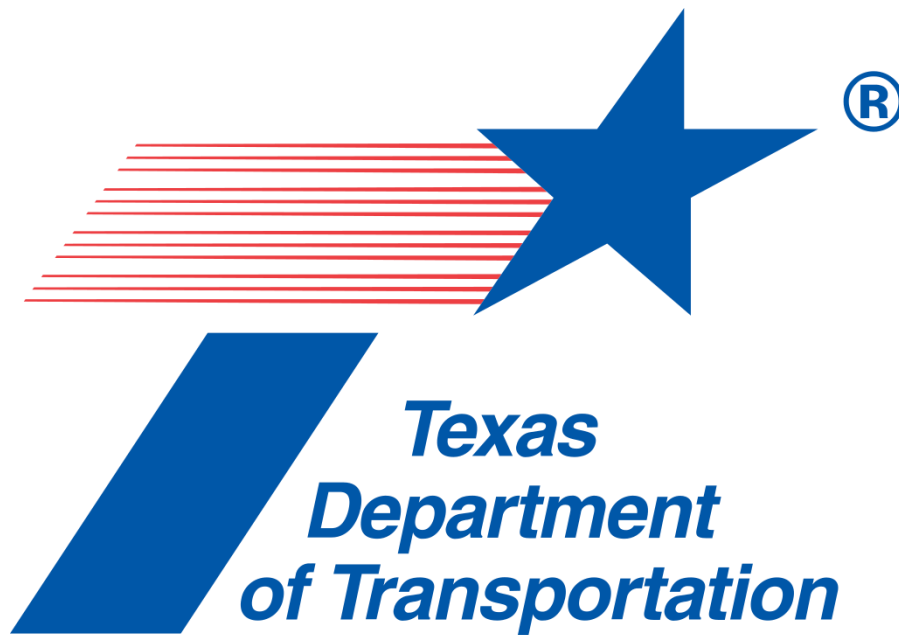


Texas Department of Transportation  
Safer by Design (SBD) Tool

<https://sbd.txdot.gov>

Users' Guide



by Texas Department of Transportation

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## Contents

1. Introduction and Disclaimer .....	1
2. Users and Roles.....	2
3. Registered User - Login and Logout.....	3
4. Registered User - Create a Project.....	5
5. Safety Assessment.....	7
6. Registered User - Project Management .....	18
7. TxDOT Division-Level Administrator - Management .....	21

## 1. Introduction and Disclaimer

Texas Department of Transportation (TxDOT) and Texas A&M Transportation Institute (TTI) developed Safer by Design (SBD) tool (formerly known as Safety Scoring Tool or SST) with the aim to provide Transportation Engineers a simple and straightforward methodology that directly incorporates data driven safety considerations into the roadway design process. The ultimate goal is to prevent crashes, reduce fatalities and injuries as a result of crashes on Texas roadways. The safety assessment process is based on analytical methods available to the Tool development team, including but not limited to American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual*, National Cooperative Highway Research Program (NCHRP) Reports, TxDOT *Roadway Design Manual*, TxDOT Research and Technology Implementation Division (RTI) research projects, the U.S. Department of Transportation Federal Highway Administration (FHWA) CMF Clearinghouse, and published journal articles. In some circumstances, the Tool development team made minor adjustments to the analytical methods to make the Tool user friendly.

Many features are developed specifically for this Tool to meet the goals. This Guide describes how to use this Tool as well as the features. There is also a Frequently Asked Questions (FAQ), which addresses specific questions related to assumptions, design elements and options in the Tool. These questions were collected from a series of in-person and virtual demonstration workshops held prior to the official launch of this Tool.

It should be noted that the analytical methods may be updated. The Tool is designed to be upgraded periodically to include the latest methods and research results, to improve user experience, and to fix issues. These upgrades may be implemented by TxDOT and TTI without prior notice.

To maximize the benefit of this Tool on reducing crashes on roadways, TxDOT intend to make this Tool publicly available to local transportation agencies, and other organizations who would like to improve roadway safety through design and safety evaluation. Users and roles are discussed in Section 2. It is important to disclaim that:

- (1) TxDOT and TTI will not share user information or project data stored in this Tool without written approval from users.

- (2) The safety assessment results are solely used for improving safety and should not be used for any other purpose.
- (3) This Tool is developed to assist Transportation Engineers conduct safety assessment and design safer roads. It should not be used as a simple decision-making tool. Engineering judgements should be used while utilizing this Tool.
- (4) TxDOT and TTI are not responsible for any misleading, or incorrect results generated from this Tool.
- (5) When selecting analytical methods, the Tool development team selected those that are conducted based on Texas roadway characteristics when possible. The safety results may not reflect the accurate results if applied to a non-Texas roadway.

## 2. Users and Roles

There are two types of users: (1) guest user; and (2) registered user.

Any person with access to the internet can use TxDOT SBD Tool to assess safety of urban roadway segments and intersections as a guest user. The Tool works as a calculator, and no data can be saved or retrieved.

All TxDOT employees (referred to as internal users) can use this Tool as registered users using TxDOT account credentials.

Non-TxDOT employees (referred to as external users) need to contact TxDOT ([DES\\_SaferByDesign@txdot.gov](mailto:DES_SaferByDesign@txdot.gov)) to establish an account. Instruction and required information can be found on tool homepage (<https://sbd.txdot.gov/home>). It may take up to two weeks to review and approve the application. Once approved, user will receive an email with initial password.

For registered users, there are four types of roles:

### (1) General

In addition to using the Tool as a calculator, a registered user with general role can save projects in the Tool. Specifically, a general user has the following privileges:

- Create projects
- Search, view, edit, delete, transfer, and submit **self-owned projects**

(2) District-level Manager

A registered user with role of district-level manager for certain district(s) has the following privileges:

- Create projects
- Search, view, edit, delete, transfer, and submit **projects within the district(s) and self-owned projects.**

For example, district-level manager of the Austin district is able to operate all projects saved in the Tool in Austin district.

(3) TxDOT Division-level Administrator

A registered user with role of TxDOT Division-level administrator has the following privileges:

- View **all projects saved in the Tool**
- Send back submitted projects
- Search, filter and download project summary table
- Manage user roles, e.g., assign a user as the district-level manager of a district

### 3. Registered User - Login and Logout

For registered users, to log in Tool, follow the steps below:

- (1) Go to the Tool website home page in browser (internet explorer is not supported)

<https://sbd.txdot.gov>

Note that a minimum screen resolution of 1280\*1024 pixels is recommended for an optimal viewing experience. This Tool is not designed for use on mobile devices (smart phones, tablets, etc.).

(2) Click Login Button on top right of the home page



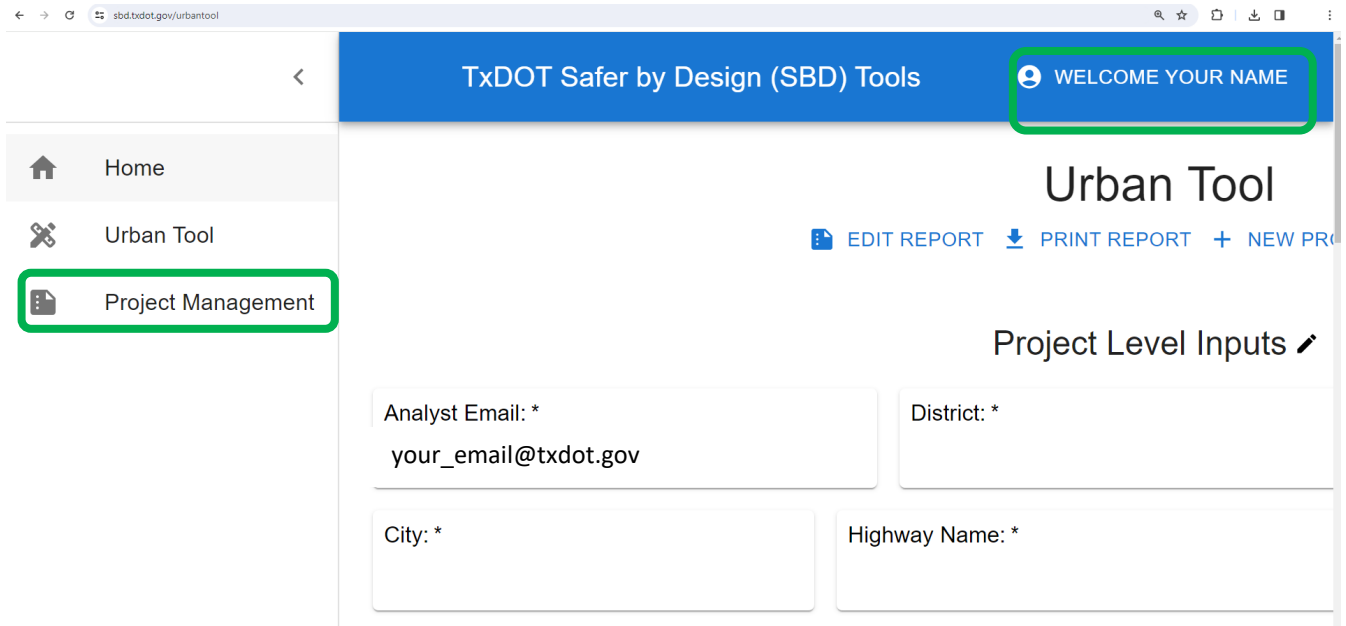
Please note that this Tool adheres to the Web Content Accessibility Guidelines 2.1 (with a few exceptions). Although the operations in the guide are initially designed for mouse-based actions, users can operate almost all the features of this Tool using either a keyboard or a keyboard interface.

(3) Enter email and password

## Sign On

A sign-on form with a green border. It contains an input field labeled 'EMAIL ADDRESS' with the placeholder text 'your\_email@txdot.gov'. Below the input field is a blue button labeled 'Next'.

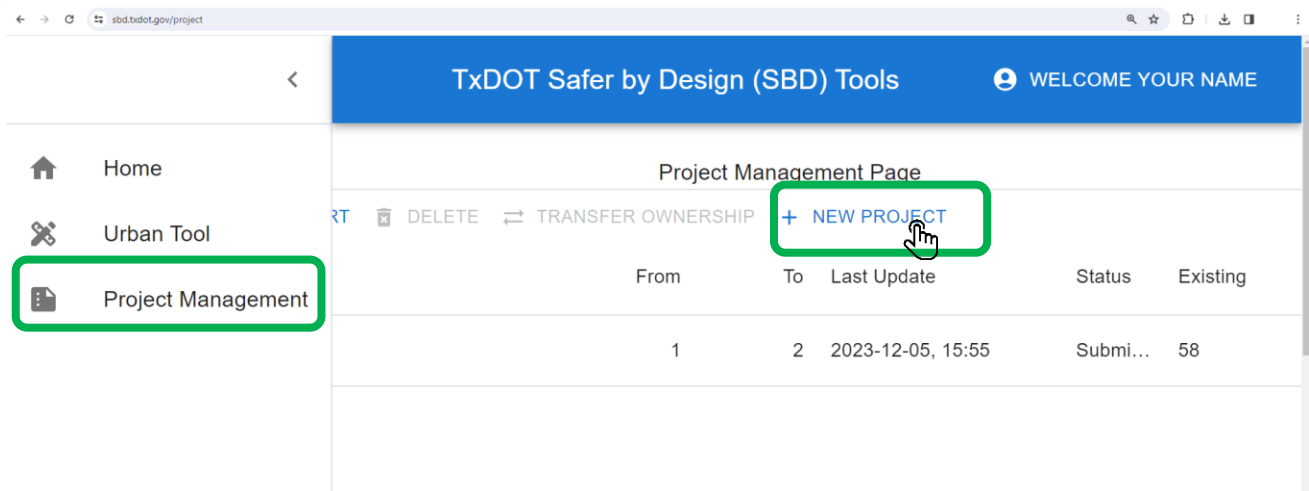
After successful login, the “WELCOME YOUR\_NAME” message will display on the top right of the home page. In addition, the “Page Management” navigation bar will display on the left side of the home page.



#### 4. Registered User - Create a Project

After successful login, a user with general role or district-level manager role can create projects. To create a project:

- (1) Click Project Management on the left, then click “NEW PROJECT” button



(2) Fill all items in the “Edit Project Information” box, then click “OK” button

The project level inputs include District, City, project CCSJ number, highway name, evaluation date, letting date, project category, number of segments, number of intersections, project start point (from DFO) and project end point (to DFO). All of these are required.

Edit Project Information

District: \* Austin  
City: \* Austin  
CCSJ Number: \* 000-000-0001  
Highway Name: \* Texas Roadway  
Evaluation Date: \* 02/02/2024  
Letting Date: \* 03/01/2024  
Project Category: \* 3R  
Number of Segments: \* 2  
Number of Intersections: \* 1  
Project From DFO: \* 12  
Project To DFO: \* 16  
CANCEL OK

After clicking on OK, the newly created project will show in the project list under Project Management Page.

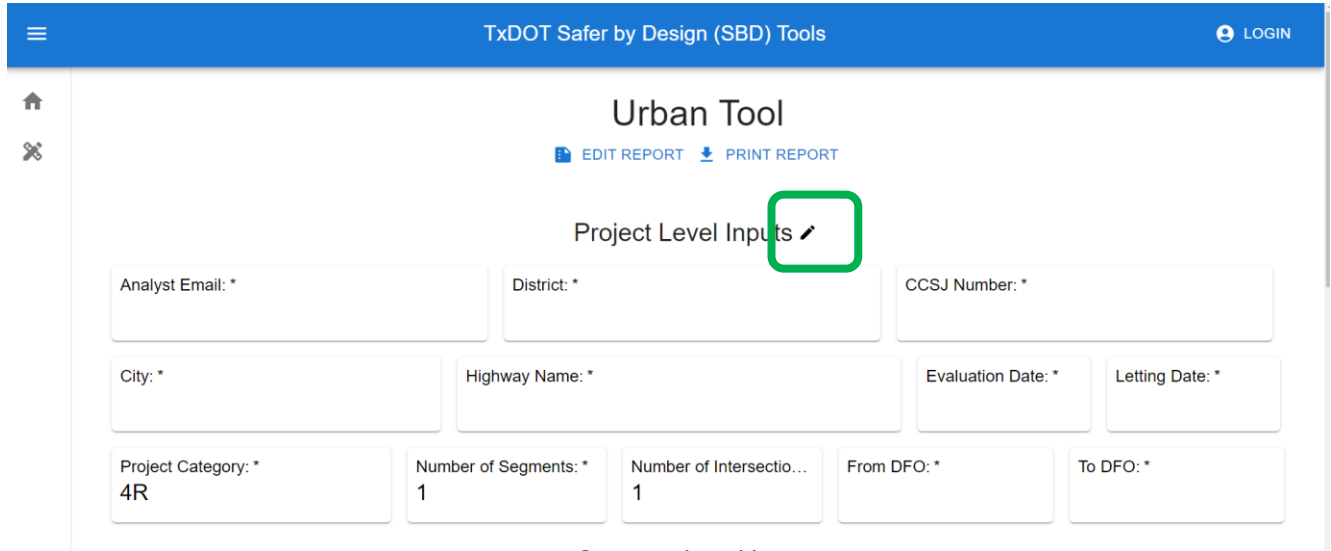
CCSJ	Owner Email	District	Highway	From	To	Last Up
000-123-345	your_email@txdot.gov	Austin	BBB	1	2	2023-11
000-000-0001	your_email@txdot.gov	Austin	Texas Roadway	12	16	2024-01

This list also shows the basic information of the project(s) associated with current login user, including CCSJ number, district, highway name, location, dates, and status.



## 5. Safety Assessment

For guest users to use the Tool as a stand-alone calculator for safety assessment, click on “Urban Tool” from the navigation bar, finish the Project Level Inputs (i.e., click on the pencil icon after Project Level Inputs, fill items, and click OK).

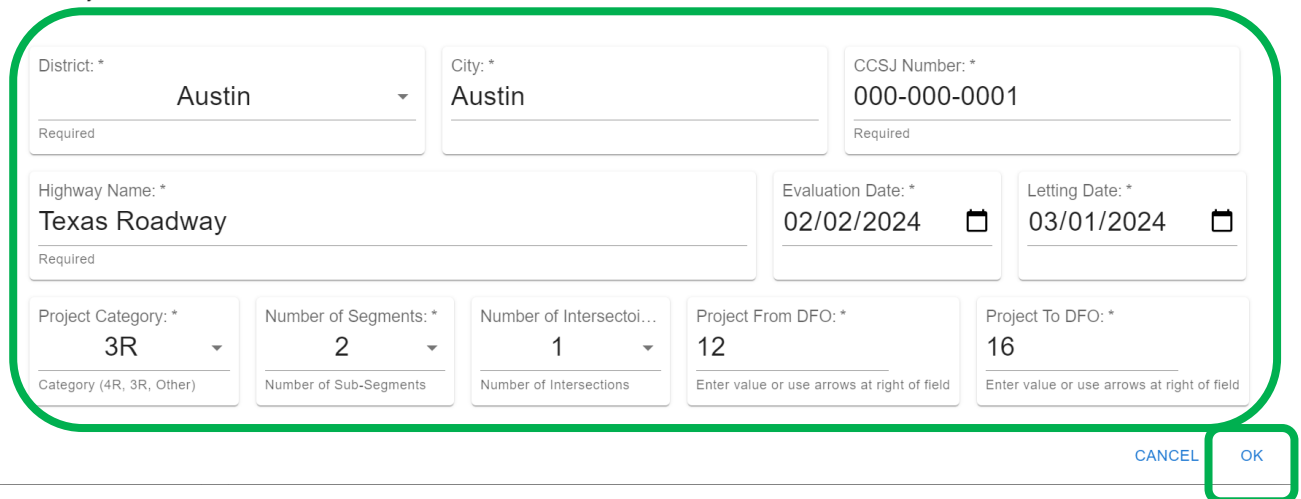


The screenshot shows the 'Urban Tool' interface. At the top, there is a blue header with 'TxDOT Safer by Design (SBD) Tools' and a 'LOGIN' button. Below the header, there is a navigation bar with a home icon and a close icon. The main content area is titled 'Urban Tool' and includes links for 'EDIT REPORT' and 'PRINT REPORT'. The 'Project Level Inputs' section is highlighted with a green box, and a pencil icon next to it is also highlighted with a green box. The form contains several input fields:

Analyst Email: *	District: *	CCSJ Number: *		
City: *	Highway Name: *	Evaluation Date: *	Letting Date: *	
Project Category: * 4R	Number of Segments: * 1	Number of Intersectio... 1	From DFO: *	To DFO: *

The project level inputs include District, City, project CCSJ number, highway name, evaluation date, letting date, project category, number of segments, number of intersections, project start point (from DFO) and project end point (to DFO).

### Edit Project Information

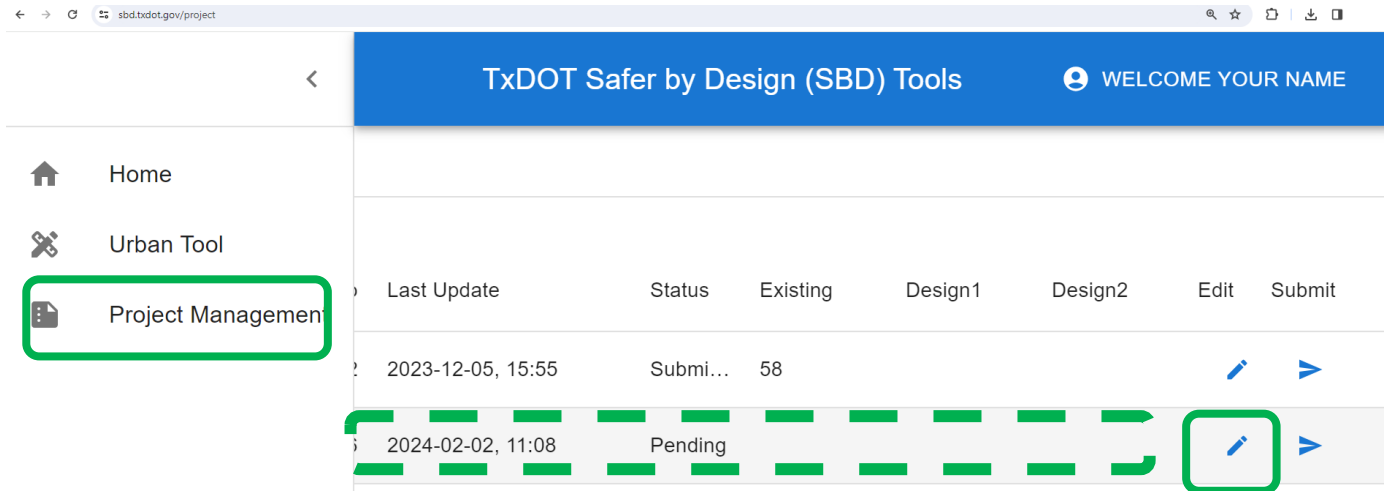


The 'Edit Project Information' form is shown with a green border. It contains the following fields:

District: * Austin	City: * Austin	CCSJ Number: * 000-000-0001		
Highway Name: * Texas Roadway	Evaluation Date: * 02/02/2024	Letting Date: * 03/01/2024		
Project Category: * 3R	Number of Segments: * 2	Number of Intersectio... 1	Project From DFO: * 12	Project To DFO: * 16

At the bottom right, there are 'CANCEL' and 'OK' buttons. The 'OK' button is highlighted with a green box.

For registered users, create a project first if the project has not been created (follow Section 3 of this guide), then go to “Project Management” page, locate the project to be assessed, click on the pencil icon (second last column called “Edit”).



This brings the target project to “Urban Tool” Page.

For each intersection and segment:

- Click on the **accordion bar** to expend the inputs

### Segment Level Inputs


START OF SEGMENT 1



	Existing Design	Standard Design	Design 1	Design 2
Segment				
Score	-	-	-	-
1	TOT: - F&I: - PDO: - PED: -	TOT: - F&I: - PDO: - PED: -	TOT: - F&I: - PDO: - PED: -	TOT: - F&I: - PDO: - PED: -

TOT = Total, F&I = Fatal and Injury, PDO = Property Damage Only, PED = Pedestrian

Click to open the inputs panel of segment 1

- Fill all the categories of **Existing** configuration

DFO Elements 	
From DFO	To DFO
12	13

Basic Elements	
Item	Existing 
ADT 	5678
Roadway Type	Two-Way
Number of Through Lanes	2
Posted Speed Limit (mph)	40

#### Edit basic Elements

 The inputs have passed the check.

Number  
ADT 5678

Roadway Type Two-Way ▾






Number of Through Lanes 2 ▾

Posted Speed Limit (mph) 40 ▾

Load Inputs from Current Standard ▾ LOAD

OK CANCEL

Note: (1) for certain elements, there are tips and clarifications, please hover on the question mark; (2) please refer to FAQ for questions regarding specific elements and options; (3) if concerns are not addressed from FAQ, please contact TxDOT design division (contacts can be found from <https://www.txdot.gov/about/divisions/design-division.html>).



Geometric Elements	
Item	Existing  
Median Configuration	No Median
Median Width (ft)	
Lane Width (ft) 	11
Shoulder Width (ft) 	0
Grass/Gravel Width (ft) 	No

**Average width of all general purpose through lanes.**



- Click “CALCULATE” button, the scores and predicted number of crashes for the current segment or intersection will display on the left side of the button.



WELCOME YOUR NAME
TxDOT Safer by Design (SBD) Tools

Crossing Traffic Control Device for Crossing 9	PHB or HAWK	
Four Pedestrian Crossing Flow Level for Crossing 10	6 to 100	
Refuge Island Presence for Crossing 10	Yes	
Crossing Traffic Control Device for Crossing 10	PHB or HAWK	

Existing  

Standard

Design1  

Design2  

Optimal

WELCOME YOUR NAME

PHB or HAWK

Optimal

0 to 5

Separated bicycle path without barrier

CALCULATE

Flow Level (both sides)

0 to 5

None





Separated bicycle path without barrier

END OF SEGMENT 1


Note: (1) if an error message displays after clicking the “CALCULATE” button, please check the inputs. There are certain types of roadway segments and intersections without available safety analytic methods. For example a two-lane divided roadway is very rare, the safety performance functions and crash modification factors are not available; (2) if all inputs are valid and error message persists, please take a screenshot of the error message and inputs, and send to the Tool development team ([DES\\_SaferByDesign@txdot.gov](mailto:DES_SaferByDesign@txdot.gov) and [SBDToolSupport@tti.tamu.edu](mailto:SBDToolSupport@tti.tamu.edu)).

- Finish Design1 and Design2 assessment as needed following the same process as Existing

There is a “Load” feature to ease the process of element input. See below on how to load inputs from another configuration.

Existing  	Standard	Design1  
No Median	No Median	
10	12	
0	4	
No	No	

**Edit geometric Elements**

 The inputs are either missing or out of range. Please check it out!

Median Configuration

Lane Width (ft)

Shoulder Width (ft)

Horizontal Curve Presence:


Load Inputs from

- Current Existing
- Current Standard
- Current Optimal
- Current Design 2

LOAD

CANCEL

**Edit geometric Elements**

 The inputs have passed the check.

Median Configuration No Median

Lane Width (ft) 12

Shoulder Width (ft) 4

Horizontal Curve Presence: No

Load Inputs from

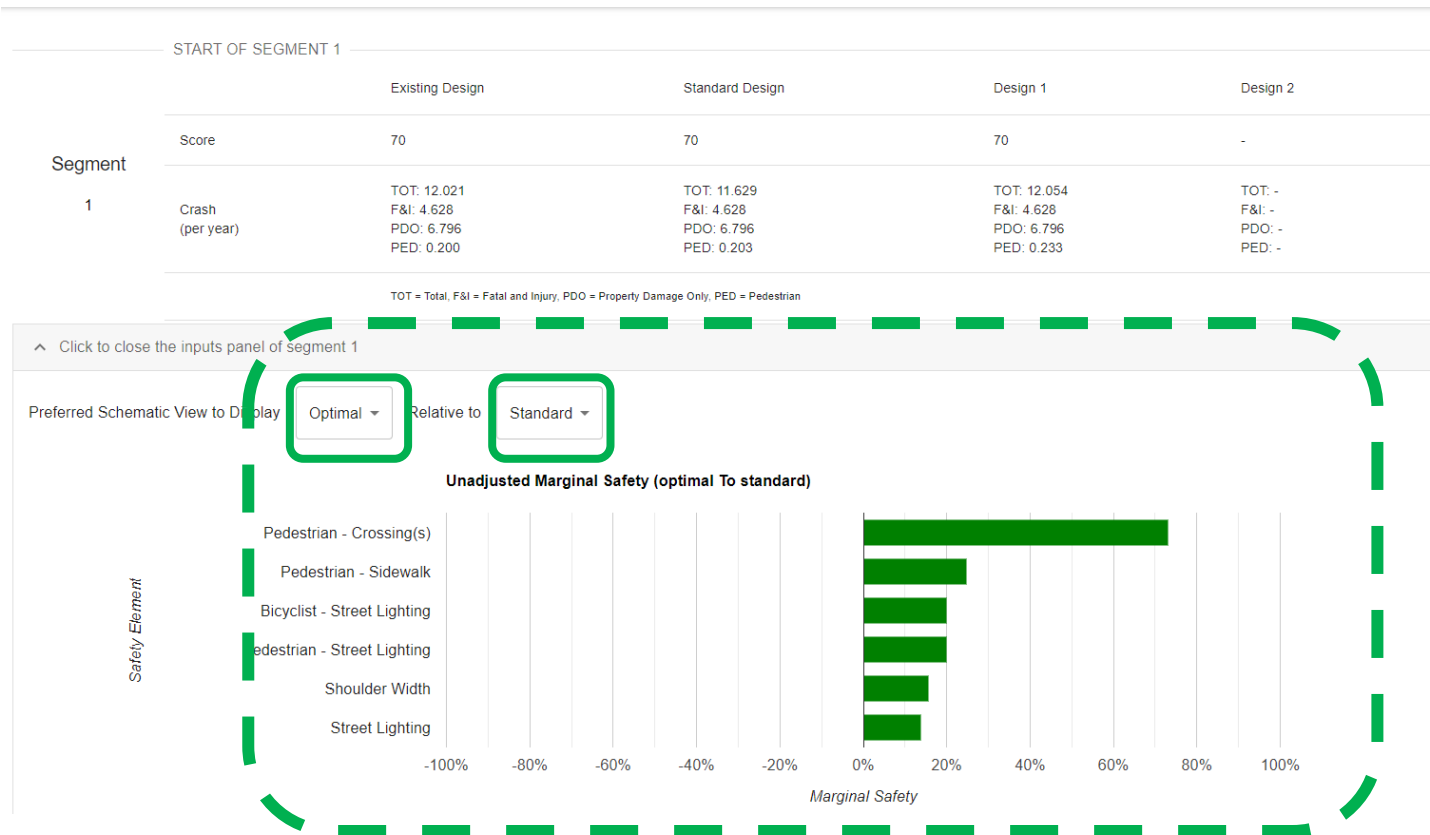
Current Existing

LOAD

OK

CANCEL

There is also vortex plot after clicking “CALCULATE” button, users can use to compare the marginal changes between different design configurations.



For registered and login users, Tool saves inputs and progress results every certain minutes. It is also highly recommended that users manually click “SAVE” button periodically.



- Click on “EDIT REPORT” button enables user to work on the project report.

The report includes basic information, summary table, elements increasing safety, constraints, and comments.



## Project Report



### General Information

Analyst	District	CCSJ	Highway Name	Evaluate Date	Letting Date
I-wu@tti.tamu.edu	Austin	000-000-0001	Texas Roadway	2023-10-19	2023-11-01

### Summary Table

Entity	Id	Alias	Location	Existing	Score			Crash		
					Design1	Design2	Existing	Design1	Design2	
Segment	1		12 - 13	59.0	74.0	93.0	5.528	1.369	0.944	
Intersection	1		Texas Roadway @ Houston Street	62.0	70.0	59.0	0.412	0.279	0.635	
Weighted Total				59.2	73.3	79.3	5.940	1.648	1.580	

### Selected Design

Design 1  Design2

### Elements Increasing Safety [LOAD DEFAULT](#)

Roadside object, Bicyclist - Lane Width, Pedestrian - Street Lighting, Lane Width, Pedestrian - Lane Width, Shoulder Width, Street Lighting, Pedestrian - Sidewalk, Bicyclist - Street Lighting

### Primary Constraints Toward Optimal Safety Score

OK CANCEL

For elements increasing safety, the “LOAD DEFAULT” button will compare the selected design (i.e., Design1 or Design2) with existing configurations, and fill the report by comparison results. This feature is provided to make the assessment process easier, users are encouraged to verify the default values, and should be modified when needed.

There are primary constraints, users need to view and check the items that applies to the project.



## Project Report



### Primary Constraints Toward Optimal Safety Score

A	Funding Eligibility / Scope	<input type="checkbox"/>
B	Schedule / Delivery Timeframe	<input checked="" type="checkbox"/>
C	Local ROW / Utilities	<input type="checkbox"/>
D	ROW / Utilities	<input checked="" type="checkbox"/>
E	Environmental Issues	<input type="checkbox"/>
F	Railroad Impact	<input type="checkbox"/>

### Funding

A	Future Funded Project	<input type="checkbox"/>
B	Future Unfunded Project Identified	<input type="checkbox"/>

Finally, users need to estimate the additional cost and time to achieve optimal safety levels, and fill comments on primary constraints. Upon clicking on the OK button, inputs in the report sections is saved.

<b>Estimated Additional Cost (\$, 0-1M) To Achieve Optimal</b> 12345	<b>Estimated Additional Time (Month, 0-36) To Achieve Optimal</b> 12
<b>Comments On Primary Constraints</b> Example constraint1, example constraints2, example constraints3	

OK CANCEL

- Click on “PRINT REPORT” button enables user to download the report as a PDF or print the report.



The PDF file includes the general information, summary table, selection, elements increasing safety, constraints, comments as well as all the inputs (configurations).

# Report

## General Information

Name	Value
Analyst	l-wu@tti.tamu.edu
CSSJ	000-000-0001
District	Austin
City	Texas Roadway
Highway Name	Texas Roadway
Evaluation Date	2023-10-19
Letting Date	2023-11-01
Project Category	3R
Number of Segment	1
Number of Intersections	1
From DFO	12
To DFO	15

## Summary Table

Entity	Id	Alias	Location	Extg	D1	D2	Extg	D1	D2
Segment	1		12 - 13	59	74	93	5.52791	1.36889	0.94446
Intersection	1		Texas Roadway @ Houston Street	62	70	59	0.41216	0.27928	0.63505
Weighted Total				59.2	73.3	79.3	5.94007	1.64817	1.57951

## Selected Design

Design 2

## Elements Increasing Safety

Roadside object, Bicyclist - Lane Width, Pedestrian - Street Lighting, Lane Width, Pedestrian - Lane Width, Shoulder Width, Street Lighting, Pedestrian - Sidewalk, Bicyclist - Street Lighting

## Primary Constraints

ID	Label	Checked
A	Funding Eligibility / Scope	Yes
B	Schedule / Delivery Timeframe	No
C	Local ROW / Utilities	Yes
D	ROW / Utilities	No
E	Environmental Issues	No
F	Railroad Impact	No

## Funding

ID	Label	Checked
A	Future Funded Project	Yes
B	Future Unfunded Project Identified	No

## Cost and Time

Name	Estimated Number to Achieve Optimal
Cost	20000
Month	3

## Configuration - segment - 1

### Milepost Elements

Item	Value
From DFO	12
To DFO	13

### Basic Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
ADT	5678	5678	5678	5678	5678
Roadway Type	Two-Way	Two-Way	Two-Way	Two-Way	Two-Way
Number of Through Lanes	2	2	2	2	2
Posted Speed Limit (mph)	40	40	40	40	40

### Geometric Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
Median Configuration	No Median	No Median	No Median	No Median	No Median
Lane Width (ft)	10	12	12	13	12
Shoulder Width (ft)	1	4	2	9	10

### Traffic Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
Major Com./Inst. Driveway Num	1	1	2	0	0
Major Residential Driveway Num	7	7	2	2	0
Minor/Other Driveway Num	2	2	1	1	0
Street Lighting Presence	No	No	Yes	Yes	Yes

### Roadside Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
Fixed Object Num within 30ft on Both Sides	2	2	0	0	0
Min. Offset Distance (ft)	2	2			

### Pedestrian Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
Peak-Hour Pedestrian Flow Level along Left Side	0 to 5	0 to 5	0 to 5	0 to 5	0 to 5
Peak-Hour Pedestrian Flow Level along Right Side	0 to 5	0 to 5	0 to 5	0 to 5	0 to 5
Sidewalk	None	Sidewalk adjacent to traveled way (within 3 ft)	Sidewalk adjacent to traveled way (within 3 ft)	Sidewalk with > 3 ft separation from traveled way with no barrier present	Sidewalk with > 10 ft separation from traveled way with no barrier present
School Zone	No school zone	No school zone	No school zone	No school zone	No school zone
Fencing (i.e., Pedestrian Barrier)	None	None	None	None	None
Number of Transit Bus Stops	0	0	0	0	0
Peak-Hour Pedestrian Crossing Flow Level at Unmarked Crossing Locations	0 to 5	0 to 5	0 to 5	0 to 5	0 to 5
Number of Marked Crossings	1	1	1	1	3
Peak-Hour Pedestrian Crossing Flow Level for Crossing -1	0 to 5	0 to 5	0 to 5	0 to 5	0 to 5
Refuge Island Presence for Crossing -1	No	No	No	No	Yes
Crossing Traffic Control Device for Crossing -1	None	None	None	None	PHB or HAWK
Peak-Hour Pedestrian Crossing Flow Level for Crossing -2					0 to 5
Refuge Island Presence for Crossing -2					Yes
Crossing Traffic Control Device for Crossing -2					PHB or HAWK
Peak-Hour Pedestrian Crossing Flow Level for Crossing -3					0 to 5
Refuge Island Presence for Crossing -3					Yes
Crossing Traffic Control Device for Crossing -3					PHB or HAWK

#### Bicyclist Elements

Item	Existing	Standard	Design 1	Design 2	Optimal
Peak-Hour Bicycle Flow Level (both sides)	0 to 5	0 to 5	0 to 5	0 to 5	0 to 5
Bicycle Facility	None	Separated bicycle path without barrier	None	None	Separated bicycle path without barrier

## 6. Registered User - Project Management

Registered users can edit a saved project. Go to the Project Management page, locate the project to be assessed, click on the pencil icon (second last column called “Edit”). Then follow the steps discussed in Section 5 Safety Assessment and click “SAVE” button.

Once the user is ready to submit a project, go to the Project Management page, locate the project to be submitted, click on the submit icon (last column called “Submit”). User may type optional message in the comments box. Then click “SUBMIT” button.

## Comments

Comment

Optimal Message.

CLOSE SUBMIT

Once submitted, the status of the project will become “Submitted,” (refresh the Project Management page), and it cannot be edited, unless a TxDOT Division-level Administrator sends it back (project status becomes “Pending”).

Users can search projects using the project attributes (e.g., CCSJ, Highway, Dates), this can be done using the FILTER button in the project management page.

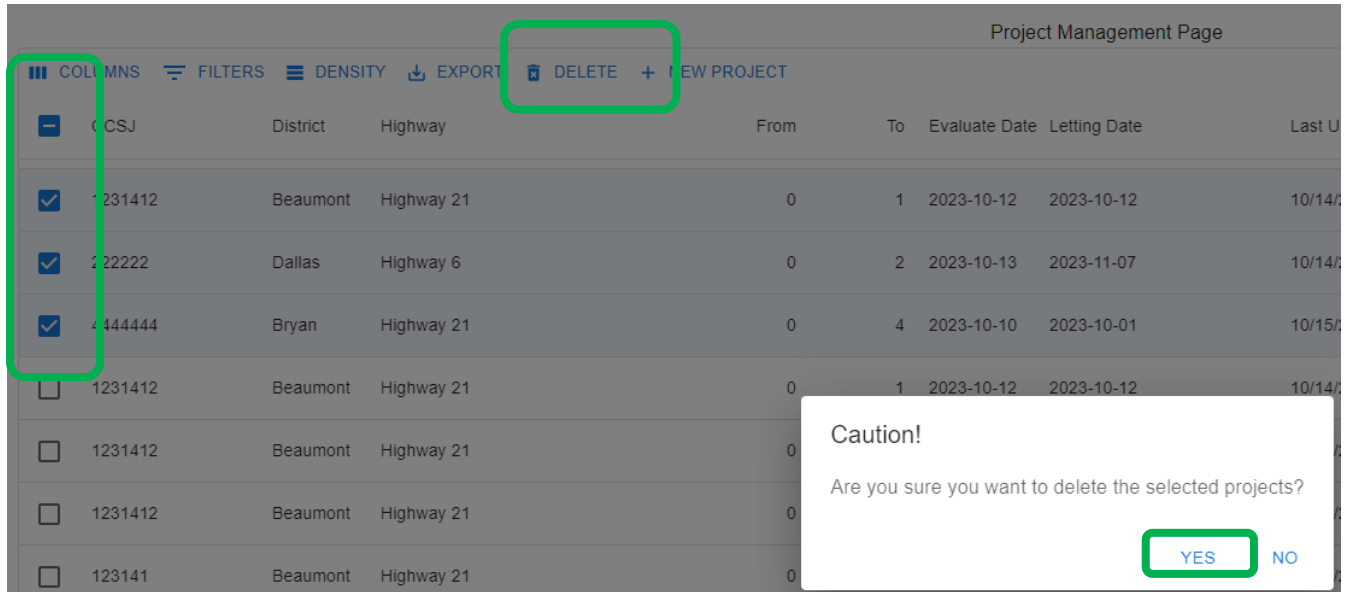
The screenshot shows a project management interface with a table of projects. A filter is applied to the 'CCSJ' column, showing only one project with ID 444444. The filter is highlighted with a green box, and the 'FILTERS' button in the top navigation bar is also highlighted with a green box and a '1' icon.

Columns	Operator	Value	From	To
CCSJ	contains	444444	0	4

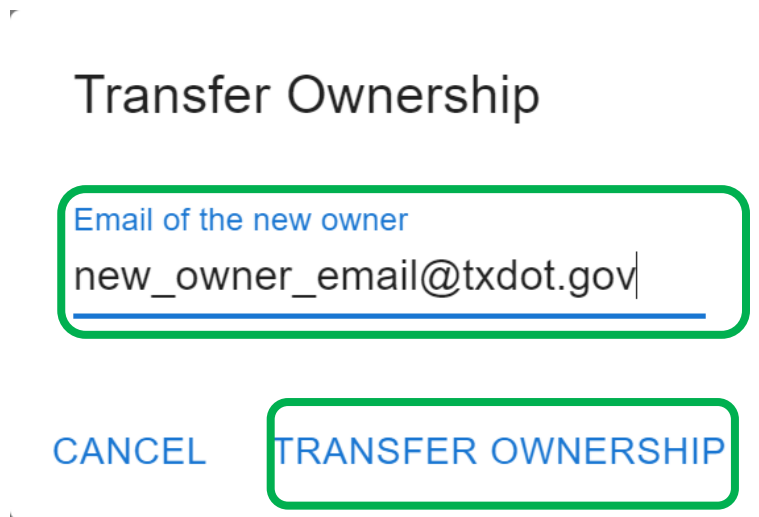
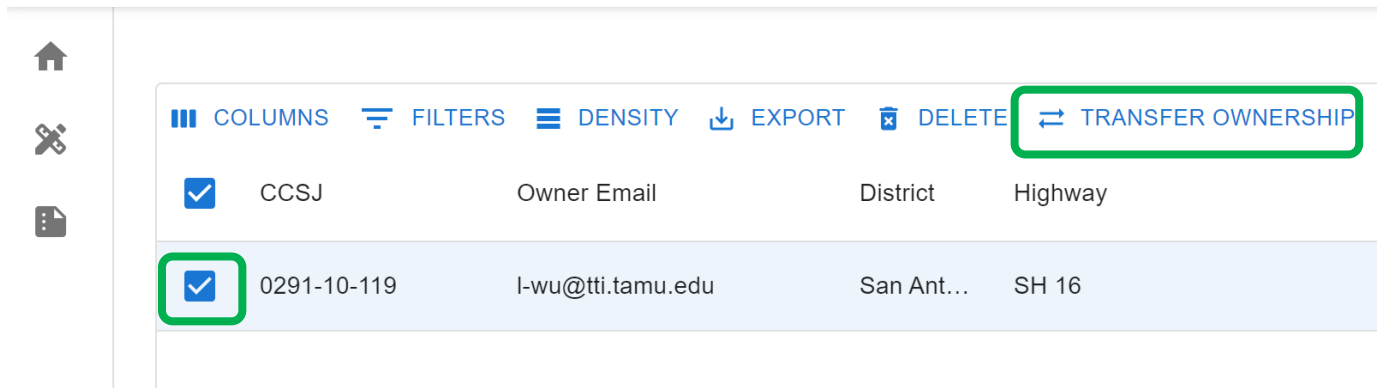
  

CCSJ	District	Highway	From	To	Evaluate Date	Letting Date	Last Update	Status
4444444	Bryan	Highway 21	0	4	2023-10-10	2023-10-01	10/15/2023, 8:44:03 PM	Pending

Users can also delete projects. Select projects by checking the box (first column of Project Management Page), then click “DELETE” button. After confirming, the selected projects will be deleted from Tool. Note, projects cannot be restored after deletion.



The ownership of a project can be transferred by the current owner, district level managers associated with the project district, or TxDOT division-level managers. To transfer ownership, locate and select the target project(s) on the Project Management Page, click “TRANSFER OWNERSHIP”, type the email of new owner, then click “TRANSFER OWNERSHIP” button.



Note that once a project is transferred to a new user, the previous user will not have access to the project.

## 7. TxDOT Division-Level Administrator - Management

### **Project Management**

Registered users with TxDOT Division-level Administrator roles can send back a submitted project. The process is similar to that of submitting a project (refer to Section 6).

Registered users with TxDOT Division-level Administrator roles can download summary table of selected projects as a CSV file. Select projects by checking the box (first column of Project Management Page), then click on “EXPORT” button, and “Downloaded as CSV.” A CSV file of the selected projects will be downloaded to local drive.

	COLUMNS	FILTERS	DENSITY	EXPORT	DELETE	NEW PROJECT
<input type="checkbox"/>	CCSJ	District	Hc	Download as CSV		From
<input checked="" type="checkbox"/>	1231412	Beaumont	Highway 21	Print		0
<input checked="" type="checkbox"/>	222222	Dallas	Highway 6			0
<input checked="" type="checkbox"/>	4444444	Bryan	Highway 21			0

### User Role Management

Registered users with TxDOT Division-level Administrator roles can add, modify, and remove roles to a registered user.

To add a registered user as a District-Level Manager, navigate to User Management Page, then click “ADD ENTRY” button. Then fill the row (at the end of this page) with email, name, role type, and district. After that click the save icon. This user is added as the manager of the selected district.

<
TxDOT Safer by Design

- 🏠 Home
- 🔧 Urban Tool
- 📁 Project Management
- 👤 User Management

+ ADD ENTRY





User Email	Name	Role
lwu-c@txdot.gov	Lingtao	admin
txdot002@txdot.gov	txdot002	admin
example_email@txdot.gov	Example Name	district_manager <span style="float: right;">Bryan <span style="border: 2px solid green; border-radius: 50%; padding: 2px;">📁</span> ×</span>







To add a registered user as a District-Level Manager, follow the same steps as adding a new district level manager, but choose Admin for Role, and TxDOT for District, then click save icon.

To update a user role, click on the pencil icon, then make changes, and click save icon.

[+ ADD ENTRY](#)

User Email	Name	Role	District	Actions
lwu-c@txdot.gov	Lingtao	admin	TxDOT	 
txdot002@txdot.gov	txdot002	admin	TxDOT	 

[+ ADD ENTRY](#)





User Email	Name	Role	District	Actions
lwu-c@txdot.gov	Lingtao	admin	TxDOT	 
txdot002@txdot.gov	<input type="text" value="New Name"/>	admin	TxDOT	 

W

To delete a user role, click on the delete icon.

User Management Page

[+ ADD ENTRY](#)

User Email	Name	Role	District	Actions
lwu-c@txdot.gov	Lingtao	admin	TxDOT	 
txdot002@txdot.gov	txdot002	admin	TxDOT	 
bryan002@txdot.gov	SafeTexas	district_manager	Bryan	