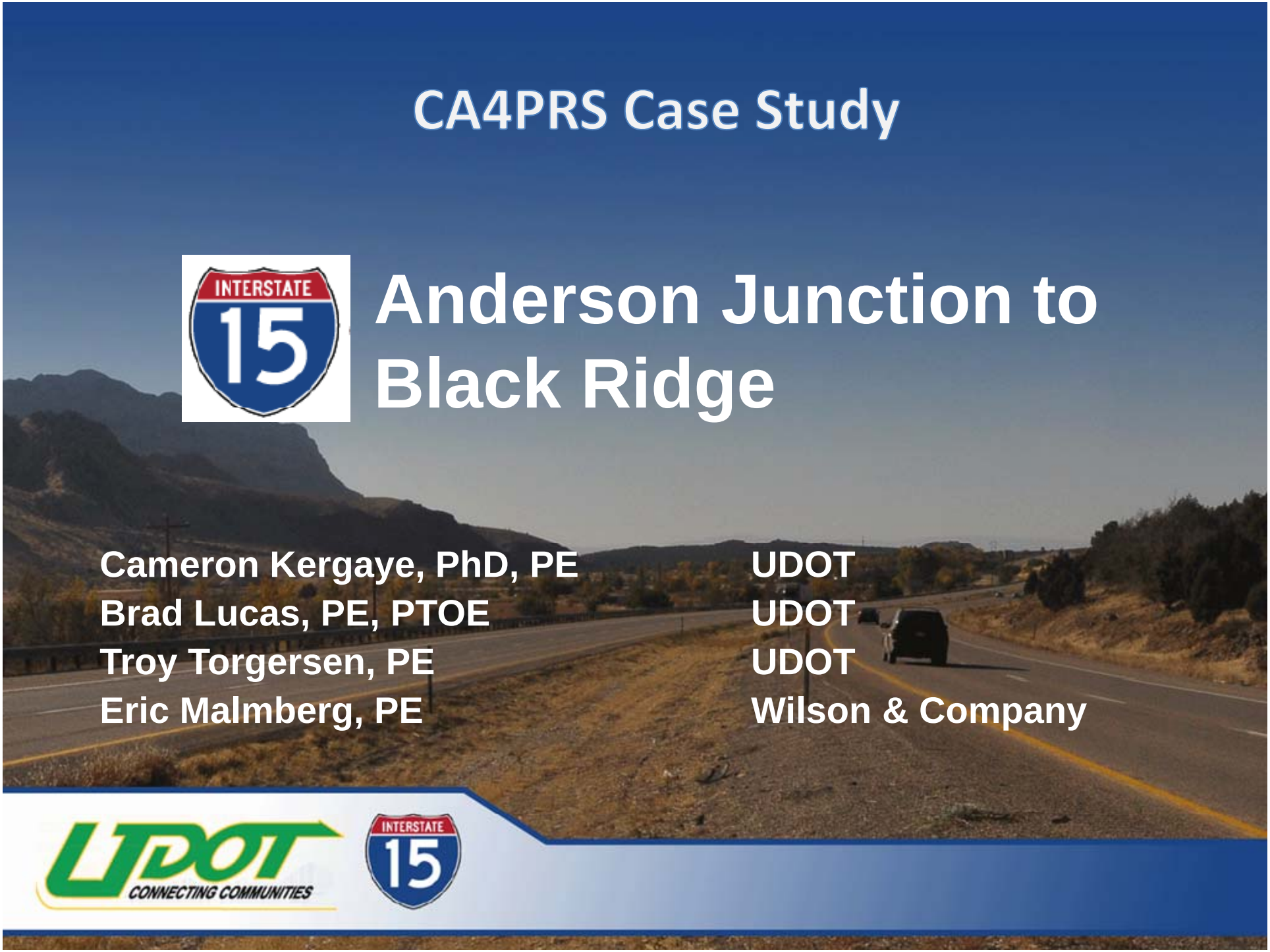


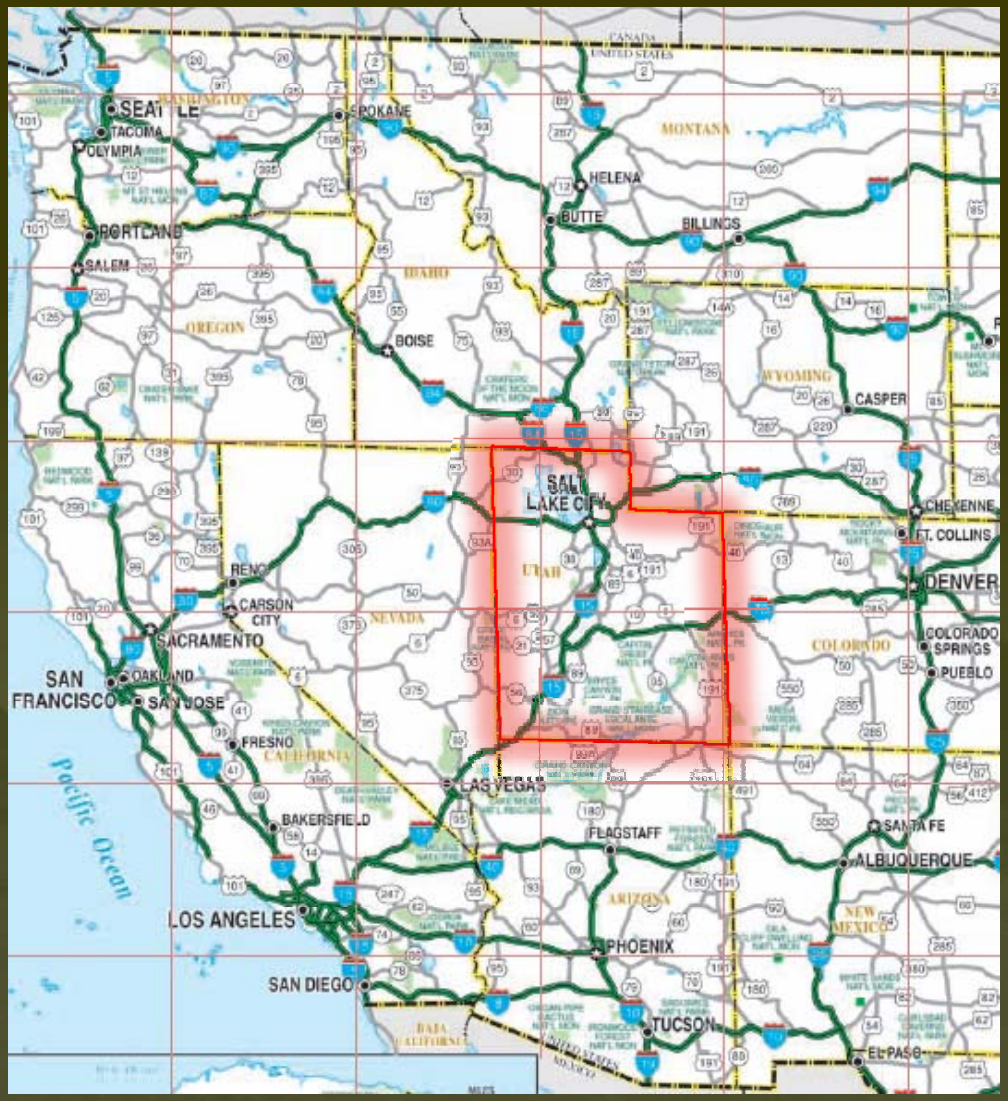
CA4PRS Case Study

Anderson Junction to Black Ridge

Cameron Kergaye, PhD, PE	UDOT
Brad Lucas, PE, PTOE	UDOT
Troy Torgersen, PE	UDOT
Eric Malmberg, PE	Wilson & Company

Project Location

- Southwest Utah
- 21 miles N of St. George, UT
- 141 miles NE of Las Vegas, NV
- Between Milepost 27 & 34



UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Project Location

- Southwest Utah
- 21 miles N of St. George, UT
- 141 miles NE of Las Vegas, NV
- Between Milepost 27 & 34

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Project Location

- Primary Freight Corridor
- 2500+ Trucks per day
- 21% to 33% Truck Traffic

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Project Location

- Primary Freight Corridor
- 2500+ Trucks per day
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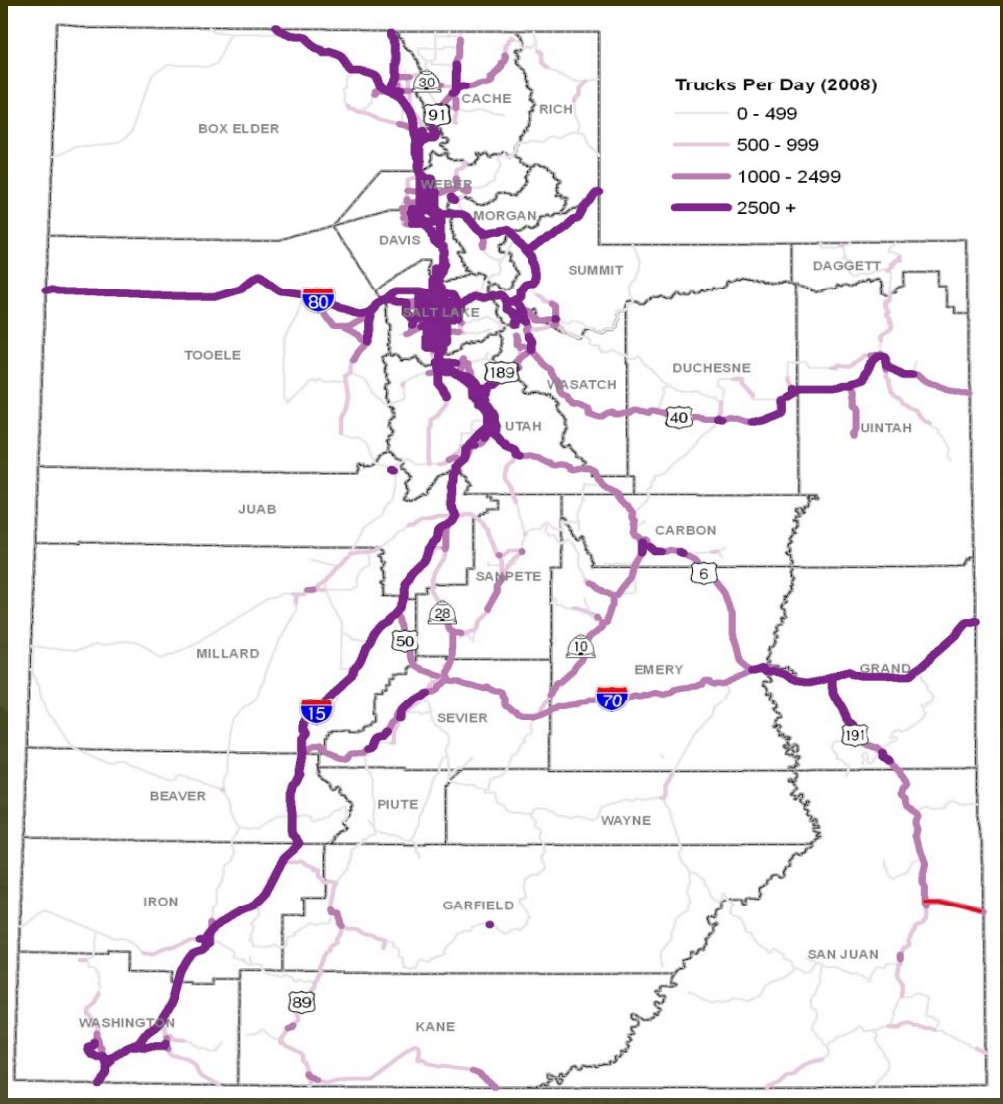
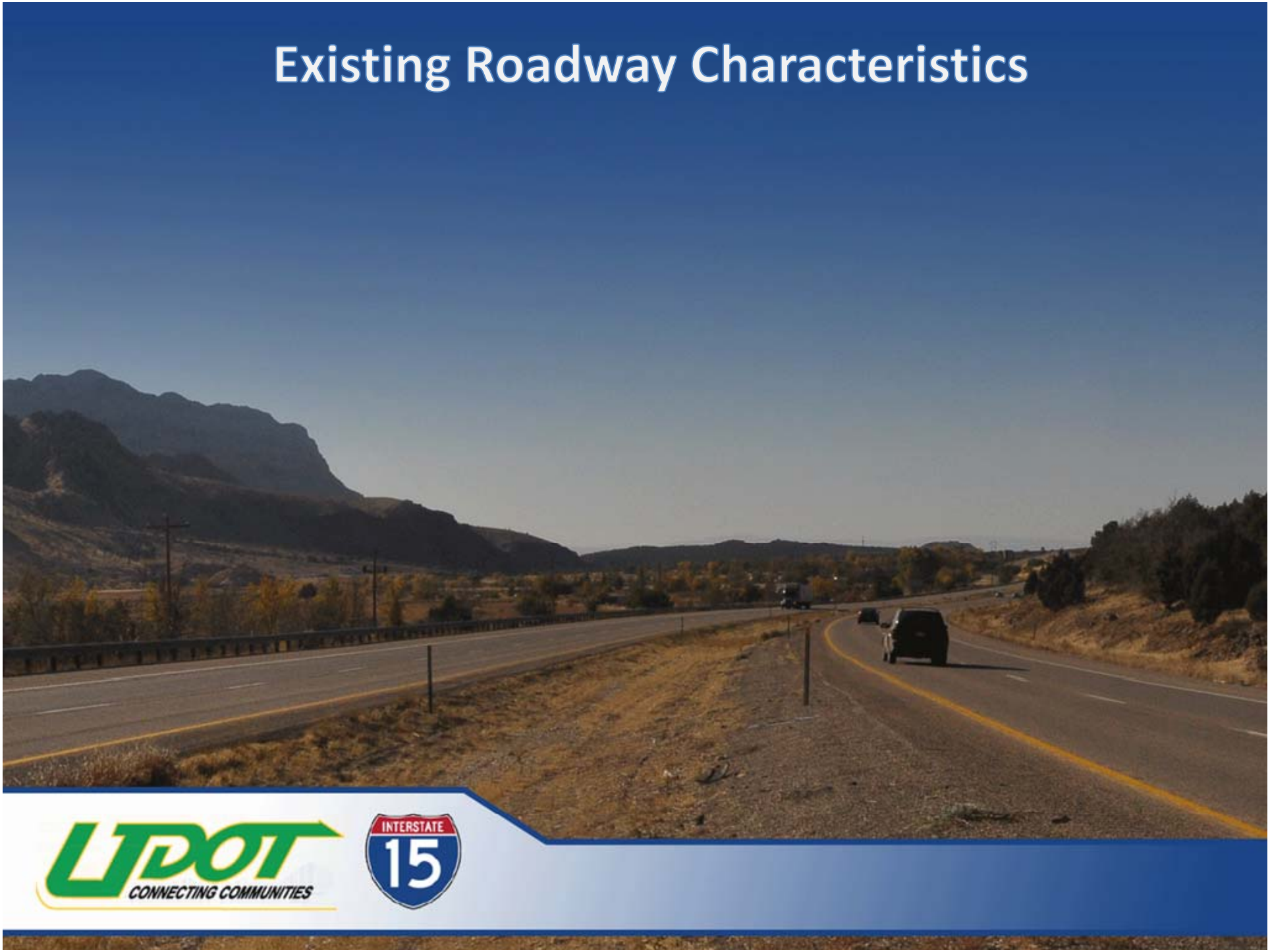


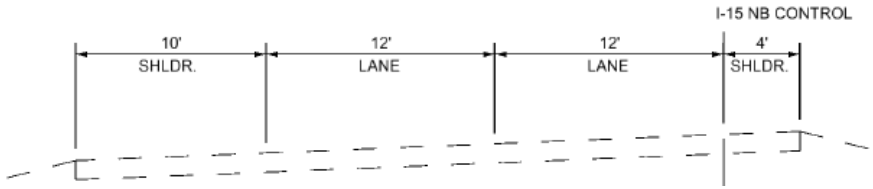
CONNECTING COMMUNITIES

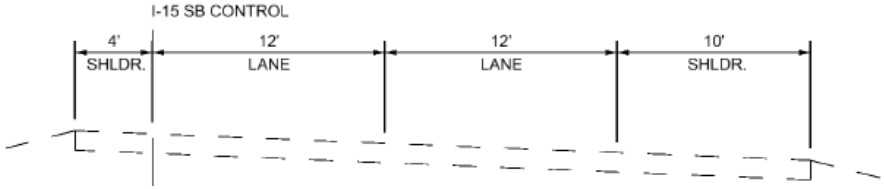
INTERSTATE 15

Existing Roadway Characteristics



Existing Roadway Characteristics





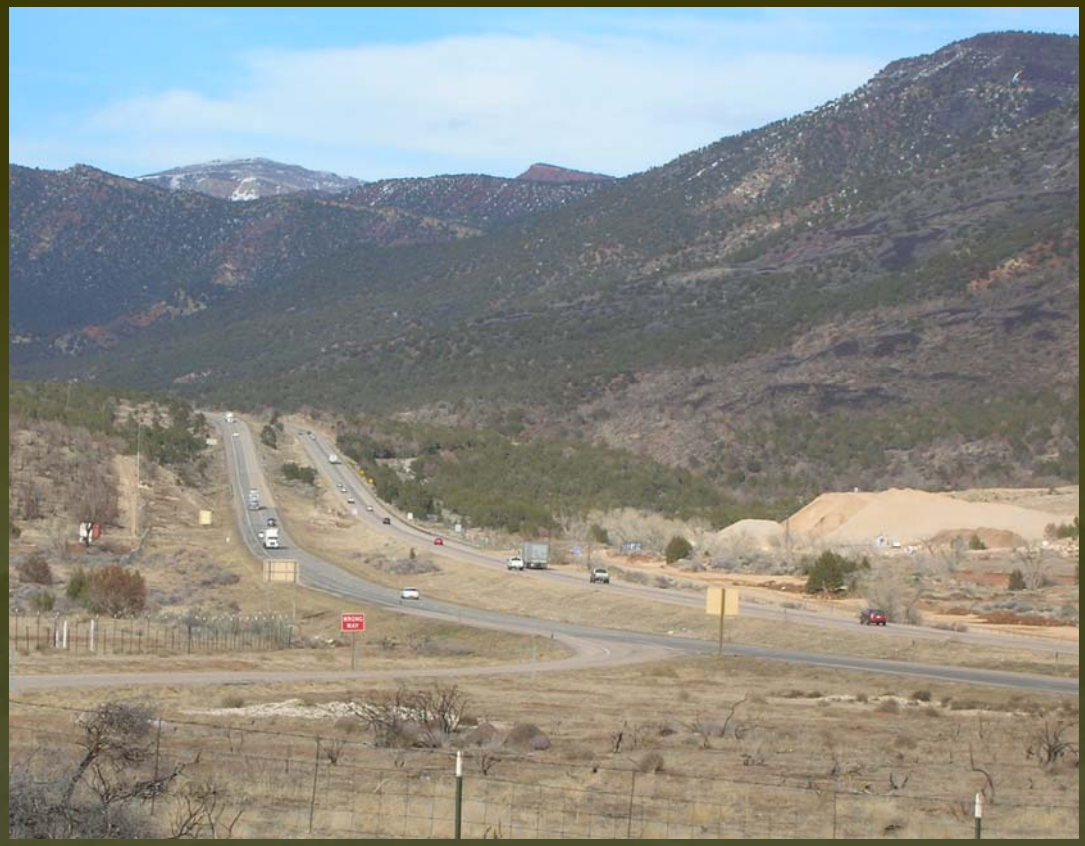
- Rural two-lane freeway with variable width median
- Two 12 ft lanes in each direction
- 4 ft left shoulders and 10 ft right shoulders

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Existing Roadway Characteristics

- Asphalt Pavement
- Rolling to Mountainous terrain with grades between 3% - 6%
- 4 – Interchange Structures within project limits



UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Proposed Pavement Rehabilitation

- 2” Mill
- 3” Cold-in-place recycle
- 1 ½” HMA
- 1 ½” SMA

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Proposed Pavement Rehabilitation

- Dig out and replace 15” of asphalt at existing structures to meet AASHTO vertical clearance at underpass structures
- Improve ramp geometry and lengths
- Construction Schedule: (between June and October 2010)

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

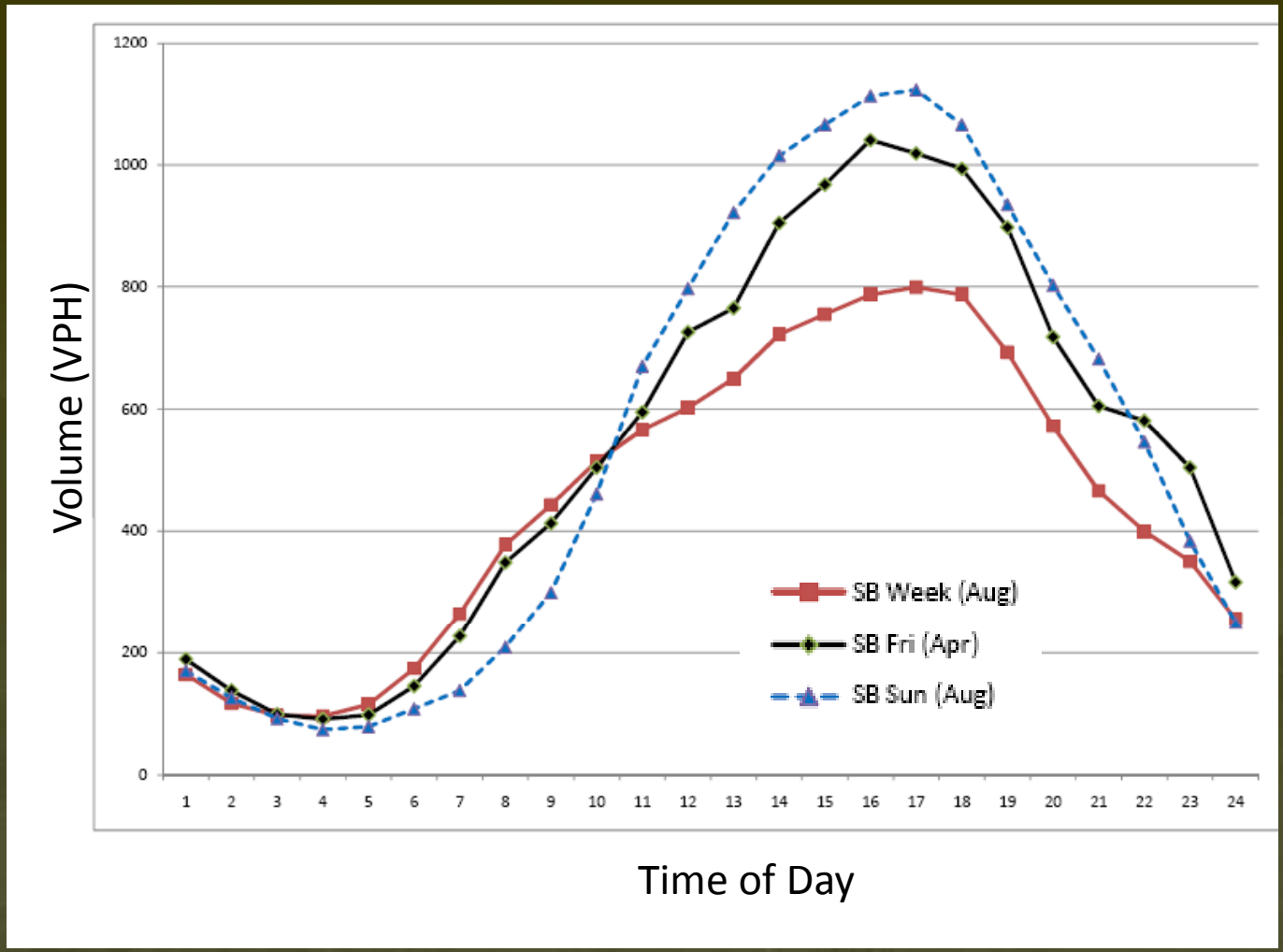
Existing Traffic Conditions

- AADT ≈ 21,760 (2009)
- 21% Trucks (4% single & 17% Combo Trucks)
- Monthly Hourly Traffic Reports obtained from UDOT (2009)
- Three months selected for Traffic Pattern Comparison (April, August, & October)

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

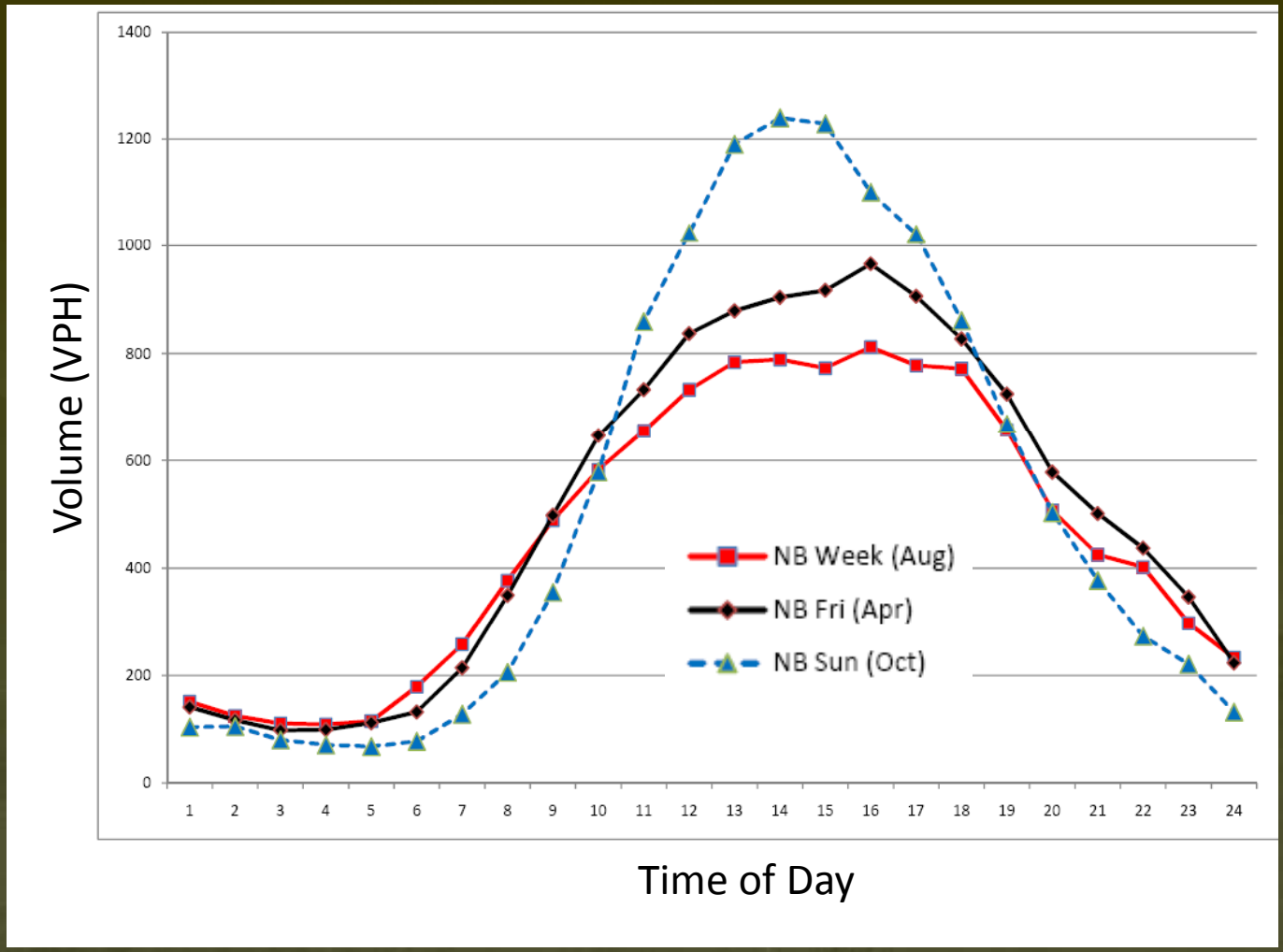
Existing Traffic Conditions Southbound



UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Existing Traffic Conditions Northbound



UDOT CONNECTING COMMUNITIES

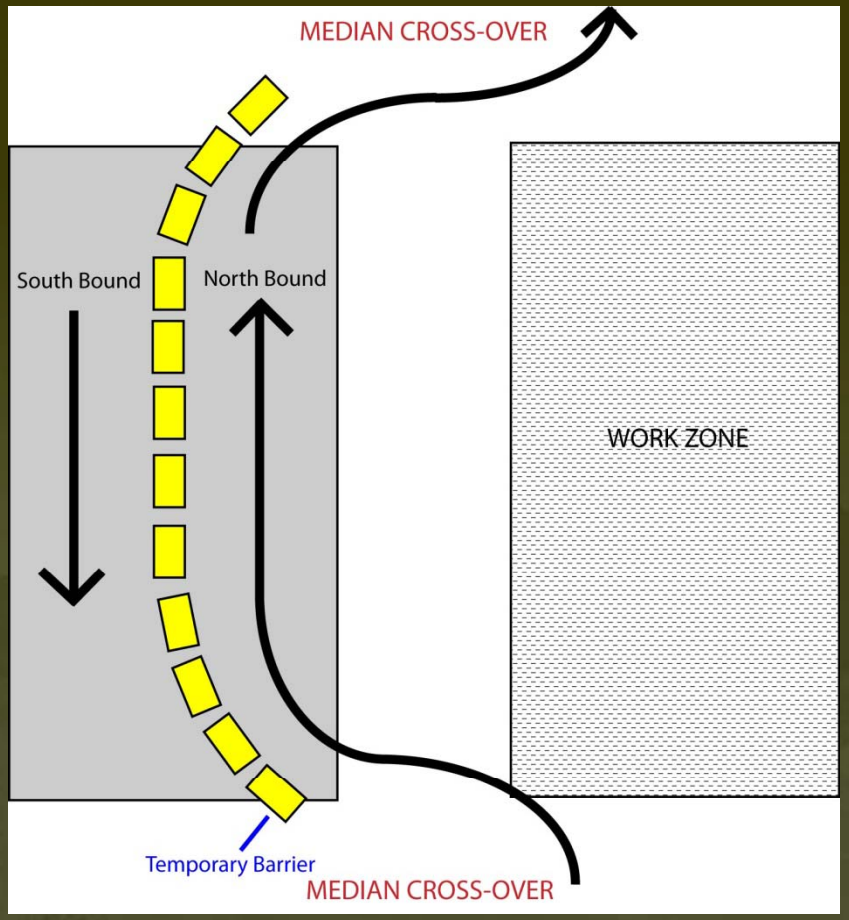
INTERSTATE 15

Goals and Objectives for using CA4PRS

- Compare construction strategies to optimize staging plans
- Reduce construction schedule
- Develop less disruptive lane closure schemes and traffic management plans
- Minimize total project cost

Construction Alternatives

- Median Crossover Closure

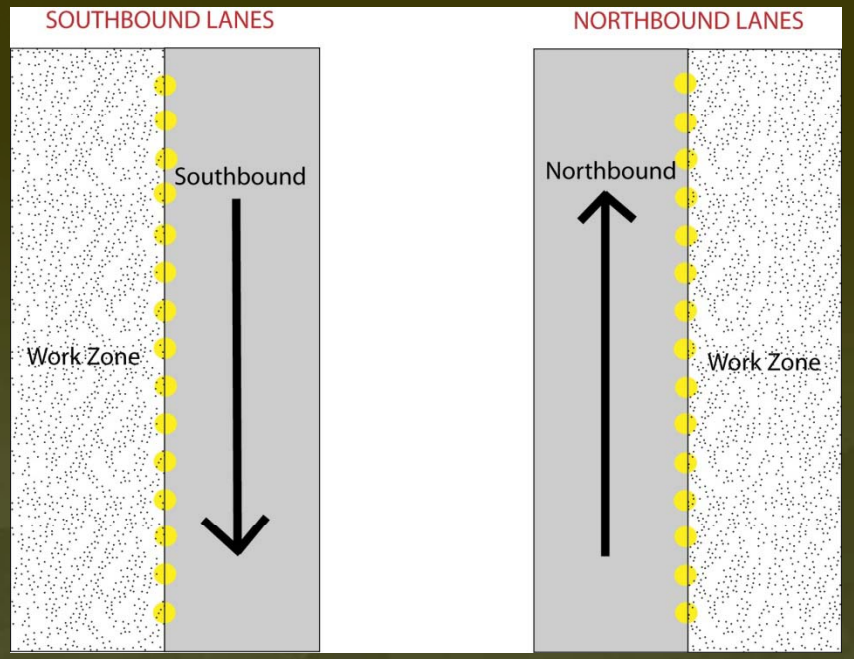


UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Construction Alternatives

- Median Crossover Closure
- 24/6 Closure (Open on Sundays)

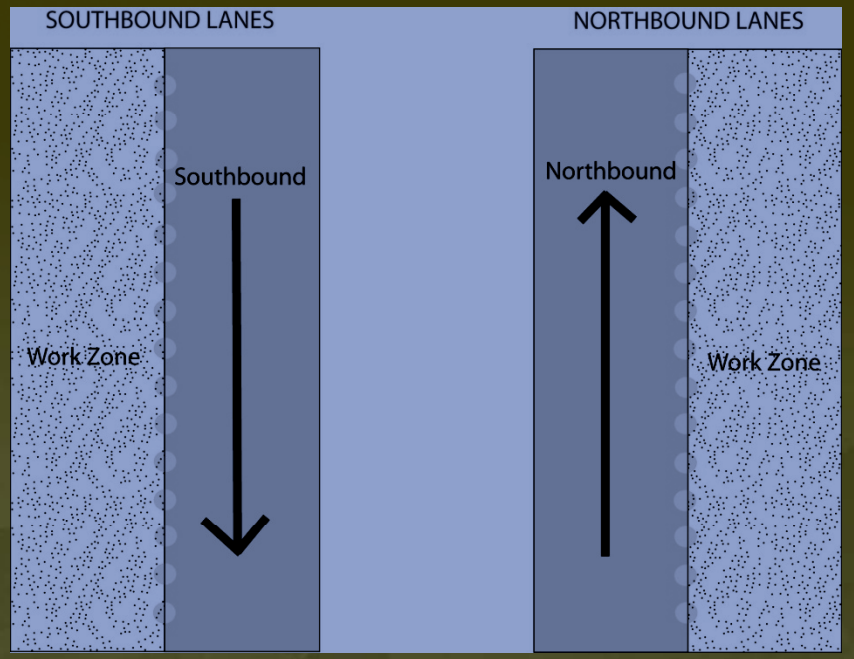


UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Construction Alternatives

- Median Crossover Closure
- 24/6 Closure (Open on Sundays)
- Nighttime Closure (7pm to 5 am)



UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Summary of CA4PRS Analysis Results

		Closure Alternative		
		Median Cross-over Closure	**24/6 Closure**	**Nighttime Closure**
SCHEDULE	Total Closure Duration (working-days)	119	154	199
	Project Duration (Month)	7	9	11
TRAFFIC	WZ Capacity (vphpl)	1,050	930	850
	Max Delay - Average weekday	Minor	Minor	Minor
	Max Delay - Sunday (minutes)	30 min (SB) 60 min (NB)	No lane closure (85 min SB / 120 min NB)^	-
	Max Queue - Sunday (mile)	3 mile (SB) 5 mile (NB)	5 mile (SB) 7 mile (NB)	-
COST	Construction ($M)	18	18	18
	Traffic Control ($M)	1.2	0.75	1
	Total Project Cost ($M)	**19.2**	**18.75**	**19**

^No lane closures on Sunday for 24/6 closure, but max delay is estimated as if the lane closure remains.

Project Construction cost was obtained from the Engineer's Estimate generated by UDOT's PDBS System.

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Summary of CA4PRS Analysis Results

•CA4PRS indicated that the Median Crossover closure alternative provides the shortest project construction Schedule but not necessarily the least impacts to traffic. Also, the Road User Cost and Total Project Costs were higher given the extra traffic control costs and expenses to build the crossovers.

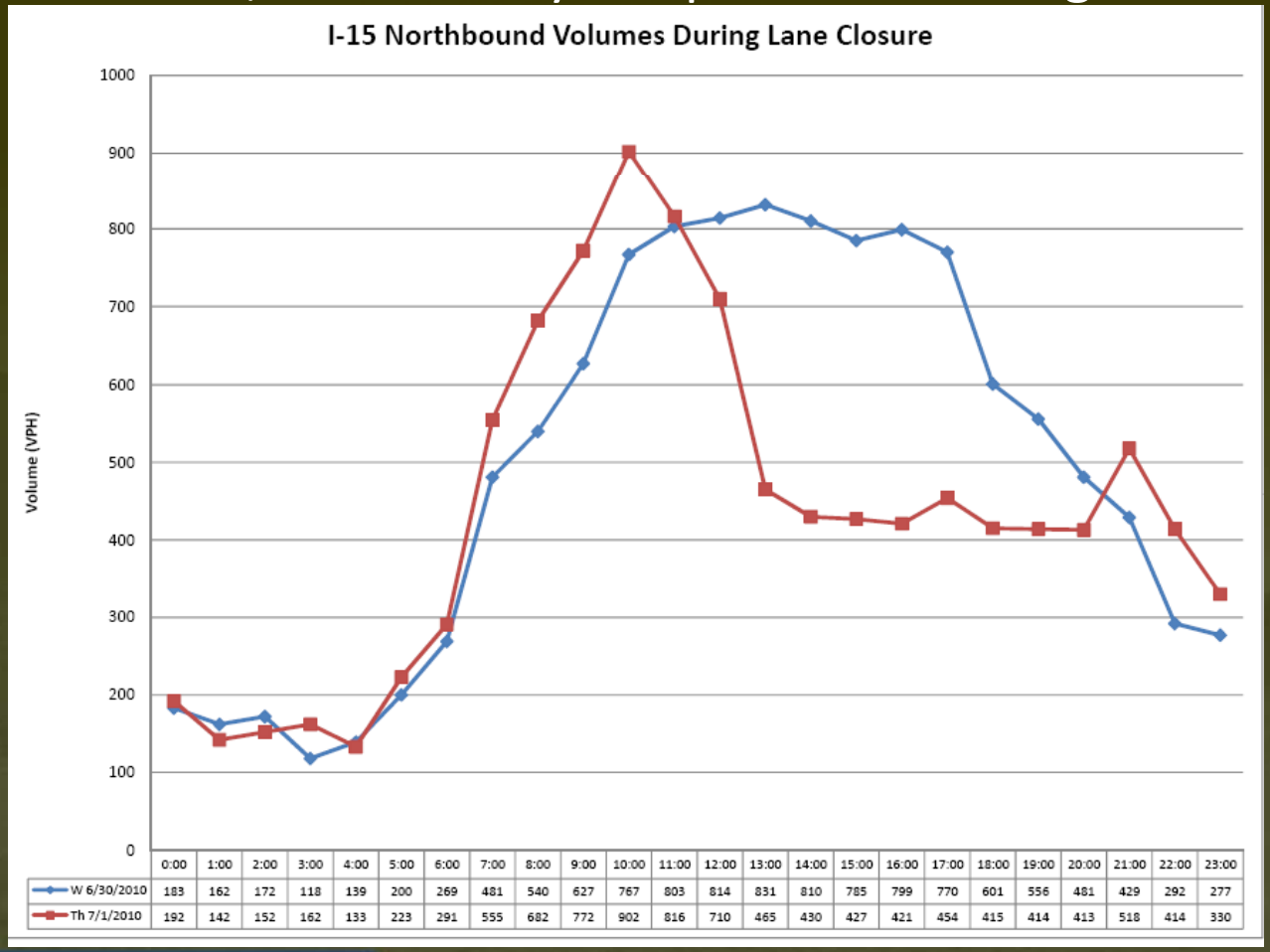
•CA4PRS indicated that both the 24/6 closure alternative and the Nighttime Closure Alternative minimized work zone traffic delay and lowered the road user cost and traffic control costs.

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted



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W 6/30/2010	183	162	172	118	139	200	269	481	540	627	767	803	814	831	810	785	799	770	601	556	481	429	292	277
Th 7/1/2010	192	142	152	162	133	223	291	555	682	772	902	816	710	465	430	427	421	454	415	414	413	518	414	330

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

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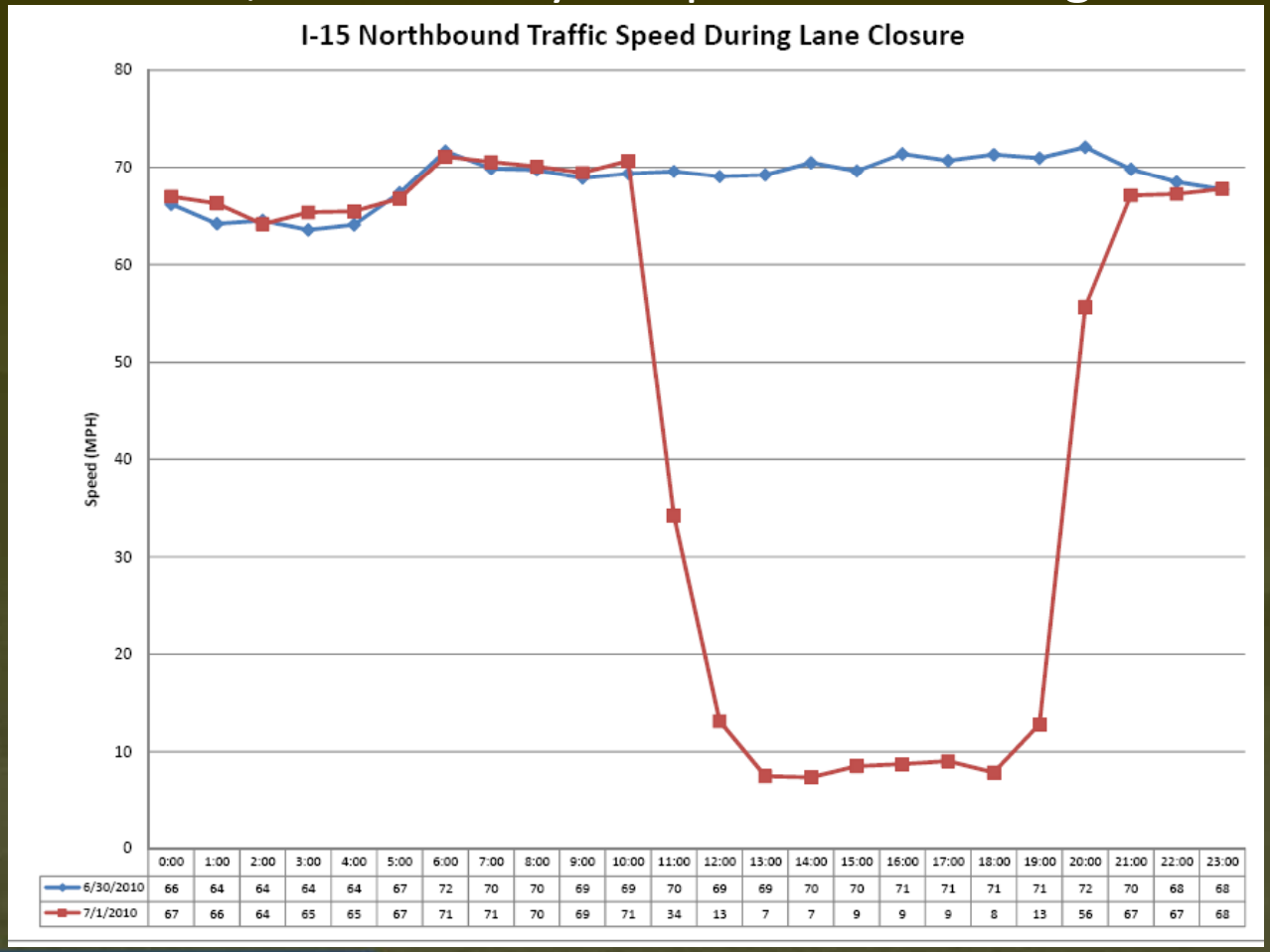

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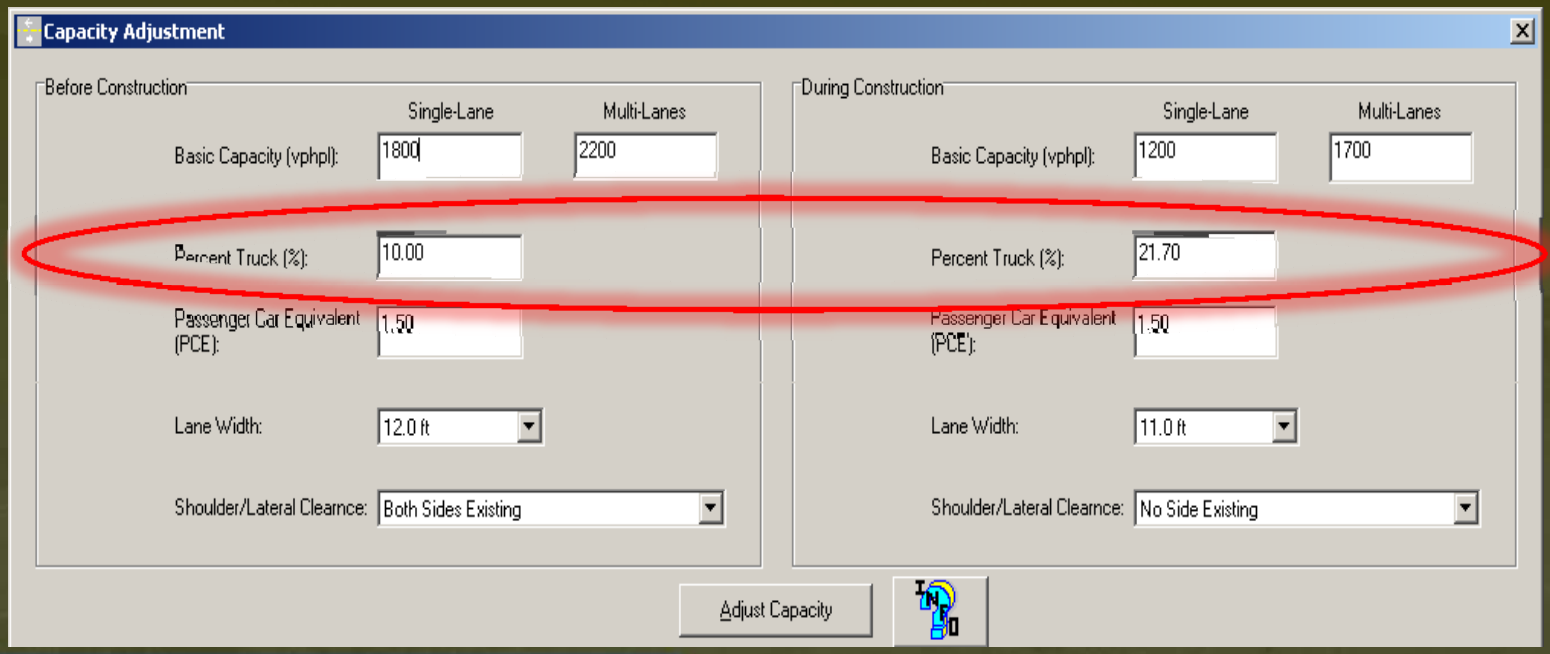
6/30/2010	66	64	64	64	64	67	72	70	70	69	69	70	69	69	70	70	71	71	71	71	72	70	68	68
7/1/2010	67	66	64	65	65	67	71	71	70	69	71	34	13	7	7	9	9	9	8	13	56	67	67	68

Observations

- During Peak hours, actual delays & queues were larger than predicted
  - ➢ **Unexpected results came from errors in data entry**
    - ✓ Percentage of Truck Traffic (2009 data shows ≈ 21% ; actually observed closer to 33% or higher)

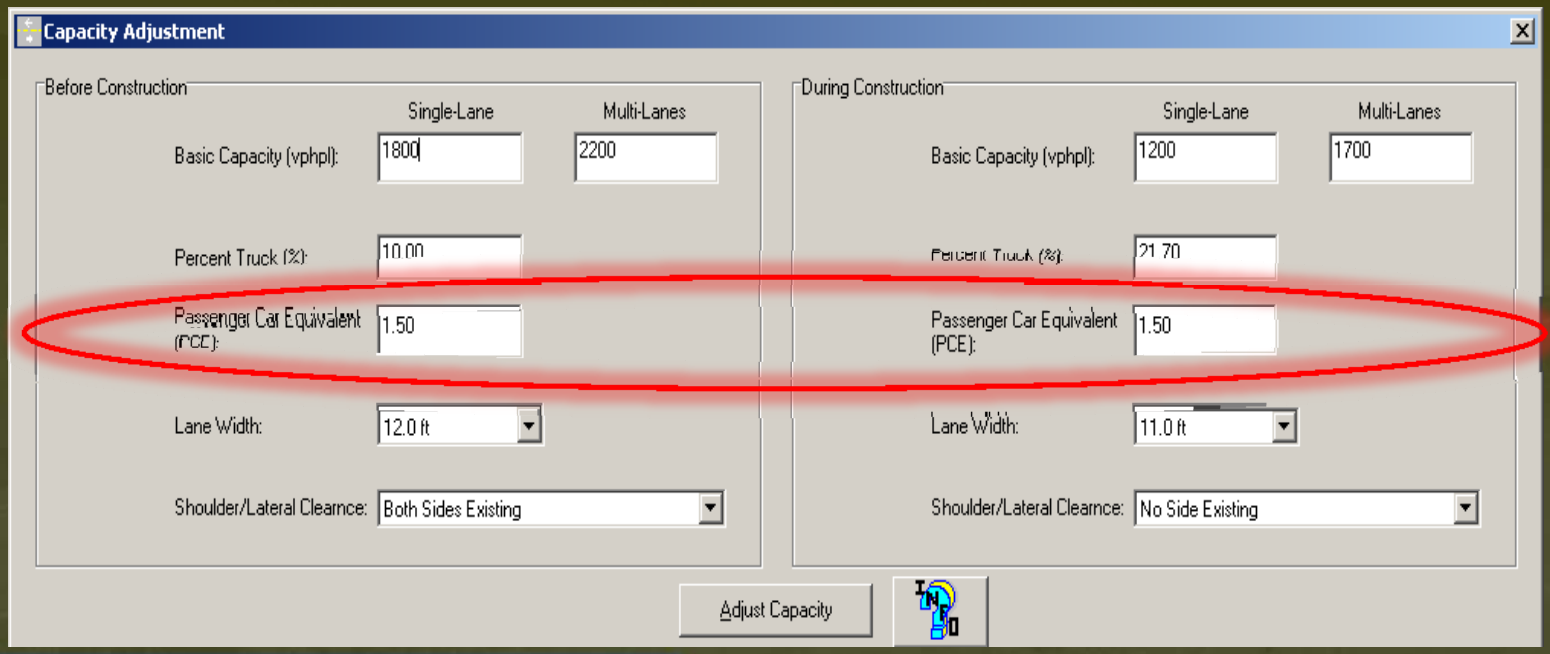


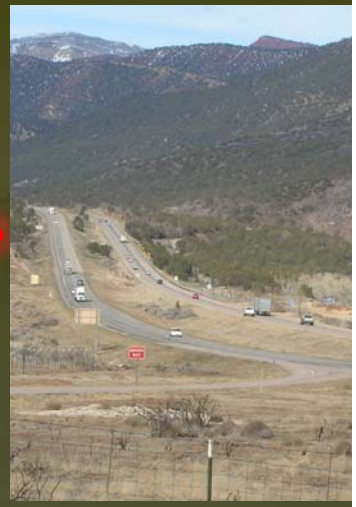
UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted
  - ➢ **Unexpected results came from errors in data entry**
    - ✓ Factor for Passenger Car Equivalent (Level= 1.5, Rolling =2.5, or **Mountainous Terrain = 4.5**)





UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted
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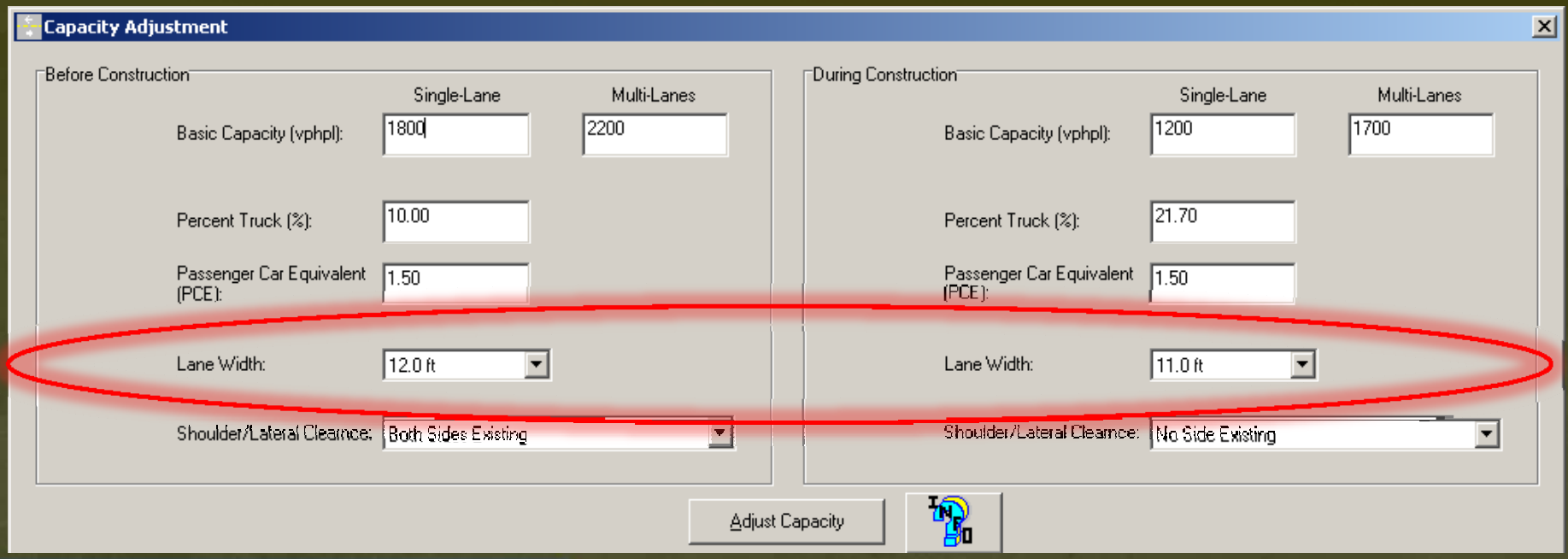
    - ✓ Traffic Control setup (10 ft lanes with no shoulders)



Observations

- During Peak hours, actual delays & queues were larger than predicted
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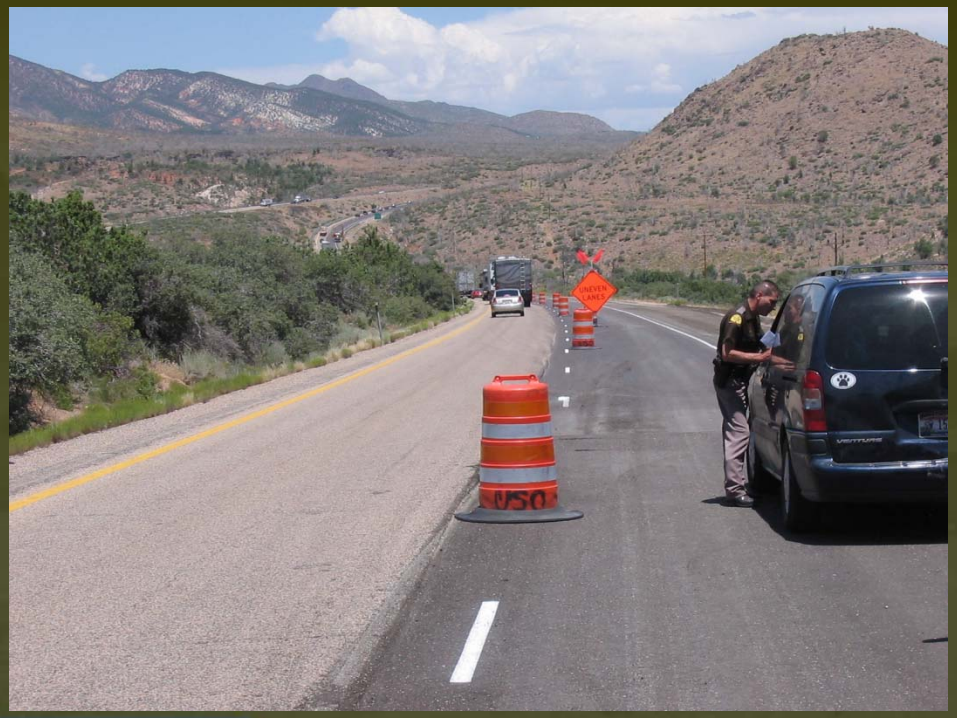
    - ✓ Police activity and speed enforcement impeded traffic



UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted
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    - ✓ Lengths of contractor operations adjacent to traffic was a distraction to drivers

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted
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    - ✓ Factor for Passenger Car Equivalent (Level= 1.5, Rolling =2.5, or **Mountainous Terrain = 4.5**)
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    - ✓ Traffic Control setup (10 ft lanes with no shoulders)
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UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Observations

- During Peak hours, actual delays & queues were larger than predicted
  - **Unexpected results came from errors in data entry**

  - When the data was entered correctly, the calculated results better reflected the observed conditions

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Lessons Learned

- Avoid exceeding capacity by using a factor of safety
- Develop support from DOT management regarding implementation of CA4PRS recommendations
- Use detailed and relevant traffic data for input variables
- Use Real-Time data to make adjustments
- Consider a Performance Based Work-Zone specification
- Listen to the recommendations of the Resident Engineer for paving operations

UDOT CONNECTING COMMUNITIES

INTERSTATE 15

Conclusions

- CA4PRS results and recommendations were useful when the program is used correctly.
- Be sure to evaluate the project entirely and consider even minor factors to be relevant and influential.
- Develop confidence and familiarity in the use of the CA4PRS program.