

ENTRYWAY ROUNDABOUT
REVIEW OF OPERATION & SAFETY



For the City of Clearwater

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CONTENTS

	Page
1. Introduction	4
2. Intersection Choice	5
- Grade Separation	5
- Traffic Signals	5
- Roundabout	5
3. The Design Problem	6
4. Roundabout Safety	8
- Vehicles	8
- Pedestrians & cyclists	8
5. Roundabout Operation	9
- Signing	9
- Geometry	10
- Striping	16
- The Fountain	16
- The Central Island	18
6. Roundabout Capacity	19
7. Blocking Back	20
8. Travel Times	21
9. Pedestrians	23
10. Bus Stops	26
11. Metering Signal	27

12.	Lighting	28
13.	Landscaping	29
14.	Emergency Vehicles	30
15.	Education	31
16.	Summary Recommendations And Phasing	32
	Appendix 1 – Questions and Answers	35
	Appendix 2 – Lane Use Signs	45
	Appendix 3 – Example advanced direction Sign	48
	Appendix 4 – Plans of modified Roundabout	49

1. INTRODUCTION

This report reviews the operation and safety of the Clearwater Entryway Roundabout. It examines the causes of the operational and safety problems with both normal traffic volumes and with the abnormally high traffic volumes during Spring Break.

It recommends changes to the geometry, signing and striping of the roundabout. As a consequence, additions and changes are required to the pedestrian crossings to maintain pedestrian safety. The changes recommended are illustrated in the accompanying CAD drawings in Appendix 4.

It is essential for normal roundabout operation, that the surrounding road network is modified to reduce backing up through the roundabout from the Parking Lots on Coronado Drive and Gulf View Boulevard during Spring Break and other peak holiday periods.

Short-term interim measures that change the signing and striping of the roundabout are recommended.

The proposed modifications form a whole package. The separate elements are dependent on the others for their effectiveness. Partial implementation is not an option, as it could make matters worse. However, it is necessary to implement the modifications in a series of closely related phases.

The proposed modifications to the roundabout are generally in accordance with, *but not limited by*, the principles incorporated in the FHWA Roundabout Information Guide. The foreword to the Guide finishes with the following statement that defines the use of the Guide within the design process.

“Since there is no absolutely optimum design, the guide is not intended as an inflexible rule-book, but rather attempts to explain *some* principles of good design and *indicate* potential trade-offs. In this respect the ‘design space’ consists of performance evaluation models and design principles *such as* those provided in the guide, *combined with the expert heuristic knowledge of a designer. **Adherence to these principles still does not ensure good design, which must remain the responsibility of the designer.**”*

The appropriate application of the Guide requires the expert heuristic knowledge of an experienced roundabout designer. This is exemplified by the fact that the crashes on the Clearwater Roundabout at both the Coronado Drive exit and at the Causeway exit were not caused by departures from principles in the Guide. **Merely applying the Guide will not resolve these crash problems.** The interim measures recommended in this report have already been implemented and have reduced crashes by 56% (a reduction of 22 crashes / month). In particular, the crashes at the Causeway exit have been virtually eliminated by using striping techniques on the circulating road that are beyond the scope of the FHWA Guide.

2. INTERSECTION CHOICE

The replacement of the original group of intersections with a single roundabout has simplified the traffic interactions, significantly reducing the number of conflict and delay points.

In view of the existing problems at the roundabout, the choice of a roundabout intersection has been questioned.

Three alternative types of intersection were possible.

1. A Grade Separated Intersection

This was rejected because of the visual intrusion, the excessive 'right of way' and the very high cost.

2. Traffic Signal Intersection

The traffic volumes and turning flows would require a very large multi-lane traffic signal intersection. The large left turn volumes from the Causeway to Coronado Drive and from Mandalay Avenue to the Causeway are very difficult to accommodate efficiently with traffic signals.

The need to include the large pedestrian movements within the signal control would reduce capacity and require a very complex multi-phase installation.

The aim of improving the environment at the end of the Causeway to provide a gateway to Clearwater Beach would not be achieved with traffic signals.

For these reasons, the traffic Signal alternative was rejected.

3. A Roundabout Intersection

The roundabout was the only alternative that came close to meeting all the aims and objectives of the project.

It was selected as it offered environmental, capacity, safety and pedestrian advantages over the other alternatives. It also facilitated the building of the fountain to provide an impressive gateway for Clearwater Beach.

Although the roundabout has had problems since it opened, these are problems of detail that can be corrected. They in no way detract from the sound strategic choice to build a roundabout.

3. THE DESIGN PROBLEM

The problems associated with the design of the Entryway Roundabout must not be underestimated, as they are both numerous and difficult.

The design had to balance the needs of both pedestrians and drivers while achieving the other aims and objectives, especially those of the landscape architects.

These aims and objective conflict and compete. Finding the right balance is difficult under the best circumstances. Under the extraordinary circumstances at Clearwater Beach it was especially difficult.

Replacing a group of intersections by a single intersection creates large unpredictable changes in the volumes and patterns of both traffic and pedestrians. Developing a design that balances the various needs for a situation that can only be approximately known is very difficult.

These problems were made more difficult by the need to accommodate both the normal traffic volumes and the abnormally large traffic volumes experienced during Spring Break.

A larger roundabout that would work well for the Spring Break traffic volumes would be over-designed for the normal conditions that prevail for most of the year.

It was essential to avoid over design to ensure pedestrian safety. Consequently a design was developed that balanced pedestrian safety against the needs of the Spring Break traffic volumes.

The design had to allow for the uncertainty in the prediction of the post roundabout situation by biasing the design in favor of the more important aims and objectives. This necessarily involved the risk of under provision for the remaining aims and objectives.

Pedestrian safety was rightly given top priority as the pedestrian volumes are exceptionally high and pedestrians are the most vulnerable users of the intersection.

However the constrictive geometry used to control speed and promote pedestrian safety makes it more difficult for the motorist to comfortably negotiate the roundabout.

The unexpected large increase in traffic volumes since the roundabout opened has upset the balance and there is an under provision for the needs of drivers. To redress this balance the roundabout needs some relatively minor modifications.

These modifications will greatly reduce vehicle accidents and improve driver comfort. However, they will allow some increase in vehicle exit speeds on the Causeway, Mandalay Avenue and on Coronado Drive. Consequently additions and modifications to the pedestrian crossings are needed to maintain pedestrian safety.

The need to modify the Entryway Roundabout is not surprising. It is very unusual for such major projects to initially fulfil all their aims and objectives and they invariably require review and modification to match the emerging conditions they create. Such modifications are especially suitable for roundabouts, as surprisingly large benefits are provided by small changes in detail.

4. SAFETY

(a) Vehicle Safety

The Clearwater Beach Traffic Study prepared by DKS revealed that a total of 76 vehicle crashes occurred at the intersections that were replaced by the roundabout in the 30 months from January 1995 to June 1997. This is an average of 0.58 accidents / week.

In the 3 months from the 21st December 1999 to 21st March 2000 there have been 131 Crashes. This is an average of 10.07 accidents / week. This crash rate has remained constant over the subsequent three-month period up until June 2000.

It is normal practice with a new intersection to discount accidents during the first three months of operation as the intersection has not settled down to normal operation.

Drivers are learning how to use the new configuration and the contractor is usually finishing minor works. Both can contribute to accidents that do not normally occur. However, if there are a large number of accidents whose type and location form a distinct pattern, it indicates underlying problems that needs remedial action. This is clearly the case at the Entryway Roundabout.

The number of accidents in the first six months is significantly above the average for other new roundabouts in the USA. Almost all are exit accidents, concentrated at the exits onto the Causeway and into Coronado Drive. Notably, these are the only two-lane exit on the roundabout. Remedial measures are therefore needed to reduce accidents.

(b) Pedestrian and Bicycle Safety

In the 30 months from January 1995 to June 1997 there were 4 pedestrian accidents at the intersections replaced by the roundabout. This is an average of one pedestrian accident every 7.5 months.

So far there have been no pedestrian accidents at or near the roundabout. This is very encouraging but it is too early to draw conclusions.

There were 5 bicycle accidents over the same period at the previous intersections. This is an average of 1 bicycle accident every 6 months.

There have been no bicycle accidents since the roundabout opened. Again it is too early to draw conclusions.

5. ROUNDABOUT OPERATION

(a). Signing

(i) Advanced Direction signs

The Advanced Direction Sign on the Causeway needs to be replaced with a larger more conspicuous sign. The lettering especially needs to be larger so that it is easily read by approaching drivers. Advanced Direction Signs should also be introduced on Coronado Drive and Mandalay Avenue.

(ii) Lane Use Signs

The existing Lane Use Signs are too small to be effective and should be replaced.



Two sets of larger Lane Use Signs are needed on the Mandalay Avenue and Coronado Drive and three sets are required on the Causeway.

Simple Lane Use Signs are essential to direct traffic into the correct approach lanes to the roundabout. Traffic will then circulate more safely without the need to change lane.

The legend on the signs needs revising to include all lane destinations. (See Appendix 2)

(iii) Exit Signs

The Street Name Signs on the splitter-islands indicate the correct exit to circulating drivers. These signs need to be seen early to avoid sudden exit maneuvers by non-local drivers, especially from the inside lane of the roundabout.

Currently some of these signs are obstructing the view to the left of drivers at the yield line waiting to enter the roundabout. This should be corrected by raising the height of the signs as lowering them make them less visible to the circulating traffic, especially at the Coronado exit where the fountain wall would obstruct the drivers view of a low sign until vehicles are too close to the exit. If the height of the fountain wall is reduced the signs could be lowered and still be visible.



Sign Blocking View to the Left

(b) Geometry

The roundabout entry and exit geometry is very constricted to maximize pedestrian safety by controlling traffic speeds. Speeds are very low, but the restricted geometry has resulted in trucks scrubbing and damaging the curbs.



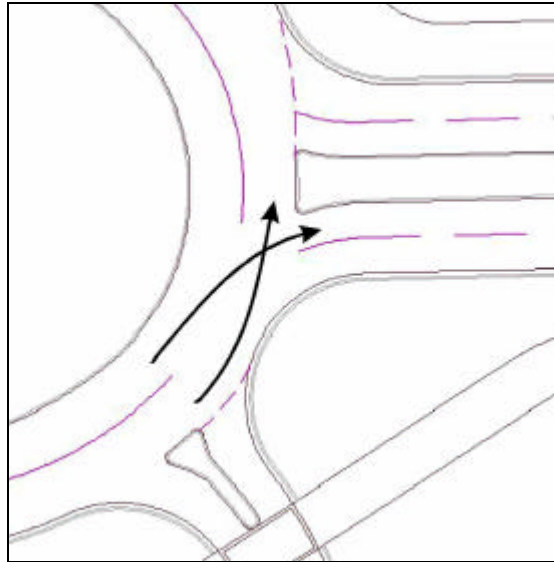
The constricted geometry has also contributed to the driver discomfort and vehicle exit accidents at Coronado Drive and at the Causeway.

(i) The Exit onto the Causeway

The accidents at this location are primarily due to the geometry, with contributions from the signing and striping. Driver inexperience is also a contributory factor.

It is incorrect and dangerous for drivers to use the outside lane of the roundabout to cross a **multiple-lane exit**. However, some drivers from Coronado or Mandalay are using the outside lane to pass the **two-lane exit** at the Causeway.

These vehicles cut across vehicles on the inner lane of the roundabout that are correctly exiting onto the Causeway. This has led to a concentration of crashes at this location.



Progress past the Causeway exit can only be made safely from the inner lane of the roundabout.

As the Lane Use Signs on Coronado and Mandalay are small and ineffective, some drivers, wishing to pass the Causeway exit, are incorrectly entering the outer lane of the roundabout. Correcting the Lane Use Signs will greatly help reduce the exit accidents by directing drivers into the correct lane.

The central striping on the circulating pavement around the roundabout is a solid line with occasional short breaks. This discourages drivers in the outer-lane, who wish to turn across the Causeway exit, from gradually merging into the inner lane. They either make a sudden lane change at the break in the solid line or inappropriately stay in the outer lane.

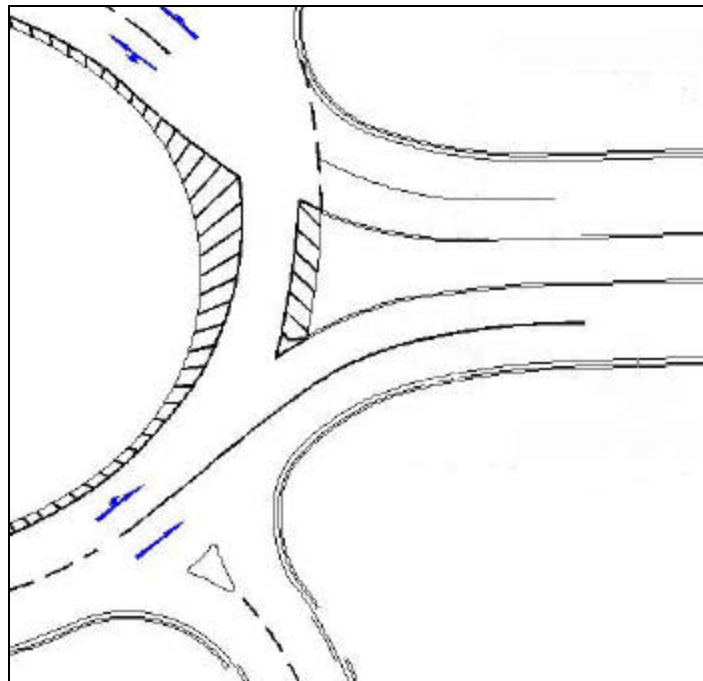
Approaching the Causeway exit, the **left curved** geometry of the outer curbing, together with the large exit angle and small exit radius onto the Causeway, combine to give drivers the strong impression that driving past the Causeway exit in the outer lane is natural and correct.



Driving in the outer lane across the Causeway Exit and crossing the path of an exiting vehicle from the inner lane

Modifications to the exit geometry, the striping, the lane signs together with the addition of lane direction arrows, will make it clear to drivers that the outer lane is solely for exiting onto the Causeway. Drivers will cease to travel past the Causeway exit in the outer lane, or in rare cases when they realize they are in the wrong lane, they will take extreme caution to avoid collision with exiting vehicles.

The recommended modifications are illustrated below:



The larger exit radius and smaller exit angle makes the exit onto the Causeway the natural path of traffic in the outer lane. This is reinforced by the revised striping and by the lane arrows. **These measures will greatly reduce vehicle accidents at the Causeway exit.**

(ii) The Exit into Coronado Drive

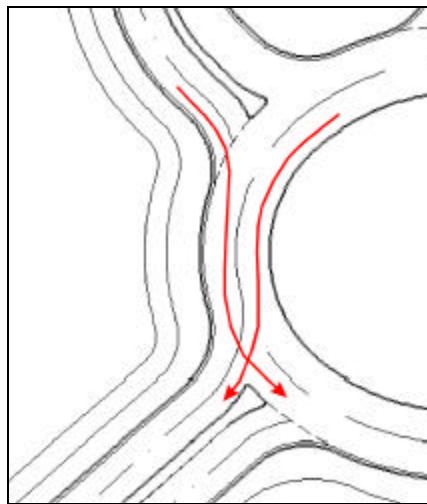
Coronado Drive has a two-lane exit to accommodate the large traffic volumes from the Causeway. It cannot be reduced to a single lane exit without creating very severe congestion.

Crashes occur at this exit when a vehicle using the inner lane of the roundabout turns right into Coronado Drive and cuts across the path of a non-exiting vehicle in the outer lane of the roundabout.

Some vehicles from the Causeway and Poinsettia are incorrectly using the outer lane of the roundabout to pass the **two-lane** exit at Coronado. Changes to the signing and striping will effectively encourage such traffic to use the correct inner lane. However, the greater part of the traffic that crosses the Coronado exit in the outer lane is from Mandalay Avenue. Crashes occur when both the Mandalay traffic and the circulating traffic behave correctly. The problem is created primarily by the roundabout geometry.

Explanation

When a vehicle is on the inner lane of the roundabout, and the outer lane is empty, a vehicle from Mandalay can **safely** enter the outer lane of the roundabout **without yielding**.



The paths of the two vehicles **do not cross**. The Mandalay vehicle makes a **merge** into the outer lane with no **entry conflict** with the inner lane vehicle. This is very undesirable as the absence of the **entry conflict** can subsequently create a dangerous **exit conflict**.

The two vehicles proceed **side by side** for about 75ft until they reach the exit of Coronado. If the outer vehicle proceeds when the inner vehicle exits, their paths suddenly cross creating an

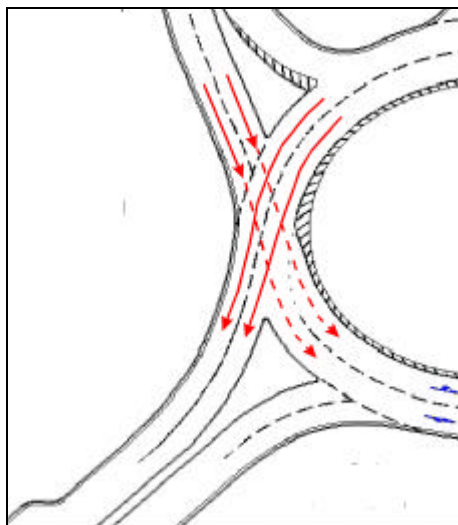
exit conflict and a crash is likely to occur. Neither has priority over the other, nor do they know the others intention until the last second, when it can be too late.



Exit conflict at the exit into Coronado Drive.
The white car exits into Coronado across the path of the non exiting red car

The Solution

This problem can be resolved by modifying the entry and the exit geometry between Mandalay and Coronado, removing the 75ft 'reverse curve' parallel **side by side** section between the entry and the exit. This will stop the entry **merge** and cause all Mandalay traffic to **yield** to traffic on both the inner and outer lanes the roundabout.



With this new arrangement, the **exit conflict** is replaced by the much safer **entry conflict** where the traffic exiting into Coronado has absolute and unambiguous priority over the Mandalay Traffic. Consequently all the Mandalay traffic will yield to all the circulating and exiting traffic. As a result, vehicles from the roundabout will exit safely into Coronado **before** the Mandalay traffic enters the roundabout. **This will virtually eliminate exit accidents at Coronado Drive.**

The entry path radius on Mandalay entry will be reduced by the above modifications and this would allow vehicles on Mandalay to enter the roundabout at unsafe speeds. To prevent this the entry-path radius must be reduced, by widening the median near to the pedestrian crossing. The approach road width must be maintained at a minimum of 20 feet so this will cut into the sidewalk on the West of Mandalay and remove four parking spaces.

(iii) The Other Exits and Entries.

The ten feet wide lanes and the small entry and exit radii make it difficult for trucks to use the remaining entries and exits without making contact with or over running the curbs. This can generally be resolved by enlarging the radii, reducing the entry and exit angles and widening the entry and exit lanes to a minimum width of twelve feet at the roundabout.

The entry and exit at Poinsettia Avenue, the splitter-island and the short median need modifying to allow WB-40 trucks to enter and exit without mounting the curbs. This will reduce the need for trucks to use East Shore Drive. The sharp radius on Poinsettia about 100 feet prior to the roundabout should also be enlarged for better truck access.

The Marina entry and exit need to be modified and widened to provide access for WB-40 trucks. The splitter-island also needs to be set back to avoid the new path of vehicles exiting onto the Causeway. The parallel tail of the splitter-island needs to be shortened and the lane widths widened to enable trucks to turn more easily into and out of the access at the Parking Lot.

The exit radius into Mandalay needs enlarging to allow a WB-67 truck to exit and avoid mounting the curb. (This will allow WB-67 vehicles to use the three main legs of the roundabout, namely the Causeway, Mandalay Avenue and Coronado drive). This will increase the exit speeds into Mandalay and this should be monitored. If exits speeds are too high for pedestrian safety then a flat-topped speed table should be introduced.

Occasionally tourists entering the roundabout from the Causeway are turning into the Hamilton access mistaking it for Mandalay. This should be signed as 'no through route'.

The alignment of the Causeway approach should be modified to increase the entry path curvature to prevent high-speed entry. The alignment of the other entries provides sufficient entry curvature. The proposed modifications to the Mariner entry, to accommodate Trucks, will reduce its entry path curvature. However, this is not a problem as the length of the road

between the Parking Lot and the roundabout yield line is too short for significant speed increase.

There is an 'entry only' access into the Marina Parking Lot from Coronado Drive. This could be made an entry and exit access.

(c) The Striping

The oval shape of the roundabout, the large number of approach roads (six) together with the complex traffic turning pattern makes the use of appropriate striping on the circulating road very necessary. On simpler roundabouts striping is not usually needed. However, on the more complex multilane roundabouts striping can be extremely beneficial when correctly applied. With multilane complexity it is very easy to stripe the circulating road inappropriately and create problems, so care is needed.

The original concentric striping on the circulating road is inappropriate and must be changed. Correct striping will greatly improve the safety of the roundabout. It is therefore strongly recommended that the circulatory striping be revised, not removed.

The solid striping around the center of the circulating road should be replaced with dashed lines so that occasional vehicles that are in the wrong lane can change lane gradually and safely. The striping must continue into the two lane exits rather than continue around the roundabout. The use of solid striping with a gap as it passes an entry is not recommended.

The striped apron around the central island should be widened near the Causeway to move left turning traffic safely from the inner to the outer lane to exit into Poinsettia or Mandalay.

Lane arrows should be introduced on the circulating road to specify lane use.

Both lanes of the Causeway should have 'S – Beach' painted on them at the three location shown in the CAD Signing drawing. The left Lane should have 'N-Beach' painted on it as per the Cad drawing. The lettering should be as wide as possible and should have a height of between 1.6 and 2.8 meters. If possible this should be repeated every 150 meters over the whole length of the Causeway.

It is essential that traffic to the south beach use **both** lanes on the Causeway as this movement accounts for two thirds of the approach traffic on the Causeway. Designating only the left lane for the south beach will increase congestion during holiday periods and contribute towards lane changing crashes on the roundabout.

(d) The Fountain

The Fountain Wall around the edge of the central island is 36 inches high. This is crossed in a number of places by safety sight lines from the roundabout entries. These are the sight lines of vehicles waiting to enter the roundabout to circulating vehicles. The sight lines start and

end at a height of 1.08 meters (42.5 inches) above the road surface. Obstructions higher than 42.5 inches along the sight lines are contrary to the Safety Standard.

The Fountain Wall was checked using sighting rods and was found to be a maximum of 41 inches high along the worst sight line. This complies with the Safety Standard by a margin of 1.5 inches.

In addition it is necessary to provide adequate sight lines for drivers to be able see low objects on the road surface so they can stop in time. The sight line must be from a height of 1.08 meters (42.5 inches) to an object height is only 0.6 meters (23.6 inches). The minimum length for the sight line is called the sight stopping distance and this is determined by the traffic speed. On the Clearwater Roundabout the sight stopping distance is 77 feet on the circulating road for the observed speed of 15 mph.

The Entryway Roundabout has sight stopping distances far greater than 77 feet over most of the length of the circulating road. It has a minimum sight stopping distance of 83ft at the small radii at the ends of the central island. The proposed 2.5ft wide striped apron around the central island will increase this minimum value from 83ft to 93ft, well within the safety requirement. If the height of the Fountain Wall is reduced by one foot (two steps) then the sight stopping distance will be further increased.



Although the Fountain Wall complies with the Safety Standards, it is very close to the edge of the roundabout and produces a ‘canyon’ effect. This is uncomfortable for some drivers on the inner lane. They have a tendency to shy away from the central island and sometimes elect to use the outer lane. They may feel more comfortable, but they may be in the wrong lane and this may contribute to exit conflict.

This situation can be eased by reducing the width of the circulating lanes to 14 feet wide to provide a 2.5 foot wide striped apron around the central island. This will move traffic away from the Fountain Wall and make the inner lane more comfortable to drive.

If the height of the wall is reduced from a height of three feet to two feet (by two steps), the 'canyon' effect will be removed. The 1.5inch margin for the main sight distance will be increased to about 12 inches. As this will make it much more comfortable for drivers it is recommended that the wall be lowered. However, this will be costly and is not required by the Safety Standards so the decision to lower the wall could be deferred until after the roundabout is modified and its performance monitored.

The fountain sometimes sprays water on the circulating road and on passing vehicles. Usually water on the circulating road comes from watering of the vegetation on the central island and contains soil or clay. This reduces the friction of the road surface. The pure water from the fountain is more like rain and is not such a problem. However spray onto drivers is distracting. The problem can be resolved by turning the fountain jets away from the roadway and by installing a system that automatically responds to wind speed, altering the water pressure to prevent over spray of the roadway.

(e) The Central Island

Normally roundabouts are round. Large oval roundabouts are to be discouraged as they can lead to high speeds on the long sections and low speeds on the smaller radii end sections. This can cause loss of control crashes.

The Entryway Roundabout has a larger radius of 110 ft and a smaller end radius of 65 ft that produce circulating speeds of 18 mph and 16 mph respectively. These speeds are very low and the 2 mph speed differential is inconsequential. Consequently the oval shape of the roundabout is not causing problems. There has been no loss of control crashes since the roundabout opened.

6. ROUNDABOUT CAPACITY

The capacity of the roundabout is sufficient for normal operating conditions when queues and delays are minimal.

The flows used for the design were the predicted 2020 volumes of 3100 vehicles / hour. During Spring Break flow volumes in excess of 3500 vehicles per hour were recorded which are not excessive for a 2 lane roundabout.

During Spring Break the queues on the Causeway are significantly less than previous years even though the daily traffic volumes were considerably higher.

The queues on the Causeway are primarily caused by traffic backing up onto the roundabout from Gulf View and Coronado Drive. This limits the rate at which traffic enters Clearwater Beach.

If the backups were removed the roundabout would be capable of moving more traffic, reducing the delays on the Causeway.

When traffic leaves the island during Spring Break there are queues and delays on Coronado Drive and Mandalay Avenue. The exit onto the Causeway is clear so the capacity of the roundabout limits the rate at which traffic leaves the island. The very large pedestrian volumes crossing Coronado and Mandalay reduces the capacity of the roundabout. The two crash locations also reduce the capacity as traffic flow is frequently reduced and disrupted by confusion over vehicle priority and by near misses and the occasional crash. However, the capacity of the roundabout is still greater than that of the intersections it replaced.

The modifications proposed to the roundabout will significantly increase capacity. Providing even greater capacity would be expensive, have environmental disbenefit, and would reduce pedestrian safety.

7. BLOCKING-BACK

If the Spring Break back ups were removed, the roundabout would move more traffic and the delays on the Causeway would be reduced.

Queuing back is partially caused by the traffic signals at Coronado and Gulf View. These signals could be replaced by a small one-way system composed of the initial section of Gulf View, part of First Street and a section of Coronado Drive.

The blocking back is mainly caused by slow moving vehicles on Gulf View looking for spaces on the Parking Lots and by the queues from the entrances to the Parking Lots.

The operation of the parking lots needs to be changed as the manned barriers considerably slow down traffic entry. This has a cumulative effect and causes large queues during Spring Break. Drivers should freely enter the parking lots and park before they collect or pay for a parking ticket.

Queuing would be further reduced, by creating an **in-only** access at the corner of the parking lot on Coronado near to the roundabout. This would take traffic off Coronado at the earliest opportunity. If, in addition, the parking lots along Gulf View were linked to the Coronado parking lot, traffic could search for spaces on any of the linked parking lots off the highway.

However cars waiting to enter spaces and cars reversing out of spaces would block this route and this could back up onto Coronado and to the roundabout.

To avoid this the proposed access into the parking lots off Coronado should be a free flow entrance onto a separate 1 way curbed link road around the periphery of the parking lots. Access to the parking spaces would be at points on the link road. The first access should be as far from Coronado as possible. Any problems inside the lots should not affect the operation of the link road.

The blocking back during Spring Break would be reduced by the above measures.

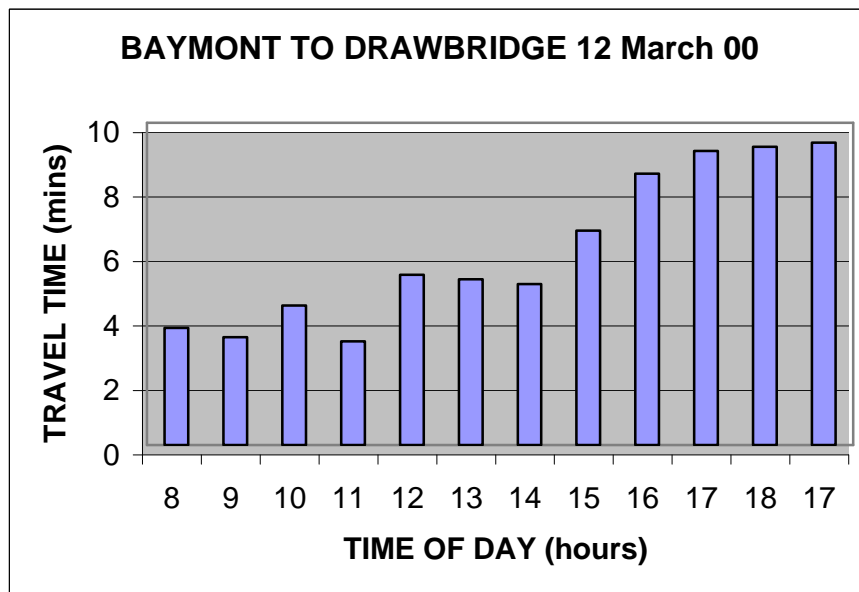
In the longer term the provision of extra parking spaces will be beneficial. Other routes or other means of transport to and from the mainland could also help reduce congestion.

8. TRAVEL TIMES BETWEEN MANDALAY AND THE CAUSEWAY

The travel times from Mandalay to the Causeway were measured from Baymont Street to the western end of the Causeway Drawbridge. The reverse travel times were measured using the same end points.

The longest travel times were recorded on 12th March 2000 during the abnormally high Spring Break traffic volumes.

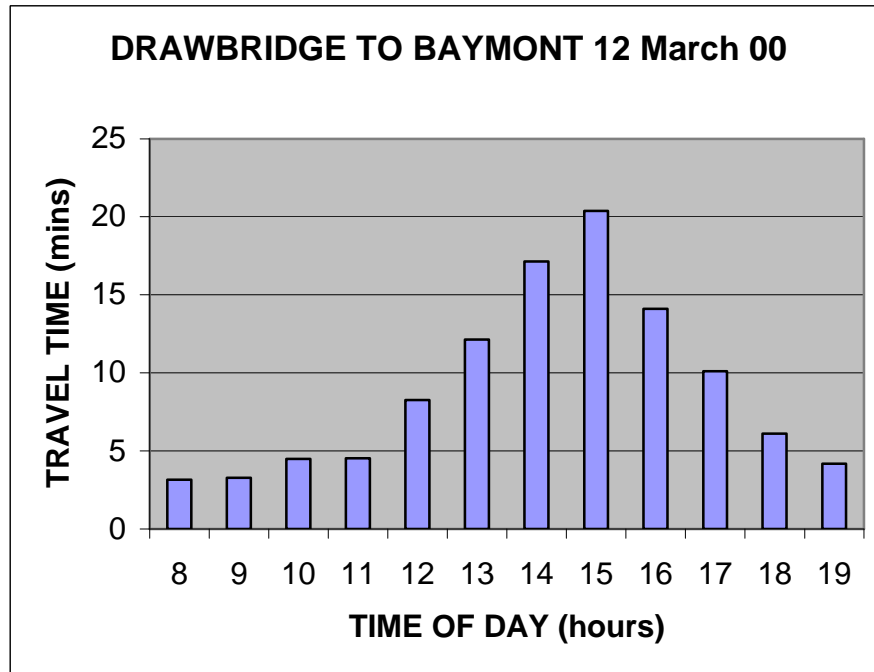
The following chart gives the travel time (minutes) between 8:00 and 17:00 for each intervening hour of the day;



The Travel Times are below 5 minutes until midday, when they slowly rise to about 9.5 minutes.

The police reduced these delays by metering the traffic from the Causeway on subsequent days. This could be done by some form of signal controlled metering.

The reverse travel-times from the western end of the Drawbridge to Baymont is shown in the Chart below;



The travel times are below 5 minutes until midday when they rise steeply to just over 20 minutes by 15:00 PM.

The metering will increase these delays a little between 15:00 and 18:00. However, it is unlikely that the queues will reach the mainland, as queue ‘compression’ will absorb the short stop time at the metering signal.

The above travel times are significant, but they are much lower than previous years. The congestion on the Causeway will reduce when measures to stop backups onto the roundabout along Coronado are implemented.

9. PEDESTRIANS

The modifications to the roundabout geometry will increase the exit speeds on Coronado, Mandalay and the Causeway. However it is essential that pedestrian safety be maintained.

1. Coronado Drive

The exit speeds on Coronado should be measured before and after the exit radius into Coronado has been increased. If the 85th percentile exit speeds exceeds twenty miles per hour then the crossing on the **exit** should be raised to form a low flat-topped speed table.

The pedestrian volumes crossing Coronado are exceptionally high during Spring Break. The backup from the Parking Lots ensures that the exit speed from the roundabout into Coronado is very low. Traffic is frequently stationary for short periods and pedestrians find it easy to cross to the median without using the crossing. However, when the recommended modifications to the Parking Lots are in place, the backups will reduce. It may then emerge that the pedestrian crossing on Coronado will cause some backups during Spring Break and other peak times. This will need to be monitored and if backups are a problem then consideration should be given to a signalized split crossing. As the existing median is too narrow to accommodate a split crossing it would need to be widened. During normal operation when both traffic and pedestrian volumes are much lower than the holiday peaks, the signals could be operated on flashing yellow.

With the higher exit speeds there is a danger to pedestrians that cross between the crossing and the roundabout. To prevent this, it is recommended that effective pedestrian barriers be introduced along Coronado between the roundabout and the crossing.

Most of the pedestrian crossings have several bollards on either side of the crossing. They reduce the pedestrian capacity of the crossing and they have caused some problems for cyclists and roller skaters. It is recommended that the inner bollards be removed.

2. The Causeway

There are large pedestrian volumes crossing the Causeway close to the roundabout and also near to East Shore Drive. Pedestrians crossing near the roundabout are not walking to or from East Shore Drive.

Safe pedestrian crossing provision is needed for both of these pedestrian streams. All of the roads to the roundabout have pedestrian crossings except the Causeway, which has by far the greatest vehicle volumes and highest vehicle exit speed. It therefore exposes pedestrians to the highest accident risk.

Providing an uncontrolled crossing near to the roundabout will probably attract more pedestrians and significantly increase the 600 pedestrians per day that cross at this location during Spring Break.

An uncontrolled crossing close to the roundabout would cause backups onto the roundabout during Spring Break and other peak holiday periods. A signal controlled split crossing would minimize backups even during holiday periods.

However, locating a signal controlled crossing so close to the roundabout is not recommended, as there is a real danger that approaching drivers could misinterpret a green light and enter the roundabout without yielding to circulating traffic.

It is therefore recommended that a split signalized crossing be located on the Causeway, but at a minimum distance on the exit of 80ft from the roundabout. The pedestrian 'walk time' plus the 'don't walk' time only needs to be 10 seconds. This will produce minimal disruption to the traffic flows. During Spring Break the 95% queues should only just reach back to the roundabout. Backup queues should therefore be short, infrequent and short-lived.

This crossing would also serve to accommodate pedestrians crossing to and from East Shore without any detour to this pedestrian route.

It is recommended that a new pedestrian access be provided from the Marina Parking Lot to the proposed signalized crossing on the Causeway.

The exit speeds onto the Causeway will be a little higher with the larger exit radius and smaller exit angle. The exit speeds must be monitored and if the 85th percentile exit speeds exceed twenty miles per hour then the crossing on the **exit** should be raised to form a suitable flat topped speed table.

Placing the crossings on flat-topped speed tables makes them more conspicuous. However, they can be uncomfortable for vehicle passengers and are disliked by many drivers. They are also unpopular with passengers in large vehicles. Consequently, they should be at the **minimum height** to effectively reduce the exit speeds to about 20 mph.

3. Mandalay Avenue

During Spring Break exiting traffic into Mandalay backs up onto the roundabout because of significantly large random delays caused by the uncontrolled pedestrian crossing.

If the backups on Coronado are reduced by the modifications to the Parking Lots then traffic will discharge onto the roundabout from the Causeway at a higher rate. Since one in three vehicles from the Causeway exits into Mandalay, the exit rate will increase, exacerbating the backups.

It is recommended that the crossing on Mandalay be moved away from the roundabout to the location shown in the accompanying drawings in Appendix 4.

It is also recommended that the striping be modified to maximize the two lane storage on the Mandalay exit prior to the crossing.

The backups on Mandalay should be monitored and if they are a persistent problem during holiday periods then a signalized split crossing should be considered. The widening of the median on Mandalay (to improve the entry deflection) will allow a split crossing. The total time needed to cross the pedestrians to and from the median, including the crossing clearance time is only 10 seconds compared to the 34 seconds needed at the non-split signalized crossing further north on Mandalay.

The recommended enlarged exit radius into Mandalay to accommodate WB-67 trucks but will allow some increase in vehicle exit speeds. This should be monitored and if the 85th percentile exit speeds exceeds twenty miles per hour then the crossing on the **exit** should be raised to form a low flat topped speed table.

(d) Poinsettia and the Marina

Traffic volumes on Poinsettia and the Marina are low and the pedestrian exposure is relatively low. However, exit speeds may increase on Poinsettia when the exit radius is increased to accommodate WB-40 trucks. This should be monitored and speed reduction measures introduced if speeds are too high for pedestrian safety.

As previously mentioned, a pedestrian access from the Marina Parking Lot to the proposed signalized crossing on the Causeway is recommended.

The Marina has no sidewalks along the vehicle access to the roundabout and pedestrians entering and leaving the Mariner walk in the roadway. Sidewalks should be provided along the access.

10. BUS STOPS

The bus stop on Mandalay approach to the roundabout is too close to the pedestrian crossing near the Hilton Hotel. This reduces the mutual visibility of pedestrians and drivers. It is recommended that the bus stop is moved closer to the roundabout to a position just past the access to the Hilton Hotel Parking Lot.

Similarly, the Bus Stop on the Coronado approach to the roundabout is poorly sited in relation to the pedestrian crossing. It is recommended that the bus stop be moved into the Coronado Parking Lot. The bus would enter From Coronado and exit onto the roundabout. Preliminary investigation indicates that a bus stop could be located without reducing the overall number of parking spaces.

11. METERING SIGNAL

During Spring Break queuing occurs on Mandalay. When the queues become quite long the police intervened and stopped the traffic on the Causeway from entering the roundabout. This reduced the traffic circulating past Mandalay allowing the queues to discharge. To perform this function a metering signal was introduced on the Causeway at East Shore. The signal is called by queues detected on Mandalay. The signal stops traffic for 135 seconds to provide sufficient time to clear the queue on Mandalay.

There have been some complaints that the 135 seconds is too long for drivers to wait on the Causeway. Locating the queue detector on Mandalay closer to the roundabout will reduce these delays. The metering signal will be called when the queue is shorter and requires less time to discharge, reducing the delay to the traffic on the Causeway. Delays to the Mandalay traffic will also be reduced.

The metering signal will therefore be called more often, but for shorter periods.

Several of the proposed modifications to the roundabout will also reduce queues on Mandalay.

- The removal of the accidents and confusion at the Coronado exit will make it easier to enter the roundabout from Mandalay and reduce its queues.
- The revised entry geometry on Mandalay has a larger radius and wider lanes. This will increase capacity and reduce its queues.
- The proposed signalized crossing on the Causeway will frequently stop Causeway traffic from entering the roundabout for short periods allowing queues on Mandalay discharge onto the roundabout.

The combined effect of these measures may significantly reduce the use for the metering signal on the Causeway.

The metering signal could be used to help emergency vehicles make a safe left turn out of East Shore onto the Causeway. See Chapter 14 on Emergency Vehicles.

12. LIGHTING

The lighting on the Roundabout is not to a sufficiently high standard and needs to be improved.

It should be upgraded to the standards recommended in the FWHA Guide and AASHTO for urban conditions.

They should apply to both the approach roads and to the circulating road of the roundabout.

Illumination should be adequate for both vehicles and pedestrians. Especial care should be taken to adequately illuminate pedestrian crossings.

13. LANDSCAPING

The palm trees and landscaping obstructs the visibility of cars by pedestrians and of pedestrians by drivers at various locations. By means of a site audit, after the roundabout has been modified, these locations should be identified and corrected especially near the existing, proposed and revised pedestrian crossings.

Some palm trees and some metal poles are located close to the roadway at locations where there is a possibility of vehicles mounting the curb (especially at exits). Any poles or light columns near the roadway should be the 'snap off' type that collapse on impact minimizing vehicle and driver injury or they should be moved.

Pedestrians are taking short cuts through the landscaping to cross at dangerous locations. This occurs close to the roundabout particularly on Coronado Drive and on the Causeway.

It is strongly recommended that the landscaping be upgraded to make it **impenetrable** to pedestrians on Coronado between the Roundabout and the pedestrian crossing and on The Causeway between the roundabout and the proposed split signalized crossing.

Rerouting the footway from Mandalay to meet Coronado at the pedestrian crossing will help reduce pedestrian jay walking.

It is also recommended that a new footpath be provided from the Marina Parking Lot to the proposed signalized pedestrian crossing on the Causeway. See Chapter 9 'Pedestrians'.

14. EMERGENCY VEHICLES

The roundabout has reduced congestion and travel times significantly even during Spring Break. However during peak holiday periods there are queues and delays that impede emergency vehicles. To mitigate this it is recommended that the median opposite East Shore be modified to allow emergency vehicles only to make a left turn from East Shore across the median.

Selective detection of emergency vehicles could be used to call a forced change to the Metering Signal and the Signalized Pedestrian Crossing to stop Causeway traffic. This would allow emergency vehicles to turn left safely onto the Causeway from East Shore without being delayed.

15. EDUCATION

When the roundabout is modified it will, to a large extent, teach drivers how to use it safely and comfortably.

If it is used incorrectly drivers will feel uncomfortable. If they use it correctly it will feel comfortable and more natural to drivers.

The original roundabout does not do this as drivers experience some difficulties and discomfort no matter how they negotiate the roundabout.

In order to remove current misconceptions and incorrect advice about how to drive the roundabout it is strongly recommended that a program be introduced to educate the public in the correct use of the roundabout. This can be done using newspapers, TV and video.

Schematic audio-visuals showing a birds-eye view of cars correctly negotiating the roundabout would be especially effective.

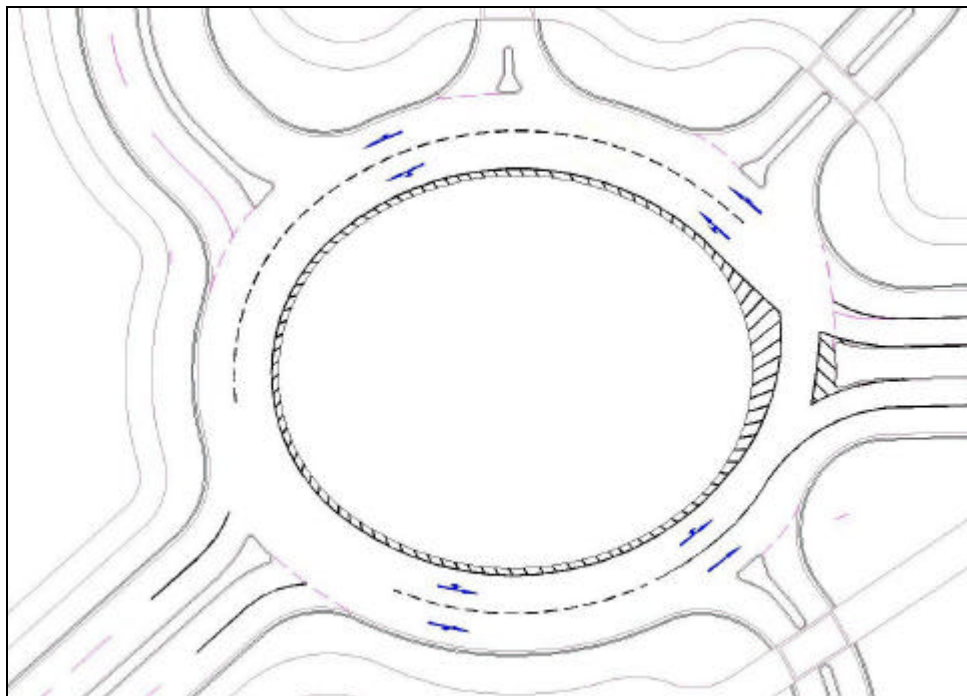
16. SUMMARY OF MAIN RECOMMENDATIONS AND PHASING

PHASE 1 Interim modifications to the Roundabout

1. Improve and enlarge the Direction Sign on the Causeway
2. Introduce a Direction Sign on both Coronado Drive and Mandalay Avenue.
3. Replace the Lane Use Signs on Coronado Avenue by two new sets.
4. Replace the Lane Use Signs on Mandalay Avenue by two new sets
5. Replace the Lane Use Signs on the Causeway by three new sets.
6. Paint 'S-Beach' and 'N Beach / S-Beach' on the lanes of the Causeway.
7. Raise the height of the Street Name Signs on the splitter-islands.
8. Introduce a chevron-type sign or similar on the central island opposite the Causeway entry to make the central island more visible at night.

PHASE 2 Interim modifications to the Roundabout (Follow phase 1 after 1-2 weeks)

1. Introduce a 2'-6" striped apron around the central island reducing the width of the inner lane to 13 feet.
2. Change the solid striping around the roundabout to dashed striping except from the Marina into the Causeway exit.
3. Widen the apron at the Causeway to provide a lane change and stripe in front of the Causeway median.
4. Introduce lane use arrows on the circulating road.



Interim Striping

PHASE 3 Full modifications to the roundabout.

1. Modify the geometry from the entry at Mandalay Avenue to the exit into Coronado Drive and revise the striping.
2. Widen the median on Mandalay to increase the entry path radius.
3. Relocate the pedestrian crossing on Mandalay.
4. Move the Bus Stop on Manadalay.
5. Enlarge the curb radius into the Mandalay exit.
6. Monitor the exit speed on Coronado and Mandalay. If the exit speeds are too high put the pedestrian crossings on a flat-topped speed tables.
7. Modify the entry and exit Geometry onto the Causeway and revise the striping.
8. Introduce a split signalized pedestrian crossing on Causeway and monitor the exit speed. If it is too high add a flat-topped speed table on the exit crossing.
9. Provide a median crossing on the Causeway for emergency vehicles from East Shore.

PHASE 4 Full modifications to the roundabout. (Follow phase 3 as soon as possible)

1. Re-stripe the circulating road with two 14 feet lanes, using a dashed line.
2. Center the lane use arrows on the circulating lanes.

PHASE 5 Full modifications to the roundabout (Follow phase 4 when possible)

1. Modify the entry geometry at Coronado Drive and re-stripe.
2. Modify the Access on Coronado to the Marina and make two-way.
3. Move the Bus Stop on Coronado into the Marina Parking Lot.
4. Modify the entry and exit geometry and splitter-island at Poinsettia Avenue.
5. Enlarge the curb radius on Poinsettia about 100 feet from the roundabout
4. Modify the lane widths, the splitter-island and the entry and exit radii at the Marina.
5. Sign the splitter-island at the Hamilton access indicating no through route.
6. Set back the splitter island in the Hamilton access
7. Monitor roundabout and reduce the Fountain Wall by two steps is if it is still a problem.
8. Review all sight lines and move offending signs and trees especially near pedestrian crossings.
9. Replace poles and column with 'snap off' type where appropriate.
10. Review and up grade the lighting on the Roundabout and on the approaches.
11. Improve the landscaping to provide effective pedestrian barriers on Coronado and the Causeway.
12. Promote a Education Program to teach the public how to drive the revised roundabout.

PHASE 6 Reduce the Queuing Back (Implement before the next holiday period)

1. Alter the Parking Lots so that drivers collect tickets and pay after they have parked
2. Immediately after the roundabout provide a 1 way curbed access road off Coronado to skirt and connect the parking lots on Coronado and Gulf view.

PHASE 7 Reduce the Queuing Back

1. Monitor the backing up during a high flow volume holiday period and if necessary modify the traffic signals at Coronado Drive and Gulf View or replace them with a one-way system using First Street.

APPENDIX 1 - ANSWERS TO QUESTIONS AND SUGGESTIONS.

The following is a list of answers the questions and suggestions raised by the public about the roundabout and associated traffic matters. They are arranged in the following groups;

1. GENERAL
2. ACCESS FROM THE MAINLAND
3. METERING CAUSEWAY TRAFFIC
4. THE NUMBER OF ACCESSES
5. ENTRY AND EXIT WIDTHS
6. LANE CHANGING AND EXIT CONFLICT
7. SIGNING AND STRIPING.
8. TRAFFIC SPEEDS
9. THE FOUNTAIN
10. PEDESTRIANS
11. TRAFFIC SIGNALS
12. PARKING
13. BYPASS LANES

1. GENERAL

Q1: “Acknowledge age and experience of drivers”

A1: The proposed revisions to the roundabout are designed to work well with both the elderly and with drivers who have no prior experience of roundabouts.

Q2: “Acknowledge the tourist make-up of drivers”

A2: The revised signing is designed to be clear and simple for tourists, The geometry is designed to control the speeds of high spirited drivers during Spring Break.

Q3: “Cite reckless drivers cutting in and out”

A3: The revised signing and geometry will virtually eliminate the need to change lanes within the roundabout.

Q4: “Disseminate pamphlets explaining how to navigate the roundabout”

A4: This is proposed in conjunction with the revised roundabout.

Q5: “Distribute movie of roundabout to hotels, motels, Chamber of Commerce”

A5: Moving graphics showing how to drive the roundabout could be made and distributed widely.

Q6: “Enforce traffic laws”

A6: The revised roundabout will greatly reduce the need or incentive for drivers to break the law.

Q7: “Give and go vs. yield to circle”

A7: It is essential that traffic yields to circulating traffic on the roundabout. ‘Give and Go’, where entering traffic has equal priority with circulating traffic is the mechanism of old ‘Traffic Circles’. They have very poor capacity and very high accident rates. The revisions to the roundabout will produce very low accident rates similar to other modern roundabouts.

Q8: “There is not enough open space for a successful roundabout”

A8: The size of the roundabout is adequate. The problems are caused by details that will be corrected by revision of the geometry, signing and striping.

Q9: “Remove the roundabout completely and return to basics”

A9: The strategic decision to build the roundabout was correct. The revised signing, striping and geometry will remedy the current problems. The roundabout will then operate as intended and will be better than the previous intersections. This will be done at a fraction of the cost of removing the roundabout and rebuilding the intersection.

Q10: “Consider alternative designs”

A10: Alternative design were originally considered and rejected. The relatively minor changes to the current design will resolve the current problems at a fraction of the cost and disruption of an alternative.

Q11: “The roundabout is not practical at this location”

A11: See Q9 above.

Q12: “Too much traffic makes roundabout impractical”

A12: The capacity of the roundabout is greater than the previous intersections. The traffic volumes entering the island during Spring Break were far greater than previous years yet the measured queues and delays on the Causeway were very much less than previous years. The capacity problem is not at the roundabout, but is caused by the backups onto the roundabout from the parking lots on Coronado and Gulf View. It is proposed to change the access and operation of the parking lots and to link them to reduce the backups.

Q13: “Too much emphasis place on beautification rather than safety”

A13: The safety problems on the roundabout will be remedied by modifications to the signing, striping and the geometry. This will have little impact on the aesthetics of the roundabout. Some palm trees will be moved to increase the visibility of signs and pedestrian crossings.

Q14: “Rank the needs of aesthetics, development, pedestrians and traffic”

A14: This is a political judgement. Pedestrian safety has been given top priority. The aesthetics have also been given a high priority. The unexpectedly large increase in traffic volumes has created an under provision for the car. The revised scheme will redress the balance between these competing needs.

Q15: “What can be done immediately”?

A15: See the recommended interim scheme on page 32 that revises the signing and striping.

2. ACCESS FROM THE MAINLAND

Q16: “Limit access to beach during peak times except to residents”

A16: This is a political decision. It would be difficult to provide a route for residents that would not be blocked by the queues of visitors during the holiday periods.

Q17: “Reduce the number of events on the beach during peak weekends”

A17: This also is a political decision. It would need careful analysis to examine the costs and benefits to the island.

Q18: “Limit delivery times”

A18: Delivery times could be limited during the peak holiday periods. However, this is not such a problem as the delay entering the island during the peak periods is an effective deterrent to delivery vehicles. There are no problems during the non-peak periods.

Q19: “A new bridge should not be built as it would only increase traffic”

A19: A major Transportation Study would be needed to determine the consequences of building a new bridge. It would have to be considered as part of a wider Structure Plan for the area and it would determine if more or less traffic was in line with its aims and objectives.

Q20: “Make Memorial Causeway a toll road to pay for bridge, ferries, and high speed transit”

A20: This is a political decision It would require careful examination as the revenue from a toll may be less than the loss of revenue to the island. Tourists may choose to visit alternative free beaches in the area.

Q21: “Build Roads for Emergency Vehicles”

A21: Building new roads is expensive and has environmental impact. The queues and delays on the revised roundabout will not be large and Emergency Vehicle will not be unduly delayed. The exception is during Spring Break when there are long queues on the Causeway. However, since the new roundabout, the observed queues on the Causeway have been significantly less than previous years even though the traffic volumes have been considerably greater. An left turn from East Shore onto the Causeway is proposed for emergency vehicle use only.

Q22: “Provide an alternative roadway on the Causeway for bus-only traffic”

A22: A ‘Park and Ride’ bus service from the mainland could be beneficial in the holiday periods. This would require the building a car park on the mainland and a ‘bus only’ lane on the Causeway. This would be expensive to build especially at the bridges. The buses would need extra large luggage racks to carry the ‘beach equipment’ of the visitors.

It is not certain how many visitors would be prepared to leave their cars and carry all their beach luggage onto a bus.

Q23: “Increase bus service”

A23: See Q22 above.

3. METERING CAUSEWAY TRAFFIC

Q24: “Place trained traffic policeman at roundabout, not Police Service Technicians”

A24: The police have been employed to meter the traffic onto the roundabout from the Causeway during Spring Break and other peak traffic conditions. The need to use the police for this function will be superseded by a proposed metering signal is on the Causeway near East Shore Road. This will automatically operate when traffic queues on Mandalay exceed a pre-set limit.

Q25: “How will the metering signal work”

A25: When a detector on Mandalay is triggered by the presence of a queue the Metering Signal will immediately stop traffic on the Causeway from entering the roundabout. This will allow Mandalay traffic to discharge. The signal will be timed to clear the queue on Mandalay. The proposed signalized pedestrian crossing on the Causeway together with the improvements to the roundabout geometry will increase the capacity at Mandalay. This will reduce queue on Mandalay and the metering signal will only be called at times of exceptionally high traffic volumes.

4. THE NUMBER OF ACCESSES

Q26: “Reduce number of access points”

A26: The roundabout has 6 legs. The Hamilton access can be discounted as it is only used a couple of times per week. The traffic volumes to and from the Marina are relatively small and closing it would provide little benefit to the operation of the roundabout. The proposed revision to the signing striping and geometry will be far more effective. The in only access to the Marina from Coronado could be made both in and out.

Q27: “Close the Marina entrance from roundabout”

A27: The revised signing and geometry will make access to and from the Marina safe and easy.

Q28: “Limit number of exits - four recommended”

A28: See Q32 and Q33 above.

5. THE WIDTH OF THE ENTRIES AND EXITS

Q29: “Cut the curbs, to allow easier access to and from roundabout”

A29: The curbs will be altered to provide wider entry and exit lanes. The entry and exit radii will also be increased. This will make it much easier to enter and exit the roundabout.

Q30: “Enlarge the on/off lanes”

A30: See Q35 above.

Q31: “Make ingress and egress points wider”

A31: See Q35 above.

Q32: “Increase the width of the lanes”

A32: See Q35 above.

Q33: “Widen off ramps”

A33: See Q35 above.

Q34: “Increase number of lanes”

A34: The number of lane is sufficient. Increasing the number of lanes would increase the accident risk. The proposed widening of the exit and entry lanes will make them more effective

6. LANE CHANGING AND EXIT CONFLICT

Q35: “Acknowledge that some drivers will not change lanes in the roundabout”

A35: The revised geometry, signing and striping will direct drivers into the correct lane before they enter the roundabout. Consequently, they will not need to change lane to reach their destination.

Q36: “Restrict right lanes to exit only lanes”

A36: This is not how modern roundabouts operate. The revised geometry, signing and striping will make the right turn exit from the inner lane natural and safe. The current conflicts and crashes will cease. (See page 10 ‘The exit onto the Causeway’ and page 13 ‘The exit into Coronado Drive’)

Q37: “Prohibit right hand turns from inside lane”

A37: See Q36 above.

Q38: “Install yield signs for right turns from center lane”

A38: See Q36 above.

Q39: “There are fears about using the inside lane and complaints that it is too difficult to change from the inside lane to the outside lane”

A39: The proposed modifications and striping will make it more comfortable to use the inside lane. There should be little or no need to change lane. However, in the exceptional case, changing lane will be a gradual and much easier maneuver, as the solid striping is to be changed to dashed striping.

Q40: “Record all accidents”

A40: The Police have recorded all accidents.

7 SIGNING AND STRIPING

Q41: “Improve signage for use of roundabout not simply increased signage”

A41: The new signs will significantly improve matters in conjunction with the revised striping and geometry. Better signing alone is not sufficient.

Q42: “Increase signage”

A42: The proposed modifications to the roundabout include a complete revision of the signage.

Q43: “More signage earlier on Causeway”

A43: The signing on the Causeway will be revised to give clear directions to visitors, informing them which lane they should use to reach their desired destination.

Q44: “Paint yield signs in roadway”

A44: There is no evidence of traffic failing to yield at the roundabout. However, the use of yield signs on the approach lanes is not uncommon at roundabouts and it could be introduced at the Gateway Roundabout.

Q45: “Place a stop sign in lieu of a yield sign at the roundabout entrance of the Causeway”

A45: There is no evidence of traffic failing to yield at the roundabout. Stop signs are never used on roundabouts, as the yield mechanism is their fundamental mode of operation.

Q46: “Should the proposed striping next to the central island be in the inner lane”?

A46: Yes. The traffic turning left past the Causeway exit must use the inner lane initially to avoid exit accidents. The striping creates a single lane between the central island and the Causeway that joins the inner lane to the outer lane.

Consequently, left turning traffic is safely moved from the central island to the outside of the roundabout without changing lane.

Q47: “Provide better line markings on lanes”

A47: All the lane markings will be revised.

Q48: “Should Coronado be signed as a double exit or should it be signed as a single exit”?

A48: It must be a double exit. About 70% of the traffic volume from the Causeway exits into Coronado and need to use both lanes to avoid a considerable increase in congestion.

8. TRAFFIC SPEEDS

Q49: “Install pavers in roundabout to slow traffic”

A49: Excessive traffic speed is not a problem on the roundabout. The observed speed is low. Paradoxically, the slow speed contributes to conflict and accidents at the Coronado exit. Widening the exit into Coronado and increasing the exit radius will sufficiently increase the speed of the circulating traffic so that it will exit into Coronado before vehicles from Mandalay can enter and cause conflict.

Q50: “Ribbed paving in roundabout to slow traffic”

A50: See Q49 above.

Q51: “Speed bumps in circle to slow traffic”

A51: See Q49 above.

Q52: “Enforce 15 mph speed limit”

A52: See Q49 above.

9. THE FOUNTAIN

Q53: “The Fountain is a distraction to drivers”

A53: The fountain wall is close to the edge of the central island and it is a distraction to drivers using the inner lane. It produces a canyon effect and drivers tend to shy away from the wall or use the outer lane even when it is inappropriate for their destination. The revised roundabout will have a striped apron around the central island that moves the inner lane 2’-6” away from the central island. This increases the distance from the fountain wall to the inside lane from 3’-0” to 5’-6”. This will make using the inside lane more comfortable and increase driver visibility. Consideration is being given to reducing the height of the wall by 12 inches by removing the two steps. Although this would be expensive it would remove the canyon effect.

Q54: “Is the fountain wall too high? Does it pose a hazard? What solution is recommended”?

A54: The fountain wall is 1.5 inches lower than the maximum allowed height and should not therefore be a safety hazard. See Q53 above for the proposed improvement.

Q55: “Remove the fountain”

A55: Removing the fountain would be very expensive and the aesthetic feature would be lost. Modifying the fountain would also be very expensive. See Q53 above for remedial measures

Q56: “The fountain center too big”

A56: See Q53 above.

Q57: “Increase visual distances”

A57: The proposed striped apron around the roundabout will increase the diameter of the roundabout by 5’-0”. This will move traffic away from the fountain wall making it more comfortable for drivers and will increase forward visibility. See Q53 above.

Q58: “Redesign the fountain for better visibility”

A58: The height of the fountain wall is within the visibility standard. See Q53 and 54 above.

Q59: “Increase circumference of roundabout for better visibility”

A59: The proposed striped apron around the roundabout will increase the diameter of the roundabout by 5’-0”. This will move traffic away from the fountain wall making it more comfortable for drivers and will increase forward visibility See Q53 and Q54 above.

10. PEDESTRIANS

Q60: “Cite jay walkers”

A60: There is a need to prevent jay walking. Effective pedestrian barriers should be installed. This would be best achieved by additional vegetation. Pedestrian barriers are recommended on Coronado Drive and the Causeway.

Q61: “Is there a need for better pedestrian access to the fountain”?

A61: Absolutely not. Pedestrians must not be encouraged to cross to the central island, as crossing the circulating road of a roundabout is extremely dangerous. Pedestrian routes are provided around the outside of the roundabout.

Q62: “Close pedestrian walkways close to roundabout”

A62: The large volumes of pedestrians need protection when crossing the high traffic volumes on the approach roads to the roundabout. Removing the crossings would increase the risk of pedestrian accidents. The provision for pedestrian is to be revised and monitored. The introduction of split signalized crossings is an alternative if backups persist as they cater for the needs of pedestrians while minimizing driver delay and backup.

Q63: “Remove pedestrian crosswalks near roundabout”

A63: See Q 62 above.

11. TRAFFIC SIGNALS

Q64: “Introduce Signal Control on the roundabout”

A64: This would create additional congestion. The revised signing, striping and geometry will resolve the problems far better than traffic signals.

Q65: “Install traffic lights at entrances to roundabout”

A65: See Q65 above

Q66: “Use turn signals & install signs to remind drivers”

A66: The proposed modifications to the roundabout include revision of the signing. The changes to the geometry and striping will cause the roundabout to operate as intended and there will be no need for traffic signals on the roundabout. Possible signalizing some of the pedestrian crossings will reduce blocking back and improve pedestrian protection.

12. PARKING

Q67: “Build parking garages”

A67: There is a real need to prevent the backing up onto the roundabout from Coronado and Gulf View. The report recommends an access off Coronado onto the first Parking Lot and that all the lots are linked. There is a need for additional parking spaces that could be provided by building parking garages. However, this is a long-term measure because of the time needed to finance and build garages.

Q68: “How difficult would it be to link the parking lots”?

A68: This would be very beneficial and should not be too difficult. See the discussion and recommendations on page 20.

13. BYPASS LANES

Q69: “Build by pass lanes north, south and east”

A69: Bypass lanes are not needed as the roundabout has sufficient capacity. The congestion at the roundabout is caused by the blocking-back from the Parking Lots on Coronado and Gulf View and by the exit conflict into Coronado. The

proposed revisions to the roundabout and the Parking Lots will increase capacity. The bypass lanes would have limited benefit as they would only carry about one third of the approach traffic. They would allow vehicle speeds that would be a danger to pedestrians. The additional ROW would be considerable and they would detract from the aesthetics of the landscaping

Q70: “What is wrong with the design provided in the St Petersburg Times”?

A70: The bypass lanes would only carry about one third of the approaching traffic. They would allow vehicle speeds that would be a danger to pedestrians. The single lanes at the roundabout would have to accommodate two thirds of the traffic and this would cause extreme congestion.

Q71: “Create one-way access road from Causeway to North Beach”

A71: One-way access roads are bypass lanes. See Q70.

Q72: “Create one-way access road from North Beach to South Beach”

A72: One-way access roads are bypass lanes. See Q70.

Q73: “Create one-way access road from South Beach to Causeway”

A73: One-way access roads are bypass lanes. See Q70.

Q74: “What is the feasibility of a straight-line link from north beach to south beach”?

A74: This is a bypass lane. See Q70.

APPENDIX 2 - LANE USE SIGNS

1. CORONADO DRIVE



The sign is 4 feet tall and 3 feet wide.

2. MANDALAY AVENUE



This sign is 4 feet tall and 3 feet wide

3. THE CAUSEWAY



This sign is shown 4 feet tall and 3 feet wide. However as space permits it could be made larger to be more conspicuous to visiting drivers.

Four identical signs are needed on each approach road and are to be placed in pairs with one on the sidewalk and one opposite on the median strip.

APPENDIX 3 – THE CAUSEWAY ADVANCED DIRECTION SIGN



The lettering on the sign should be as large as possible and be between 3 and 12 inches tall.

The primary destinations, Coronado and Mandalay, are depicted by wider road widths and longer road sections. The lettering for the primary destinations can also be larger than the secondary destinations.

The size of the sign should be larger on the Causeway than on Coronado or Mandalay

APPENDIX 4 - CAD DRAWING OF MODIFIED ROUNDABOUT

FINAL LAYOUT

