

MEMORANDUM

TO: Honorable Mayor and Members of the City Council
THROUGH: J. Crystal Dyches, City Manager
FROM: Jorge Gastelum, P.E., Development Services Director / City Engineer 
CC: Paul N. Marzocca, Police Chief
SUBJECT: Citywide Traffic Signal Review
DATE: June 8, 2021

Background

Councilman David Shapera has requested to increase the all-red clearance interval, the period of time that follows the yellow signal indication during which a red signal indication is displayed to all conflicting movements at an intersection, for traffic signals in the City. The increase in this interval is an attempt to prevent collisions by providing the additional time needed to clear the intersection.

The purpose of the red clearance interval is to provide additional time as a safety factor for a driver that legally entered the intersection at the very last instant of the yellow change interval to avoid conflict with traffic releasing from an adjacent opposing intersection approach. The all-red clearance intervals are calculated based on posted speed limit and intersection width using the Institute of Transportation Engineers (ITE) equation for the red clearance interval. The Manual of Uniform Traffic Control Devices (MUTCD) recommends a maximum red clearance time of 6 seconds. This method is being used by most municipalities in the valley. The all-red clearance intervals in El Mirage signals vary and currently run between 1.5 seconds (El Mirage Rd/Cinnabar Ave) and 4.3 seconds (Dysart Rd/Thunderbird Rd).

In addition, the Maricopa Associations of Governments (MAG) has included El Mirage signals in their Traffic Signal Optimization Program (TSOP) which involves over 1,100 signalized intersections in the region. The program provides suggestions to improve traffic signal coordination and enables optimization and review of operations through simulation modeling.

As a justification to deviate from the above-mentioned standard procedures, the following engineering and traffic analysis has been completed.

Engineering and Traffic Analysis

The Police Department has provided accident reports at all signalized intersections in the City, including the intersections under the jurisdiction of the Arizona Department of Transportation (ADOT) and

Maricopa County Department of Transportation (MCDOT). A total of 199 reports were received. Copies of the reports are available in the Development Services offices upon request.

Engineering staff reviewed the reports in an attempt to verify whether timing issues at the traffic signals may be causing some of the incidents. A summary of each accident is shown in the attached Exhibit “A” which notes, in the opinion of the reviewer, whether the incident was caused by the signal timing at the intersection. It shall be noted that none of the reports specifically mentioned a timing issue so none of the cases were labeled as a definitive “Yes”. There were some cases where a potential issue with timing could be plausible, so those reports were labeled as “Maybe”. A summary of each intersection is shown below along with the reviewer’s interpretation of the results:

Grand Avenue & Thunderbird Road/Thompson Ranch Road

Signalized?: Yes
Number of Accidents: 41
Jurisdiction: ADOT

There was one report where both drivers, each traveling in different directions, stated that they had a green light. Although this is highly unlikely, it has been listed in the spreadsheet as “Maybe” regarding whether or not a timing issue is present at this intersection. The issues here seem to be rear end crashes with vehicles waiting in traffic, unsafe lane changes and improper turns. The improper turns were often northbound vehicles looking to make a right onto Grand Avenue and colliding with through traffic on Grand Avenue. The recent Grand Avenue TSOP Report prepared by ADOT and MAG reviewed crashes along Grand Avenue from 99th Avenue to 163rd Avenue from 2014 to 2018 and found that this intersection had the highest crash volume along this corridor. It was noted that “high traffic volumes from all approaches could be a contributing factor to the higher crash volume”. The timing for this intersection is controlled by ADOT and was recently revised as a result of the TSOP Report.

129th Avenue & Thunderbird Road

Signalized?: Yes
Number of Accidents: 15
Jurisdiction: COEM

Most of these accidents did not occur at the intersection. Only 5 were actually within the intersection, 5 were in the Wal-Mart parking lot and only 3 did not have specific reasons for the accidents. There was no reference to any timing issues in those three reports and all could be just as easily attributed to speeding or being distracted.

Northern Parkway & El Mirage Road

Signalized?: Yes
Number of Accidents: 1
Jurisdiction: Maricopa County

This intersection was under construction for most of 2020 and a new signal for the new configuration was placed in service in the fourth quarter of the year. This signal was controlled by the City of El Mirage for a portion of 2020 but is now under control by Maricopa County. A variety of crashes occurred at this intersection with several caused by running red lights, which all had witnesses. There was one report that mentioned an abrupt stop to traffic that has been listed as a “Maybe”, but this occurred in January 2020 which has a different configuration than the current signal.

El Mirage Road & Thunderbird Road

Signalized?: Yes
Number of Accidents: 11
Jurisdiction: COEM

Almost all the accidents were rear end collisions due to inattentive driving which are very common at signalized intersections.

Olive Avenue & Dysart Road

Signalized?: Yes
Number of Accidents: 12
Jurisdiction: COEM

The majority of the accidents were rear end collisions due to inattentive driving. One report did not have enough information due to it being a hit and run.

Greenway Road and Grand Avenue

Signalized?: Yes
Number of Accidents: 3
Jurisdiction: ADOT

Greenway Road and Grand Avenue Frontage

Signalized?: No
Number of Accidents: 5
Jurisdiction: COEM/Surprise

The eight reports were split between Greenway Road/Grand Avenue and Greenway Road/Grand Avenue Frontage Road. The Greenway Road and Grand Avenue intersection only had three accidents and they were all due to careless driving. The timing for this intersection is controlled by ADOT and was recently revised as a result of the Grand Avenue TSOP Report prepared by ADOT and MAG. The Greenway Road and Grand Avenue Frontage Road intersection is not signalized and had 4 accidents (1 of the 5 was near the NAPA parking lot) and were all due to a vehicle’s failure to yield.

Dysart Road & Cactus Road

Signalized?: Yes
Number of Accidents: 11
Jurisdiction: COEM

One report had a driver that was hit stating that the other ran the red light, so it was noted as a “Maybe” on the spreadsheet. There was one report with no narrative but since one driver was cited for failure to yield, it is assumed that it was not timing related.

Olive Avenue & El Mirage Road

Signalized?: Yes
Number of Accidents: 10
Jurisdiction: COEM

This intersection had mostly rear end collisions due to inattentive or careless drivers. One report only found debris and an abandoned vehicle so a determination could not be made.

Acoma Drive and Grand Avenue

Signalized?: No
Number of Accidents: 4
Jurisdiction: ADOT

Acoma Drive and Grand Avenue Frontage

Signalized?: No
Number of Accidents: 7
Jurisdiction: COEM

The eleven reports were split between Acoma Drive/Grand Avenue and Acoma Drive/Grand Avenue Frontage Road, neither of which are signalized. The Acoma and Grand Avenue intersection only had three accidents (1 was not at the intersection) and they were due to three different reasons. The Acoma Drive and Grand Avenue Frontage Road intersection had 5 accidents (2 were at private driveways to the north) and most were due to one vehicle failing to yield to the other. It is possible the atypical configuration of this intersection played a part in these five accidents.

Dysart Road & Peoria Avenue

Signalized?: Yes
Number of Accidents: 10
Jurisdiction: COEM

Two reports had left turning vehicles being hit during yellow lights. Although unlikely, it is possible that timing may be a factor so both incidents were labeled as “Maybe”.

Dysart Road & Thunderbird Road

Signalized?: Yes
Number of Accidents: 7
Jurisdiction: COEM

Only four accidents actually took place at the intersection. The City may want to review placing an island(s) or additional signage at the driveways for Goodwill and Wal-Mart parking lots to discourage through movements from one parking lot to the other.

Primrose Street and Grand Avenue

Signalized?: Yes
Number of Accidents: 6
Jurisdiction: ADOT

Primrose Street and Grand Avenue Frontage

Signalized?: No
Number of Accidents: 4
Jurisdiction: COEM

The ten reports were split between Primrose Street/Grand Avenue and Primrose Street/Grand Avenue Frontage Road. The Primrose Street and Grand Avenue intersection only had two accidents (the others were away from the intersection) and they were both rear end collisions. The timing for this intersection is controlled by ADOT and was recently revised as a result of the Grand Avenue TSOP Report prepared by ADOT and MAG. The Primrose Street and Grand Avenue Frontage Road intersection is not signalized and had 3 accidents (1 was away from the intersection) and were all due to a vehicle’s failure to yield. It is possible the atypical configuration of this intersection played a part in these three accidents.

El Mirage Road & Cactus Road

Signalized?: Yes
Number of Accidents: 7
Jurisdiction: COEM

Only 5 accidents were actually at the intersection. There were several different types of accidents at this intersection, all typical to what would be expected at an arterial-arterial intersection.

Northern Parkway & Dysart Road

Signalized?: Yes
Number of Accidents: 7
Jurisdiction: Maricopa County

This intersection was under construction for most of 2020 and a new signal for the new configuration was placed in service in the fourth quarter of the year. This signal was controlled by the City of El Mirage for a portion of 2020 but is now under control by Maricopa County. Two of the accidents were due to malfunctioning lights that were installed as part of the County's Northern Parkway project.

El Mirage Road & Peoria Avenue

Signalized?: Yes
Number of Accidents: 3
Jurisdiction: COEM

One report had both drivers stating that the other ran the red light, so it was noted as a "Maybe" on the spreadsheet.

127th Avenue & Thunderbird Road

Signalized?: No
Number of Accidents: 6
Jurisdiction: COEM

There is no signal at this intersection. The majority of the accidents were due to either failure to yield or an unsafe lane change.

127th Avenue & Cactus Road

Signalized?: HAWK
Number of Accidents: 6
Jurisdiction: COEM

This intersection has a HAWK signal which is primarily used during times when Dysart Elementary School students are walking to/from school. All but one accident was caused by either speeding or failure to yield and none occurred during times when students would typically be crossing.

Dysart Road & Acoma Drive

Signalized?: No
Number of Accidents: 4
Jurisdiction: COEM

This intersection is scheduled to be signalized in 2021. All of the accidents occurred with vehicles turning from Acoma Drive and hitting a vehicle driving on Dysart Road.

Thunderbird Road and Grand Avenue Frontage Road

Signalized?: Yes
Number of Accidents: 7
Jurisdiction: COEM

One report noted that both drivers seemed confused about the color of the light at the time of the accident so it is possible that there may have been a timing issue, although unlikely. It was listed as a “Maybe” on the spreadsheet.

El Mirage Road & Cinnabar Avenue

Signalized?: Yes
Number of Accidents: 1
Jurisdiction: COEM

Only 1 accident occurred, and it was due to a road rage incident.

Conclusions

While the increase to the all-red clearance interval will reduce the “optimization” of the timing of a signal and reduce the available green time at signals that are coordinated, the additional time could add an additional measure of safety without unduly reducing the traffic flow. It should be noted that although research has been performed that shows the effect of adding the all-red clearance interval to a signal that previously did not have one, the City was unable to find any studies that analyzed the results where the interval was increased. Exhibit “B” shows the proposed all-red timing revisions at intersections under El Mirage’s jurisdiction.

Exhibit “A”
Accident Summary

Grand Avenue and Thunderbird Road/Thompson Ranch Road

Accident No.	Report No.	Location	Issue	Grand & TRR/Tbird Timing Related?
1	E20010563	?	Speeding	No
2	E20011256	East of intersection	Hit stopped vehicle	No, traffic
3	E20012228	East of intersection	Unsafe lane change	No
4	E20020230	North of intersection	Hit and run	No
5	E20020706	South of intersection	Hit stopped vehicle	No
6	E20022164	West of intersection	Hit stopped vehicle due to emergency vehicle, hit and run	No, traffic
7	E20022230	South of intersection	Hit stopped vehicle, hit and run	No
8	E20022341	East of intersection	Speeding	No
9	E20022342	East of intersection	Hit stopped vehicle	No, traffic
10	E20030949	In Intersection	Hit stopped vehicle	No, traffic
11	E20031348	East of intersection	Unsafe lane change	No
12	E20032429	South of intersection	Hit stopped vehicle	No
13	E20040704	South of intersection	Unsafe lane change	No
14	E20041215	South of intersection	Hit stopped vehicle	No
15	E20050197	In Intersection	Ran red light	No
16	E20050469	East of intersection	Speeding	No
17	E20051353	East of intersection	Hit stopped vehicle	No, traffic
18	E20051436	South of intersection	Followed too closely	No
19	E20051488	In Intersection	Speeding	No
20	E20061004	East of intersection	Unsafe lane change	No
21	E20061335	Grand & 115th	Speeding	No
22	E20062108	West of intersection	Unsafe lane change	No
23	E20062313	East of intersection	Unsafe lane change	No
24	E20072008	West of intersection	Speeding	No
25	E20080096	East of intersection	Followed too closely	No
26	E20080343	In Intersection	Ran red light	No
27	E20081049	East of intersection	Speeding	No
28	E20081246	East of intersection	Hit stopped vehicle	No
29	E20081501	In Intersection	Speeding	No
30	E20081617	In Intersection	Ran red light	No
31	E20091775	East of intersection	Unsafe lane change	No
32	E20101361	In Intersection	Ran red light	No
33	E20101886	In Intersection	Ran red light? (Both said they had green light)	Maybe
34	E20102250	East of intersection	Hit stopped vehicle	No
35	E20111527	In Intersection	Improper turn	No
36	E20111657	In Intersection	Improper turn	No
37	E20112326	East of intersection	Inattentive driving	No
38	E20120228	North of intersection	Hit stopped car, possible DUI, hit and run	NO
39	E20121660	Near Agua Fria	Hit stopped vehicle	No, traffic
40	E20121854	East of intersection	Emergency vehicle started chain reaction of slamming brakes	No
41	E20122136	In Intersection	Failed to stay in lane	No

129th Avenue and Thunderbird Road

Accident No.	Report No.	Location	Issue	129th & Tbird Timing Related?
1	E20030821	West of 129th Ave	Driver coming out of private drive	No
2	E20030885	Intersection	Left turn crash	?
3	E20031445	West of 129th Ave	Lane change	No
4	E20031846	Wal-Mart	Occurred in Parking Lot	No
5	E20012290	Intersection	Speeding through yellow Light	?
6	E20020485	West Wal-Mart Entrance & Tbird	Misjudged speed of other vehicle	No
7	E20051414	Intersection	Disabled vehicle	No
8	E20091574	West Wal-Mart Entrance & Tbird	Illegal Movement	No
9	E20100296	Intersection	Both drivers said they had green light	?
10	E20100830	Intersection	Running red light	No
11	N/A	Wal-Mart	Occurred in Parking Lot	No
12	N/A	Wal-Mart	Occurred in Parking Lot	No
13	N/A	Wal-Mart	Occurred in Parking Lot	No
14	N/A	Wal-Mart	Occurred in Parking Lot	No
15	E20051573	130th Avenue	Improper lane change/hit and run	No

Northern Parkway and El Mirage Road

Accident No.	Report No.	Location	Issue	Northern & EMR Timing Related?
1	E20010600	In intersection	Driver said he did not see other vehicle	No
2	E20010646	West of Intersection	Hit stopped vehicle at signal	No
3	E20011462	West of Intersection	Traffic came to abrupt stop	Maybe
4	E20040974	North of Intersection	Unsafe lane change	No
5	E20041544	In intersection	Surface drop in Construction Zone	No
6	E20060563	North of Intersection	Debris from Construction Zone	No
7	E20071577	North of Intersection	Unsafe lane change	No
8	E20101255	In intersection	Ran red light	No
9	E20101519	North of Intersection	Hit stopped vehicle at signal	No
10	E20110248	In intersection	Ran red light	No
11	E20111598	In intersection	Ran red light	No
12	E20122304	North of Intersection	Medical Issue	No
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El Mirage Road and Thunderbird Road

Accident No.	Report No.	Location	Issue	EMR & Tbird Timing Related?
1	E20032121	In Intersection	Ran red light	No
2	E20051834	West of Intersection	Abrupt stop due to pedestrian	No
3	E20052029	East of Intersection	Hit stopped vehicle	No
4	E20061617	East of Intersection	Hit stopped vehicle	No
5	E20090454	South of Intersection	Hit median, hit & run	No
6	E20091898	West of Intersection	Hit stopped vehicle	No
7	E20100133	Tbird & 124th	Hit from behind, hit & run	No
8	E20110140	West of Intersection	Hit stopped vehicle (traffic)	No
9	E20111211	East of Intersection	Hit stopped vehcile (traffic)	No
10	E20120998	East of Intersection	Hit stopped vehcile	No
11	E20121771	East of Intersection	Hit from behind, hit & run	No
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Olive Avenue and Dysart Road

Accident No.	Report No.	Location	Issue	Olive & Dysart Timing Related?
1	E20030431	West of Intersection	Hit stopped vehcile (traffic), Driver Inattentive	No
2	E20030433	West of Intersection	Hit stopped vehcile (traffic), Driver Distracted	No
3	E20050047	In Intersection	Failure to Yield, hit & run	No
4	E20050480	West of Intersection	Followed too closely	No
5	E20100010	North of Intersection	Hit stopped vehcile	No
6	E20101900	North of Intersection	Hit stopped vehcile	No
7	E20110499	In Intersection	???, Hit and run	???
8	E20110872	In Intersection	Ran red light, hit & run	No
9	E20111150	In Intersection	Failure to yeild or Improper turn	No
10	E20111739	South of Intersection	Reckless Driving	No
11	E20111994	North of Intersection	Hit stopped vehcile	No
12	E20120636	South of Intersection	Hit stopped vehcile	No
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Greenway Road and Grand Avenue/Frontage Road

Accident No.	Report No.	Location	Issue	Greenway & Grand Timing Related?
1	E20012447	Greenway & Grand Ave Frontage Road	Failure to yield	No
2	E20020212	Greenway & Grand Ave Frontage Road	Failure to yield	No
3	E20030222	Grand Ave Frontage Road	Failure to yield	No
4	E20050191	Greenway & Grand Ave	Careless driving	No
5	E20050282	Greenway & Grand Ave Frontage Road	Speeding or Failure to yield	No
6	E20080846	This is a duplicate E20050282		
7	E20081590	Greenway & Grand Ave	DUI, hit & run	No
8	E20110673	Greenway & Grand Ave Frontage Road	Failure to yield	No
9	E20121451	Greenway & Grand Ave	Unsafe lane change	No
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Dysart Road and Cactus Road

Accident No.	Report No.	Location	Issue	Dysart & Cactus Timing Related?
1	E20022325	North of Intersection	Hit stopped vehicle	No
2	E20041573	South of Intersection	Rear end collision, speeding	No
3	E20051031	South of Intersection	Hit stopped vehicle, hit and run	No
4	E20062219	South of Intersection	Hit stopped vehicle	No
5	E20062422	In Intersection	Failure to yield	No Narrative, Probably Not
6	E20070882	North of Intersection	Unsafe lane change, hit and run	No
7	E20071927	In Intersection	Speeding or following too closely, dip in Cactus	No
8	E20080539	In Intersection	Failure to yield	No
9	E20090125	In Intersection	Failure to yield	No
10	E20120894	In Intersection	Speeding or ran red light	Maybe
11	E20121391	South of Intersection	Hit stopped vehicle	No
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Olive Avenue and El Mirage Road

Accident No.	Report No.	Location	Issue	Olive & EMR Timing Related?
1	E20010838	North of Intersection	Careless driving or speeding	No
2	E20011760	East of Intersection	Inattentive driver	No
3	E20090418	In Intersection	Speeding, solo car	No
4	E20100606	North of Intersection	Hit stopped vehicle	No
5	E20110497	North of Intersection	Medical Condition	No
6	E20111486	South of Intersection	Speeding, hit from behind	No
7	E20120341	East of Intersection (Burger King driveway on Olive)	Failure to yield	No
8	E20121221	East of Intersection	Hit stopped vehicle	No
9	E20121373	In Intersection	??? Debris and abandoned vehicle	???
10	E20122027	West of Intersection	Unsafe lane change??? Hit and run	No
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Acoma Drive and Grand Avenue/Frontage Road

Accident No.	Report No.	Location	Issue	Acoma & Grand Intersection Related?
1	E20010864	Grand Avenue Frontage Road north of Acoma	Collision from behind, speeding	No Signal
2	E20011963	Grand Avenue Frontage Road north of Acoma	Failure to yield	No Signal
3	E20021022	Grand Avenue & Acoma	Speeding	No Signal
4	E20031666	Grand Avenue Frontage Road & Acoma	Ran stop sign	No Signal
5	E20031777	Grand Avenue Frontage Road & Acoma	Failure to yield	No Signal
6	E20050413	Grand Avenue Frontage Road & Acoma	Failure to yield	No Signal
7	E20050556	Grand Avenue Frontage Road & Acoma	Failure to yield	No Signal
8	E20060813	Grand Avenue & Acoma	Mechanical Issues	No Signal
9	E20111653	Grand Avenue Frontage Road & Acoma	Not sure which driver had right of way	No Signal
10	E20121559	Grand Avenue & Acoma	Failure to yield/No headlights	No Signal
11	E20122014	Grand Avenue, north of Acoma	Unsafe lane change	No Signal
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Dysart Road and Peoria Avenue

Accident No.	Report No.	Location	Issue	Dysart & Peoria Timing Related?
1	E20010488	South of Intersection	Hitting stopped vehicle	No
2	E20011454	In Intersection	Car hit signal and left scene	??? Probably not
3	E20020886	South of Intersection	Unsafe lane change	No
4	E20021925	In Intersection	Failure to yield	Maybe
5	E20030723	South of Intersection	Speeding (Strange Narrative)	No
6	E20051792	South of Intersection	Unsafe lane change	No
7	E20091035	North of Intersection	Hit stopped vehicle/Driver Inattentive	No
8	E20111833	In Intersection	One driver said he had a green, the other said his was yellow	Maybe
9	E20120752	In Intersection	Failure to yield	No
10	E20121598	South of Intersection	Failure to keep in proper lane	No
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Dysart Road and Thunderbird Road

Accident No.	Report No.	Location	Issue	Tbird & Dysart Timing Related?
1	E20011753	Circle K parking lot	Hit bicyclist, failure to yield	No
2	E20031658	In Intersection	Failure to keep proper lane???	No
3	E20041512	In Intersection	Ran red light	No
4	E20062040	West Wal-Mart entrance & Tbird	Failure to yield	No
5	E20062201	In Intersection	Failure to yield	No
6	E20091688	East of Intersection	Motorcycle accident	No
7	E20092070	West Wal-Mart entrance & Tbird	Illegal maneuver	No
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Primrose Street and Grand Avenue/Frontage Road

Accident No.	Report No.	Location	Issue	Grand & Primrose Timing Related?
1	E20011634	East side RR Tracks across Grand (West of Intersection)	Hit stopped vehicle	No
2	E20020085	East of Grand Avenue Intersection	Hit stopped vehicle	No
3	E20031596	Primrose & Grand Avenue Frontage Road	Failure to yield	No
4	E20040505	West of Grand Avenue Intersection	Unsafe lane change	No
5	E20051249	Grand Avenue Frontage Road (Eats of Intersection)	Reckless driving	No
6	E20051943	Primrose & Grand Avenue Frontage Road	Ran stop sign	No
7	E20062603	West of Grand Avenue Intersection	Rear end collision	No
8	E20070380	East of Grand Avenue Intersection	Unsafe lane change	No
9	E20091616	Primrose & Grand Avenue	Hit stopped vehicle, hit & run	No
10	E20121247	Primrose & Grand Avenue Frontage Road	Ran stop sign	No
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El Mirage Road and Cactus Road

Accident No.	Report No.	Location	Issue	EMR & Cactus Timing Related?
1	E20010039	In Intersection	Failure to yield	No
2	E20020908	West of Intersection	Hit stopped vehicle	No
3	E20021044	South of Intersection	Unsafe Lane change	No
4	E20040710	West of Intersection (near 123rd Lane)	Speeding	No
5	E20061791	Walgreens parking lot	Hit & run	No
6	E20110617	West of Intersection	Hit stopped vehicle, hit & run	No
7	E20111538	In Intersection	Failure to yield, hit & run	No
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Northern Parkway and Dysart Road

Accident No.	Report No.	Location	Issue	Northern & Dysart Timing Related?
1	E20010741	West of Intersection	Unsafe lane change	No
2	E20020730	North of Intersection	Speeding, rear end collision	No
3	E20061328	East of Intersection	Animal	No
4	E20071875	North of Intersection	Wrong way vehicle caused car to swerve (Construction Zone)	No
5	E20081806	In Intersection	Ran red light, hit & run (Construction Zone)	No
6	E20121448_1	In Intersection	Malfunctioning traffic signals	No
7	E20121448_2	In Intersection	Malfunctioning traffic signals	No
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El Mirage Road and Peoria Avenue

Accident No.	Report No.	Location	Issue	EMR & Peoria Timing Related?
1	E20020240	South of Intersection	Hitting stopped vehicle, hit and run, possible DUI	No
2	E20100875	In Intersection	Solo, served to avoid coyote	No
3	E20112152	In Intersection	Ran red light, both drivers said the other ran red light	Maybe
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127th Avenue and Thunderbird Road

Accident No.	Report No.	Location	Issue	129th & Tbird Intersection Related?
1	E20020669	West of Intersection	Unsafe lane change	No signal
2	E20021153	In Intersection	Ran stop sign or unsafe lane change	No signal
3	E20021435	In Intersection	Driver slammed brakes due to dog, motorcycle crashed	No signal
4	E20030729	Tbird & 126th Ave	Driver fell asleep	No signal
5	E20081749	In Intersection	Failure to yield	No signal
6	E20101221	In Intersection	Failure to yield	No signal
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127th Avenue and Cactus Road

Accident No.	Report No.	Location	Issue	127th & Cactus Timing Related?
1	E20011715	In Intersection	Failure to Yield	No Signal
2	E20012511	West of Intersection	Hit stopped vehicle, possible distraction	No Signal
3	E20020113	In Intersection	Failure to Yield	No Signal
4	E20021449	West of Intersection	Speeding, Inattentive	No Signal
5	E20100899	In Intersection	Failure to Yield	No Signal
6	E20101305	West of Intersection	Speeding, Inattentive	No Signal
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8				
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12				
13				
14				
15				
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Dysart Road and Acoma Drive

Accident No.	Report No.	Location	Issue	Dysart & Acoma Timing Related?
1	E20021086	In Intersection	Failure to yield	No signal
2	E20071073	In Intersection	Failure to yield	No signal
3	E20091031	In Intersection	Did not see vehicle	No signal
4	E20100124	In Intersection	Failure to yield	No signal
5				
6				
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Thunderbird Road and Grand Avenue Frontage Road

Accident No.	Report No.	Location	Issue	Tbird & Frontage Timing Related?
1	E20010371	In intersection	Ran red light	No
2	E20011464	North of intersection	Hit stopped vehicle, hit and run	No
3	E20050228	South of intersection	Driver was scared	No
4	E20051038	South of intersection	Hit stopped vehicle	Maybe
5	E20051930	In intersection	Failure to stay in lane, hit and run	No
6	E20061244	South of intersection	Improper turn	No
7	E20091908	South of intersection	Hit stopped vehicle, hit and run	No
8				
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El Mirage Road and Cinnabar Avenue

Accident No.	Report No.	Location	Issue	EMR & Cinnabar Timing Related?
1	E20011446	North of intersection	Careless Driving/Road rage	No
2				
3				
4				
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Exhibit “B”

Traffic Signal Timing Parameters

Traffic Signal Timing Parameters
Thunderbird Road and 129th Avenue
March 3, 2017

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB		NB	WBLT	EB		SB
Minimum Green	7	10		10	7	10		10
Walk		8		12		8		12
Pedestrian Clearance		20		29		20		29
Passage	2.0	2.0		2.0	2.0	2.0		2.0
Max I	7	29		41	7	29		20
Max II								
Max III								
Yellow	3.0	3.9		3.0	3.0	3.9		3.0
Red	2.6	2.0 3.5		3.5	2.6	2.0 3.5		3.5
Vehicle Recall		Max				Max		

Bryce Christo, P.E.
Civil Engineer II

Traffic Signal Timing Parameters
El Mirage Road and Thunderbird Road
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBL	WB	SBL	NB	WBL	EB	NBL	SB
Minimum Green	7	12	7	12	7	12	7	12
Walk		10		9		10		9
Pedestrian Clearance		18		25		21		25
Vehicle Extension	1	3	1	2	1	3	1	2
Max	20	40	20	50	20	40	20	50
Split 1 Cycle Length: 110 Offset 1: 106	12	44	14	40	15	41	14	40
Split 2 Cycle Length: 110 Offset 2: 96	14	42	14	40	16	40	14	40
Split 3 Cycle Length: 110 Offset 3: 105	13	45	12	40	15	43	12	40
Yellow	3	3.6	3	3.6	3	3.6	3	3.6
Red	2	2 3.5	2	2.4 3.9	2	2 3.5	2	2.4 3.9
Vehicle Recall	None	C-Max	None	None	None	C-Max	None	None
Reference Phase	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am

Split 2 (PM Peak) –03:00 pm. to 07:00 pm

Split 3 – (Weekend)– 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Olive Avenue and Dysart Road
March 16, 2020

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB	SBLT	NB	WBLT	EB	NBLT	SB
Minimum Green	5	10	5	10	5	10	5	10
Walk		7		7		7		7
Pedestrian Clearance		26		26		26		26
Passage	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max I	30	50	30	30	30	37	15	50
Max II								
Max III								
Yellow	3.0	4.3	3.0	4.7	3.0	4.3	3.0	4.7
Red	3.2	1.8 3.3	3.2	1.8 3.3	3.2	1.8 3.3	3.2	1.8 3.3
Vehicle Recall		Min				Min		

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Cactus Road and Dysart Road
May 9, 2016

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB	SBLT	NB	WBLT	EB	NBLT	SB
Minimum Green	5	15	5	15	5	15	5	15
Walk		10		10		10		10
Pedestrian Clearance		33		31		33		31
Passage	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Max I	10	43	10	44	10	43	10	44
Max II								
Max III								
Yellow	3.0	4.3	3.0	4.3	3.0	4.3	3.0	4.3
Red	4.1	2.6 4.1	3.7	2.0 3.5	4.1	2.6 4.1	3.7	2.0 3.5
Vehicle Recall				Min				Min

Bryce Christo, P.E.
Civil Engineer II

Traffic Signal Timing Parameters
El Mirage Road and Olive Avenue
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBL	WB	SBL	NB	WBL	EB	NBL	SB
Minimum Green	7	12	7	12	7	12	7	12
Walk		7		7		7		7
Pedestrian Clearance		37		34		37		35
Vehicle Extension	1	4	1	4	1	4	1	4
Max	20	60	20	60	20	60	20	60
Split 1 Cycle Length: 90 Offset 1: 4	12	25	33	20	12	25	12	41
Split 2 Cycle Length: 90 Offset 2: 89	12	28	29	21	12	28	12	38
Split 3 Cycle Length: 90 Offset 3: 0	12	42	12	24	12	42	12	24
Yellow	3	4.3	3	4.7	3	4.3	3	4.7
Red	2	2.5 4.0	2	2.5 4.0	2	2.5 4.0	2	2.5 4.0
Vehicle Recall	None	None	None	C-Max	None	None	None	C-Max
Reference Phase:	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am

Split 2 (PM Peak) –03:00 pm. to 07:00 pm

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Peoria Avenue and Dysart Road
February 28, 2020

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB	SBLT	NB	WBLT	EB	NBLT	SB
Minimum Green	12	11	12	25	12	11	12	25
Walk								
Pedestrian Clearance								
Passage	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max I	30	60	60	45	30	60	12	45
Max II	30	20	30	25	30	20	12	25
Yellow	3.0	4.3	3.0	4.7	3.0	4.3	3.0	4.7
Red	3.2	3.0 4.5	3.2	3.0 4.5	3.2	3.0 4.5	3.2	3.0 4.5
Vehicle Recall				Min				Min

Max I – 06:00 am. to 09:00 am, 03:00 pm. to 07:00 pm. M-F

Max II – 12:00 am. to 6:00 am., 09:00 am. to 03:00 pm., 07:00 pm. to 12:00am M-F
12:00am. to 12:00am. Sat & Sun

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Dysart Road and Thunderbird Road
January 27, 2017

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB	SBLT	NB	WBLT	EB	NBLT	SB
Minimum Green	8.0	10.0	8.0	10.0	8.0	10.0	8.0	10.0
Walk		7.0		7.0		7.0		7.0
Pedestrian Clearance		37.0		38.0		39.0		39.0
Passage	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max I	15.0	25.0	15.0	25.0	15.0	25.0	15.0	25.0
Max II	20.0	35.0	20.0	35.0	20.0	35.0	20.0	35.0
Max III								
Yellow	3.2	4.3	3.2	4.3	3.2	4.3	3.2	4.3
Red	4.3	2.5	4.3	2.3	4.3	2.5	4.3	2.3
Vehicle Recall	N/L	X	N/L	N/L	N/L	X	N/L	N/L

Max I – 9:00 am to 3:00 pm 7:30 pm to 6:00 am
Max II – 6:00 am to 9:00 am 3:00 pm to 7:30 pm

(Max II is for through phases only, Mon-Fri)

Railroad Preemptor
Preempt 1
Track Clr = Ph. 1 & 6
Priority
Out of flash green
Track Clr timing
Green = 10
Yellow = 4.5
Red = 7.5

Bryce Christo, P.E.
Civil Engineer II

Traffic Signal Timing Parameters
El Mirage Road and Cactus Road
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBL	WB	SBL	NB	WBL	EB	NBL	SB
Minimum Green	7	12	7	12	7	12	7	12
Walk		7		7		7		7
Pedestrian Clearance		24		24		32		27
Vehicle Extension	1	2	1	4	1	2	1	4
Max	20	40	20	50	20	40	20	50
Split 1 Cycle Length: 90 Offset 1: 5	12	32	12	34	12	32	12	34
Split 2 Cycle Length: 90 Offset 2: 0	12	27	12	39	13	26	23	28
Split 3 Cycle Length: 90 Offset 3: 6	16	27	14	33	19	24	18	29
Yellow	3	4	3	4	3	4	3	4
Red	2	<u>2</u> 3.5	2	<u>2</u> 3.5	2	<u>2</u> 3.5	2	<u>2</u> 3.5
Vehicle Recall	None	Min	None	C-Max	None	Min	None	C-max
Reference Phase:	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am

Split 2 (PM Peak) –03:00 pm. to 07:00 pm

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
El Mirage Road and Peoria Avenue
June 12, 2019

Interval Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBL	WB	SBL	NB	WBL	EB	NBL	SB
Minimum Green		10	7	12		10	7	12
Walk		7		7		7		7
Pedestrian Clearance		23		18		27		21
Vehicle Extension		2	1	4		2	1	4
Max		40	20	50		50	20	50
Split 1 Cycle Length: 90 Offset 1: 13		27	14	49		27	16	47
Split 2 Cycle Length: 90 Offset 2: 12		24	14	52		24	16	50
Split 3 Cycle Length: 90 Offset 3: 14		26	16	48		26	20	44
Yellow		4	3	4		4	3	4
Red		2 3.5	2	2 3.5		2 3.5	2	2 3.5
Vehicle Recall		None	None	C-Max		None	None	C-Max
Reference Phase:	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am

Split 2 (PM Peak) –03:00 pm. to 07:00 pm

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Thunderbird Road and Grand Avenue Frontage Road
Assume Thunderbird as N-S Roadway, Frontage Rd as E-W Roadway
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	WBL	EB	NBL	SB	EBL	WB	SBL	NB
Minimum Green		12	7	15		12	7	15
Walk		7		7		7		7
Pedestrian Clearance		31		17		33		20
Vehicle Extension		2	2	4		2	2	4
Max		50	20	50		50	20	50
Split 1: Cycle Length: 65 Offset 1: 36		19	13	33		19	13	33
Split 2: Cycle Length: 65 Offset 2: 35		19	13	33		19	13	33
Split 3 Cycle Length: 65 Offset 3: 1		19	13	33		19	13	33
Yellow		4	3	4		4	3	4
Red		2.5 4.0	2.5	2 3.5		2.5 4.0	2.5	2 3.5
Vehicle Recall		Max	None	C-Max		Max	None	C-Max
Reference Phase	Start/Begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am

Split 2 (PM Peak) –03:00 pm. to 07:00 pm

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
El Mirage Road and Cinnabar Avenue
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBL	WB	SBL	NB	WBL	EB	NBL	SB
Minimum Green				15		7		15
Walk						7		7
Pedestrian Clearance						27		12
Vehicle Extension				5		2		5
Max				80		40		80
Split 1 Cycle Length: 90 Offset 1: 63				67		23		67
Split 2 Cycle Length: 90 Offset 2: 66				63		27		63
Split 3 Cycle Length: 90 Offset 3: 66				56		34		56
Yellow				4.3		3.5		4.3
Red				4.5 3.0		2 3.5		4.5 3.0
Vehicle Recall				C-Max		None		C-Max
Reference Phase:	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am.

Split 2 (PM Peak) –03:00 pm. to 07:00 pm.

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
El Mirage Road and Joe R Ramirez Road
June 12, 2019

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
		WBTL	SBL	NBTL		EBTL	NBL	SBTL
Minimum Green		7	7	15		7	7	15
Walk		7		7		7		7
Pedestrian Clearance		27		16		28		22
Vehicle Extension		3	2	5		3	2	5
Max		40	20	60		40	20	60
Split 1 Offset 1: 58		20	16	54		20	16	54
Split 2 Offset 2: 64		19	16	55		19	16	55
Split 3 Offset 3: 62		22	20	48		22	20	48
Yellow		3.5	3	4.3		3.5	3	4.3
Red		2	2 3.5	2		2	2 3.5	2
Vehicle Recall		None	None	C-Max		None	None	C-Max
Reference Phase:	Start/begin of Yellow							

Split 1 (AM Peak) –06:00 am. to 09:00 am.

Split 2 (PM Peak) –03:00 pm. to 07:00 pm.

Split 3 – (Weekend) – 8:00 am – 7:00 pm

Run Free – Weekday 7:00 pm – 6:00 am, and Weekend 7:00 pm to 8:00 am

Bryce Christo, P.E.
Assistant City Engineer

Traffic Signal Timing Parameters
Dysart High School
February 13, 2017

Interval / Movement	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
	EBLT	WB	SBLT	NB	WBLT	EB	NBLT	SB
Minimum Green		5	5	10	5			
Walk				8				
Pedestrian Clearance				18				
Passage		2.0	5.0	2.0	2.0			
Max I		35	55	35	35			
Max II								
Max III								
Yellow		3.0	3.0	4.3	3.0			
Red		3.0	2.6	2.6 4.1	2.6			
Vehicle Recall								

Bryce Christo, P.E.
Civil Engineer II