Using the New Roadside Safety Analysis Program (RSAPv3)

Malcolm H. Ray, P.E., Ph.D.
Christine Carrigan, P.E., Ph.D.
Chuck Plaxico, Ph.D.

Let's introduce ourselves…

Malcolm Ray
Presenter

Christine Carrigan
Presenter

Chuck Plaxico
Moderator

Introduction

What does RSAPv3 do and how does it do it?

Malcolm H. Ray, P.E., Ph.D.

How do we decide what the best roadside safety treatment at a particular site?

- Example – let's say we have a divided highway.
  - What is the best median barrier to use?
  - What does ***best*** mean?

The roadside treatment that gives the largest crash cost reduction for the money invested to construct and maintain the treatment.

How do we decide what the best roadside safety treatment is at a particular site?

- Options:
  - No median barrier.
  - Cable median barrier.
  - W-beam median barrier.
  - TL4 concrete median barrier.
  - TL5 concrete median barrier.

How do we decide what the best roadside safety treatment is at a particular site?

- Options:
  - No median barrier.
  - Cable median barrier.
  - W-beam median barrier.
  - TL4 concrete median barrier.
  - TL5 concrete median barrier.

More Effective

Costs Less

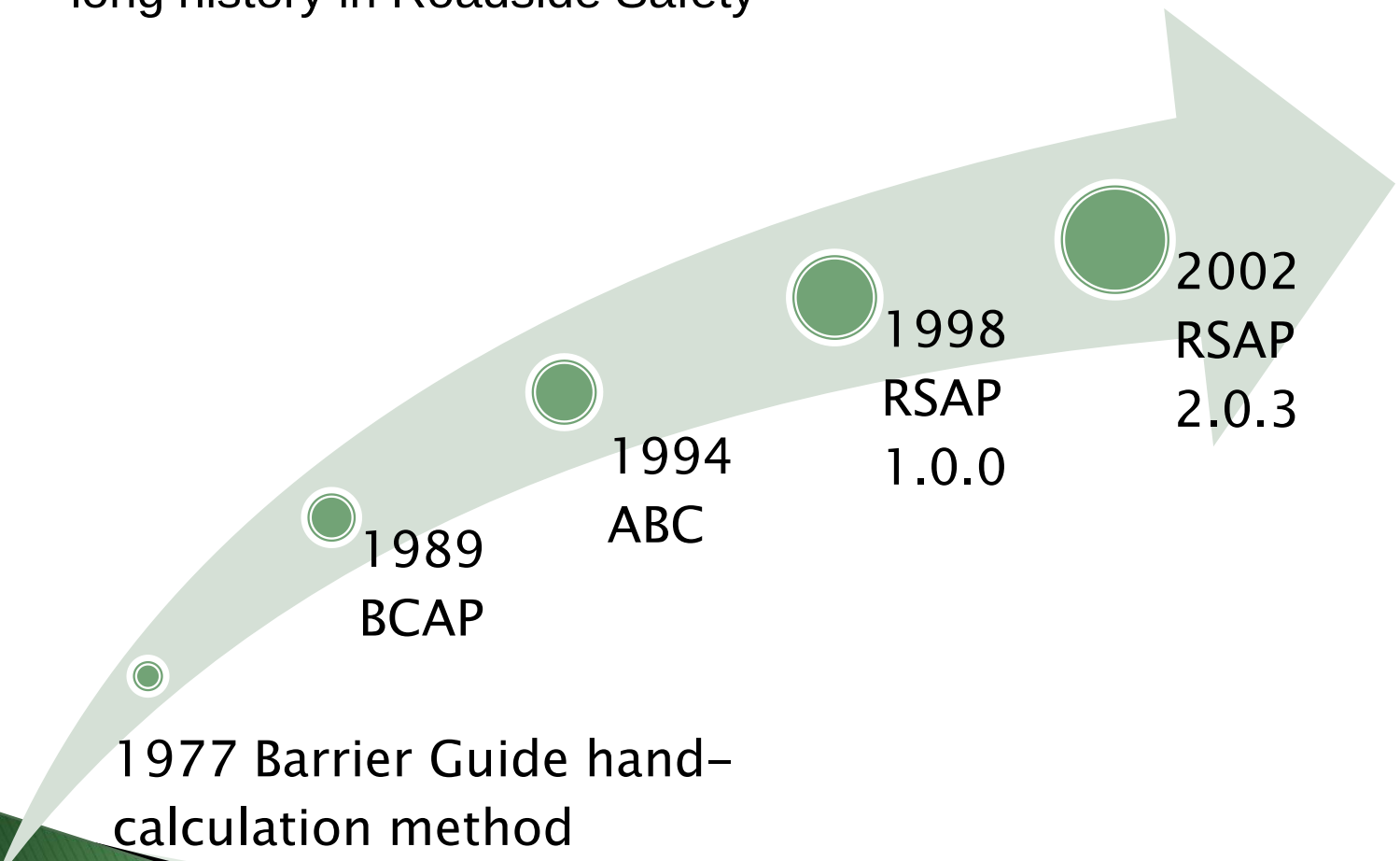
BENFIT COST RATIO

$$BCR = \frac{\text{Reduction in crash costs}}{\text{Cost of the Improvement}}$$

RSAPv3 calculates and ranks the BCR of alternatives to find the “best” roadside treatment option.

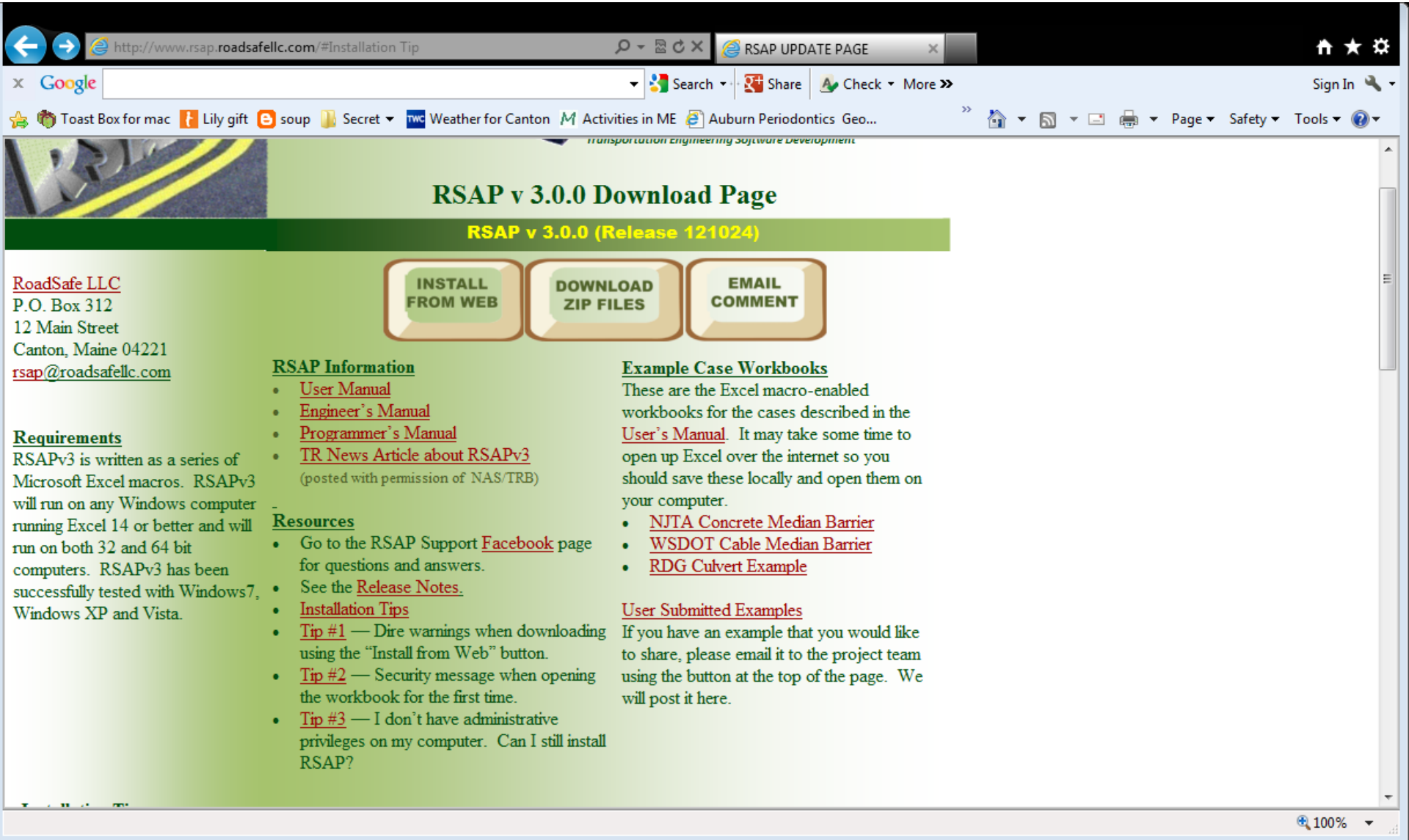
History

Encroachment-Based Benefit-Cost Methods have a long history in Roadside Safety



Where can I get RSAPv3?

http://www.rsap.roadsafellc.com/



Current Version

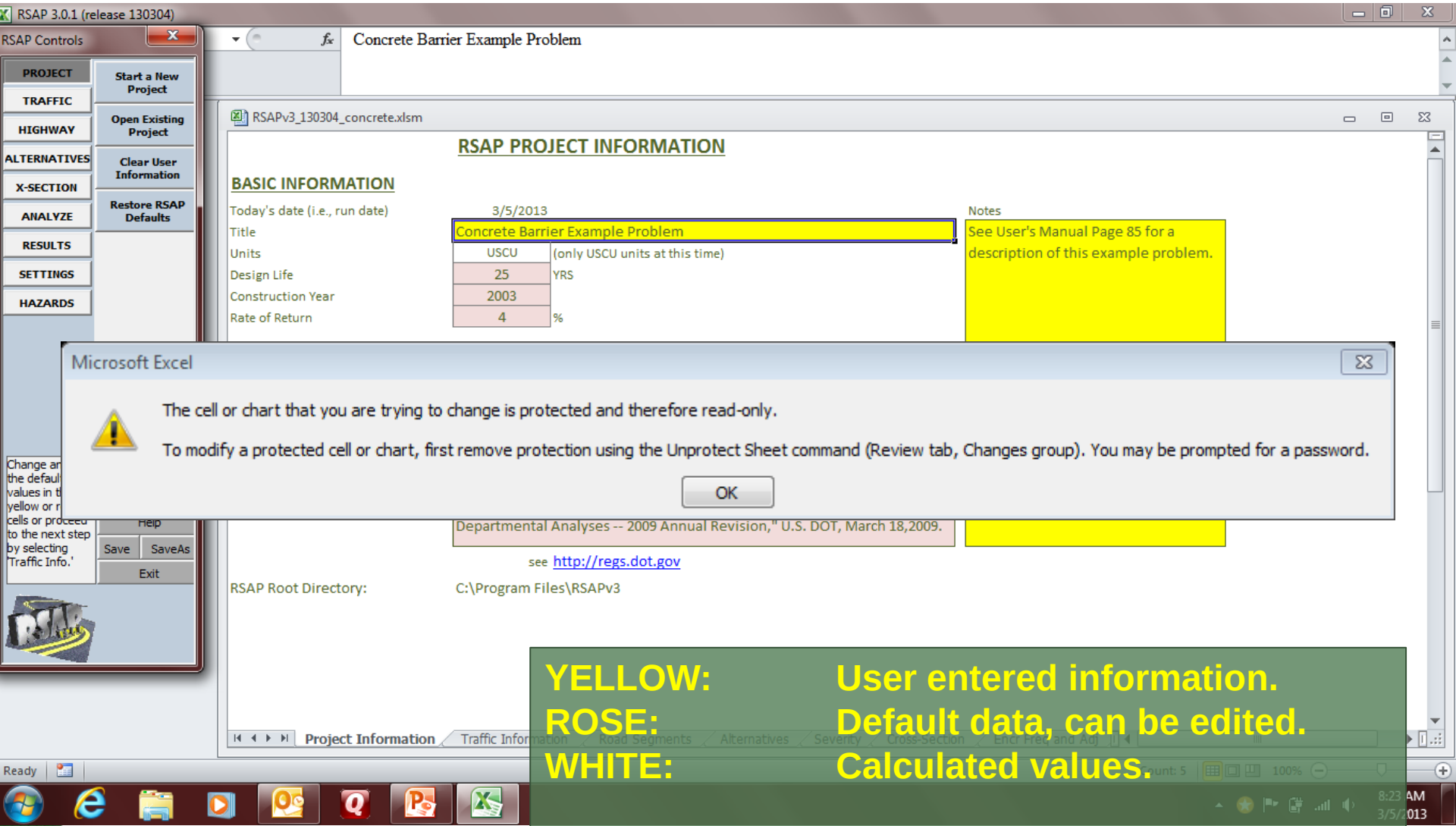
- RSAPv3 is actually a group of Excel Macros → Excel must be installed on your computer.
- Current release is RSAP 3.0.1 release 130304.
- Release 121024 and later run on either 32 or 64 bit computers.
- Same code runs on both architectures regardless of whether you have the 32 or 64 bit version of excel installed.
- If you have Excel 12 (i.e., Windows 2007) you need a slightly different version → contact the development team.
- Register your copy so you are notified about updates, changes and training opportunities.

Remember:
Enable editing after download

Example Problem

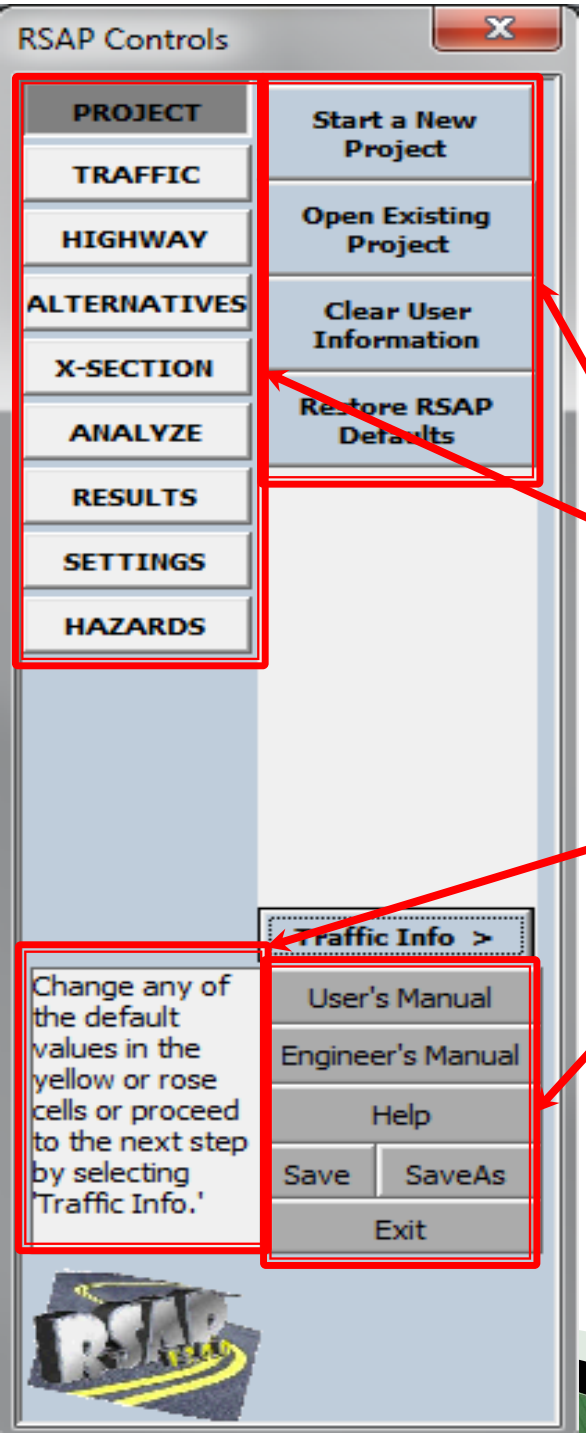
Median Barrier Alternatives on a High-Speed, High-Volume Divided Highway

Christine E. Carrigan, P.E., Ph.D.



YELLOW: User entered information.
ROSE: Default data, can be edited.
WHITE: Calculated values.

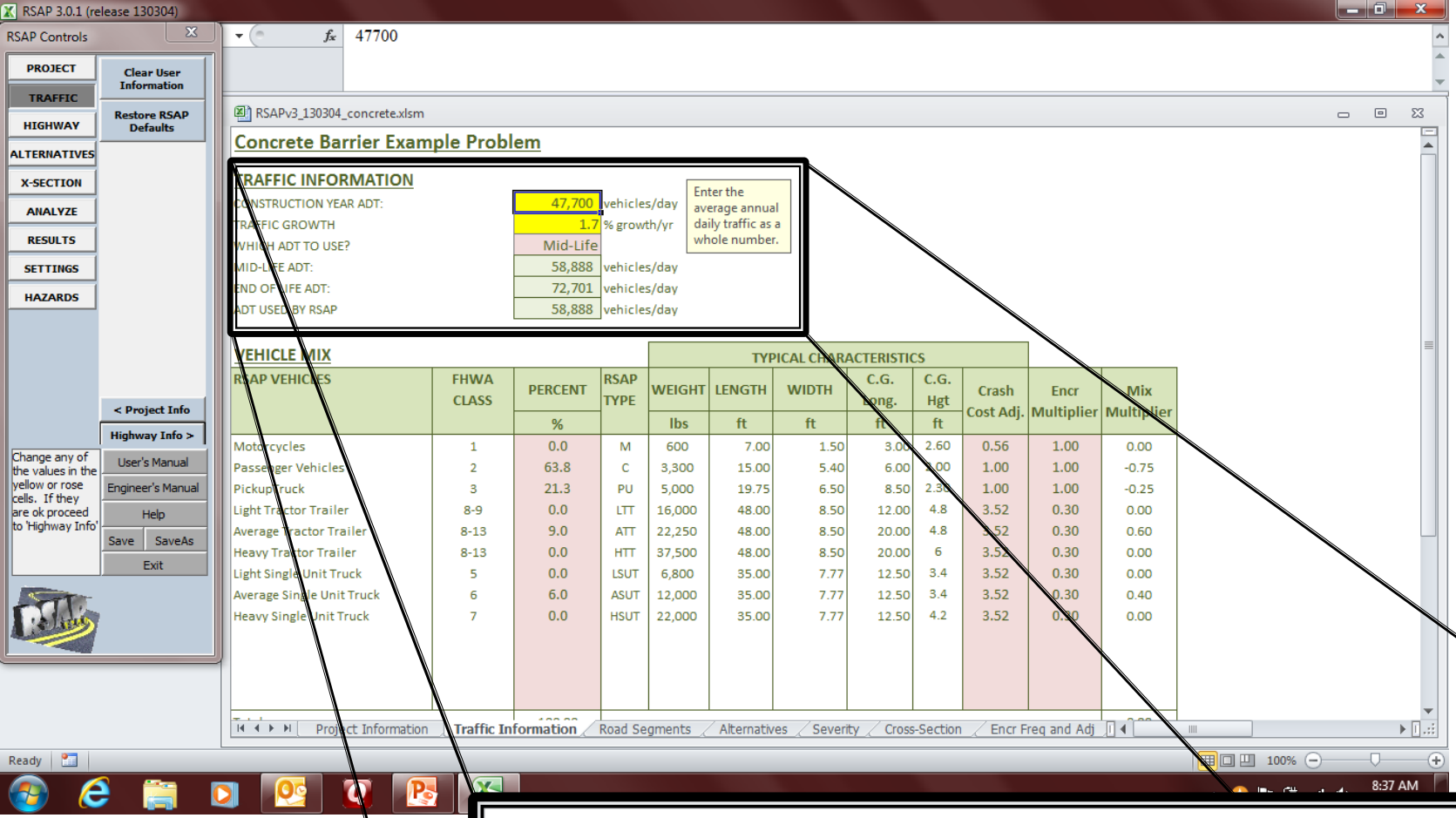
Note: Each term and input cell is defined in the User's Manual.



- RSAP Controls
  - Always on the left side of screen.
  - Work flows from:
    - Top to bottom
    - Left to right
  - Correspond to each worksheet.
  - Button options change with the context of the worksheet.
  - Hints about what to do next.
  - General purpose buttons – available all the time.

Our Focus: Example Problem

- Entry of Project Data
  - Traffic characteristics
  - Highway types
  - Highway characteristics
  - Properly locating data
  - Roadside cross-section
- Analysis Settings
- Results

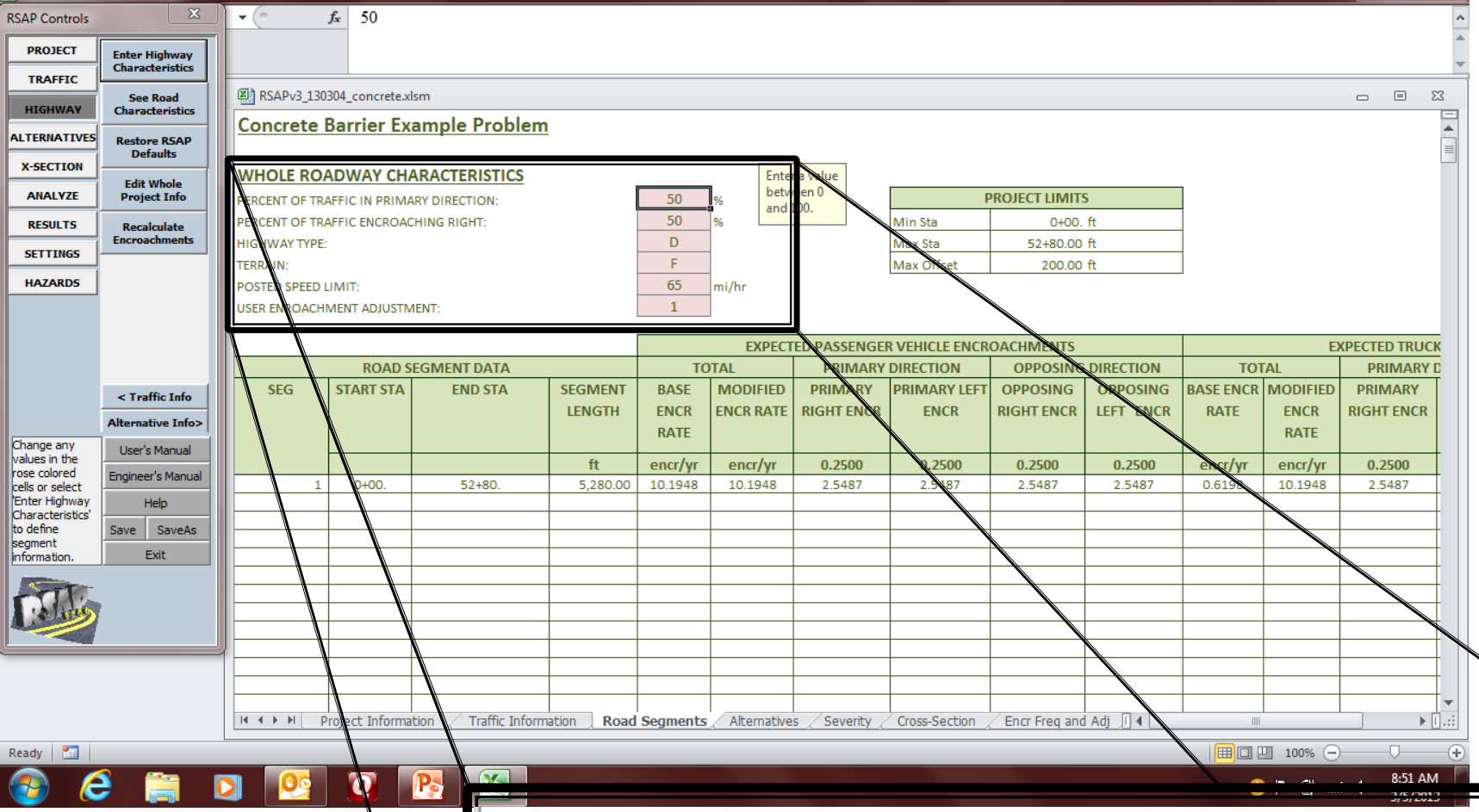


Concrete Barrier Example Problem

TRAFFIC INFORMATION

CONSTRUCTION YEAR ADT:	47,700	vehicles/day
TRAFFIC GROWTH	1.7	% growth/yr
WHICH ADT TO USE?	Mid-Life	
MID-LIFE ADT:	58,888	vehicles/day
END OF LIFE ADT:	72,701	vehicles/day
ADT USED BY RSAP	58,888	vehicles/day

Enter the average annual daily traffic as a whole number.

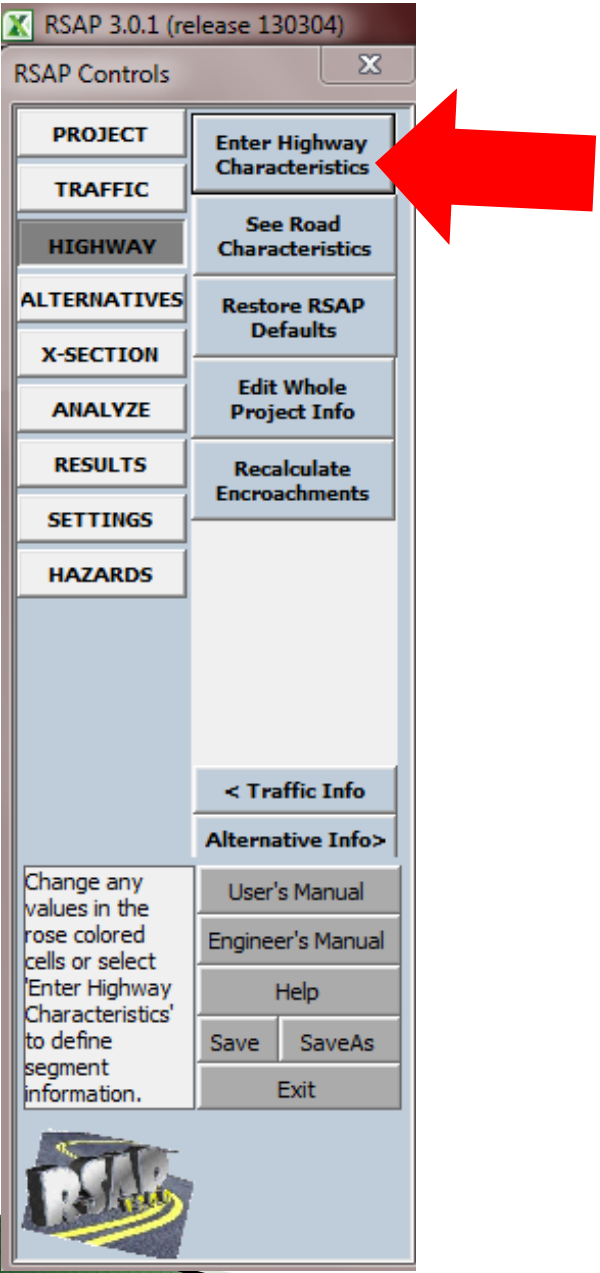


WHOLE ROADWAY CHARACTERISTICS

PERCENT OF TRAFFIC IN PRIMARY DIRECTION:	50	%
PERCENT OF TRAFFIC ENCROACHING RIGHT:	50	%
HIGHWAY TYPE:	D	
TERRAIN:	F	
POSTED SPEED LIMIT:	65	mi/hr
USER ENROACHMENT ADJUSTMENT:	1	

Highway Types

- Undivided
- Divided
- One way


RSAP 3.0.1 (release 130304)
RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Enter Highway Characteristics
See Road Characteristics
Restore RSAP Defaults
Edit Whole Project Info
Recalculate Encroachments
< Traffic Info
Alternative Info>
Change any values in the rose colored cells or select 'Enter Highway Characteristics' to define segment information.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit

RSAP 3.0.1 (release 130304)

RSAP Controls

PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS

Segment Project
See Road Characteristics
Clear User Information
< Traffic Info
Alternative Info>

Enter the road characteristics in the yellow cells. When finished select 'Segment Project.'

User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit

RSAPv3_130304_concrete.xlsm

Concrete Barrier Example Problem

WHOLE ROADWAY CHARACTERISTICS

PERCENT OF TRAFFIC IN PRIMARY DIRECTION:	50	%
PERCENT OF TRAFFIC ENCROACHING RIGHT:	50	%
HIGHWAY TYPE:	D	
TERRAIN:	F	
POSTED SPEED LIMIT:	65	mi/hr
USER ENROACHMENT ADJUSTMENT:	1	

PROJEC	
Min Sta	
Max Sta	5
Max Offset	

USER-ENTERED CHARACTERISTICS

Total segments =

START STATION	END STATION	KEYWORD	VALUE	SEG.
0+00.	52+80.	LANES TOTAL	4	
0+00.	52+80.	LNWIDTH	2	
0+00.	52+80.	MED_SHLR_WIDTH	27	
		MED_WIDTH		
		PRM_CURV_RAD		
		PRM_GRADE		
		PRM_NUM_LNS		
		RMBLSTRIP		

RSAP DEFAULT HIGHWAY CHARACTERISTIC

DIVIDED HIGHWAYS

ACCESS DENSITY	0	poin
LANES TOTAL	4	
LNWIDTH	12	
MED_SHLR_WIDTH	10	
MED_WIDTH	30	
PRM_CURV_RAD	T	
PRM_GRADE	0	
PRM_NUM_LNS	2	
RMBLSTRIP	FALSE	TRUE
RT_SHLR_WIDTH	6	

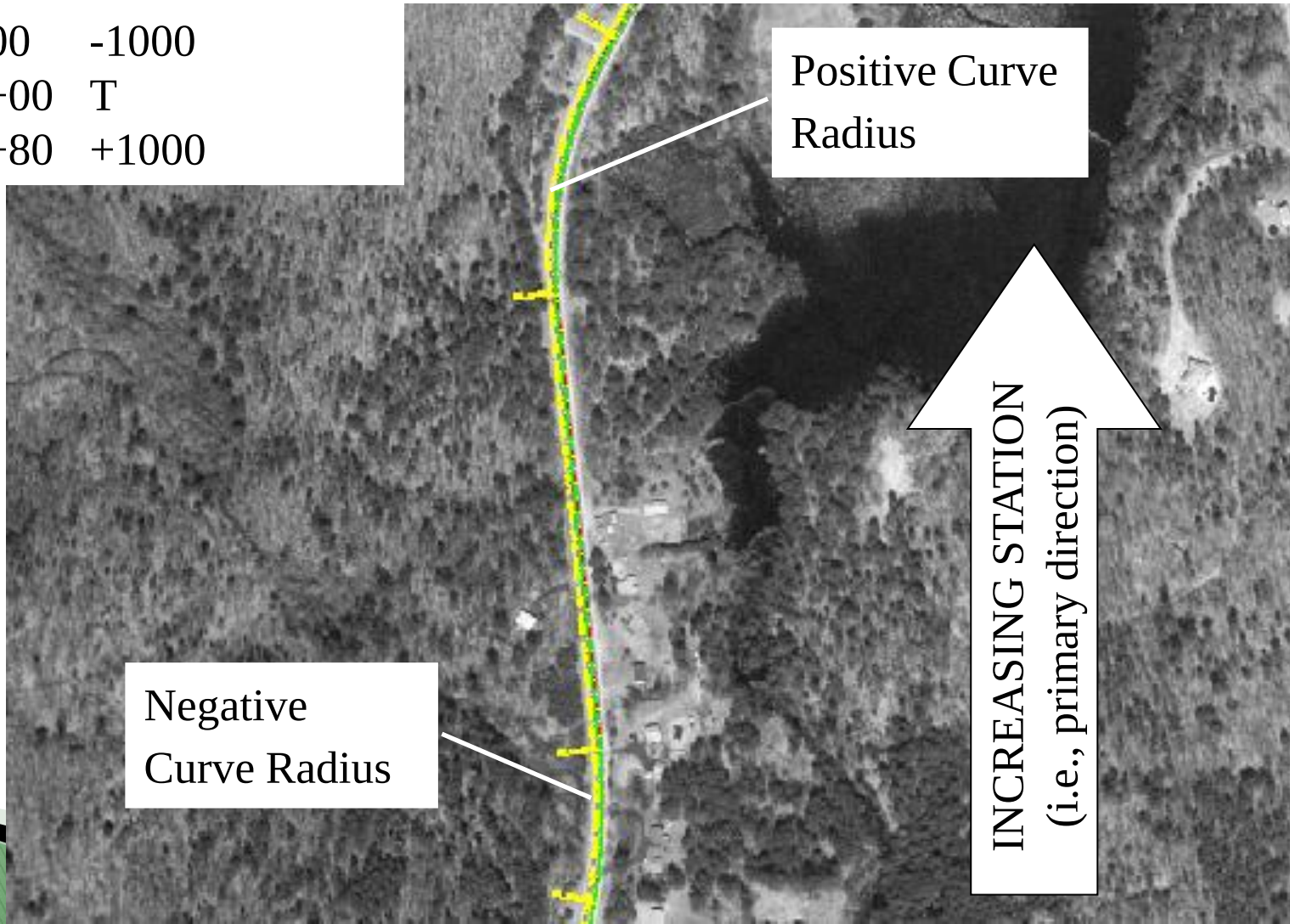
RSAPv3 includes many dropdown menus that provide the appropriate input options.

Project Information | Traffic Information | Road Segments | Alternatives | Severity | Cross-Section | Encr

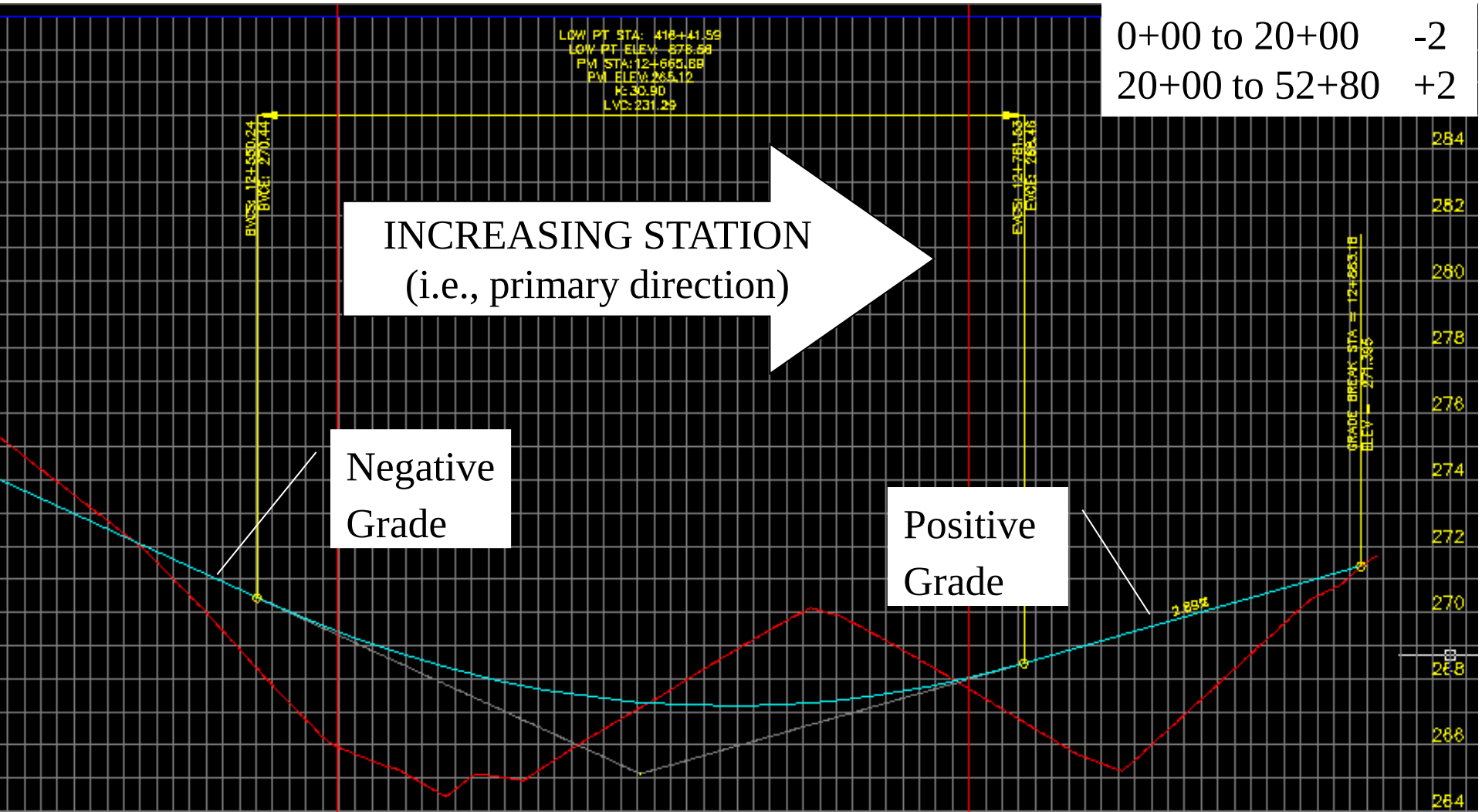
Ready

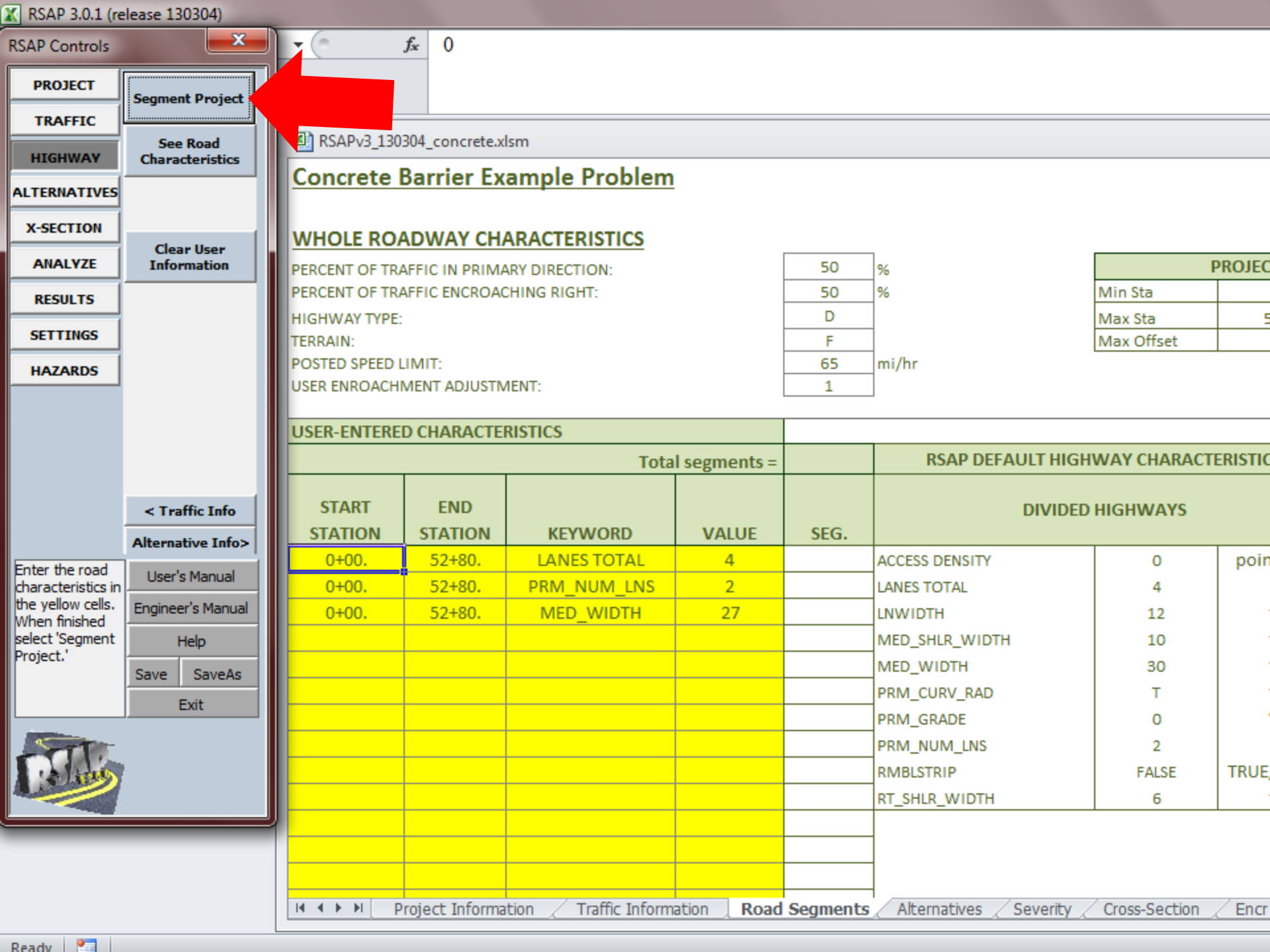
Highway Characteristics: prm_curv_rad (feet)

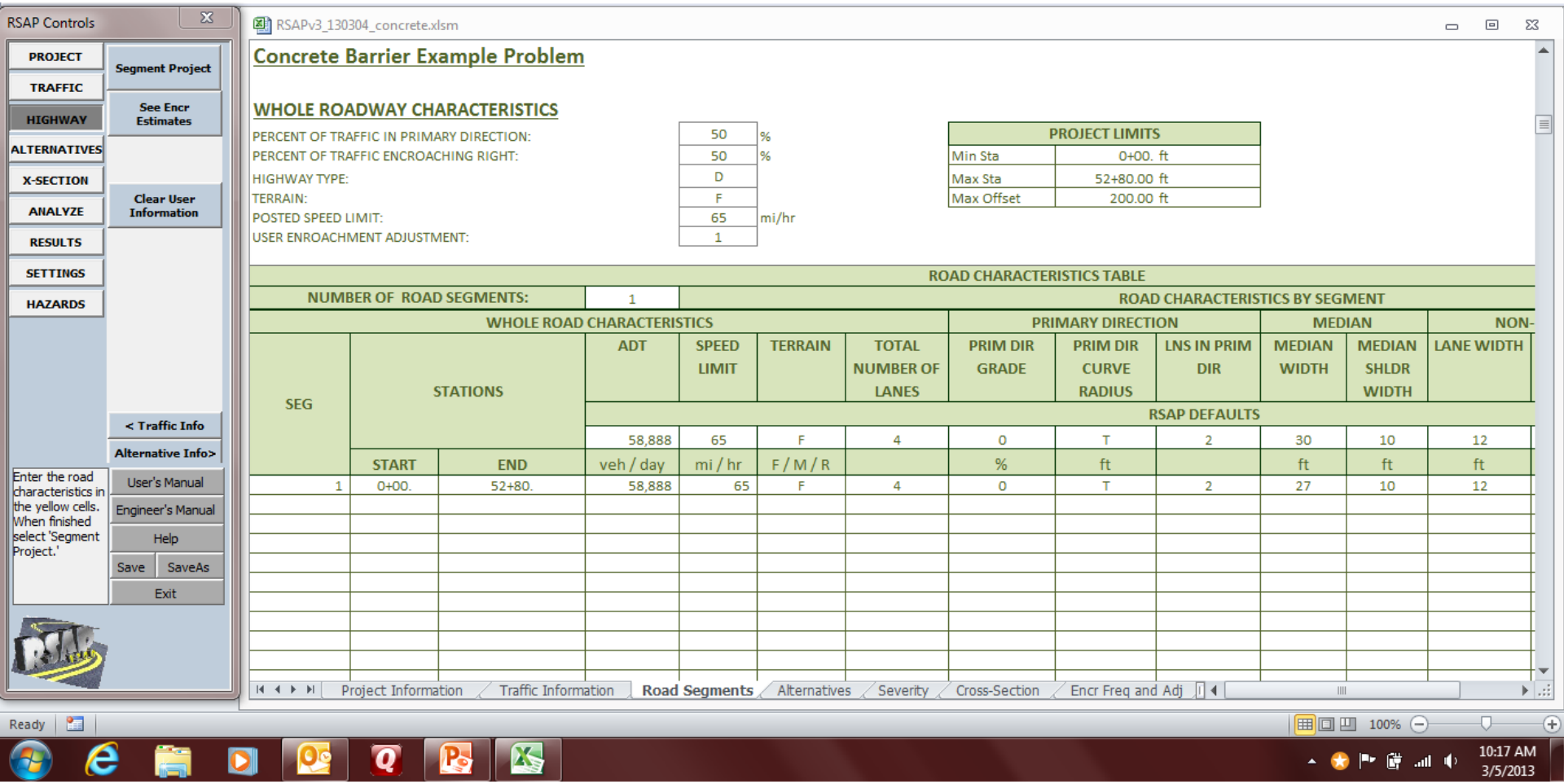
0+00 to 30+00 -1000
30+00 to 45+00 T
45+00 to 52+80 +1000

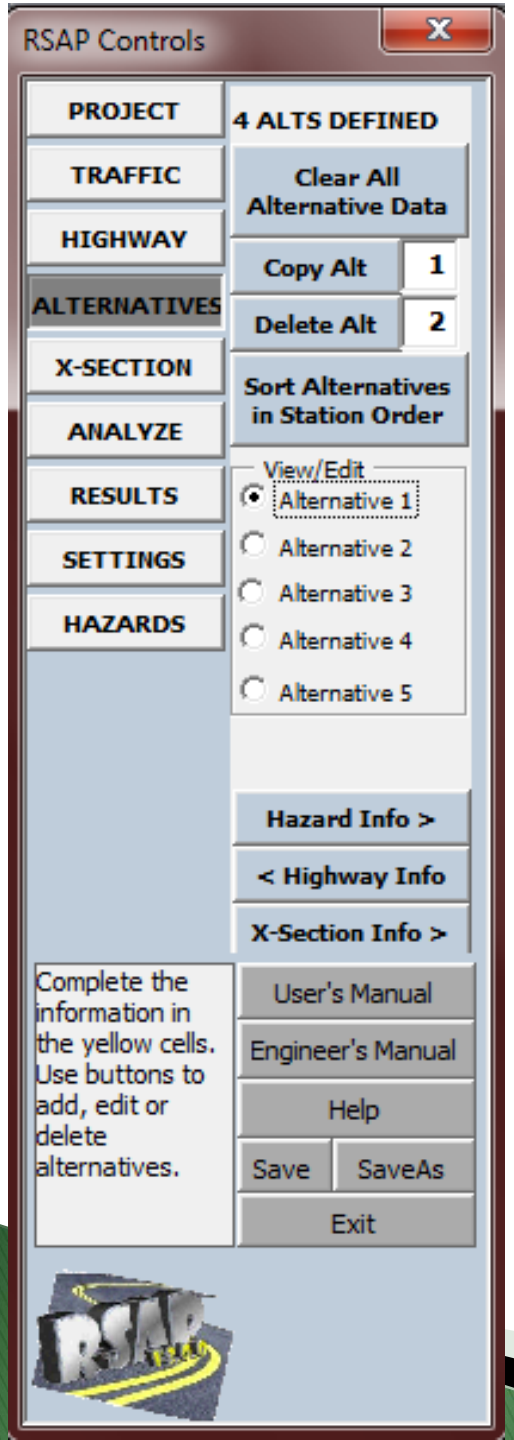


Highway Characteristics: prm_grade (percent)




RSAP 3.0.1 (release 130304)
RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Segment Project
See Road Characteristics
Clear User Information
< Traffic Info
Alternative Info>
Enter the road characteristics in the yellow cells. When finished select 'Segment Project.'
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
Concrete Barrier Example Problem
WHOLE ROADWAY CHARACTERISTICS
PERCENT OF TRAFFIC IN PRIMARY DIRECTION: 50 %
PERCENT OF TRAFFIC ENCROACHING RIGHT: 50 %
HIGHWAY TYPE: D
TERRAIN: F
POSTED SPEED LIMIT: 65 mi/hr
USER ENROACHMENT ADJUSTMENT: 1
PROJEC
Min Sta
Max Sta
Max Offset
USER-ENTERED CHARACTERISTICS
Total segments =
START STATION
END STATION
KEYWORD
VALUE
SEG.
0+00. 52+80. LANES TOTAL 4
0+00. 52+80. PRM_NUM_LNS 2
0+00. 52+80. MED_WIDTH 27
RSAP DEFAULT HIGHWAY CHARACTERISTIC
DIVIDED HIGHWAYS
ACCESS DENSITY 0
LANES TOTAL 4
LNWIDTH 12
MED_SHLR_WIDTH 10
MED_WIDTH 30
PRM_CURV_RAD T
PRM_GRADE 0
PRM_NUM_LNS 2
RMBLSTRIP FALSE
RT_SHLR_WIDTH 6
Project Information
Traffic Information
Road Segments
Alternatives
Severity
Cross-Section
Ready


RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Segment Project
See Encr Estimates
Clear User Information
< Traffic Info
Alternative Info>
Enter the road characteristics in the yellow cells. When finished select 'Segment Project.'
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
Concrete Barrier Example Problem
WHOLE ROADWAY CHARACTERISTICS
PERCENT OF TRAFFIC IN PRIMARY DIRECTION: 50 %
PERCENT OF TRAFFIC ENCROACHING RIGHT: 50 %
HIGHWAY TYPE: D
TERRAIN: F
POSTED SPEED LIMIT: 65 mi/hr
USER ENROACHMENT ADJUSTMENT: 1
PROJECT LIMITS
Min Sta 0+00. ft
Max Sta 52+80.00 ft
Max Offset 200.00 ft
ROAD CHARACTERISTICS TABLE
NUMBER OF ROAD SEGMENTS: 1
ROAD CHARACTERISTICS BY SEGMENT
WHOLE ROAD CHARACTERISTICS
PRIMARY DIRECTION
MEDIAN
NON-
SEG
STATIONS
ADT
SPEED LIMIT
TERRAIN
TOTAL NUMBER OF LANES
PRIM DIR GRADE
PRIM DIR CURVE RADIUS
LNS IN PRIM DIR
MEDIAN WIDTH
MEDIAN SHLDR WIDTH
LANE WIDTH
RSAP DEFAULTS
58,888 65 F 4 0 T 2 30 10 12
START
END
veh / day
mi / hr
F / M / R
%
ft
ft
ft
ft
1 0+00. 52+80. 58,888 65 F 4 0 T 2 27 10 12
Project Information
Traffic Information
Road Segments
Alternatives
Severity
Cross-Section
Encr Freq and Adj
Ready
100%
10:17 AM
3/5/2013

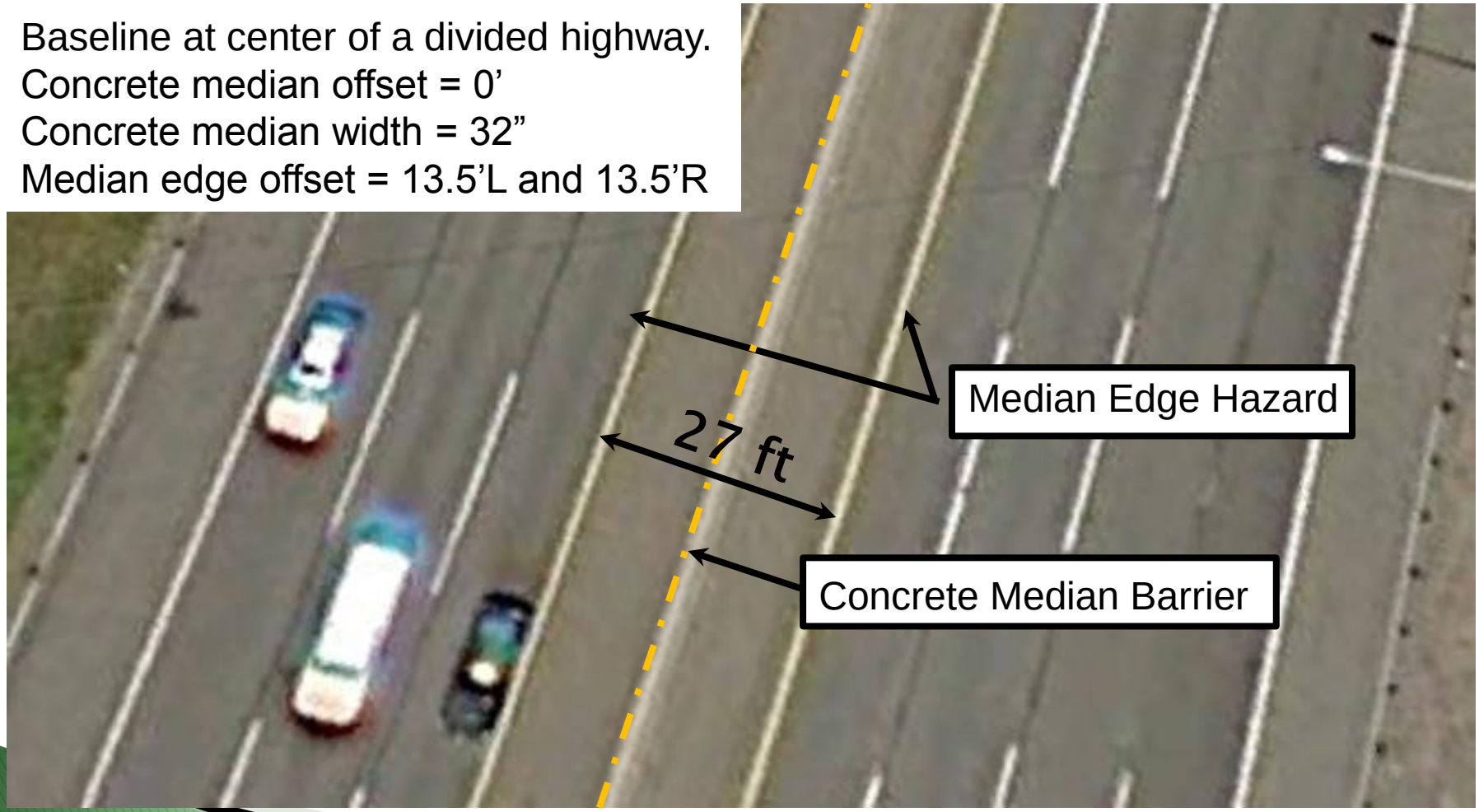


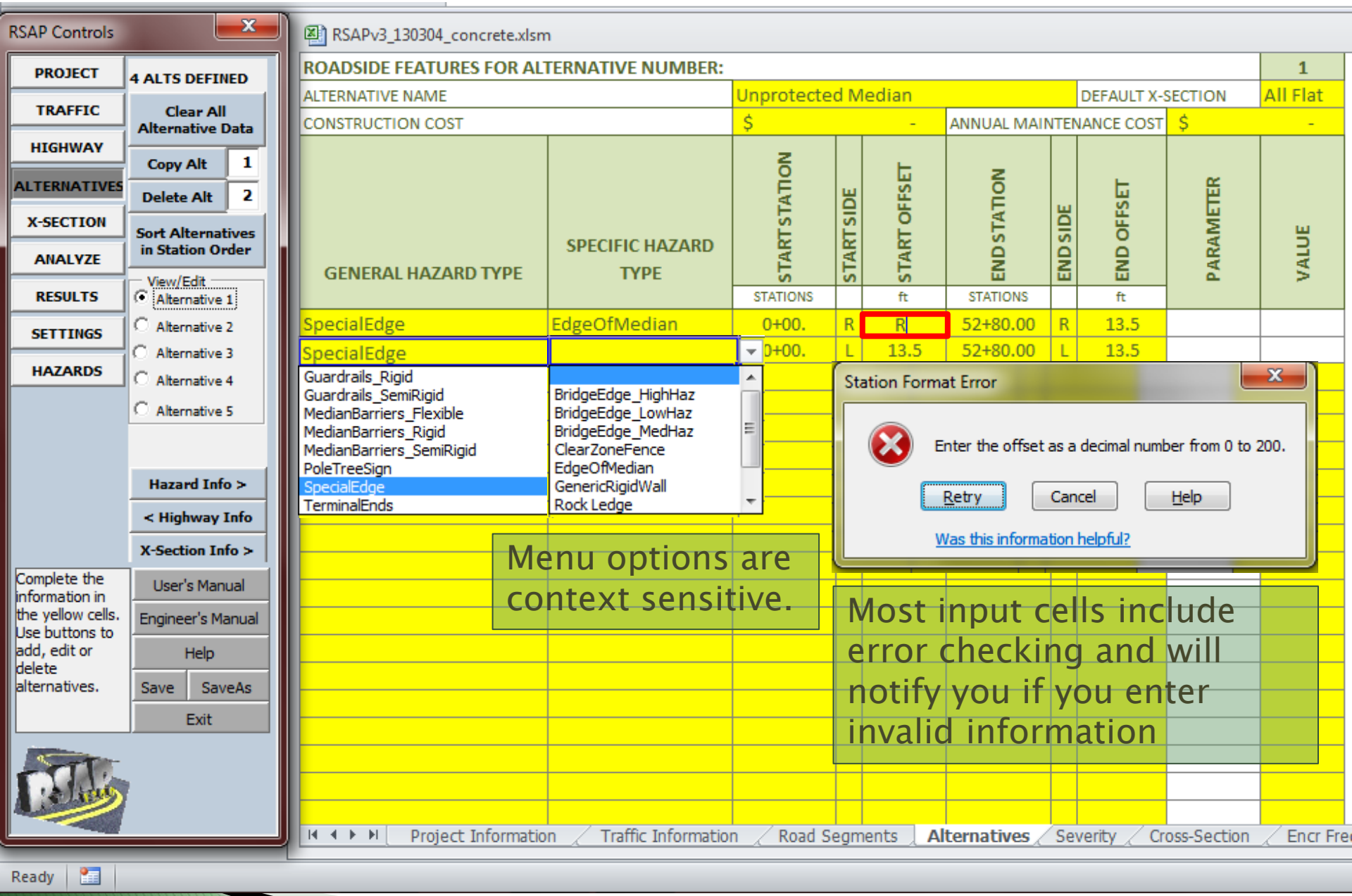
Roadside Alternatives

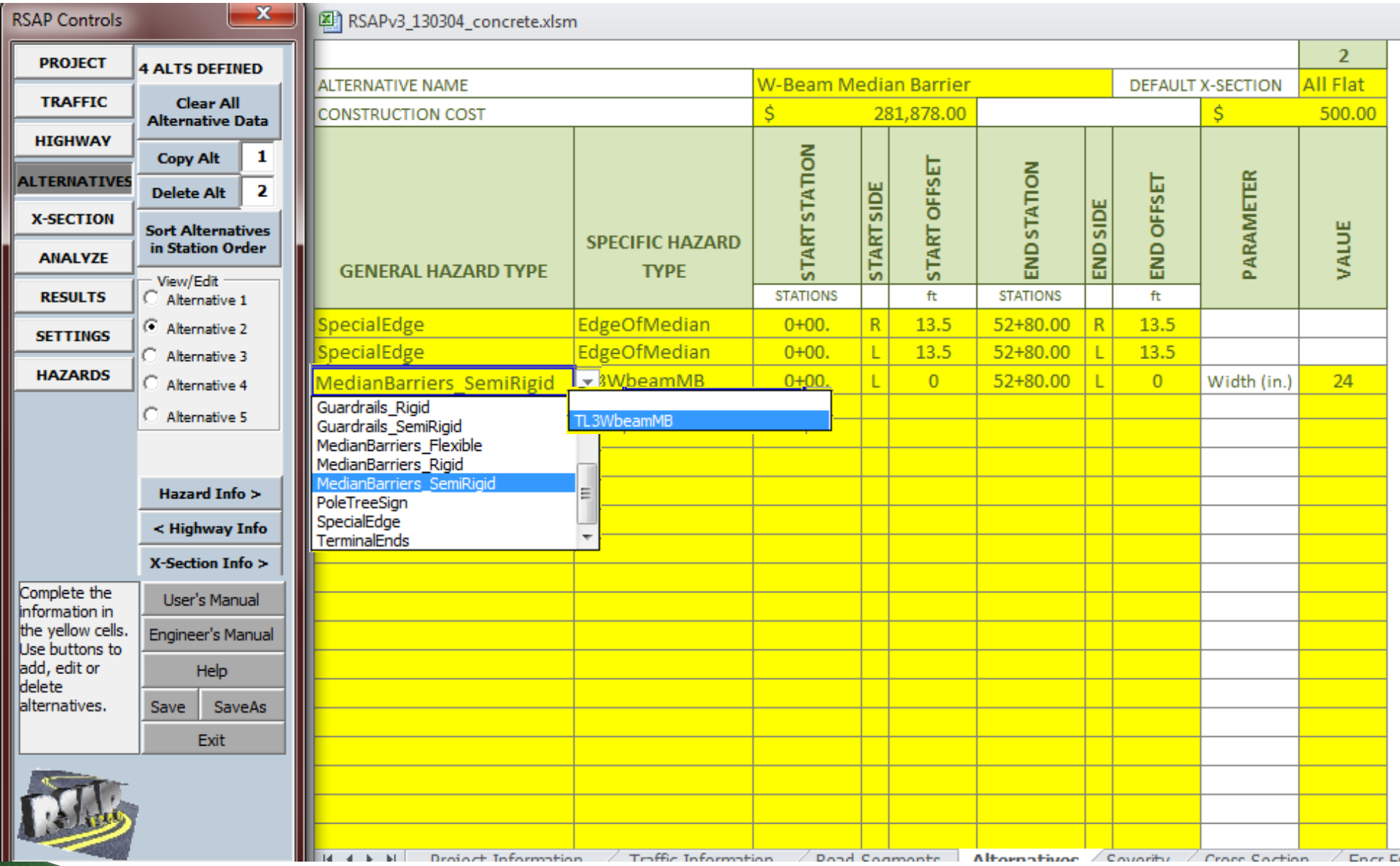
- RSAPv3 will evaluate up to five alternatives with up to 25 segments at one time.
- Enter from lowest to highest construction cost.
  - Alternative 1: Unprotected median
  - Alternative 2: W-beam median
  - Alternative 3: TL-3+ concrete median
  - Alternative 4: TL5 NJ Shape median

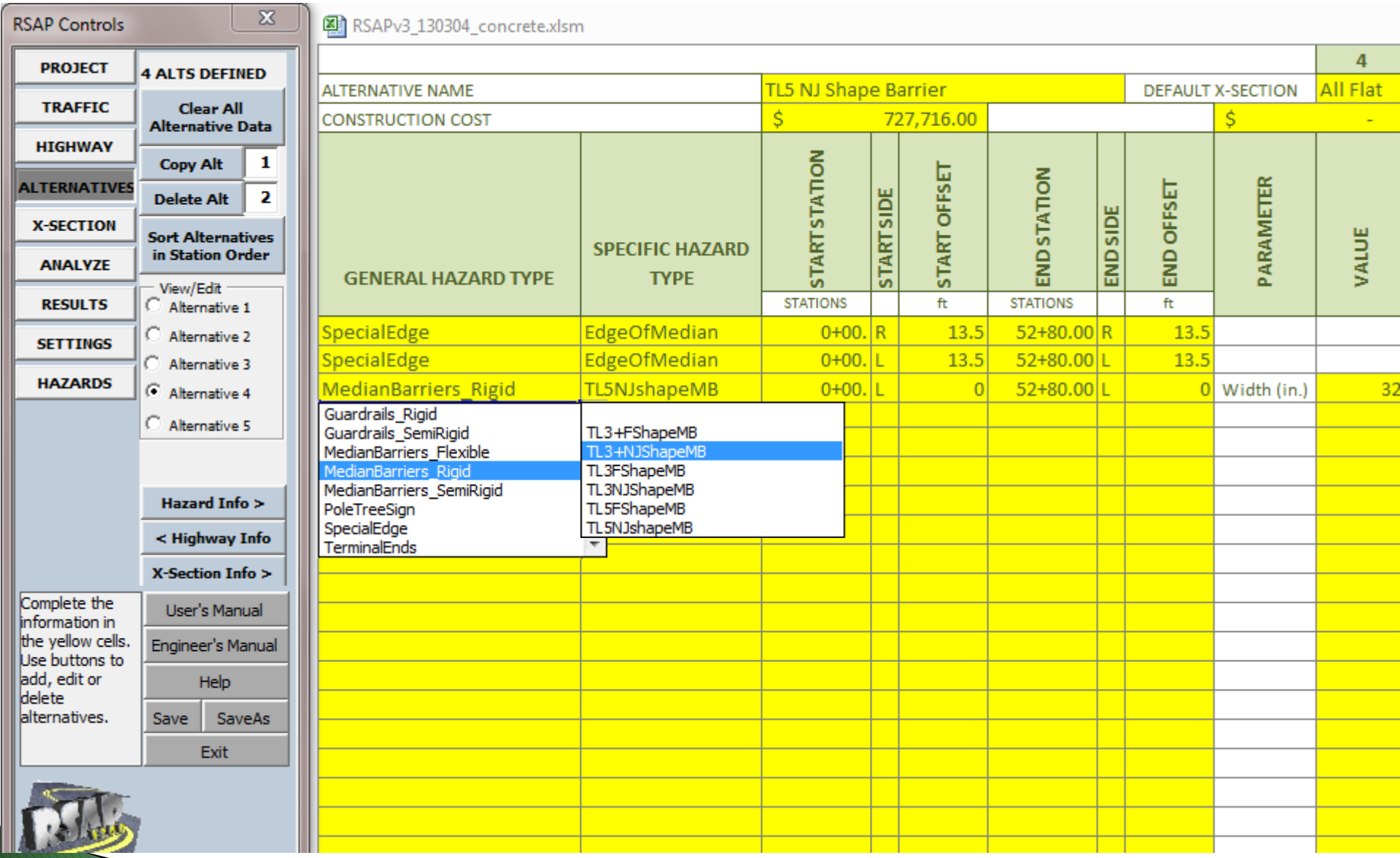
Locating Hazards

Baseline at center of a divided highway.
Concrete median offset = 0’
Concrete median width = 32”
Median edge offset = 13.5’L and 13.5’R



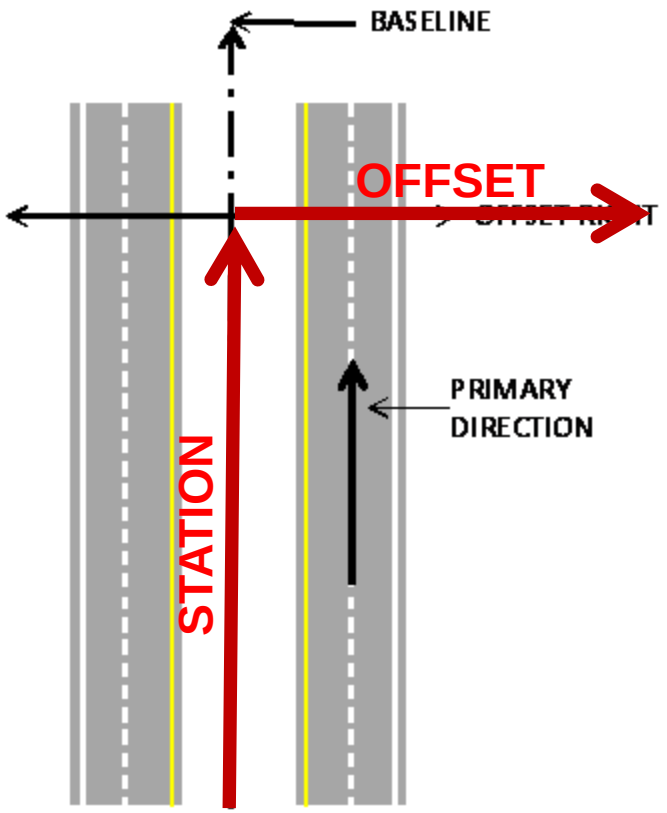

RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
4 ALTS DEFINED
Clear All Alternative Data
Copy Alt 1
Delete Alt 2
Sort Alternatives in Station Order
View/Edit
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Hazard Info >
< Highway Info
X-Section Info >
Complete the information in the yellow cells. Use buttons to add, edit or delete alternatives.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
ROADSIDE FEATURES FOR ALTERNATIVE NUMBER: 1
ALTERNATIVE NAME Unprotected Median
DEFAULT X-SECTION All Flat
CONSTRUCTION COST $ -
ANNUAL MAINTENANCE COST $ -
GENERAL HAZARD TYPE
SPECIFIC HAZARD TYPE
START STATION
START SIDE
START OFFSET
END STATION
END SIDE
END OFFSET
PARAMETER
VALUE
STATIONS
ft
STATIONS
ft
SpecialEdge EdgeOfMedian 0+00. R R 52+80.00 R 13.5
SpecialEdge 0+00. L 13.5 52+80.00 L 13.5
Guardrails_Rigid
Guardrails_SemiRigid
MedianBarriers_Flexible
MedianBarriers_Rigid
MedianBarriers_SemiRigid
PoleTreeSign
SpecialEdge
TerminalEnds
BridgeEdge_HighHaz
BridgeEdge_LowHaz
BridgeEdge_MedHaz
ClearZoneFence
EdgeOfMedian
GenericRigidWall
Rock Ledge
Station Format Error
Enter the offset as a decimal number from 0 to 200.
Retry
Cancel
Help
Was this information helpful?
Menu options are context sensitive.
Most input cells include error checking and will notify you if you enter invalid information
Project Information
Traffic Information
Road Segments
Alternatives
Severity
Cross-Section
Ready


RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
4 ALTS DEFINED
Clear All Alternative Data
Copy Alt 1
Delete Alt 2
Sort Alternatives in Station Order
View/Edit
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Hazard Info >
< Highway Info
X-Section Info >
Complete the information in the yellow cells. Use buttons to add, edit or delete alternatives.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
2
ALTERNATIVE NAME
W-Beam Median Barrier
DEFAULT X-SECTION
All Flat
CONSTRUCTION COST
$ 281,878.00
$ 500.00
GENERAL HAZARD TYPE
SPECIFIC HAZARD TYPE
START STATION
START SIDE
START OFFSET
END STATION
END SIDE
END OFFSET
PARAMETER
VALUE
STATIONS
ft
STATIONS
ft
SpecialEdge EdgeOfMedian 0+00. R 13.5 52+80.00 R 13.5
SpecialEdge EdgeOfMedian 0+00. L 13.5 52+80.00 L 13.5
MedianBarriers_SemiRigid 0+00. L 0 52+80.00 L 0 Width (in.) 24
Guardrails_Rigid
Guardrails_SemiRigid
MedianBarriers_Flexible
MedianBarriers_Rigid
MedianBarriers_SemiRigid
PoleTreeSign
SpecialEdge
TerminalEnds
TL3WbeamMB
Project Information
Traffic Information
Road Segments
Alternatives
Severity
Cross Section


RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
4 ALTS DEFINED
Clear All Alternative Data
Copy Alt 1
Delete Alt 2
Sort Alternatives in Station Order
View/Edit
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Hazard Info >
< Highway Info
X-Section Info >
Complete the information in the yellow cells. Use buttons to add, edit or delete alternatives.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
4
ALTERNATIVE NAME
TL5 NJ Shape Barrier
DEFAULT X-SECTION
All Flat
CONSTRUCTION COST
$ 727,716.00
$ -
GENERAL HAZARD TYPE
SPECIFIC HAZARD TYPE
START STATION
START SIDE
START OFFSET
END STATION
END SIDE
END OFFSET
PARAMETER
VALUE
STATIONS
ft
STATIONS
ft
SpecialEdge EdgeOfMedian 0+00. R 13.5 52+80.00 R 13.5
SpecialEdge EdgeOfMedian 0+00. L 13.5 52+80.00 L 13.5
MedianBarriers_Rigid TL5NJshapeMB 0+00. L 0 52+80.00 L 0 Width (in.) 32
Guardrails_Rigid
Guardrails_SemiRigid
MedianBarriers_Flexible
MedianBarriers_Rigid
MedianBarriers_SemiRigid
PoleTreeSign
SpecialEdge
TerminalEnds
TL3+FShapeMB
TL3+NJShapeMB
TL3FShapeMB
TL3NJShapeMB
TL5FShapeMB
TL5NJshapeMB

Locating Data

- Station→ Measured longitudinally in Stations in the Primary Direction.
- Offset→ Measured as a distance left or right from the BASELINE.
- The baseline is different for different highway types.

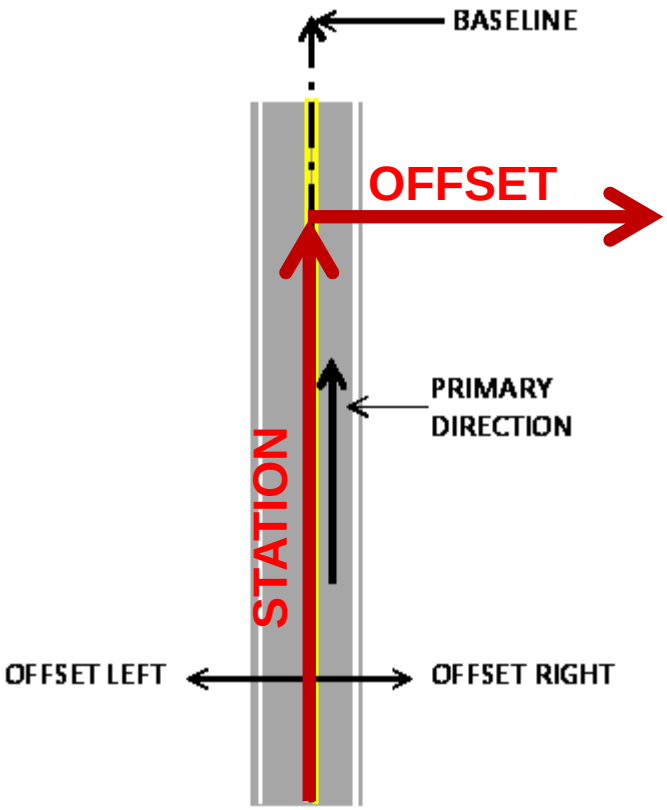


4 LANE DIVIDED

The baseline runs along the center-line of the median in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line.

Locating Data

- Station→ Measured longitudinally in Stations in the Primary Direction.
- Offset→ Measured as a distance left or right from the BASELINE.

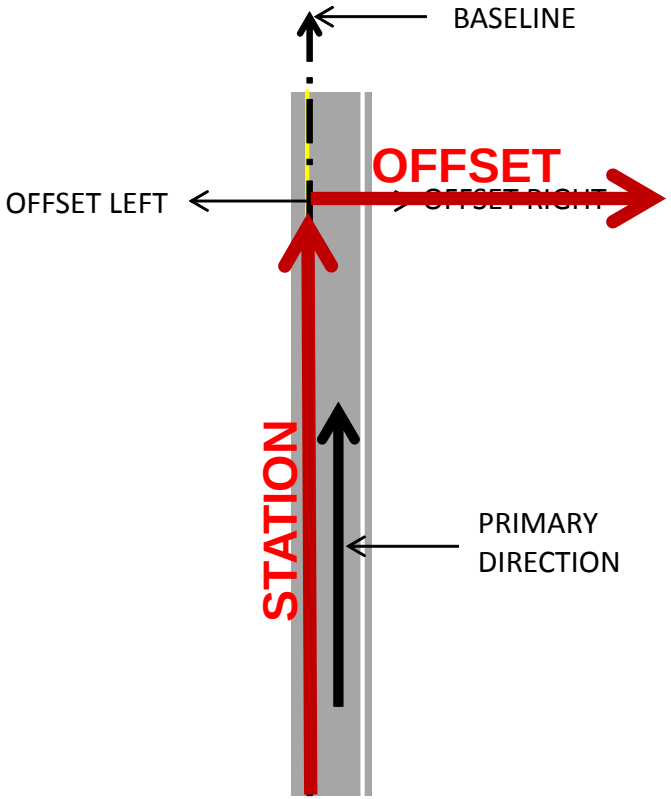


2 LANE UNDIVIDED

The baseline runs along the center-line of the undivided highway in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line.

Locating Data

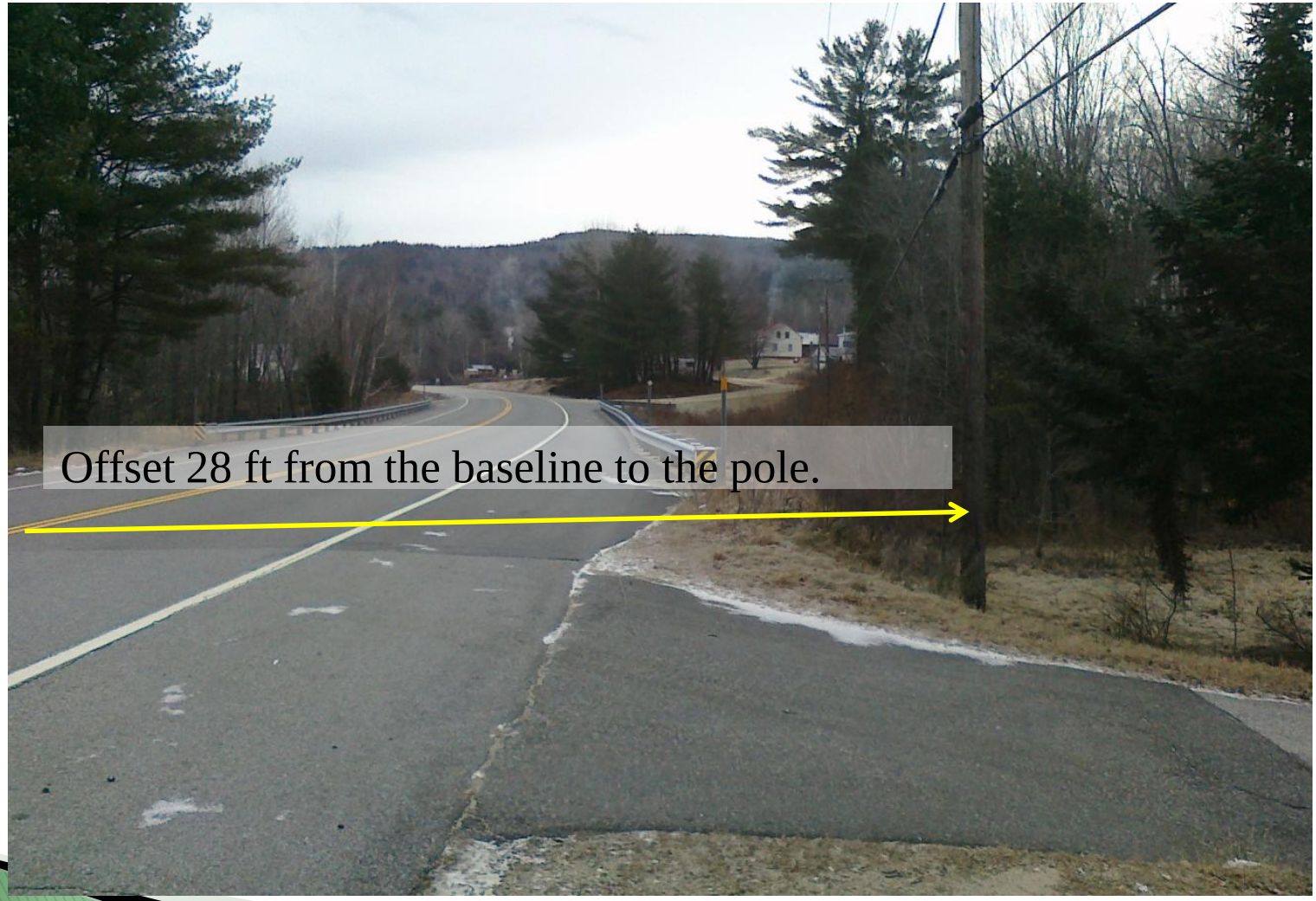
- Station→ Measured longitudinally in Stations in the Primary Direction.
- Offset→ Measured as a distance left or right from the BASELINE.



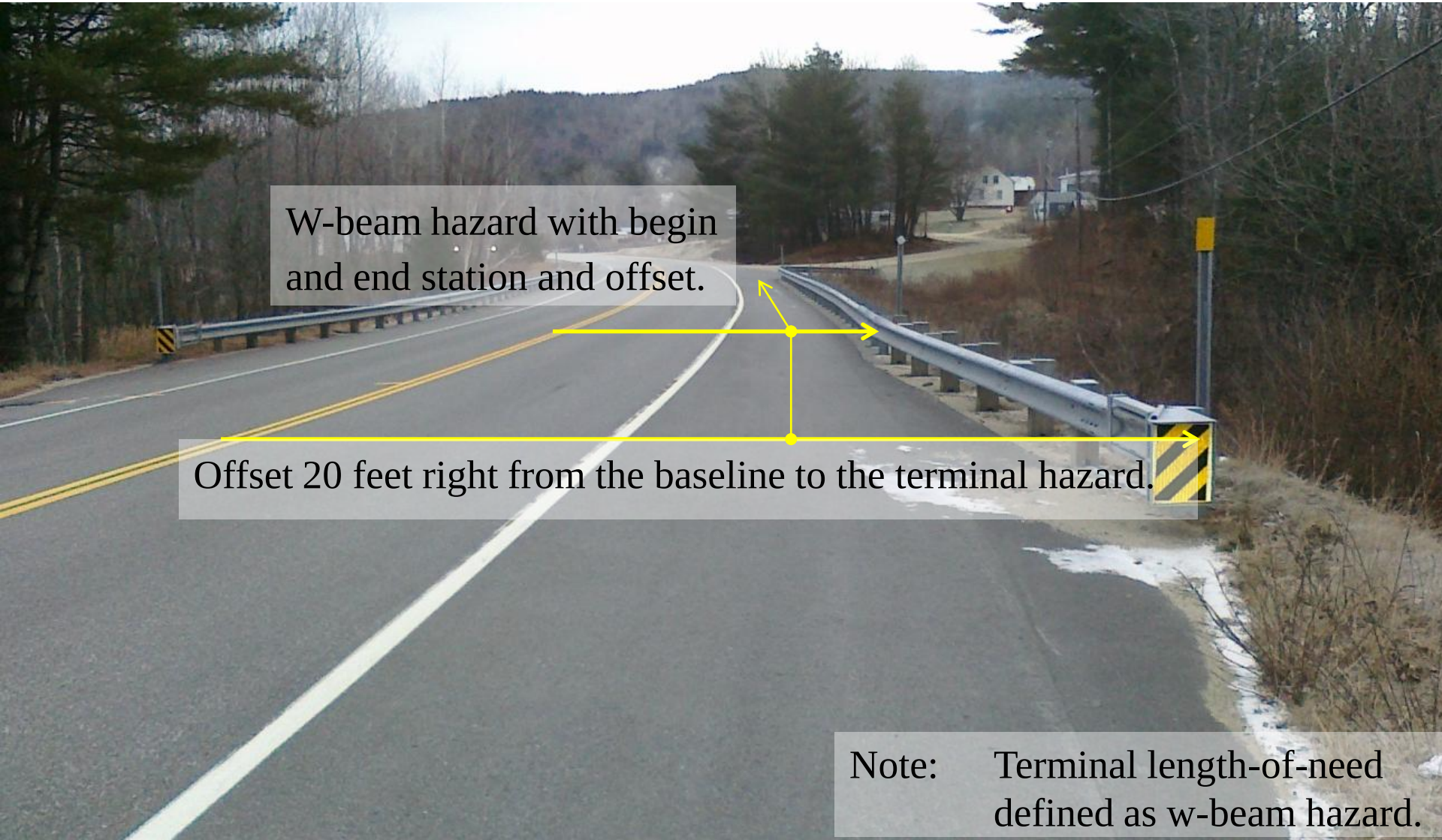
ONE WAY

The baseline runs along the left lane edge of the one-way road in the direction of increasing stationing. All objects are located as being a distance to the left or right of the base line. Use one-way roads for ramps or divided highways with independent alignments.

Locating Hazards



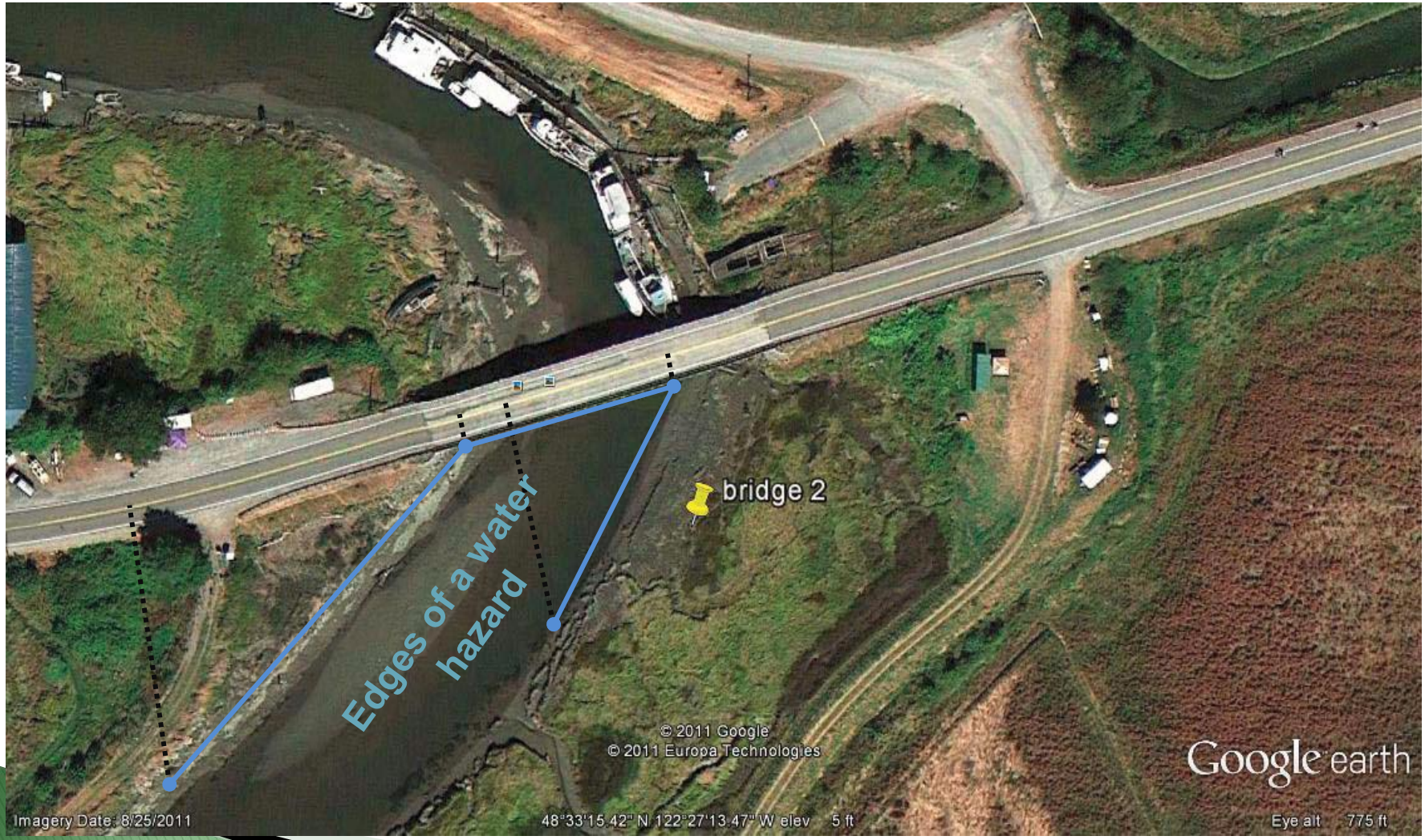
Locating hazards

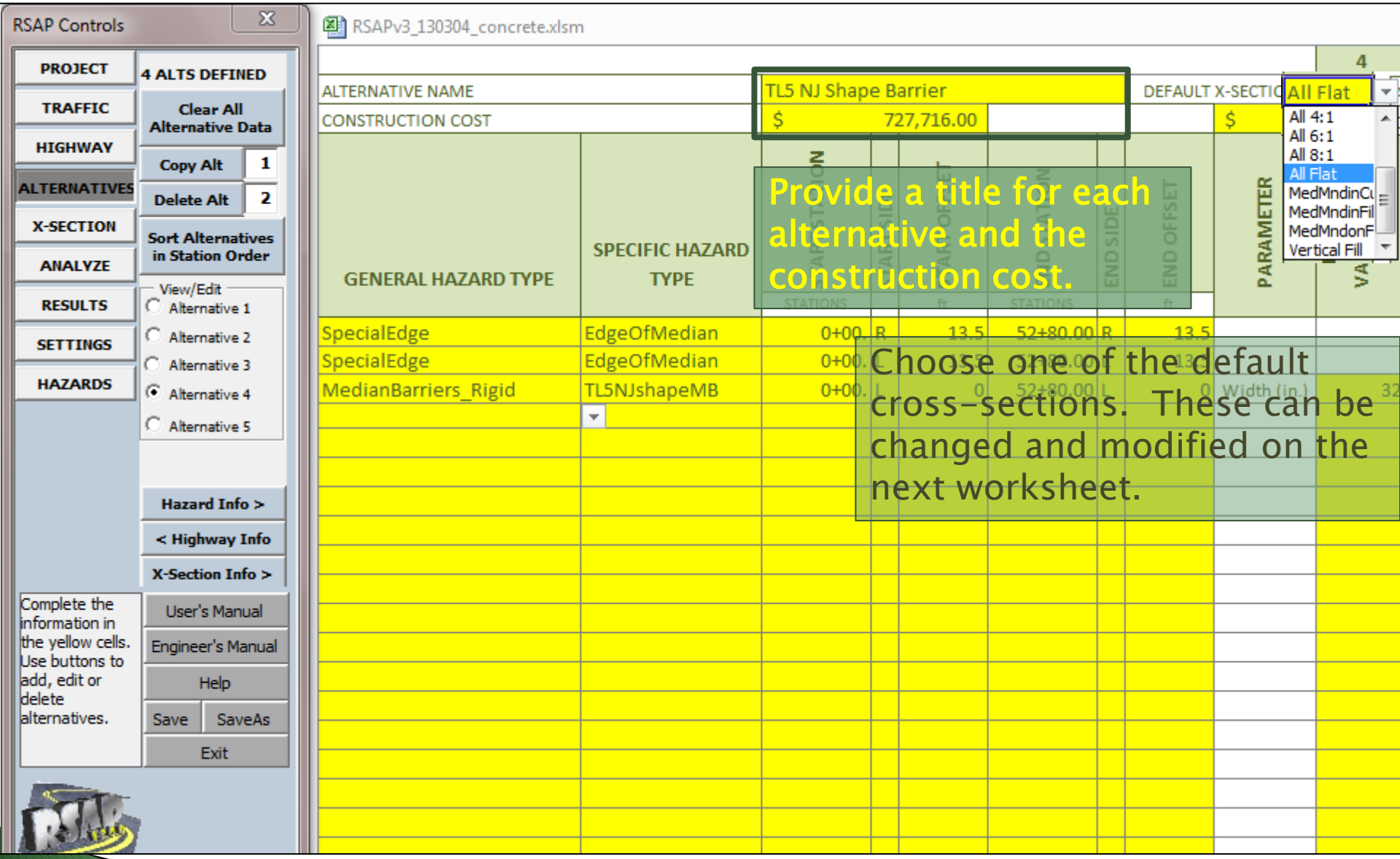


Note: Terminal length-of-need defined as w-beam hazard.

Locating Hazards

Baseline is always in middle of road




RSAP Controls
PROJECT
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ALTERNATIVES
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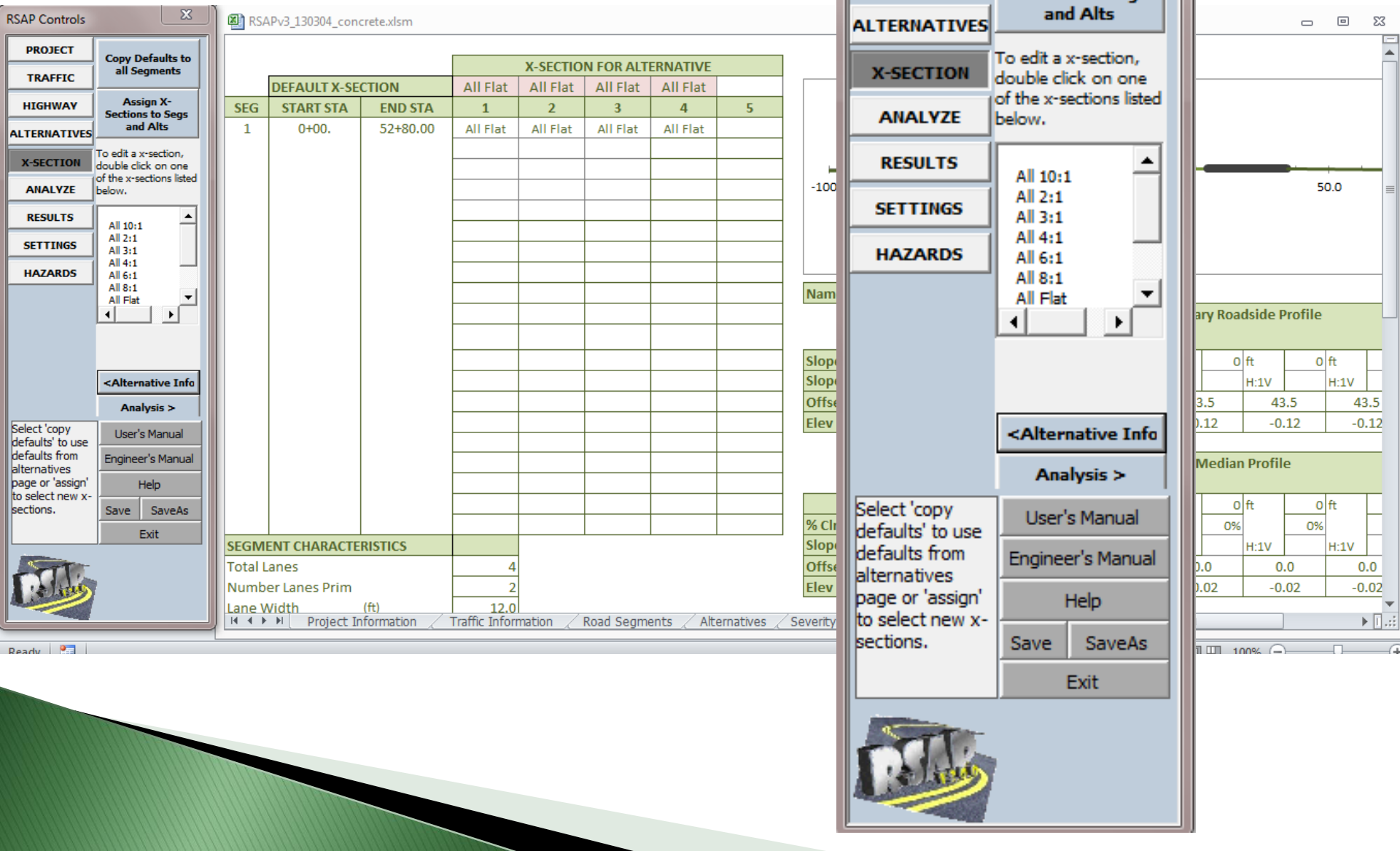
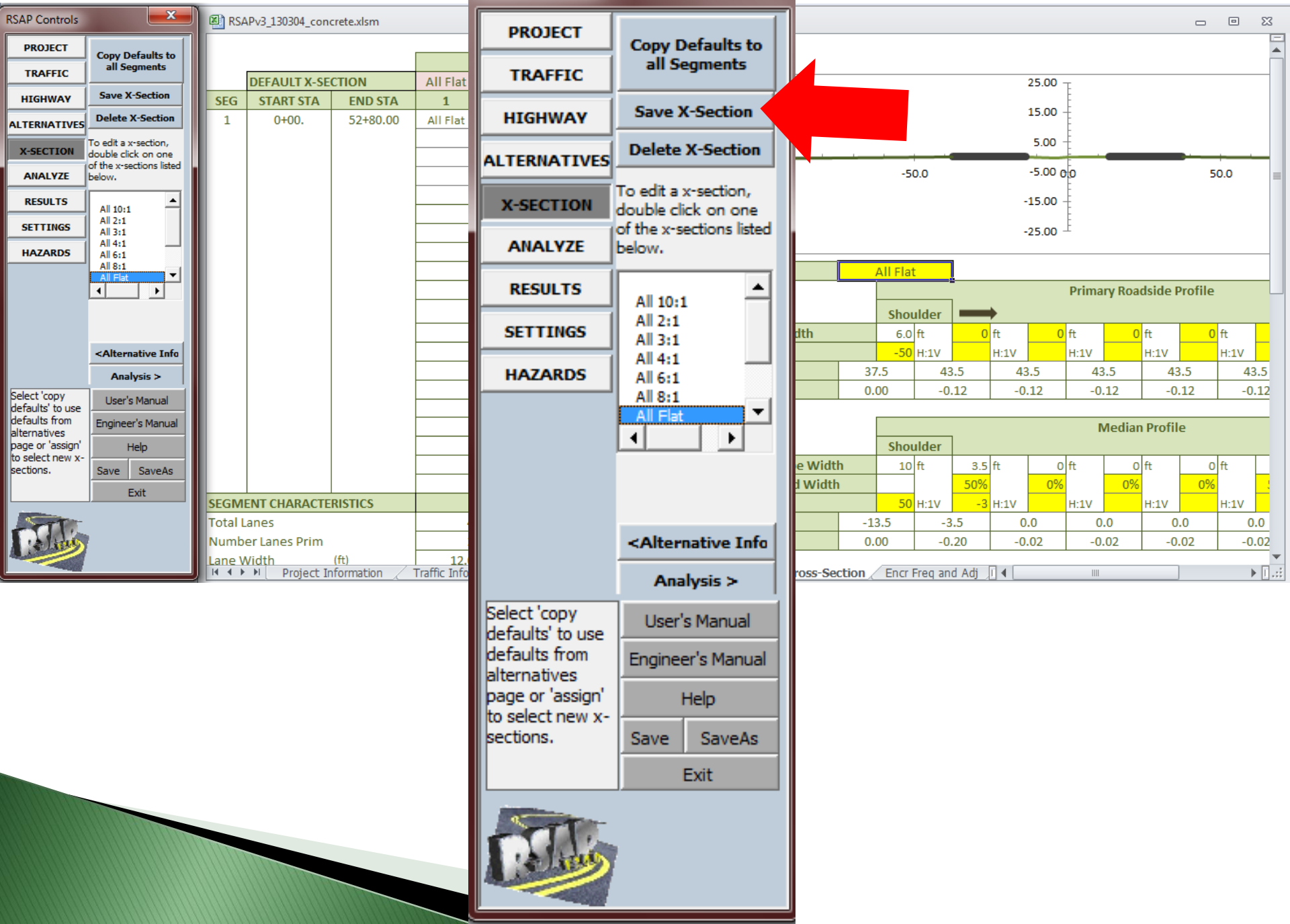
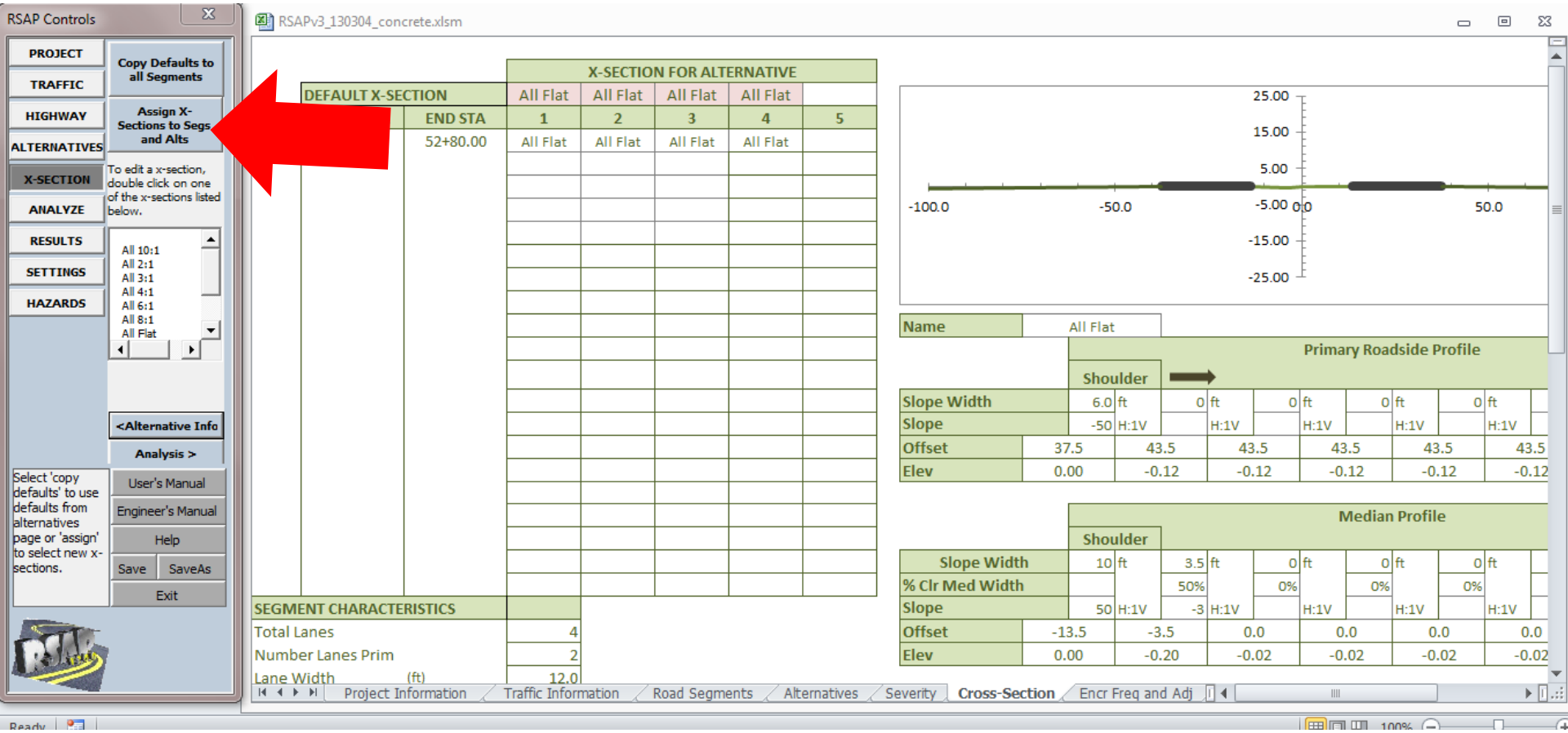
ANALYZE
RESULTS
SETTINGS
HAZARDS
4 ALTS DEFINED
Clear All Alternative Data
Copy Alt 1
Delete Alt 2
Sort Alternatives in Station Order
View/Edit
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Hazard Info >
< Highway Info
X-Section Info >
Complete the information in the yellow cells. Use buttons to add, edit or delete alternatives.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
ALTERNATIVE NAME
TL5 NJ Shape Barrier
DEFAULT X-SECTIO
All Flat
All 4:1
All 6:1
All 8:1
All Flat
MedMndinCu
MedMndinFil
MedMndonF
Vertical Fill
CONSTRUCTION COST
$ 727,716.00
$
GENERAL HAZARD TYPE
SPECIFIC HAZARD TYPE
PARAMETER
SpecialEdge
EdgeOfMedian
0+00
R
13.5
52+80.00
R
13.5
SpecialEdge
EdgeOfMedian
0+00
52+80.00
MedianBarriers_Rigid
TL5NJshapeMB
0+00
L
0
52+80.00
L
0
Width (in.)
Provide a title for each alternative and the construction cost.
Choose one of the default cross-sections. These can be changed and modified on the next worksheet.

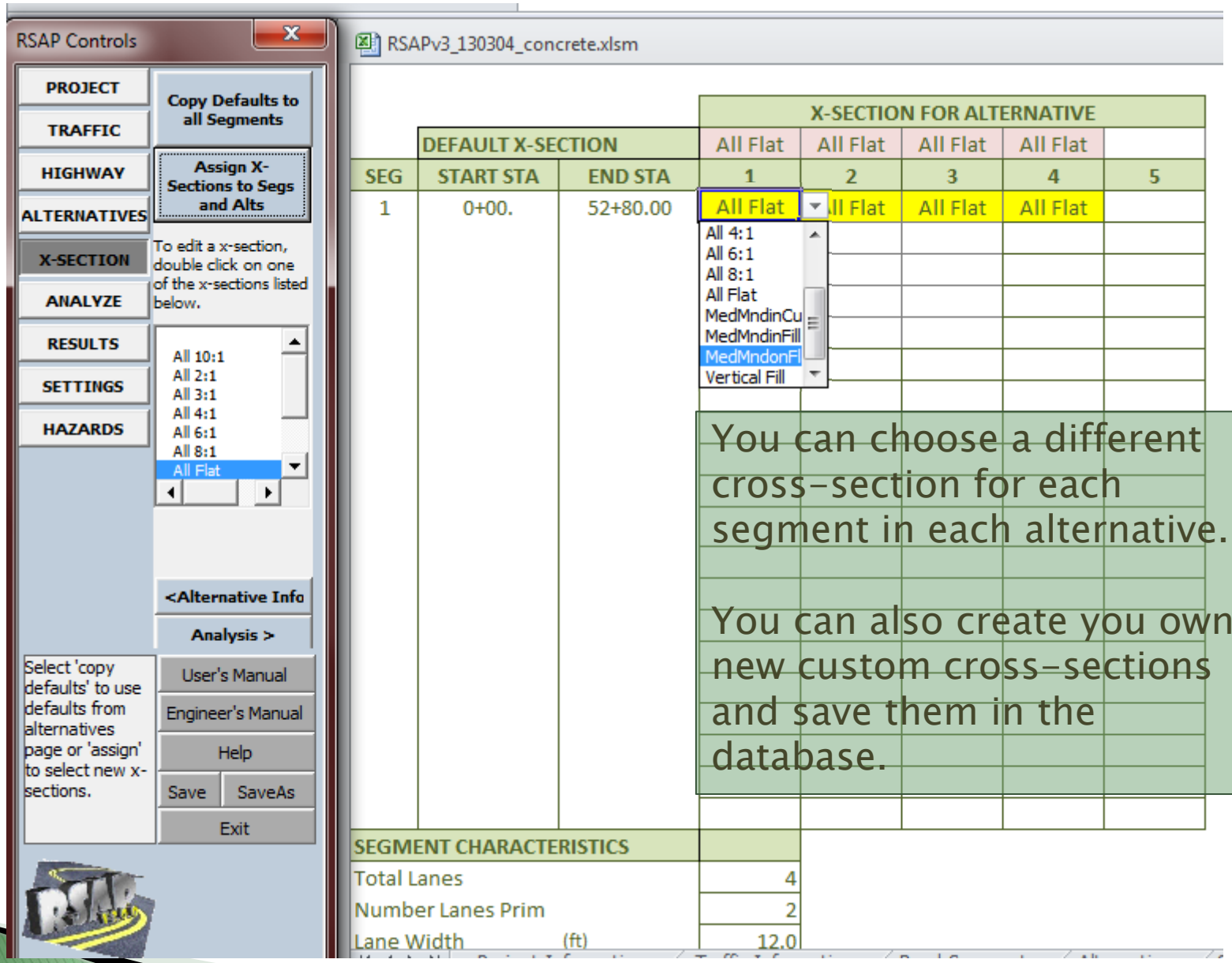
Roadside X-Sections




RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Copy Defaults to all Segments
Save X-Section
Delete X-Section
To edit a x-section, double click on one of the x-sections listed below.
All 10:1
All 2:1
All 3:1
All 4:1
All 6:1
All 8:1
All Flat
<Alternative Info
Analysis >
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
DEFAULT X-SECTION
All Flat
SEG
START STA
END STA
1
0+00.
52+80.00
SEGMENT CHARACTERISTICS
Total Lanes
Number Lanes Prim
Lane Width (ft)
Project Information
Traffic Info
25.00
15.00
5.00
-5.00
-15.00
-25.00
-50.0
0.0
50.0
Primary Roadside Profile
Shoulder
Median Profile
Cross-Section
Encr Freq and Adj

Roadside X-Sections

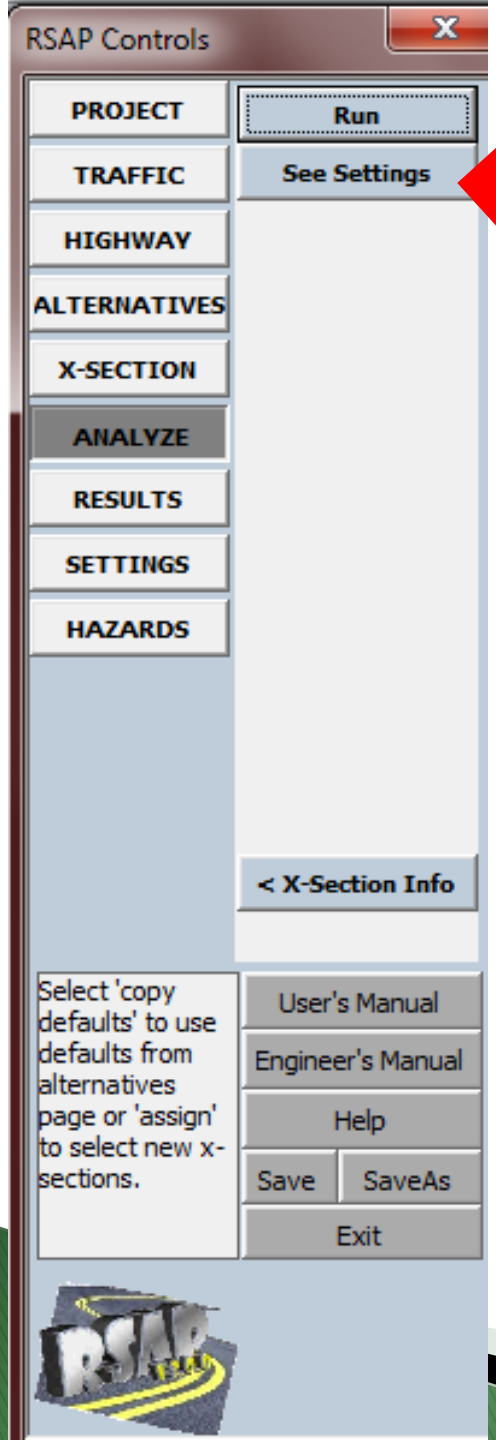



RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Copy Defaults to all Segments
Assign X-Sections to Segs and Alts
To edit a x-section, double click on one of the x-sections listed below.
All 10:1
All 2:1
All 3:1
All 4:1
All 6:1
All 8:1
All Flat
<Alternative Info
Analysis >
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
X-SECTION FOR ALTERNATIVE
DEFAULT X-SECTION
All Flat
SEG
START STA
END STA
1
2
3
4
5
1
0+00.
52+80.00
All Flat
All 4:1
All 6:1
All 8:1
All Flat
MedMndinCu
MedMndinFill
MedMndonFi
Vertical Fill
You can choose a different cross-section for each segment in each alternative.
You can also create you own new custom cross-sections and save them in the database.
SEGMENT CHARACTERISTICS
Total Lanes
4
Number Lanes Prim
2
Lane Width
(ft)
12.0

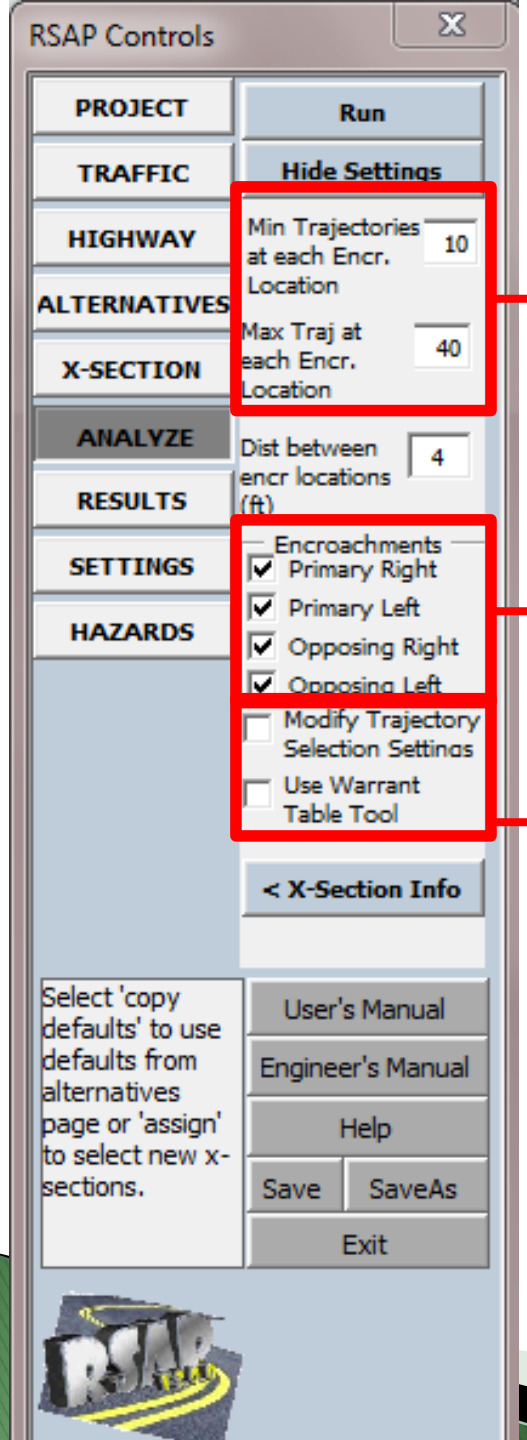
Analysis and Results

Median Barrier Alternatives

Malcolm H. Ray, PE, PhD



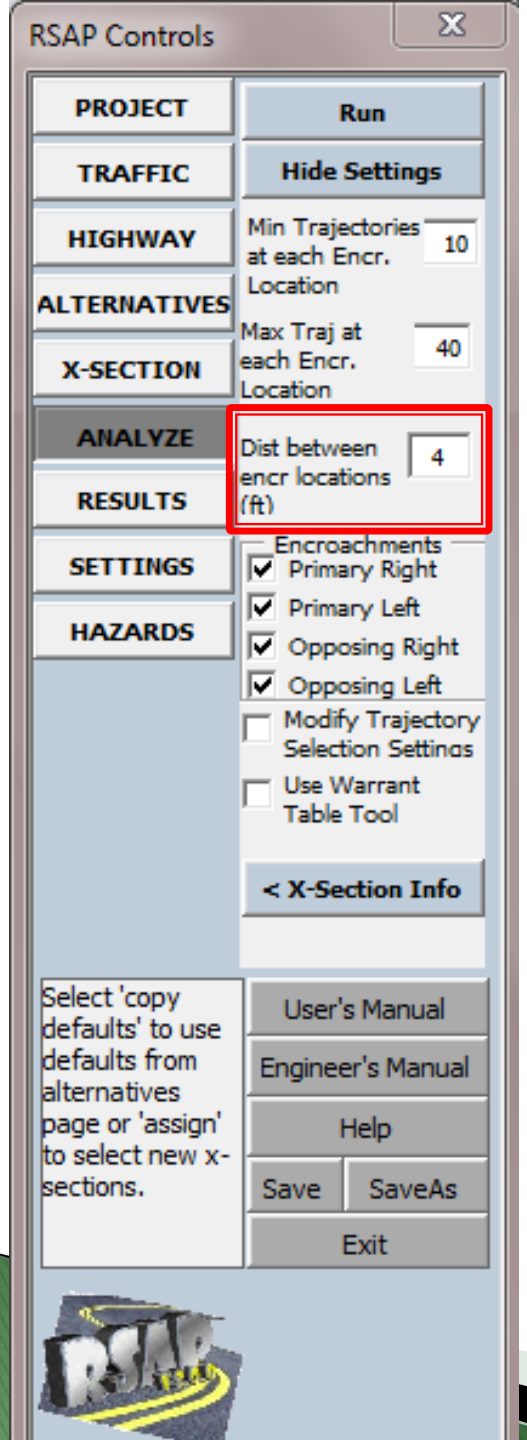
ANALYZE:
How do I pick the best analysis settings?



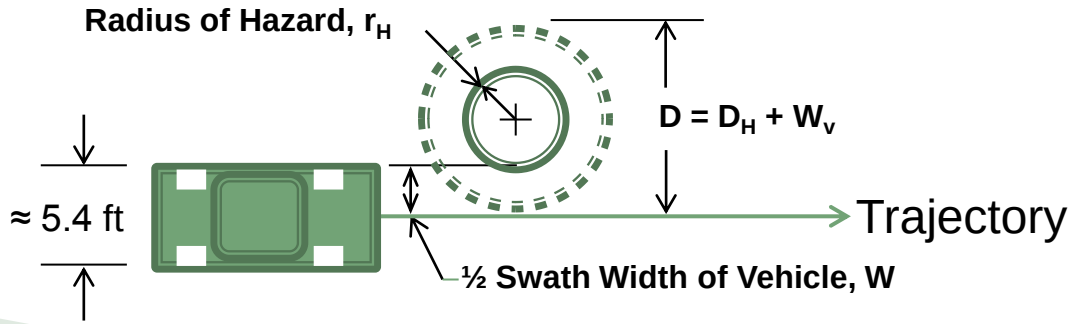
Minimum and Maximum number of trajectories to select.

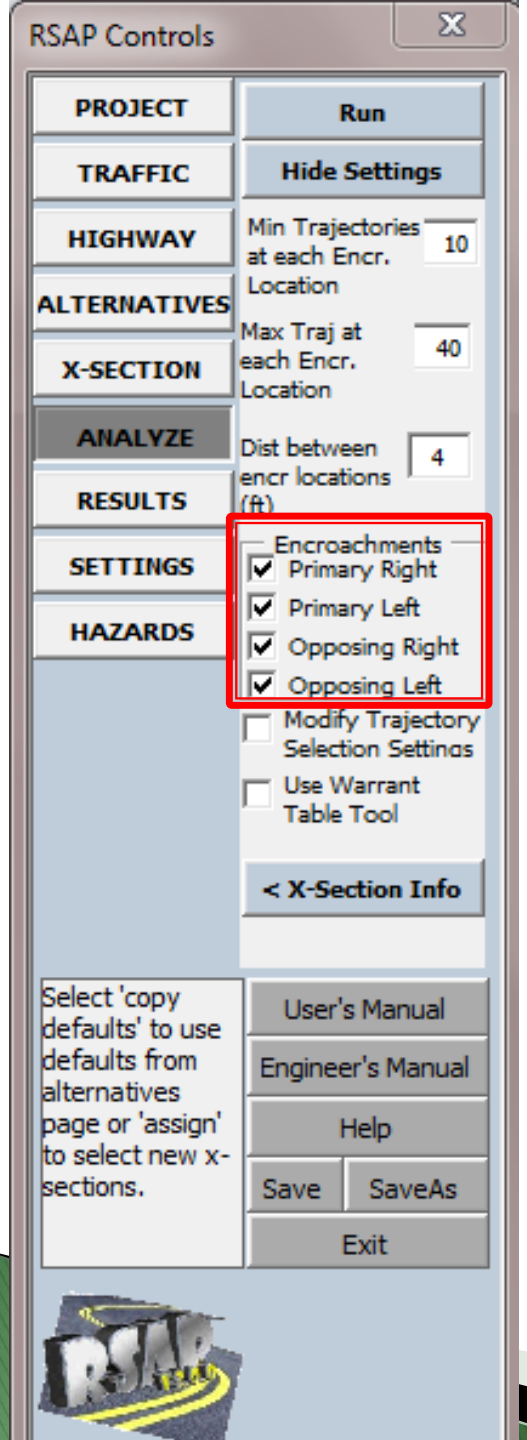
Select which encroachments you want to include in the analysis.

Outside scope of this course.



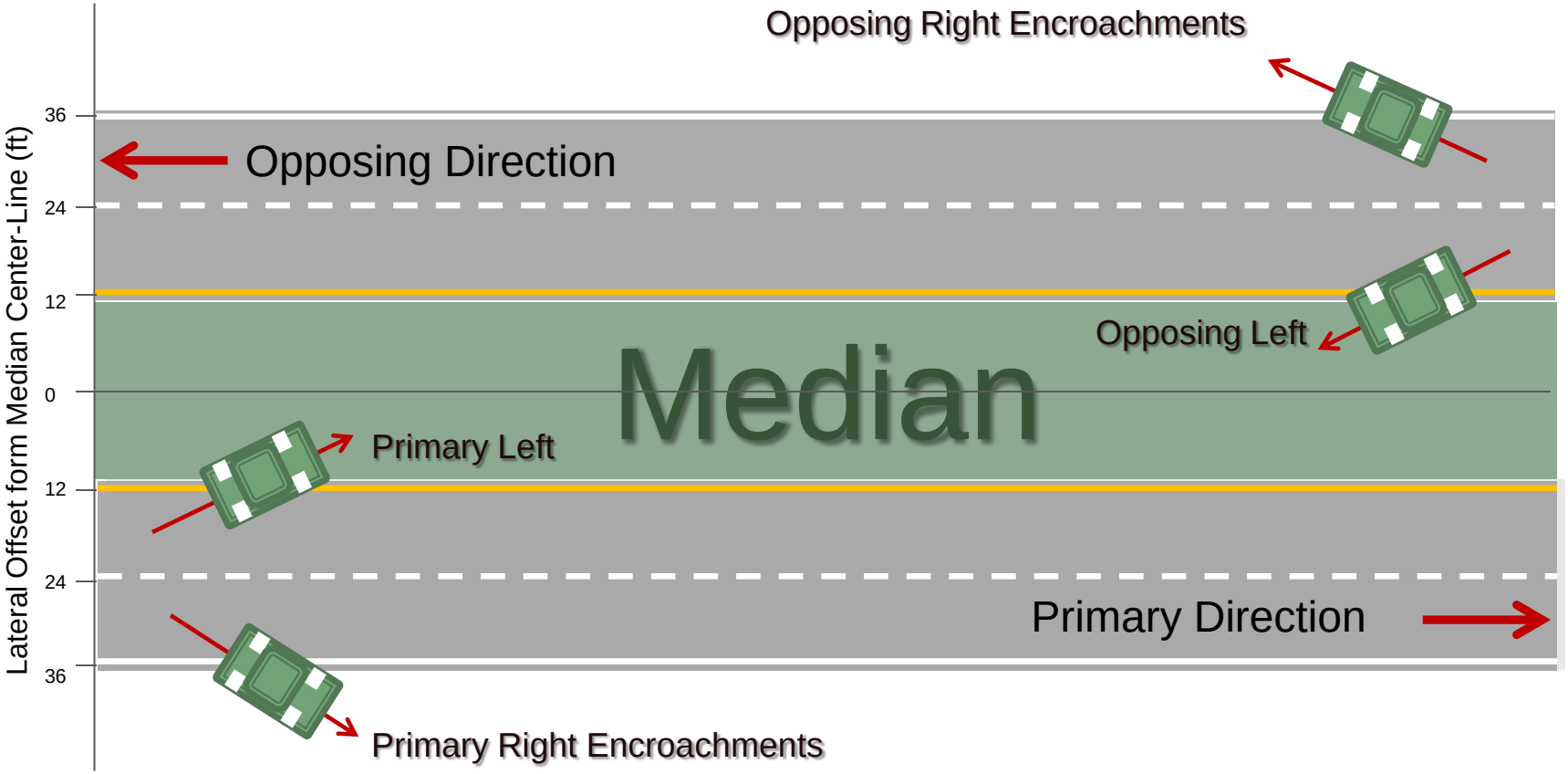
- Distance between encroachment locations.
- Default value is 4 ft.
- If you have point hazards you need a small number like 4 ft to make sure you don't miss any hazards.
- 1000 ft works well when considering longitudinal hazards like our example problem.



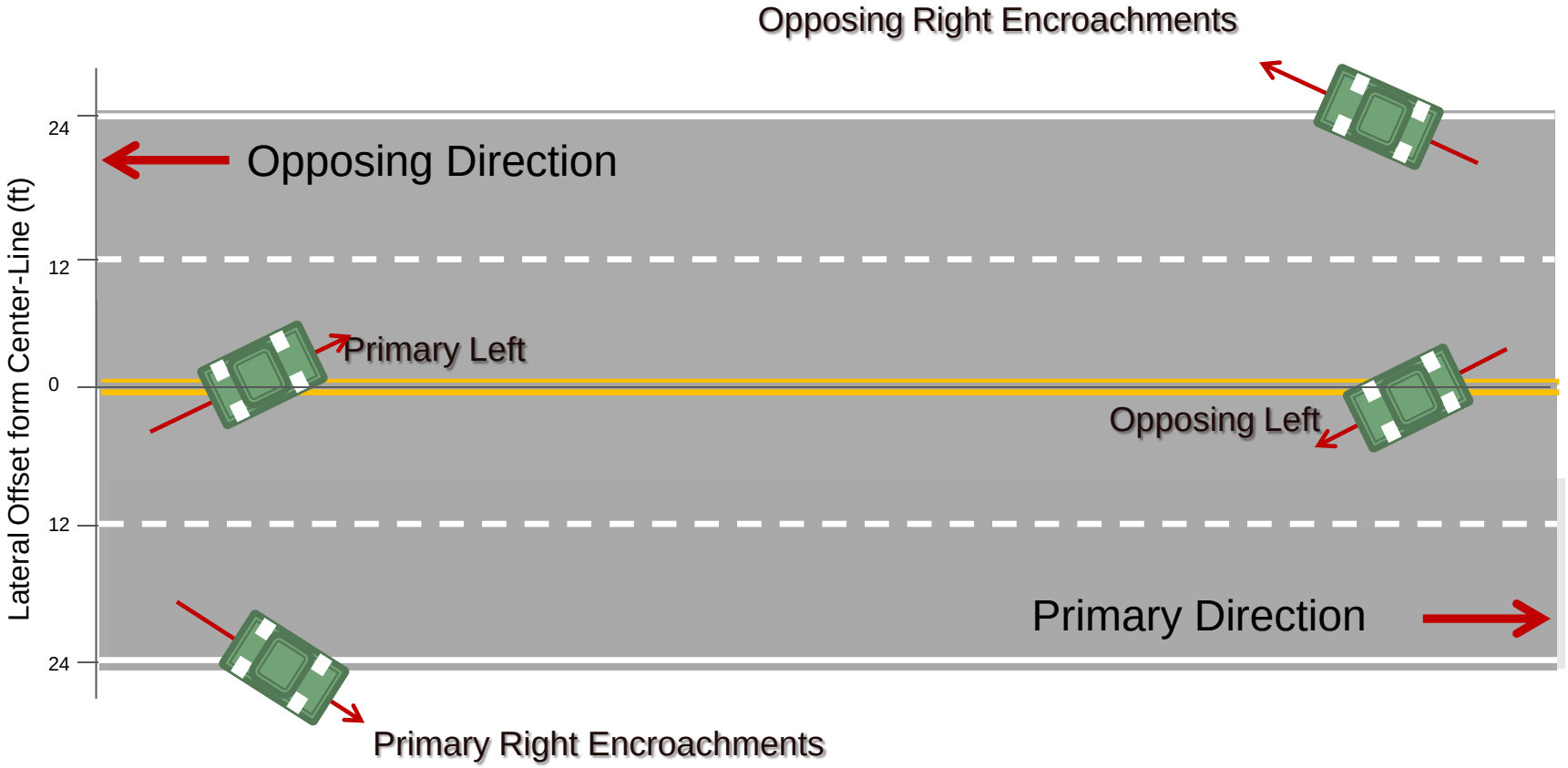


Encroachments to consider.

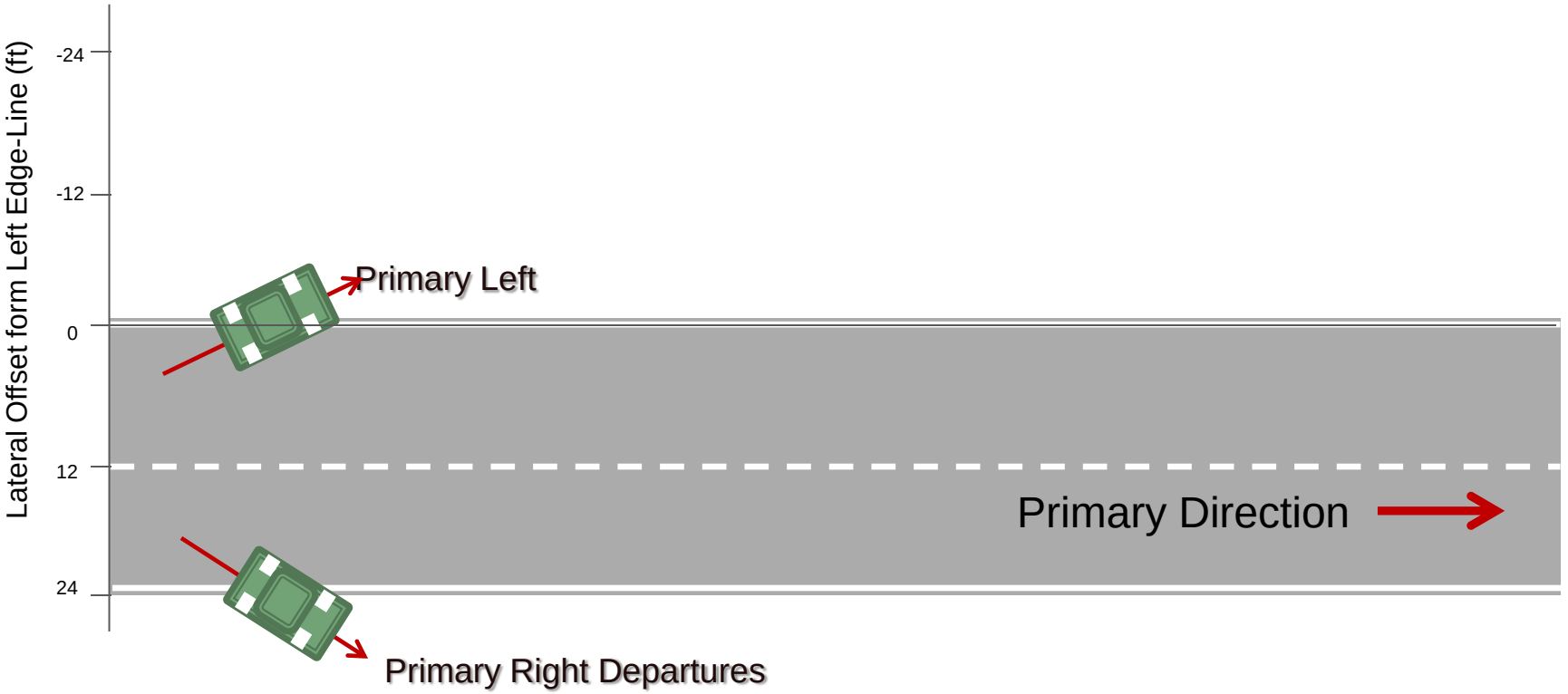
Encroachments
Divided Highways

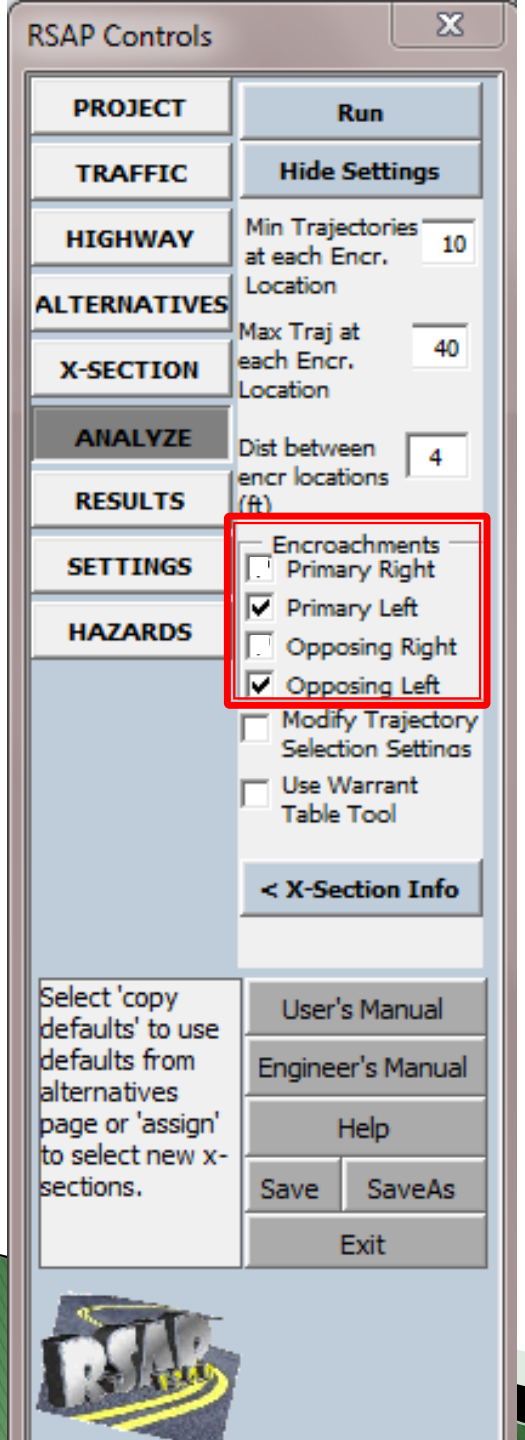


Encroachments
Undivided Highways

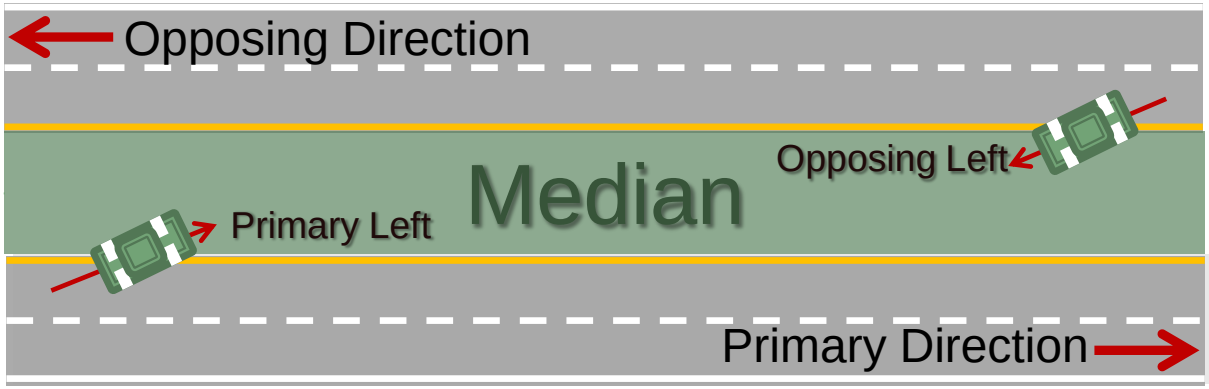


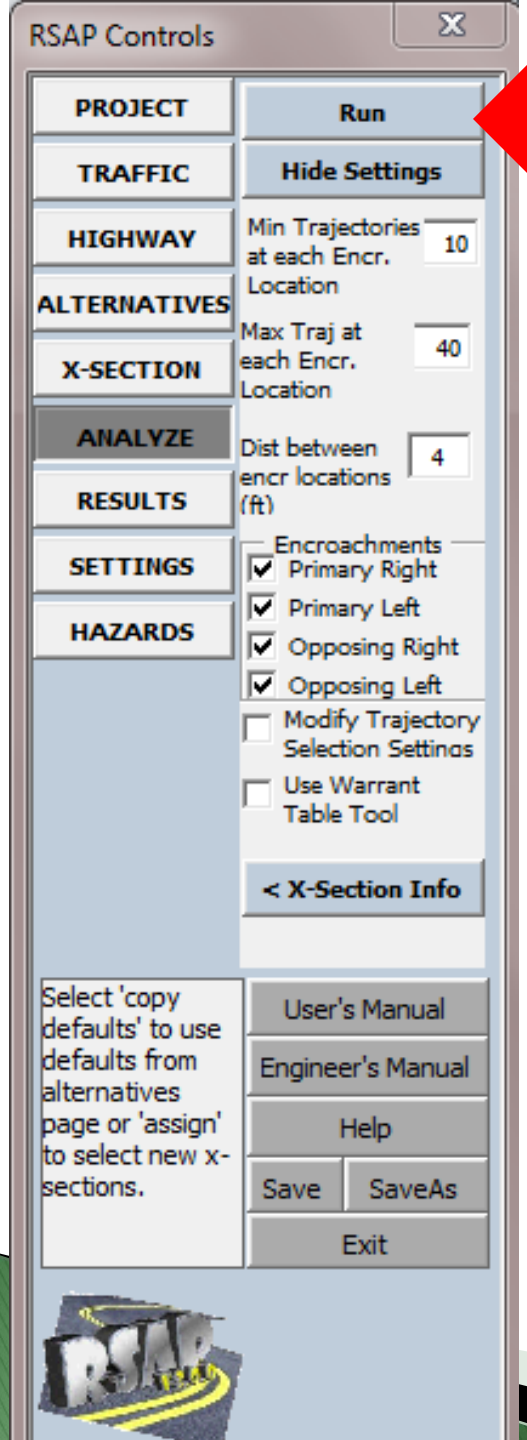
Encroachments
One-Way Highways



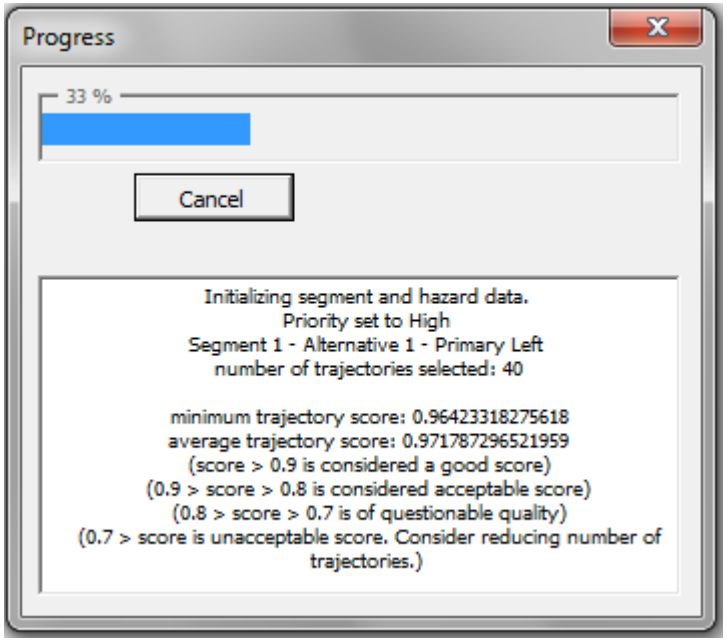


- Only check the boxes for encroachments that you want to consider.
- Our example is evaluating a median barrier so we will consider only:
  - primary left and
  - opposing left.

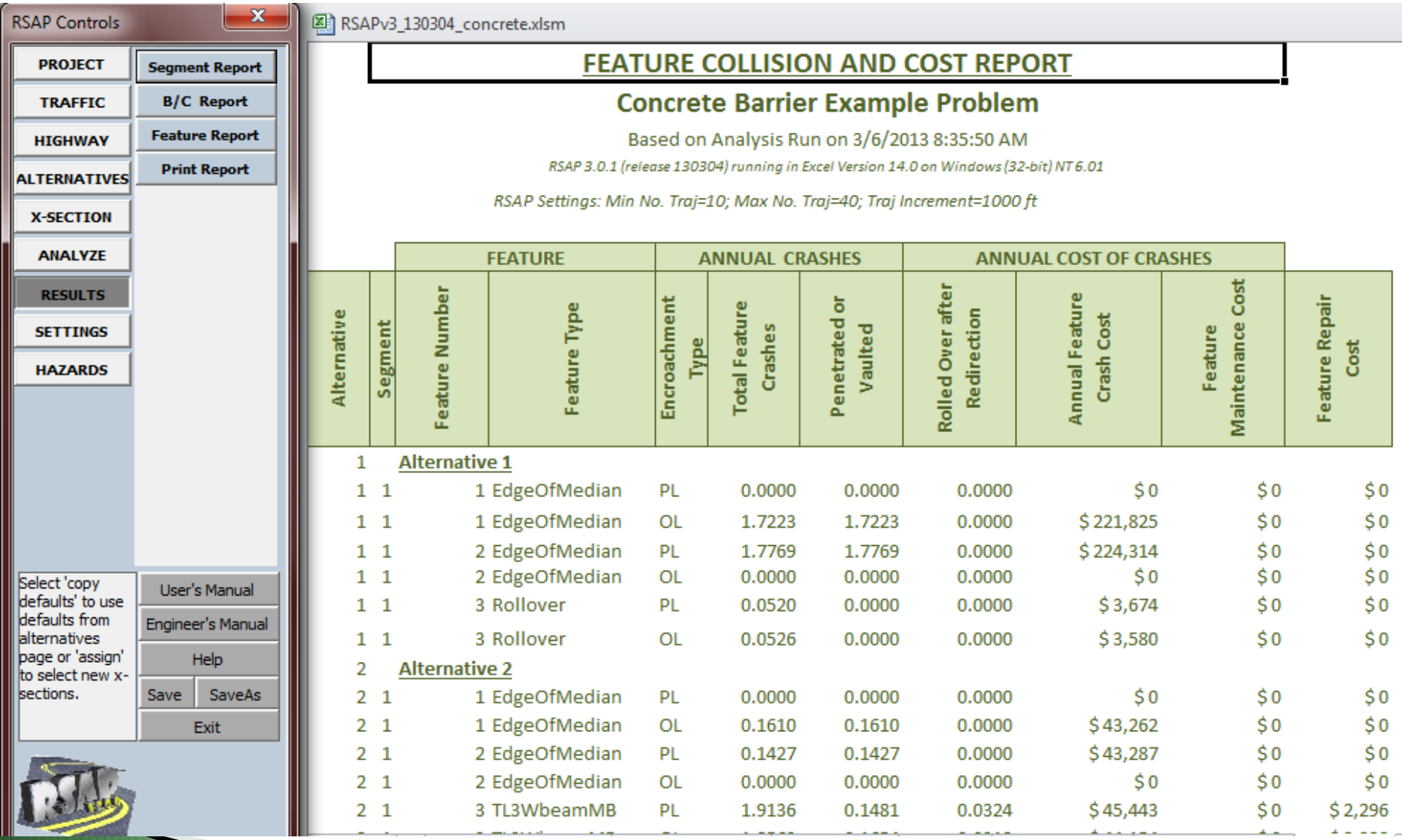




Selecting RUN starts the analysis.



A progress bar will appear during the run to let you know how the run is progressing.



FEATURE COLLISION AND COST REPORT

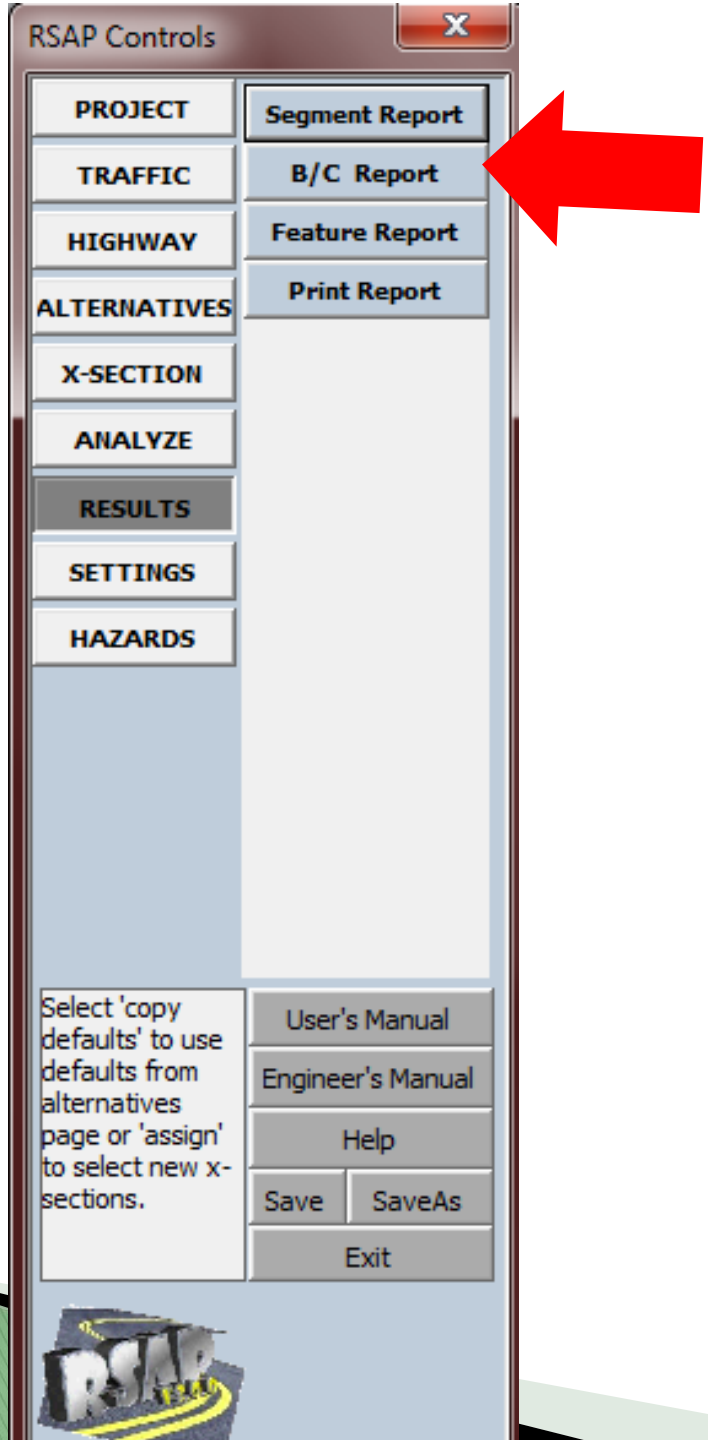
Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

RSAP Settings: Min No. Traj=10; Max No. Traj=40; Traj Increment=1000 ft

		FEATURE		ANNUAL CRASHES			ANNUAL COST OF CRASHES			
Alternative	Segment	Feature Number	Feature Type	Encroachment Type	Total Feature Crashes	Penetrated or Vaulted	Rolled Over after Redirection	Annual Feature Crash Cost	Feature Maintenance Cost	Feature Repair Cost
1		Alternative 1								
1	1	1	EdgeOfMedian	PL	0.0000	0.0000	0.0000	$0	$0	$0
1	1	1	EdgeOfMedian	OL	1.7223	1.7223	0.0000	$221,825	$0	$0
1	1	2	EdgeOfMedian	PL	1.7769	1.7769	0.0000	$224,314	$0	$0
1	1	2	EdgeOfMedian	OL	0.0000	0.0000	0.0000	$0	$0	$0
1	1	3	Rollover	PL	0.0520	0.0000	0.0000	$3,674	$0	$0
1	1	3	Rollover	OL	0.0526	0.0000	0.0000	$3,580	$0	$0
2		Alternative 2								
2	1	1	EdgeOfMedian	PL	0.0000	0.0000	0.0000	$0	$0	$0
2	1	1	EdgeOfMedian	OL	0.1610	0.1610	0.0000	$43,262	$0	$0
2	1	2	EdgeOfMedian	PL	0.1427	0.1427	0.0000	$43,287	$0	$0
2	1	2	EdgeOfMedian	OL	0.0000	0.0000	0.0000	$0	$0	$0
2	1	3	TL3WbeamMB	PL	1.9136	0.1481	0.0324	$45,443	$0	$2,296


RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Segment Report
B/C Report
Feature Report
Print Report
Select 'copy defaults' to use defaults from alternatives page or 'assign' to select new x-sections.
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit

What do all those numbers in the incremental cost-benefit table mean?

EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
With Respect to Alternative			1	2	3	4	
		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	**1.91**	
	4	TL5 NJ Shape Barrier				0.00	

Best Choice is: **TL5 NJ Shape Barrier**

The Challenger–Defender Game

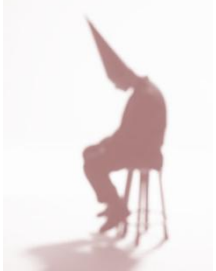
			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
			1	2	3	4	
With Respect to Alternative		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	**1.91**	
	4	TL5 NJ Shape Barrier				0.00	

1.00

Defender

11.80 >1

Challenger



The Challenger–Defender Game

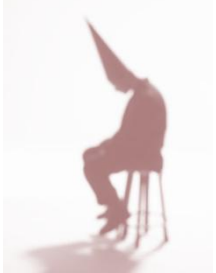
			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
			1	2	3	4	
With Respect to Alternative		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	1.91	
	4	TL5 NJ Shape Barrier				0.00	

11.80

Defender

10.58 >1

Challenger

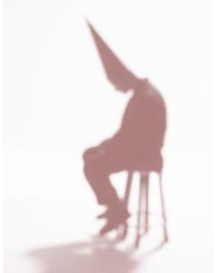


The Challenger–Defender Game

			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
			1	2	3	4	
With Respect to Alternative		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	1.91	
	4	TL5 NJ Shape Barrier				0.00	

10.58
Defender

1.91 >1
Challenger



EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

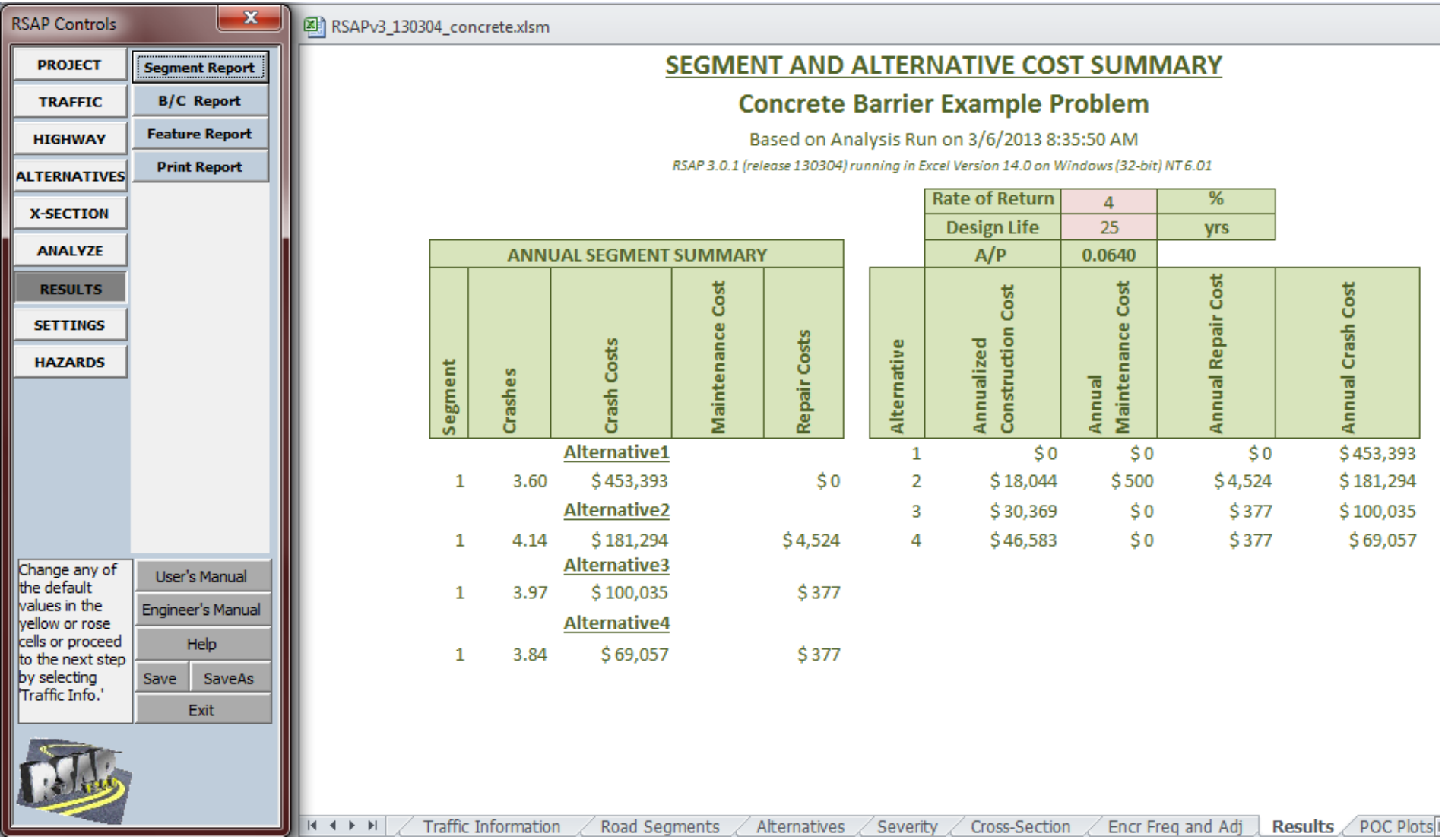
Concrete Barrier Example Problem

Based on Analysis Run on 3/6/2013 8:35:50 AM

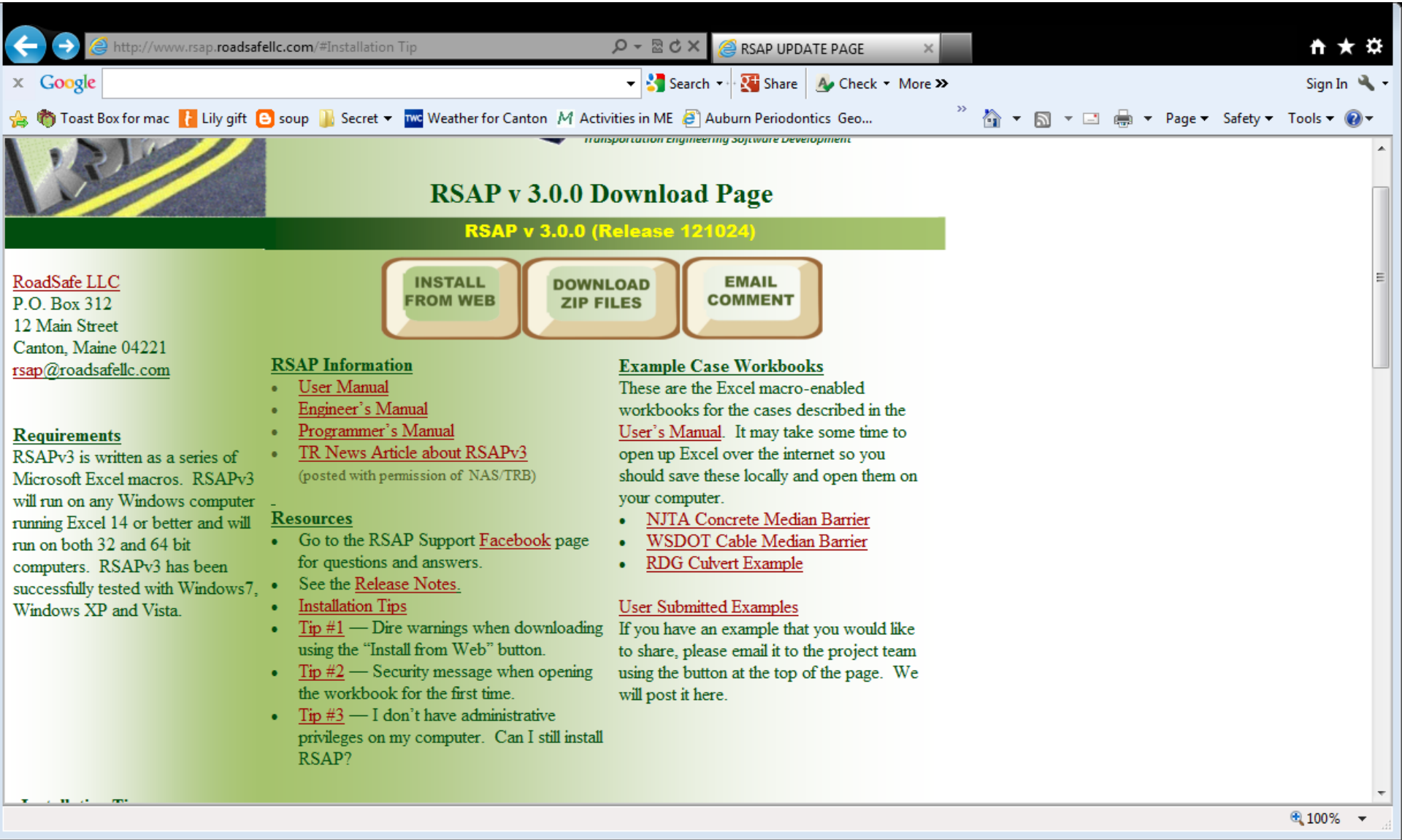
RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

			Decision Point Benefit-Cost Ratio:				1
			Alternative Choice				
With Respect to Alternative			1	2	3	4	
		ALTERNATIVES	Unprotected Median	W-Beam Median Barrier	TL3+ NJ Shape Barrier	TL5 NJ Shape Barrier	
	1	Unprotected Median	1.00	11.80	11.49	8.18	
	2	W-Beam Median Barrier		0.00	10.58	4.70	
	3	TL3+ NJ Shape Barrier			0.00	**1.91**	
	4	TL5 NJ Shape Barrier				0.00	

Best Choice is: **TL5 NJ Shape Barrier**


RSAP Controls
PROJECT
TRAFFIC
HIGHWAY
ALTERNATIVES
X-SECTION
ANALYZE
RESULTS
SETTINGS
HAZARDS
Segment Report
B/C Report
Feature Report
Print Report
Change any of the default values in the yellow or rose cells or proceed to the next step by selecting 'Traffic Info.'
User's Manual
Engineer's Manual
Help
Save
SaveAs
Exit
RSAPv3_130304_concrete.xlsm
SEGMENT AND ALTERNATIVE COST SUMMARY
Concrete Barrier Example Problem
Based on Analysis Run on 3/6/2013 8:35:50 AM
RSAP 3.0.1 (release 130304) running in Excel Version 14.0 on Windows (32-bit) NT 6.01
Rate of Return 4 %
Design Life 25 yrs
A/P 0.0640
ANNUAL SEGMENT SUMMARY
Segment
Crashes
Crash Costs
Maintenance Cost
Repair Costs
Alternative1
1 3.60 $453,393 $0
Alternative2
1 4.14 $181,294 $4,524
Alternative3
1 3.97 $100,035 $377
Alternative4
1 3.84 $69,057 $377
Alternative
Annualized Construction Cost
Annual Maintenance Cost
Annual Repair Cost
Annual Crash Cost
1 $0 $0 $0 $453,393
2 $18,044 $500 $4,524 $181,294
3 $30,369 $0 $377 $100,035
4 $46,583 $0 $377 $69,057
Traffic Information
Road Segments
Alternatives
Severity
Cross-Section
Encr Freq and Adj
Results
POC Plots

http://www.rsap.roadsafellc.com/



Finding the RSAP Facebook Page

- Go to http://www.facebook.com/RSAPv3
- Or … search for the RSAPv3 Facebook Page by name within Facebook
- Or … search for RSAPv3 in Google.
- Or … If you see the RSAPv3 Page on a friend's profile, you can click on the RSAP logo.
- When on the RSAPv3 Page, click on the "Like" button in the upper right hand corner.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Malcolm Ray
RSAPv3
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Wall
Hidden Posts
Info
Friend Activity (1+)
Insights
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EDIT
About Edit
Use this page to provide feedback, discuss tips with other users and share...
More
49
like this
37
talking about this
Remove from My Page's Favorites
Get Updates via SMS
Get Updates via RSS
Unlike
Wall
RSAPv3 · Everyone (Most Recent)
Share: Status Photo Link Video Question
Write something...
RSAPv3
RSAPv3 Release 120116 has been posted on at http://rsap.roadsafellc.com/.
Unlike · Comment · Share · January 16 at 5:02pm
You like this.
1 share
Write a comment...
RSAPv3
After downloading and using the Alpha version of RSAPv3, please take this survey to provide your feedback. Thank you!
Can you spare a few moments to take my survey?
www.surveymonkey.com
Please take the survey titled "RSAPv3 Software Evaluation". Your feedback is important!
Like · Comment · Share · January 15 at 11:30am
Admins (2)
Use Facebook as
Notifications 2
Promote with an
View old Insights
Invite Friends
You and RSAPv3
16 friends like thi
Sponsored
Free Electricity Ho
homemadeenergy.org
No Young Guys Wa
lps.seniorpeoplemeet
Chat (3)

I'm not a Facebook user. Can I participate?

- The page is publicly *viewable*.
- Posting on the Page (i.e., full participation) does require joining Facebook.
- You can also go to the RSAPv3 download page (rsap.roadsafellc.com) and send a comment by email to rsap@roadsafellc.com.
- The development team will post responses on Facebook and also answer any emails.

Acknowledgments

- The work is funded by the National Cooperative Highway Research Program (NCHRP) Project 22-27, “Roadside Safety Analysis Program (RSAP) Update.”

Thank you!

- Visit rsap.roadsafellc.com
  - Download the newest release of RSAPv3
  - Link to Facebook page.
  - Manuals which accompany the software.
  - List of improvements.
  - Register your copy.
- Questions? Email: rsap@roadsafellc.com