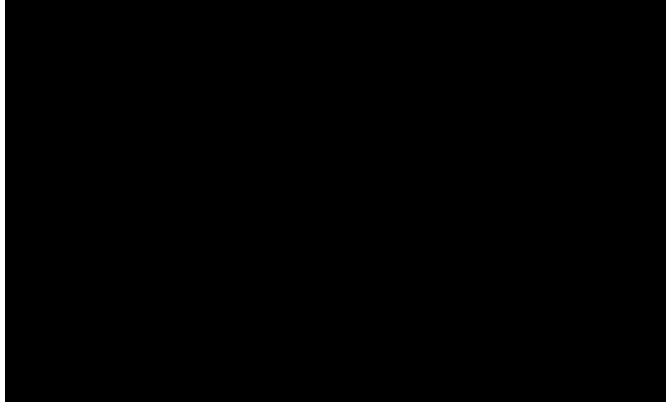
UDOT Weather Program
Traffic Operations Center

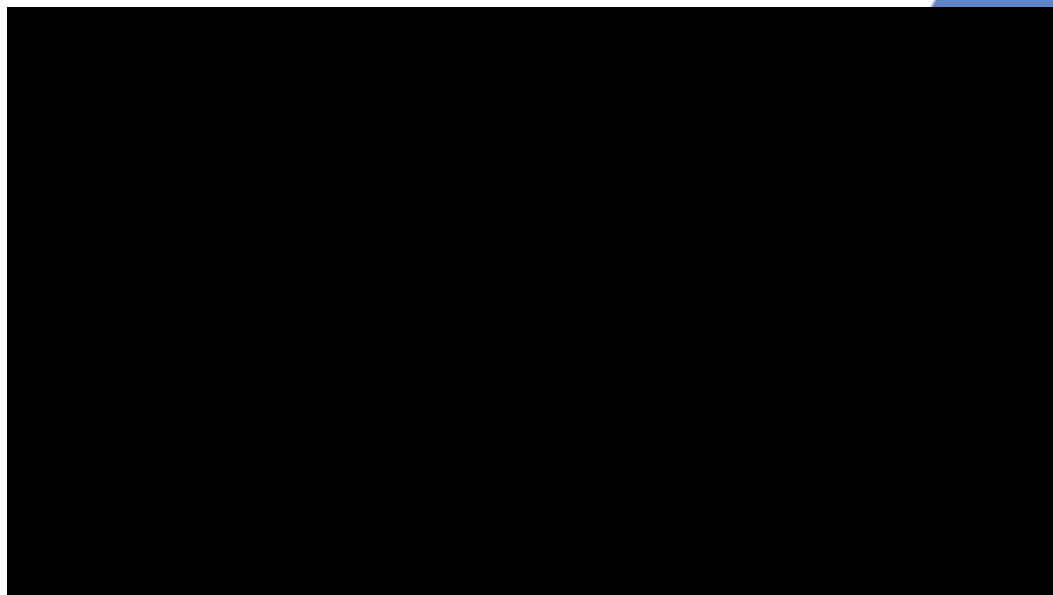
UDOT
Keeping Utah Moving

Welcome to Utah

State of Utah

- 3,216,857 (2019)
  - Highest population growth in the country (2010-2018)
  - 80% of population along Wasatch Front
- Varied Terrain
  - Highest: Kings Peak (13,527')
  - Lowest: Beaver Dam Wash (2,179')
- Five National Parks
  - 15.2 million visitors a year
  - Arches
  - Bryce Canyon
  - Canyonlands
  - Capital Reef
  - Zion (4th highest nationally)
- Ski Resorts
  - 5.13 million visits last winter
  - 151 ski lifts handling 163,000 skiers per hour





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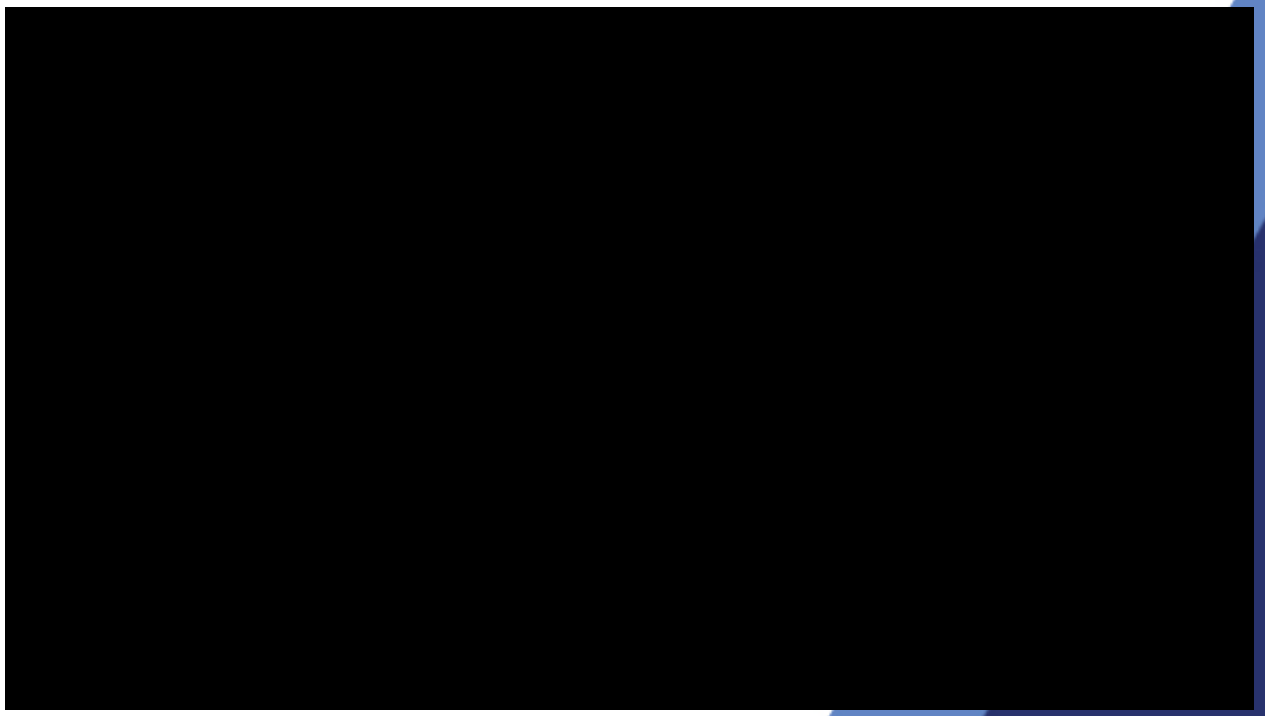
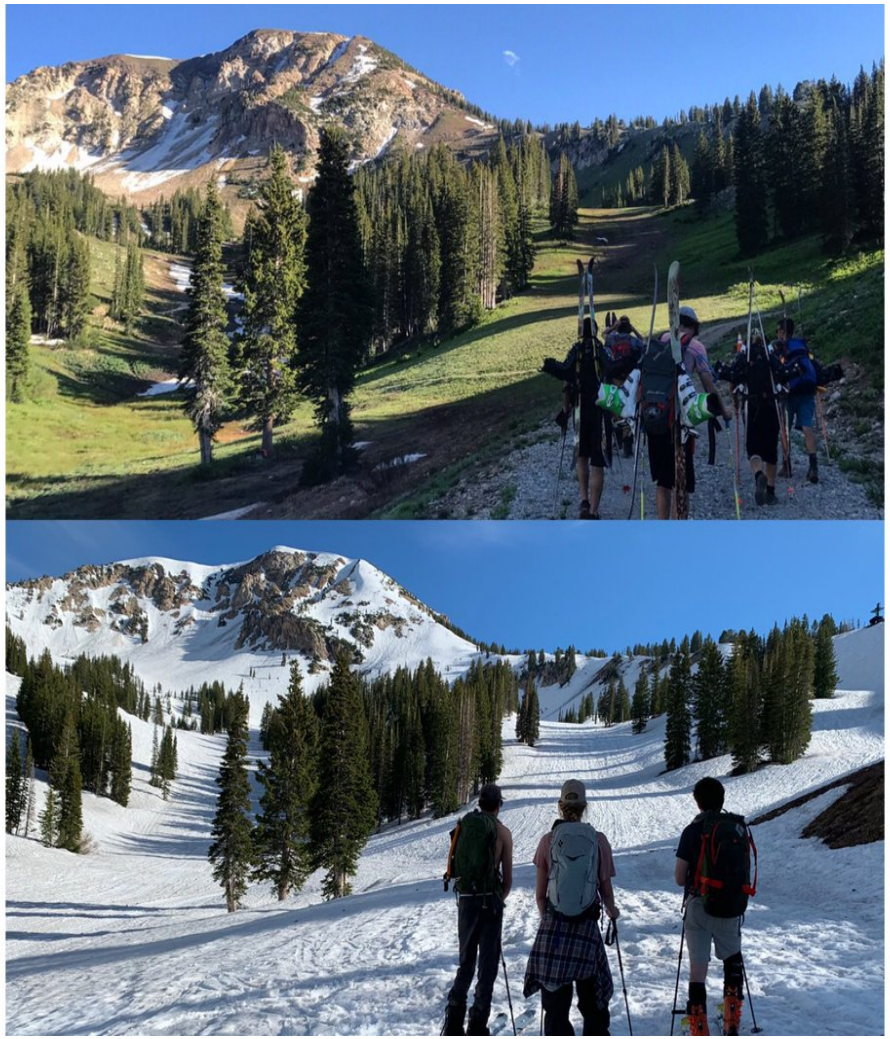
Utah Weather Challenges

State of Utah

- Varied Snowfall
  - Alta – 508” per year, record is 910” (1983)
  - Wasatch Front - 40-120” per year
  - St George – 3” per year, Wendover 5” per year
  - Shaded canyons
- Lake Effect Snowfall
  - Great Salt Lake never freezes
- Downslope wind events
  - 113 mph along I-15 @ Brigham City on 4/24/99
- Monsoon
  - Frequent flash flooding in southern Utah
- Wildfire burn scars
  - Can impact highways up to 5 years
  - Fire size does not determine impacts



Alta – Comparison of last two winters



June 20, 2018

June 19, 2019

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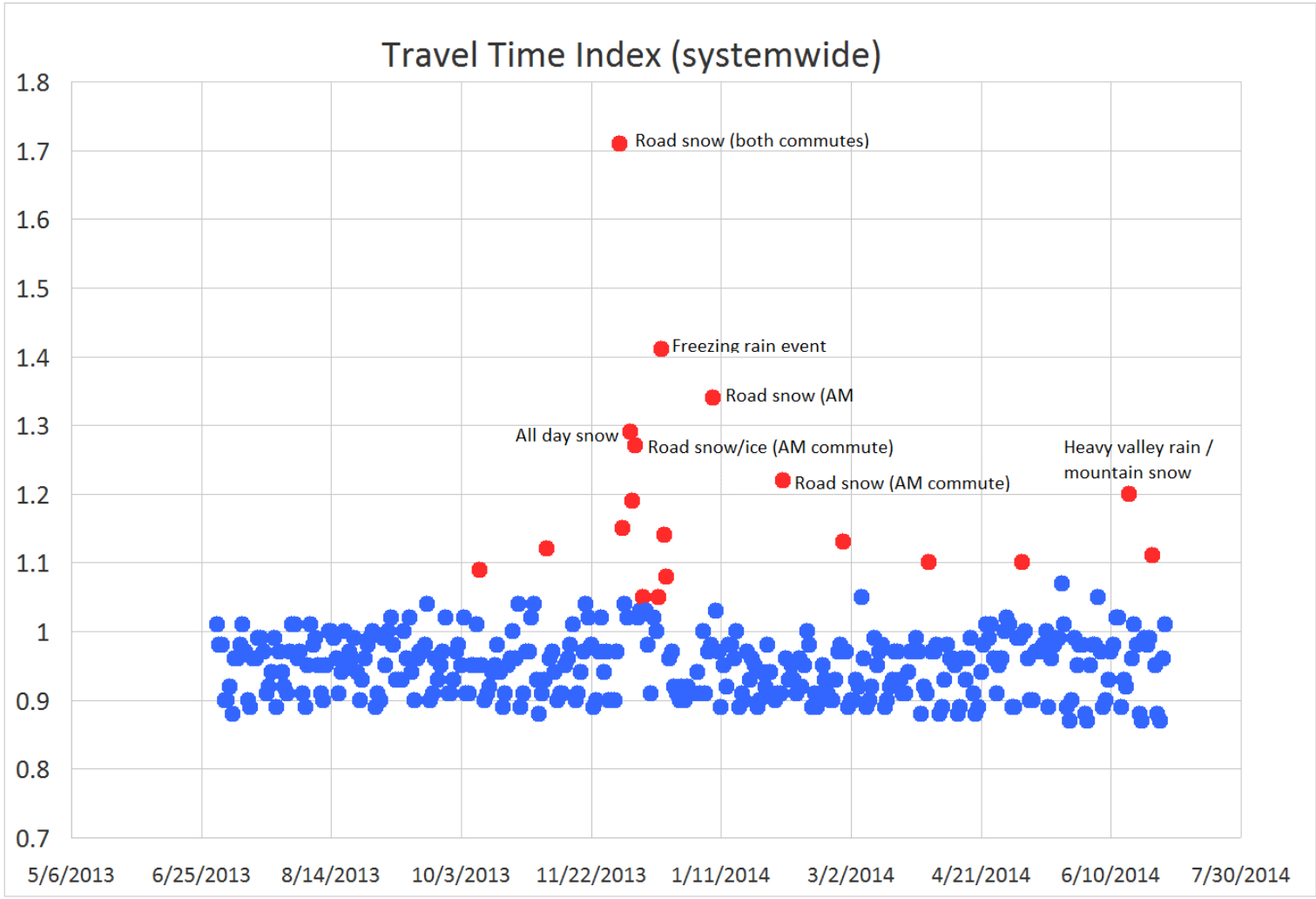
Weather and Travel Time Reliability



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Economic Impact of Road Weather Events

Economic impact in Utah for a 24 hour statewide winter storm

Total Economic Impact
$66.36 million

- **Wages & Salaries**
  - $42.81 Million
- **Retail Sales**
  - $18.26 million
- **Federal Taxes**
  - $3.32 million
- **State and Local Taxes**
  - $1.98 million

Source: American Highway Users Alliance performed by IHS Global Insight (2009)

States and provinces covered by the study include:
Illinois, $400 million lost per day
Indiana, $157 million lost per day
Iowa, $70 million lost per day
Kentucky, $96 million lost per day
Maryland, $184 million lost per day
Massachusetts, $265 million lost per day
Michigan, $251 million lost per day
Minnesota, $167 million lost per day
Missouri, $162 million lost per day
New Jersey, $289 million lost per day
New York, $700 million lost per day
Ohio, $300 million lost per day
Pennsylvania, $370 million lost
Utah, $66 million lost per day
Virginia, $260 million lost per day
Wisconsin, $149 million lost per day
Ontario, $474 million lost per day
Quebec, $250 million lost per day

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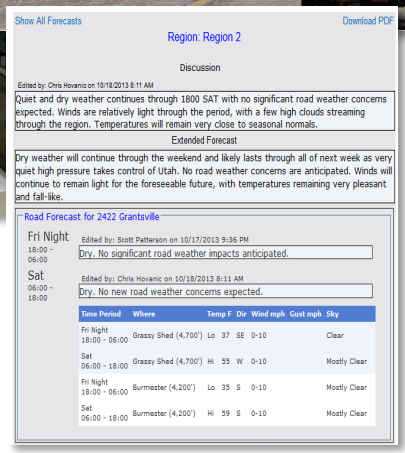
UDOT Weather Operational Design

- **Contract Transportation Meteorologists**
  - Allowed to do business with outside entities:
    - Forecast for runways for several major airports, and local municipalities
    - Keeps UDOT costs down; increases hours of coverage
- **24/7 Support**
- **Over 5,000 logged interactions/year**
- **Alerting service**
- **Operations Weather Briefings**
- **Yes/No deterministic approach (no probabilities)**
  - Update forecast as needed
  - Timing of road weather impacts to the nearest hour
  - Snow intensities in inches per hour
- **Forecast VMS messaging with timing to the hour**

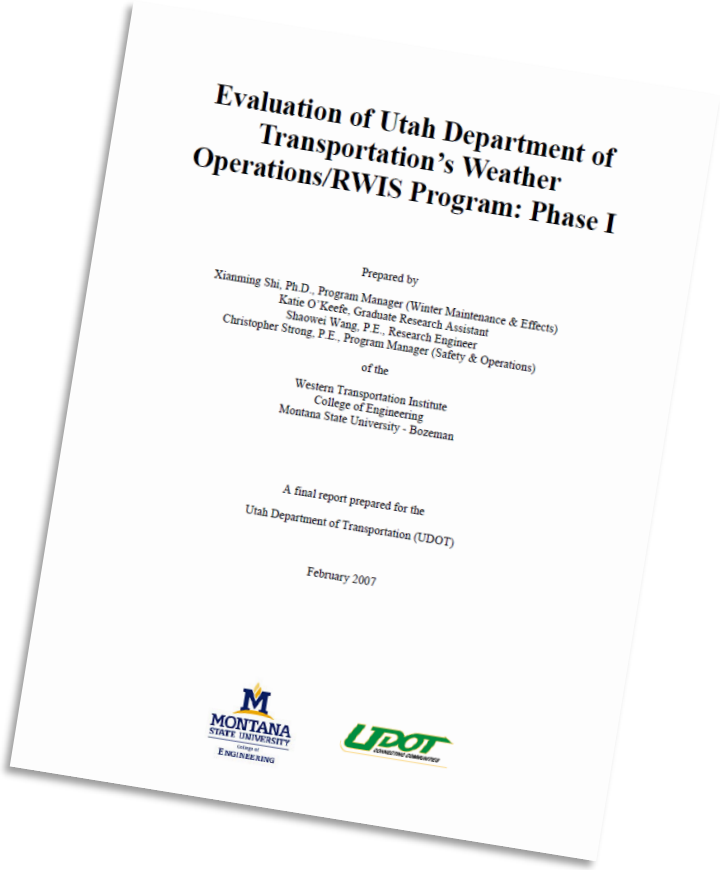


Transportation Meteorologists Benefit

UDOT Weather Operations Evaluation
Western Transportation Institute, 2007

Benefit-Cost Ratio
11:1
Based on winter maintenance cost savings
(only labor and materials considered)
($2.75 million)

UDOT Maintenance Personnel
80%
Changed maintenance approach
based on road weather forecasts


Evaluation of Utah Department of Transportation's Weather Operations/RWIS Program: Phase I

Prepared by

Xianming Shi, Ph.D., Program Manager (Winter Maintenance & Effects)
Katie O'Keefe, Graduate Research Assistant
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Christopher Strong, P.E., Program Manager (Safety & Operations)

of the

Western Transportation Institute
College of Engineering
Montana State University - Bozeman

A final report prepared for the
Utah Department of Transportation (UDOT)

February 2007

MONTANA STATE UNIVERSITY
ENGINEERING

UDOT

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Non-Maintenance Operational Benefits

- **Traffic Signals**
  - Snow timing plans
  - Wet snow covering traffic signals
  - Twisted heads

- **Specialized Alerts**
  - Wildfire alerts to suspend field work
  - Concrete buckling forecasts
  - Burn scar debris flows
  - Concrete buckle forecast

- **UDOT Communications**
  - Anticipate weather news stories
  - Push pre-storm messaging to traveling public

- **ATMS Electronics**
  - Prioritize maintenance
  - Variable Speed Limits

- **Department of Safety, Incident Management, UHP**
  - Determine staffing requirements due to weather

RWIS Network Statistics

- **123 total RWIS sites**
  - ***5*** trailers
  - ***4*** tripods
  - ***1,349*** tracked devices
    - ***4-18*** devices per site
  - Communication:
    - ***53%*** cellular
    - ***44%*** UDOT private fiber network
    - ***3%*** radio to fiber/other sites, DSL
  - Power:
    - ***59%*** solar powered / lithium ion batteries
    - ***41%*** AC powered

  - Backbone of real-time road weather messaging
  - Basis for the Snow and Ice Performance Measure

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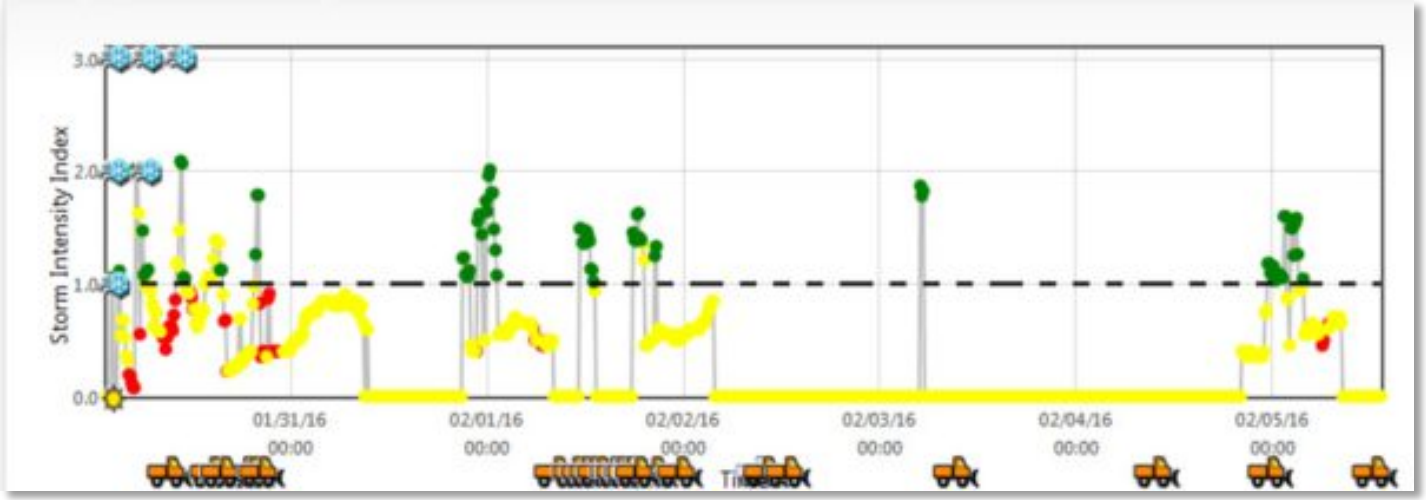
UDOT Snow and Ice Performance Measure

- Developed in-house by Jeff Williams and Cody Oppermann
- Performance measure by RWIS data
- Real-time storm intensity/road friction comparison
- Web GUIs:
  - State/Region Performance Dashboard
  - Storm Management Dashboard
  - Real-time graphs



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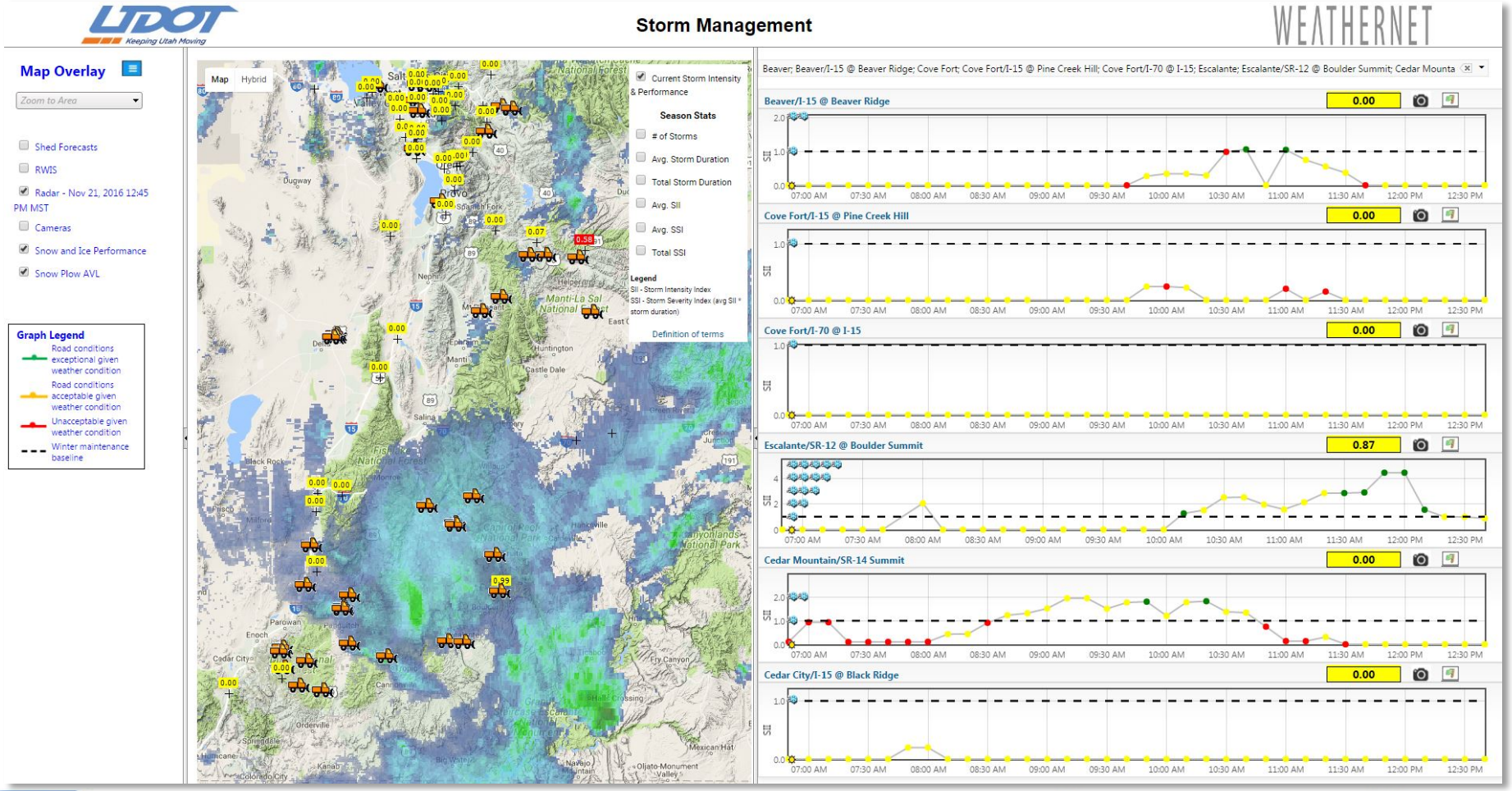
Storm Management Dashboard



Travel Weather Services

- Forecasting for post-mitigated road snow and associated travel impacts via a variety of public products
- Coordinate with the National Weather Service to create a unified message
  - Salt Lake City, UT
  - Grand Junction, CO
- Road weather alert
- Road condition forecasts
- Current road conditions
- Quality control citizen reporters
- UDOT social media (road weather)
- Pre-storm travel weather videos

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Weather Responsive Traffic Management (WRTM)

Pathfinder
- Pioneers
- Statewide – NWS Salt Lake / Grand Junction

Road Segment Warning System
- Provo Canyon (US-189)
- Fish Creek Bridge (I-70)
- Cottonwood Canyons (4 ski resorts)

Connect Vehicles / Spot Weather Warnings
- Panasonic

Truck Rollover Warning System (Winter 19/20)
- Taggart (I-84)
- Weber Canyon (I-84)

Variable Speed Limits
- Parleys Canyon (I-80)
- Baker Canyon (I-15 – coming soon)

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Pathfinder / Coordination with the NWS

- **Salt Lake City and Grand Junction NWS**

- **Unified message out to the public**
  - Modify commuter behavior that leads to improved mobility and safety

- **Collaboration**
  - Pre-storm messaging strategies
  - Specific areas to highlight
  - Observations

- **Communication Methods**
  - NWSChat
  - Daily phone briefings

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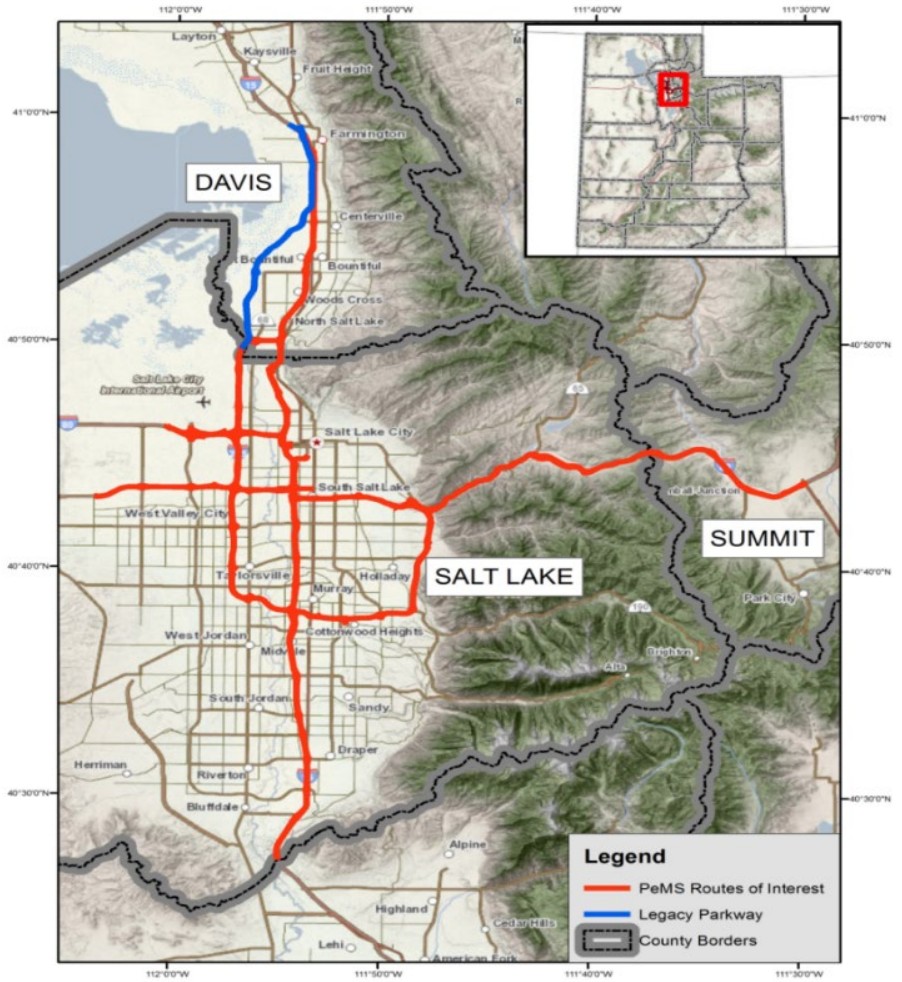
January 2013 Case Study

Study of Driver Awareness and Response to Winter Storms

Partnered by UDOT, NWS, and the University of Utah

- **Two events were surveyed**
  - Heavy snow, PM commute (January 10)
  - Freezing rain, AM commute (January 24)
- **400 surveys completed per event**
  - Awareness of weather forecast
  - Sources of weather and road information
  - Modification of travel plans



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Heavy Snow During PM Commute

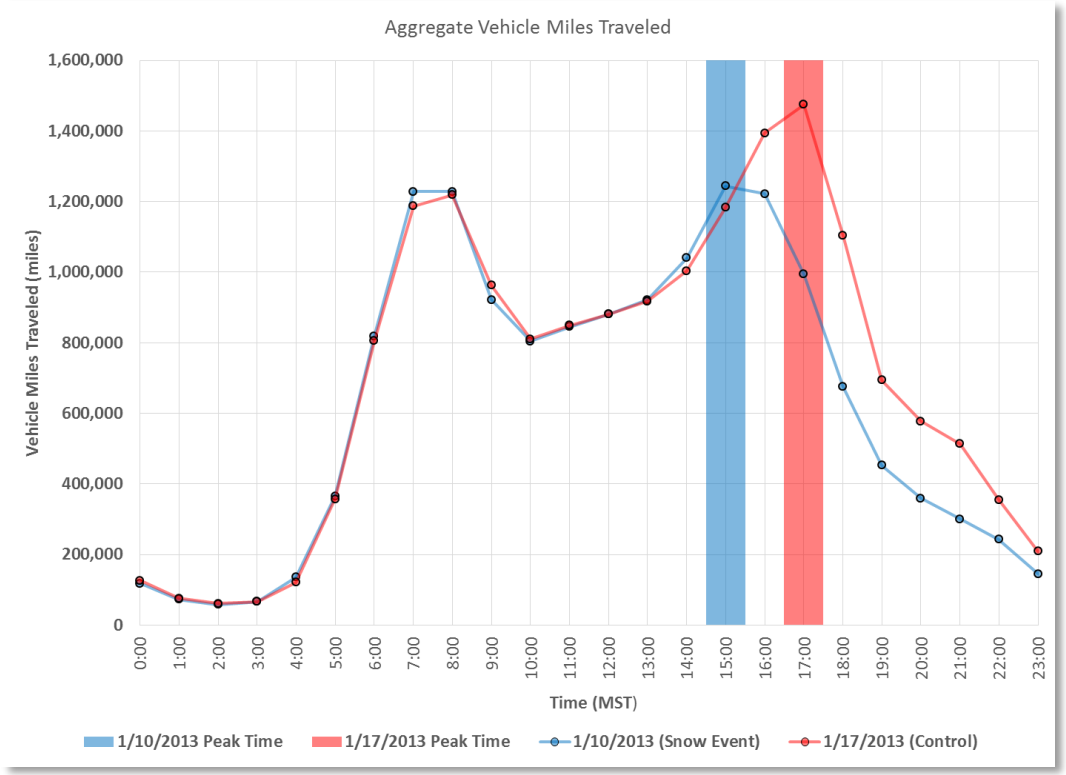
PM Commute Travel Data Comparison – Salt Lake County
Jan 10th, 2013 (Snow Event) vs Jan 17th, 2013 (Dry Conditions)

Weather Conditions On Snow Event Day

Noon:
49 F, dry and partly sunny

2 PM:
36 F, dry conditions

5 PM:
2” per hour snowfall rates



Blue - Snow Event **Red – Dry Conditions**

Key Observations:

- *Commute peak shifted by 2 hours*
- *43% less volume during typical peak*
- *Peak occurred before it began snowing!*

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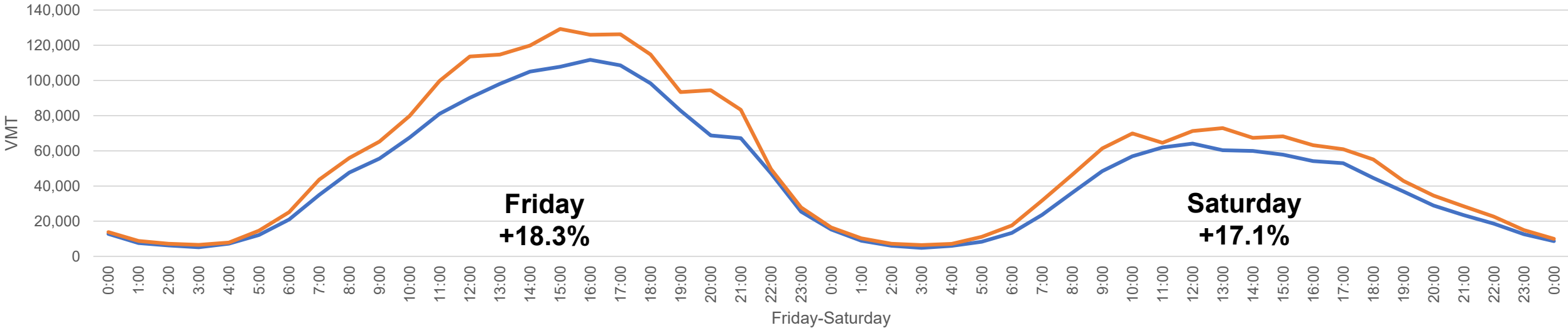
2018 President's Day Storm Pathfinder Results Pre-Storm

Friday, February 16, 2018

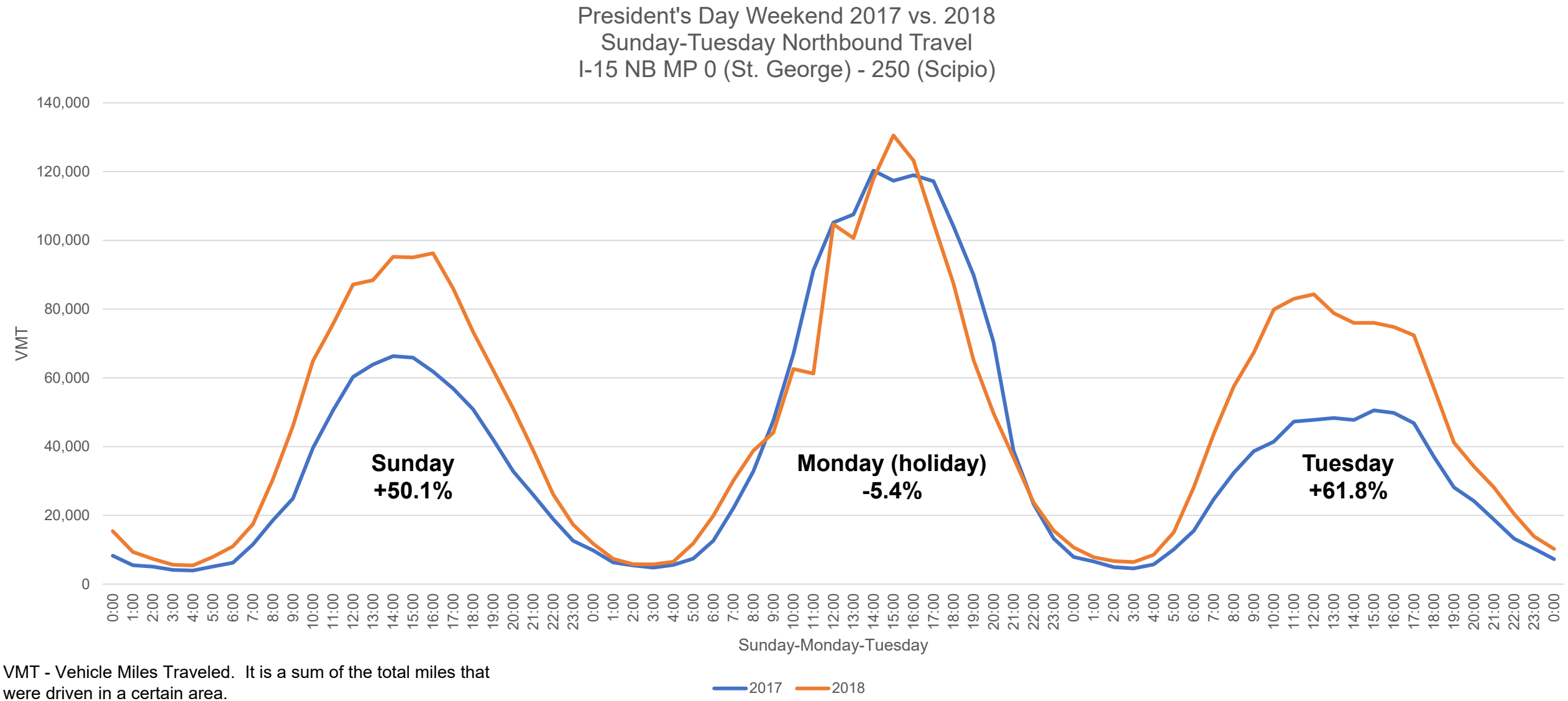
UDOT Keeping Utah Moving Weather Brief

President's Day Weekend 2017 vs. 2018
Friday and Saturday Southbound Travel
I-15 SB MP 250 (Scipio) - MP 0 (St. George)



VMT - Vehicle Miles Traveled. It is a sum of the total miles that were driven in a certain area.

2018 President's Day Storm Pathfinder Results Post-Storm



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Thank You!

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