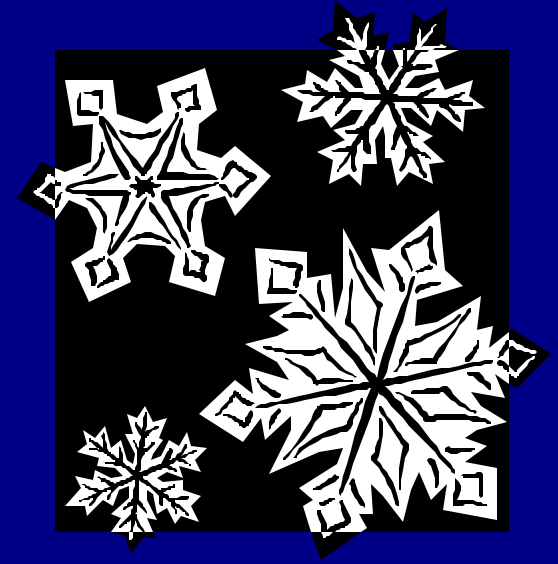


# RWIS Program

---

**Mark Pinet**

**M.F. Pinet & Associates**



# Information Session

## ITS Blueprint-RWIS

---

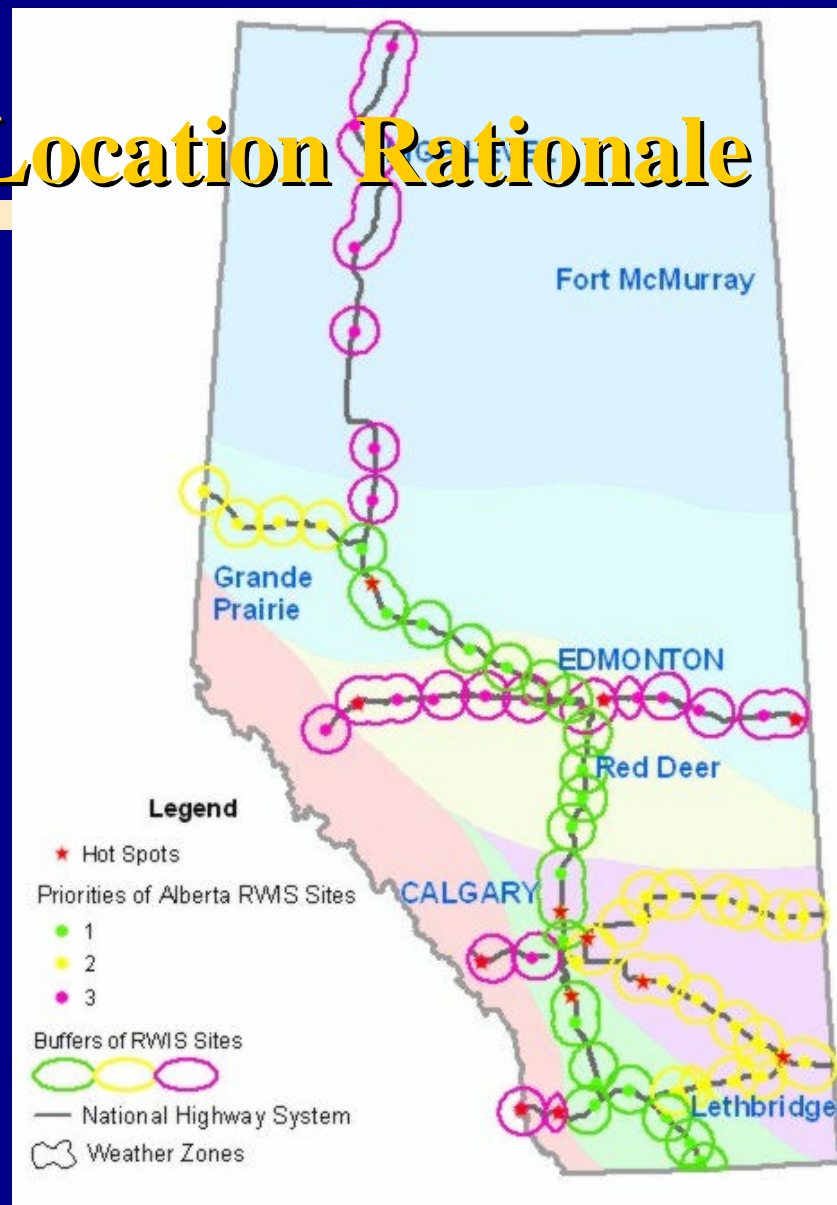
### PM

- **Site location details**
- **Summary of recommendations**
- **Equipment suite to be deployed**

# Information Session

## ITS Blueprint-RWIS Location Rationale

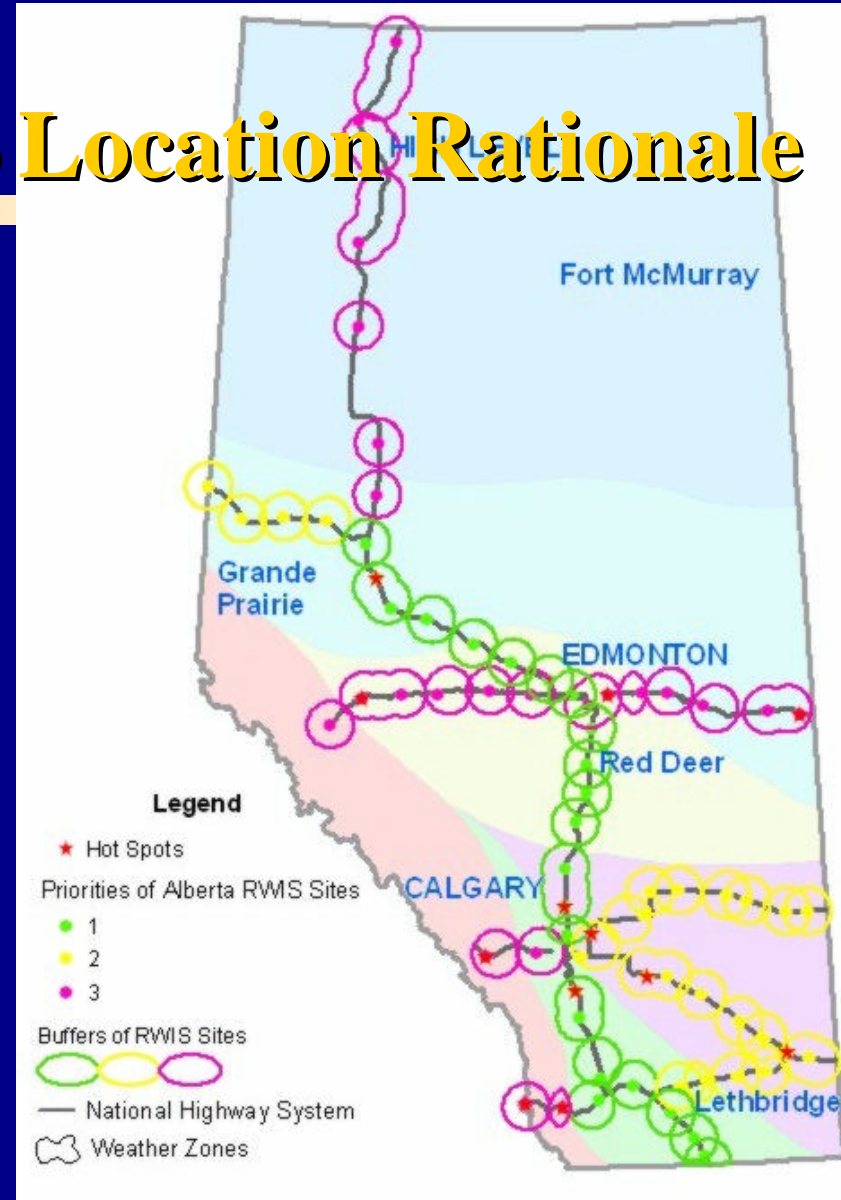
- RWISC proposal Dictated Results –
  - 70 Sites
  - NHS
  - Completion Mar. 2006
  - Basic and “Limited Deployment” Equipment
- Two year deployment selected
- Two contracts



# Information Session

## ITS Blueprint-RWIS Location Rationale

- Result –
  - GIS Model Highway Segments Represented By Each RWIS site
  - Table in document listing sites, equipment information





# Information Session

## ITS Blueprint-RWIS Location Rationale

---

### Site Types

- Remote sensing
  - Hot spots/Problem Locations
  - Site Specific
- VS
- Deployment Trigger
  - Representative of a larger area
  - Pavement Condition Forecasts
- 120 Trigger/hot spot sites proposed

# Information Session

## ITS Blueprint-RWIS Location Rationale

- FACTORS INFLUENCING NETWORK  
ZONE LOCATION-**MACRO** FACTORS

# Information Session

## ITS Blueprint-RWIS Location Rationale

- FACTORS INFLUENCING NETWORK ZONE LOCATION

- Representative conditions in the Zone

- Topography/Geography



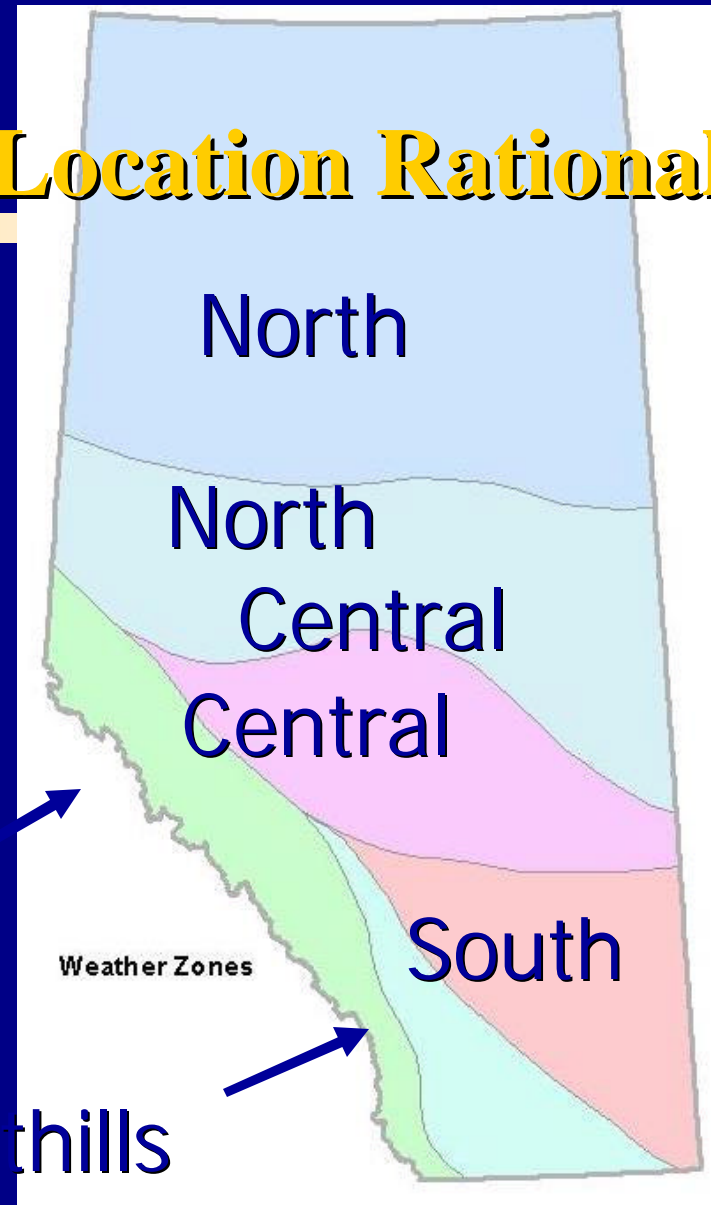
# Information Session

## ITS Blueprint-RWIS Location Rationale

6 Meteorological Zones

Mountain

Foothills

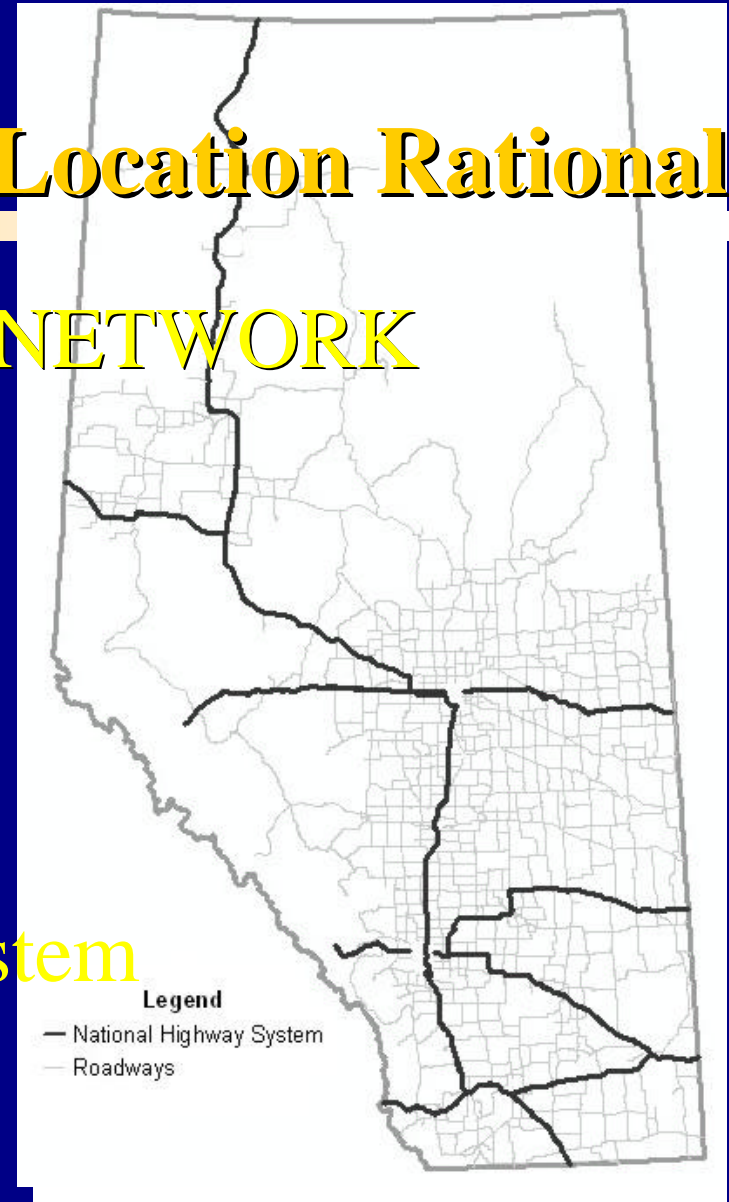


# Information Session

## ITS Blueprint-RWIS Location Rationale

- FACTORS INFLUENCING NETWORK ZONE LOCATION

- Provincial Highways
- National Highway system



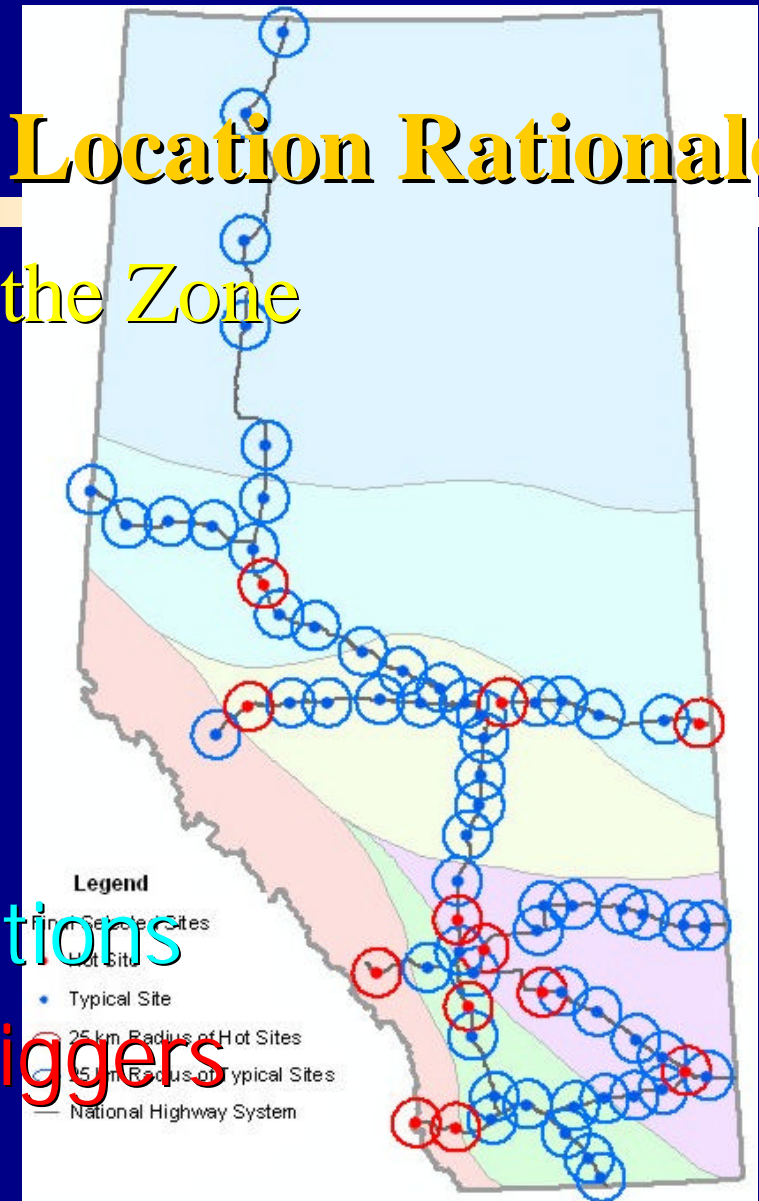
# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in the Zone
  - 50km Rural spacing
  - 30km Urban spacing

■ Hot Spots- Problem locations

■ Representative Sites -Triggers

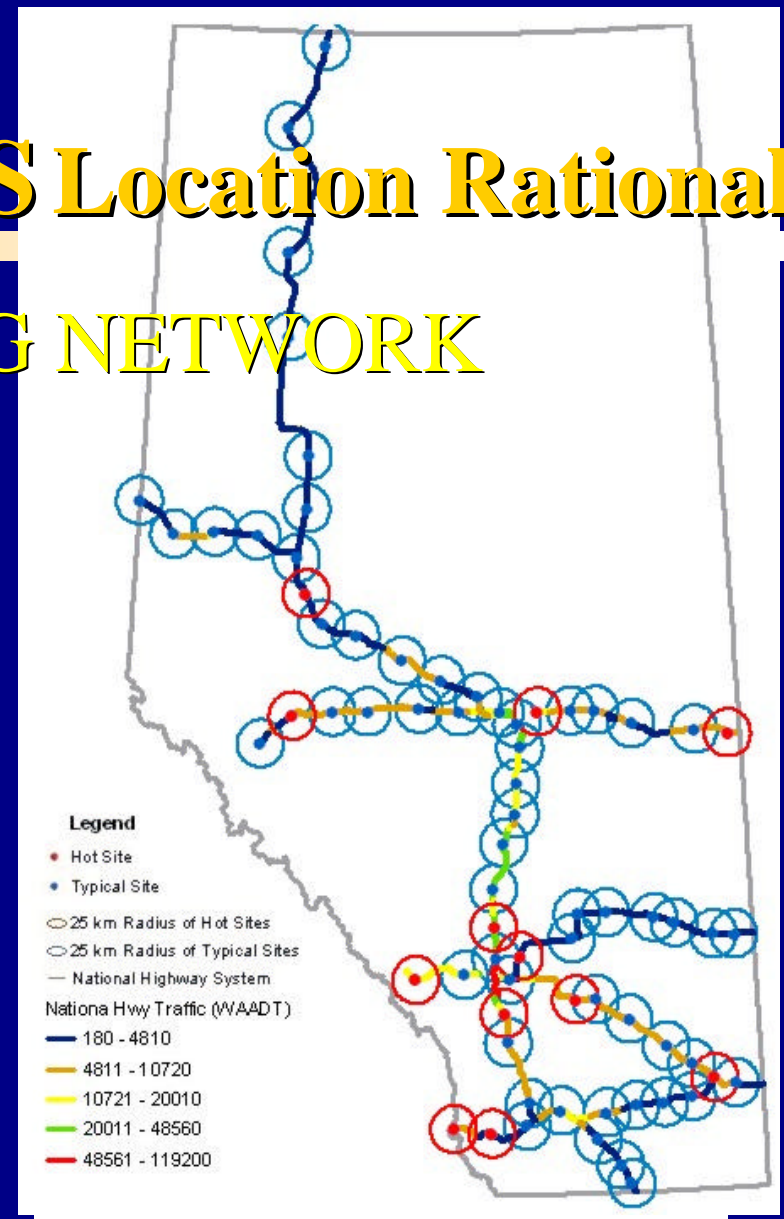


# Information Session

## ITS Blueprint-RWIS Location Rationale

- FACTORS INFLUENCING NETWORK ZONE LOCATION

–Traffic Volumes



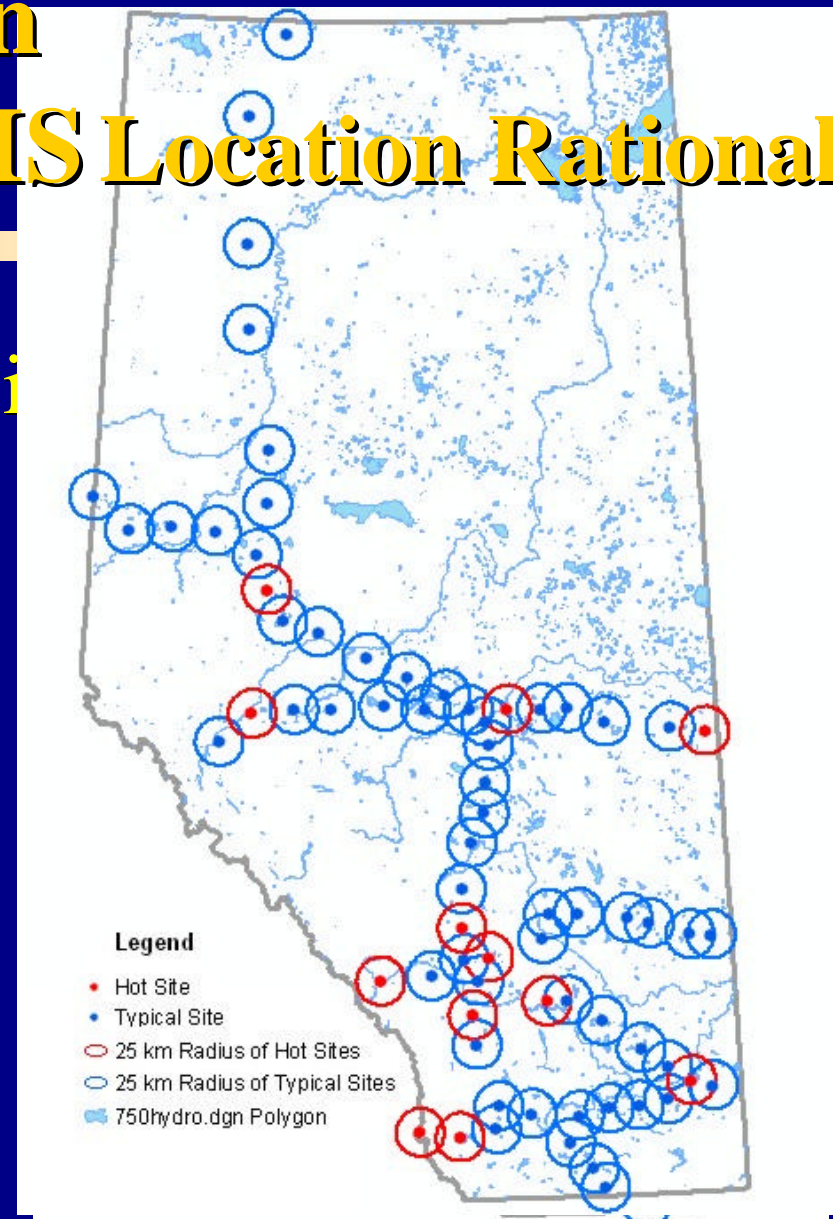


# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in

- Water courses and
- Bridge Locations

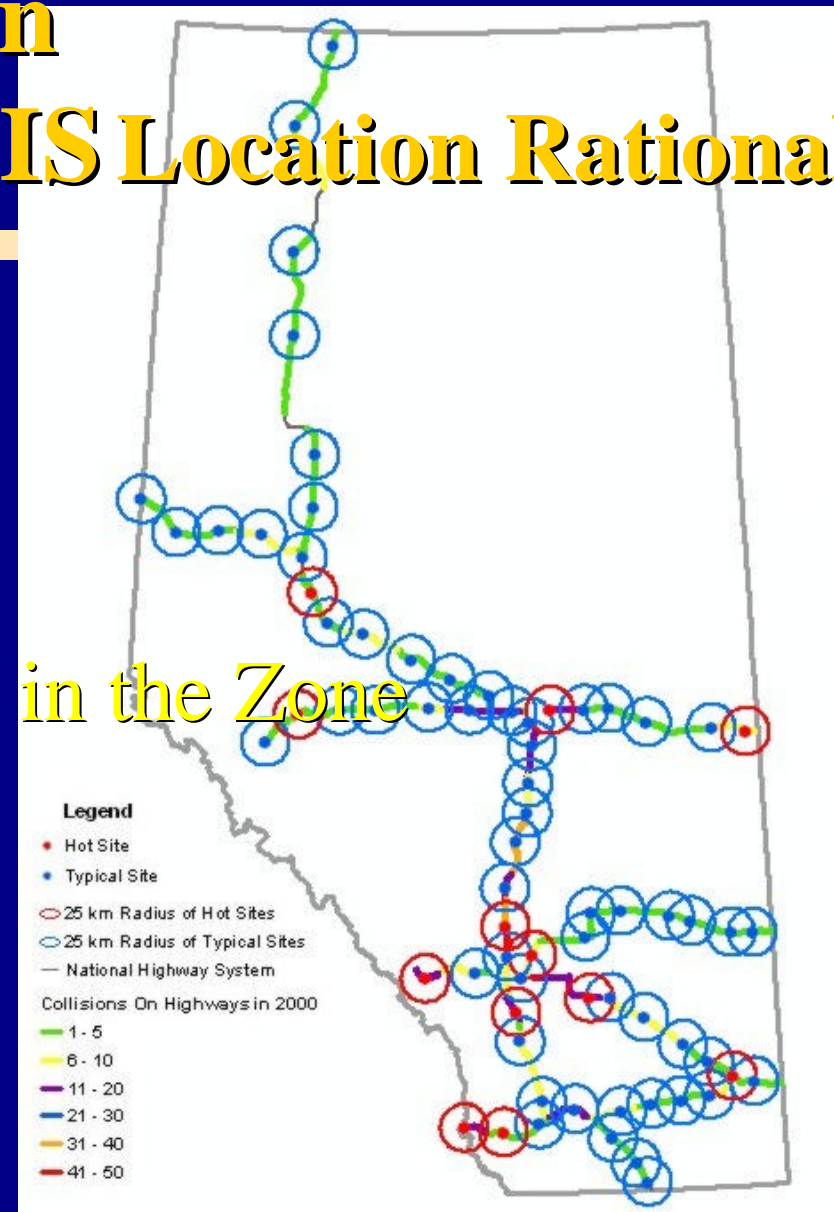




# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in the Zone
  - Collisions.



# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in the Zone
  - Topography

Steeper = Darker

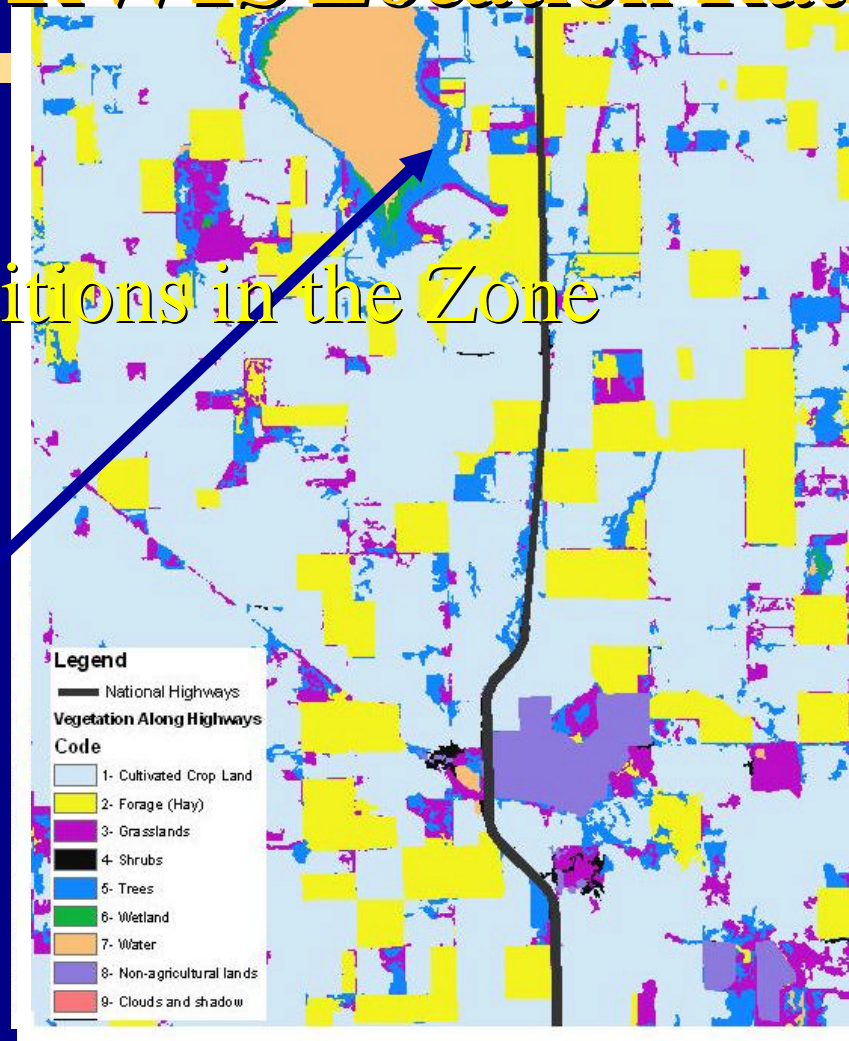


# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in the Zone
  - Vegetation

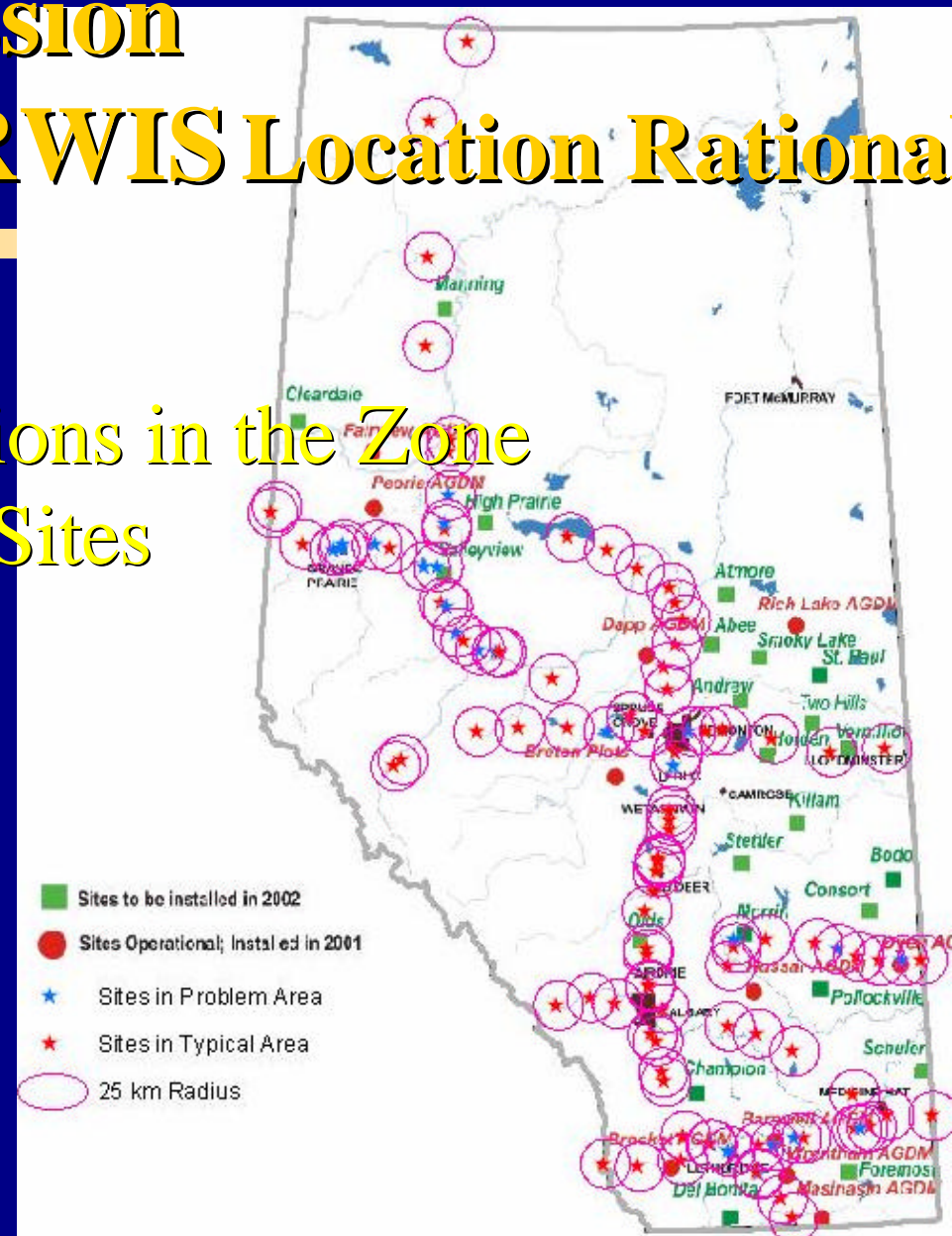
Trees Blue



# Information Session

## ITS Blueprint-RWIS Location Rationale

- Representative conditions in the Zone  
Other Monitoring Sites





# Information Session

## ITS Blueprint-RWIS Location Rationale

- Result –
  - GIS Model Results Illustrating Highway Segments Represented By Each RWIS site



# Information Session

## ITS Blueprint-RWIS Location Rationale

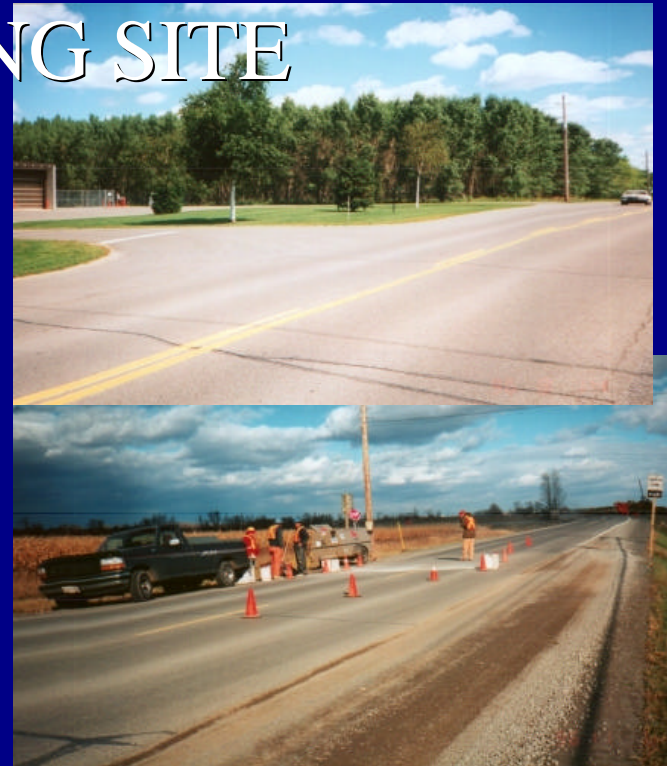
- FACTORS INFLUENCING SITE LOCATION—MICRO

- Physical Geography

- Soil Type
- Sky View
- Obstructions (Vegetation)

- Operational

- Pavement Conditions
- Routes



# Information Session

## ITS Blueprint-RWIS Location Rationale

---

*Depending on Information Required and  
Warrant -Dictated type of Equipment*

### *Categories*

**Level 1 RWIS Trigger Site**

**Level 2 RWIS Hot Spot**

**Level 3 RWIS Trouble Hot Spot-FAST**

# Information Session ITS Blueprint- RWIS Recommendations

---

- **Phase One**- Thirty basic RWIS sites, central server and advanced sensor demo site
- **Phase One b)** - Retrofit of Phase One with advanced Pavement sensors
- **Phase Two** Forty RWIS sites including advanced pavement sensors (11) with upgrades of seven existing RWIS sites.



# Information Session ITS Blueprint- RWIS Recommendations

---

## Future

- Evaluate NHS RWIS/Extend RWIS to other Areas
- Warrant and Priority Analysis FAST
- Exploit benefits of RWIS
  - Salt Management and Data Fusion

# Information Session ITS Blueprint- RWIS Staging Phase 1 Deployment

- Phase One Scope
  - 30 Site
- Timing
  - Completion Dec. /04
- Basic Equipment including CCTV
- RWIS Watch Expert Model
- User Interface, VAM
- Retrofit Ph1 Advanced
- Cost \$3M



# Information Session ITS Blueprint- RWIS Staging Phase 2 Deployment

- Phase Two Scope
- Timing
  - Installed Dec. /05
- Basic Equipment, Cameras
- Advanced RWIS sensors Ph2,
- Cost \$4M

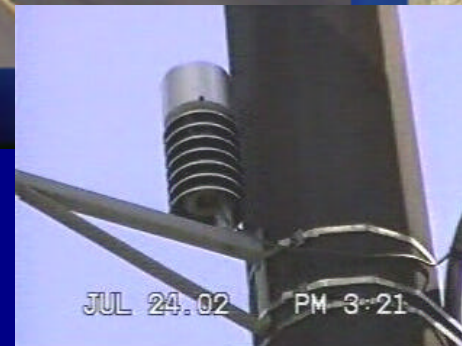
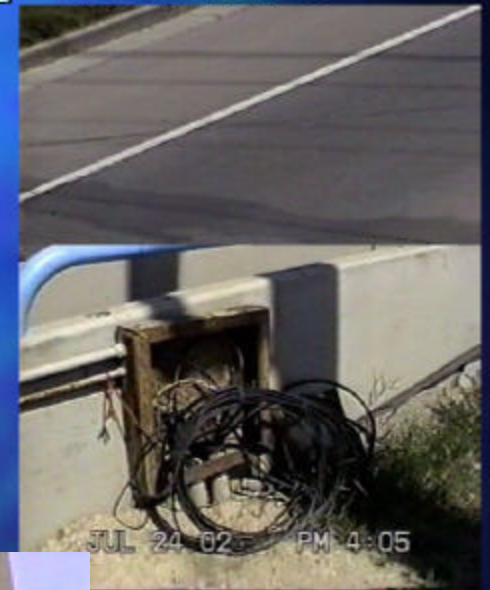


# ITS Blueprint-RWIS

## Phase 2 Deployment Deerfoot upgrades

- Calgary
- Deerfoot RWIS upgrades
- Ph 2 (proposed)
- Advanced sensor Retrofit
- Adapt Calgary server
- Cost \$0.3M
- 

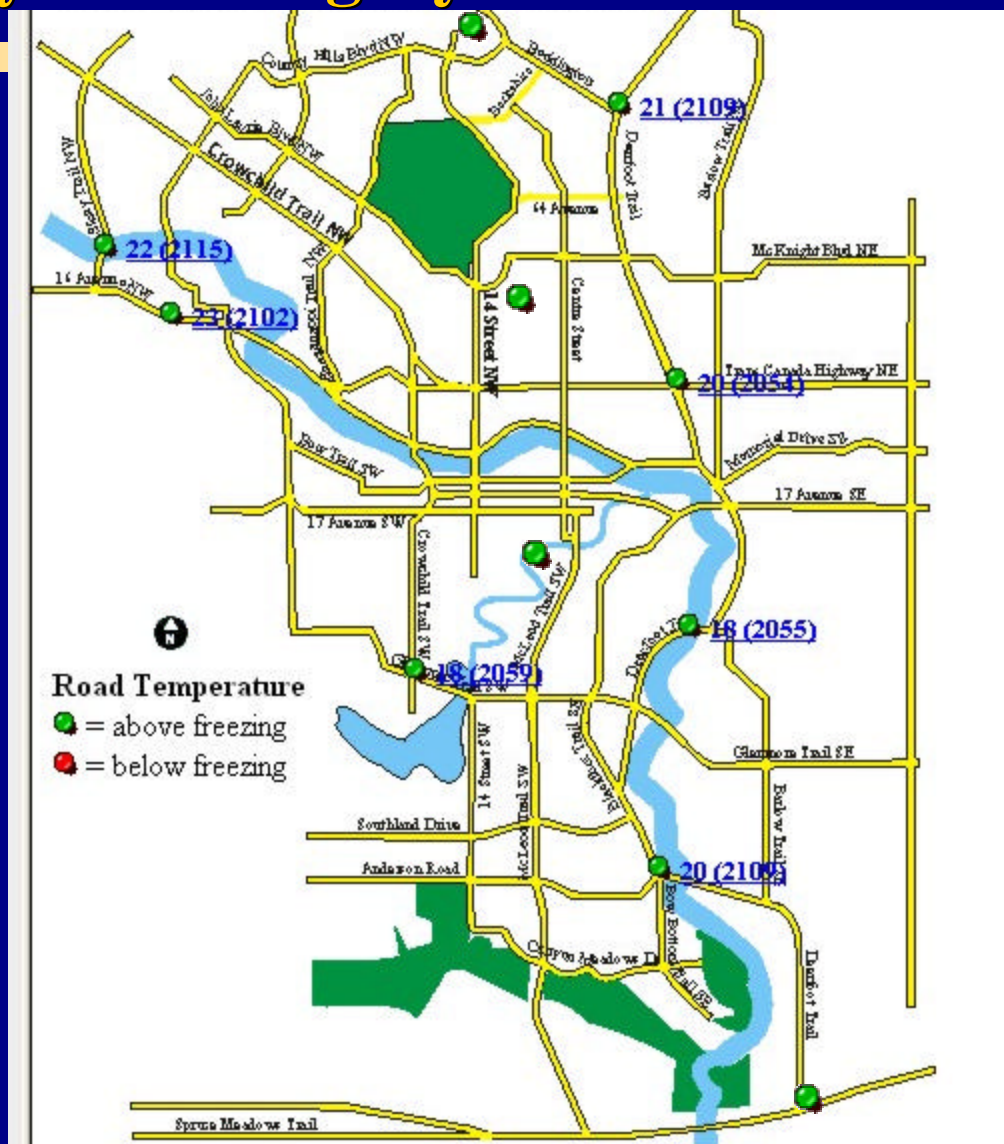
RWIS Deerfoot @ 16th Ave



# Information Session ITS Blueprint- RWIS Phase 2 Deployment Calgary

Capture Calgary  
RWIS on AT  
NTCIP ESS  
server

Deerfoot Trail  
RWIS Upgrade





# Information Session ITS Blueprint- RWIS Phase 1 Deployment Edmonton

**Century Road**

**Clover Bar**

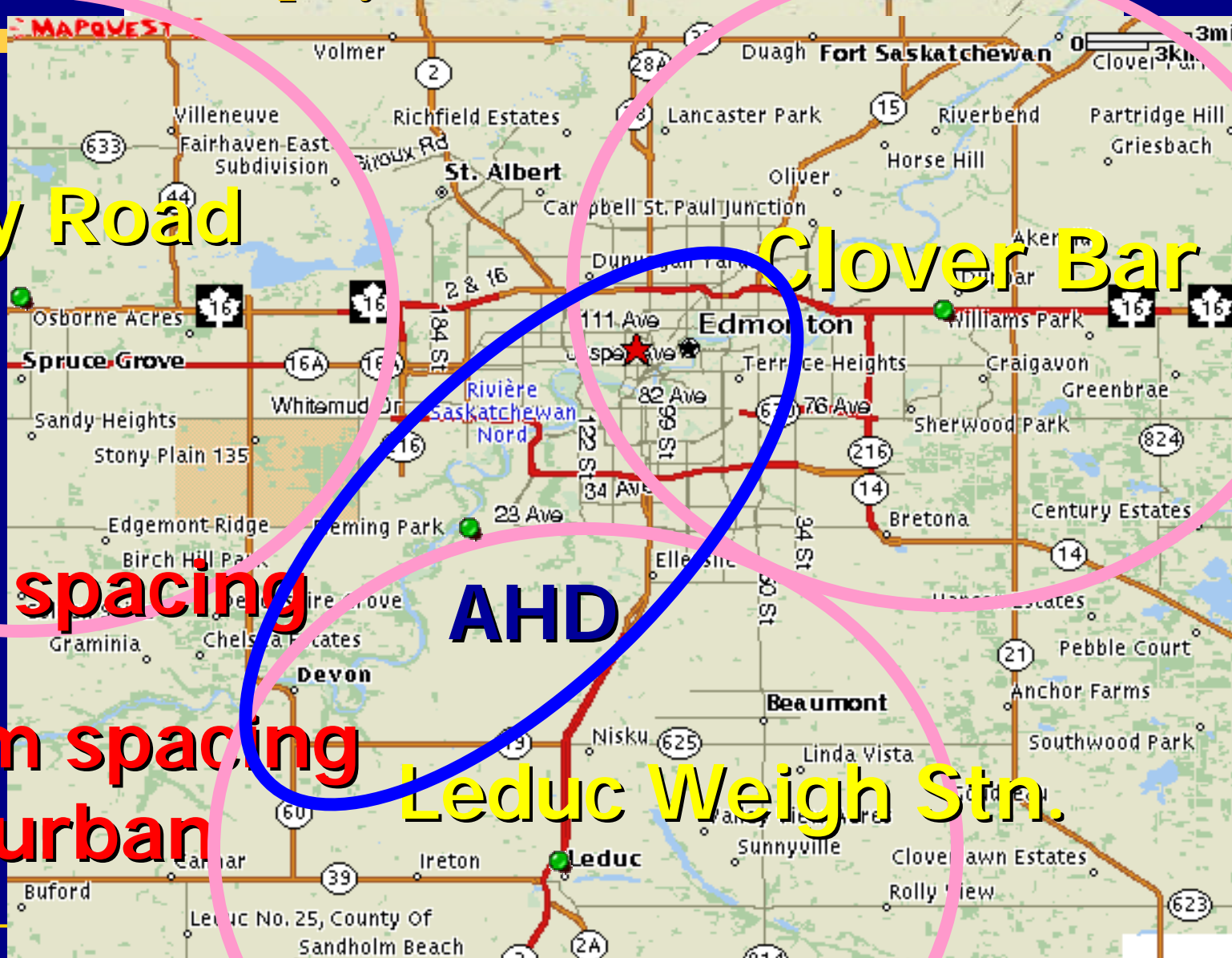
**50 Km spacing**

**AHD**

**Rural  
30 Km spacing**

**Leduc Weigh Stn.**

**Suburban**



# Information Session

## ITS Blueprint-RWIS Equipment Suite

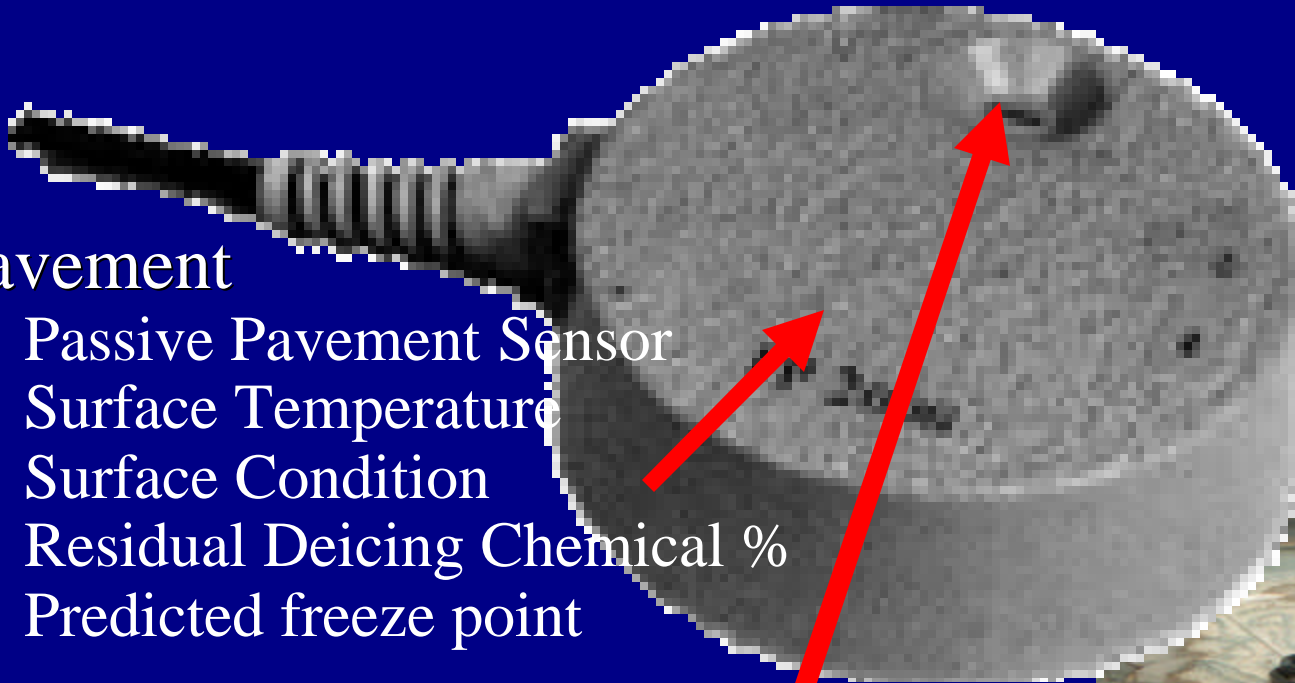
- Atmospheric
  - Wind Speed/Dir.
  - Precipitation
  - RH/Temp
  - Barometric Pressure
  - RPU
  - Tower



# Information Session

## ITS Blueprint-RWIS Equipment Suite

- Pavement
  - Passive Pavement Sensor
  - Surface Temperature
  - Surface Condition
  - Residual Deicing Chemical %
  - Predicted freeze point
- Ground
  - 2x Sub Surface Temperature



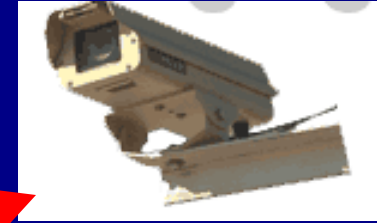


# Information Session

## ITS Blueprint-RWIS Equipment Suite

- Cameras for Visibility

- (LIMITED DEPLOYMENT SENSORS - 30% of all Stations per RWISC)



- Expert Models for prediction of
  - Fog
  - Blowing Snow
  - Rely RH, temp and Wind Speed for prediction Vs Detection

# Information Session

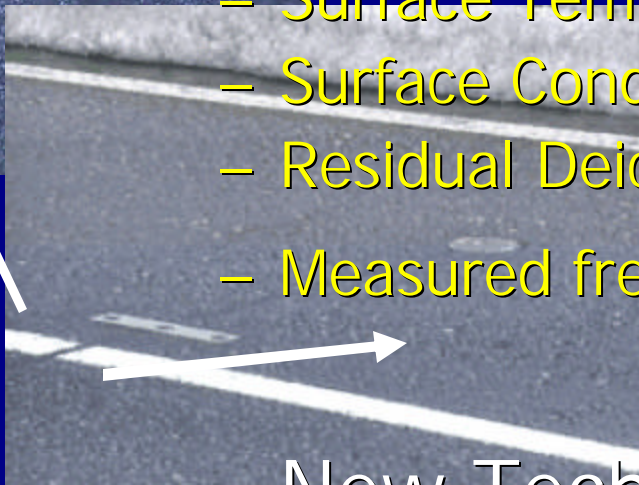
## ITS Blueprint-RWIS Equipment Suite

### Active "Advanced" Pavement Sensors

### Passive Pavement Sensor

- Surface Temperature
- Surface Condition
- Residual Deicing Chemical %
- Measured freeze point

- New Technology
- Phase 2 retrofit



# Alberta Transportation RWIS Network Design

## Advanced RWIS Next gen-FAST



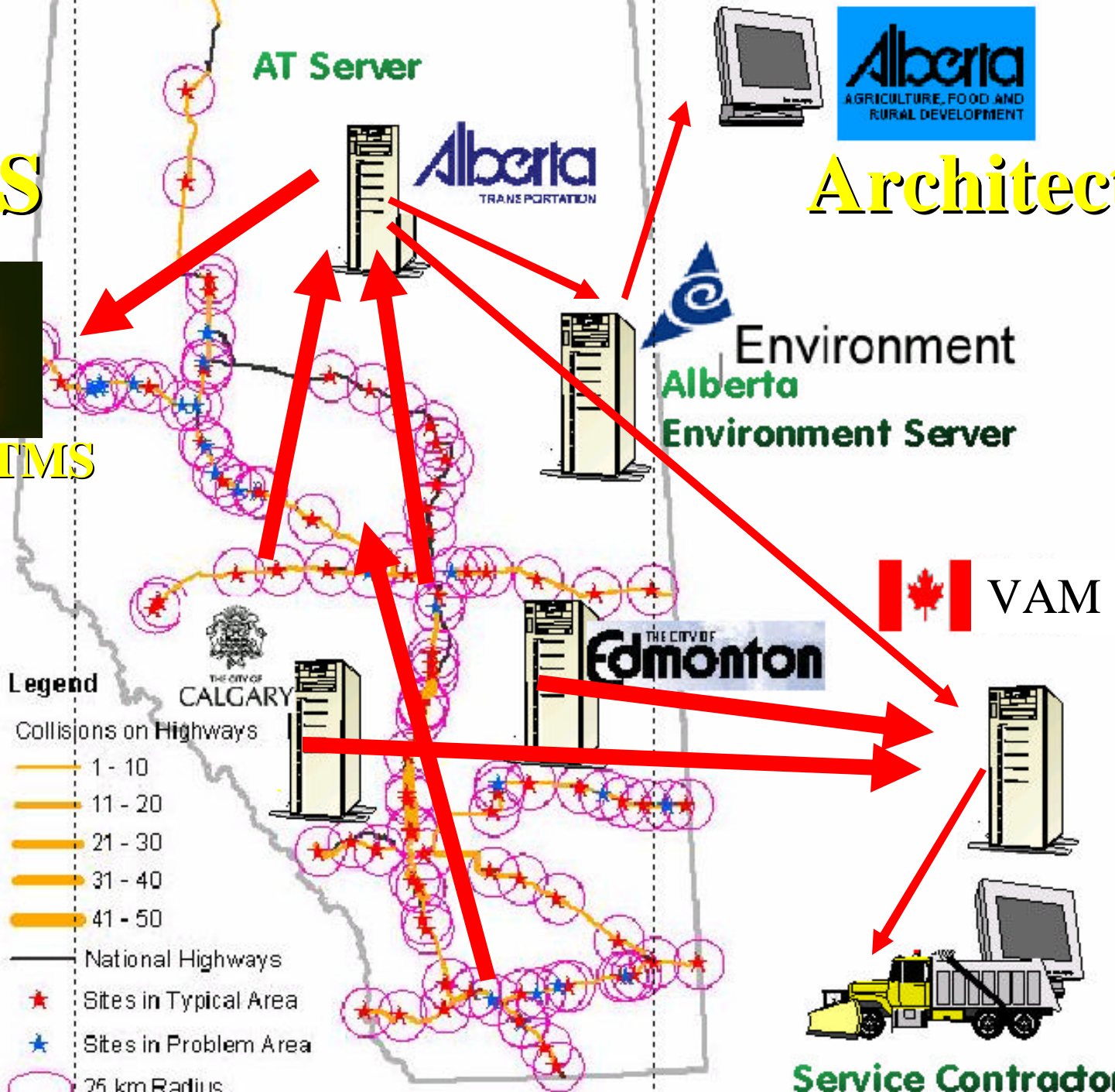


**RWIS**

**FOG  
SLOW  
DOWN**

**ATIS ATMS**

**Architecture**



- Legend**
- Collisions on Highways
    - 1 - 10
    - 11 - 20
    - 21 - 30
    - 31 - 40
    - 41 - 50
  - National Highways
  - ★ Sites in Typical Area
  - ★ Sites in Problem Area
  - 25 km Radius

# Information Session

## ITS Blueprint-RWIS User Interface

The screenshot shows a Netscape 6 browser window displaying the 'Alberta Infrastructure Weather Display' website. The browser's address bar shows the URL: [http://merchant.mb.ec.gc.ca/multiuse/data/HTML/abinfrastructure/abinfrastructure\\_frames.html](http://merchant.mb.ec.gc.ca/multiuse/data/HTML/abinfrastructure/abinfrastructure_frames.html). The website content is as follows:

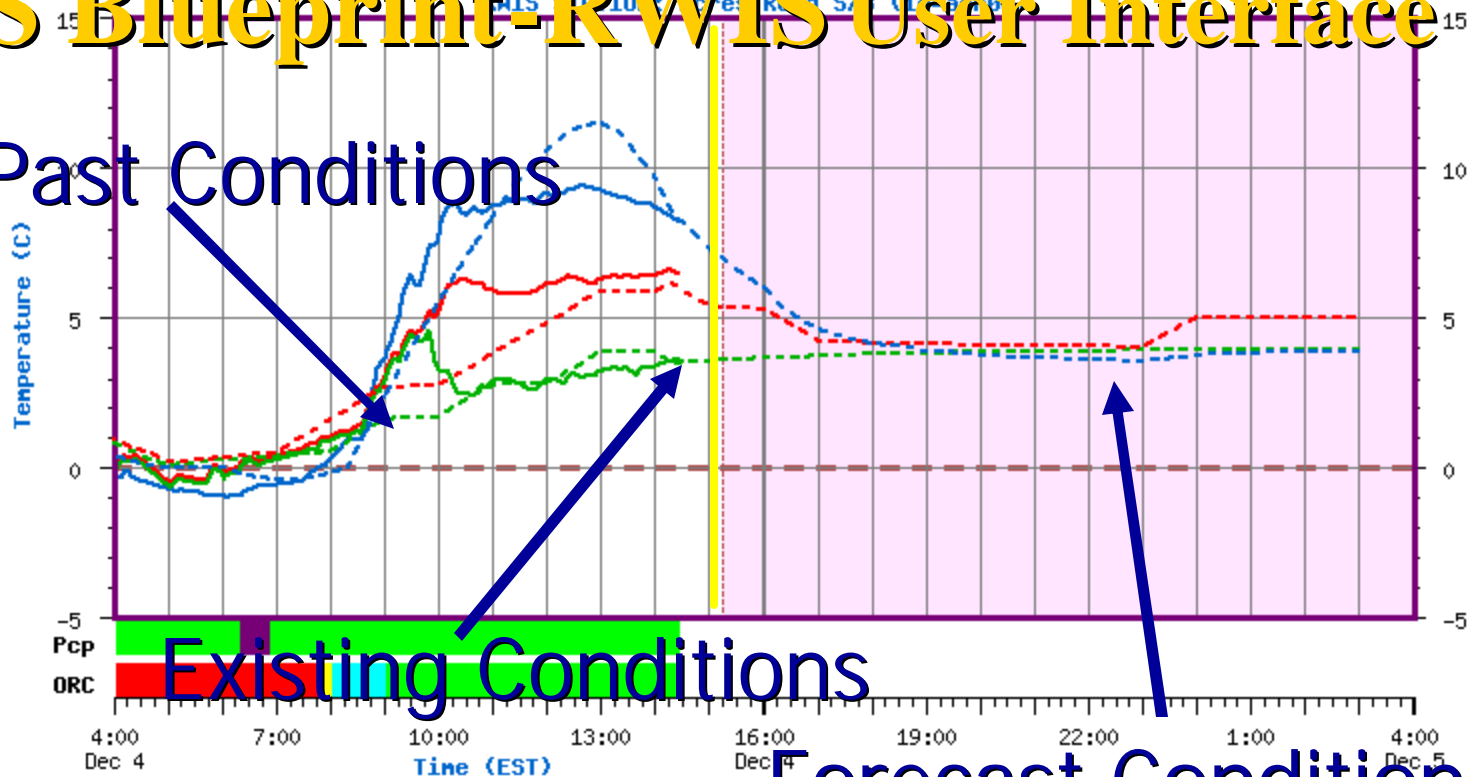
- Precipitation Maps**
  - [PCPN 6AM-6PM Today](#)
  - [PCPN 6PM-6AM Tonight](#)
  - [PCPN 6AM-6PM Tomorrow](#)
- Road Weather**
  - [Road Wx Conditions](#)
- Radar+Satellite**
  - [AB Composite Radar](#)
  - [Wm Canada Satellite](#)
- Weather Warnings**
  - [Srn AB Wx Warnings](#)
  - [Nrn+Cntrl AB Wx Warnings](#)
- Current-Past Weather**
  - [AB Current Conditions](#)
  - [Yesterday Hourly Temps](#)
  - [Station Locations](#)
- General Wx Fcsts**
  - [Srn AB Day 1+2 Wx Fcst](#)
  - [Nrn+Cntrl AB Day 1+2 Wx Fcst](#)
  - [Srn AB Extended Wx Fcst](#)
  - [Nrn+Cntrl AB Extended Wx Fcst](#)
- [MAIN Page](#)

The main content area features a large graphic with the text 'alberta infra structure' overlaid on images of a road, a building, and a dam. Below the graphic, the text reads: 'Phone Consultation 1 888 377-7770 (passcode required)'. At the bottom of the main area are the logos for 'Environment Canada' and 'Environnement Canada'. A link for '[E-mail questions or comments](#)' is located at the bottom left of the main content area.

# Information Session

## ITS Blueprint-RWIS User Interface

Past Conditions



Existing Conditions

Forecast Conditions

**Pcp: Precipitation**

None  
Yes

Rain  
Snow  
Mixed

**ORC: Observed Road Conditions**

Dry  
Damp  
Wet  
Wet Above Freezing  
Snow/Ice Watch  
Chemical Wet  
Slush

Snow/Ice Warning  
Frost  
Wet Below Freezing  
Black Ice Warning  
No data

2001/12/04 14:26

Sfc temp : 8.2 C

Air temp : 6.5 C

Dew temp : 3.6 C

Precip : None

Road cond: Dry

Forecast Temperature  
Obs Road Temperature  
Fcst Air Temperature  
Obs Air Temperature  
Fcst Dewpoint Temperature  
Obs Dewpoint Temperature

METRo Forecast Model

[Graph updated 20011204.15:17]



# Information Session

---

## ITS Blueprint-RWIS

### Implementation Process

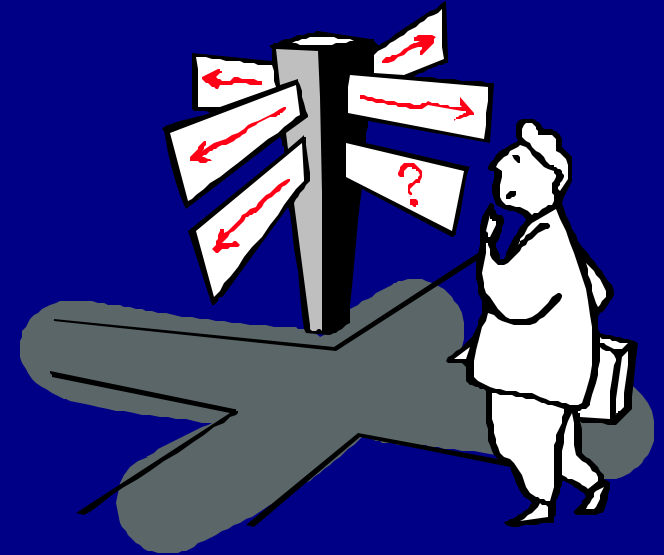
- Tender Process
- Detailed engineering designs / approvals
- Construction contract administration and review during construction
- Post construction services
- Post implementation services

# Summary

---

**Tim Schnarr**

**Delcan Corporation**

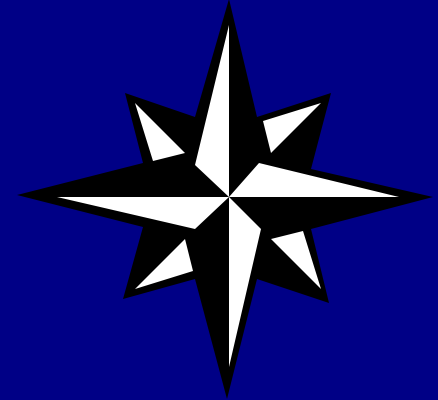




# ITS Blueprint

---

- Framework
  - ITS Actions / Deployments
  - Priority Sections
  - Staged Implementation
- Reference
  - Infrastructure Projects
  - Partnerships



# Challenges & Opportunities

---

- Institutional
- Inter-agency Coordination/Cooperation
- Partnerships

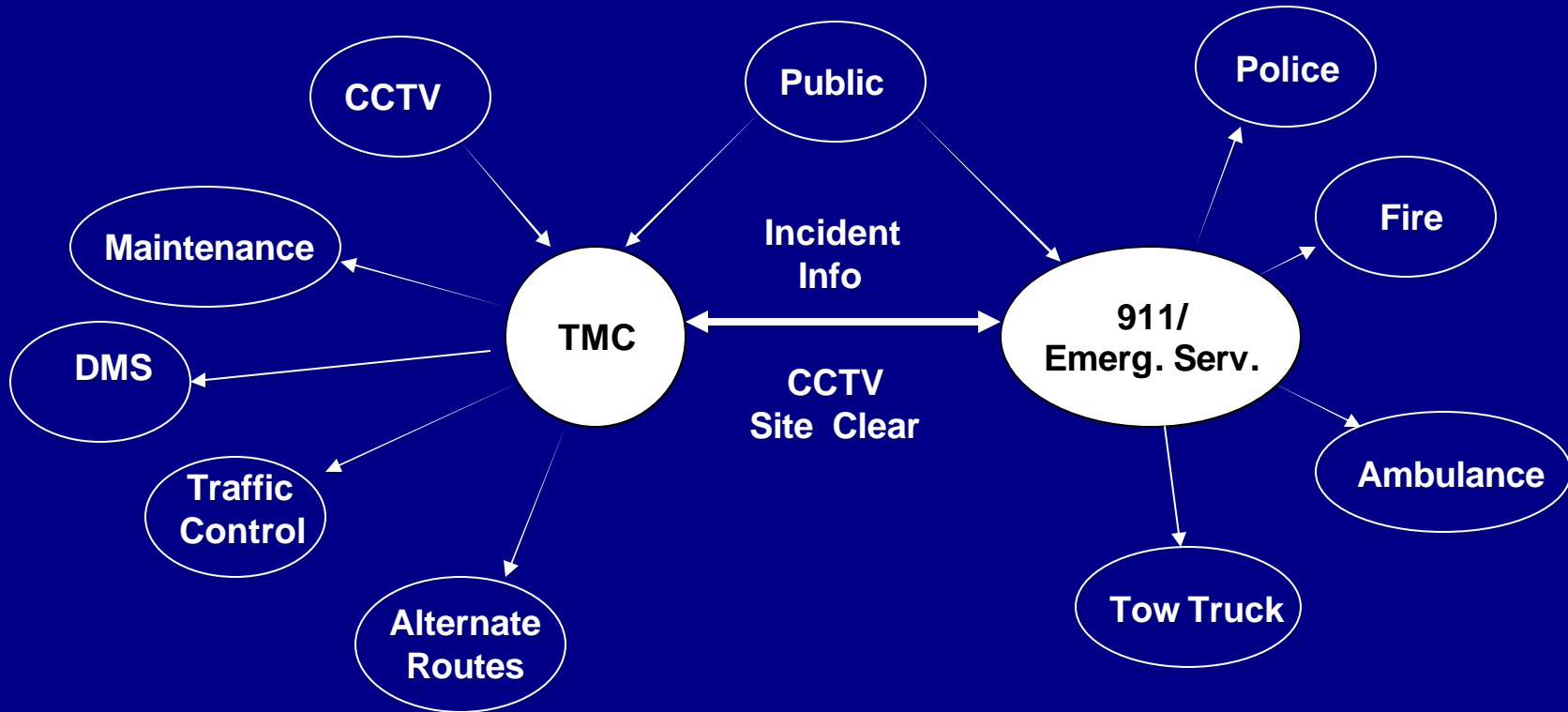


# Regional Traffic Management Centres

---

- 3 Regional TMC's
- Role
  - Incident Detection
  - Monitor Incident & Traffic Conditions
  - Traffic Management/Response
  - Traveller Information
- Partnership
  - 911/Emergency Management
  - Local Municipality

# Roles & Responsibilities



# RWIS Value-Added Meteorological Services (VAM)

---

- Data Retrieval
- Forecasting
- Web Hosted User Interface
- Environment Canada / Private Sector

# Where Are We Now ?

---

- Projects Underway
  - DMS
  - RWIS
- Projects Proposed
  - Road & Traffic Condition Database
  - Deerfoot Trail
    - CCTV, DMS, FAST, etc.
  - Red Deer
    - CCTV, Animal Warning
  - Anthony Henday Drive
    - CCTV



# Next Steps

- “ITS Champion” within Alberta Transportation
- Partnerships with Adjacent Municipalities
  - Regional TMC’s
  - Joint Funding & Implementation of Projects
- Partnerships with Others
  - Emergency Management
  - Maintenance Contractors
  - Traveller Information – AMA
- Rationalize Projects



# The End?

