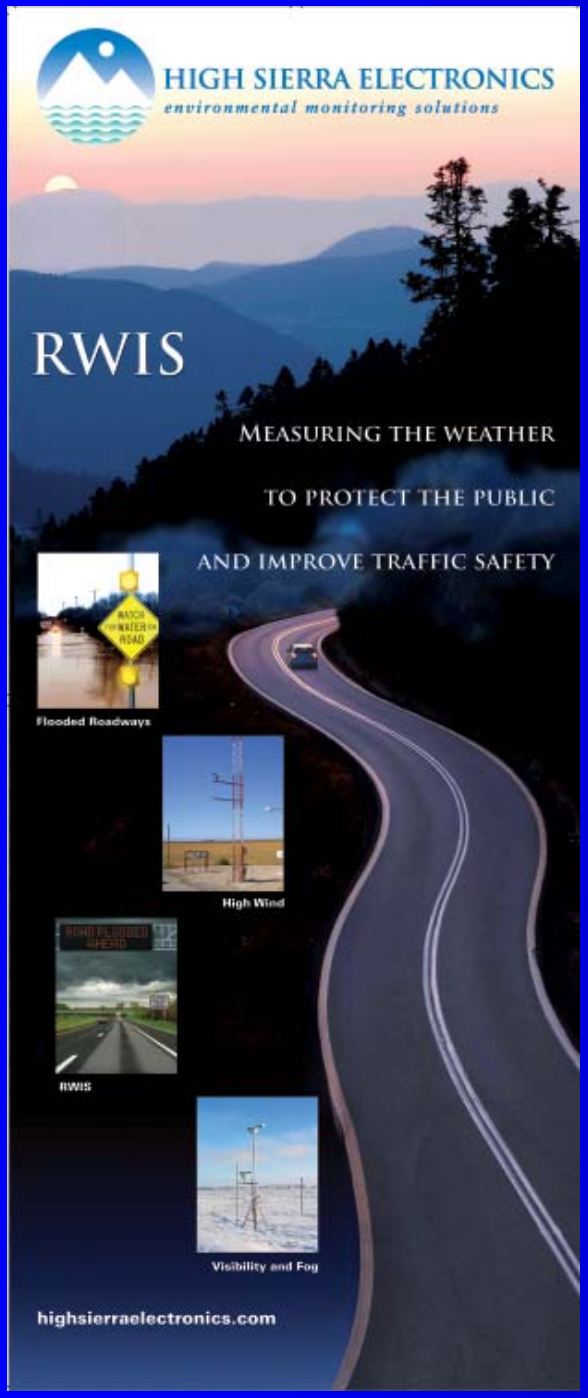


Frank Gutierrez

Southeast Region Sales Manager

Site Specific RWIS Implementation

www.highsierraelectronics.com

TxDOT Site

- SH 35 at Brazos River
  - Weather Station
- Ultrasonic Level Sensor

Advanced Flooded Roadway Warning System Benefits

- Immediate response to developing flood emergency
- Relieves manpower requirements during flood for other emergency response activities
- Emergency Management personnel are notified as actions are taken by the system
- Optional Video monitoring provides visual confirmation of conditions
- Audit trail of system data and controller actions

Regional RWIS Problem Solving

- Full Regional RWIS
  - NTCIP 1204 ESS compliant
  - Full RPU & suite of sensors
    - Road Surface Condition
      - Lufft IRS-31
      - Zydax ZAPSS
      - SSI Sensit
    - Precipitation Type & Rate (Lufft R2S)
    - Snow Depth (Judd)
    - Wind (RM Young)
    - Air Temp (Vaisala/Rotronics)
    - Relative Humidity (Vaisala/Rotronics)
    - Barometric Pressure (HSE)
    - Visibility (EnviroTech Sentry)
    - Traffic Sensor (Wavetronix/EIS)

- Dedicated tower on concrete pad
- Siting compromises can overlook site-specific local conditions
- New Right-of-Way space required
- Relatively large investment
- Construction costs can approach equipment cost

Regional vs. Local RWIS Problem Solving

- Full RWIS provides useful **regional** data.
- Full RWIS installations are expensive and often have information "gaps" between stations.
- Information about site-specific **local** road weather conditions is needed.
- Municipalities need to know conditions **locally** as well as regionally.
  - De-icing, plowing, road closure
- Many weather related traffic hazards are unique to a localized area.
  - Icy intersection
  - Bridge icing
  - High winds through a pass
  - Localized flooding at low water crossing
  - Low visibility at foggy stretch

Local RWIS Problem Solving

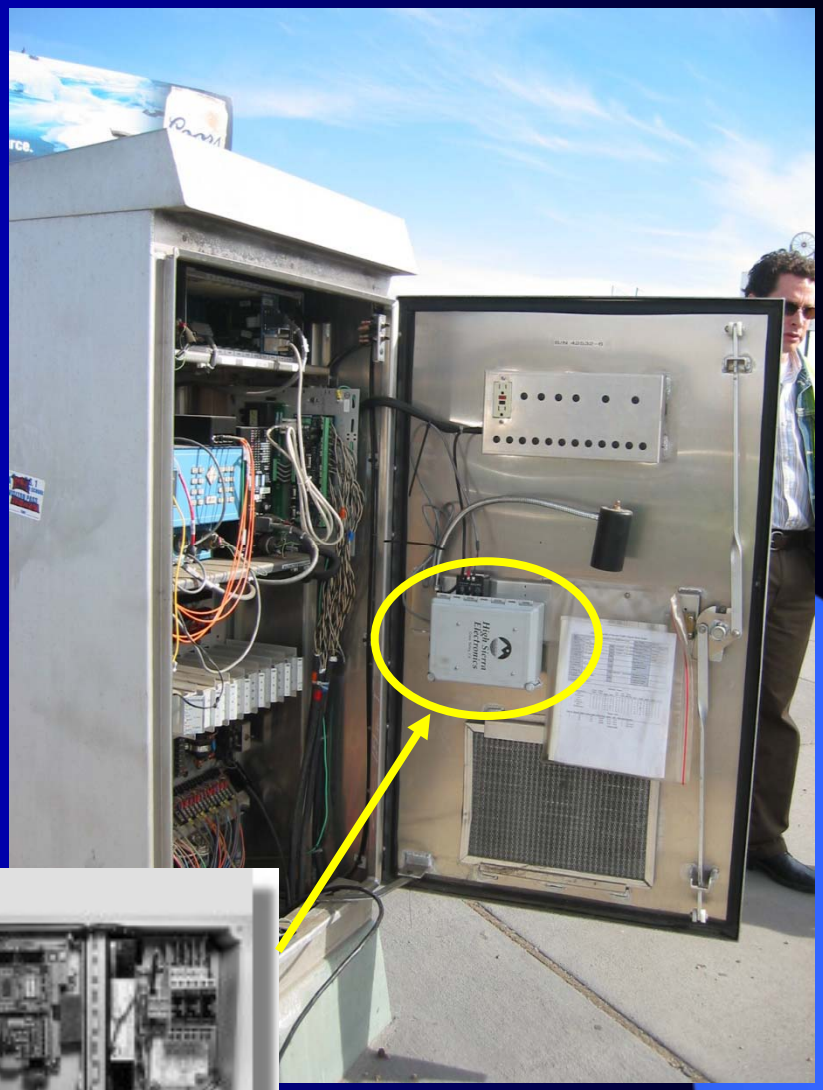
- The FHWA Road Weather Information System Environmental Sensor Station Siting Guidelines devote substantial attention to **Local** Siting Guidelines in support of monitoring local road weather conditions.
- Targeting specific local traffic hazards can improve traffic safety while contributing data to the regional RWIS network, filling in gaps.
- Many locations in municipalities already have ITS infrastructure in place that can house and connect compact RWIS systems to monitor local conditions.

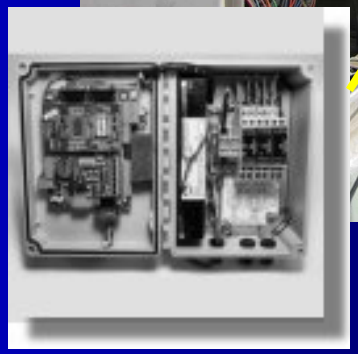
Innovating Outside the RWIS Box

Several RWIS are around Denver, CO, but conditions within the City were not monitored. Determining pavement conditions around this large city was a guessing game.

The problem was solved with Traffic Cabinet mounted Road Sensor Stations. Public Works now determines road surface conditions remotely.

- NTCIP Road Sensor Station
  - NTCIP 1204 ESS Compliant
  - Passive sensor
    - Pavement Surface Temperature
    - Deep Road Temperature
    - Surface Status derived by Remote Processing Unit (RPU)
      - dry, wet & ice
- EIA-232 connection to pre-existing camera system
- Low Cost, not expandable (5721-05 < $2,500)

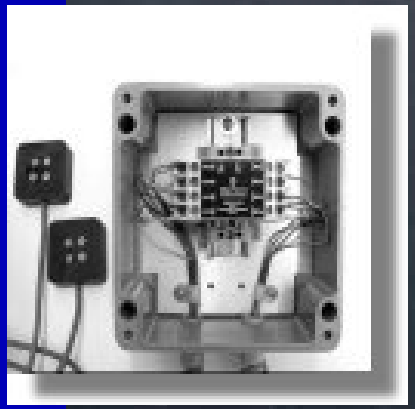




City & County of Denver, CO Public Works

Innovating Outside the RWIS Box

Similarly, adding pavement sensors to the City of Overland Park, KS large existing flood warning system has improved PW road treatment response and traffic safety.



- Model 5721 Road Sensor
  - Integrates with existing ALERT weather data collection systems
  - Passive sensor
    - Pavement Surface Temperature
    - Deep Road Temperature
    - Surface Status derived by Central Software
      - Dry, wet & ice
- Very low cost, simple sensor.
- Provided opportunity to collect pavement surface status data by tying into the existing flood warning system.

MiniRWIS - Overland Park, KS

Compact 1U MiniRWIS system resides in ATC 2070 cabinet.

Targeted RWIS implementation

- NTCIP 1204 ESS RWIS technology integrated into ATC/DMS Cabinet.
- Utilizes existing cabinet power supply & communications
  - Built in surge protection
- Allows local sign, beacon or DMS activation.
- Affordable, expandable technology conserves budget.
  - Model 5470 < $5K

Remote Surface Sensor

- Optical Road Surface Temperature & Surface Status
- Air Temperature
- Derives surface friction coefficient
- Wi-Fi access simplifies set-up and calibration functions (new features)
  - One-Click Automatic calibration function
  - Pavement Temperature calibration function
- Spring 2009 report for UDOT compares favorably to the Vaisala DSC 111
- Laser spot for aiming
- Affordable
  - 2020E < $10K

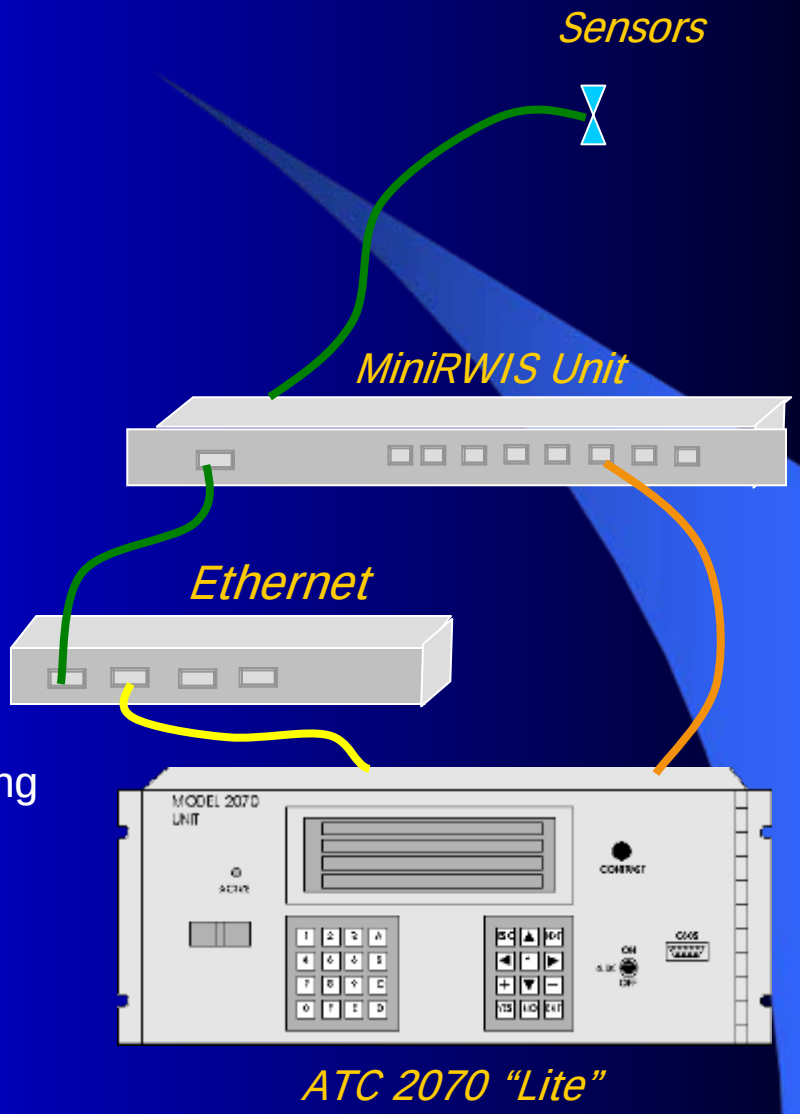
2020E


2020

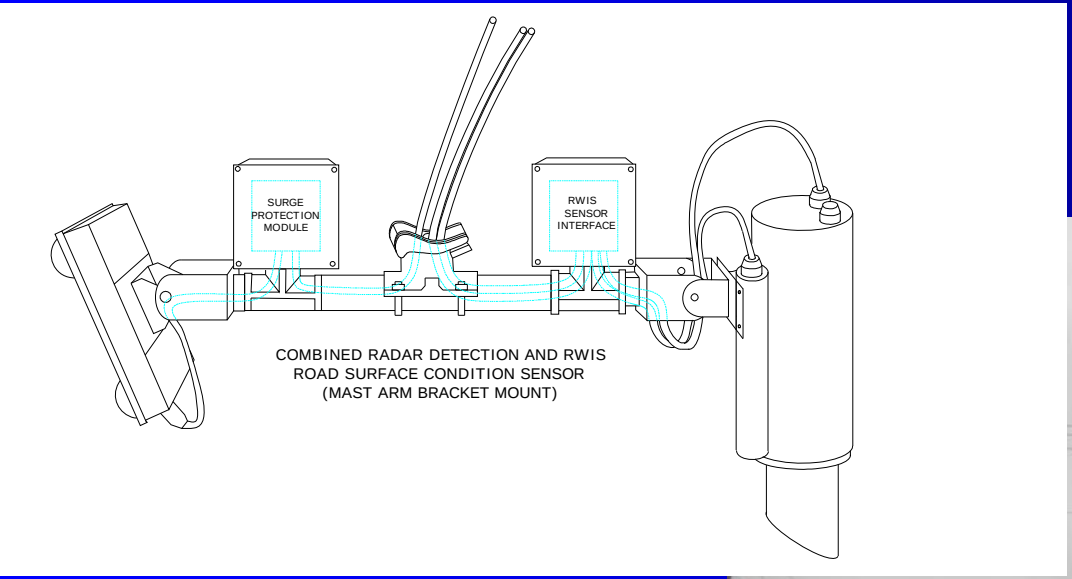
MiniRWIS Architecture

- "Actionable" Sensor Suite
  - Road Surface Condition
    - IceSight 2020 Series Remote Surface Condition Sensor
    - Lufft IRS-31
    - HSE 5721-01
    - Zydax ZAPSS
  - Wind (RM Young)
  - Visibility (EnviroTech Sentry)
  - 2 Flood Water Level Sensors
    - Pressure Transducer
    - Radar
    - Ultrasonic
    - Bubbler
  - Precipitation

- Each sensor drives dry contact output enabling local control of public safety devices
- Ethernet or EIA-232 connectivity
- 12V, 24V or AC power



Remote Surface Sensor Mounting



- Astro-Brac Mast Arm Mount
  - Combines RWIS Road Surface Condition Sensor and Wavetronix Radar Sensor
- EIA-485 connection to RPU in ATC 2070 Cabinet
- Wireless Router allows remote sensor calibration


MYERS

Deployment and Installation

- Entire installation took 3 hours, including aiming (laser dot) and calibration (via wireless router).
- Database connectivity accomplished in 2 hours.
- OP pleased with ease of installation and is installing these without HSE Field Service assistance.
- We were blessed with rain overnight and confirmed correct readings from the sensor the next day.
- Data from sensor appeared on www.stormwatch.org the next day.

Laser aiming dot is visible between lanes 2 & 3.

The City of Overland Park KANSAS

Flood Warning System

STORMWATER MANAGEMENT PROGRAM
JOHNSON COUNTY, KANSAS

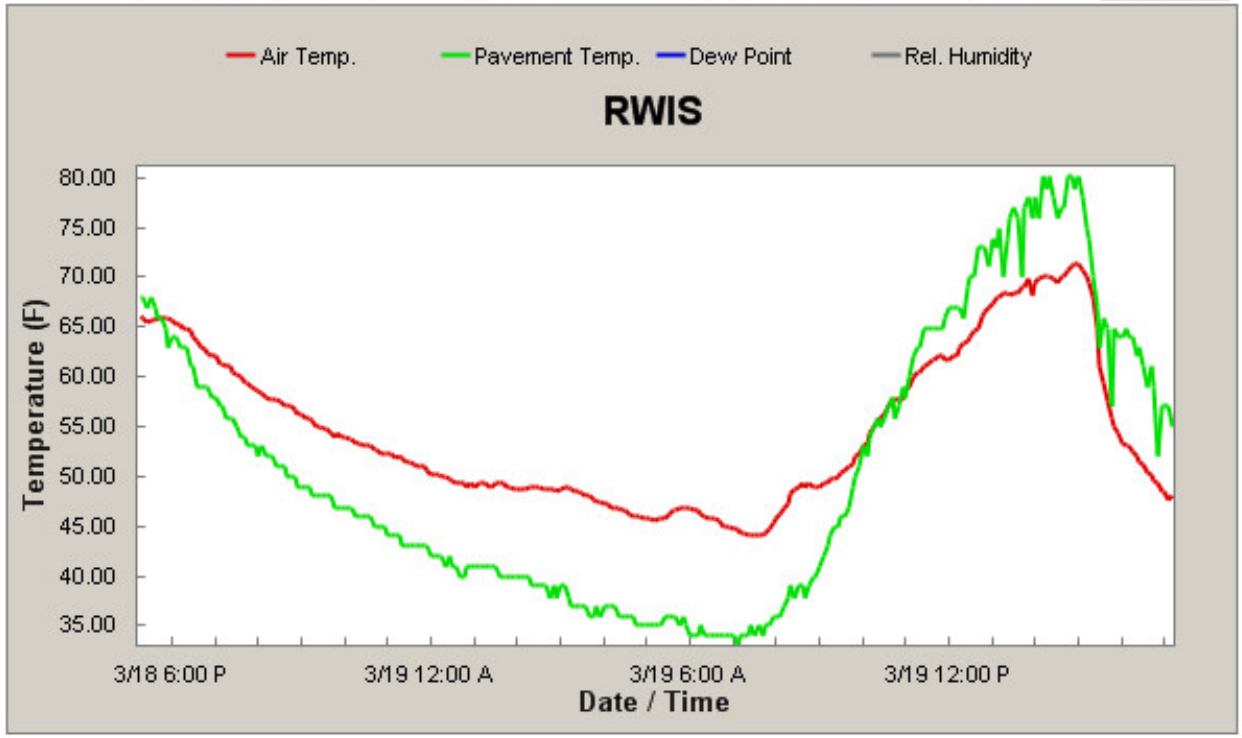
HOME
SITES
RAW DATA
RAIN
STREAMS
WEATHER
GRAPH
R.W.I.S.
LINKS

RWIS - Roadway Information System

Friday, March 19, 2010

Contact Us

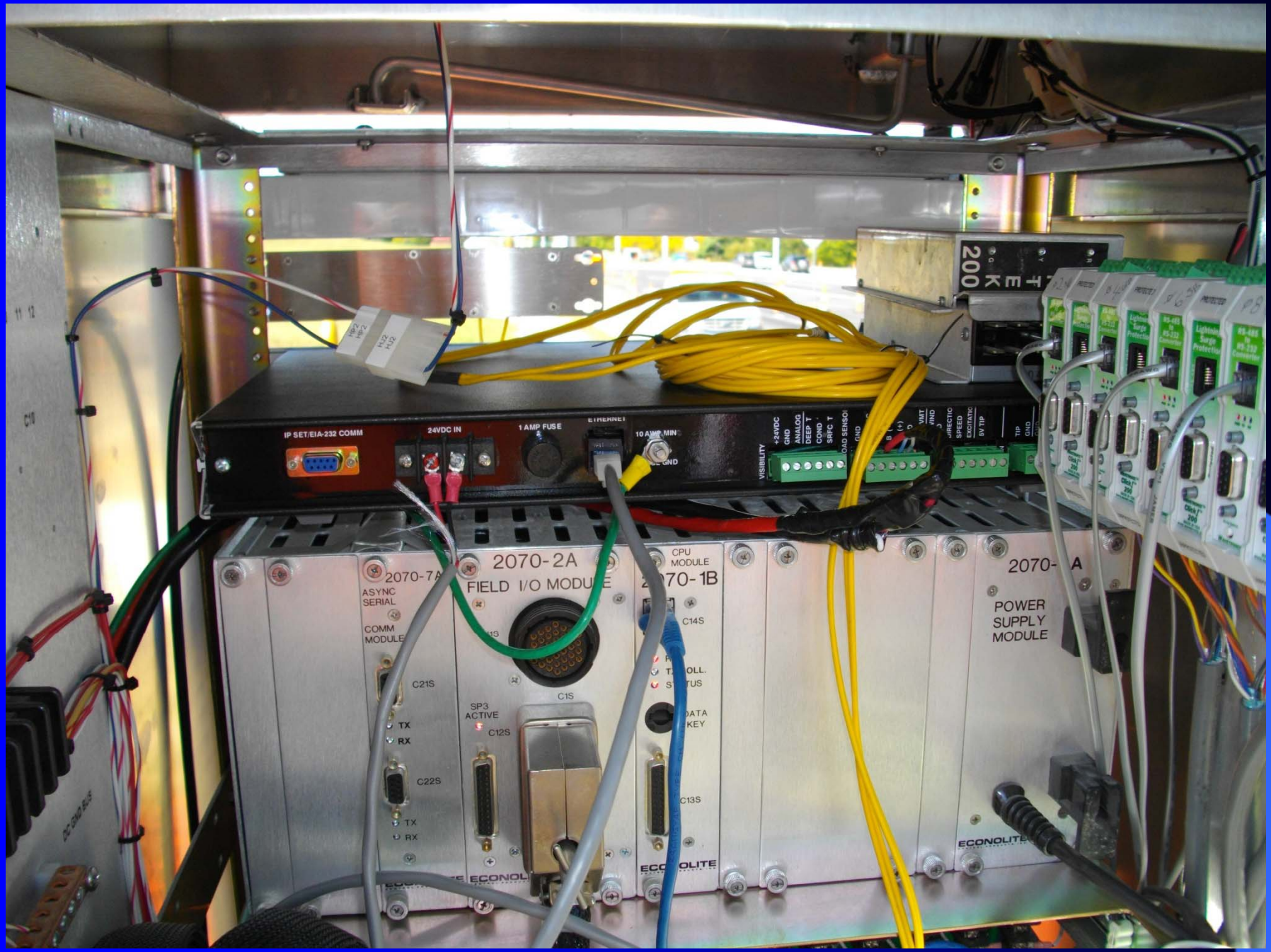
RWIS Site: College&Quivira IceSight Time Frame: Last 24 hours Update



Precipitation State	Road State		Alarm State
NO SENSOR FOUND	3/19/2010 5:10:00 PM	Dry	NO SENSOR FOUND

Website developed by **Peridian Group, Inc.**


High Sierra Electronics
ISOLATED ROAD WEATHER OUTPUTS
MODEL 2070
UNIT
2070
ATC
ACTIVE
CONTRAST
C50S
ECONOLITE
WAVETRONIX
WAVETRONIX


IP SET/EIA-232 COMM
24VDC IN
1 AMP FUSE
ETHERNET
10 AMP MIN
2070-2A
FIELD I/O MODULE
CPU MODULE
2070-1B
2070-7A
ASYNC SERIAL
COMM MODULE
POWER SUPPLY MODULE
C21S
C1S
C14S
C12S
C22S
C13S
SP3 ACTIVE
TX
RX
ECONOLITE


Altec

Communications & Data Dissemination

- Ethernet over Fiber
  - Ruggedcom RuggedSwitch (10 port Ethernet Switch)
    - Shared with 2070 controller, AutoScope cameras & Wavetronix SmartSensors

- NTCIP 1204 ESS RPU is polled by NTCIP compliant Central Software
  - DEC Data Systems DataWise NTCIP Environmental Data Acquisition Database Management and Control Software
    - Collects and stores sensor data
    - Monitor digital output status
    - Notifications sent to First Responders via text message, email or pager
    - Hydrological Forecasting and analysis tools
    - Import existing USGS Stream Gauge data automatically
    - Easily interfaces with other databases, such as GIS, MDSS, Oracle, etc.
    - Serves WebPages (Apache, IIS)
    - Extensive quality checking
    - Completely open data access. No hidden or “proprietary” information

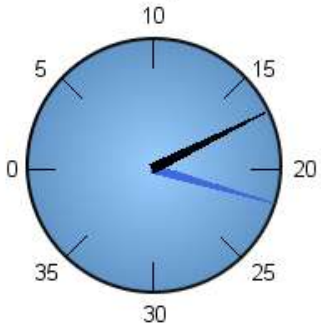
  - Intelligent Devices’ Intelligent Control software
    - Integrates management of NTCIP field devices, including DMS/VMS signs, cameras, traffic sensors, weather stations, ramp meters, parking systems & incident management.

Site Specific RWIS Implementation

TxDOT, South Padre Island, TX

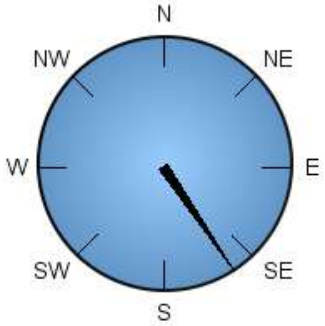
Updated: October 20, 2009 at 2:24 PM CDT

Wind Speed



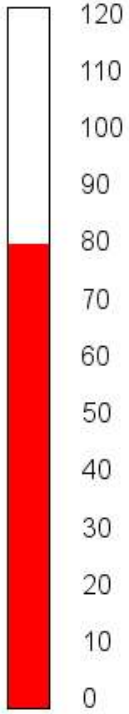
Wind Speed 17.1mph
Wind Gust 21.8mph

Wind Direction



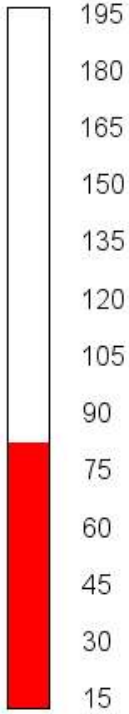
Southeast

Air Temp



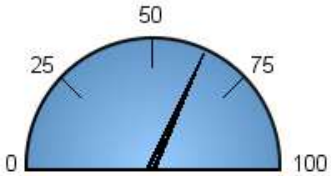
79.6°F

Road Temp



83.4°F

Humidity

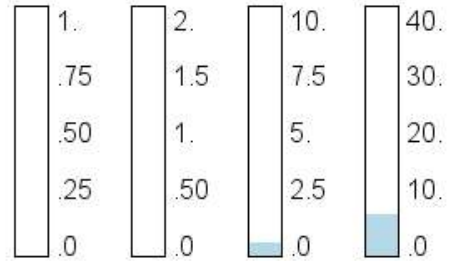


63.8%

Road Surface

DRY

Rainfall

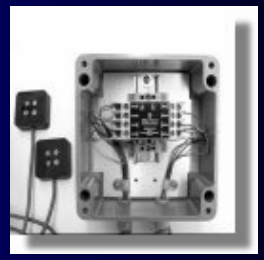


0.00in | 0.00in | 0.55in | 6.73in

Tabular Data

In Pavement Road Sensors

- High Sierra Electronics 5721-01 Road Sensor



- Lufft IRS-31 Intelligent Road Sensor

- Zydax ZAPSS Active Passive Surface Sensor

Flooded Roadway Traffic Hazard

- Flood Sensor (Pressure Transducer)
  - 2 Sensor Inputs
  - 2 Thresholds for each sensor
    - Deep Water (Yellow beacon)
    - Very Deep Water (Red beacon)
- Actions
  - 2 outputs for each sensor
  - Central Software notifies first responders of flood conditions

High Wind Traffic Hazard

- Wind Sensor
  - Wind Speed
  - Wind Direction

- Actions
  - Active when spot wind speed exceeds value
  - Deactivated when 10 minute wind gust below value
  - Central Software notifies first responders of high wind conditions

Low Visibility Traffic Hazard

- Visibility Sensor
  - Forward Scatter Visibility Sensor
  - 10m to 16Km range
  - AC Power (DC optional)
  - Optional hood heater
- Actions
  - Low Visibility output
  - Central Software notifies first responders of poor visibility conditions

Precipitation

- Rain Sensor
  - 8” Rain Gauge (small size) with pole mount
  - 12” Rain Gauge
- Actions
  - Cumulative rainfall reports via Central Software augment existing National Weather Service or Agency data

Sensor Selection

- Remote Surface Sensor
  - Non-Intrusive
    - No pavement cuts
    - No risk of damage from plows, traffic, resurfacing or stripping
  - Optically determines:
    - Surface temperature Road surface status
    - Surface Friction coefficient
    - Air Temperature
- Actions
  - Wet Road output
  - Snow/Icy Road output
  - Central Software notifies first responders of wet or icy conditions

City of Overland Park, KS

- These two previous innovations led to discussions with OP about the usefulness of an RWIS designed specifically for deployment in traffic cabinets. OP already had installed other RWIS systems, but was discouraged by high cost, susceptibility to damage and poor reliability.

- Existing large ALERT Flood Warning system
- Several road sensors and RWIS stations around the City
- Communications a mix of RF and Ethernet (over fiber)
- Ongoing infrastructure improvement and road widening projects

IceSight Performance

3/30 Parleys														
Puck		IceSight							Vaisala					
Condition	# Detects	Dry	Damp	Wet	Ice	Snow	Unknown	Agree %	Dry	Damp	Wet	Ice	Snow/Slush	Unknown	Agree %
Dry	1008	1003	5	0	0	0	0	99.4%	747	91	127	14	29	0	74.0%
Damp	13	3	10	0	0	0	0	76.9%	13	0	0	0	0	0	0.0%
Wet	2	0	2	0	0	0	0	0.0%	2	0	0	0	0	0	0.0%
Ice	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
Snow	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
Slush	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
Res Salt	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
Freez Wet	39	8	24	0	3	0	4	69.2%	37	1	1	0	0	0	5.1%
Unknown	331	64	202	0	28	0	37	NA	220	26	63	2	20	0	NA