



# PRACTICAL DESIGN

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# Practical Design Guide

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OR

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## Practical Design Guide

Planning and Designing Practical Transportation Solutions for Utah

02/01/2011

# What is Practical Design?

Strategy to maximize the delivery of focused improvements for the State's transportation system.

**Focus on value  
to meet our needs  
with limited resources.**

# Why Practical Design?

- Focus on Value
- Provide Needs
- Obligation to the Public

# Why Practical Design?

“We Already Do This.”

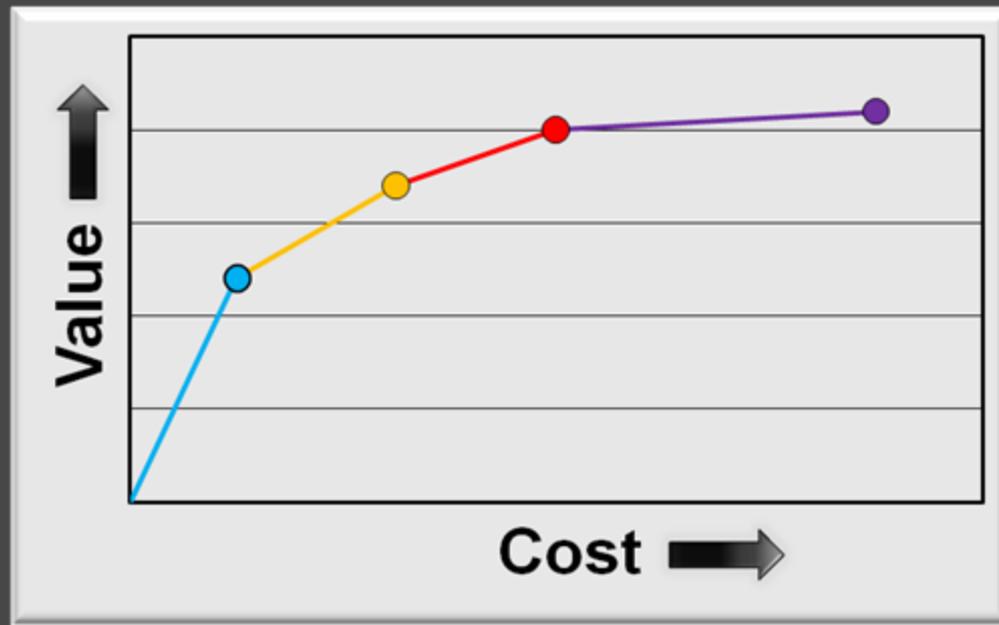
# UDOT's Mission

## Final Four (Needs)

- Take care of what we have
- Make the system work better
- Improve safety
- Increase capacity

# Practical Design Vision

## Point of Diminishing Returns (Value)



# Practical Design Vision

“Building **good** not **great** projects will result in a **great system**.”

# Practical Design In Action

University of Kentucky Study

Design Option	Cross Section	Crashes per Year per Mile	Speed (mph)
Existing	2 Lanes, 10 ft L, 2 ft S	5.4	41.4

# Keys for Practical Design Success



# Practical Design KEY 1: Project Objective Statement

- ✓ **Foundation for ALL improvements**
- ✓ **Clear**
  - ✓ Easy for the Public to understand
  - ✓ Comprehensive and specific
  - ✓ Factual and numerical
  - ✓ Expected positive outcome, not a solution
  - ✓ Address UDOT's Final Four
- ✓ **Do Not expect more than the stated objective.**

# Project Objective Statement Examples

1. Reduce crashes by 50% at the intersection of X and Y.
2. Add right turn lane at the intersection of X and Y.
3. Add traffic calming measures to street X between Y and Z.
4. Reduce traveling speed on street X between Y and Z from 45 mph to 35 mph.

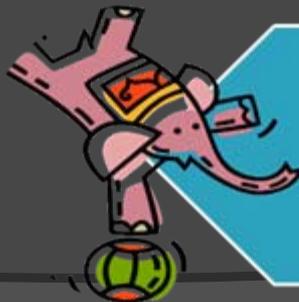
# Practical Design Key 2: Practical Design Goals



Optimize the transportation system.



Meet the Objective Statement



Maximize Value

# Practical Design Key 3: Collaboration



## Multi-disciplinary teams

- Involve everyone
- Allow disciplines to remove themselves
- Add specific knowledge needed
- Assemble a team adequate for the complexity of the project

## Project Communication Plan

- Complexity Project = Complexity Plan
- Who engages the public and agencies.
- How all input information will be gathered and disseminated.

## Encourage Open Discussion

# Practical Design Key 4: Professional Judgment

## 1. Understand :

Objective Statement

Problem vs. Symptoms

Context

## 2. Consider:

Full set of alternatives

## 3. Eliminate:

Does not meet Object Statement

Beyond Objective Statement

## 4. Evaluate:

Value

Life Cycle Costs

## 5. Exceptions, Deviations, and Waivers

# Standards and Objective Statement

## Old Practice

- Design standards dictate the desired level of improvement.
- Exceptions, deviations, and waivers are used when resources do not allow for the design standard to be built.
- The design starts with the standard and strips down to meet budget.

## Practical Design Practice

- The project objective statement states the desired level of improvement.
- Exceptions, deviations, and waivers are used for the following reasons:
  1. The design standard exceeds the objective statement
  2. A lower cost solution, that does not compromise safety, is identified
- The design starts with the existing conditions and builds up to meet the objective statement.

# Roles and Responsibilities

## **Project Sponsor**

Identify the need and funding.

## **Project Definition Team**

Develop and document the project Objective Statement.

## **Project Team**

Concept and Design

Develop improvements to meet the Objective Statement.

Evaluate improvement values, including life cycle costs.

## **Operations Group**

Give clear understanding of maintenance costs and operational needs.

Assist project team develop solutions to meet objective statement.

# Roles and Responsibilities

Who is responsible to make sure the project meets the objective statement and adds the most value?



# Examples

## Planning Perspective

How the planning process works.

## System Perspective

Identify the issues and selecting appropriate solutions

## Project Perspective

Region 2 – 4015 West 5400 South

# Avenue Consultants

David Thompson, PE

# The Goal

Appropriately allocate limited resources to maximize system wide improvements.

**How do we  
do more  
with less?**

# How do we do more with less?

- start at the planning / concept phase
- create a problem-solving mind-set
- be willing to “*think AND ACT outside the box*”



*"Never, ever, think outside the box."*



**"Your proposal is innovative. Unfortunately, we won't be able to use it because we've never tried something like that before."**

# How do we do more with less?

***innovation*** is not a novelty... but an appropriately applied and technically sound creative approach to identify and develop ***cost effective*** and ***big-benefit*** solutions

# Bluff Street EA

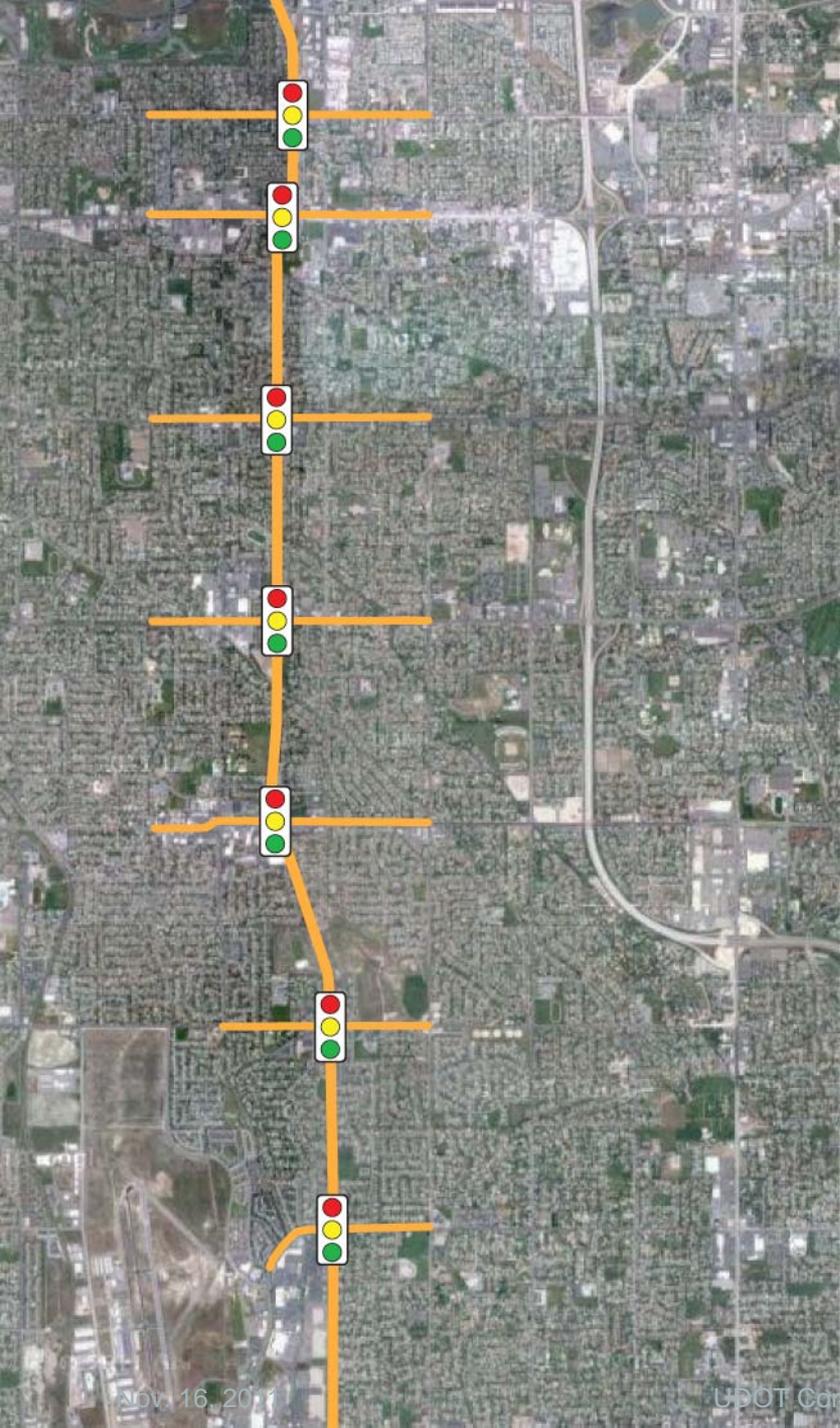


# Bluff Street EA

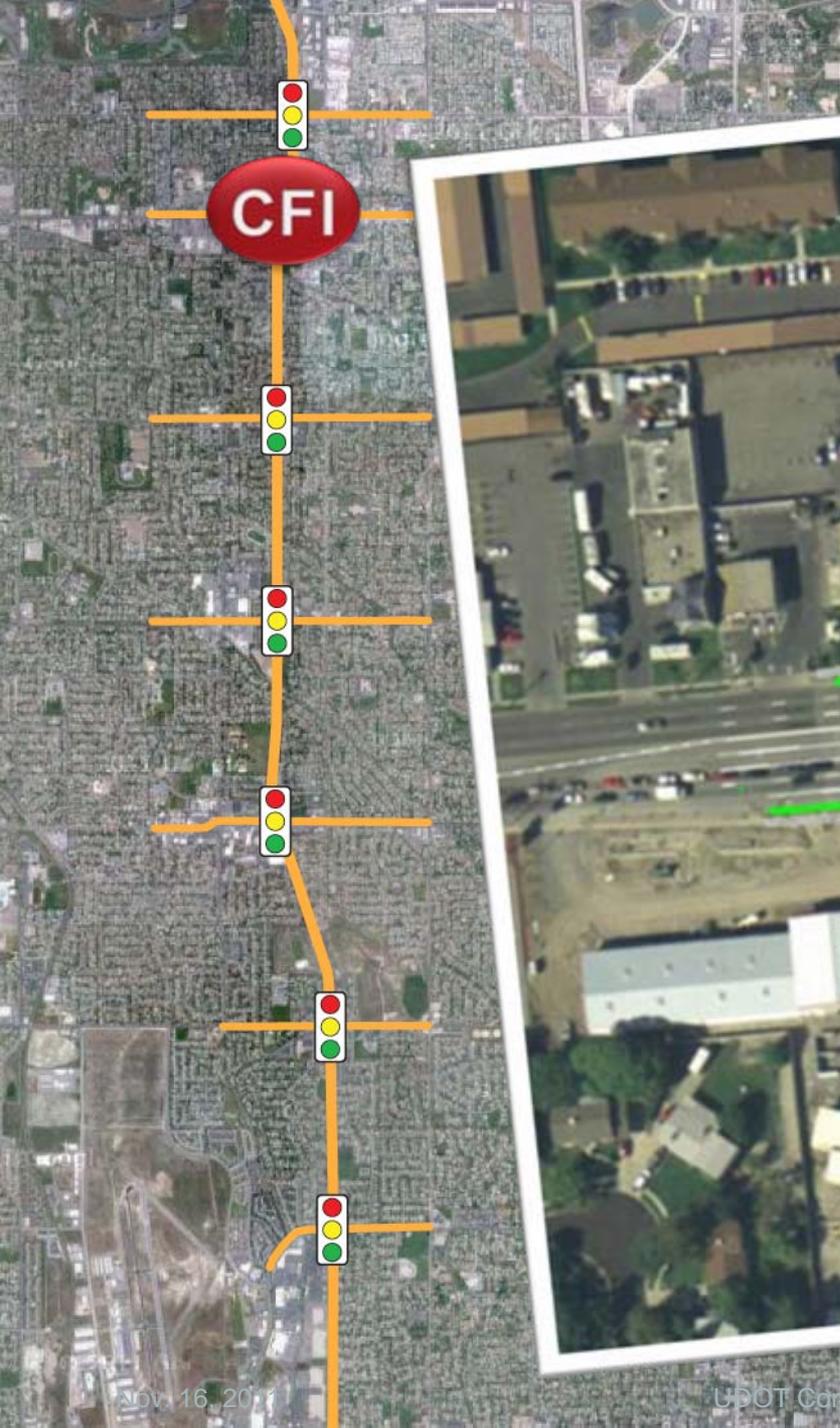


# Bluff Street EA

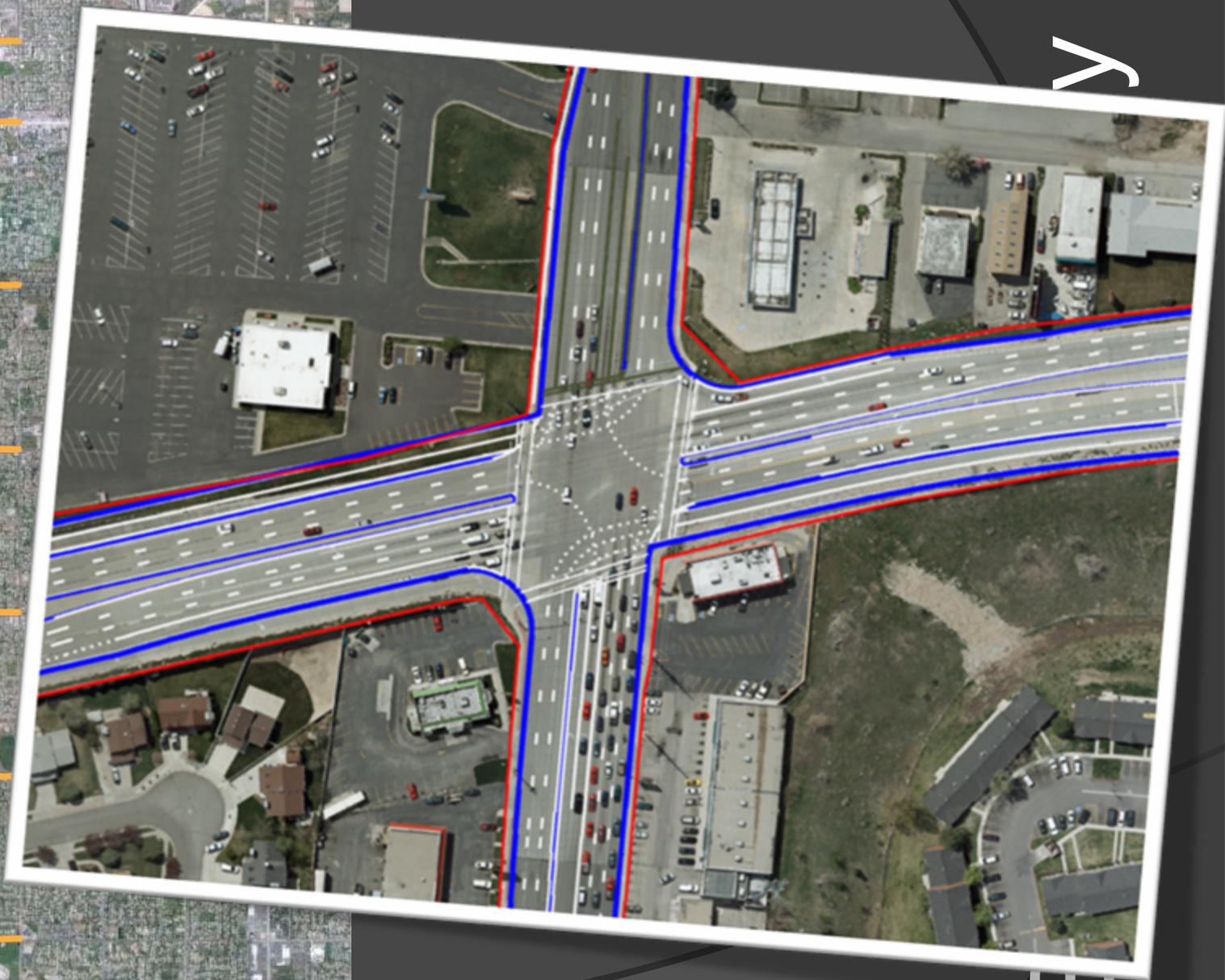




# Bangerter Highway



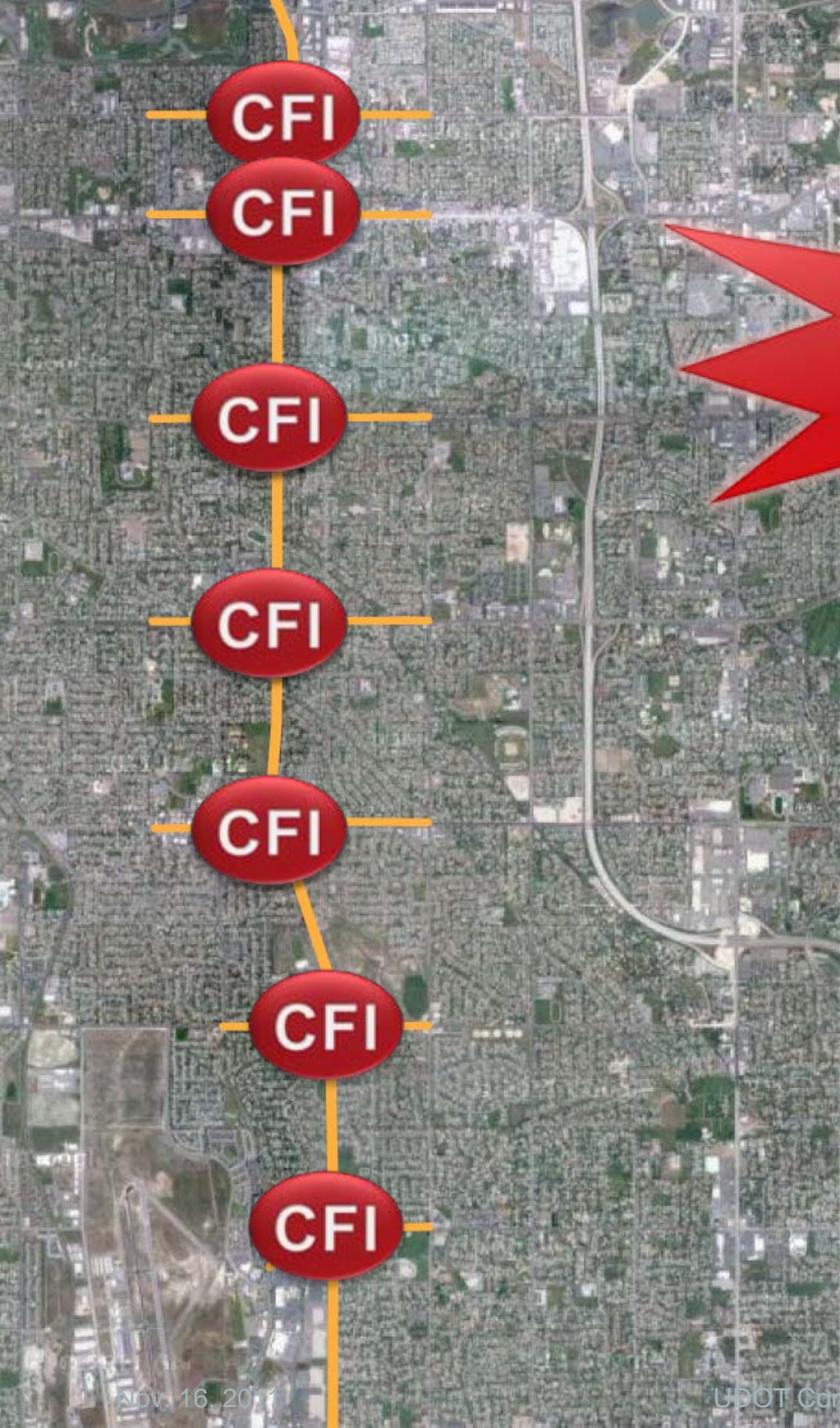




y

E





7 CFIs

# Bangerter Highway



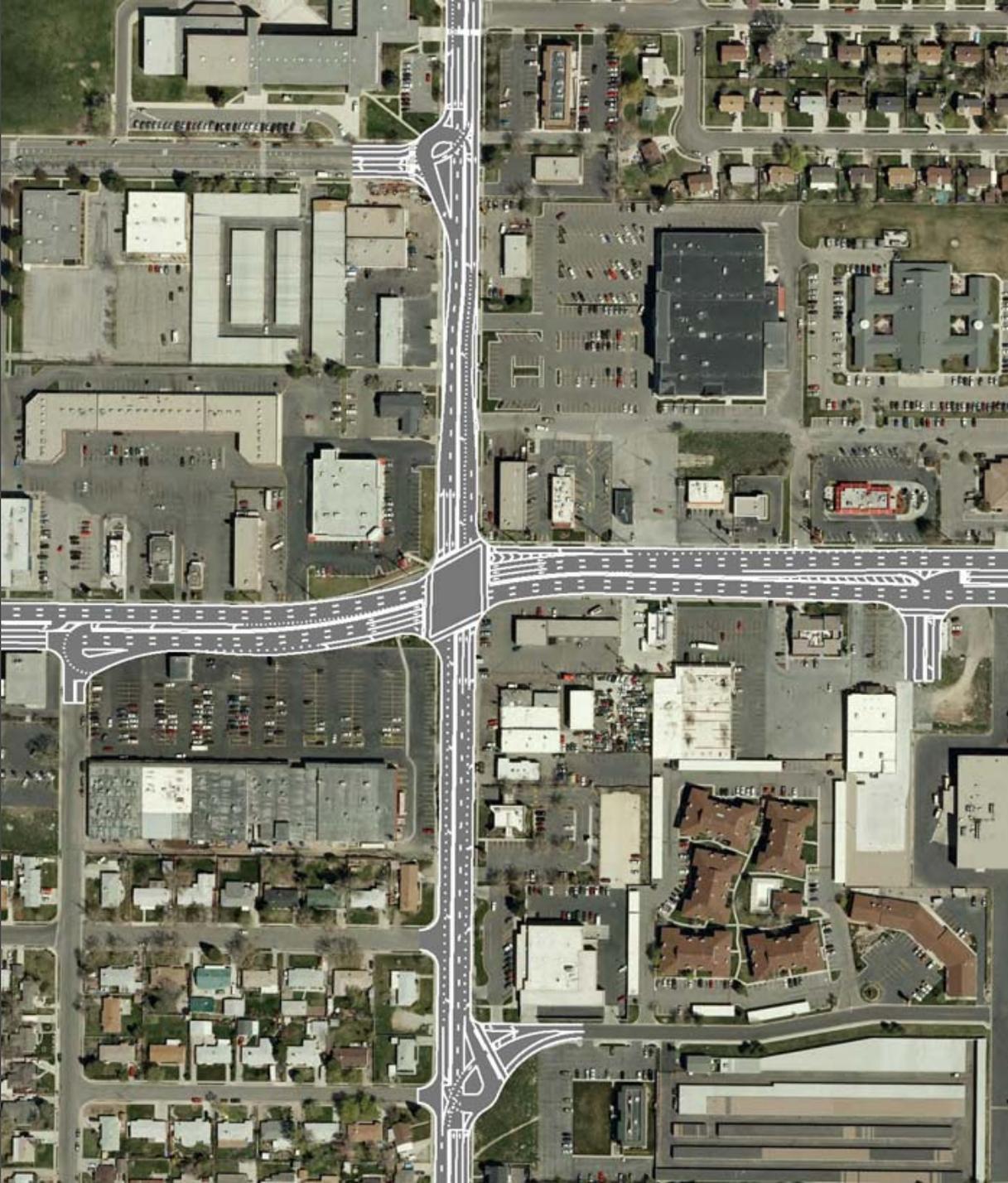
# 12300 South & State



# 12300 South & State



# 5400 South & 4015 W



# 5400 South & 4015 W

# Key Elements to a Practical Design Approach

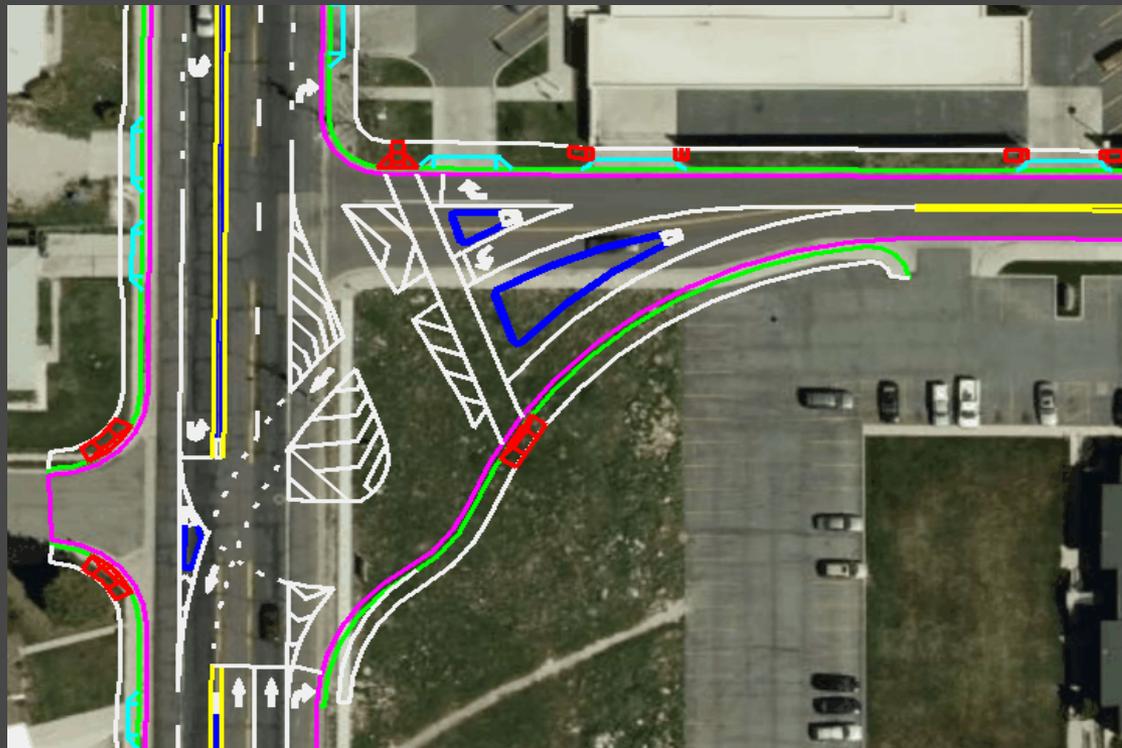
- Collaboration
- Brainstorming – encourage **ALL** ideas
- Effective Screening & Evaluation Methods
- Effective Communication

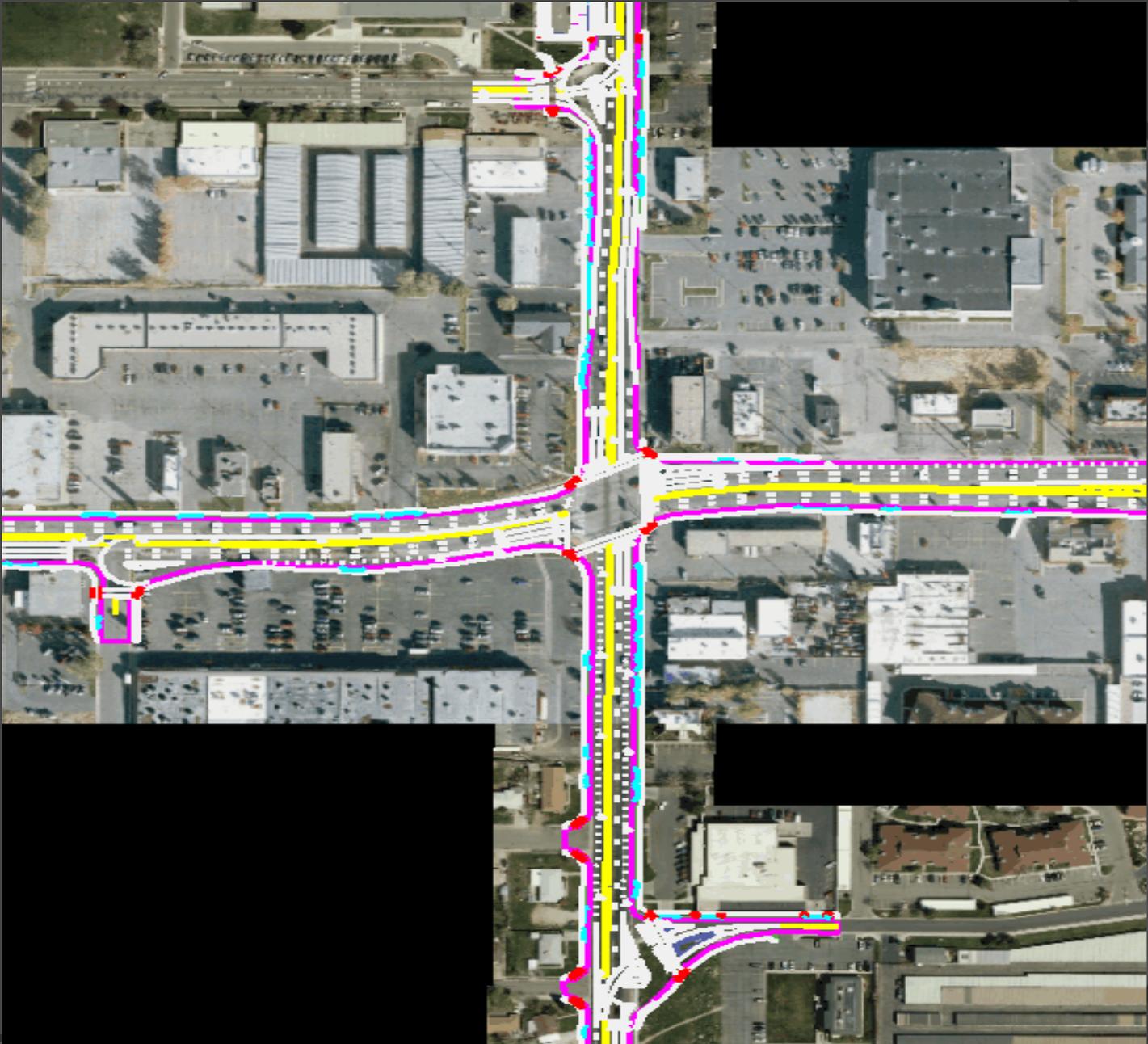
# Project Perspective – 4015 W. 5400 S.

Project Objective Statement – Increase capacity at stated intersection.

Initial concept – Dual lefts

Final design – ThrU Turn Intersection (TTI)

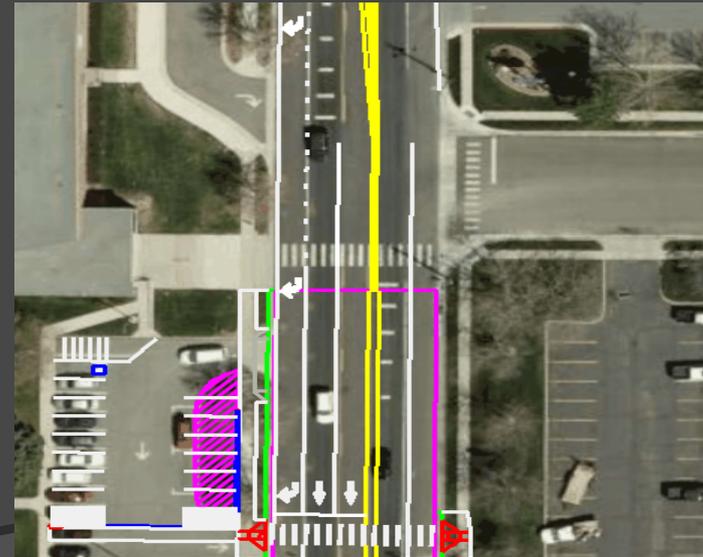
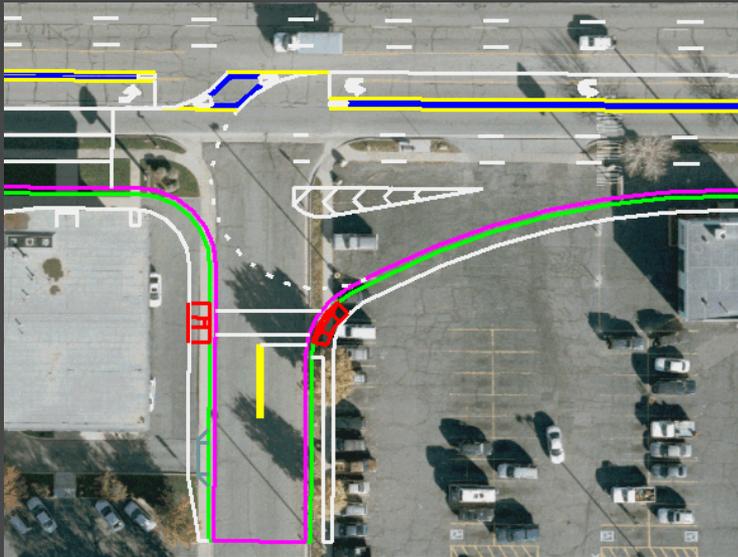




# Project Perspective – 4015 W. 5400 S.

## Practical Design Elements

1. Safety – To improve safety at the school, added an additional bulb on 5400 South.
2. Design Up – Determined existing cross section was sufficient, designed 11' lanes, 3' shoulders
3. Reduced Cost – Eliminated existing raised median at the elementary school to reduce project limits.



# Success Indicators



## Institutionalized Practical Design

- All projects have a clear objective statement.
- Every objective statement is clear.
- Project teams focus on improving the system as a whole, not just within their project limits.
- Project teams focus on meeting the objective statement.

# Exceptions, Deviations, and Waivers

## Purpose:

Flexibility

Documentation

Tracking

## Keys:

- Do Not Discourage.
- Provide more than enough information for approval.
- Include cost savings from maintenance, schedule, risk, etc.

# Tools



- Value Engineering
- Context Sensitive Solutions
- Project Definition Document
- Project Status Report
- Objective Statement Development Guide
- Scoping Phase – Suggested Questions Checklist

# Project Definition Document

- To document project objective statement and constraints
- Documents planning process
- Completed by the Project Definition Team
- Use to gain support from the Project Sponsor, Project Team, and Advisory Team Members.
- Key Info Included:
  - ✓ Objective Statement
  - ✓ Constraint Matrix (Scope/Schedule/Budget)
  - ✓ Project Team Members & Advisory Team Members

# Project Definition Document

Project Definition Document				
<b>Description</b>	XXXX Road Reconstruction			
<b>Location</b>	SR-XX, I-15 to US 89			
<b>PIN</b>	Project Manager		Design Leader	
<b>Project Objective Statement</b> <small>A short statement of: What is to be accomplished When will it be completed How much will it cost Should be less than 25 words and includes construction period</small>	Widen and reconstruct XXXX road between I-15 and Valley View road by November 30 <sup>th</sup> 20XX for \$X million			
<b>Proposed Project Defined Benefits</b> <small>Develop "big picture" project goals that express results instead of project work items</small>	<ol style="list-style-type: none"> <li>1. Improve Level of Service from "E" to "C"</li> <li>2. Reduce intersection accidents by 30%</li> </ol>			
<b>Constraint Matrix</b> <small>Indicates the relative process flexibility of the Scope, Schedule, and Budget. Place only 1 X in each column and row</small>		<b>Most Constrained</b>	<b>Moderately Constrained</b>	<b>Least Constrained</b>
Scope		X		
Schedule			X	
Budget				X
<b>Develop Preliminary Scope</b> <small>List major project components</small>	<ol style="list-style-type: none"> <li>1. Widen to 7 lanes from I-XX to Valley View road and 5 lanes from I-XX to I-15.</li> <li>2. Reconstruct pavement to 25 year design life.</li> <li>3. Construct new SPUI interchange @ I-84 and XXX road</li> <li>4. Purchase approximately XX total parcels and 35 partial parcels to accommodate widening.</li> <li>5. Replace and synchronize all 7 traffic signals within project limits</li> <li>6. Replace city waterline under betterment agreement</li> <li>7. Relocate major power transmission line on north side of road</li> </ol>			
<b>Sponsor's Expected Delivery Dates</b> <small>List major proposed Milestone Dates</small>	Stage	Milestone	Completion	Completion Date
	1	Design Completion	- - -	2-15-20XX
	2	Construction Completion	- - -	3-25-20XX
<b>Develop Preliminary Budget Estimate</b> <small>List Preliminary budget estimates ( ePM S05 screen)</small>	Environmental	0	Utilities	900,000
	Concept Dev.	0	Construction	41,000,000
	P.E.	3,800,000	CE	3,500,000
	ROW	2,500,000	Incentives, Miscellaneous, Contingency	3,300,000
			<b>Total Budget Estimate</b>	<b>55,000,000</b>

Direct Project Team	Role	Name	Email	Phone 1	Phone 2
<small>List Project Team members who are the lead for their Discipline and are directly responsible for the production and completion of the project in the pre-construction</small>	Project Manager				
	Design Leader				
	Roadway Design				
	Roadway Hydraulics				
	Environmental Lead				
	Survey / Mapping				
	Public Involvement				
	Utilities Lead				
	Materials Lead				
	Aesthetics / Landscaping				
	Structures Lead				
	Structures Hydraulics				
	Geotechnical Lead				
	Right of Way Design				
	Right of Way Region				
	Right of Way Acquisition				
	Traffic and Safety ITS (ATMS) Lead				

Advisory Project Team	Role	Name	Email	Phone 1	Phone 2
<small>List Project Team members who will advise, review and/or approve the project pre-construction package</small>	Resident Engineer				
	District Engineer				
	Preconstruction Engineer				
	Region Public Involvement (1)				
	Region Design oversight(1)				
	Region Utility Coordinator (1)				
	Maintenance Representative				
	Region Traffic & Safety Lead				

(1) Only applicable if not a member of the "Direct Project Team".

# Project Status Report (COGNOS)

- To document decisions, commitments, and limitations
- Follows design, construction, and maintenance
- ePM
- Information input by any team member
- Update information often
- Information includes:
  - ✓ Project Goals
  - ✓ Project Costs
  - ✓ Limitations/Risks
  - ✓ Project Commitments
  - ✓ Stakeholders
  - ✓ Project Decisions
  - ✓ Coordinating Agencies

# Project Status Report (COGNOS)

Project Definition Document					
Project Name:	I-15, Manderfield NB Bridge Repair			UDOT Project Manager:	TORGERSEN, TROY
FIN:	10226			UDOT Design Lead:	RINK, MATTHEW
Project Number:	S-15-3/37 J119			UDOT Resident Engineer:	CONDIE, LIEF J.
Delivery Method:	Design, Bid, Build			Consultant Project Manager:	N/A
PDL Category:	Structures Preventative Maintenance			Organization:	N/A
Project Phase:	CONSTRUCTION ENGINEERING			Consultant Design Lead:	N/A
Project Sponsor:	UTAH DEPT. OF TRANSPORTATION			Organization:	N/A
Route:	I-15			Consultant Resident Engineer:	N/A
Mill Post:	116.5 - 116.4			Organization:	N/A
Funding Type:	State				
Project Goals:	Shoring of Northbound Bridge using emergency contract. Shoring of Northbound Bridge using emergency contract. Thank you for setting up the Fin, I am going to make a few changes and put the project under our FY 2011 Bridge Preservation Program (BPP) and request that we A-After funds from an existing project (B026) in the amount of \$300k to the newly created p/n(10226). Daniel Page S.E. UDOT Bridge Operations BY: Robert Pally ON: THU SEP 01, 2011 07:46:37 AM				
Limitations/Risks:	Under Development				
Stakeholders:	Under Development				
Coordinating Agencies:	Under Development				
Project Schedule			Key Documents		
Advertising	Submit Date	Commil Date	Completion Date	Document Location	Document Status
	Sep 14, 2011	Jan 14, 2012		Concept Report	
Design	Start Date	End Date		Environmental Document	
	Sep 8, 2011	Dec 30, 2011		Design Exceptions	
PS&E	Date			Project Design Criteria	
	Oct 3, 2011			Plan Set	
				Interstate Access Change Request	
Construction Schedule					
	Start Date	NIP Date	Schedule/Slip Complete Date		
	Sep 27, 2011	Oct 20, 2011			
	Percent Complete	Estimated Complete Date	Original Projected Complete Date		
			Nov 23, 2011		
	Days Charged	Original Total Days			
		24			
Project Costs			Project Commitments		
	Cost Estimate	Expenditures	Commitment Type	Commitments Count	Most Recent Commitment Modified Date
Right of Way:	\$0.00	\$0.00		ALL	
Utilities:	\$0.00	\$0.00		CONCEPT DEVELOPMENT	
Construction:	\$30,091.00	\$0.00		CONSTRUCTION	
Contingency:	\$2,000.00	---		CONSTRUCTION ENGINEERING	
Miscellaneous:	\$0.00	\$0.00		COOPERATIVE AGREEMENTS	
Environmental:	\$0.00	\$0.00		ENVIRONMENTAL DOCUMENT	
Preliminary Engineering:	\$5,000.00	\$0.00		MAINTENANCE	
Construction Engineering:	\$3,000.00	\$0.00		MISCELLANEOUS	
Total:	\$38,091.00	\$43,797.00		PRELIMINARY ENGINEERING	
Project Value:	\$38,091.00	\$46,098.00		RIGHT OF WAY	
Difference:	\$0.00	\$4,203.00		UTILITY	
Project Decisions					
Decision Type	Decisions				Decision Added Date
Major Decisions	1. Decision text listed here				
	2. Decision text listed here				
	3. Decision text listed here				
	4. Decision text listed here				
Minor Decisions	1. Decision text listed here				
	2. Decision text listed here				

# Objective Statement Development Guide

- Assist Project Definition Team develop the Objective Statement
- Located in the Practical Design Guide
- 5 Step Process
  1. Identify the current conditions.
  2. Determine the existing deficiencies. (Final Four deficiency)
  3. Identify the deficiencies to be improved.
  4. Determine the project objective.
  5. Clearly and specifically describe the objective statement of the project.

# Scoping Phase – Suggested Questions Checklist

- Assist Project Team develop the project scope
- Located in the Practical Design Guide
- Questions focus on the following:
  1. Safety
  2. Corridor Context
  3. Optimize the System
  4. Public Support
  5. Efficient Cost



# QUESTIONS AND COMMENTS