8 PREDICTIVE SAFETY ANALYSIS

An analysis of the predicted number of crashes along mainline I-275 was conducted for both the No-Build and Build concepts to assess and compare both alternatives' safety conditions. The study area limits for the safety analysis on the I-275 extend from the north end of the Howard Frankland Bridge to North Ashley Drive/Tampa Street and south of the I-275 to north of Cypress Street along the SR 60.

The study period for this project is between 2025 and 2045.

8.1 DATA COLLECTION

- The Opening Year (2025) and the Design Year (2045) traffic volumes for all the basic freeway segments and ramps were used.
- All the required geometric design and traffic control data were obtained from the design files that were provided.

8.2 METHODOLOGY

The analysis followed the procedures from Chapters 18 and 19 of the Highway Safety Manual (HSM) – 1st Edition Supplement 2014 by the American Association of State Highway and Transportation Officials (AASHTO). The HSM provides techniques to estimate crashes for a given facility, test the effectiveness of design alternatives on crash reduction, and evaluate their economic crash benefits. The analysis compares the anticipated number of crashes between the No-Build and Build Alternatives within the study limits for the study period. This analysis was completed using the Enhanced Interchange Safety Analysis Tool (ISATe). This Excel-based worksheet helps analyze the safety performance of freeways, ramps, and ramp terminals based on facility type, traffic volumes, and geometric conditions of the roadway. The HSM freeway crash-predictive models have not been calibrated with Florida jurisdiction-specific data. Default calibration parameters were used for analysis to compare the No-Build and Build Alternatives. The crash severity distribution was taken from the FDOT Design Manual (FDM) 2021, HSM Crash Distribution for Florida, Table 122.6.4, and can be seen in **Table 30**.

Table 30: HSM Crash Severity Distribution for Florida Freeways

Freeways	K	A	B	C	O
Urban	0.006	0.035	0.113	0.206	0.641
Ramps	0.004	0.032	0.107	0.210	0.647

Note: K – Fatality, A - Incapacitating Injury, B - Non-incapacitating Injury, C - Possible (or minor) Injury, O - Property Damage Only

8.3 ANALYSIS

The project was divided into freeway segments and ramps segments. All the freeway segments within the study limits were included in the freeway analysis, whereas the ramps at the interchange were included in the ramp analysis. However, most of the improvements proposed as part of the SIMR are on the mainline and the ramp terminals for No-Build and Build Alternatives are equivalent. Therefore, the predictive safety analysis was not performed for the terminals. The results from the analysis are summarized in the following sections. The ISATe output summary sheets are provided in **Appendix K**.

8.3.1 Predicted Crashes for the No-Build Alternative

The ISATe worksheet was utilized to analyze the predicted crashes for the No-Build Alternative using the Opening Year (2025) and the Design Year (2045) traffic projections. The summary results for the I-275 and SR 60 No Build Alternatives by severity are shown in **Tables 31** and **32**, respectively, while the results by crash type are shown in **Tables 33** and **34**, respectively.

The predicted number of crashes along I-275 over the study period is 12,117, with 69 fatal (K) crashes, 419 incapacitating injury (A) crashes, 1,359 non-incapacitating (B) crashes, 2,503 possible injury (C) crashes, and 7,767 property damage only (PDO) crashes. Approximately 64 percent of crashes are PDO crashes. Of the 12,117 total crashes, 10,394 crashes occur on freeway segments, accounting for 86 percent of the total crashes. The top three collision types are rear-end crashes (56%), sideswipe crashes (19%), and crashes with fixed objects (15%). 80 percent of crashes involved multiple-vehicle crashes.

The predicted number of crashes on SR 60 over the study period is 1,795, with 10 fatal (K) crashes, 61 incapacitating injury (A) crashes, 199 non-incapacitating (B) crashes, 372 possible injury (C) crashes, and 1,153 property damage only (PDO) crashes. Approximately 64 percent of crashes are PDO crashes. Of the 1795 total crashes, 1,228 crashes occur on freeway segments, accounting for 68 percent of the total crashes. The top three collision types are rear-end crashes (58%), sideswipe crashes (20%), and crashes with fixed objects (12%). 84 percent of crashes involved multiple-vehicle crashes.

Table 31: Predicted Crashes for the I-275 No-Build Alternative by Severity

Crash Severity	No-Build	
K	69	0.6%
A	419	3.5%
B	1,359	11.2%
C	2,503	20.7%
PDO	7,767	64.1%
Total Freeway Crashes	10,394	85.8%
Total Ramp Crashes	1,723	14.2%
Total Crashes	**12,117**	

Table 32: Predicted Crashes for the SR 60 No-Build Alternative by Severity

Crash Severity	No-Build	
K	10	0.5%
A	61	3.4%
B	199	11.1%
C	372	20.7%
PDO	1,153	64.2%
Total Freeway Crashes	1,228	68.4%
Total Ramp Crashes	567	31.6%
Total Crashes	**1,795**	

Table 33: Predicted Crashes for the I-275 No-Build Alternative by Crash Type

Crash Type	Crash Type Category	No-Build	
Multiple Vehicle	Head-on crashes:	45	0.4%
	Right-angle crashes:	194	1.6%
	Rear-end crashes:	6,800	56.1%
	Sideswipe crashes:	2,295	18.9%
	Other multiple-vehicle crashes:	356	2.9%
	Total multiple-vehicle crashes:	9,690	
Single Vehicle	Crashes with an animal:	31	0.3%
	Crashes with fixed object:	1,792	14.8%
	Crashes with other objects:	205	1.7%
	Crashes with a parked vehicle:	35	0.3%
	Other single-vehicle crashes	365	3.0%
	Total single-vehicle crashes:	2,427	

Table 34: Predicted Crashes for the SR 60 No-Build Alternative by Crash Type

Crash Type	Crash Type Category	No-Build	
Multiple Vehicle	Head-on crashes:	10	0.5%
	Right-angle crashes:	26	1.4%
	Rear-end crashes:	1,031	57.5%
	Sideswipe crashes:	356	19.8%
	Other multiple-vehicle crashes:	85	4.7%
	Total multiple-vehicle crashes:	1,507	
Single Vehicle	Crashes with an animal:	4	0.2%
	Crashes with fixed object:	213	11.8%
	Crashes with other objects:	23	1.3%
	Crashes with a parked vehicle:	4	0.2%
	Other single-vehicle crashes	44	2.5%
	Total single-vehicle crashes:	288	

8.3.2 Predicted Crashes for the Build Alternative

The ISATe worksheet was utilized to analyze the predicted crashes for the Build Alternative using the Opening Year (2025) and the Design Year (2045) traffic projections. The I-275 and SR 60 Build Alternatives' summary results by severity are shown in **Tables 35** and **36**, respectively, while the results by crash type are shown in **Tables 37** and **38**, respectively. The predictive analysis results of the Build Alternative consist of analyzing both the general use and express lanes. These facilities' results are presented in the following tables separately and as a total for the entire Build Alternative.

The predicted number of crashes on I-275 over the study period is 8,796, with 50 fatal (K) crashes, 303 incapacitating injury (A) crashes, 985 non-incapacitating (B) crashes, 1,818 possible injury (C) crashes, and 5,640 PDO crashes. 64 percent of crashes are PDO crashes. Of the 8,796 total crashes, 7,227 crashes occur on freeway segments, accounting for 82 percent of the total crashes. The top three collision types are rear-end crashes (48%), crashes with fixed objects (23%), and side-swipe crashes (17%). 69 percent of crashes involved multiple-vehicle crashes.

The predicted number of crashes on SR 60 over the study period is 920, with 5 fatal (K) crashes, 31 incapacitating injury (A) crashes, 101 non-incapacitating (B) crashes, 191 possible injury (C) crashes, and 592 PDO crashes. 64 percent of crashes are PDO crashes. Of the 920 total crashes, 498 crashes occur on freeway segments, accounting for 54 percent of the total crashes. The top three collision types are rear-end crashes (41%), crashes with fixed objects (27%), and side-swipe crashes (16%). 63 percent of crashes involved multiple-vehicle crashes.

Table 35: Predicted Crashes for the I-275 Build Alternative by Severity

Crash Severity	Build General Use Lanes	Build Managed Lanes	Total Build	
K	39	10	50	0.6%
A	238	65	303	3.4%
B	772	212	985	11.2%
C	1,422	396	1,818	20.7%
PDO	4,413	1,227	5,640	64.1%
Total Freeway Crashes	5,915	1,312	7,227	82.2%
Total Ramp Crashes	970	599	1,569	17.8%
Total Crashes	**6,885**	**1,910**	**8,796**	

Table 36: Predicted Crashes for the SR 60 Build Alternative by Severity

Crash Severity	Build General Use Lanes	Build Managed Lanes	Total Build	
K	2	2	5	0.5%
A	17	14	31	3.4%
B	57	45	101	11.0%
C	109	82	191	20.8%
PDO	337	255	592	64.3%
Total Freeway Crashes	146	352	498	54.2%
Total Ramp Crashes	375	46	421	45.8%
Total Crashes	**522**	**398**	**920**	

Table 37: Predicted Crashes for the I-275 Build Alternative by Crash Type

Crash Type	Crash Type Category	Build General Use Lanes	Build Managed Lanes	Total Build	
Multiple Vehicle	Head-on crashes:	22	7	29	0.3%
	Right-angle crashes:	102	18	119	1.4%
	Rear-end crashes:	3,466	742	4,208	47.8%
	Sideswipe crashes:	1,200	277	1,477	16.8%
	Other multiple-vehicle crashes:	165	65	230	2.6%
	Total multiple-vehicle crashes:	4,954	1,109	6,063	
Single Vehicle	Crashes with animal:	25	11	36	0.4%
	Crashes with fixed object:	1,425	588	2,012	22.9%
	Crashes with other object:	166	73	239	2.7%
	Crashes with parked vehicle:	28	12	39	0.4%
	Other single-vehicle crashes	289	118	407	4.6%
	Total single-vehicle crashes:	1,931	802	2,733	

Table 38: Predicted Crashes for the SR 60 Build Alternative by Crash Type

Crash Type	Crash Type Category	Build General Use Lanes	Build Managed Lanes	Total Build	
Multiple Vehicle	Head-on crashes:	4	1	5	0.5%
	Right-angle crashes:	4	4	8	0.8%
	Rear-end crashes:	237	142	379	41.2%
	Sideswipe crashes:	98	50	147	16.0%
	Other multiple-vehicle crashes:	37	7	44	4.8%
	Total multiple-vehicle crashes:	378	204	583	
Single Vehicle	Crashes with animal:	2	3	5	0.5%
	Crashes with fixed object:	108	141	249	27.0%
	Crashes with other object:	10	20	30	3.2%
	Crashes with parked vehicle:	2	3	5	0.5%
	Other single-vehicle crashes	22	28	49	5.4%
	Total single-vehicle crashes:	143	194	338	

8.3.3 Summary of Results and Conclusions

The results of the predictive analysis show that there is an anticipated reduction in crashes over the length of the study period by implementing the Build Alternative. The summary of predicted crashes based on KABCO levels for the freeway and ramps and for the entire facility in the study limit is given in **Tables 39** and **40** below, respectively. Even though there is an increase in the AADT, as well as the number of lanes, I-275 is expected to see a reduction in crashes of 27 percent, and SR 60 is expected to see a reduction of 49 percent, as seen in **Figure 36**. This reduction is likely due to volumes now being split between the general use lanes and express lanes. With the volumes split, crashes are decreased on the general use lanes.

Table 39: Summary of Predicted Crashes by Facility

Alternative	Facility	Total	K	A	B	C	PDO
I-275 No-Build	Freeway	10,394	62	364	1,175	2,141	6,652
	Ramp	1,723	7	55	184	362	1,115
I-275 Build	Freeway	7,227	43	253	817	1,489	4,625
	Ramp	1,569	6	50	168	330	1,015
SR 60 No-Build	Freeway	1,228	7	43	139	253	786
	Ramp	567	2	18	61	119	367
SR 60 Build	Freeway	499	3	17	56	103	319
	Ramp	421	2	14	45	89	273

Table 40: Summary of Predicted Crashes

KABCO Level	I-275 No-Build	I-275 Build	SR 60 No-Build	SR 60 Build
K	69	50	10	5
A	419	303	61	31
B	1359	985	199	101
C	2503	1818	372	191
O	7767	5640	1153	592
Total	**12,117**	**8,796**	**1,795**	**920**

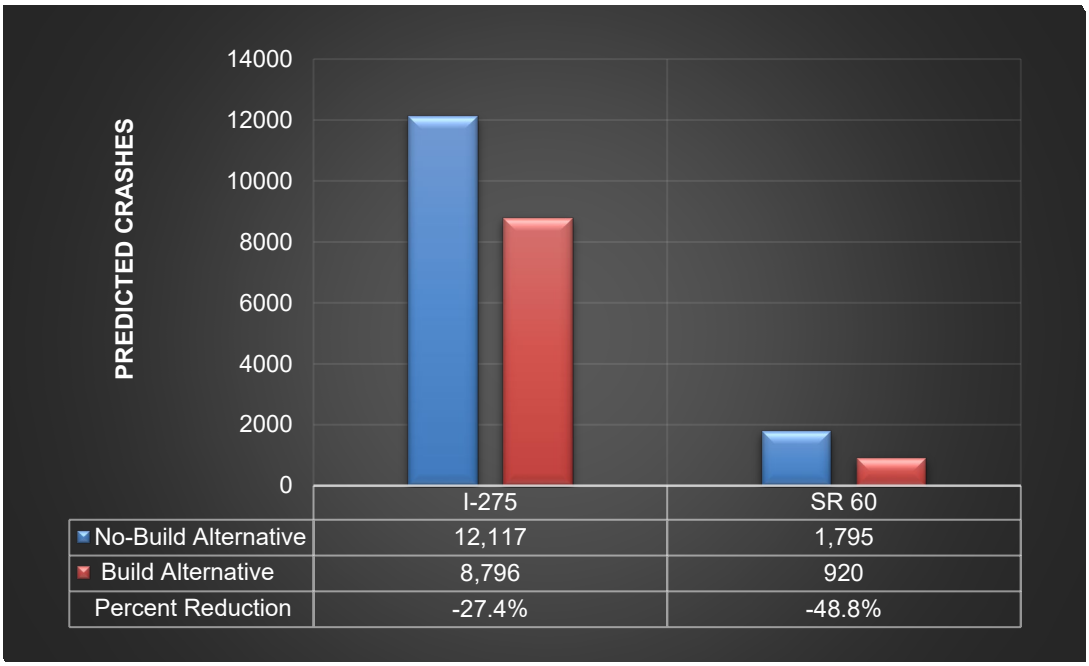

Figure 36: Predicted Crash Summary – No-Build Alternative & Build Alternative

The I-275 corridor is expected to experience a reduction in individual severity types, with the largest decrease in PDO crashes at 27 percent. SR 60 is expected to experience significant reductions in possible injury and PDO crashes, both at 49 percent. The Build Alternative is also expected to reduce the number of total multiple vehicles crashes along the I-275 and SR 60 corridors by 37 percent and 61 percent, respectively. This is likely due to a reduction in rear-end and side-swipe crashes due to splitting the volumes between general use lanes and express lanes. However, the I-275 and SR 60 corridors are expected to experience an increase in total single-vehicle crashes by 13 percent and 17 percent, respectively. This is likely due to an increased amount of barrier walls and delineators throughout the study limits due to separating the general use lanes from the express lanes.