



CUC ROUNDAABOUT TO TOMLINSON ROUNDAABOUT CORRIDOR

MULTIMODAL IMPROVEMENT PLAN



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BACKGROUND

The National Roads Authority (NRA) conducted this planning study to evaluate the benefits of potential transportation investments to reduce congestion and improve the quality of life on Grand Cayman. This study is intended to provide concepts for improving multimodal transportation and safety while accommodating future growth along the heavily-travelled CUC to Tomlinson Roundabout corridor.

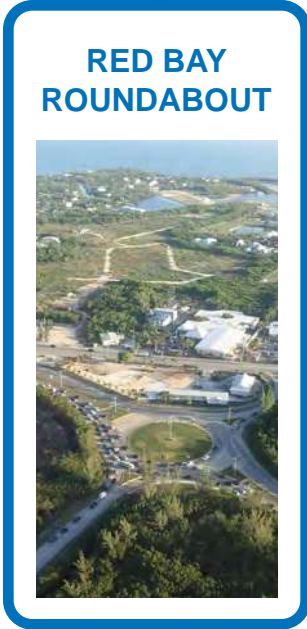
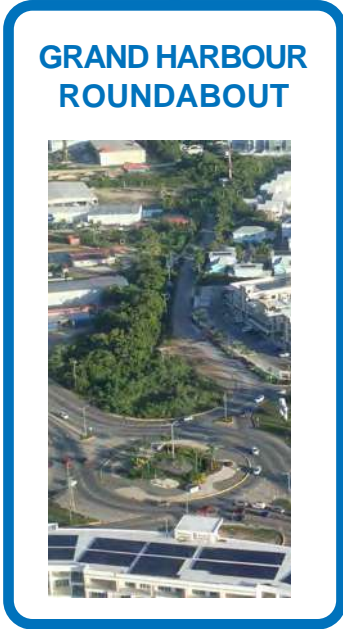
The study corridor extends 1.5 miles, connecting the districts of Bodden Town and George Town. There are four major roundabout intersections within this area: the CUC Roundabout, Grand Harbour Roundabout, Red Bay Roundabout, and Tomlinson Roundabout. The proposed Service Road is a committed project that is anticipated to run parallel to the main study corridor and will connect the CUC Roundabout to the Red Bay area on Shamrock Road.

The CUC to Tomlinson Roundabout corridor serves as the primary route for daily commuters travelling from the east side of Grand Cayman to the heavily-developed west side of the island, where key destinations such as George Town, West Bay, the Owen Roberts International Airport, and the Cayman Islands Hospital are located. Under existing conditions, the corridor experiences heavy congestion, with commuters often opting to rearrange their typical travel patterns to avoid peak traffic conditions. All of the four main roundabouts in this study experience heavy westbound throughput during the AM peak. For example during the AM Peak, westbound traffic ranges from 2,300 - 3,800 vehicles per hour. Motorists traveling westbound can either turn left on South Sound Road toward the Walkers Road school area or continue along Crewe Road toward George Town. The existing PM congestion is the most prevalent on the eastbound lanes of Linford Pierson Highway (LPH) and Crewe Road.

The area immediately surrounding the study corridor is the site of increased mixed-use development, particularly around the Grand Harbour Roundabout. New residential and retail developments continue to open between the Grand Harbour and Tomlinson Roundabouts. As a result, the corridor faces the added challenge of balancing competing needs: maximizing vehicle throughput for commuters while providing safe access for pedestrians. To address these shifting needs, this plan takes a multimodal approach and assesses impacts across all users.

To examine the corridor's future needs, the NRA provided a list of committed roadway projects which served as the study's starting point. This plan examines the committed project conditions of the four main roundabout intersections, providing improvement alternatives at each location.

CORRIDOR PLAN MAP



PROJECT BACKGROUND MAP



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodastatyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureay, USDA

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STUDY GOALS



GROWTH: Accommodate future growth along this heavily-travelled corridor connecting the east and west side of Grand Cayman



OPERATIONS: Alleviate congestion and optimize operations of the parallel Service Road that will connect the CUC Roundabout to the Red Bay area on Shamrock Road



PEDESTRIAN FACILITIES: Improve bicycle and pedestrian accessibility across the Grand Harbour Roundabout to connect the residential and commercial developments located on either side of the roundabout



SAFETY: Improve safety for all users throughout the corridor



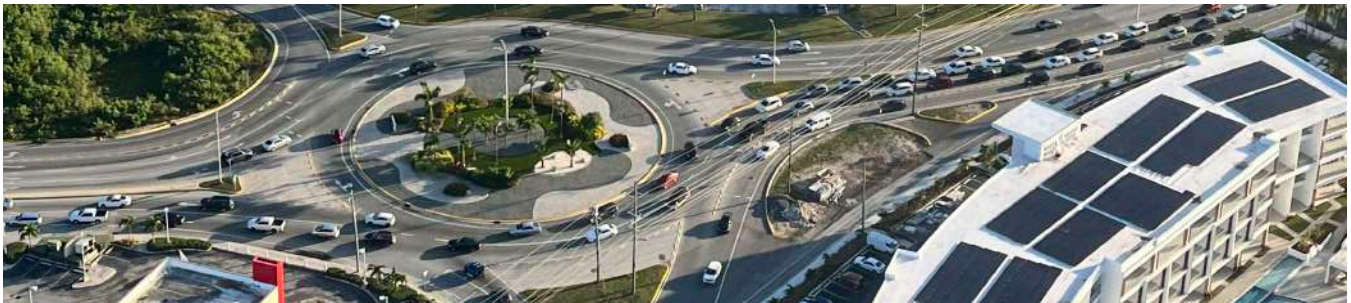
TRANSIT ACCESSIBILITY: Improve transit accessibility through the corridor by offering convenient stop locations and addressing pedestrian safety concerns

SCENARIO DEVELOPMENT

UNDERSTANDING EXISTING CONDITIONS

The NRA identified concerns expressed by community members to understand the needs of different groups who live in and travel through the corridor. Existing conditions include heavy congestion, poorly operating intersections, dangerous roundabout maneuvers, lack of safe pedestrian crossings, and poor transit connectivity.

Traffic modelling software was used to analyse the alternatives presented in this plan. The traffic models were developed using census data, field observations, traffic counts, travel time data, signal timing information, and NRA input. Field observations were conducted to confirm that the models correctly replicated driver behaviours and existing congestion.



ANTICIPATING FUTURE CONDITIONS

The planning study accounts for future conditions based on the following:

- Alternatives were analysed under future year 2026 and 2036 conditions.
- Future population growth was based on historic district growth rates from the 2021 Census as well as anticipated major development projects.
- The future roadway network was provided by the NRA as a list of “committed projects,” which were assumed in addition to the existing roadway network.

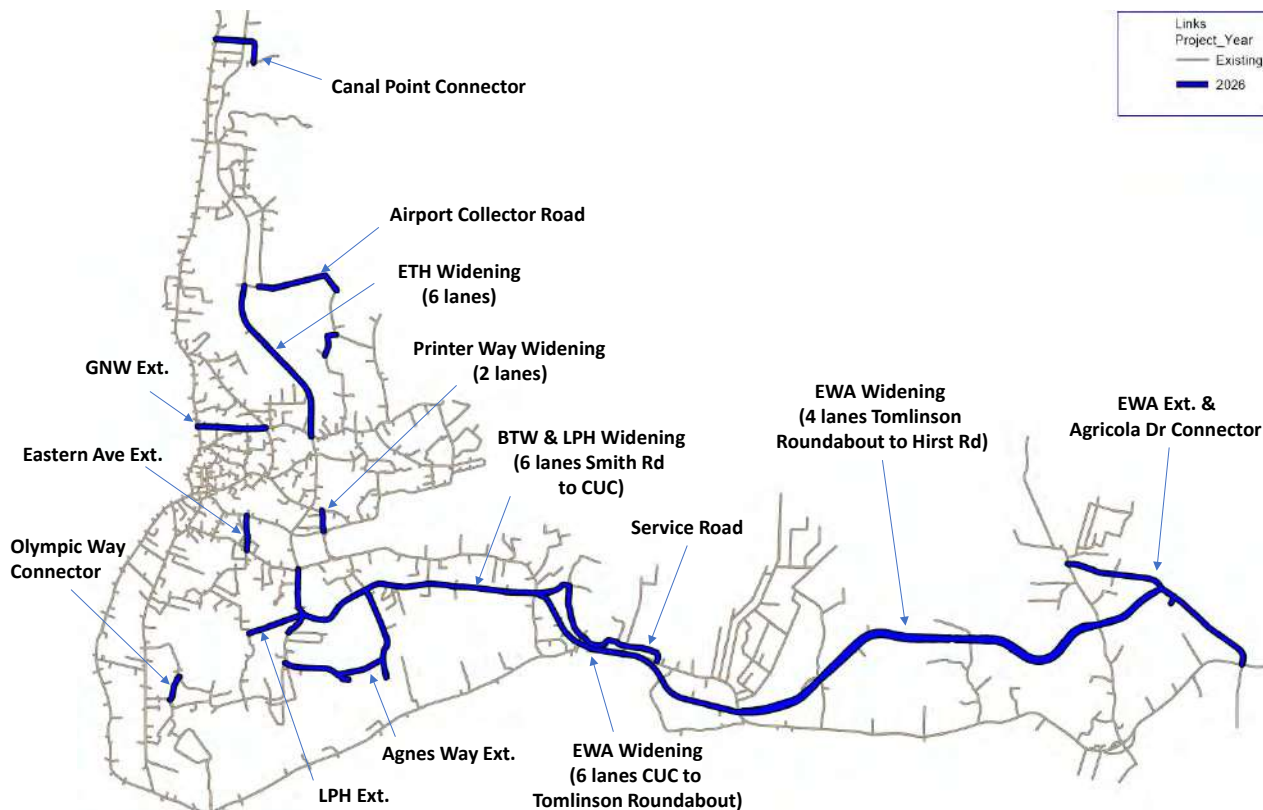
EXISTING CONDITIONS & COMMITTED PROJECTS (E+C)

The NRA provided information regarding future committed roadway projects, which were built upon the existing roadway network to develop the model network for each future analysis year. These committed projects include the six-lane widening from the Tomlinson Roundabout to Bobby Thompson Way (BTW) as well as the parallel Service Road alignment provided by the NRA.

The 2026 E+C scenario includes the following committed roadway projects:

- **East-West Arterial (EWA) Extension** to Woodland Drive, including **Agricola Drive Connector** to Agricola Drive – one lane in each direction
- **EWA Widening** between Tomlinson Roundabout and Hirst Road – two lanes in each direction
- **EWA Widening** between CUC Roundabout and Tomlinson Roundabout – three lanes in each direction
- **Service Road** from CUC Roundabout to Red Bay via Grand Harbour development
- **Bobby Thompson Way (BTW) & Linford Pierson Highway (LPH) Widening** – three lanes in each direction
- **Linford Pierson Highway (LPH) Extension** to Outpost Road – one lane in each direction
- **Agnes Way Extension** from Linford Pierson Highway to Cayman Enterprise and Fairbanks Road – one lane in each direction
- **Fairbank Road Widening** between LPH and Agnes Way Ext. – two lanes in each direction
- **Airport Collector Road (ACR)** to Industrial Park – one lane in each direction
- **Eastern Avenue Extension** from Elgin Avenue to Smith Road – one lane in each direction
- **Godfrey Nixon Way (GNW) Extension** to North Church Street – one lane in each direction
- **Olympic Way Connector** to Academy Way for school/stadium complex – one lane in each direction
- **Printer Way** widened to two-direction road from Elgin Avenue to Shedden Road – one lane in each direction
- **Esterly Tibbetts Highway (ETH) Widening** between North Sound Road and Airport Collector Road – three lanes in each direction
- **ETH Connector** to Reverend Blackman Road – one lane in each direction
- **Canal Point Drive Connector** to West Bay Road – one lane in each direction
- **Austin Connolly Connector** to Sunnyfield Drive – one lane in each direction

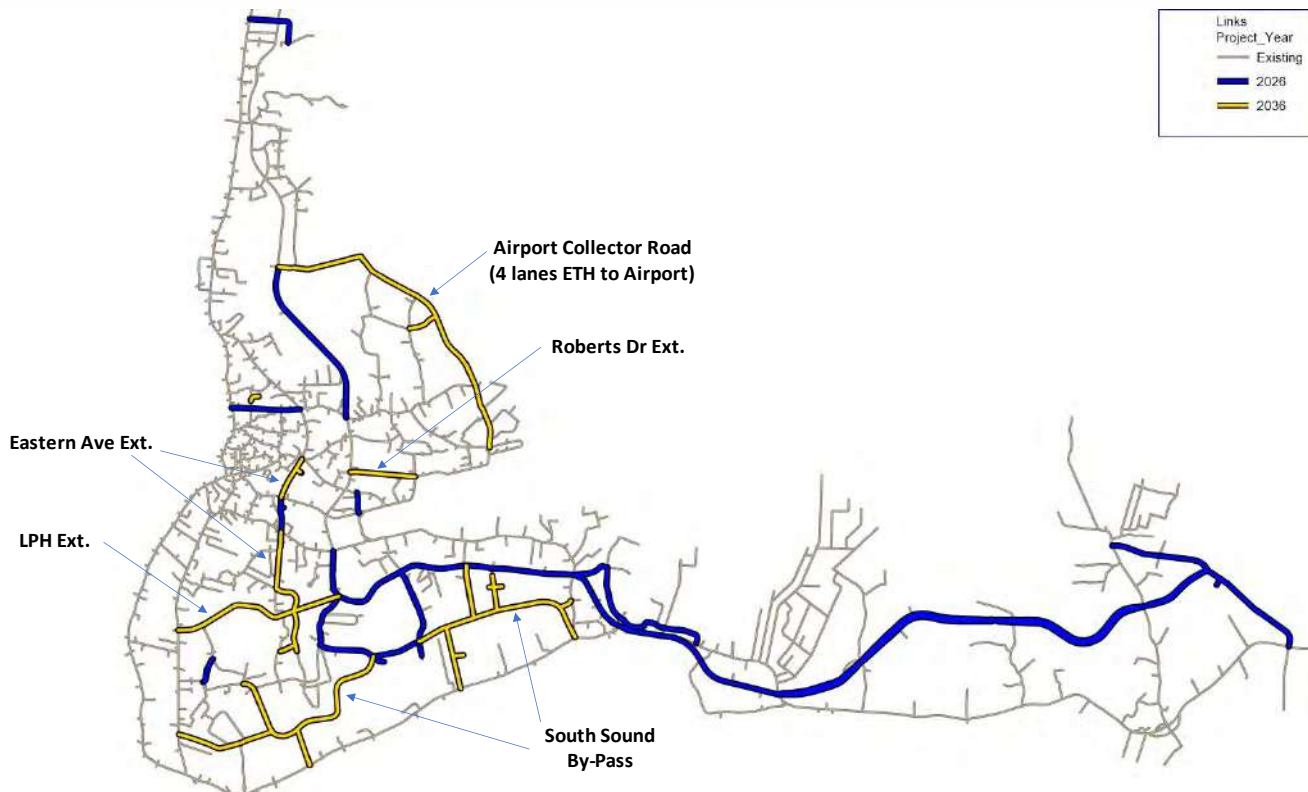
2026 COMMITTED PROJECTS



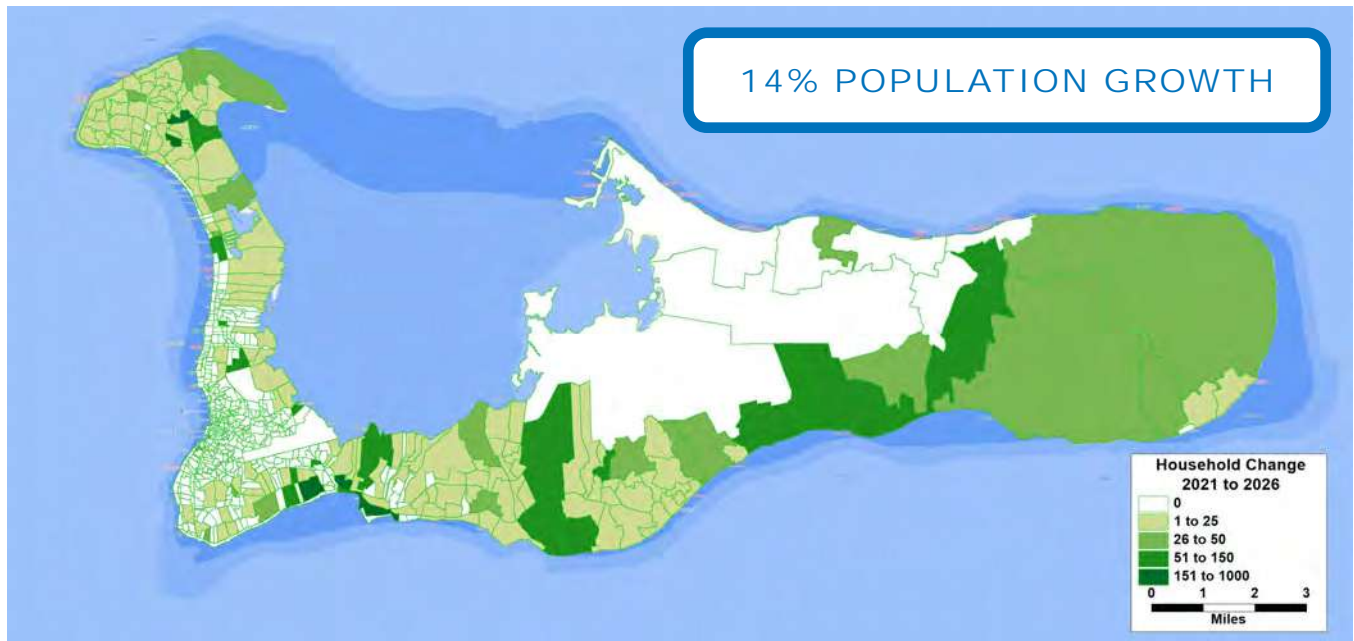
The 2036 E+C scenario includes all 2026 committed projects as well as the following additional projects, as shown in the figure below:

- **ACR** – Full build out between Esterly Tibbetts Highway and Airport – two lanes in each direction
- **Roberts Drive Extension** between North Sound Road and Dorcy Drive – one lane in each direction
- **Eastern Avenue Extension** from Shedden Road to Elgin Avenue and from Smith Road to Outpost Street – one lane in each direction
- **South Sound By-Pass Corridor** – one lane in each direction
- **LPH Extension** to Walkers Rd – two lanes in each direction between BTW and Outpost Street; one lane in each direction between Outpost Street and Walkers Road
- **Fairbanks Road Widening** between Cayman Enterprise and LPH – two lanes in each direction
- **Hell Road Extension** to Northwest Point Road – one lane in each direction

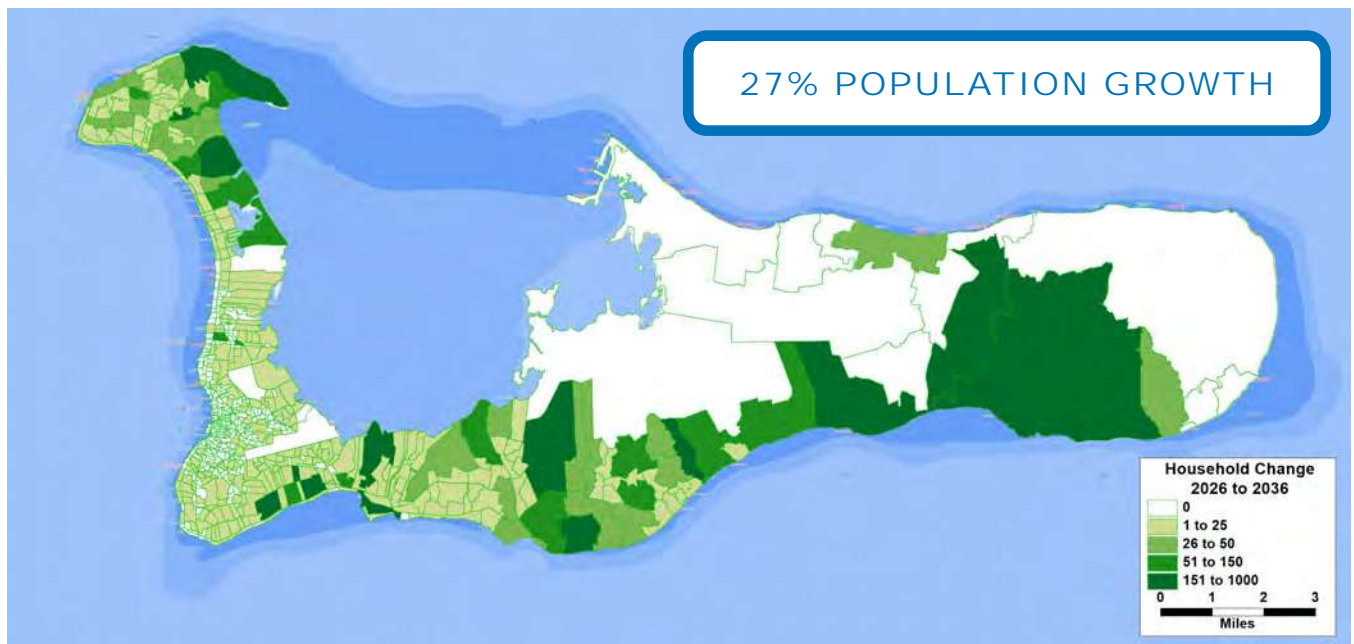
2036 COMMITTED PROJECTS



ANTICIPATED HOUSEHOLD GROWTH FROM 2021-2026



ANTICIPATED HOUSEHOLD GROWTH FROM 2026-2036



POPULATION GROWTH PER YEAR	
DISTRICT 1 - GEORGE TOWN	2.2%
DISTRICT 2 - WEST BAY	3.3%
DISTRICT 3 - BODDEN TOWN	3.7%
DISTRICT 4 - NORTH SIDE	2.6%
DISTRICT 5 - EAST SIDE	2.8%

HOUSEHOLD AND POPULATION GROWTH IMPLICATIONS

The projected household and population growth levels across Grand Cayman through 2036 will directly influence future travel patterns and related transportation system needs. Much of the anticipated growth is projected to occur east of the Tomlinson Roundabout, which will result in more people traveling through the study area to access employment and activity centers in the west. These travel patterns will result in higher future traffic volumes along the Shamrock Road and Crewe Road corridors, which in turn will affect traffic operations and congestion through the area, as well as related improvement needs and options.

As an example of the traffic increases affecting the study area roadways, total east/west traffic estimates were compiled along Shamrock Road (plus the future parallel Service Road) just east of the Grand Harbour Roundabout. With projected population growth through 2026, daily east/west traffic crossing through this area will increase by 19%, adding more than 9,500 vehicles per day (900-1,000 vehicles per peak hour) to the corridor. With continued growth, the overall 2021-2036 traffic increase through this area will reach 57%, adding more than 28,000 vehicles per day (2,600-2,800 vehicles per peak hour) to the corridor.

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CORRIDOR PLAN

After determining existing needs and issues, alternatives were evaluated based on how well they addressed these concerns. The concepts provided in the following sections were developed for each of the study corridor's four major roundabouts. Multiple alternatives are presented for some locations for further consideration.

The improvement concepts are presented in the four sections depicted on the following page, starting with the CUC Roundabout and moving west to east along the study corridor.

For each roundabout, the following sections provide:

- An overview map of the existing conditions and committed projects (E+C), illustrating the immediate area's landmarks and existing multimodal network
- Conceptual graphics for each alternative
- Relative performance metrics suggested for each alternative, as well as discussion of benefits/impacts

PERFORMANCE METRICS

Relative measures of effectiveness are suggested for each alternative compared to the E+C scenario, with benefits and impacts qualitatively ranging from low to high.

- **Operational benefit** – how the intersection operates for vehicular traffic
- **Safety benefit** – how safe the intersection is for all users
- **Pedestrian accessibility** – whether the intersection improves pedestrian/bicycle facilities
- **Transit accessibility** – whether the intersection improves transit facilities and mobility
- **Right-of-way (ROW)** – whether the concept requires property impacts
- **Rough order of magnitude (ROM) cost** – relative construction and maintenance costs

Qualitative relative benefits are provided for each concept based on the following scale, with green icons representing an improvement or benefit against the E+C scenario and red representing worsening conditions:

●	High
↑	Moderate
▲	Low
–	Neutral or N/A
▼	Low
↓	Moderate
●	High

CORRIDOR PLAN MAP



CUC ROUNDABOUT

- Alt 1:** Hybrid Signalized Roundabout (pg. 18)
- Alt 2:** Signalized Traffic Metering (pg. 19)

GRAND HARBOUR ROUNDABOUT

- Alt 0:** Restricted Southbound Through/Right (pg. 23)
- Alt 1:** Hybrid Signalized Roundabout (pg. 26)
- Alt 2A:** Signalized Traffic Metering (pg. 27)
- Alt 2B:** Signalized Traffic Metering (pg. 28)
- Alt 3:** Traditional Signalized Intersection (pg. 29)
- Alt 4A:** Controlled Access Highway (GH access permitted) (pg. 31)
- Alt 4B:** Controlled Access Highway (GH access prohibited) (pg. 32)

RED BAY ROUNDABOUT

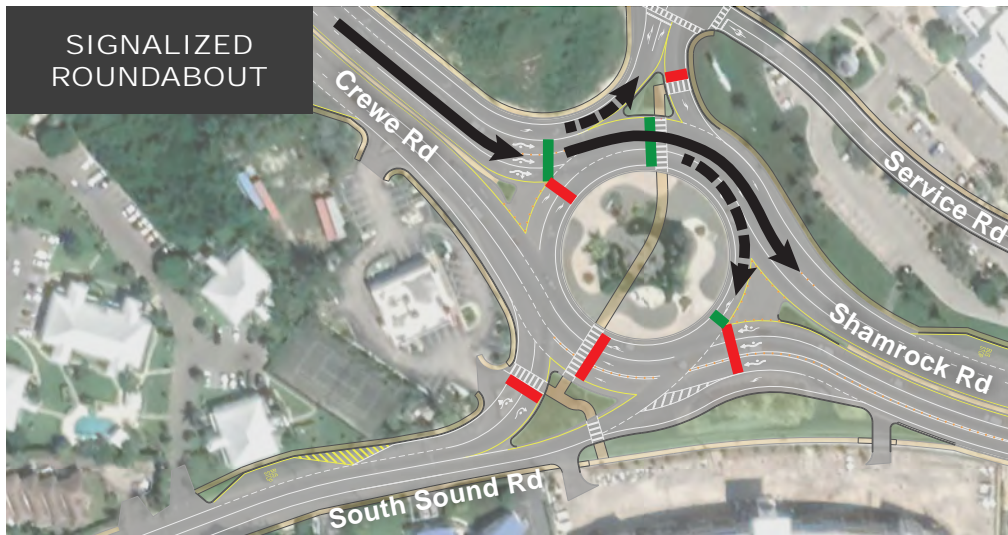
- Alt 1:** Signalized Traffic Metering (pg. 37)

TOMLINSON ROUNDABOUT

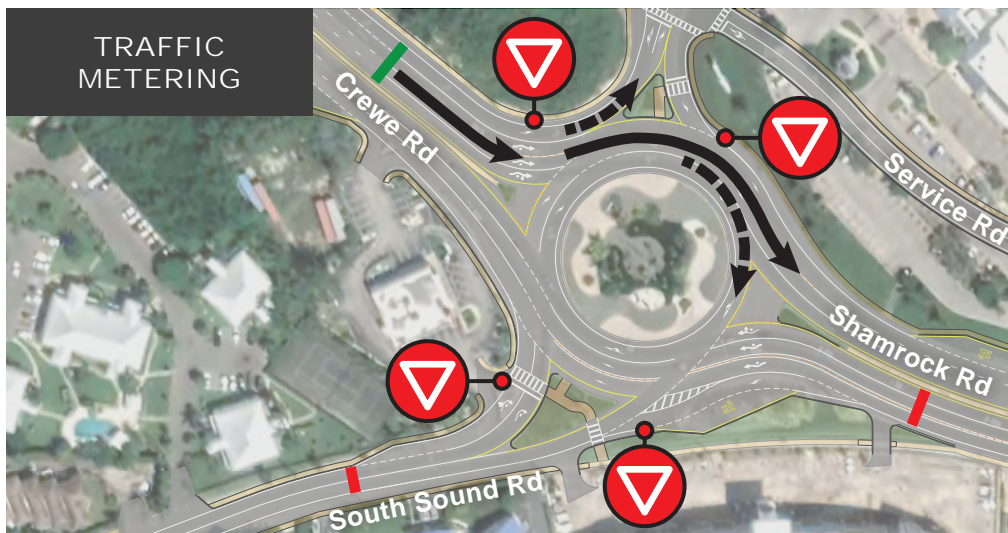
- Alt 1:** Hybrid Signalized Roundabout (pg. 40)
- Alt 2:** Signalized Traffic Metering (pg. 41)

Note: Due to the likelihood of geometric constraints, construction impacts, and costs, a flyover alternative was not considered a feasible option as part of this study.

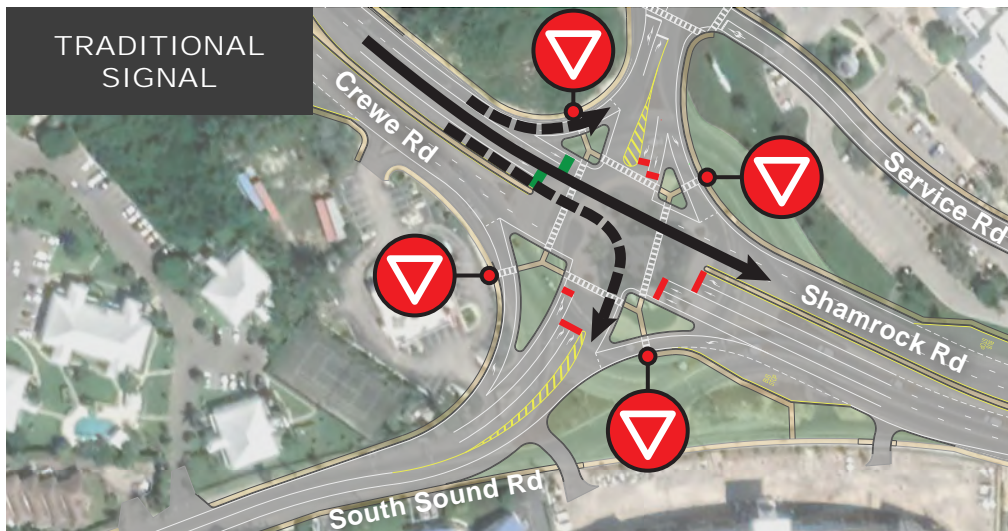
HOW DO THESE SOLUTIONS WORK

SIGNALIZED
ROUNDBOUT

How it works:
Full signalization of the circulatory roadway, including signals at each entry and within circulating lanes. Pedestrian phases provided, with center island crossing and crosswalk push buttons. Signals may only operate during periods of peak congestion.

TRAFFIC
METERING

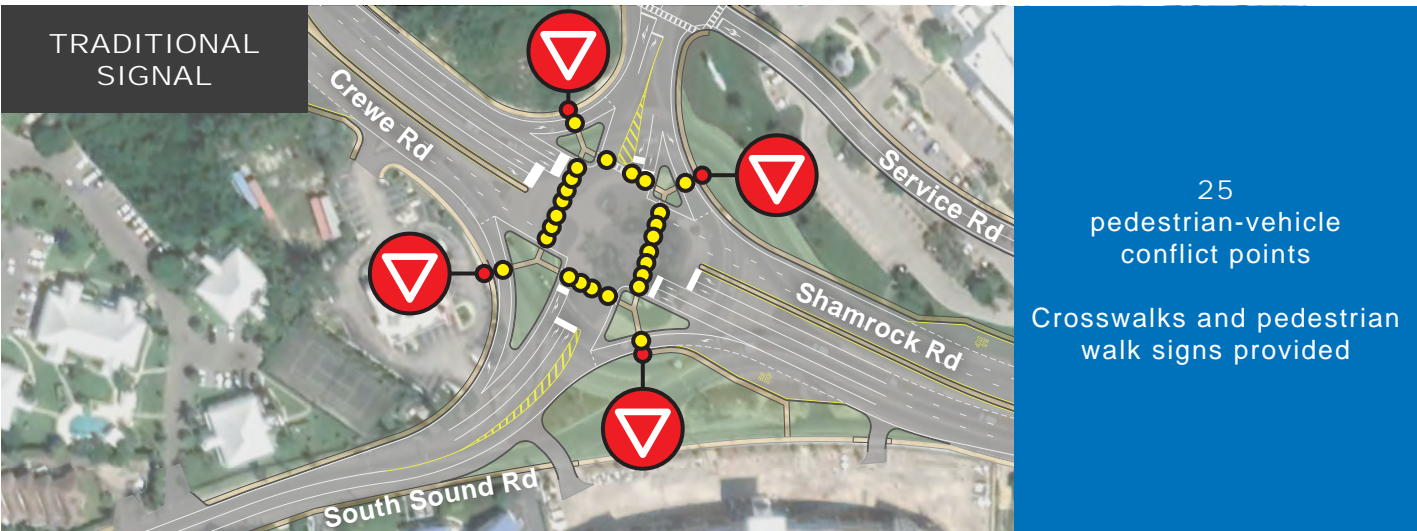
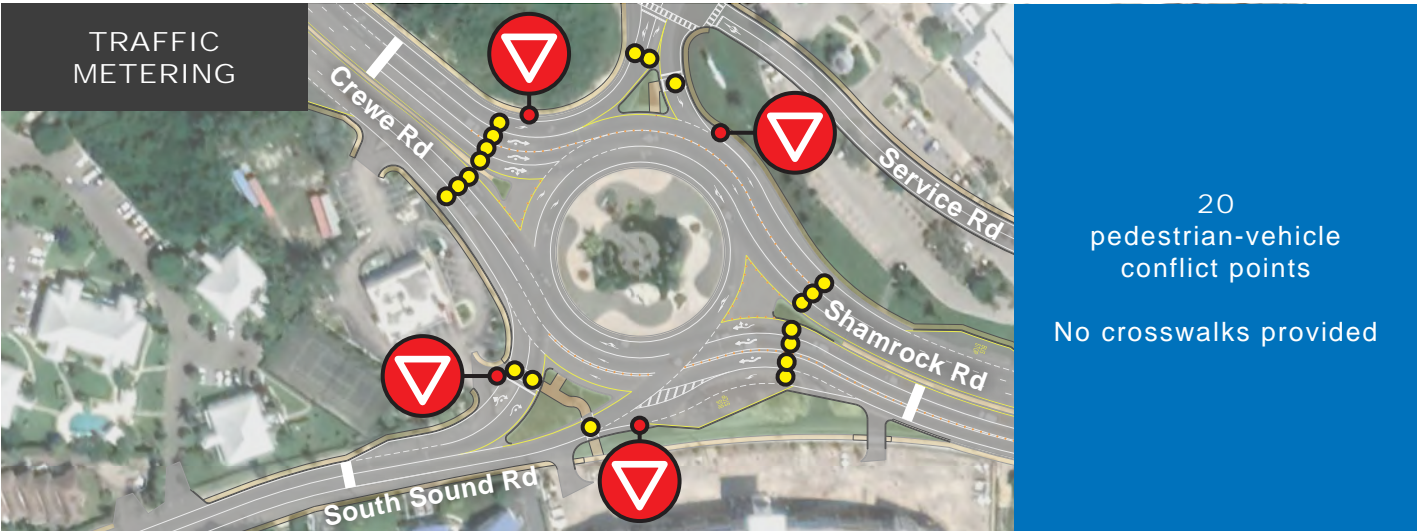
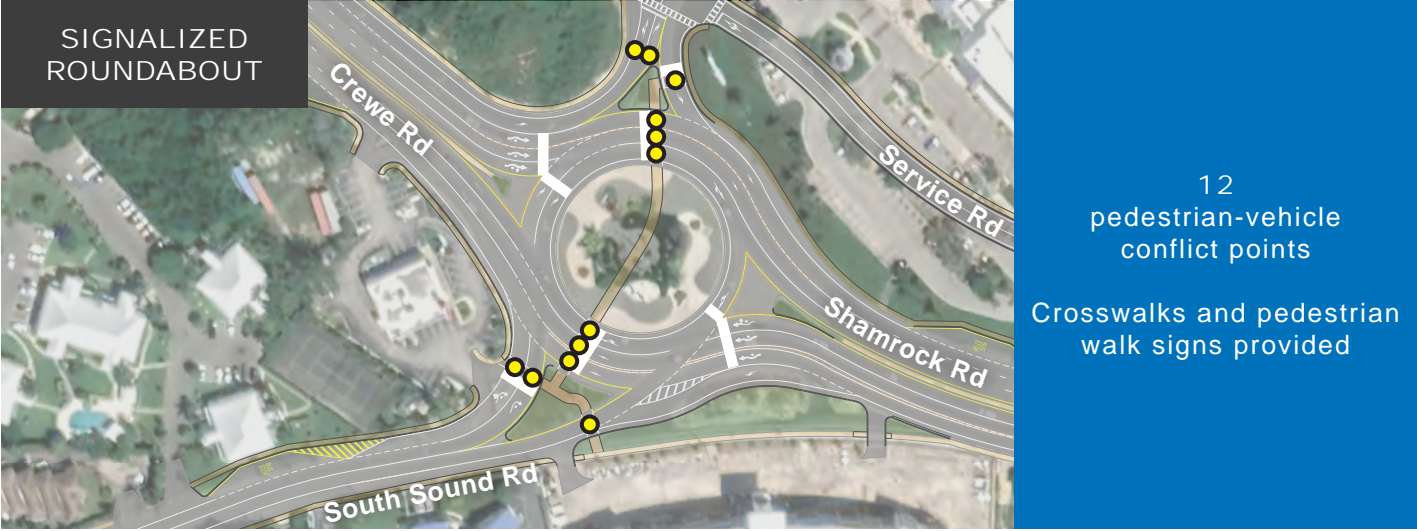
How it works:
Installation of a signal in advance of roundabout entry yield lines. Metering a high-flow entry creates gaps for side streets to enter the roundabout safely. Includes full vehicle detection and actuation, making it more advanced than existing roundabout entrance meters. No pedestrian phase is provided. Signals may only operate during periods of peak congestion.

TRADITIONAL
SIGNAL

How it works:
Conversion to traditional signal, with dedicated right/left turn lanes. Pedestrian phases provided, with crosswalk push buttons.

PEDESTRIAN SAFETY INSIGHTS

A pedestrian-vehicle conflict point is any location in an intersection where vehicle and pedestrian paths cross. Conflict points are locations where collisions are most likely to occur and are used to define the potential for traffic accidents.



CUC ROUNDABOUT

OVERVIEW

The CUC Roundabout is located near several residential developments, including Silver Oaks Condos and Lakeland Villas. Other surrounding landmarks include King's Sports Centre and multiple churches. Sidewalks exist along Crewe Road, but there are no safe pedestrian crossings across the roundabout. A bus shelter exists at the southbound Crewe Road entry. This roundabout is currently a major congestion point during the PM peak period due to the convergence of westbound traffic on Crewe Road and Linford Pierson Highway.



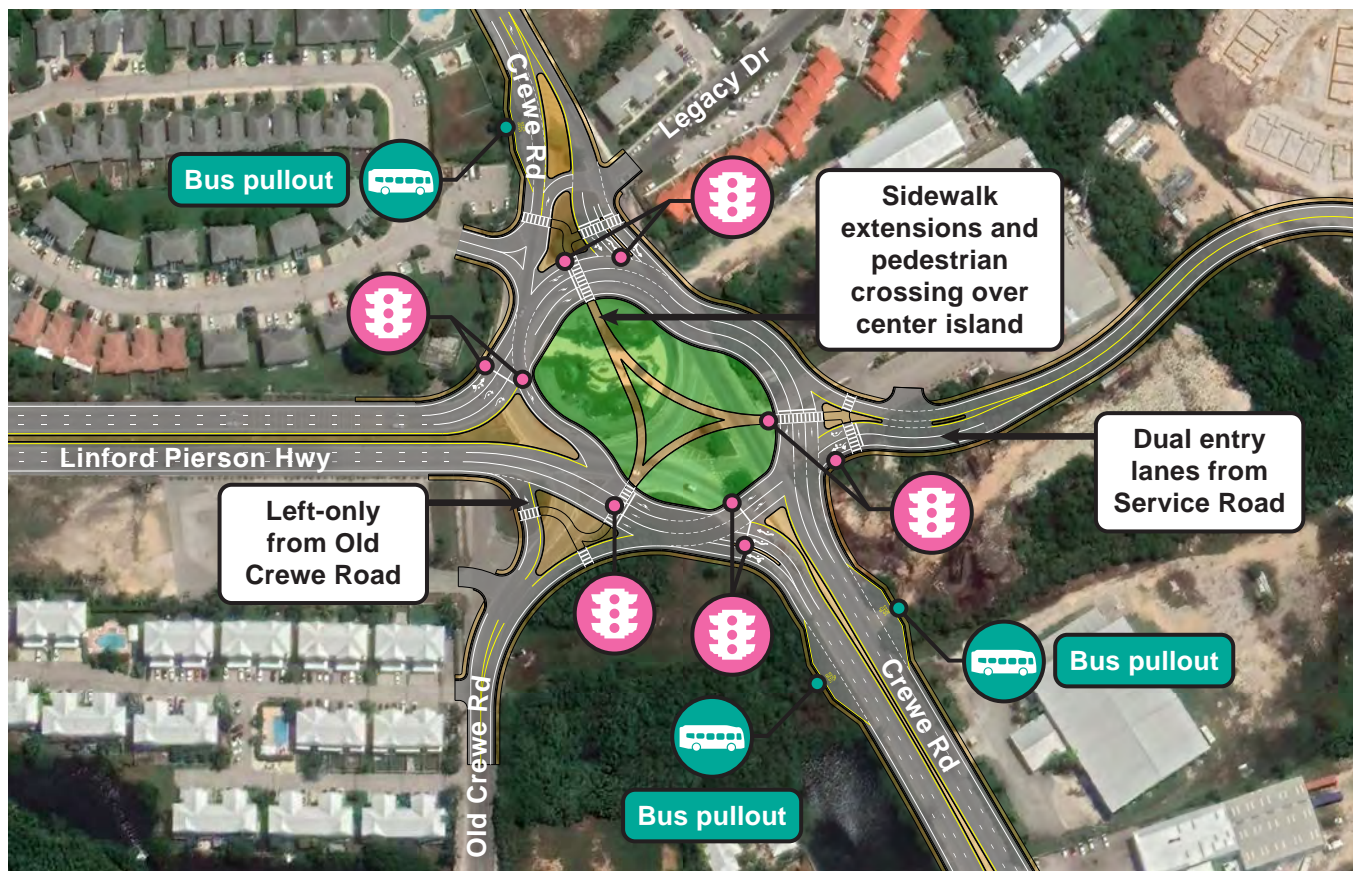
EXISTING CONDITIONS & COMMITTED PROJECTS

By 2026, LPH, BTW, and Crewe Road (between CUC and Grand Harbour Roundabouts) will be widened to six lanes to tie into widened Shamrock Road. The roundabout geometry will be reconfigured to a peanut-shape design to safely tie in the proposed Service Road as the roundabout's fifth leg. Future population growth is anticipated to increase vehicle demand. Once these roadways are widened to six lanes, most drivers are anticipated to shift off of Crewe Road (between Agnes Way and CUC Roundabout) to use LPH, with the widened peak direction approaches experiencing reduced intersection delay. However, the increased traffic flow during the peak periods along widened LPH and Crewe Road will cause side street queues to increase on Old Crewe Road and the proposed Service Road as they become unable to find gaps to safely enter the roundabout.

By 2036, construction of the South Sound By-Pass will divert a portion of vehicles off of LPH and Crewe Road by providing an alternate east-west path; however, traffic congestion at the CUC Roundabout will continue to worsen due to population growth across Grand Cayman.



CUC ALT 1: HYBRID SIGNALIZED ROUNDABOUT

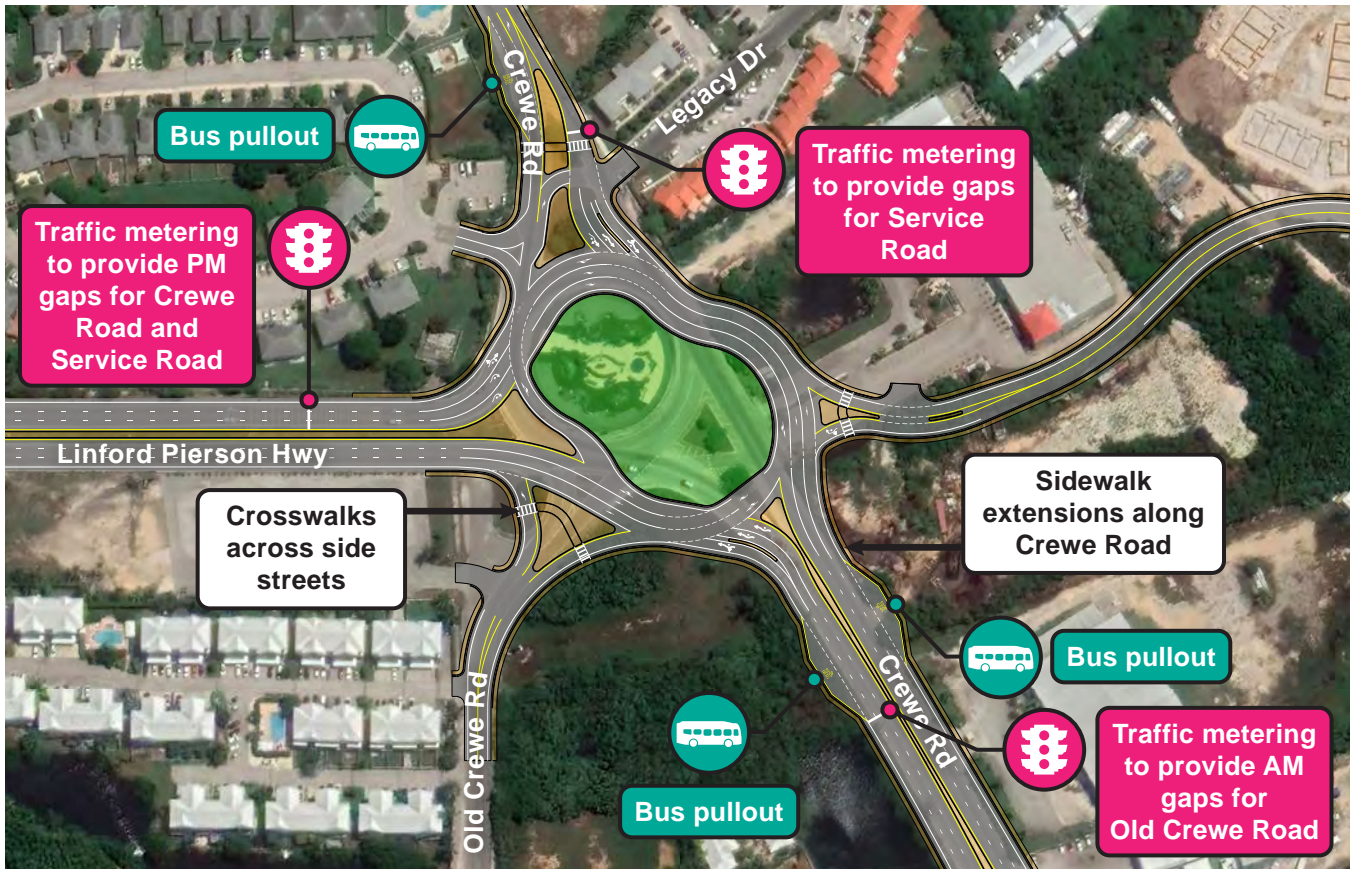


RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
↑	↑	↑	↑	LOW	\$\$

This alternative fully signalizes the roundabout during peak traffic conditions. For off-peak hours, signals will flash yellow to indicate yield control operations. This option would increase delay on mainline LPH and Crewe Road approaches but would reduce side street queuing along Old Crewe Road and the proposed Service Road. The signal timings will be triggered by vehicle detection and pedestrian push buttons. Old Crewe Road is converted to a left-only approach to reduce conflicting movements circulating the roundabouts; vehicles from Old Crewe Road may access the Grand Harbour Roundabout to travel east. This alternative also requires an additional Service Road entry lane to reduce queues at this approach.

This alternative improves overall safety by controlling the movements entering the roundabout, thereby reducing the opportunity for accidents that may occur as vehicles attempt to enter a congested roundabout. Pedestrian facilities are improved by connecting existing sidewalks and providing crosswalks, walk signals, and push buttons. New bus pullouts will enhance transit access.

CUC ALT 2: SIGNALIZED TRAFFIC METERING



RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
●	▲	-	▲	LOW	\$

This alternative introduces traffic signals to meter heavy mainline approaches on LPH and Crewe Road during peak traffic conditions, reducing side street queues on Old Crewe Road and the proposed Service Road. The meter timings are to be triggered by vehicle detection. For off-peak hours, the signals will be shut off, resuming typical yield operations. Old Crewe Road is converted to a left-only approach to reduce conflicting movements circulating the roundabouts; vehicles from Old Crewe Road may access the Grand Harbour Roundabout to travel east.

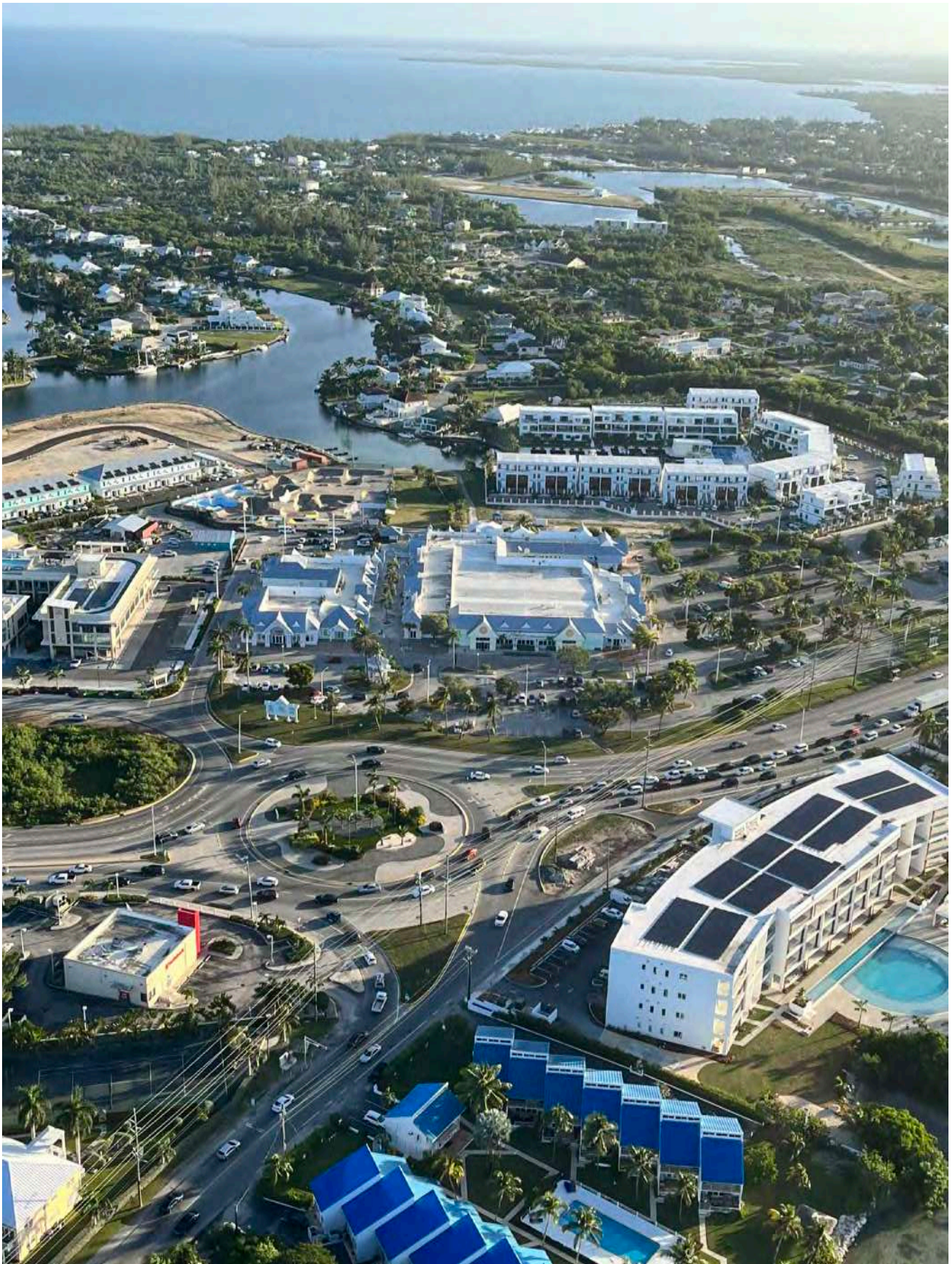
This alternative improves overall safety by providing adequate gaps for side street traffic to safely enter the roundabout, thereby reducing the opportunity for accidents that may occur as vehicles attempt to enter a congested roundabout. Unfortunately, this traffic metering option does not provide safe pedestrian crossing over the six-lane legs of the roundabout. New bus pullouts will enhance transit access.

GRAND HARBOUR ROUNDABOUT

OVERVIEW

The Grand Harbour Roundabout is located near several residential developments, including new developments along Shamrock Road. The north leg of the roundabout is the entrance to the Grand Harbour Shopping Centre, which includes Hurley's supermarket. Pedestrian demand exists between residential and retail areas, yet this intersection lacks multimodal facilities with no safe pedestrian crossings over the roundabout. A bus shelter is located 450' east of the roundabout, with no sidewalk connecting to the bus stop. Due to developments on either side of the intersection, space constraints will prevent widening beyond three lanes in each direction along Shamrock Road and Crewe Road.

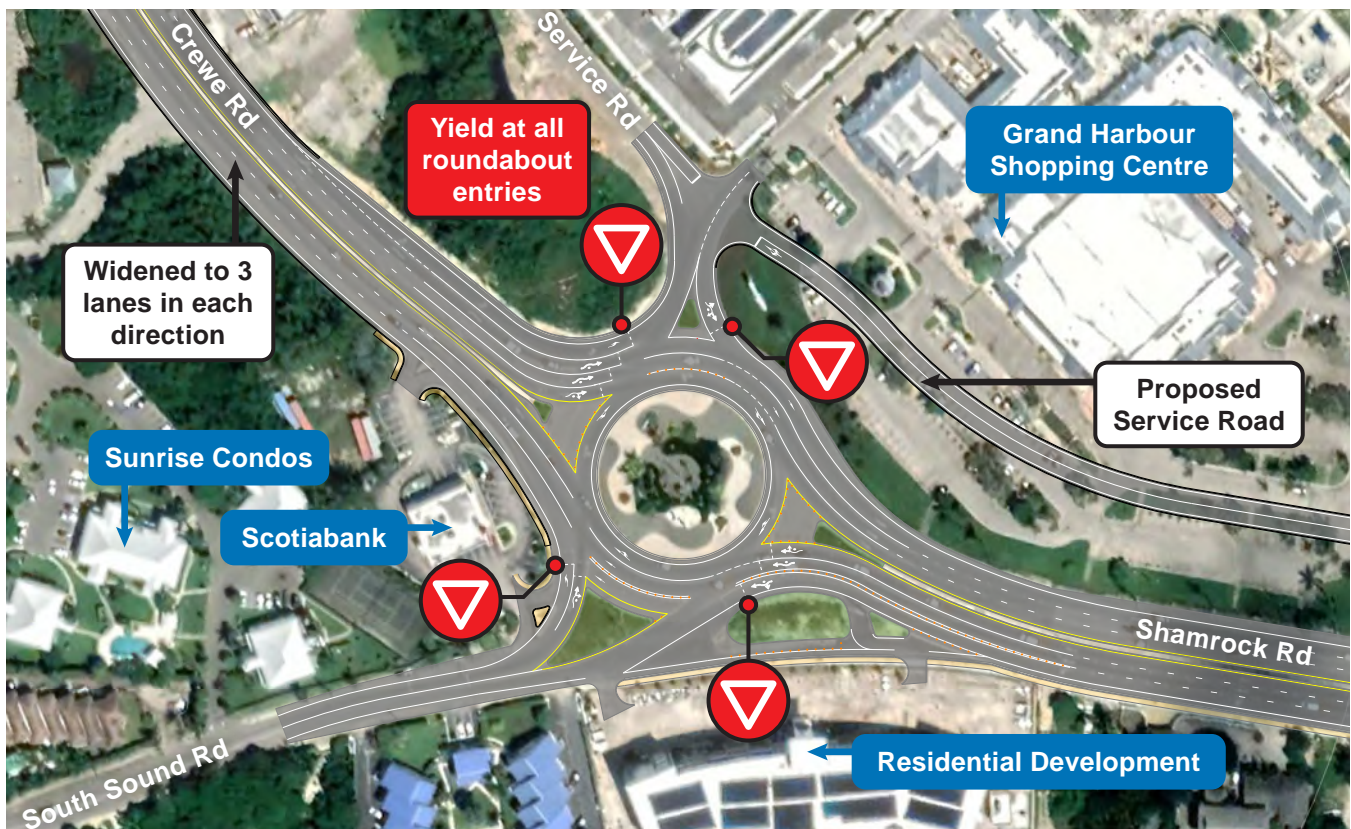




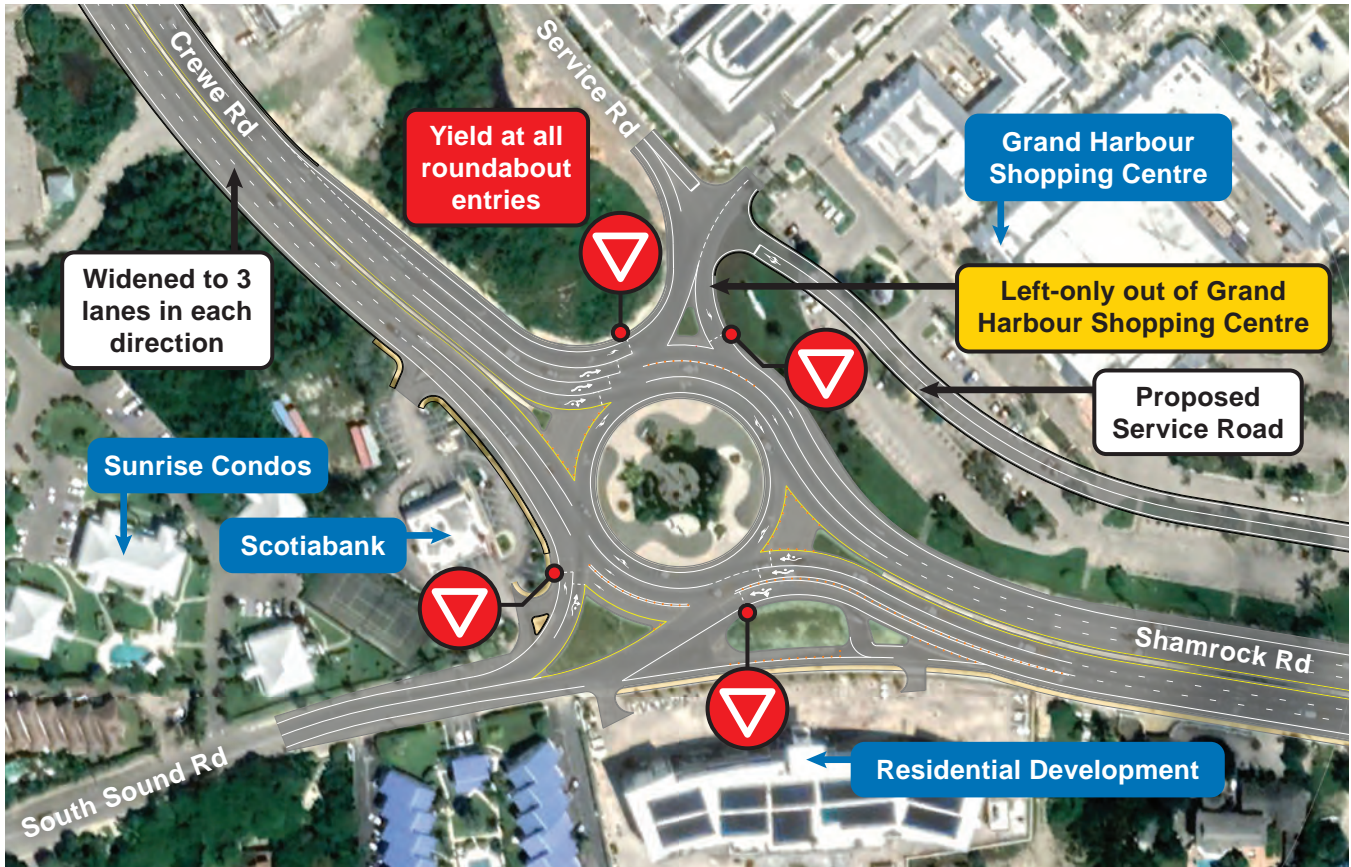
EXISTING CONDITIONS & COMMITTED PROJECTS

By 2026, Crewe Road will be widened to six lanes to the CUC Roundabout. The parallel Service Road will create a new intersection north of the roundabout, presenting queuing challenges between the closely spaced intersections. Future population growth is anticipated to increase vehicle demand. However, the increased traffic on Shamrock Road will cause side street queues to increase on South Sound Road as they become unable to find gaps to safely enter the roundabout. Similarly, downstream queues will develop on Selkirk Drive and Bimini Drive. Increased mixed-use development on either side of this intersection is anticipated to increase pedestrian demand and the need for pedestrian facilities.

By 2036, construction of the South Sound By-Pass will divert a portion of vehicles off of Crewe Road by providing an alternate east-west path. AM westbound left-turns from Shamrock Road to South Sound Road are anticipated to increase. Traffic congestion will continue to worsen due to population growth across Grand Cayman.



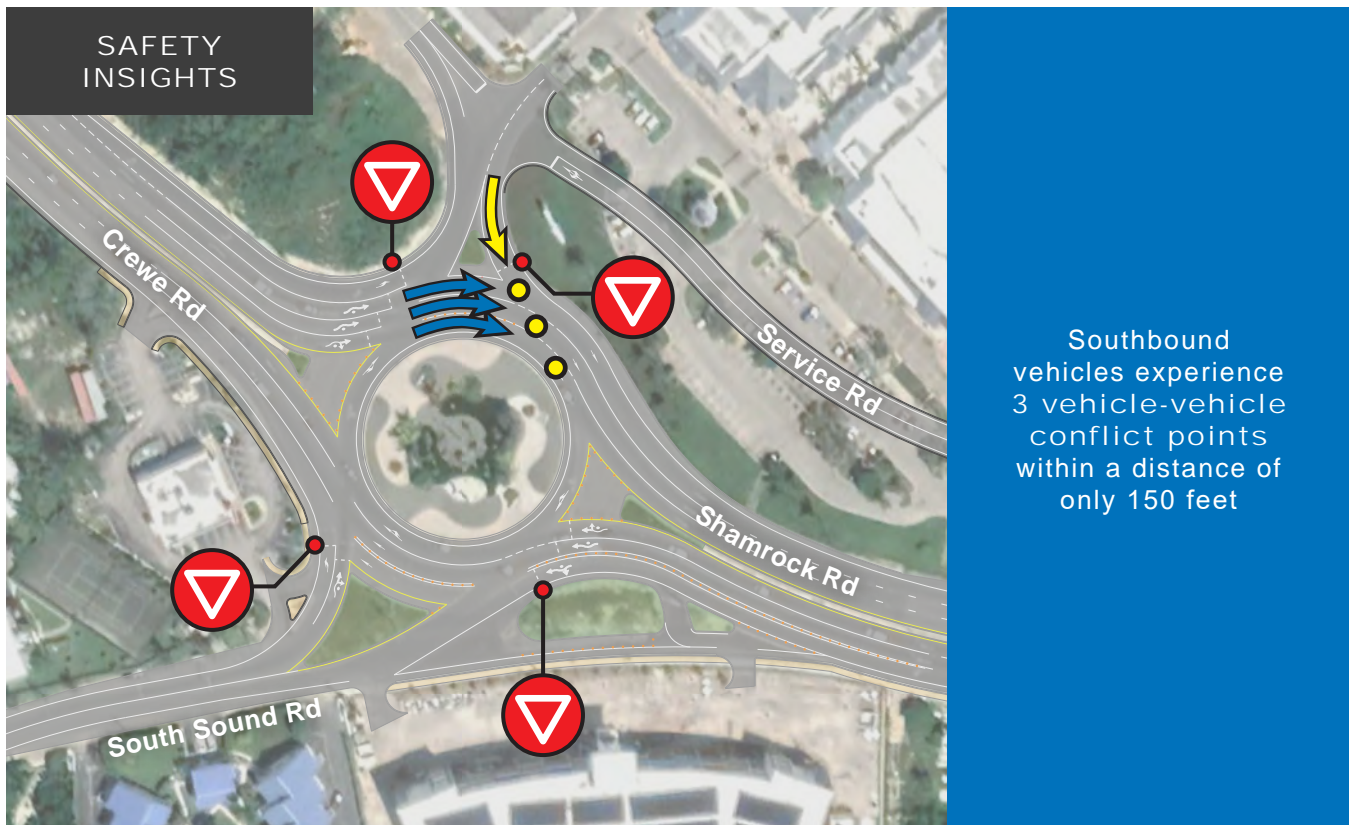
GRAND HARBOUR ALT 0: RESTRICTED SOUTHBOUND THROUGH/RIGHT

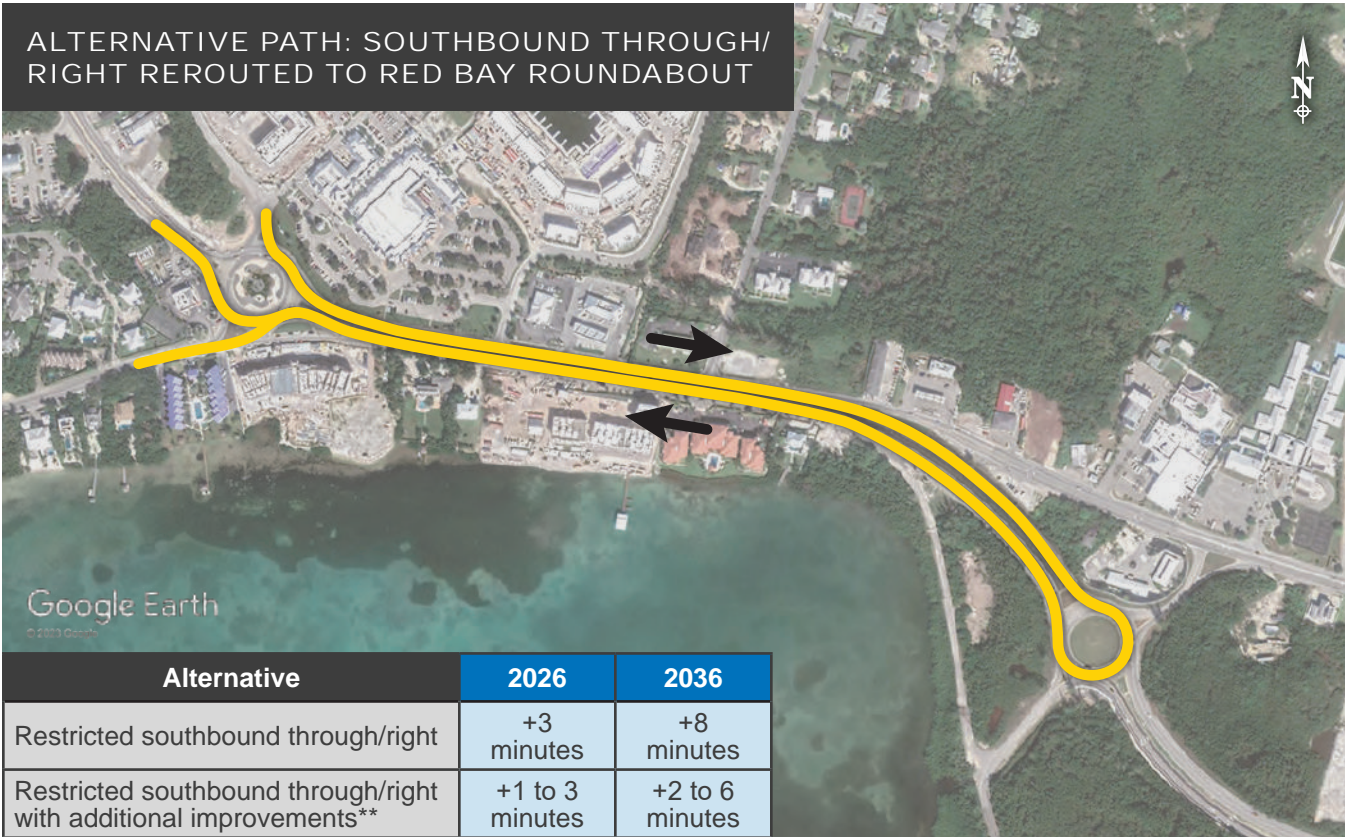


RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
▼	▲	-	-	-	\$

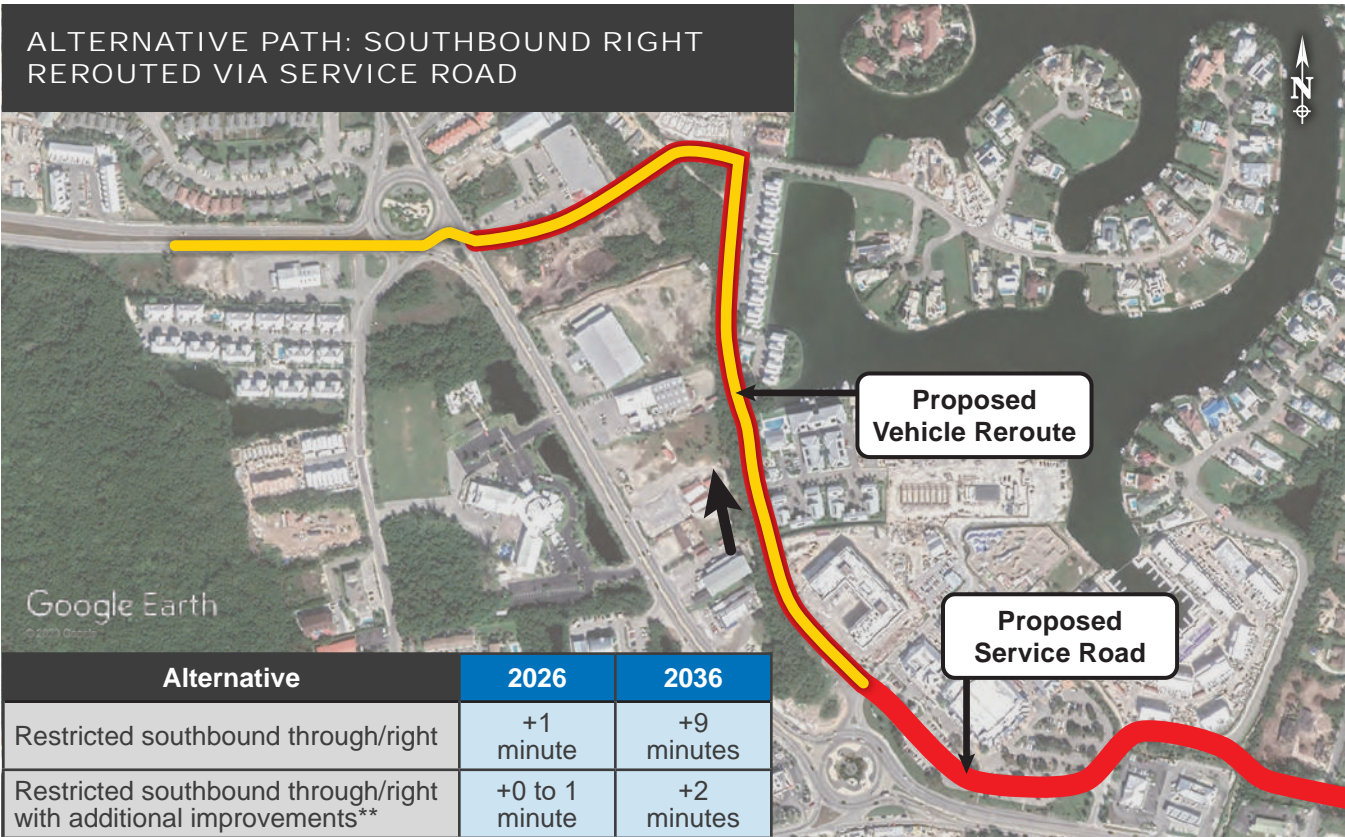
This alternative retains the existing roundabout configuration with yield traffic control and does not provide any pedestrian improvements, but it enhances safety performance by restricting the southbound through and right movements. All southbound traffic is required to turn left only, and access to points south or west can still be achieved via U-turns through the downstream Red Bay Roundabout or by using other alternate paths such as the Parallel Service Road connection west to the CUC Roundabout. These alternative paths, which can be seen in the following figures, add approximately 3 minutes and 1 minute, respectively, to the 2026 AM Peak commute.

From a safety perspective, the southbound through and right movements proposed for restriction must (under existing conditions) simultaneously anticipate gaps and driver behaviours across all three high-volume lanes approaching the roundabout, merge into the circulating traffic stream, and immediately change/cross three lanes of traffic within a distance of only 150 feet. Additionally, from a gap perspective and assuming random arrivals with no upstream traffic signal metering, it is estimated that a car will travel past the southbound approach in one or more of the roundabout circulating lanes approximately once every four seconds in the AM peak, and once every second in the PM peak, based on 2026 circulating volumes of 875 AM and 3,150 PM vehicles per hour in the portion of the roundabout where the southbound traffic must enter. By comparison, according to the American Association of State Highway and Transportation Officials (AASHTO), a 9 second gap is recommended for turning vehicles to adequately merge into the appropriate through/right lane, not including time for additional lane changes. With only 150 feet and 1-4 second gaps, southbound traffic attempting to navigate through or right via the roundabout is essentially “blocked out”. This condition forces southbound drivers to wait long periods of time for all three lanes to be clear before entering the roundabout, which contributes to southbound queuing and delays. More significantly, it often leads to southbound drivers entering with inadequate gaps and then slowing/blocking the circulating roundabout flows while attempting to complete the lane changes, or drivers may enter with more aggressive driving behaviours to “jump” across the lanes more quickly. Both scenarios increase the overall crash potential and travel safety risks, which in turn can also lead to broader system breakdowns if/when crashes do occur and block the roundabout for longer periods of time. Although quicker, the alternative path via the Parallel Service Road is not recommended because you will be entering the CUC Roundabout under the same difficult conditions.



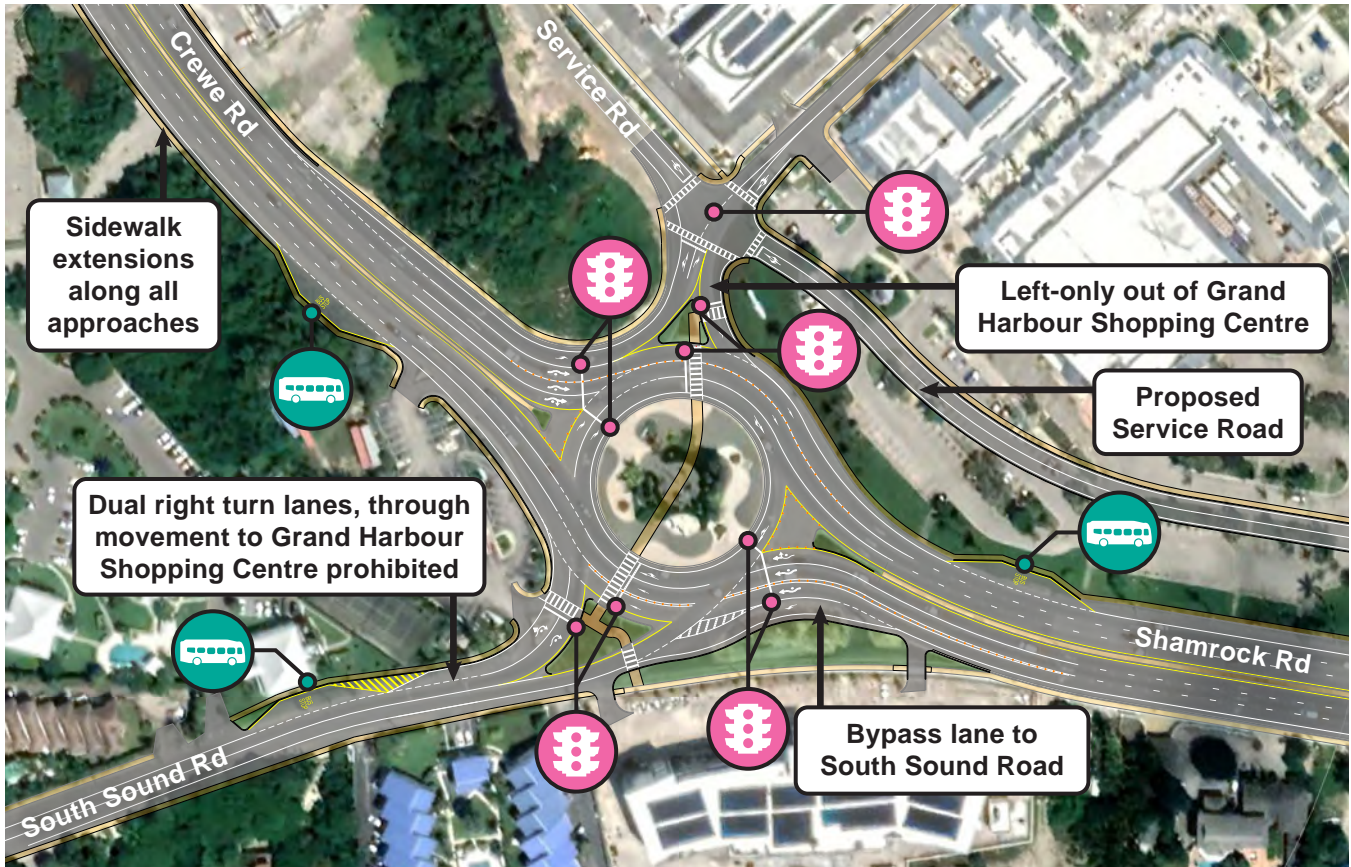


** See Hybrid Signalized Roundabout and Signalized Traffic Metering alternatives



** See Hybrid Signalized Roundabout and Signalized Traffic Metering alternatives

GRAND HARBOUR ALT 1: HYBRID SIGNALIZED ROUNDABOUT

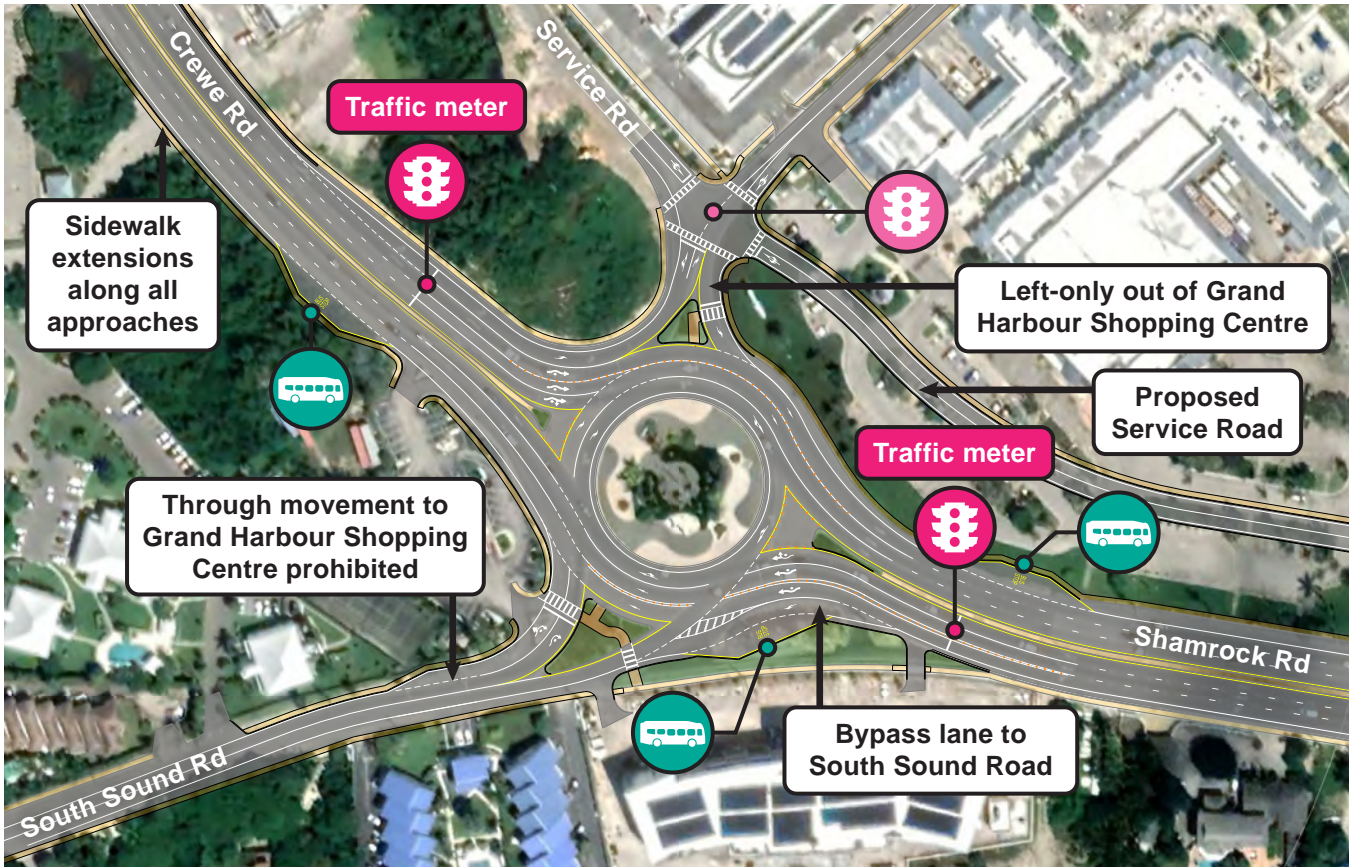


RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
●	↑	↑	↑	LOW	\$\$

This alternative fully signalizes the roundabout during peak traffic conditions, with signal timings triggered by vehicle and pedestrian detection. For off-peak hours, signals will flash yellow to indicate yield control operations. This option increases delay on Crewe Road / Shamrock Road but reduces queues on South Sound Road, Bimini Drive, and Selkirk Drive. This option includes lane reconfiguration, including a left-turn pocket on Shamrock Road. The adjacent Service Road intersection will be signalized to reduce delay along the new road. Due to close spacing with the roundabout, the two intersections will run coordinated signal timings to minimize queue spillback between them.

This alternative improves safety by protecting entry movements, thereby reducing potential accidents that may occur as vehicles attempt to enter a congested roundabout. By restricting movements in/out of Grand Harbour Shopping Centre, this alternative removes potentially dangerous side street maneuvers and reduces mainline delay. Pedestrian facilities improve by providing crosswalks and walk signals. New bus pullouts enhance transit access, with sidewalk connecting the existing bus stop on Shamrock Road.

GRAND HARBOUR ALT 2A: SIGNALIZED TRAFFIC METERING

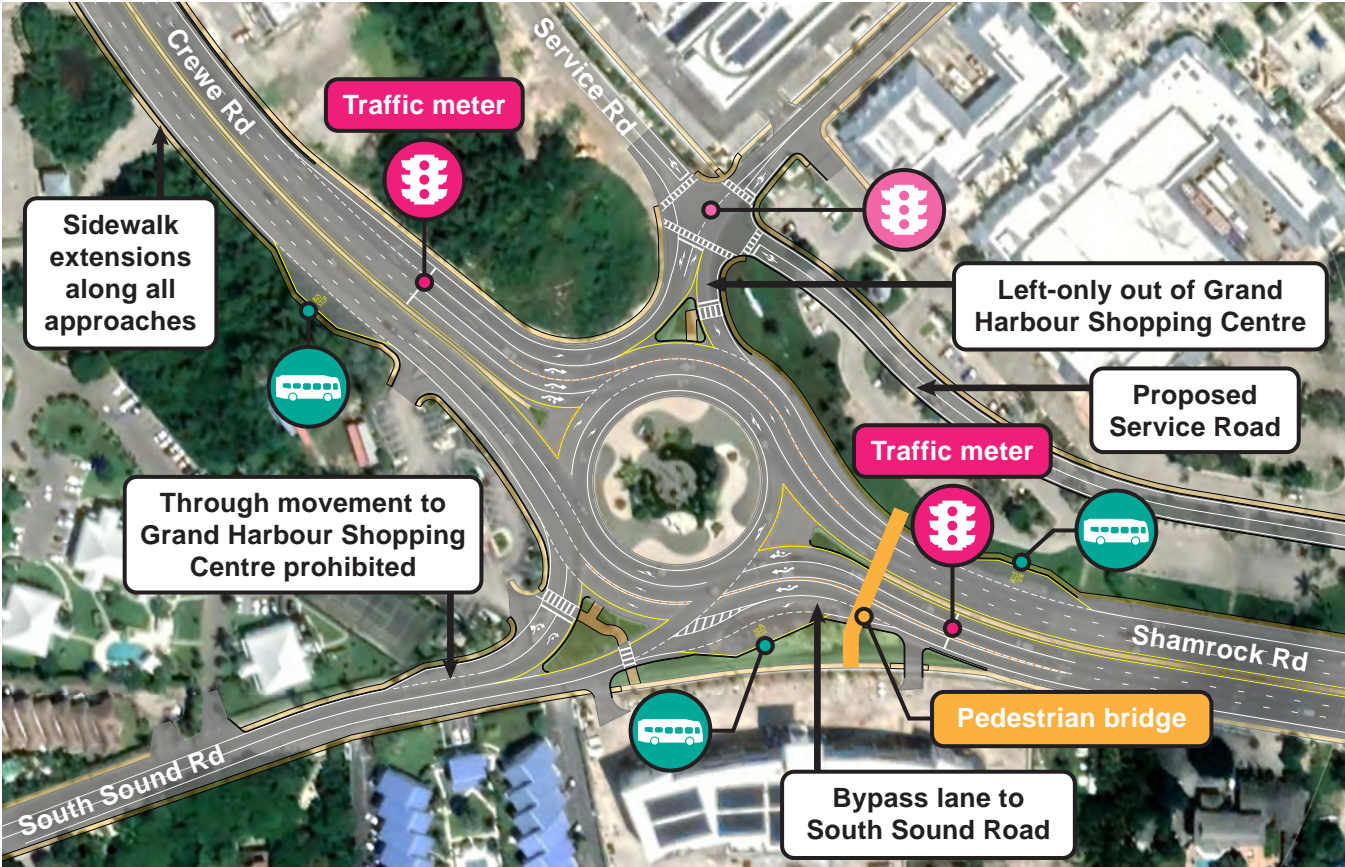


RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
●	▲	-	▲	LOW	\$

This alternative introduces signals to meter mainline Crewe Road / Shamrock Road during peak traffic conditions, reducing side street queues on South Sound Road but likely not at downstream Selkirk Drive and Bimini Drive. Signals are to be triggered by vehicle detection, with queue detection to prevent spillback. For off-peak hours, the signals will be shut off, resuming typical yield operations. This option includes lane reconfiguration, including a left-turn pocket on Shamrock Road. Due to close spacing with the roundabout, the adjacent Service Road intersection will run with vehicle detection to minimize queue spillback and optimize traffic operations.

This alternative improves safety by providing gaps for minor streets, thereby reducing potential accidents that may occur as vehicles attempt to enter a congested roundabout. By restricting movements in/out of Grand Harbour Shopping Centre, this alternative also removes potentially dangerous side street maneuvers. This option provides no safe pedestrian crossing over the six-lane legs of the roundabout. Bus pullouts are provided to enhance transit access, with sidewalks connecting the existing bus stop on Shamrock Road.

GRAND HARBOUR ALT 2B: SIGNALIZED TRAFFIC METERING (WITH PEDESTRIAN BRIDGE)

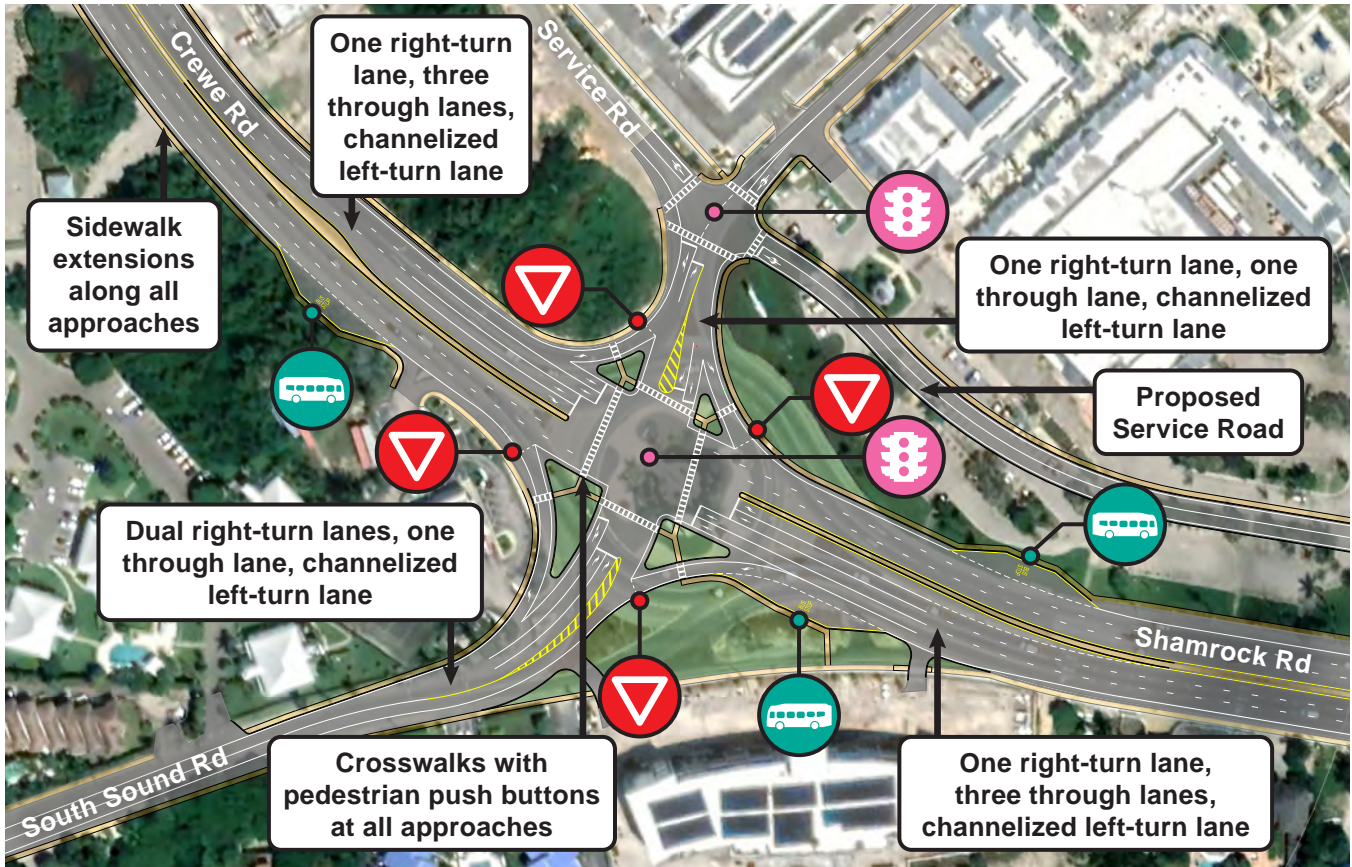


RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
●	▲	▲ - ●	▲	MODERATE	\$\$ - \$\$\$

This alternative introduces traffic signals to meter mainline approaches during peak traffic conditions as shown in Alt. 2A.

To accommodate increased pedestrian demand, a pedestrian bridge is provided to safely cross Shamrock Road between residential and retail areas. It is worth noting that the bridge’s safety benefit is dependent on whether pedestrians choose to use the bridge correctly rather than crossing the street at-grade.

GRAND HARBOUR ALT 3: TRADITIONAL SIGNALIZED INTERSECTION



RELATIVE BENEFIT (WITHOUT WIDENING)					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
▼	▼	▲	▲	HIGH	\$\$\$

This alternative converts the existing roundabout into a traditional signalized intersection, with right-turn lanes and channelized left turns at all approaches. This concept fits within the existing right-of-way, assuming no additional widening occurs beyond the six-lane roadway. The signal is expected to operate poorly, generating heavy queuing along Crewe Road and Shamrock Road.

The adjacent Service Road intersection will be signalized to reduce delay along the new road. Due to close spacing with Shamrock Road/Crewe Road, the two intersections will run coordinated signal timings to minimize queue spillback between them, but queue spillback is still likely to be an issue.

This alternative worsens overall safety by introducing additional vehicle-to-vehicle and vehicle-to-pedestrian conflict points, thereby increasing the chance for highspeed head-on collisions. Pedestrian facilities are improved by connecting existing sidewalks and providing crosswalks,

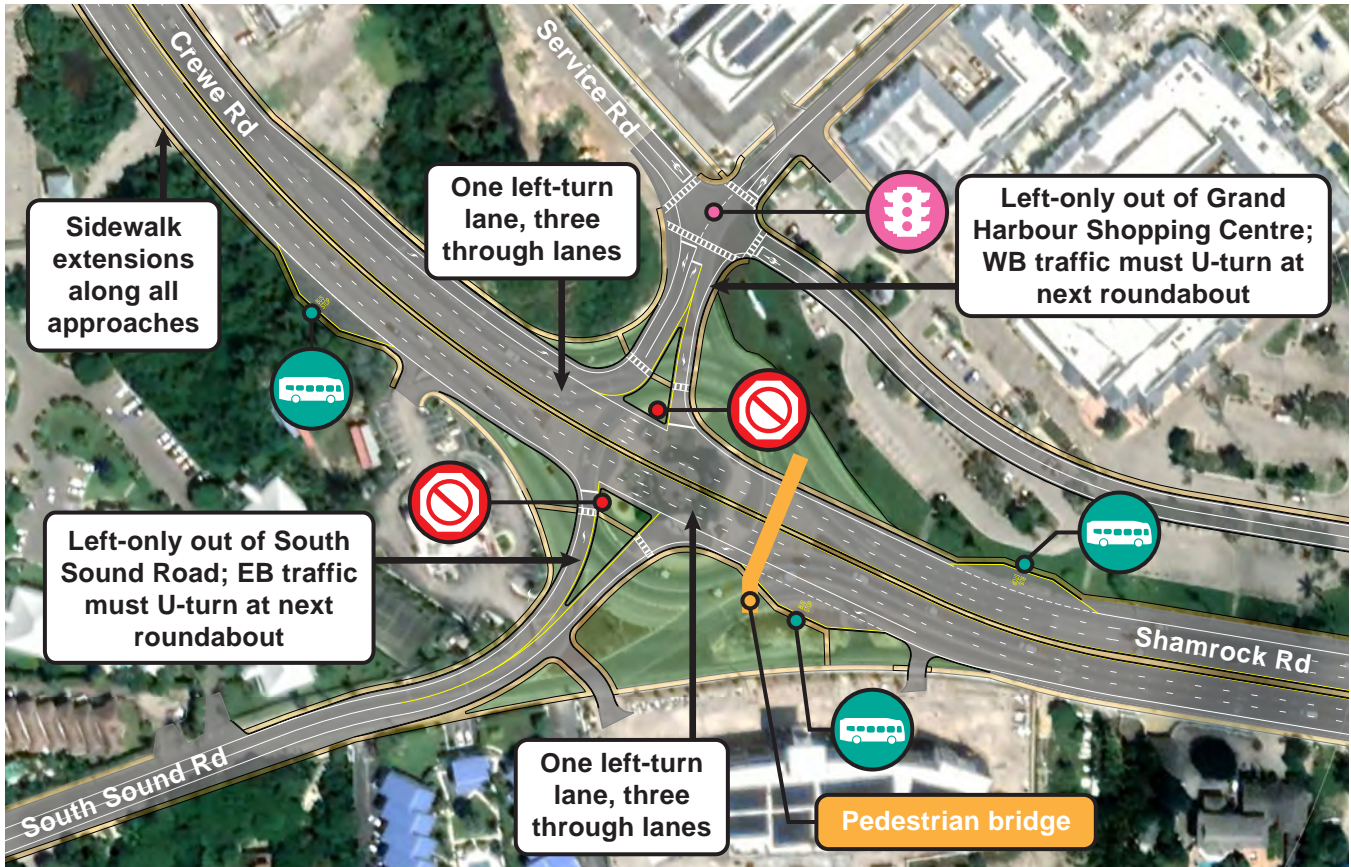
walk signals, and push buttons. However, long pedestrian phases would be required to allow pedestrians to cross eight lanes of traffic at one approach. New bus pullouts are provided to enhance transit access, with sidewalk connecting to the existing bus stop on Shamrock Road.

RELATIVE BENEFIT (WITH WIDENING)					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
▲	▼	▲	▲	HIGH	\$\$\$

For this alternative to operate with acceptable levels of delay, the intersection would need to be widened to five or six lanes in each direction along Crewe Road and Shamrock Road, in addition to left and right-turn lanes. The intersection cannot be widened further without significant impacts to adjacent property and to the proposed parallel Service Road. Widening would also create unsafe conditions for pedestrians, requiring people to walk across ten or more lanes of traffic to reach their destination.



GRAND HARBOUR ALT 4A: CONTROLLED ACCESS HIGHWAY (GH ACCESS PERMITTED)



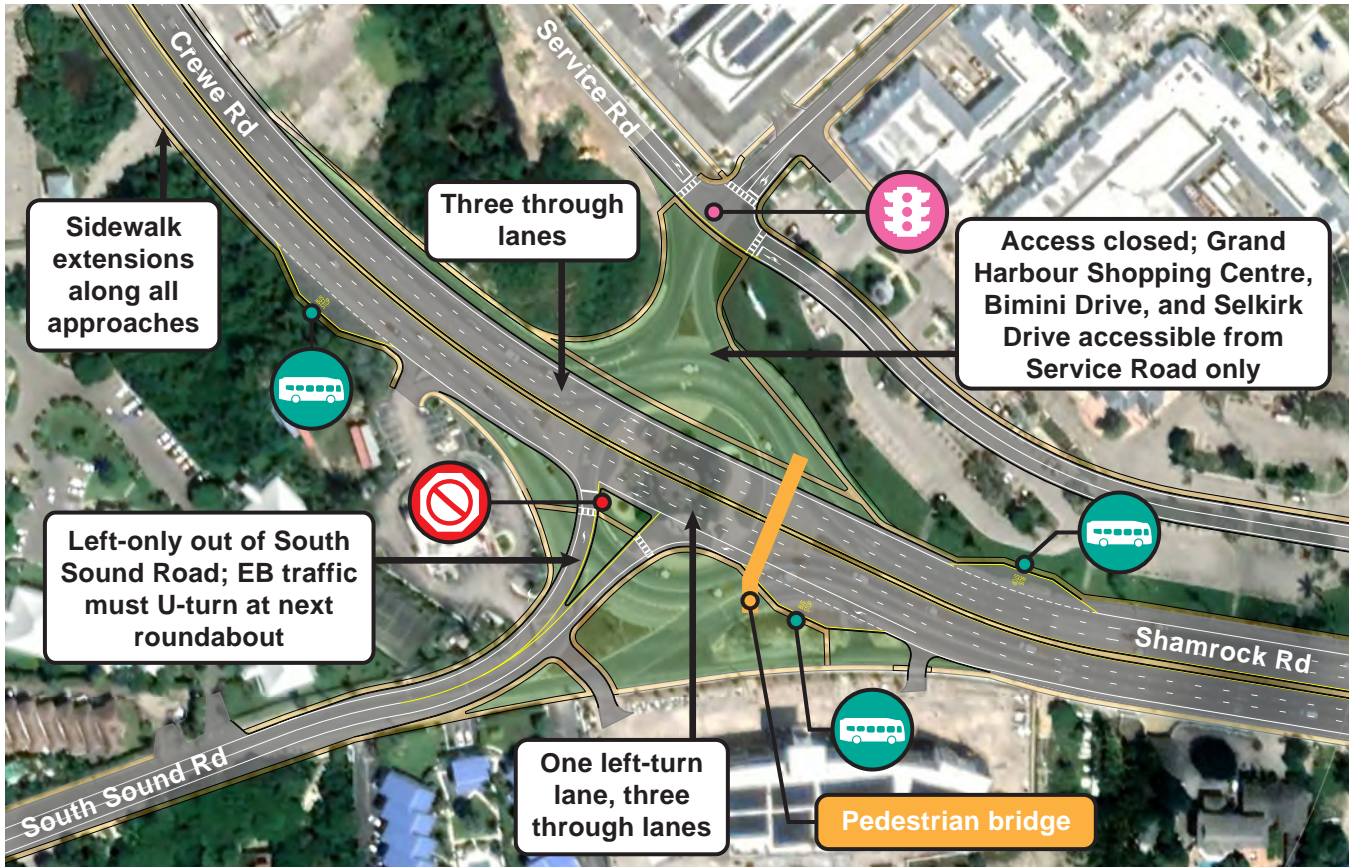
RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
▲ **See note	●	▲ - ●	▲	LOW	\$

**Note: This alternative relieves congestion at Grand Harbour, but produces delays comparable to No-build conditions at the CUC, Red Bay, and Tomlinson Roundabouts as vehicles shift to downstream roundabouts for for all right-turns, U-turns, and Service Road access.

This alternative converts the existing roundabout into a two-way stop controlled intersection. The South South Road and Grand Harbour Shopping Centre approaches will be limited to left-in / left-out movements. All right-turn movements will be accommodated by U-turns at the next available roundabout. This alternative relieves congestion at Grand Harbour, but produces delays comparable to No-Build conditions along the rest of the corridor. As drivers shift to downstream roundabouts to access the Service Road or complete right-turn movements, heavy queues are anticipated at the CUC Roundabout along Crewe Road, LPH, and the Service Road.

This alternative fits within the existing right-of-way and improves safety by constructing a pedestrian bridge to cross Shamrock Road between the residential and retail areas, otherwise retaining only the side-street crossings at the controlled access intersection location. However, it is worth noting that the bridge's overall safety benefit is dependent on whether pedestrians use the bridge correctly rather than crossing the street at-grade. This alternative also removes potentially difficult, high-conflict side street maneuvers and eliminates one of the closely spaced roundabouts.

GRAND HARBOUR ALT 4B: CONTROLLED ACCESS HIGHWAY (GH ACCESS PROHIBITED)



RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
- **See note	●	↑ - ●	▲	LOW	\$

**Note: This alternative relieves congestion at Grand Harbour, but produces delays comparable to No-build conditions at the CUC, Red Bay, and Tomlinson Roundabouts as vehicles shift to downstream roundabouts for for all right-turns, U-turns, and Service Road access.

This alternative converts the existing roundabout into a two-way stop controlled intersection. The South South Road approach will be limited to left-in / left-out movements, while the Grand Harbour Shopping Centre access (the former southbound approach) is closed. Additionally the accesses to Bimini Drive and Selkirk Drive from Shamrock Road are closed, limiting Service Road access from only the CUC Roundabout or Red Bay. All right-turn movements will be accommodated by U-turns at the next available roundabout. This alternative relieves congestion at Grand Harbour, but produces delays comparable to No-Build conditions along the rest of the corridor as vehicles shift to the downstream roundabouts for all right-turn movements and Service Road access. Significant congestion is anticipated along the Service Road and at the CUC Roundabout along Crewe Road and LPH.

This alternative fits within the existing right-of-way and improves safety by constructing a pedestrian bridge to cross Shamrock Road between the residential and retail areas, otherwise retaining only the side-street crossing at the controlled access intersection location. This

improvement reduces the pedestrian-vehicle conflict points to only two. However, it is worth noting that the bridge's overall safety benefit is dependent on whether pedestrians use the bridge correctly rather than crossing the street at-grade. This alternative also removes potentially difficult, high-conflict side street maneuvers and eliminates one of the closely spaced roundabouts.

RED BAY ROUNDABOUT

OVERVIEW

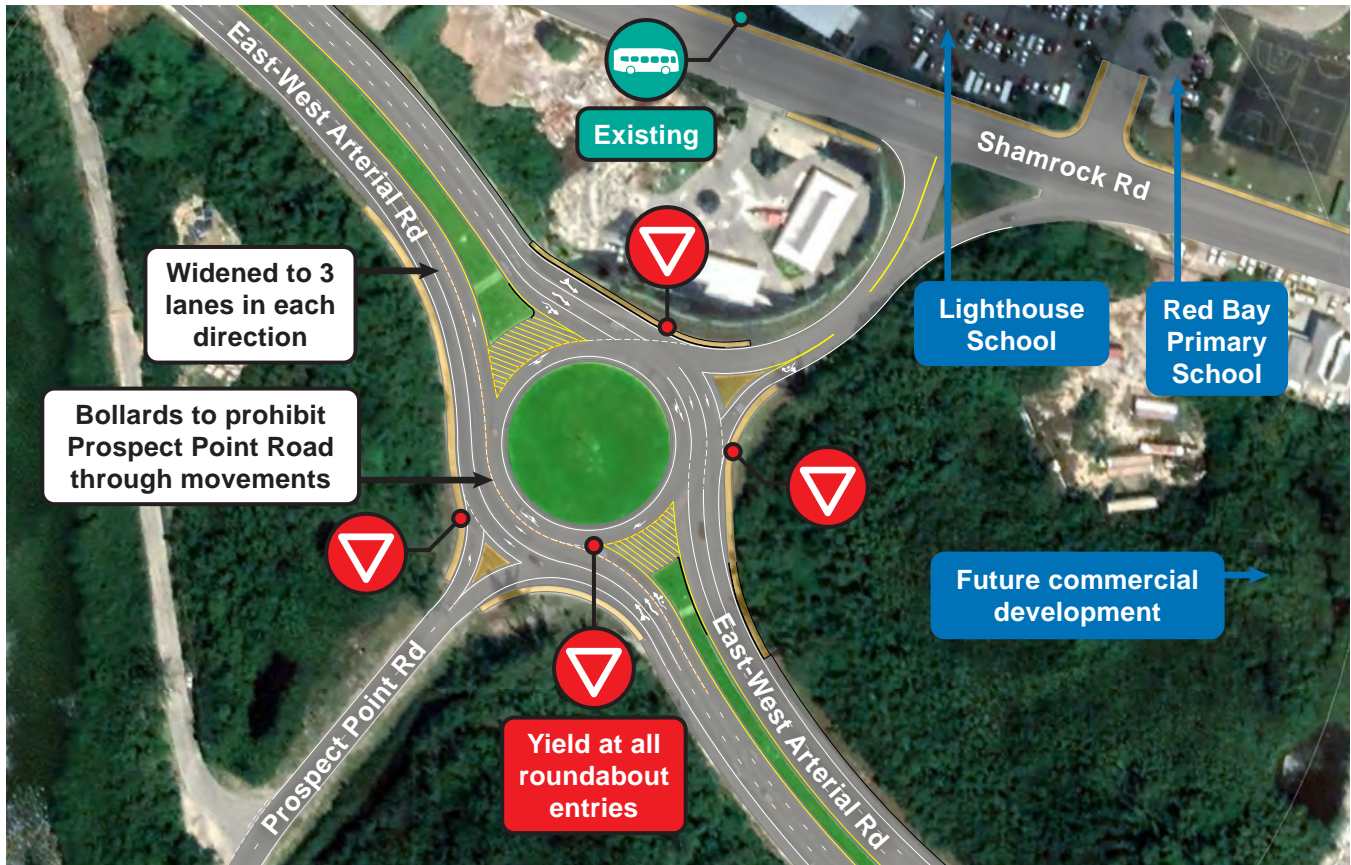
The Red Bay Roundabout is located near Red Bay Primary School and Lighthouse School. Commercial development is planned just east of the roundabout along the East-West Arterial (EWA). The roundabout provides access to residential neighbourhoods along Shamrock Road. There are some existing sidewalks around the roundabout, but no safe pedestrian crossings over the roundabout. There are no bus stops located at the intersection itself, but an existing bus shelter is located on Shamrock Road north of the roundabout. Commuters often use Prospect Point Road as a cut through route, producing AM queues at this approach.



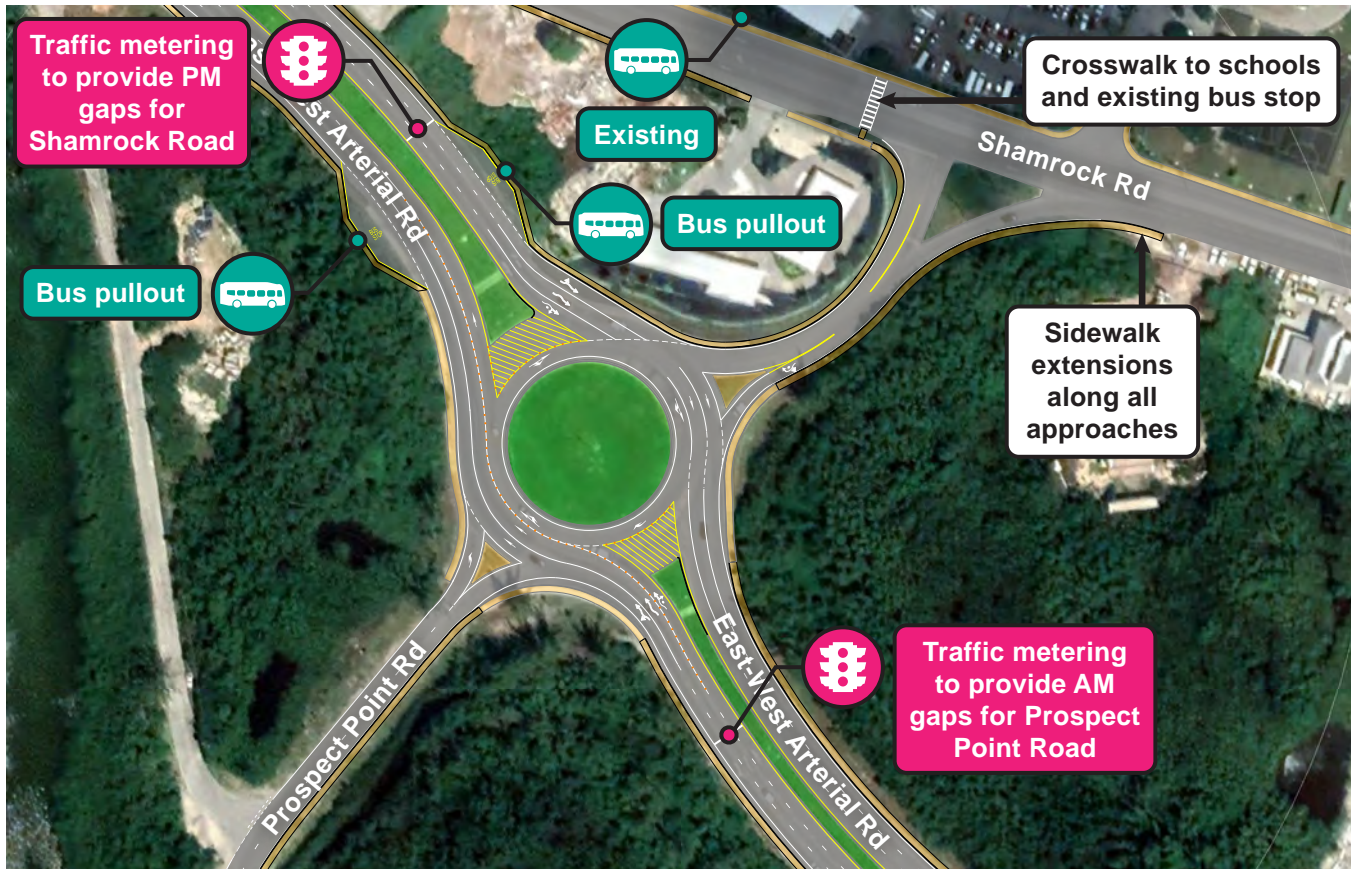


EXISTING CONDITIONS & COMMITTED PROJECTS

By 2026, EWA will be widened to six lanes. The parallel Service Road will tie in on Shamrock Road but is unlikely to have significant impact on the Red Bay Roundabout's traffic operations. Future population growth is anticipated to increase vehicle demand. However, the increased traffic on EWA will cause side street queues to increase on Prospect Point Road and Shamrock Road as they become unable to find gaps to safely enter the roundabout.



RED BAY ALT 1: SIGNALIZED TRAFFIC METERING



RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
●	▲	-	▲	LOW	\$\$

This alternative introduces traffic signals to meter mainline approaches on EWA during peak traffic conditions, reducing side street queues on Prospect Point Road and Shamrock Road. The meter timings are to be triggered by vehicle detection, with queue detection in place to prevent long queue spillback. For off-peak hours, the signals will be shut off, resuming typical yield operations. This option maintains the prohibited movements to/from Prospect Point Road that are enforced today using bollards installed within the roundabout

This alternative improves overall safety by providing adequate gaps for side street traffic to safely enter the roundabout thereby reducing the opportunity for accidents that may occur as vehicles attempt to enter a congested roundabout. Unfortunately, this traffic metering option does not provide safe pedestrian crossing over the six-lane legs of the roundabout. New bus pullouts are provided to enhance transit access along EWA, with sidewalk extensions along all approaches.

TOMLINSON ROUNDABOUT

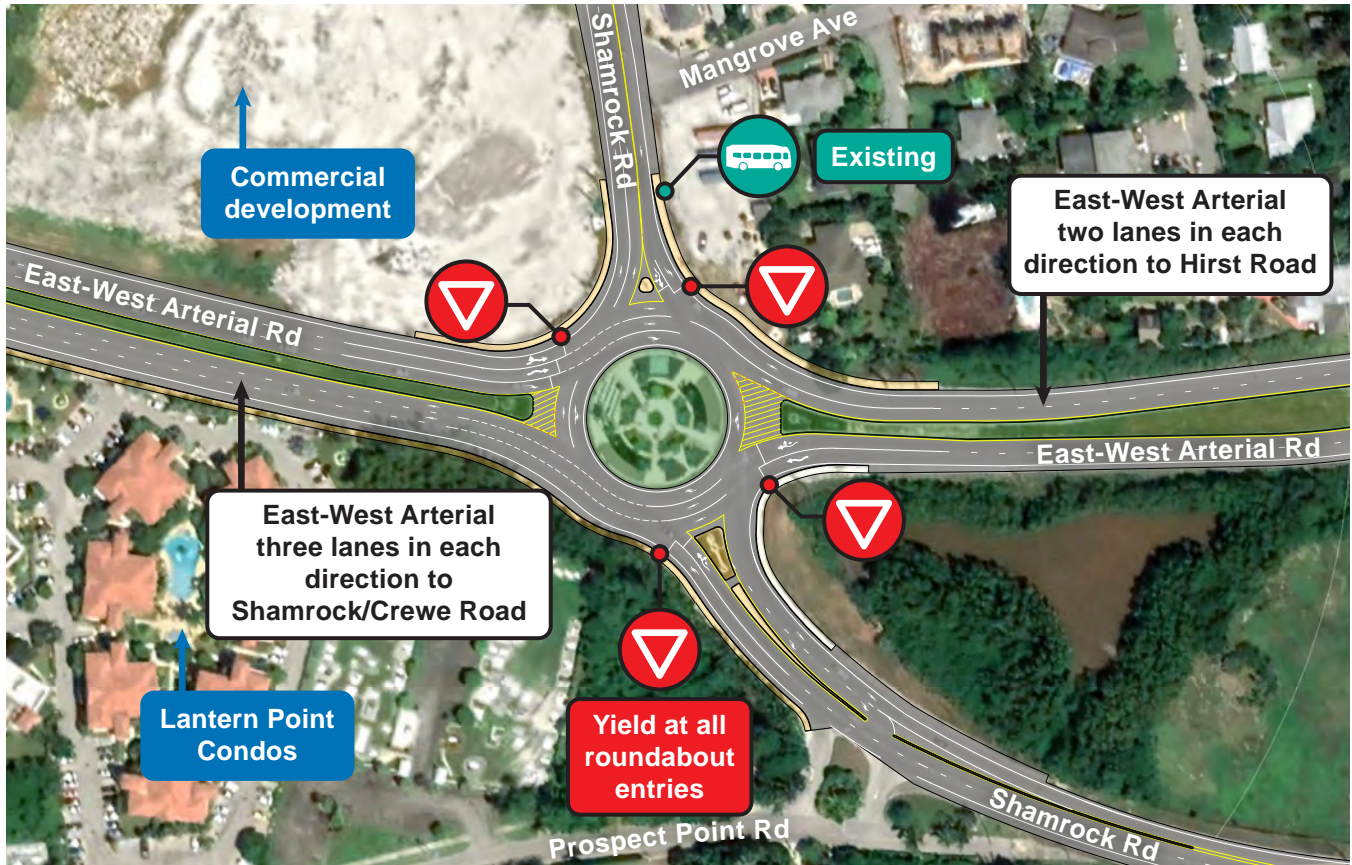
OVERVIEW

The Tomlinson Roundabout provides access to residential neighbourhoods located along Shamrock Road. Commercial developments are planned just west of the roundabout along the EWA and Shamrock Road. There are some existing sidewalks surrounding the roundabout, but no safe pedestrian crossings across the intersection. An existing bus shelter is located on the southbound Shamrock Road entry of the roundabout. This roundabout is an AM congestion point, with long queues occurring along westbound Shamrock Road and EWA.

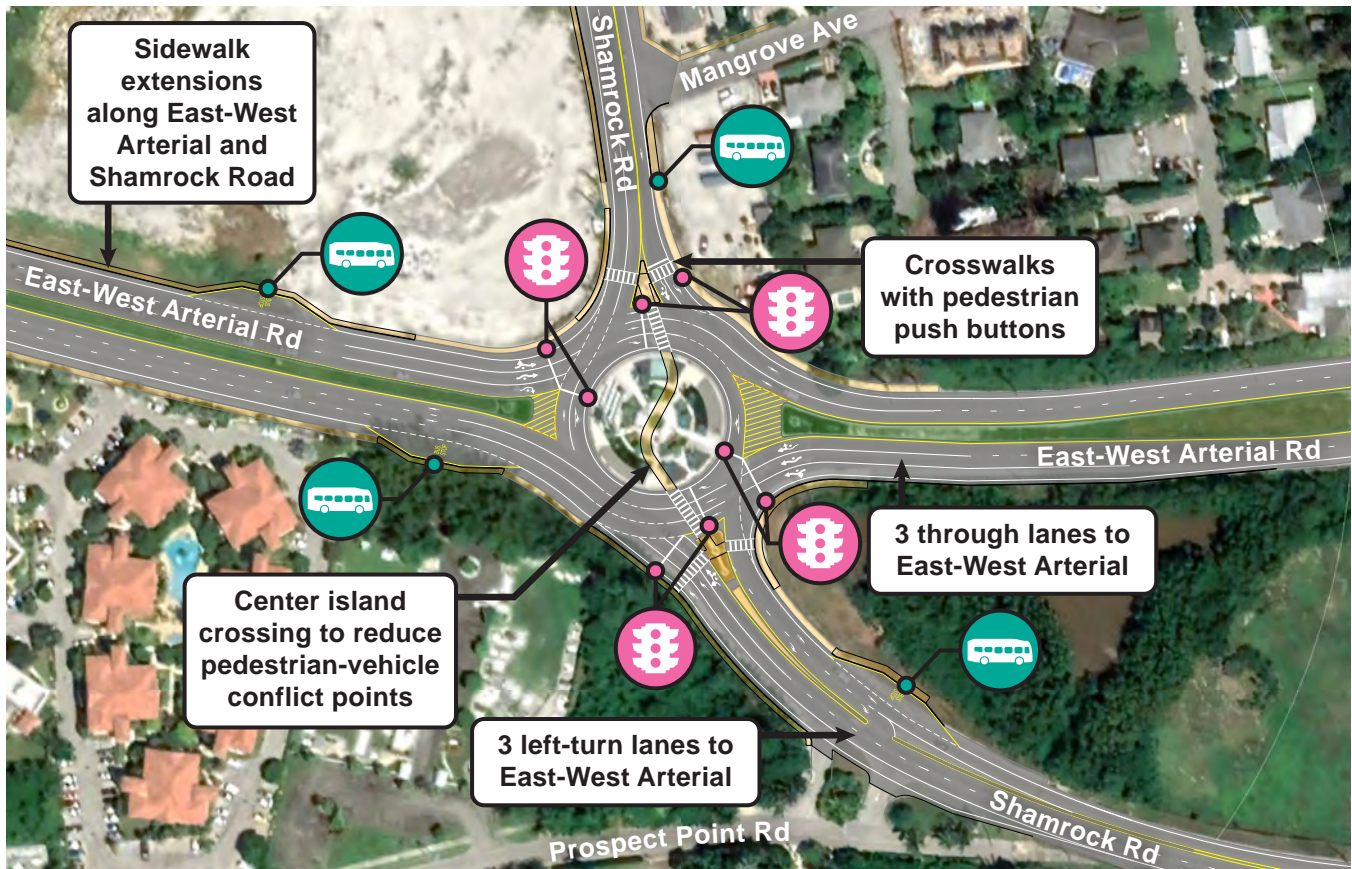


EXISTING CONDITIONS & COMMITTED PROJECTS

By 2026, EWA will be widened to six lanes between the Red Bay and Tomlinson Roundabouts. The EWA Extension and Agricola Drive Connector will be constructed, which is anticipated to shift volume away from Shamrock Road and onto EWA. Future population growth is anticipated to increase vehicle demand, and it will be important to balance competing queues on EWA and Shamrock Road.



TOMLINSON ALT 1: HYBRID SIGNALIZED ROUNDABOUT



RELATIVE BENEFIT					
OPERATIONAL BENEFITS	SAFETY BENEFITS	PEDESTRIAN ACCESS	TRANSIT ACCESS	ROW	ROM COST
↑	↑	↑	↑	LOW	\$\$

This alternative fully signalizes the roundabout during peak traffic conditions, with signal timings triggered by vehicle detection and pedestrian push buttons. For off-peak hours, signals will flash yellow to indicate yield control operations. Full signalization increases delay on eastbound EWA, but reduces queuing on westbound EWA and northbound Shamrock Road approaches. This option includes some lane reconfiguration, including additional entry lanes on the westbound and northbound approaches.

This alternative improves overall safety by controlling the movements entering the roundabout, thereby reducing the opportunity for accidents that may occur as vehicles attempt to enter a congested roundabout. Pedestrian facilities are improved by connecting existing sidewalks and providing crosswalks, walk signals, and push buttons. New bus pullouts will enhance transit access.

SUMMARY MATRIX

The following matrix summarizes the improvement alternatives provided in the report, suggesting their relative performance metrics and costs compared to the E+C scenario, with benefits and impacts qualitatively ranging from low to high. Qualitative relative benefits are provided for each concept, with green icons representing an improvement or benefit against the E+C scenario and red representing worsening conditions:

●	High
↑	Moderate
▲	Low
–	Neutral or N/A
▼	Low
↓	Moderate
●	High

Note: Due to the likelihood of geometric constraints, construction impacts, and costs, a flyover alternative was not considered a feasible option as part of this study.

CUC ROUNDABOUT	Operations Benefits	Safety Benefits	Pedestrian Access	Transit Access	ROW	ROM Cost
Alt 1: Hybrid Signalized Roundabout	▲	▲	▲	▲	LOW	\$\$
Alt 2: Signalized Traffic Metering	●	▲	–	▲	LOW	\$

GRAND HARBOUR ROUNDABOUT	Operations Benefits	Safety Benefits	Pedestrian Access	Transit Access	ROW	ROM Cost
Alt 0: Restricted Southbound Through/Right	▼	▲	–	–	–	\$
Alt 1: Hybrid Signalized Roundabout	●	▲	▲	▲	LOW	\$\$
Alt 2A: Signalized Traffic Metering	●	▲	–	▲	LOW	\$

GRAND HARBOUR ROUNDABOUT CONT'D	Operations Benefits	Safety Benefits	Pedestrian Access	Transit Access	ROW	ROM Cost
Alt 2B: Signalized Traffic Metering (with pedestrian bridge)	●	▲	↑ - ●	▲	MODERATE	\$\$ - \$\$\$
Alt 3: Traditional Signalized Intersection (without widening)	▼	▼	▲	▲	HIGH	\$\$\$
Alt 3: Traditional Signalized Intersection (with widening)	▲	▼	▲	▲	HIGH	\$\$\$
Alt 4A: Controlled Access Highway (GH access permitted)	▲ **See note	●	↑ - ●	▲	LOW	\$
Alt 4B: Controlled Access Highway (GH access prohibited)	- **See note	●	↑ - ●	▲	LOW	\$

**Note: This alternative relieves congestion at Grand Harbour, but produces delays comparable to No-build conditions at the CUC, Red Bay, and Tomlinson Roundabouts as vehicles shift to downstream roundabouts for for all right-turns, U-turns, and Service Road access.

RED BAY ROUNDABOUT	Operations Benefits	Safety Benefits	Pedestrian Access	Transit Access	ROW	ROM Cost
Alt 1: Signalized Traffic Metering	●	▲	-	▲	LOW	\$\$

TOMLINSON ROUNDABOUT	Operations Benefits	Safety Benefits	Pedestrian Access	Transit Access	ROW	ROM Cost
Alt 1: Hybrid Signalized Roundabout	↑	↑	↑	↑	LOW	\$\$
Alt 2: Signalized Traffic Metering	●	▲	-	▲	LOW	\$

ADDITIONAL CONSIDERATIONS

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

The signalized alternatives described in this plan aim to provide innovative traffic management solutions using intelligent transportation systems (ITS). Installation of such technology will improve overall traffic flow and travel times throughout the corridor.

Features of this system may include the following:

- **Adaptive signal timings** – use sensors/detectors to adjust signal timings, accommodate fluctuating traffic patterns, and reduce traffic congestion in real time
- **Advanced metering detection** – use detectors to collect volume data, optimize traffic metering operations, and reduce queue spillback at metered locations
- **Signal coordination** – synchronize multiple intersections to improve the progression of vehicles travelling through the corridor, reduce the number of stops, and improve air quality
- **NRA headquarters remote access** – Referred to as an Advanced Traffic Management System (ATMS), this would allow the NRA to remotely monitor, adjust, and operate the traffic signals or advanced meters in order to improve traffic flow and safety. In the future, this could include remote operation of variable message signs or other traffic technology
- **Pedestrian actuation** – install sensors, push buttons, and walk signals at crosswalks to improve pedestrian safety
- **Advanced warning signals** – install flashers and signage warning drivers to prepare to stop in advance of signalized intersections

PUBLIC OUTREACH

To implement any of the alternatives discussed in this plan, the NRA will launch a public outreach campaign to educate drivers on changing traffic patterns, including new lane configurations and signal operations. Public outreach will be integral to improve safety and traffic flow throughout the study corridor.

PEAK VS. OFF-PEAK ROUNDABOUT SIGNAL OPERATIONS

The hybrid signalized roundabout and signalized traffic metering alternatives discussed in this plan aim to ease traffic congestion and improve vehicle/pedestrian safety during peak traffic conditions. During off-peak hours, signalization may no longer be required for intersections to operate acceptably.

The following suggest potential roundabout operations during peak versus off-peak times of day:

- **Hybrid signalized roundabout** – During peak traffic periods, the roundabout is fully signalized with traffic signals at each entry. During off-peak periods, these traffic signals will operate on flashing yellow mode, warning drivers to yield to circulating traffic and use caution navigating the roundabout.
- **Signalized traffic metering** – During peak traffic periods, signal heads placed in advance of roundabout entry yield lines will provide intermittent red lights to break up vehicle platoons on designated approaches, creating gaps for minor street approaches to safely enter the roundabout. During off-peak periods, signal heads will be placed in dark mode (no indication displayed), resuming typical roundabout operations. The NRA has already installed one such example at the South Sound Road entry onto the Grand Harbour Roundabout.



Traffic metering signal in dark mode during off-peak periods

(Source: Google Earth Street View Imagery of Diamond Creek Rd Roundabout in Greensborough, Victoria)

PERFORMANCE METRIC SUMMARY

The following graphics illustrate how each alternative affects overall travel conditions compared to the E+C conditions, which include committed projects such as the EWA widening, Agricola Drive Connector, and LPH widening as listed in the Scenario Development section of this report. The following graphics examine quantitative performance metrics from a larger systemwide perspective:

- **TRAVEL TIMES:** During AM and PM peak conditions, average travel times are provided for selected routes to demonstrate overall cumulative travel time savings if the specified intersection type is implemented throughout the corridor.
- **QUEUE LENGTHS:** During AM and PM peak conditions, anticipated maximum queue lengths are provided at selected locations to demonstrate the effect of specified intersection operations.

It is worth noting that construction of the committed roadway projects included in the E+C scenario is anticipated to create future travel patterns that may differ from existing conditions; such shifts are discussed in the following section. The performance metrics quantified in this section also reflect an assumption of the current mode share; investments in improving transit access and other modes of transportation could reduce the vehicular travel times and queues presented.

AM TRAVEL TIME

Under 2026 and 2036 E+C conditions, the construction of the EWA widening and Agricola Drive Connector are anticipated to make EWA a more desirable path, shifting traffic patterns so that AM westbound commuters using the EWA will exceed those using Shamrock Road by over 1000 vehicles. This shift will initially help to reduce traffic volumes on Shamrock Road, however this reduced volume of vehicles entering the Tomlinson Roundabout from Shamrock Road will face delay by yielding to EWA who enter the roundabout first.

Both the hybrid signalized roundabout and traffic metering alternatives are anticipated to reduce overall travel times for AM commuters when implemented throughout the study corridor. The selected travel paths show the travel time savings to reach the Grand Harbour Roundabout, which is the main AM congestion point along the study corridor under both existing conditions and future E+C scenarios.

Under AM conditions, the improvement alternatives will mainly function to meter conflicting turning movements, providing sufficient gaps in traffic for westbound commuters to safely enter roundabouts and continue toward their destination. Signal timings will be triggered by detection and will adapt to daily traffic conditions. The roundabouts are anticipated to operate more efficiently to reduce delay on side street approaches such as Prospect Point Road and South Sound Road, where drivers may have trouble finding gaps to safely enter the intersection.

AM TRAVEL TIME - HIRST ROAD TO GRAND HARBOUR VIA EAST-WEST ARTERIAL



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodastystyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA

Powered by Esri

2026 E+C	2026 Signalized Roundabout	2026 Traffic Metering	2036 E+C	2036 Signalized Roundabout	2036 Traffic Metering	2036 Controlled Highway (GH Access Permitted)	2036 Controlled Highway (GH Access Prohibited)
10 min	8 min	7 min	34 min	13 min	12 min	25 min	17 min

AM TRAVEL TIME - HIRST RD TO GRAND HARBOUR VIA SHAMROCK RD



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodastystyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA

Powered by Esri

2026 E+C	2026 Signalized Roundabout	2026 Traffic Metering	2036 E+C	2036 Signalized Roundabout	2036 Traffic Metering	2036 Controlled Highway (GH Access Permitted)	2036 Controlled Highway (GH Access Prohibited)
16 min	9 min	7 min	30 min	15 min	16 min	16 min	30 min

AM TRAVEL TIME - WALKERS RD TO GRAND HARBOUR VIA SOUTH SOUND RD



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Powered by Esri
 Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin,
 Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureay, USDA

2026 E+C	2026 Signalized Roundabout	2026 Traffic Metering	2036 E+C	2036 Signalized Roundabout	2036 Traffic Metering
31 min	8 min	7 min	43 min	8 min	8 min

AM travel time savings shown along South Sound Road demonstrate the anticipated benefit to drivers accessing the study corridor from side streets. The signalization modelled in the analysis scenarios differ from the South Sound Road signalization that exists under current conditions. The improvement alternatives will introduce signal timings triggered by detection that will respond to daily traffic conditions and can be remotely controlled by the NRA in the event of an accident.

PM TRAVEL TIME

Under 2026 and 2036 E+C conditions, the six-lane widening from BTW to the Tomlinson Roundabout is anticipated to release major PM congestion points currently observed within the study corridor. When LPH is widened to six lanes, PM eastbound commuters are anticipated to shift their travel patterns to favour LPH, reducing traffic along alternate eastbound routes Crewe Road and South Sound Road. This shift will initially help reduce queues and delays along side streets but will make it more difficult for drivers to access the study corridor from side streets if they must yield to heavier movements that enter the roundabout first.

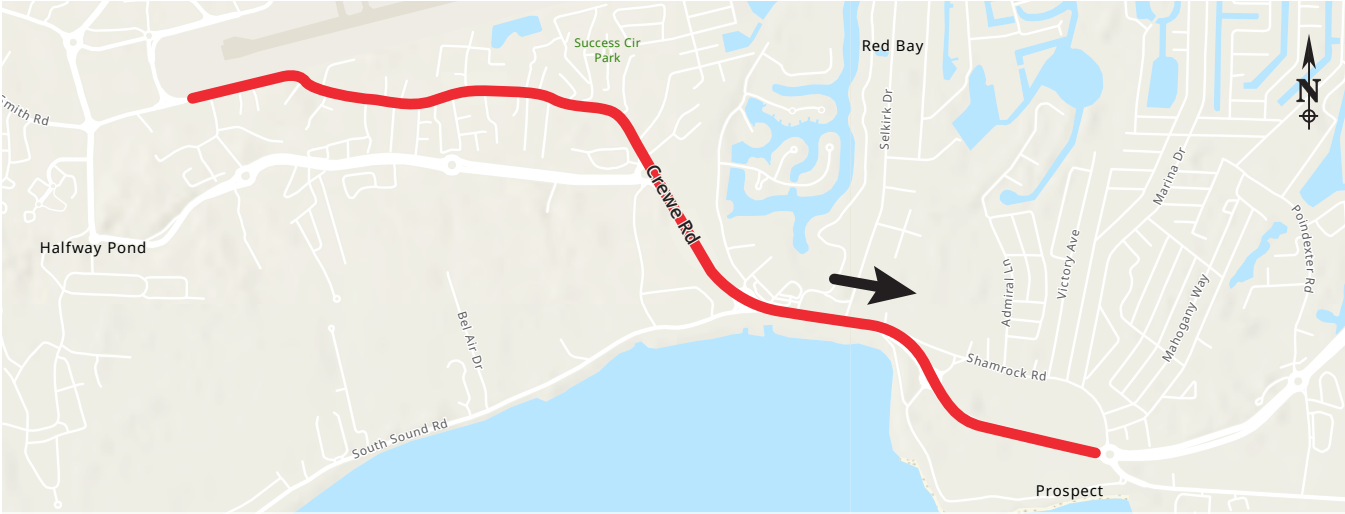
Compared to E+C conditions, both the hybrid signalized roundabout and traffic metering alternatives are anticipated to produce similar travel times for PM commuters when implemented throughout the study corridor. These alternatives may increase delay along the study corridor but will make intersections operate more efficiently at side street movements while providing safe pedestrian crossings during busy peak traffic conditions. Signal timings will be triggered by detection and will adapt to daily traffic conditions.

The traditional signal option is anticipated to increase PM travel time compared to E+C conditions, generating long queues at the Grand Harbour intersection that spill back into adjacent upstream CUC Roundabout.



CUC Roundabout during PM Peak (Image taken October 2019)

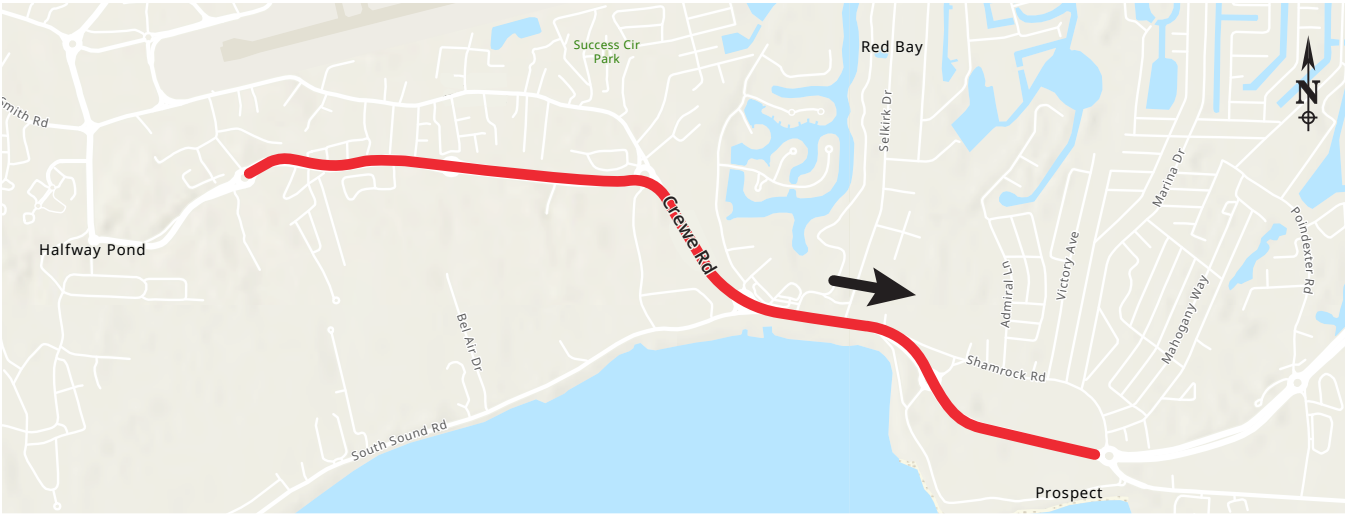
PM TRAVEL TIME - AGNES WAY TO TOMLINSON ROUNDABOUT VIA CREWE RD



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA

2026 E+C	2026 Signalized Roundabout	2026 Traffic Metering	2026 Traditional Signal	2036 E+C	2036 Signalized Roundabout	2036 Traffic Metering	2036 Traditional Signal	2036 Controlled Highway (GH Access Permitted)	2036 Controlled Highway (GH Access Prohibited)
10 min	10 min	7 min	19 min	24 min	11 min	9 min	37 min	7 min	7 min

PM TRAVEL TIME - AGNES WAY TO TOMLINSON ROUNDABOUT VIA LPH



Esri, Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA

2026 E+C	2026 Signalized Roundabout	2026 Traffic Metering	2026 Traditional Signal	2036 E+C	2036 Signalized Roundabout	2036 Traffic Metering	2036 Traditional Signal	2036 Controlled Highway (GH Access Permitted)	2036 Controlled Highway (GH Access Prohibited)
6 min	7 min	6 min	10 min	9 min	9 min	8 min	11 min	23 min	23 min

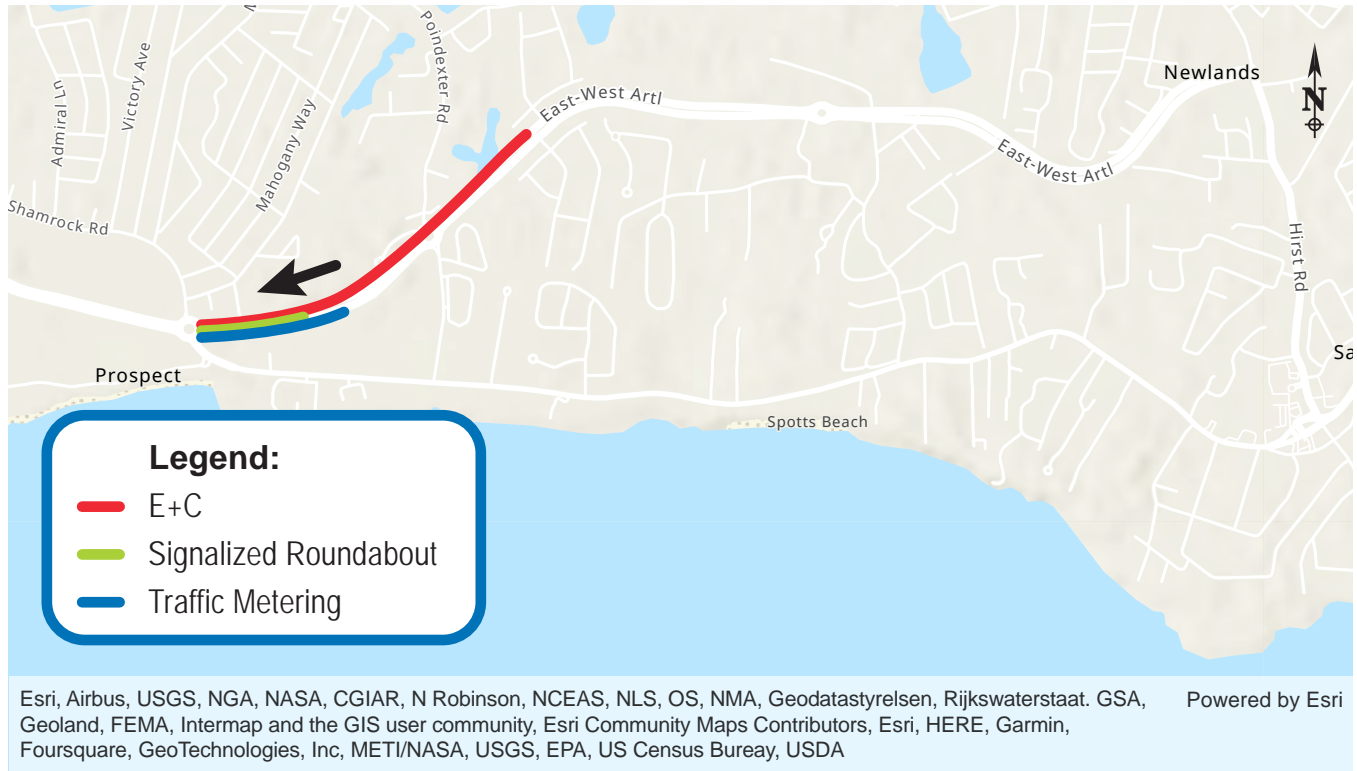
AM QUEUE LENGTHS

By 2036, AM peak queues at the Tomlinson Roundabout will continue to worsen, extending beyond Hirst Road along both EWA and Shamrock Road. The signalized roundabout and traffic metering alternatives are anticipated to significantly reduce these queues as shown in the following graphics. By controlling the opposing conflicting movements at the Tomlinson Roundabout, these alternatives will provide longer gaps for westbound commuters to traverse the roundabout and continue toward their destination.

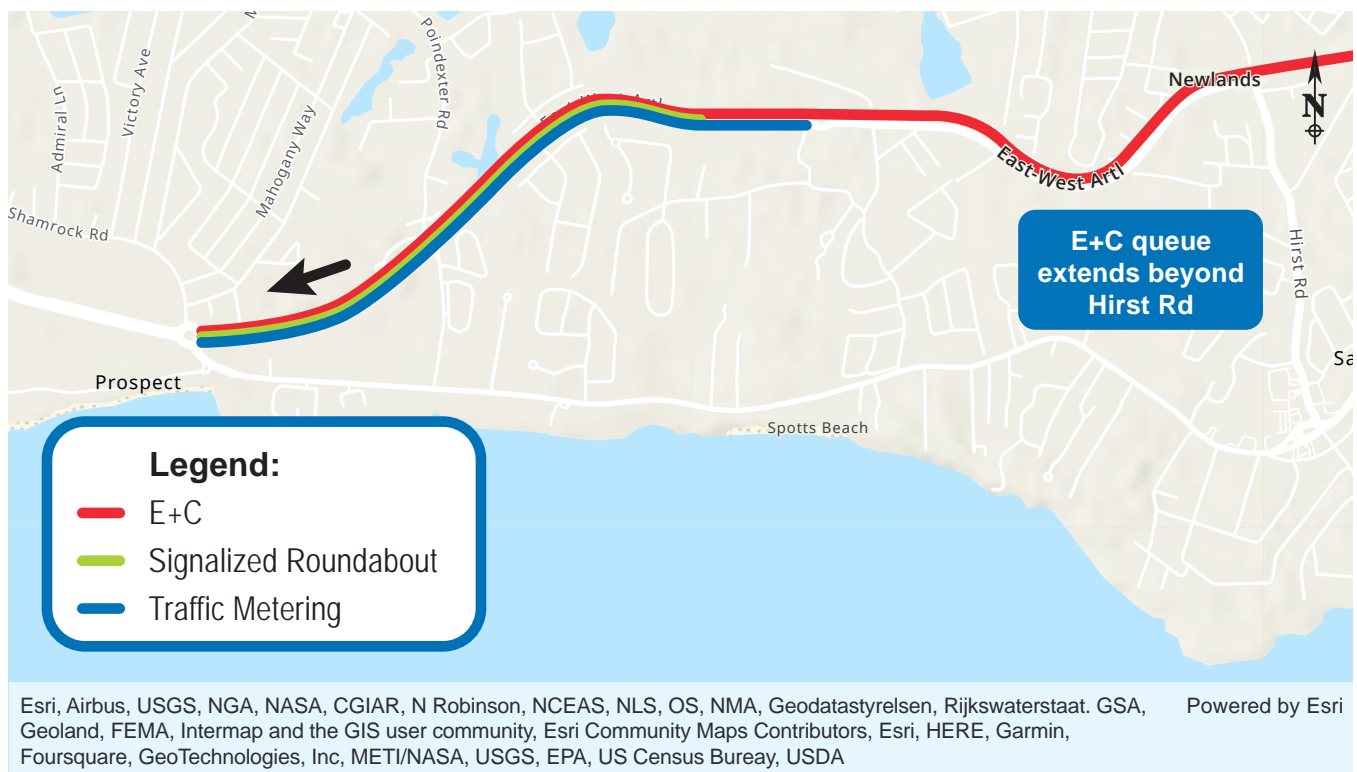


Existing AM queue at Tomlinson Roundabout *(Image taken February 2023)*

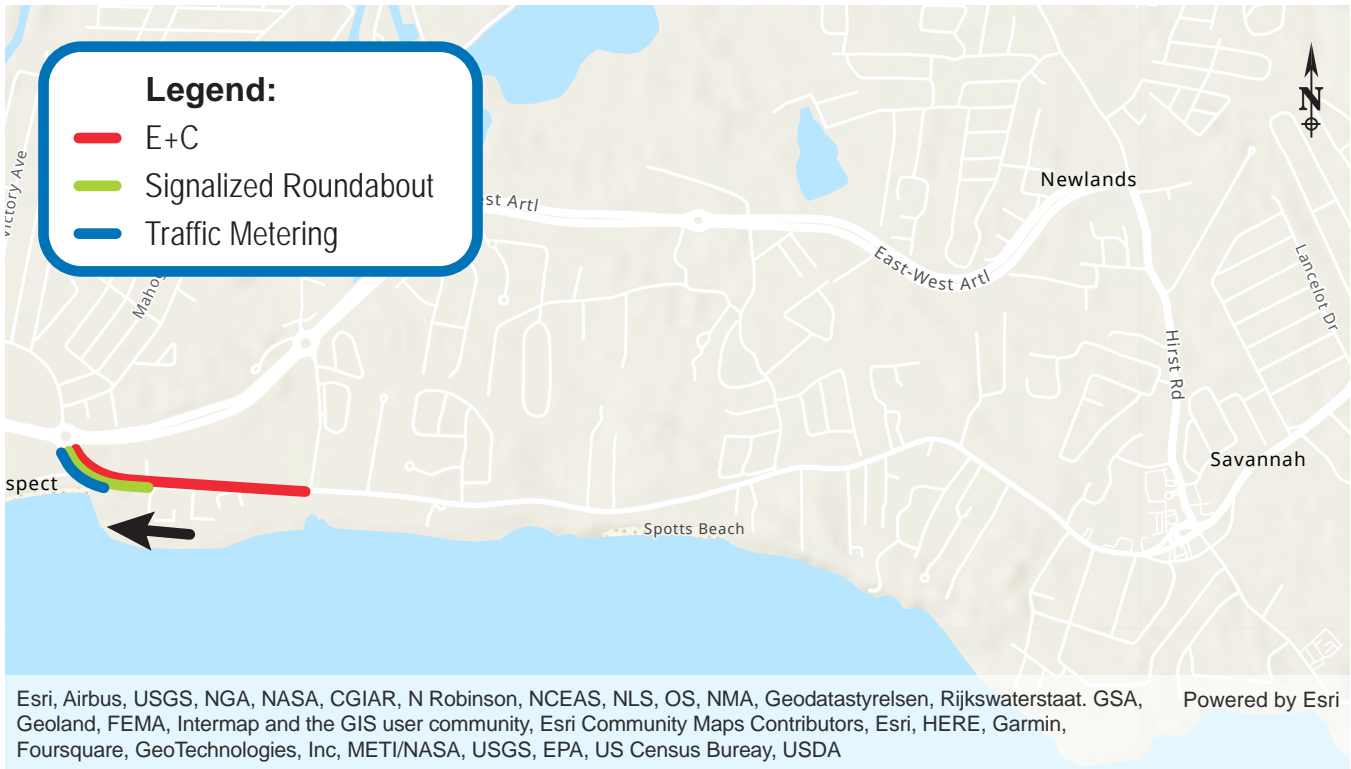
2026 AM MAXIMUM QUEUE - EAST-WEST ARTERIAL QUEUE AT TOMLINSON ROUNDABOUT



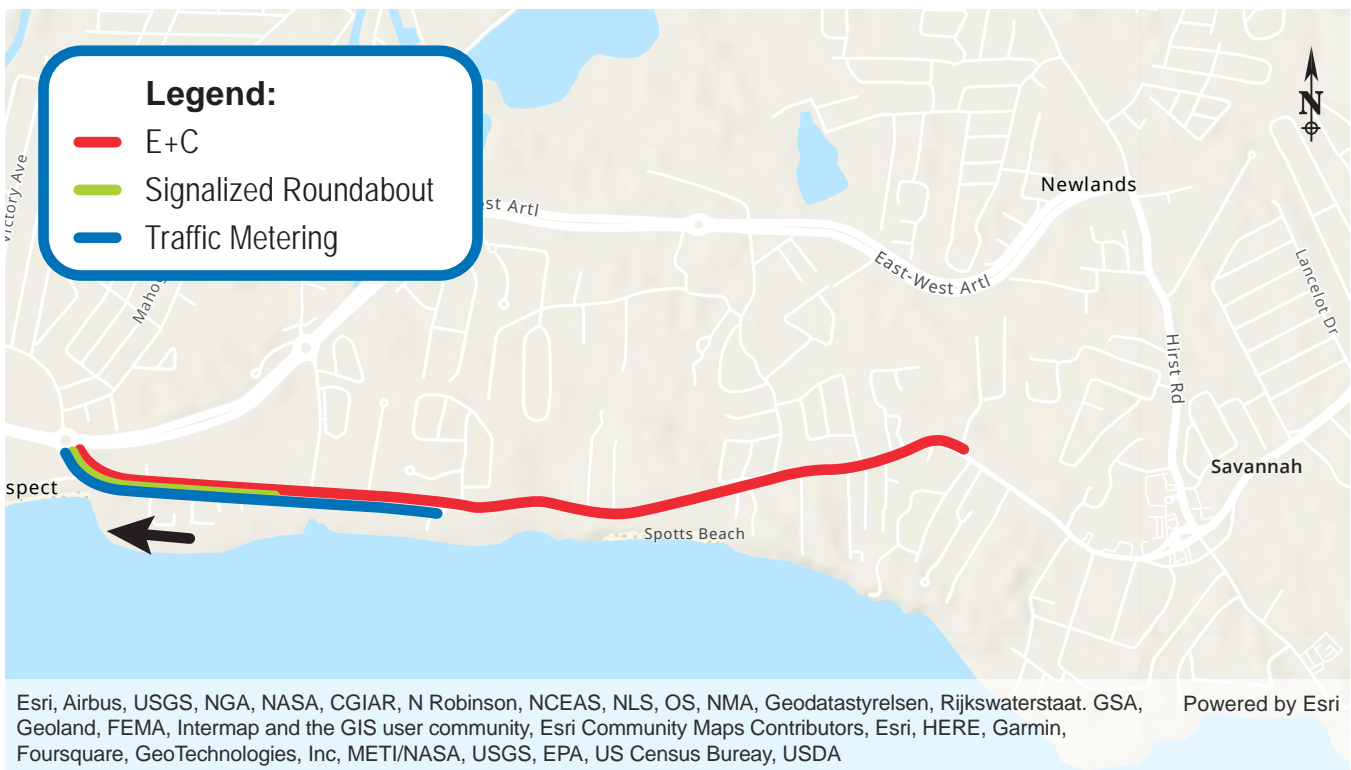
2036 AM MAXIMUM QUEUE - EAST-WEST ARTERIAL QUEUE AT TOMLINSON ROUNDABOUT



2026 AM MAXIMUM QUEUE - SHAMROCK ROAD QUEUE AT TOMLINSON ROUNDABOUT



2036 AM MAXIMUM QUEUE - SHAMROCK ROAD QUEUE AT TOMLINSON ROUNDABOUT



PM QUEUE LENGTHS

Under 2026 E+C conditions, PM peak queues at the CUC and Grand Harbour Roundabouts will be relatively short as commuters will favour widened LPH over alternate eastbound paths along Crewe Road and South Sound Road. The signalized roundabout alternative is anticipated to increase these eastbound queues but will operate acceptably while providing safe pedestrian crosswalks and walk signals. The traffic metering alternative is anticipated to reduce queue lengths without providing opportunity for pedestrian crosswalks. The traditional signal alternative at Grand Harbour (without widening Crewe Road/Shamrock Rd) is anticipated to increase queue lengths and spill back through adjacent upstream CUC Roundabout.

Under 2036 E+C conditions, PM peak queues will (minus any other congestion relief strategies) deteriorate at the CUC and Grand Harbour Roundabouts, with eastbound queues spilling back between Grand Harbour into adjacent CUC Roundabout. The signalized roundabout and traffic metering alternatives are anticipated to improve these queues, managing to prevent spillback between the two roundabouts. The traditional signal alternative at Grand Harbour (without widening Crewe Road/Shamrock Rd) is anticipated to increase queue lengths and spill back through adjacent upstream CUC Roundabout.

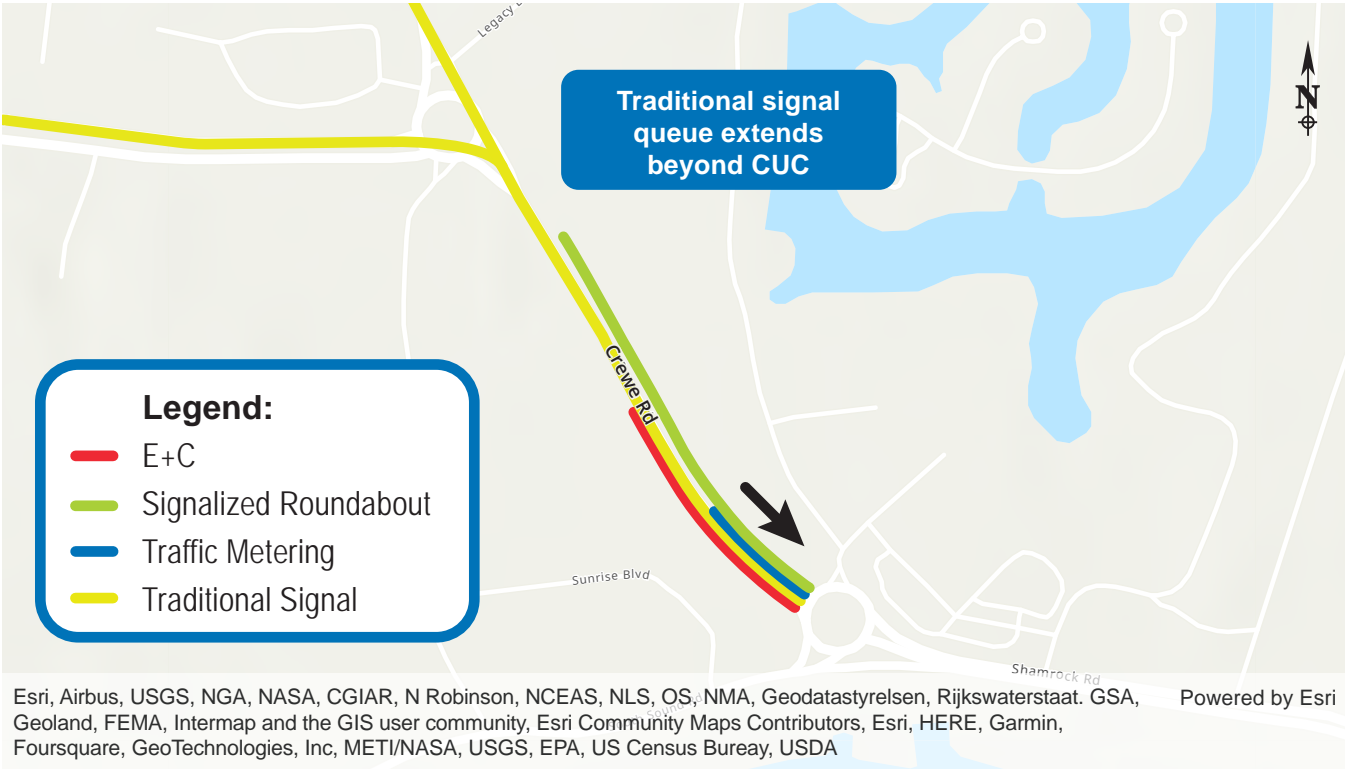
At the Red Bay Roundabout, southbound Shamrock Road queues are anticipated to nearly spill back to the Tomlinson Roundabout under 2026 and 2036 E+C conditions due to heavy eastbound traffic that would make it difficult for the southbound movement to find adequate gaps to safely enter the roundabout.

The traffic metering option is shown to drastically improve this queue using queue detection to activate meters along the mainline approach.

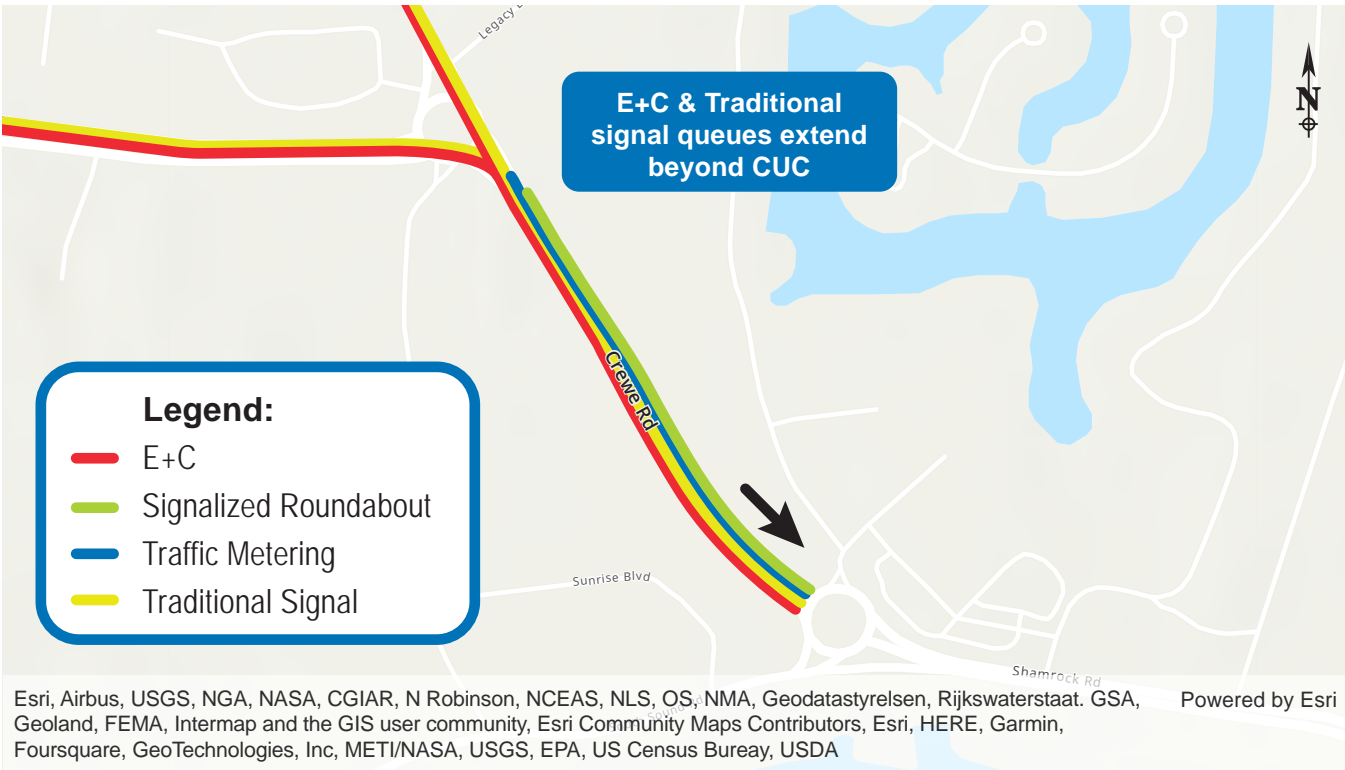


Crewe Road queue between CUC and Grand Harbour Roundabout during PM peak
(Image taken October 2019)

2026 PM MAXIMUM QUEUE - CREWE ROAD QUEUE AT GRAND HARBOUR ROUNDABOUT



2036 PM MAXIMUM QUEUE - CREWE ROAD QUEUE AT GRAND HARBOUR ROUNDABOUT



2026 PM MAXIMUM QUEUE - SHAMROCK ROAD QUEUE AT RED BAY ROUNDABOUT



2036 PM MAXIMUM QUEUE - SHAMROCK ROAD QUEUE AT RED BAY ROUNDABOUT



BROADER PLANNING CONSIDERATIONS

POLICY RECOMMENDATIONS

Local regulations and policy decisions play a large role in shaping the future travel patterns of Grand Cayman. Transportation planning components such as land use development, mode share, and multimodal facilities influence where traffic is generated. The following policy recommendations can be paired with roadway improvements to help alleviate heavy congestion observed today.

- **Locate more employment to Bodden Town and East End** – Local land use policies supporting development and job opportunities on the east side of Grand Cayman will reduce the number of commuters to the downtown area. Additionally, integrating mixed-use spaces that contain residential and commercial land use with convenient transit service and pedestrian facilities would enhance opportunities for people to reduce their dependency on vehicle travel.
- **Disincentivize car ownership** – Growth in vehicle travel has historically outpaced construction of additional roadway capacity on Grand Cayman due to space constraints. Local policies may be used to disincentivize car ownership, either by imposing import regulations or by providing more attractive modes of transportation such as an improved transit system.
- **Increase telecommuting** – Another strategy to reduce commuters on the road is to encourage telecommuting, allowing workers to work from home on selected days.
- **Improve sidewalks and bike lanes** – Safe and accessible pedestrian/bike facilities provide connectivity between residential and commercial areas. Local regulations could require new developments and roadway projects to guarantee safe, accessible pedestrian/bike connections including sidewalks and crosswalks. A prioritization plan can be developed to upgrade and connect sidewalks and add bike lanes at key locations.
- **Improve public transportation** – Investments and improvements in public transportation will provide an attractive alternative to vehicle travel. By ensuring public transport routes are both convenient and reliable, public transport may be able to divert many vehicle trips from the roadway network.

FUTURE STUDIES

Although improving the CUC to Tomlinson Roundabout corridor is integral to reduce congestion on Grand Cayman, the NRA has identified additional studies that will play a key role to continue improving traffic conditions across the island.

- **Linford Pierson Highway corridor** – Further evaluation of this study corridor including LPH once it is widened to six lanes
- **Downtown revitalization** – An in-depth traffic operational analysis of the downtown area's roadway network, land use development, and multimodal needs.

- **South Sound By-Pass** – With construction anticipated to be completed in 2036, a further analysis is needed to maximize the benefits of this new corridor
- **Land use shifts to eastern districts** – A modelling study to evaluate how travel patterns may shift if jobs and land use development are shifted to eastern districts like Bodden Town and East End.
- **Public transport share** – The study conducted for this report assumed the current vehicle share. With transit improvements and increased transit share, benefits may increase throughout Grand Cayman.
- **Creation of more housing in George Town and the Central Business District**

ADDITIONAL OPERATIONAL CONSIDERATIONS

The following locations were identified as anticipated additional congestion points under future 2026 and 2036 E+C conditions.

- **North-south corridor between Smith Road and North Sound Road** – After widening LPH and BTW to three lanes in each direction, this corridor becomes a major AM congestion point due to the lane drop back to two lanes in each direction along Huldah Avenue, Thomas Russel Avenue, and North Sound Road. Additional northbound capacity is needed to connect the three-lane sections located south of the Smith Road signal and north of Butterfield Roundabout. However, the NRA has acknowledged the unlikelihood of widening the entire roadway segment due to existing buildings and property boundaries. As an alternate solution, systemwide traffic metering may be installed to meter mainline inbound congestion at multiple intersections along the main corridors of LPH, Crewe Road, and Shamrock Road during peak travel times. This approach would control the frequency at which vehicles enter mainline traffic flow, breaking up platoons of vehicles and maintaining desired roadway capacity using ITS.
- **Shedden Road at Thomas Russel Avenue / North Sound Road signal** – This signalized intersection becomes a congestion point during both AM / PM peak conditions as operations degrade under competing heavy turning movements. To improve operations, additional left and right turn lanes are recommended, particularly for the northbound, southbound, and eastbound approaches.
- **Butterfield Roundabout** – Additional capacity is needed at this roundabout, particularly at the northbound and southbound approaches for both AM / PM peaks. Providing three northbound/southbound through lanes would help ease congestion.
- **Smith Road at Claude Hill Road / Anthony Drive** – This mini roundabout intersection is anticipated to cause congestion under future conditions. To improve operations, conversion to a signalized intersection is recommended.
- **Central G.T. Road Improvements** – As downtown congestion worsens under future conditions, additional right-turn lanes should be considered to reduce queues for through traffic. Additional right-turn pockets may be needed along Shedden Road, Mary Street, Walkers Road, Boilers Road, and Goring Avenue. Future modeling is also proposed by the NRA in testing various traffic circulation patterns including switching traffic flow direction, and/or converting some one-way and two-way streets.

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**CUC ROUNDABOUT
TO TOMLINSON
ROUNDABOUT CORRIDOR**
MULTIMODAL IMPROVEMENT PLAN

Grand Cayman Travel Demand Model & Traffic Operational Analysis Model

QUICK WIN SCENARIO ANALYSIS

MEMORANDUM

March 2024

Prepared for: National Roads Authority

Prepared by: Whitman, Requardt & Associates, LLP (WRA)



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INTRODUCTION AND BACKGROUND

The National Roads Authority (NRA) conducted this study to evaluate the benefits of potential transportation investments along the heavily travelled CUC to Tomlinson Roundabout corridor, which consists of four major roundabout intersections. This task evaluated the benefit of several committed and proposed projects, including the proposed Service Road running parallel to Shamrock Road from Red Bay to CUC Roundabout. The analysis focused on improvements needed to alleviate congestion at critical locations, particularly at the CUC and Grand Harbour Roundabouts.

This analysis was conducted with the NRA's travel demand and operational modelling tools using PTV VISUM, VISSIM, and VISTRO version 2022 software.

FUTURE SCENARIO DEVELOPMENT

The Grand Cayman models evaluated anticipated traffic conditions under two future analysis years 2026 and 2036. District-level annual growth rates were developed using 2021 census data to calculate anticipated population growth for each analysis year, as summarized in [Table 1](#).

Table 1: Summary of District Population Growth

District Population	Growth Rate	2021	2026	2036
District 1 - George Town	2.21 %	34,914	38,777	46,494
District 2 - West Bay	3.33 %	15,337	17,888	22,995
District 3 - Bodden Town	3.71 %	14,846	17,598	23,106
District 4 - North Side	2.60 %	1,902	2,302	3,098
District 5 - East End	2.84 %	1,846	2,108	4,008
Total Grand Cayman	-	68,845	78,673	99,701

To develop the zonal input for each analysis year, the NRA provided information regarding anticipated key major land developments expected to open by 2026 and 2036. A summary of the development information and additional growth when converted to the model inputs is provided in [Table 2](#). The 2026 analysis year added 4,263 households, which equates to 9,828 additional persons. The 2036 analysis year added another 9,041 households, equating to an additional 21,028 in population. District level average household size values were used to convert the housing units to population.

Table 2: Summary of Major Land Development Projects

YEAR	2021-2026	2026-2036
POPULATION	9,828	21,028
HOUSEHOLDS	4,263	9,041
HOTEL ROOMS	839	1,740
BUILDING SF - GOVERNMENT	-	-
BUILDING SF - TOURISM/LEISURE	-	-
BUILDING SF - HOTEL	990,859	2,054,940
BUILDING SF - INDUSTRIAL	-	-
BUILDING SF - MIXED USE	161,219	1,200,000
BUILDING SF - RESTAURANT	35,681	149,806
BUILDING SF - RETAIL/PROFESSIONAL	899,203	2,167,296
BUILDING SF - UTILITIES	-	-

When including the 2021 zonal data as the basis, the resulting 2026 and 2036 input data for the model is presented in [Table 3](#).

Table 3: Grand Cayman Model Inputs

YEAR	2021	2026	2036
POPULATION	68,845	78,673	99,701
HOUSEHOLDS	30,222	34,485	43,526
HOTEL ROOMS	3,453	4,292	6,032
BUILDING SF - GOVERNMENT	1,922,667	1,922,667	1,922,667
BUILDING SF - TOURISM LEISURE	496,684	496,684	496,684
BUILDING SF - HOTEL	4,078,954	5,069,813	7,124,753
BUILDING SF - INDUSTRIAL	1,065,295	1,065,295	1,065,295
BUILDING SF - MIXED USE	301,332	462,551	1,662,551
BUILDING SF - RESTAURANT	485,441	521,122	670,928
BUILDING SF - RETAIL/PROFESSIONAL	10,151,932	11,051,135	13,218,431
BUILDING SF - UTILITIES	648,362	648,362	648,362

The projected household growth across Grand Cayman by 2026 and 2036 are shown in [Figure 1](#) and [Figure 2](#), respectively. The majority of anticipated growth is projected to occur east of the Tomlinson Roundabout.

Figure 1: Additional Households from 2021-2026

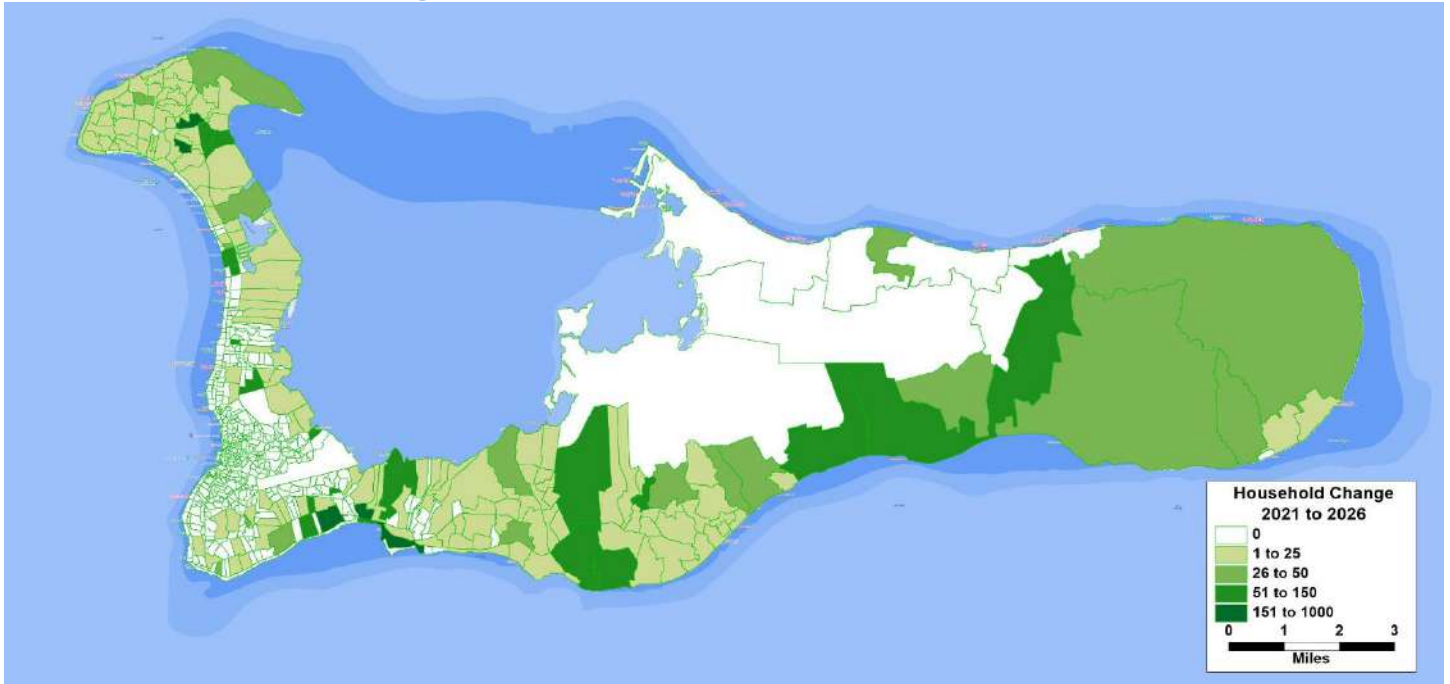
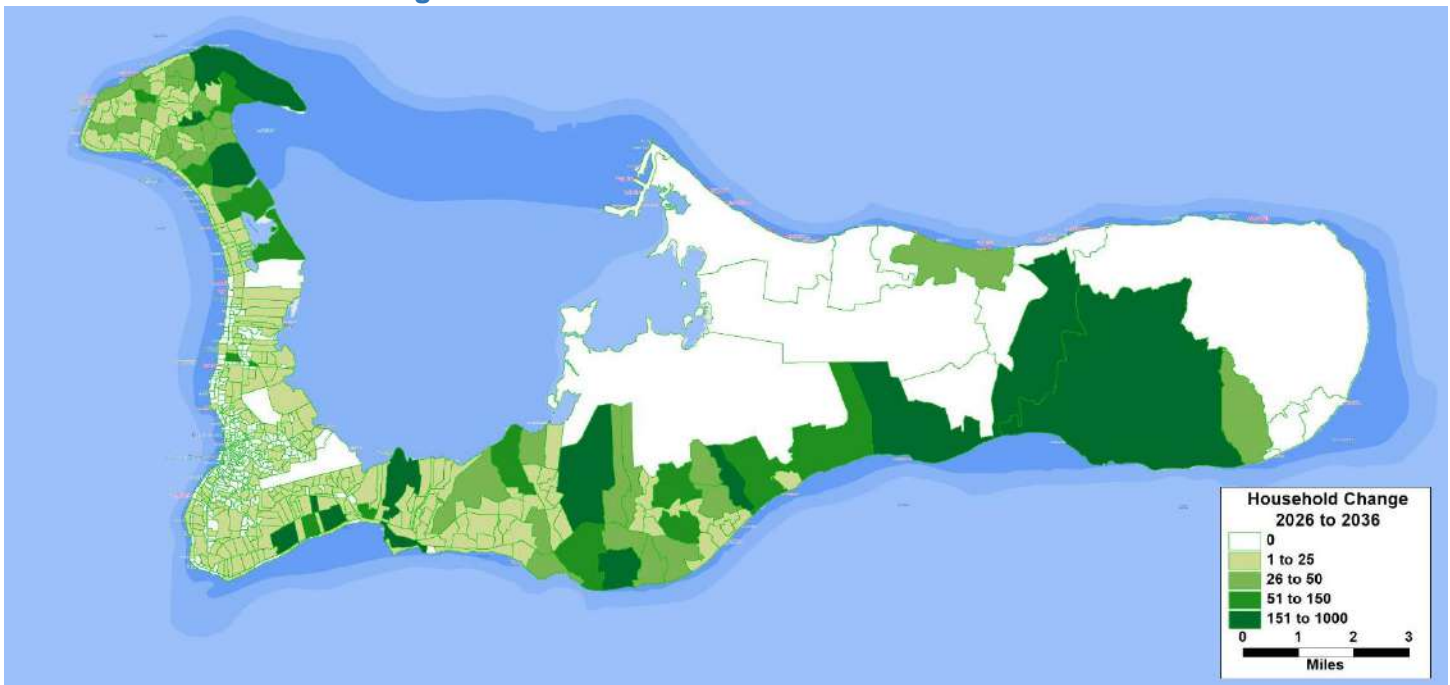


Figure 2: Additional Households from 2026-2036



To develop the model network for each future analysis year, the NRA provided information regarding future committed roadway projects, which were used as the basis for the Existing Conditions and Committed Project (E+C) scenarios in each future year and were built upon the current 2022 roadway network.

The 2026 E+C scenario includes the following, as shown in [Figure 3](#).

- **East-West Arterial (EWA) Extension** to Woodland Drive, including **Agricola Drive Connector** to Agricola Drive – one lane in each direction
- **EWA Widening** between Tomlinson Roundabout and Hirst Road – two lanes in each direction
- **EWA Widening** between CUC Roundabout and Tomlinson Roundabout – three lanes in each direction
- **Service Road** from CUC Roundabout to Red Bay via Grand Harbour development
- **Bobby Thompson Way (BTW) & Linford Pierson Highway (LPH) Widening** – three lanes in each direction
- **Linford Pierson Highway (LPH) Extension** to Outpost Road – one lane in each direction
- **Agnes Way Extension** from Linford Pierson Highway to Cayman Enterprise and Fairbanks Road – one lane in each direction
- **Fairbank Road Widening** between LPH and Agnes Way Ext. – two lanes in each direction
- **Airport Collector Road (ACR)** to Industrial Park – one lane in each direction
- **Eastern Avenue Extension** from Elgin Avenue to Smith Road – one lane in each direction
- **Godfrey Nixon Way (GNW) Extension** to North Church Street – one lane in each direction
- **Olympic Way Connector** to Academy Way for school/stadium complex – one lane in each direction
- **Printer Way** widened to two-direction road from Elgin Avenue to Shedden Road – one lane in each direction
- **Esterly Tibbetts Highway (ETH) Widening** between North Sound Road and Airport Collector Road – three lanes in each direction
- **ETH Connector** to Reverend Blackman Road – one lane in each direction
- **Canal Point Drive Connector** to West Bay Road – one lane in each direction
- **Austin Connolly Connector** to Sunnyfield Drive – one lane in each direction

The 2036 E+C scenario includes all 2026 committed projects as well as the following additional projects, as shown in [Figure 4](#).

- **ACR** – Full build out between Esterly Tibbetts Highway and Airport – two lanes in each direction
- **Roberts Drive Extension** between North Sound Road and Dorcy Drive – one lane in each direction
- **Eastern Avenue Extension** from Shedden Road to Elgin Avenue and from Smith Road to Outpost Street – one lane in each direction
- **South Sound By-Pass Corridor** – one lane in each direction
- **LPH Extension** to Walkers Rd – two lanes in each direction between Bobby Thompson Way and Outpost Street; one lane in each direction between Outpost Street and Walkers Road
- **Fairbanks Road Widening** between Cayman Enterprise and LPH – two lanes in each direction
- **Hell Road Extension** to Northwest Point Road – one lane in each direction

Figure 3 and Figure 4 display the locations of all future year 2026 and 2036 committed and proposed projects assumed for this modelling effort.

Figure 3: 2026 Committed Projects

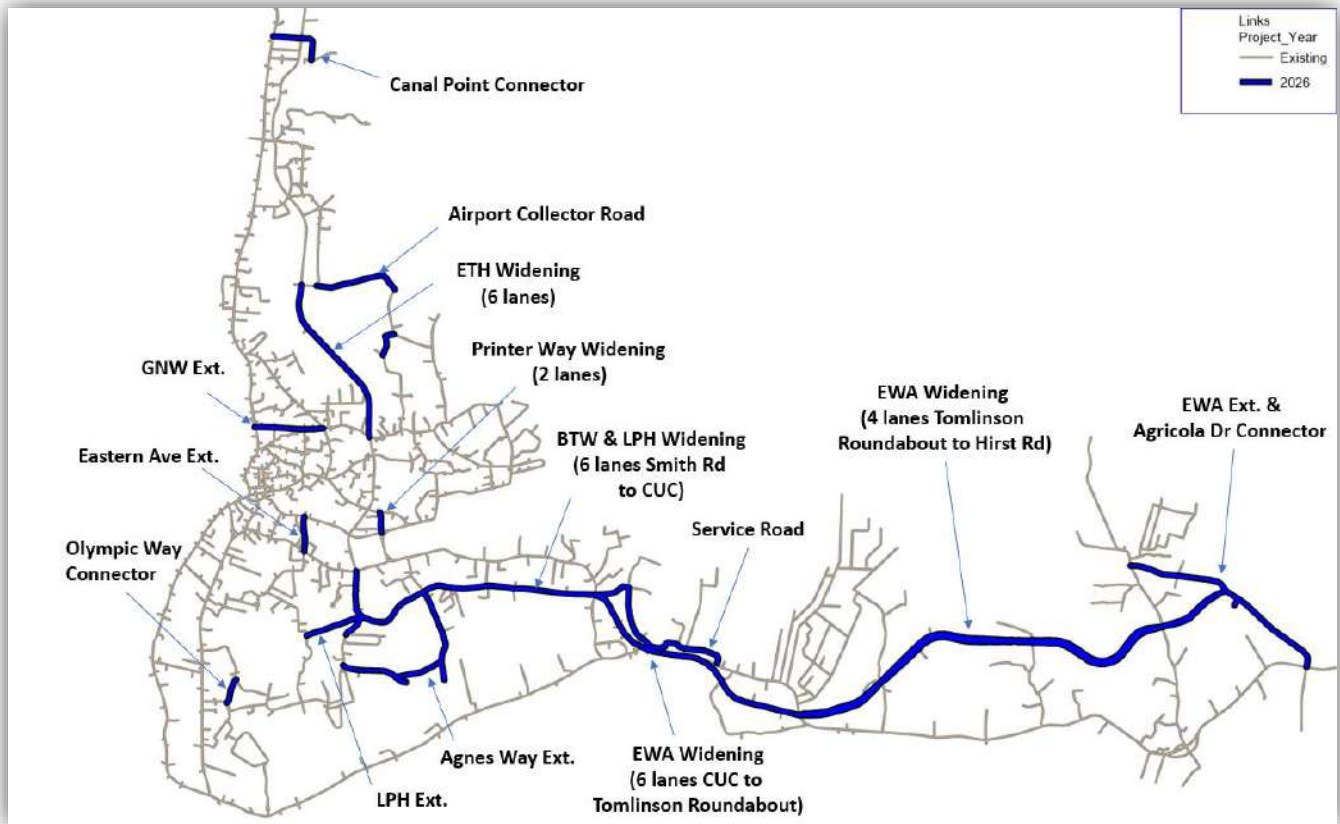
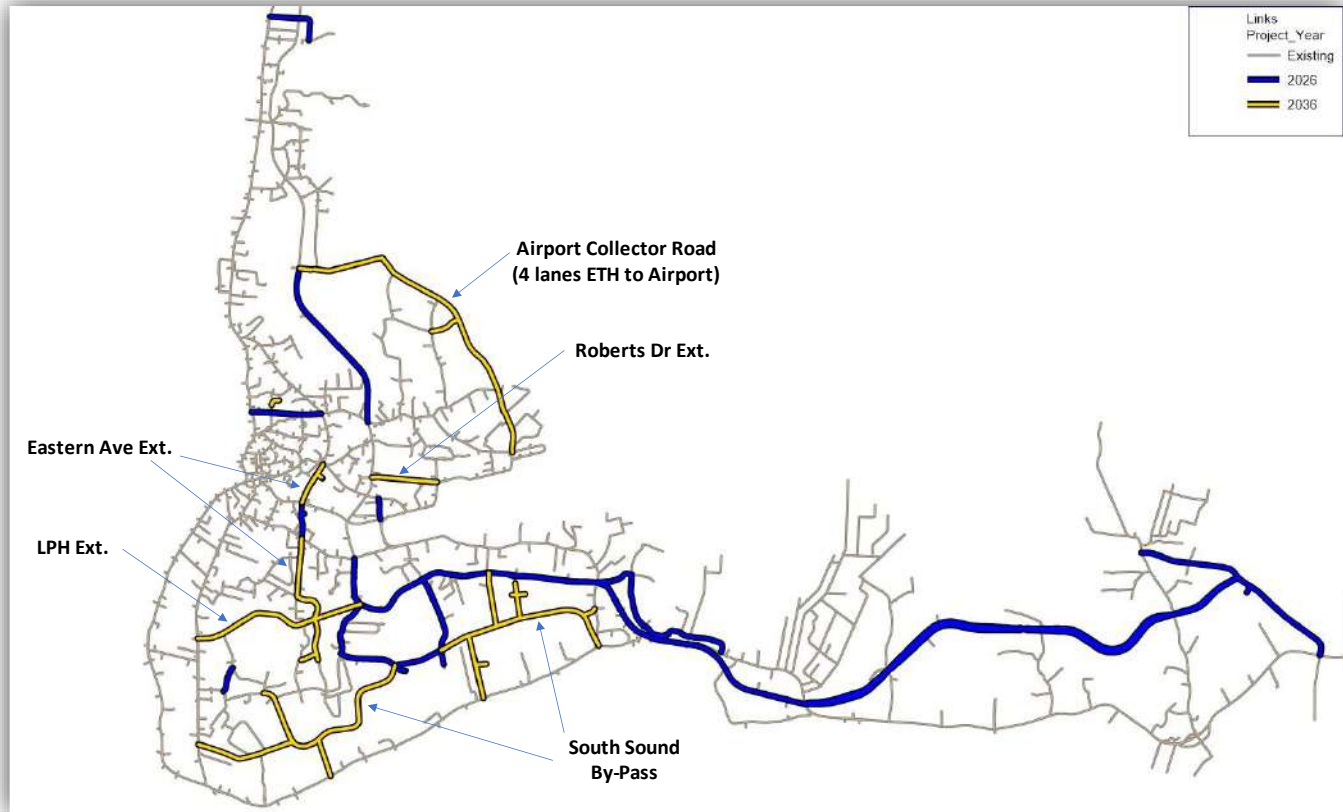


Figure 4: 2036 Committed Projects



For each analysis year, build scenarios were developed at the four major roundabouts along the study corridor: the CUC, Grand Harbour, Red Bay, and Tomlinson Roundabouts.

Much of the anticipated growth is projected to occur east of the Tomlinson Roundabout, which will result in more people traveling through the study area to access employment and activity centres in the west. These travel patterns will result in higher future traffic volumes along the Shamrock Road and Crewe Road corridors, which in turn will affect traffic operations and congestion through the area, as well as related improvement needs and options.

To demonstrate the traffic growth anticipated for the study area corridor, future year traffic volumes along Shamrock Road, Crewe Road, and the parallel Service Road are provided for daily and peak hour conditions in [Figure 5](#) and [Table 4](#). Detailed volume diagrams are provided in [Attachment 1](#). As an example of the traffic increases affecting the study area roadways, total east/west traffic estimates were compiled along Shamrock Road (plus the future parallel Service Road) just east of the Grand Harbour Roundabout. With projected population growth through 2026, daily east/west traffic crossing through this area will increase by 19%, adding more than 9,500 vehicles per day (900-1,000 vehicles per peak hour) to the corridor. It is worth noting that under 2026 AM peak hour conditions, mainline segments between the Red Bay and CUC Roundabouts are anticipated to decrease in volume compared to 2021 AM conditions because a portion of the mainline volume along Crewe Road/Shamrock Road is anticipated to shift to the

newly constructed Service Road. With continued growth, the overall 2021-2036 traffic increase through this area will reach 57%, adding more than 28,000 vehicles per day (2,600-2,800 vehicles per peak hour) to the corridor.

Figure 5: Future Year Shamrock Road/Crewe Road & Service Road Volumes, E+C Scenario

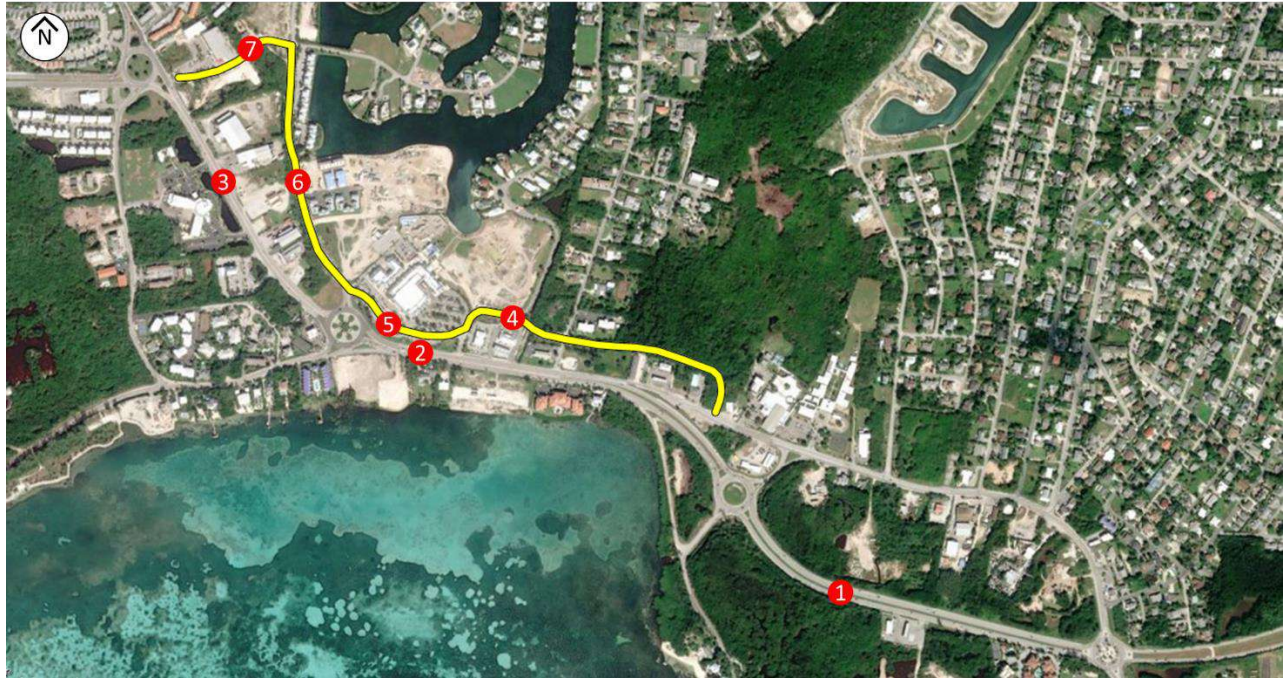


Table 4: Future Year Shamrock Road/Crewe Road & Service Road Volumes, E+C Scenario

Map ID #	Roadway	Direction	AM Peak Hour (vph)			PM Peak Hour (vph)			Daily (bi-directional vpd)		
			2021	2026	2036	2021	2026	2036	2021	2026	2036
1	Shamrock Road	Westbound	2,330	2,980	3,700	890	1,185	1,795	38,395	44,755	58,705
		Eastbound	530	715	1,205	2,285	2,645	3,490			
2	Shamrock Road	Westbound	3,725	3,700	4,735	1,240	1,490	2,200	49,015	55,200	71,145
		Eastbound	840	1,195	1,685	3,260	3,590	4,555			
3	Crewe Road	Northbound	2,910	2,810	3,025	1,290	1,410	1,720	44,005	50,185	56,500
		Southbound	820	1,080	1,270	2,720	3,435	4,065			
4	Service Road	Westbound	-	570	755	-	150	150	-	3,360	6,015
		Eastbound	-	5	20	-	300	420			
5	Service Road	Westbound	-	530	720	-	170	170	-	2,925	5,065
		Eastbound	-	5	15	-	295	405			
6	Service Road	Northbound	-	700	905	-	295	305	-	5,585	7,235
		Southbound	-	15	40	-	210	360			
7	Service Road	Westbound	-	755	965	-	305	310	-	5,975	7,690
		Eastbound	-	5	30	-	230	380			

FUTURE SCENARIO OPERATIONAL ANALYSIS & EVALUATION

This analysis assesses Grand Cayman's proposed and committed projects as well as the need for additional infrastructure improvements along the CUC to Grand Harbour corridor. This study refines proposed projects and identifies functional solutions such as intersection improvements or access restrictions along the Service Road to minimize traffic delays on the existing roadway network.

Modelling Approach

The AM and PM peak traffic operational analysis base models were calibrated to 2018 conditions primarily based on field-observed queues supplemented with other travel time and traffic volume data sources as secondary references. After evaluating critical congestion and associated queues against field-collected data while also considering day-to-day travel variability, the AM and PM models were considered reasonably calibrated. The 2018 AM and PM base model networks were used as a starting point to create the 2026 and 2036 models through PTV's ANM Adaptive process.

The Quick Win analysis developed the E+C models as a starting point to incorporate committed projects required under future conditions. Due to the nature of shifting congestion under future conditions, this analysis became an iterative process to refine proposed projects and identify solutions to the anticipated congestion. After modelling an initial set of committed projects under 2026 and 2036 conditions, projected congestion locations were presented to the NRA to address additional roadway project needs. To release anticipated congestion outside the study area and produce meaningful results along the study corridor, additional roadway network refinements included signal timing optimization, modified roundabout lane configurations, and additional lane capacity.

After developing the E+C scenario, operational and safety needs were identified along the study corridor from CUC to Tomlinson Roundabout at the following four main roundabout intersections: CUC Roundabout, Grand Harbour Roundabout, Red Bay Roundabout, and Tomlinson Roundabout. A multimodal approach was taken to identify improvement scenarios that could accommodate the needs of all modes of travel.

2026 AND 2036 E+C SCENARIO

The 2026 E+C Scenario includes all 2026 committed and proposed projects, and the 2036 E+C Scenario includes all 2026 and 2036 committed and proposed projects, as discussed in the *Future Scenario Development* section. The following section discusses traffic conditions anticipated to occur in 2026 and 2036 due to the increase in development and traffic growth between base year 2018 and future years. These locations were discussed with the NRA to confirm operations against both existing congestion and expected trends. Detailed travel time and queue summary tables are provided in [Attachment 2](#).

AM Model Refinements

Once committed projects such as the six-lane widening from Tomlinson Roundabout to Bobby Thompson Way (BTW) are constructed, congestion is expected to ease during the AM along this corridor, causing new congestion to form farther downstream along Linford Pierson Highway (LPH) and BTW. The most significant new congestion is expected to occur during the AM at the Smith Road / BTW signalized intersection, where three northbound lanes south of Smith Road will drop to two northbound lanes between Smith Road and Godfrey Nixon Way. The traffic models demonstrated that long queues are expected to spill back from the Smith Road / BTW signal through the CUC Roundabout via BTW and LPH due to anticipated traffic along this corridor of up to 3,600 inbound vehicles during 2026 and 4,000 vehicles during 2036.

To relieve the AM congestion at the Smith Road and BTW signalized intersection, a combination of the following options was incorporated into the AM E+C scenario models.

- **Additional northbound capacity** will be needed to connect the three-lane sections located south of the Smith Road signal and north of the Butterfield Roundabout at Godfrey Nixon Way. Widening Thomas Russel Avenue and North Sound Road to three northbound lanes would provide the capacity needed to reduce congestion stemming from the three-to-two lane drop at the Smith Road / BTW signalized intersection. However, the NRA has acknowledged the challenges of widening this roadway segment due to existing buildings and property boundaries located in close proximity to the road edge.
- **Systemwide traffic metering** was identified as an alternate solution due to the unlikelihood of widening Thomas Russel Avenue and North Sound Road. This option consists of metering mainline inbound congestion at multiple roundabouts located along the main corridors of LPH, Crewe Road, and Shamrock Road during AM peak travel times. The metering approach controls the frequency at which vehicles enter mainline traffic flow, breaking up platoons of vehicles, and maintaining a desired roadway capacity using intelligent transportation systems (ITS). It is more effective to meter several locations to create smaller pockets of controlled congestion along the corridor rather than at a single crippling location where it becomes very difficult for queues to recover during the peak period. Roundabout metering during peak periods is also anticipated to improve safety at these intersections by providing adequate gaps to vehicles entering the roundabouts from both major and minor movements. The traffic meters incorporated into the models used timings that respond to detection placed downstream, at the signal head itself, and upstream for queues. These timings were

optimized for the traffic models, but ITS solutions implemented in the field will allow timings to react to traffic conditions more fluidly with increased sensitivity.

AM Analysis Results

Under 2026 AM E+C conditions without additional traffic management improvements, congestion at the Grand Harbour and Tomlinson Roundabouts are anticipated to worsen along the corridor due to increased development and traffic growth. The following discussion of the corridor's roundabout intersections highlights anticipated AM traffic conditions from east to west:

- **Tomlinson Roundabout** – During the AM peak, this roundabout will experience greater throughput due to population growth expected in the east. After widening EWA to four lanes from Tomlinson Roundabout to Hirst Road, traffic volume along EWA is anticipated to reach nearly 2,000 vehicles during the AM peak hour, shifting a portion of traffic off of Shamrock Road. **Westbound EWA** is anticipated to spill back beyond Poindexter Road because of this traffic growth. **Northbound Shamrock Road** is also expected to spill back beyond Poindexter Road, initially benefiting from construction of the EWA Extension and Agricola Drive Connector, but ultimately experiencing added delay when yielding to circulating traffic and having trouble finding gaps to safely enter the roundabout.
- **Red Bay Roundabout** – Without traffic management and improvements, the congestion at this roundabout will worsen. **Northbound Prospect Point Road** may also experience increased delay due to difficulty finding gaps to safely enter the roundabout.
- **Grand Harbour Roundabout** – During the AM peak, vehicle throughput at this roundabout increases with over 3,700 anticipated westbound vehicles. **Northbound South Sound Road** is anticipated to queue back nearly 4,000 feet to Bel Air Drive due to difficulty finding gaps to safely enter the roundabout.
- **CUC Roundabout** – After widening the westbound Crewe Road approach to three travel lanes, westbound drivers will likely face relatively low levels of delay at this roundabout, especially with traffic metered by upstream congestion. Drivers using **northbound Old Crewe Road** will have difficulty finding gaps to safely enter the roundabout, creating long queues spilling back to South Sound Road. The Service Road produced low levels of delay, likely due to low vehicle throughput arriving from upstream congestion.

Anticipated AM travel times along the study corridor are provided in [Table 5](#) based on 2026 E+C traffic conditions.

Table 5: 2026 AM E+C Travel Time Summary

TRAVEL PATH	AM TRAVEL TIME
HIRST ROAD TO CUC ROUNDABOUT VIA EWA	11 minutes
HIRST ROAD TO CUC ROUNDABOUT VIA SHAMROCK RD	17 minutes
RED BAY PRIMARY SCHOOL TO CUC ROUNDABOUT VIA SERVICE ROAD	12 minutes

Under 2036 AM E+C conditions without additional traffic management improvements, traffic conditions are anticipated to deteriorate further, worsening 2026 congestion.

- **Tomlinson Roundabout** – This roundabout will worsen without additional traffic management strategies in 2036, with EWA volume anticipated to reach 2,400 vehicles and Shamrock Road volume to reach 1,200 vehicles. **Westbound EWA** is anticipated to spill back beyond Hirst Road as a result of this traffic growth, and **westbound Shamrock Road** is expected to spill back 9,000 feet to Tuckerman Lane.
- **Red Bay Roundabout** – This roundabout is anticipated to fail due to queue spill back from the Grand Harbour Roundabout. Both **westbound EWA** and **northbound Prospect Point Road** are anticipated to spill back to the Tomlinson Roundabout and Shamrock Road.
- **Grand Harbour Roundabout** – This roundabout will worsen without additional traffic management strategies in 2036, with over 4,700 anticipated westbound vehicles. **Westbound Shamrock Road** is expected to spill back through the Red Bay Roundabout. **Northbound South Sound Road** is anticipated to spill back to Bel Air Drive due to difficulty finding gaps to safely enter the roundabout.
- **CUC Roundabout** – This roundabout is anticipated to face relatively low levels of delay due to traffic metered by upstream congestion. The Service Road approach is anticipated to fail with queues spilling back 2,500 feet.

Anticipated AM travel times along the study corridor are provided in [Table 6](#) based on 2036 E+C traffic conditions.

Table 6: 2036 AM E+C Travel Time Summary

TRAVEL PATH	AM TRAVEL TIME
HIRST ROAD TO CUC ROUNDABOUT VIA EWA	35 minutes
HIRST ROAD TO CUC ROUNDABOUT VIA SHAMROCK RD	32 minutes
RED BAY PRIMARY SCHOOL TO CUC ROUNDABOUT VIA SERVICE ROAD	12 minutes

PM Model Refinements

Following construction of the committed projects including the six-lane widening from Tomlinson Roundabout to BTW, existing PM congestion along the study corridor will likely be released. Model refinements were applied to ease outbound congestion in the downtown George Town area such as optimizing signal timings and adding turn lane pockets. The Butterfield Roundabout is likely to become a PM congestion point for northbound vehicles headed to ETH, spilling back toward Shedden Road and Elgin Ave. The northbound roundabout approach volume is anticipated to reach 2,000 vehicles in 2026 and 2,400 vehicles in 2036. To alleviate anticipated congestion, the traffic models were modified to widen ETH to six lanes between Butterfield Roundabout to the proposed Airport Collector Road, with the northbound Butterfield Roundabout approach fanning out to three lanes ahead of the roundabout. By 2036, additional northbound capacity may be needed between Smith Road and Godfrey Nixon Way to alleviate outbound congestion toward ETH.

PM Analysis Results

The following discussion of the corridor's roundabout intersections highlights anticipated traffic conditions under 2026 PM E+C conditions from west to east:

- CUC Roundabout** – The LPH widening to six lanes is expected to shift a portion of drivers off of Crewe Road (between Agnes Way and CUC) onto LPH, with **eastbound LPH** anticipated to serve 3,500 drivers. The widening will likely ease eastbound LPH congestion, with queues anticipated to extend about 1,000'. **Southbound Crewe Road** may queue back over 1,200' during the PM peak, initially benefiting from the LPH widening but ultimately experiencing delay due to difficulty finding gaps to safely enter the roundabout.
- Grand Harbour Roundabout** – After Crewe Road eastbound (between CUC and Grand Harbour Roundabouts) is widened to three lanes, this roundabout is anticipated to operate acceptably during the PM peak. **Eastbound Crewe Road** is anticipated to queue back nearly 800', and **South Sound Road** is anticipated to queue back nearly 600'.
- Red Bay Roundabout** – After widening the eastbound EWA approach to three travel lanes, **eastbound EWA** drivers will likely face relatively low levels of delay at this roundabout. **Southbound Shamrock Road** will have difficulty finding gaps to safely enter the roundabout, creating queues spilling back nearly half a mile.
- Tomlinson Roundabout** – **Eastbound EWA** is anticipated to queue back 1,000' during the PM peak due to anticipated traffic growth and the release of upstream congestion. **Westbound EWA** is anticipated to queue back 500' due to difficulty finding gaps to safely enter the roundabout despite being the off-peak direction.

Anticipated PM travel times along the study corridor and are provided in [Table 7](#) based on 2026 E+C traffic conditions.

Table 7: 2026 PM E+C Travel Time Summary

TRAVEL PATH	PM TRAVEL TIME
AGNES WAY TO TOMLINSON ROUNDABOUT VIA LPH	6 minutes
AGNES WAY TO TOMLINSON ROUNDABOUT VIA CREWE RD	10 minutes

Under 2036 PM E+C conditions, traffic conditions are anticipated to deteriorate, with congestion worsening at multiple roundabouts along the study corridor (minus any other major congestion relief strategies).

- **CUC Roundabout** – In 2036, **eastbound LPH** is anticipated to experience queues that extend to Agnes Way, with volume reaching 4,000 drivers during the PM peak hour and queues worsened from Grand Harbour queue spillback. The **Service Road** queue is expected to worsen, spilling back 1,500'. **Southbound Crewe Road** may queue back over one mile during the PM peak despite a large portion of traffic likely shifting from southbound Crewe Road to eastbound LPH; the southbound approach will initially benefit from the LPH widening but ultimately experience delay due to difficulty finding gaps to enter the roundabout.
- **Grand Harbour Roundabout** – This roundabout is anticipated to become a congestion point under PM conditions, with **eastbound Crewe Road** spilling back through the CUC Roundabout. South Sound Road is expected to queue back 2,000'.
- **Red Bay Roundabout** – After widening the eastbound EWA approach to three travel lanes, **eastbound EWA** drivers will likely continue to face relatively low levels of delay at this roundabout. **Southbound Shamrock Road** will have difficulty finding gaps to safely enter the roundabout, creating queues spilling back to Tomlinson Roundabout.
- **Tomlinson Roundabout** – For **Eastbound EWA**, anticipated traffic growth, the alleviation of upstream congestion, and increased traffic from opposing roundabout movements are expected to cause infrequent long queues of 1,000', but the average queues are projected to remain within 100' during the PM peak. **Westbound EWA** is anticipated to queue back over one mile due to difficulty finding gaps to safely enter the roundabout despite being the off-peak direction.

Anticipated PM travel times along the study corridor and are provided in [Table 8](#) based on 2036 E+C traffic conditions.

Table 8: 2036 PM E+C Travel Time Summary

TRAVEL PATH	PM TRAVEL TIME
AGNES WAY TO TOMLINSON ROUNDABOUT VIA LPH	9 minutes
AGNES WAY TO TOMLINSON ROUNDABOUT VIA CREWE RD	24 minutes

2026 AND 2036 QUICK WIN SCENARIOS

The 2026 and 2036 Quick Win Scenarios build upon the 2026 E+C conditions, incorporating all committed and proposed projects discussed in the *Future Scenario Development* and *2026 and 2036 E+C Scenario* sections for each respective year. The Quick Win scenarios include additional roadway infrastructure improvements to improve operations and safety at the corridor's four main roundabouts as well as the Service Road. The solutions evaluated for each intersection are discussed in the following section. For conceptual graphics of each alternative, refer to the *CUC to Tomlinson Roundabout Corridor Multimodal Improvement Plan*. Detailed travel time and queue summary tables are provided in [Attachment 2](#).

All scenarios were evaluated using PTV VISSIM for both AM / PM peaks except for Grand Harbour Alt 3 (Traditional Signalized Intersection), which was evaluated in VISSIM under PM conditions and screened separately under AM / PM conditions using VISTRO. Detailed VISTRO delay and queue summary tables for Grand Harbour Alt 3 are provided in [Attachment 4](#).

Signal timings were iteratively optimized for each option, with vehicle detection assumed for each. When implemented in the field, signals will use ITS to adapt timings to changing traffic conditions in real time. The traffic meters incorporated into the models used timings that respond to detection placed downstream, at the signal head itself, and upstream for queues. The meter timings modelled for the study corridor intersections are provided in [Attachment 3](#). These timings were optimized for the traffic models, but ITS solutions implemented in the field will allow meter timings to react to traffic conditions more fluidly with increased sensitivity. For further discussion of implementation considerations, refer to the *CUC to Tomlinson Roundabout Corridor Multimodal Improvement Plan*.

CUC Roundabout

CUC Alt 1: Signalized Roundabout

- This option fully signalizes the roundabout at all approaches, providing pedestrian crosswalks and walk signs. To reduce conflicting circulating movements, northbound Old Crewe Road is converted to a left-only approach. ITS solutions such as adaptive signal timings and vehicle detection will optimize overall operations. This option is anticipated to increase delay along mainline eastbound LPH and westbound Crewe Road but will allow the intersection to operate more efficiently overall by reducing minor approach queues.
- 2026 Operations: During the **AM peak**, this option is anticipated to increase delay along westbound Crewe Road but significantly reduce minor approach queues on Old Crewe Road. It is worth noting that this option generated longer westbound queues on Crewe Road and the Service Road compared to E+C conditions partially due to higher volume throughput following the release of upstream congestion. During the **PM peak**, this option will increase delay along eastbound LPH but reduce queues on southbound Crewe Road.
- 2036 Operations: During the **AM Peak**, this option is anticipated to increase delay along westbound Crewe Road but reduce minor approach queues on Old Crewe Road and the Service Road by 1,000' per approach. This option generated longer westbound queues on Crewe Road compared to E+C conditions partially due to higher volume throughput following

the release of upstream congestion. During the **PM peak**, eastbound LPH will queue back 1,000', and southbound Crewe Road queues will significantly improve compared to E+C conditions.

CUC Alt 2: Traffic Metering

- This option provides signalized traffic meters at selected approaches to provide gaps for other approaches to safely enter the roundabout. Meters will be offset from the roundabout entry yield lines by approximately 200', with no pedestrian crosswalks provided across the six-lane approaches. To reduce conflicting circulating movements, northbound Old Crewe Road is converted to a left-only approach. ITS solutions such as advanced metering detection will optimize overall operations.
- 2026 Operations: During the **AM peak**, traffic metering will be implemented on westbound Crewe Road (to provide gaps for Old Crewe Road) and southbound Crewe Road (to provide gaps for the Service Road). This option is expected to reduce Old Crewe Road and Service Road queues while maintaining efficient operations on the mainline westbound Crewe Road approach. During the **PM peak**, traffic metering will be implemented on eastbound LPH (to provide gaps for southbound Crewe Road) and westbound Crewe Road (to provide gaps for eastbound LPH). This option is anticipated to improve PM operations by reducing queues on east LPH and southbound Crewe Road.
- 2036 Operations: Traffic meters will be placed on the same approaches as 2026. During the **AM peak**, this option will improve northbound Old Crewe Road queues, while producing comparable Service Road queues against E+C conditions. During the **PM peak**, this option will improve operations by reducing queues on eastbound LPH, southbound Crewe Road, and the Service Road by over 1,000' per approach.

Grand Harbour Roundabout

Grand Harbour Alt 0: Restricted Southbound Through / Right

- This option retains the existing roundabout configuration with yield traffic control and does not provide any pedestrian improvements, but it enhances safety performance by restricting the southbound through and right movements. All southbound traffic is required to turn left only, and access to points south or west can still be achieved via U-turns through the downstream Red Bay Roundabout or by using other alternate paths such as the Parallel Service Road connection west to the CUC Roundabout.

From a safety perspective, the southbound through and right movements proposed for restriction must (under existing conditions) simultaneously anticipate gaps and driver behaviours across all three high-volume lanes approaching the roundabout, merge into the circulating traffic stream, and immediately change/cross three lanes of traffic within a distance of only 150 feet. Additionally, from a gap perspective and assuming random arrivals with no upstream traffic signal metering, it is estimated that a car will travel past the southbound approach in one or more of the roundabout circulating lanes approximately once every four seconds in the AM peak, and once every second in the PM peak, based on 2026 circulating

volumes of 875 AM and 3,150 PM vehicles per hour in the portion of the roundabout where the southbound traffic must enter. By comparison, according to the American Association of State Highway and Transportation Officials (AASHTO), a 9 second gap is recommended for turning vehicles to adequately merge into the appropriate through/right lane, not including time for additional lane changes. With only 150 feet and 1-4 second gaps, southbound traffic attempting to navigate through or right via the roundabout is essentially “blocked out”. This condition forces southbound drivers to wait long periods of time for all three lanes to be clear before entering the roundabout, which contributes to southbound queuing and delays. More significantly, it often leads to southbound drivers entering with inadequate gaps and then slowing/blocking the circulating roundabout flows while attempting to complete the lane changes, or drivers may enter with more aggressive driving behaviours to “jump” across the lanes more quickly. Both scenarios increase the overall crash potential and travel safety risks, which in turn can also lead to broader system breakdowns if/when crashes do occur and block the roundabout for longer periods of time.

- **2026 Operations:** During the **AM Peak**, restricting the southbound through and right movements is expected to nominally increase commute time, with none of the proposed alternatives adding more than 3 minutes extra ([Table 9](#)). For this option, the alternative path via the Red Bay Roundabout U-turn (Routes 2 & 4 in [Table 9](#)) increases travel time by 3 minutes, and the alternative path via the Service Road (Routes 3 & 5 in [Table 9](#)) increases travel time by 1 minute. Since downstream Tomlinson Roundabout is a congestion point, vehicles are traveling close to free-flow speeds, limiting the delay caused by the reroute. Although quicker, the alternative path via the Parallel Service Road is not recommended because drivers will be entering the CUC Roundabout under the same difficult conditions as the Grand Harbour southbound through/right movement, crossing three circulating lanes of traffic. For comparison, [Table 9](#) provides the anticipated AM travel times of each alternate path if signalized traffic metering or signalized roundabout improvements were implemented throughout the corridor, adding up to 3 minutes of additional travel time.
- **2036 Operations:** During the **AM Peak**, restricting the southbound through and right movements is expected to increase commute time significantly ([Table 9](#)). For this option, the alternative path via the Red Bay Roundabout U-turn (Routes 2 & 4 in [Table 9](#)) increase travel time by 8 minutes, and the alternative path via the Service Road (Routes 3 & 5 in [Table 9](#)) increase travel time by 9 minutes. For comparison, [Table 9](#) provides the anticipated AM travel times of each alternate path if signalized traffic metering or signalized roundabout improvements were implemented throughout the corridor, adding up to 6 minutes of additional travel time.

Table 9: Southbound Left Only AM Peak Travel Time Summary (Minutes)

Route	2026				2036			
	E+C	Grand Harbour Alt 0	Traffic Metering	Signalized Roundabout	E+C	Grand Harbour Alt 0	Traffic Metering	Signalized Roundabout
Grand Harbour SB Approach to CUC								
Route 1: via Grand Harbour SBR to Crewe Road	2	-	-	-	3	-	-	-
Route 2: via Grand Harbour SBL & Red Bay U-turn	-	5	4	5	-	11	5	9
Route 3: via Service Rd	-	3	2	3	-	12	5	5
Grand Harbour SB Approach to Old Crewe Rd								
Route 4: via Grand Harbour Roundabout SBT	2	-	-	-	3	-	-	-
Route 5: via Grand Harbour SBL & Red Bay U-turn	-	5	3	4	-	11	6	6

Grand Harbour Alt 1: Signalized Roundabout

- This option fully signalizes the roundabout at all approaches while providing pedestrian crosswalks and walk signs. ITS solutions such as adaptive signal timings and vehicle detection will optimize overall operations. Lane reconfiguration consists of an additional westbound left-turn lane from Shamrock Road to South Sound Road and dual northbound right-turn lanes from South Sound Road to Shamrock Road. To reduce conflicting circulating movements, northbound South Sound Road is converted to left/right only (through movement prohibited), and the southbound approach from Grand Harbour Shopping Centre is converted to a left-only approach. The adjacent Service Road intersection will be signalized with coordinated signal timings between the two intersections. This option is anticipated to increase delay along mainline eastbound Crewe Road and westbound Shamrock Road approaches but will allow the intersection to operate more efficiently overall by reducing minor approach queues.
- 2026 Operations: During the **AM peak**, this option is anticipated to reduce delay along westbound Shamrock Road by providing an additional left-turn lane. Signalization will also significantly reduce South Sound Road delay and queues. During the **PM peak**, signalization will increase delay, but the intersection will still operate acceptably without spilling back through adjacent CUC and Red Bay Roundabouts while providing pedestrian safety benefits with crosswalks and walk signs.
- 2036 Operations: During the **AM peak**, this option is still anticipated to reduce delay along westbound Shamrock Road by providing an additional left-turn lane. This option significantly reduces queues on South Sound Road, reducing the queue by almost 3,000'. During the **PM peak**, signalization increases delay in the off-peak direction on westbound Crewe Road but improves delay on eastbound Crewe Road by preventing spillback into the CUC Roundabout. South Sound Road queues also improve, reduced by almost 1,000' during the PM peak.

Grand Harbour Alt 2: Traffic Metering

- This option provides signalized traffic meters at selected approaches to provide gaps for other approaches to safely enter the roundabout. Meters will be offset from the roundabout entry yield lines by approximately 200', with no additional pedestrian crosswalks provided. ITS solutions such as advanced metering detection will optimize overall operations. To reduce conflicting circulating movements, northbound South Sound Road is converted to left/right only (through movement prohibited), and the southbound approach from Grand Harbour Shopping Centre is converted to a left-only approach. The adjacent Service Road intersection will be signalized to reduce delay along the new road.
- 2026 Operations: During the **AM peak**, traffic metering will be implemented on westbound Shamrock Road to provide gaps for South Sound Road. This option reduces westbound Shamrock Road queues by providing an additional left-turn lane. Traffic metering is expected to reduce South Sound Road queues by 2,000'. During the **PM peak**, traffic metering will be implemented for eastbound Crewe Road (to provide gaps for southbound Grand Harbour Shopping Centre) and westbound Shamrock Road (to provide gaps for South Sound Road). This option is anticipated to improve PM operations by reducing queues on eastbound Crewe Road and South Sound Road.
- 2036 Operations: Traffic meters will be installed on the same approaches as 2026. During the **AM peak**, this South Sound Road queues will be reduced by 3,000'. This option will continue to reduce westbound Shamrock Road delay by providing an additional left-turn lane. During the **PM peak**, traffic metering will improve operations by reducing eastbound queues so that they no longer spill back to CUC Roundabout. This option also reduces South Sound Road queues by 2,000'.

Grand Harbour Alt 3A: Traditional Signalized Intersection (additional turn lanes, no widening)

- This option converts the existing roundabout into a traditional signalized intersection with right-turn lanes and channelized left turns at all approaches. ITS solutions such as adaptive signal timings and vehicle detection will optimize overall operations. The adjacent Service Road intersection will be signalized with coordinated signal timings between the two intersections. This option provides pedestrian crosswalks and walk signs, but pedestrian phases will cause traffic operations to deteriorate further due to lengthy times required to cross up to eight lanes of traffic.
- The concept fits within the existing right-of-way assuming no additional widening occurs beyond the six-lane roadway. The NRA has acknowledged the challenges of widening this intersection due to existing buildings and property boundaries located in close proximity to the road edge, as well as the proposed alignment of parallel the Service Road.
- 2026 Operations: During the **AM peak**, this option is expected to fail operationally. Westbound Shamrock Road spills back through the Red Bay Roundabout, with vehicle demand of nearly 3,000 drivers during the AM peak hour. The opposing eastbound right-turn approach is also expected to operate poorly due to such heavy westbound traffic. During the **PM peak**, this option is anticipated to fail operationally; eastbound Crewe Road spills back

through the CUC Roundabout, with vehicle demand of nearly 3,000 drivers during the PM peak hour.

- 2036 Operations: During the **AM peak**, this option will fail operationally, with westbound Shamrock Road volume exceeding 3,000 vehicles and queues spilling back through the Tomlinson Roundabout. The opposing eastbound right-turn approach will continue to operate poorly due to high opposing westbound volume. During the **PM peak**, this option will continue to fail operationally, with eastbound Crewe Road volume of 3,800 vehicles and queues spilling back to Agnes Way.

Grand Harbour Alt 3B: Traditional Signalized Intersection (with widening)

- Using VISTRO, this option was modelled to determine how many lanes a traditional signalized intersection would need to operate with acceptable levels of delay (level of service D or better) at this location. Based on this analysis, the intersection would require six eastbound through lanes and five westbound through lanes, in addition to right-turn lanes and channelized left-turn lanes at each approach. This intersection cannot be widened to accommodate these lanes without significant impacts to adjacent property and the proposed parallel Service Road. Widening would also create unsafe conditions for pedestrians, requiring people to walk across ten or more lanes of traffic.
- 2026 Operations: This option is expected to reduce queues and delay, allowing the intersection to operate acceptably; however, operational failures would likely occur when transitioning from the widened intersection back to the six-lane segment along the remainder of the study corridor. During the **AM peak**, this option reduces queues along eastbound Crewe Road to 100'. During the **PM peak**, this option reduces queues along westbound Shamrock Road to 250'.
- 2036 Operations: During the **AM peak**, this option is expected to reduce queues along eastbound Crewe Road to 400'. During the **PM peak**, this option is expected to reduce queues along westbound Shamrock Road to 650'.

Grand Harbour Alt 4A: Controlled Access Highway (GH Access Permitted)

- This option provides a controlled access highway by converting the intersection into a two-way stop-controlled intersection. This option maintains left in / left out access on Grand Harbour Road and South Sound Road prohibiting through and right movements for both directions. Prohibited movements will have to travel to the next roundabout to make a U-turn. A pedestrian bridge will be provided to accommodate crossing the 6-lane divided controlled access highway. Only 2036 operations were evaluated for this option.
- 2036 Operations: This option is anticipated to reduce queues for Crewe Road/Shamrock Road and delay, allowing the intersection to operate acceptably; however, it will likely produce delays comparable to No-Build conditions at the CUC, Red Bay, and Tomlinson Roundabout as vehicles shift to the downstream roundabouts for all right-turn and U-turn movements.

During the **AM peak**, this option is anticipated to shift over 300 eastbound vehicles from South Sound Road to LPH, causing the westbound Service Road queue to worsen and spillback to the Tomlinson Roundabout. During the **PM peak**, restricting all right-turn movements at Grand Harbour is anticipated to affect the CUC Roundabout because over 500 vehicles are expected to U-turn onto Crewe Road to travel east. The CUC Roundabout westbound U-turn approach from Crewe Road enters the roundabout first, cutting off the heavy eastbound LPH movement, likely resulting in eastbound LPH spillback to Bobby Thompson way. Additionally, the southbound Shamrock Road queue at the Red Bay Roundabout from Red Bay is expected to spill back toward Tomlinson Roundabout, and the South Sound Road queue at Grand Harbour is expected to spill back over 800’.

Grand Harbour Alt 4B: Controlled Access Highway (GH Access Prohibited)

- This option provides a controlled access highway by converting the intersection into a two-way stop-controlled intersection. This option maintains left in / left out access on South Sound Road prohibiting through and right movements for South Sound Road and prohibits all access from Grand Harbour Road, Bimini Drive, and Selkirk Drive. Prohibited movements will have to travel to the next roundabout to make a U-turn. Grand Harbour Road, Centre Drive, and Selkirk Drive will only be accessible from the Service Road. A pedestrian bridge will be provided to accommodate crossing the 6-lane divided controlled access highway. Only 2036 operations were evaluated for this option.
- 2036 Operations: This option is expected to reduce queues for Crewe Road/ Shamrock Road and delay, allowing the intersection to operate acceptably; however, this alternative is expected to produce delays comparable to No-Build conditions at the CUC, Red Bay, and Tomlinson Roundabout as vehicles shift to the downstream roundabouts for all right-turns, U-turns, or Service Road access. During the **AM peak**, this option is expected to shift over 400 eastbound vehicles from South Sound Road to LPH, causing operations to worsen at the CUC Roundabout. Multiple side streets will only be accessible from the Service Road, so the westbound Service Road queue is expected to spillback to the Tomlinson Roundabout, spilling back faster than the Alt 4A AM queue and worsening until it spills back in both the eastbound and westbound directions along Shamrock Road. During the **PM peak**, the closures of right-turn movements at Grand Harbour are anticipated to affect CUC because over 500 vehicles are expected to U-turn onto Crewe Road to travel east. The Siver Oaks Roundabout westbound U-turn approach from Crewe Road enters the roundabout first, cutting off the heavy eastbound LPH movement, likely resulting in eastbound LPH spillback to Bobby Thompson way. Additionally, the westbound Service Road queue at CUC is expected to nearly reach the Grand Harbour Roundabout, and the South Sound Road queue at Grand Harbour is expected to spill back over 2,500’.

Red Bay Roundabout

Red Bay Alt 1: Traffic Metering

- This option provides signalized traffic meters at selected approaches to provide gaps for other approaches to safely enter the roundabout. Meters will be offset from the roundabout entry yield lines by approximately 200', with no additional pedestrian crosswalks provided. ITS solutions such as advanced metering detection will optimize overall operations. This option maintains existing restricted movements, with northbound Prospect Road left-only and southbound Shamrock Road left/right-only (through movement prohibited).
- 2026 Operations: During the **AM peak**, traffic metering will be implemented on westbound EWA to provide gaps for northbound Prospect Point Road. Traffic metering is expected to reduce Prospect Point Road queues while maintaining efficient operations along EWA. During the **PM peak**, traffic metering will be implemented for eastbound Shamrock Road to provide gaps for southbound Shamrock Road. Traffic metering is expected to reduce southbound Shamrock Road queues by 2,000'.
- 2036 Operations: Traffic meters will be installed at the same locations as 2026 conditions. During the **AM peak**, Prospect Point Road queues will improve to 1,500' in length. During the **PM peak**, this option is expected to increase delay on eastbound Shamrock Road but will reduce queues on southbound Shamrock Road by 3,000'.

Tomlinson Roundabout

Tomlinson Alt 1: Signalized Roundabout

- This option fully signalizes the roundabout at all approaches while providing pedestrian crosswalks and walk signs. In 2026, no additional lane reconfiguration is required from the existing roundabout configuration. ITS solutions such as adaptive signal timings and vehicle detection will optimize overall operations.
- 2026 Operations: During the **AM peak**, this option is anticipated to reduce queues along westbound EWA and northbound Shamrock Road by 3,000' and 1,500', respectively. During the **PM peak**, signalization will improve operations by reducing queues on EWA.
- 2036 Operations: During the **AM peak**, this option is anticipated to reduce queues along westbound EWA and northbound Shamrock Road by 9,000' and 7,000', respectively. During the **PM peak**, signalization will improve operations by reducing queues on southbound Shamrock Road and westbound EWA.

Tomlinson Alt 2: Traffic Metering

- This option provides signalized traffic meters at selected approaches to provide gaps for other approaches to safely enter the roundabout. Meters will be offset from the roundabout entry yield lines by approximately 200', with no additional pedestrian crosswalks provided. ITS solutions such as advanced metering detection will optimize overall operations.
- 2026 Operations: During the **AM peak**, traffic metering will be implemented for eastbound EWA and southbound Shamrock Road to provide gaps for both westbound EWA and northbound Shamrock Road. This option is anticipated to reduce queues along both westbound EWA and northbound Shamrock Road by over 2,000' each. During the **PM peak**, traffic metering will be implemented for eastbound EWA to provide gaps for southbound Shamrock Road and westbound EWA. Traffic metering is expected to reduce queues on southbound Shamrock Road and westbound EWA.
- 2036 Operations: Traffic meters will be installed on the same approaches as the 2026 scenario. During the **AM peak**, this option is expected to reduce queues along both westbound EWA and northbound Shamrock Road by 9,000' and 5,000', respectively. During the **PM peak**, this option is expected to reduce queues on southbound Shamrock Road and westbound EWA.

Travel Time Comparison

Average travel times are provided for selected routes to demonstrate cumulative travel time savings during AM and PM peak conditions if the specified intersection type is implemented throughout the corridor.

AM Travel Times

A comparison of westbound travel times during 2026 AM peak conditions is provided in [Table 10](#). Traffic conditions deteriorate further under 2036 AM peak conditions, as summarized in [Table 11](#).

Table 10: 2026 AM Quick Win Travel Time Summary

TRAVEL PATH	E+C	SIGNALIZED ROUNDABOUT	TRAFFIC METERING
HIRST ROAD TO CUC ROUNDABOUT VIA EWA	11 minutes	9 minutes	8 minutes
HIRST ROAD TO CUC ROUNDABOUT VIA SHAMROCK RD	17 minutes	11 minutes	8 minutes
RED BAY PRIMARY SCHOOL TO CUC ROUNDABOUT VIA SERVICE ROAD	12 minutes	4 minutes	4 minutes

Table 11: 2036 AM Quick Win Travel Time Summary

TRAVEL PATH	SIGNALIZED ROUNDABOUT		TRAFFIC METERING		CONTROLLED HIGHWAY (GH ACCESS PERMITTED)	CONTROLLED HIGHWAY (GH ACCESS PROHIBITED)
	E+C					
HIRST ROAD TO CUC ROUNDABOUT VIA EWA	35 minutes	17 minutes	14 minutes	27 minutes	19 minutes	
HIRST ROAD TO CUC ROUNDABOUT VIA SHAMROCK RD	32 minutes	19 minutes	18 minutes	18 minutes	32 minutes	
RED BAY PRIMARY SCHOOL TO CUC ROUNDABOUT VIA SERVICE ROAD	12 minutes	7 minutes	7 minutes	14 minutes	9 minutes	

The construction of the EWA widening and Agricola Drive Connector are anticipated to make EWA a more desirable path, shifting traffic patterns so that AM westbound commuters using the EWA will exceed those using Shamrock Road by over 1000 vehicles. This shift will initially help to reduce queues and delay on Shamrock Road, but motorists entering the Tomlinson Roundabout from Shamrock Road will still face delay by yielding to EWA who enter the roundabout first.

Both the signalized roundabout and traffic metering alternatives are anticipated to reduce overall travel

times for AM commuters when implemented throughout the study corridor. Under AM conditions, the improvement alternatives will mainly function to meter conflicting turning movements, providing sufficient gaps in traffic for westbound commuters to safely enter roundabouts and continue toward their destination. Signal timings will be triggered by detection and will adapt to daily traffic conditions. The roundabouts are anticipated to operate more efficiently to reduce delay on side street approaches such as Prospect Point Road and South Sound Road, where drivers may have trouble finding gaps to safely enter the intersection.

PM Travel Times

A comparison of eastbound travel times during AM peak conditions is provided in [Table 12](#). Traffic conditions deteriorate further under 2036 AM peak conditions, as summarized in [Table 13](#).

Table 12: 2026 PM Quick Win Travel Time Summary

TRAVEL PATH	E+C	SIGNALIZED ROUNDABOUT	TRAFFIC METERING	TRADITIONAL SIGNAL
AGNES WAY TO TOMLINSON ROUNDABOUT VIA LPH	6 minutes	7 minutes	6 minutes	10 minutes
AGNES WAY TO TOMLINSON ROUNDABOUT VIA CREWE RD	10 minutes	10 minutes	7 minutes	19 minutes

Table 13: 2036 PM Quick Win Travel Time Summary

TRAVEL PATH	E+C	SIGNALIZED ROUNDABOUT	TRAFFIC METERING	TRADITIONAL SIGNAL	CONTROLLED HIGHWAY (GH ACCESS PERMITTED)	CONTROLLED HIGHWAY (GH ACCESS PROHIBITED)
AGNES WAY TO TOMLINSON ROUNDABOUT VIA LPH	9 minutes	9 minutes	8 minutes	11 minutes	23 minutes	23 minutes
AGNES WAY TO TOMLINSON ROUNDABOUT VIA CREWE RD	24 minutes	11 minutes	9 minutes	37 minutes	7 minutes	7 minutes

Under 2026 E+C conditions, the six-lane widening from BTW to the Tomlinson Roundabout is anticipated to release major PM congestion currently observed within the study corridor. When LPH is widened to six lanes, PM eastbound commuters are anticipated to shift their travel patterns to favour LPH, reducing traffic along alternate eastbound routes Crewe Road and South Sound Road. This shift will initially help reduce queues and delays along side streets but will make it more difficult for drivers to access the study corridor from side streets if they must yield to heavier movements that enter the roundabout first.

Compared to E+C conditions, both the hybrid signalized roundabout and traffic metering alternatives are anticipated to produce similar travel times for PM commuters when implemented throughout the study corridor. These alternatives may increase delay along the study corridor but will make intersections

operate more efficiently at side street movements while providing safe pedestrian crossings during busy peak traffic conditions. Signal timings will be triggered by detection and will adapt to daily traffic conditions.

The traditional signal option is anticipated to increase PM travel time compared to E+C conditions, generating long queues at the Grand Harbour intersection that spill back into adjacent upstream CUC Roundabout.

SUMMARY

As Grand Cayman continues to experience growth, the NRA acknowledges and understands that these Quick Win solutions are only one part of a comprehensive island-wide solution to be combined with:

- The need for land use planning, particularly with the concentration of employment in George Town while West Bay, Bodden Town, East End, and North Side experience the highest rates of population growth.
- The need for enhanced public transport that is both frequent and reliable.
- The need for active transportation to provide options for residents and visitors who do not have access to cars; to improve first- and last-mile connections for transit riders; and to improve recreational opportunities that improve public health by encouraging active transportation.

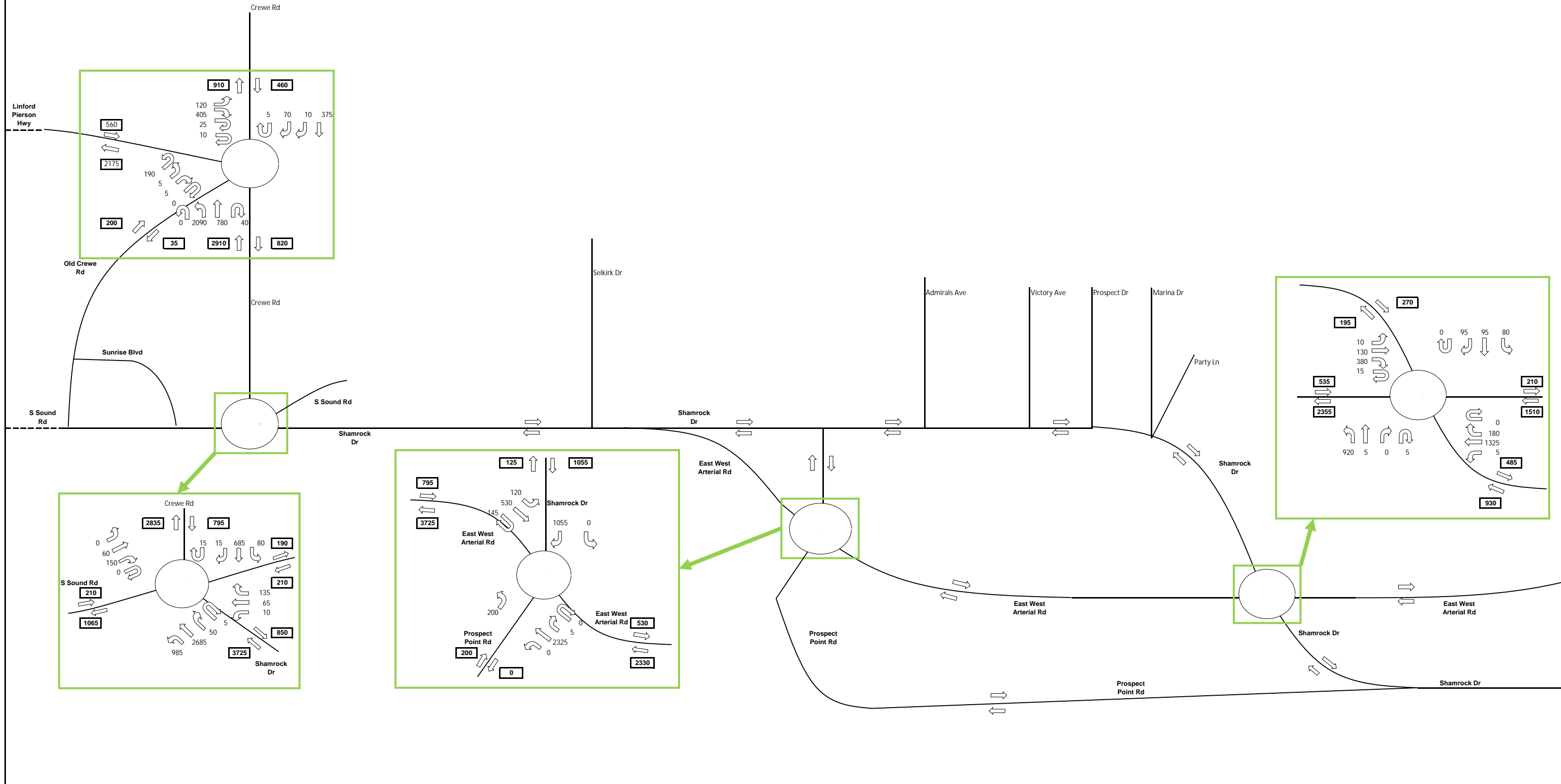
This is an overall approach that the NRA actively supports, although many of these strategies fall outside of the NRA's ambit. However, this Quick Win scenario analysis demonstrates the NRA's commitment not only to alleviating traffic congestion through this critical corridor but also to providing improved multimodal amenities, such as pedestrian/bicyclist facilities and transit accessibility, with the goal of making these modes of travel both safer and more attractive. The overarching goal is to improve the overall quality of life and economic competitiveness for Caymanians with a more resilient, efficient, and safer infrastructure system.

Attachment 1

Volume Diagrams

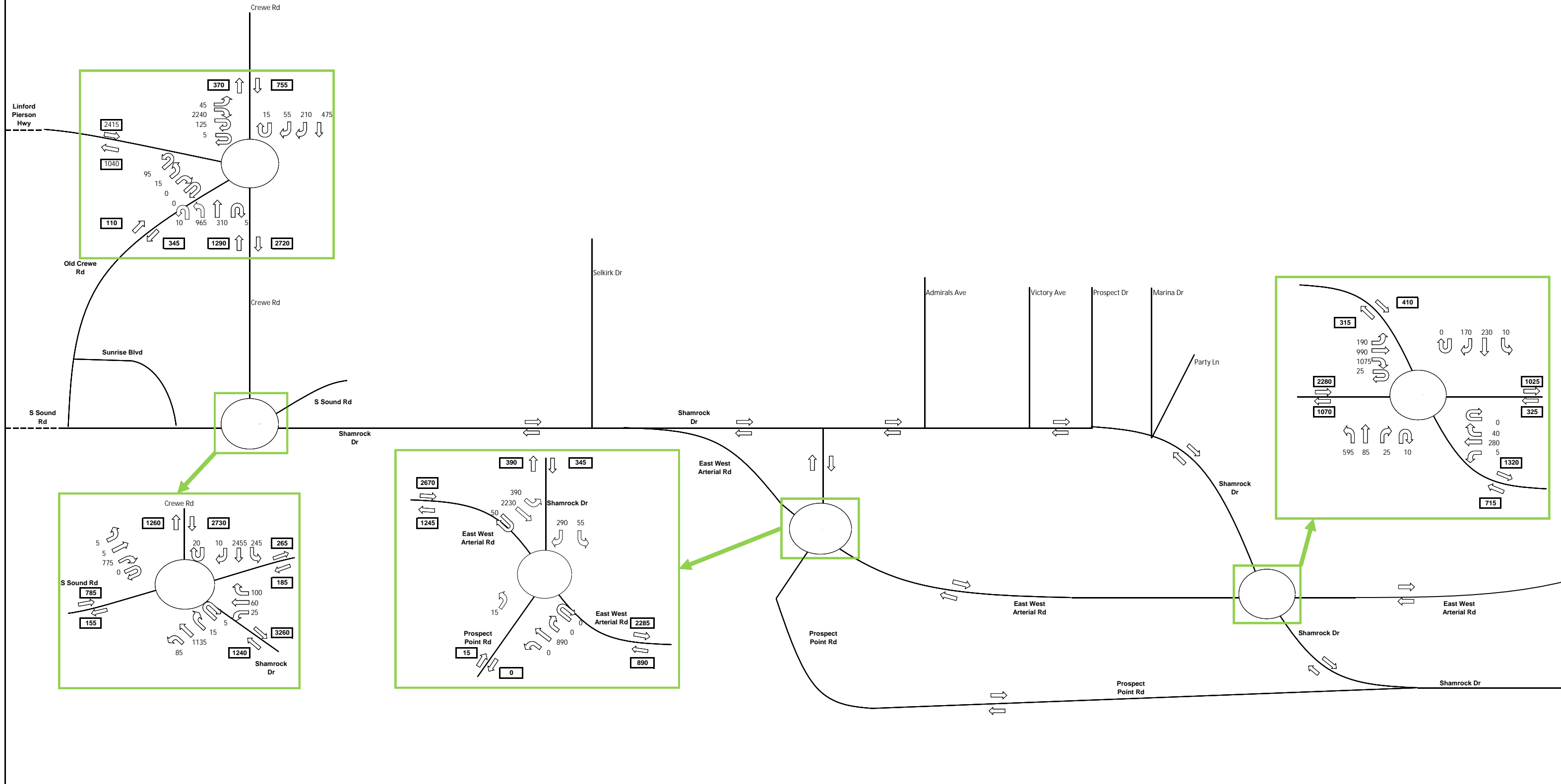
2021 Volume Diagram
 CUC to Tomlinson Roundabout
 7-8 AM

2021 Cayman Traffic Volume 7-8 AM



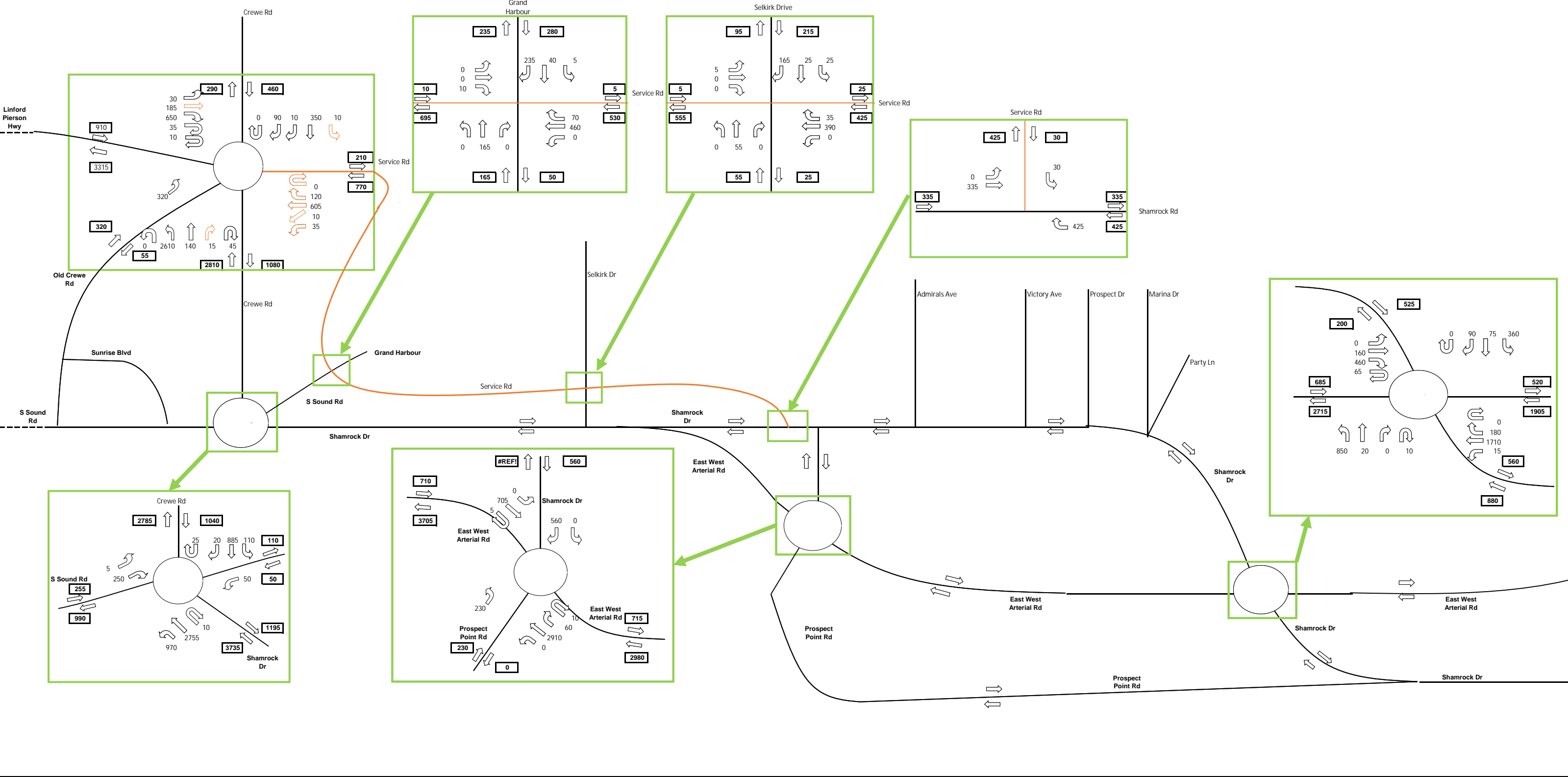
2021 Volume Diagram
 CUC to Tomlinson Roundabout
 5-6 PM

2021 Cayman Traffic Volume 5-6 PM



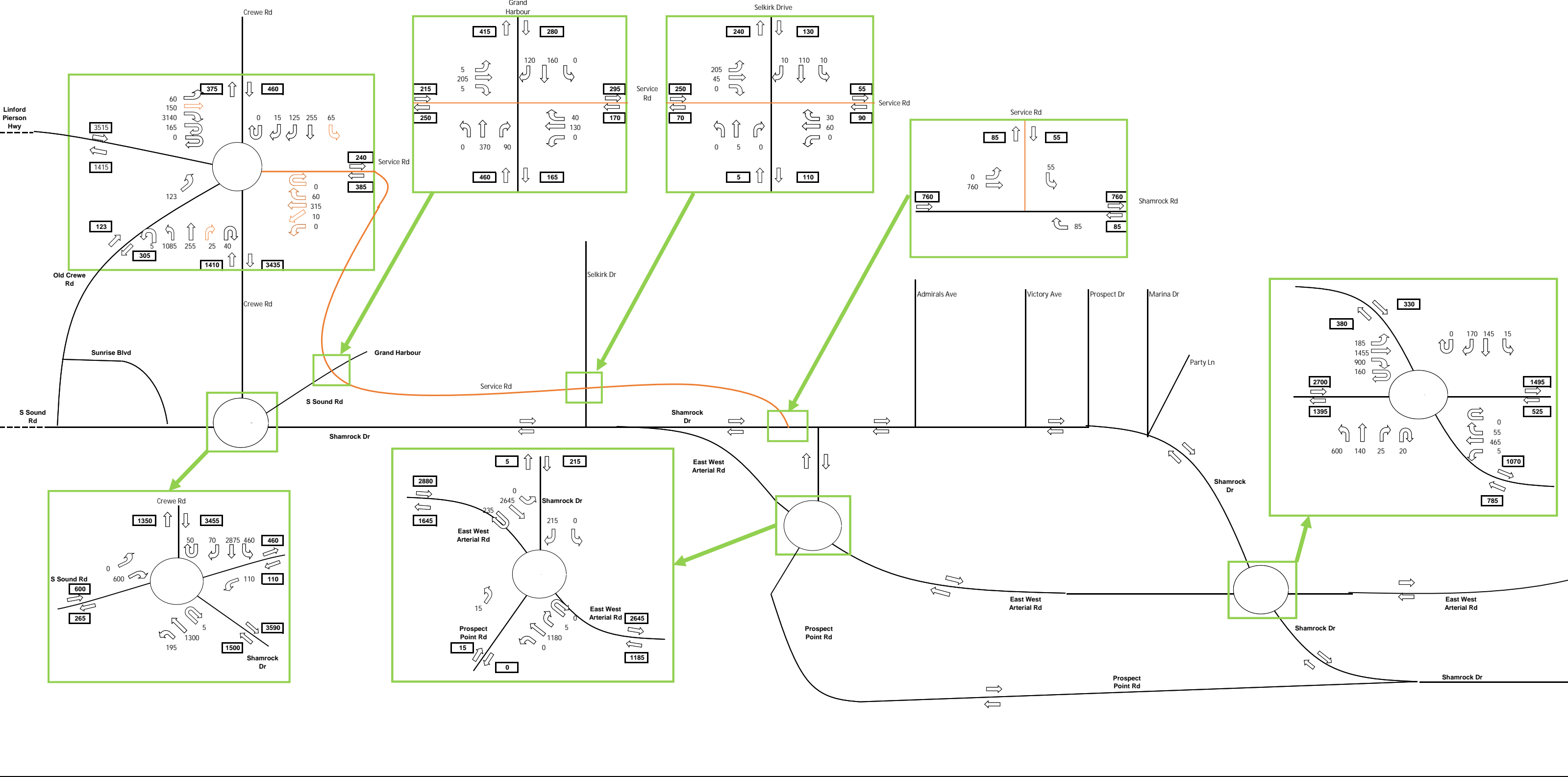
2026 Volume Diagram
 CUC to Tomlinson Roundabout
 7-8 AM

2026 Cayman Traffic Volume 7-8 AM



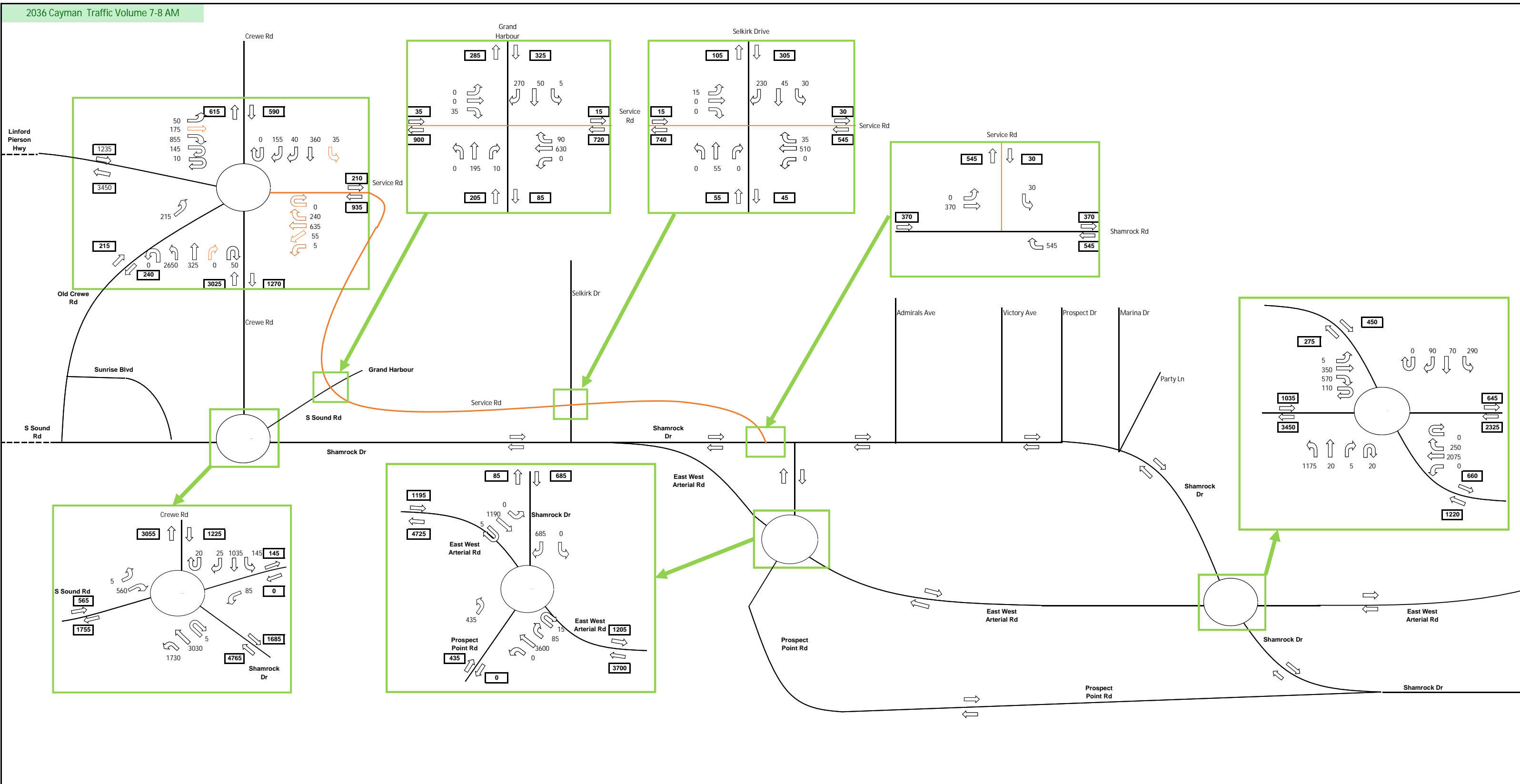
2026 Volume Diagram
 CUC to Tomlinson Roundabout
 5-6 PM

2026 Cayman Traffic Volume 5-6 PM



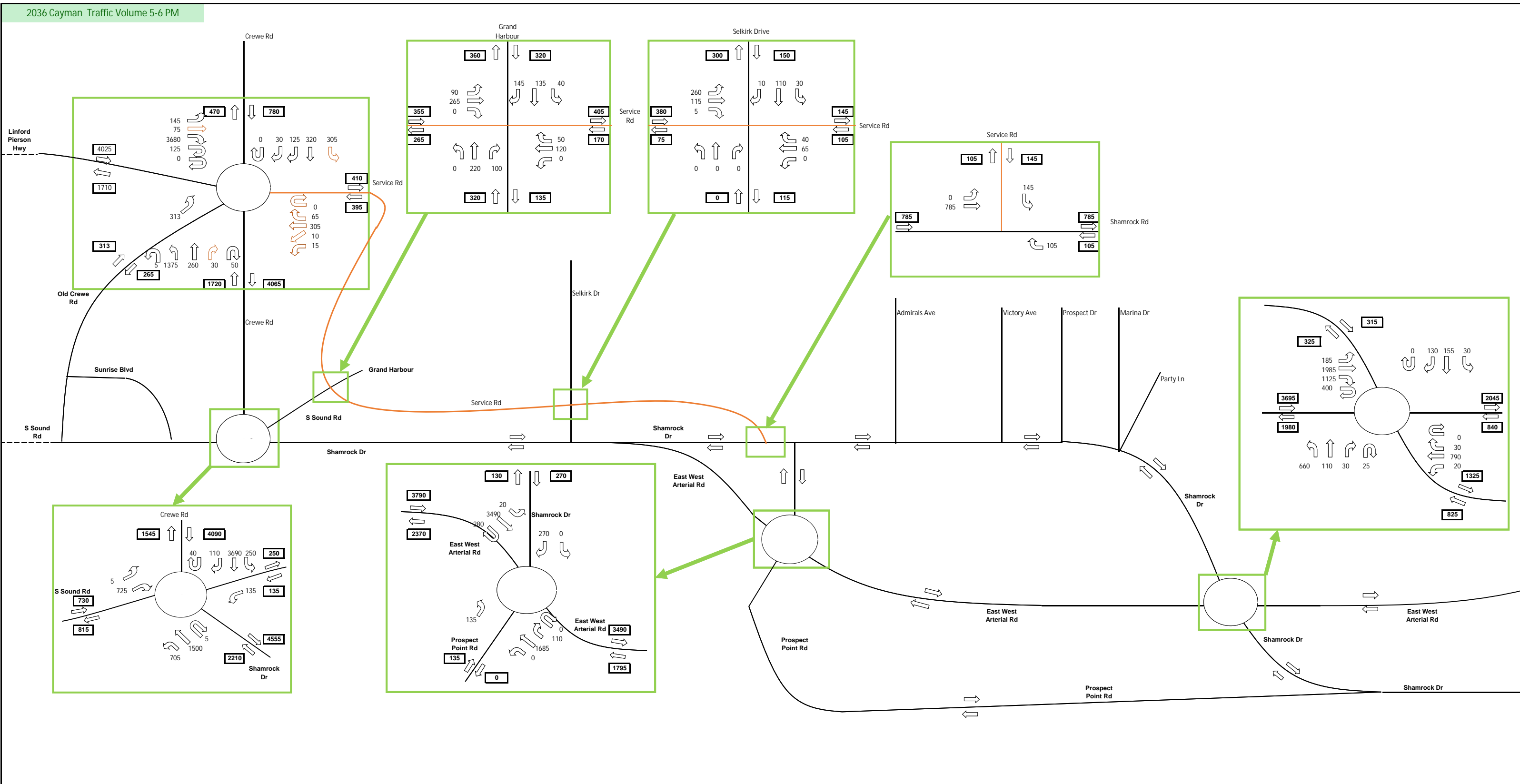
2036 Volume Diagram
 CUC to Tomlinson Roundabout
 7-8 AM

2036 Cayman Traffic Volume 7-8 AM



2036 Volume Diagram
 CUC to Tomlinson Roundabout
 5-6 PM

2036 Cayman Traffic Volume 5-6 PM



Attachment 2

VISSIM AM/PM Peak Operations
(Detailed Travel Time and Queue Tables)

2026 AM Travel Times (minutes)

Travel Segments	E+C	SIGNALIZED ROUNDABOUT	TRAFFIC METERING
Hirst Rd to Poindexter Rd	3.3	3.2	3.2
Poindexter Rd to Tomlinson Roundabout	3.1	1.8	1.6
Tomlinson to Red Bay Roundabout	1.5	1.1	1.1
Red Bay to Grand Harbour Roundabout	2.3	1.5	1.2
Grand Harbour to CUC Roundabout via Crewe Rd	1.1	1.7	1.1
Hirst Road to Grand Harbour via East-West Arterial <i>(shown in Multimodal Improvement Plan)</i>	10	8	7
Hirst Road to CUC via East-West Arterial	11	9	8
WB Hirst Rd to Prospect Point Rd	10.9	5.2	4.2
Prospect Point Rd to Red Bay Roundabout	3.2	2.6	1.7
Red Bay to Grand Harbour Roundabout	2.3	1.5	1.2
Grand Harbour to CUC Roundabout via Crewe Rd	1.1	1.7	1.1
Hirst Rd to Grand Harbour via Shamrock Rd <i>(shown in Multimodal Improvement Plan)</i>	16	9	7
Hirst Rd to CUC via Shamrock Rd	17	11	8
Red Bay Primary to Service Rd	0.2	0.3	0.2
Service Rd to Selkirk Dr	2.9	0.7	0.7
Selkirk Dr to Bimini Dr	3.2	0.4	0.4
Bimini Dr to Grand Harbour Roundabout	4.4	0.6	0.6
Grand Harbour to CUC Roundabout via Service Rd	1.7	2.3	1.8
Red Bay Primary School to CUC Roundabout via Service Road	12	4	4
Walkers Rd to Old Crewe Rd	18.1	6.2	6.4
Old Crewe Road to Grand Harbour Roundabout via South Sound Rd	13.3	1.4	0.7
Walkers Rd to Grand Harbour Roundabout via South Sound Rd	31	8	7

2026 PM Travel Times (minutes)

Travel Segments	E+C	SIGNALIZED ROUNDABOUT	TRAFFIC METERING	TRADITIONAL SIGNAL
EB LPH from Agnes Way to LPH Roundabout	0.9	0.9	0.9	0.9
LPH Roundabout to CUC Roundabout	1.4	1.4	1.1	2.4
CUC to Grand Harbour Roundabout	1.1	1.8	1.0	3.5
Grand Harbour to Red Bay Roundabout	1.4	1.4	1.4	1.4
Red Bay to Tomlinson Roundabout	1.4	1.4	1.5	1.2
Agnes Way to Tomlinson Roundabout via LPH	6	7	6	10
EB Crewe Rd from Agnes Way to CUC	5.9	5.0	3.1	12.5
CUC to Grand Harbour Roundabout	1.1	1.8	1.0	3.5
Grand Harbour to Red Bay Roundabout	1.4	1.4	1.4	1.4
Red Bay to Tomlinson Roundabout	1.4	1.4	1.5	1.2
Agnes Way to Tomlinson Roundabout via Crewe Rd	10	10	7	19

2036 AM Travel Times (minutes)

Travel Segments	E+C	Signalized Roundabout	Traffic Metering	Controlled Highway (GH Access Permitted)	Controlled Highway (GH Access Prohibited)
Hirst Rd to Poindexter Rd	18.3	3.7	3.7	15.7	8.9
Poindexter Rd to Tomlinson Roundabout	6.1	2.7	2.9	7.2	5.6
Tomlinson to Red Bay Roundabout	4.9	4.2	3.7	1.2	1.1
Red Bay to Grand Harbour Roundabout	4.6	2.3	1.9	1.1	1.1
Grand Harbour to CUC Roundabout via Crewe Rd	1.1	4.0	1.6	1.2	2.0
Hirst Road to Grand Harbour via East-West Arterial <i>(shown in Multimodal Improvement Plan)</i>	34	13	12	25	17
Hirst Road to CUC via East-West Arterial	35	17	14	26	19
WB Hirst Rd to Prospect Point Rd	19.6	7.3	9.1	12.5	26.7
Prospect Point Rd to Red Bay Roundabout	6.2	5.5	5.2	2.3	2.7
Red Bay to Grand Harbour Roundabout	4.6	2.3	1.9	1.1	1.1
Grand Harbour to CUC Roundabout via Crewe Rd	1.1	4.0	1.6	1.2	2.0
Hirst Rd to Grand Harbour via Shamrock Rd <i>(shown in Multimodal Improvement Plan)</i>	30	15	16	16	30
Hirst Rd to CUC via Shamrock Rd	32	19	18	17	32
Red Bay Primary to Service Rd	0.2	0.3	0.3	0.3	0.5
Service Rd to Selkirk Dr	0.7	0.7	0.7	0.7	0.7
Selkirk Dr to Bimini Dr	0.4	0.4	0.4	0.4	0.5
Bimini Dr to Grand Harbour Roundabout	1.9	0.8	1.2	0.7	0.6
Grand Harbour to CUC Roundabout via Service Rd	9.1	4.4	4.5	12.0	6.2
Red Bay Primary School to CUC Roundabout via Service Road	12	7	7	14	9
Walkers Rd to Old Crewe Rd	25.6	6.9	7.2	7.5	7.1
Old Crewe Road to Grand Harbour Roundabout via South Sound Rd	17.4	1.6	0.6	0.5	0.5
Walkers Rd to Grand Harbour Roundabout via South Sound Rd	43	8	8	8	8

2036 PM Travel Times (minutes)

Travel Segments	E+C	Signalized Roundabout	Traffic Metering	Traditional Signal	Controlled Highway (GH Access Permitted)	Controlled Highway (GH Access Prohibited)
EB LPH from Agnes Way to LPH Roundabout	1.0	1.0	1.0	0.9	10.5	10.6
LPH Roundabout to CUC Roundabout	1.5	1.6	1.3	3.4	8.7	9.3
CUC to Grand Harbour Roundabout	2.6	2.3	1.4	3.6	0.8	0.8
Grand Harbour to Red Bay Roundabout	2.3	2.7	2.3	1.7	1.4	1.4
Red Bay to Tomlinson Roundabout	1.4	1.6	1.7	1.5	1.2	1.2
Agnes Way to Tomlinson Roundabout via LPH	9	9	8	11	23	23
EB Crewe Rd from Agnes Way to CUC	17.7	4.5	3.5	30.0	3.4	3.6
CUC to Grand Harbour Roundabout	2.6	2.3	1.4	3.6	0.8	0.8
Grand Harbour to Red Bay Roundabout	2.3	2.7	2.3	1.7	1.4	1.4
Red Bay to Tomlinson Roundabout	1.4	1.6	1.7	1.5	1.2	1.2
Agnes Way to Tomlinson Roundabout via Crewe Rd	24	11	9	37	7	7

2026 AM Queue Summary

Intersection	Direction	Street	E+C		SIGNALIZED ROUNDABOUT		TRAFFIC METERING	
			Average Queue (ft)	Maximum Queue (ft)	Average Queue (ft)	Maximum Queue (ft)	Average Queue (ft)	Maximum Queue (ft)
CUC Roundabout	EB	Linford Pierson Hwy	0	53	85	290	331	462
	WB	Crewe Road	8	158	333	945	262	464
	WB	Service Road	50	390	205	1034	120	476
	NB	Old Crewe Road	3348	4573	57	342	10	122
	SB	Crewe Road	0	27	7	140	337	590
Grand Harbour Roundabout	EB	Crewe Road	0	27	69	248	0	49
	WB	Shamrock Road	859	2973	383	1553	288	774
	NB	South Sound Road	2553	3778	38	162	3	96
	SB	Grand Harbour Shopping Centre	0	30	18	120	0	0
Red Bay Roundabout	EB	Shamrock Road	0	0			0	0
	WB	East-West Arterial	327	2954			252	426
	NB	Prospect Point Road	66	528			24	225
	SB	Red Bay	21	313			14	216
Tomlinson Roundabout	EB	East-West Arterial	0	0	113	296	315	440
	WB	East-West Arterial	1375	4215	378	1236	349	1437
	NB	Shamrock Road	1738	2422	487	911	100	349
	SB	Shamrock Road	9	351	94	342	578	886

2026 PM Queue Summary

Intersection	Direction	Street	E+C		SIGNALIZED ROUNDABOUT		TRAFFIC METERING		SIGNAL	
			Average Queue (ft)	Maximum Queue (ft)	Average Queue (ft)	Maximum Queue (ft)	Average Queue (ft)	Maximum Queue (ft)	Average Queue (ft)	Maximum Queue (ft)
CUC Roundabout	EB	Linford Pierson Hwy	131	991	174	603	252	343		
	WB	Crewe Road	2	150	248	566	348	600		
	WB	Service Road	9	110	29	122	1	49		
	NB	Old Crewe Road	89	516	1	47	0	0		
	SB	Crewe Road	485	1247	188	541	1	62		
Grand Harbour Roundabout	EB	Crewe Road	54	757	654	1462	4	217	2196	10054
	WB	Shamrock Road	0	26	208	528	278	414	78	425
	NB	South Sound Road	158	585	185	867	267	686	93	652
	SB	Grand Harbour Shopping Centre	29	120	80	120	9	119	99	163
Red Bay Roundabout	EB	Shamrock Road	0	17			253	519		
	WB	East-West Arterial	0	16			0	34		
	NB	Prospect Point Road	0	16			0	16		
	SB	Red Bay	2219	2565			38	289		
Tomlinson Roundabout	EB	East-West Arterial	102	965	88	685	302	1036		
	WB	East-West Arterial	177	471	444	786	59	445		
	NB	Shamrock Road	3	61	448	529	2	93		
	SB	Shamrock Road	64	370	60	184	261	531		

2036 AM Queue Summary

Intersection	Direction	Street	E+C		SIGNALIZED ROUNDABOUT		TRAFFIC METERING		CONTROLLED HWY (GH Access Maintained)		CONTROLLED HWY (GH Access Prohibited)	
			Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)
CUC Roundabout	EB	Linford Pierson Hwy	2	72	61	289	311	817	29	238	922	3718
	WB	Crewe Road	8	238	2020	2284	423	995	746	1811	15	249
	WB	Service Road	2104	2644	1448	1636	1660	2644	2633	2647	2639	2647
	NB	Old Crewe Road	987	1045	18	172	105	901	11	147	2	141
	SB	Crewe Road	1	73	13	198	430	931	2	53	796	3395
Grand Harbour Roundabout	EB	Crewe Road	0	29	41	272	0	28	0	36	1697	2893
	WB	Shamrock Road	2745	2972	1680	2974	1192	3016	15	336	4	184
	NB	South Sound Road	2991	3225	128	386	6	136	22	163	4	91
	SB	Grand Harbour Shopping Centre	1	104	18	118	0	0	0	23	0	0
Red Bay Roundabout	EB	Shamrock Road	0	24			0	0	0	34	0	0
	WB	East-West Arterial	2151	3155			2507	3542	1	89	0	100
	NB	Prospect Point Road	4573	13401			1074	1565	2508	3507	469	2925
	SB	Red Bay	408	917			506	2012	1619	3095	2898	3107
Tomlinson Roundabout	EB	East-West Arterial	0	0	99	354	465	723				
	WB	East-West Arterial	13217	15016	1896	6061	2494	6399				
	NB	Shamrock Road	5312	9333	1297	2203	2128	4047				
	SB	Shamrock Road	17	348	50	388	278	499				

2036 PM Queue Summary

Intersection	Direction	Street	E+C		SIGNALIZED ROUNDABOUT		TRAFFIC METERING		TRADITIONAL SIGNAL		CONTROLLED HWY (GH Access Maintained)		CONTROLLED HWY (GH Access Prohibited)	
			Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)	Simulated Average Queue (ft)	Simulated Maximum Queue (ft)
CUC Roundabout	EB	Linford Pierson Hwy	1078	4806	252	1058	302	755			8187	8190	8177	8190
	WB	Crewe Road	24	492	1261	1803	299	651			352	1903	261	577
	WB	Service Road	1388	1482	71	299	253	301			551	934	1681	2258
	NB	Old Crewe Road	228	789	26	325	5	115			5	115	14	215
	SB	Crewe Road	5675	6479	471	1629	17	648			12	165	17	164
Grand Harbour Roundabout	EB	Crewe Road	872	9259	802	1728	460	1839	1821	17692	250	250	250	250
	WB	Shamrock Road	0	53	1755	2970	278	649	136	579	250	282	250	250
	NB	South Sound Road	1016	2123	614	1279	254	361	49	210	398	1035	2230	2785
	SB	Grand Harbour Shopping Centre	94	119	27	118	20	118	101	230	3	78	0	0
Red Bay Roundabout	EB	Shamrock Road	77	773			1000	2872			251	355	252	408
	WB	East-West Arterial	5	120			6	158			2	76	1	60
	NB	Prospect Point Road	2	114			5	127			7	131	2	110
	SB	Red Bay	2809	3587			148	350			757	1261	3556	3838
Tomlinson Roundabout	EB	East-West Arterial	101	1114	1602	1625	550	1209						
	WB	East-West Arterial	5343	7151	148	478	58	377						
	NB	Shamrock Road	1	78	91	287	2	86						
	SB	Shamrock Road	4487	5990	410	1376	273	468						

Attachment 3

VISSIM Traffic Metering Timings

VISSIM Traffic Meter Timings

The traffic meter timings below were used to model each intersection's respective traffic metering alternative. These timings are provided as base green/red times, but the VISSIM models incorporated advanced metering detection and queue detection to adjust the base timings as needed during the simulation. Note that timings were optimized for VISSIM modelling, but traffic metering implemented in the field will use advanced metering detection and queue detection to react to traffic conditions more fluidly with increased sensitivity.

Intersection	Approach	Street	2026 AM		2036 AM	
			Green time (seconds)	Red time (seconds)	Green time (seconds)	Red time (seconds)
CUC Roundabout	EB	Linford Pierson Hwy	15	50	10	50
	WB	Crewe Rd	10	5	45	15
	SB	Crewe Rd	20	40	25	40
Grand Harbour Roundabout	WB	Shamrock Rd	10	5	40	15
Red Bay Roundabout	WB	East-West Arterial	35	10	35	25
Tomlinson Roundabout	EB	East-West Arterial	15	50	15	50
	SB	Shamrock Rd	15	50	18	45

Intersection	Approach	Street	2026 PM		2036 PM	
			Green time (seconds)	Red time (seconds)	Green time (seconds)	Red time (seconds)
CUC Roundabout	EB	Linford Pierson Hwy	45	10	40	20
	WB	Crewe Rd	15	30	20	20
Grand Harbour Roundabout	EB	Crewe Rd	-	-	45	15
	WB	Shamrock Rd	20	20	30	15
	NB	South Sound Rd	20	15	30	15
Red Bay Roundabout	EB	Shamrock Rd	50	10	25	25
Tomlinson Roundabout	EB	East-West Arterial	30	15	25	15
	SB	Shamrock Rd	20	20	20	20

Attachment 4

VISTRO Grand Harbour Signalized Intersection Operations
(Detailed Intersection Delay and Queue Tables)

Grand Harbour Alt 3: Traditional Signalized Intersection
Intersection Delay Summary (without widening)

Year - Intersection Approach	Additional Turn Lanes Conditions Delay (sec/veh) and LOS											
	AM Peak						PM Peak					
	2026											
Overall Intersection	306.2			F			240.6			F		
By Approach / Lane Group	Approach			Lane Group			Approach			Lane Group		
South Sound Rd	NB	42.0	D	LT	28.5	C	NB	52.9	D	LT	35.5	D
				R	46.7	D				R	53.9	D
Grand Harbour Shopping Centre	SB	44.9	D	LT	43.1	D	SB	50.8	D	LT	38.4	D
				R	61.8	E				R	51.3	D
Crewe Rd	EB	24.4	C	L	15.2	B	EB	372.4	F	L	8.7	A
				T	23.3	C				T	442.8	F
				R	81.1	F				R	57.4	E
Shamrock Rd	WB	413.2	F	L	9.8	A	WB	28.3	C	L	9.7	A
				T	527.5	F				T	29.5	C
				R	15.1	B				R	61.0	E
2036												
Overall Intersection	525.8			F			684.5			F		
By Approach / Lane Group	Approach			Lane Group			Approach			Lane Group		
South Sound Rd	NB	45.7	D	LT	29.6	C	NB	57.1	E	LT	28.3	C
				R	48.7	D				R	57.5	E
Grand Harbour Shopping Centre	SB	50.1	D	LT	47.0	D	SB	60.3	E	LT	43.8	D
				R	62.2	E				R	67.8	E
Crewe Rd	EB	31.0	C	L	15.6	B	EB	1138.6	F	L	11.8	B
				T	29.8	C				T	1230.7	F
				R	123.7	F				R	62.1	E
Shamrock Rd	WB	730.8	F	L	22.7	C	WB	33.0	C	L	13.2	B
				T	1071.9	F				T	38.8	D
				R	85.9	F				R	67.0	E

Grand Harbour Alt 3: Traditional Signalized Intersection
Queue Summary (without widening)

Year - Intersection Approach	Additional Turn Lanes Conditions					
	95th Percentile Queue (ft/ln)					
	AM Peak			PM Peak		
2026						
By Lane Group	Lane Group			Lane Group		
South Sound Rd	NB	LT	60.5	NB	LT	23.9
		R	115.0		R	253.0
Grand Harbour Shopping Centre	SB	LT	173.8	SB	LT	9.9
		R	23.1		R	265.9
Crewe Rd	EB	L	113.4	EB	L	226.6
		T	229.1		T	3763.2
		R	76.4		R	124.7
Shamrock Rd	WB	L	207.5	WB	L	40.1
		T	4282.6		T	401.3
		R	10.3		R	30.1
2036						
By Lane Group	Lane Group			Lane Group		
South Sound Rd	NB	LT	51.2	NB	LT	7.7
		R	183.3		R	320.1
Grand Harbour Shopping Centre	SB	LT	228.1	SB	LT	76.0
		R	70.3		R	211.8
Crewe Rd	EB	L	139.6	EB	L	123.2
		T	393.6		T	10436.0
		R	113.7		R	183.7
Shamrock Rd	WB	L	638.0	WB	L	188.8
		T	8122.6		T	573.5
		R	36.5		R	42.1

Grand Harbour Alt 3: Traditional Signalized Intersection
Intersection Delay Summary (with widening)

Year - Intersection Approach	Widening Conditions Delay (sec/veh) and LOS											
	AM Peak					PM Peak						
2026												
Overall Intersection	29.7			C			29.4			C		
By Approach / Lane Group	Approach			Lane Group			Approach			Lane Group		
South Sound Rd	NB	32.1	C	LT	20.2	C	NB	38.3	D	LT	24.1	C
				R	36.2	D				R	39.1	D
Grand Harbour Shopping Centre	SB	35.2	D	LT	33.4	C	SB	32.9	C	LT	23.9	C
				R	51.5	D				R	33.3	C
Crewe Rd	EB	24.2	C	L	17.2	B	EB	28.4	C	L	10.3	B
				T	23.8	C				T	31.0	C
				R	60.3	E				R	42.9	D
Shamrock Rd	WB	30.8	C	L	10.7	B	WB	28.8	C	L	12.4	B
				T	35.9	D				T	30.3	C
				R	57.8	E				R	46.9	D
2036												
Overall Intersection	34.3			C			35.6			D		
By Approach / Lane Group	Approach			Lane Group			Approach			Lane Group		
South Sound Rd	NB	44.6	D	LT	29.0	C	NB	49.3	D	LT	23.3	C
				R	47.6	D				R	49.7	D
Grand Harbour Shopping Centre	SB	49.1	D	LT	46.0	D	SB	52.2	D	LT	35.6	D
				R	61.1	E				R	59.7	E
Crewe Rd	EB	27.4	C	L	15.8	B	EB	36.9	D	L	13.5	B
				T	25.7	C				T	37.6	D
				R	116.3	F				R	54.7	D
Shamrock Rd	WB	35.1	D	L	22.5	C	WB	28.6	C	L	13.8	B
				T	40.5	D				T	32.8	C
				R	83.5	F				R	59.0	E

Grand Harbour Alt 3: Traditional Signalized Intersection
Queue Summary (with widening)

Year - Intersection Approach	Widening Conditions 95th Percentile Queue (ft/ln)					
	AM Peak			PM Peak		
2026						
By Lane Group	Lane Group			Lane Group		
South Sound Rd	NB	LT	44.3	NB	LT	16.2
		R	89.5		R	193.0
Grand Harbour Shopping Centre	SB	LT	135.8	SB	LT	6.5
		R	19.0		R	193.7
Crewe Rd	EB	L	109.1	EB	L	211.8
		T	105.4		T	373.0
		R	59.3		R	90.5
Shamrock Rd	WB	L	196.7	WB	L	38.9
		T	508.7		T	223.3
		R	49.6		R	45.3
2036						
By Lane Group	Lane Group			Lane Group		
South Sound Rd	NB	LT	50.1	NB	LT	6.4
		R	179.3		R	283.6
Grand Harbour Shopping Centre	SB	LT	224.5	SB	LT	63.3
		R	69.1		R	190.7
Crewe Rd	EB	L	139.3	EB	L	123.7
		T	198.2		T	625.4
		R	108.7		R	160.3
Shamrock Rd	WB	L	629.5	WB	L	179.9
		T	709.4		T	307.5
		R	71.3		R	74.4