GPI Greenman - Pedersen, Inc.
Engineering and Construction Services

REF. MAX-2009027.00

September 26, 2011

Mr. Thomas Broderick, PE
Acting Chief Engineer
Massachusetts Department of Transportation
Ten Park Plaza
Boston, MA 02116

ATTN: Mr. Thomas Currier, P.E., Project Manager

SUBJECT: Project Number: 604813
Oak Bluffs – Intersection Improvement Project
Edgartown-Vineyard Haven Road at Barnes and Airport Road
September 10, 2011 - Questions from the Martha's Vineyard Commission

Dear Mr. Broderick:

On September 26, 2011, GPI received additional questions from the Martha's Vineyard Commission pertaining to the design of the roundabout at the above location. Many of these questions have been addressed at various public presentations or through previous correspondence. However, for clarity, the following responses have been compiled.

1. Layout and Dimensions

a. What are the diameter of the inner planted circle, the inner circle including the apron, and the outer diameter of the circular travel lane, and the outer dimension of the paved area with shoulders?

MassDOT Response:

- *The inner planted island is a 40' Diameter with a 12' Stamped Brick Apron resulting in a 64' inner circle.*
- *The pavement on the travel lane is 20' curb to curb and striped to 17'.*
- *The physical "outer circle" is 110' diameter, the "outer striped circle" is 100' diameter.*

b. Did the roundabout's diameter increase from the initial concept? Is so, why? How was the design speed affected?

MassDOT Response:

- *The diameter of roundabout has not changed since the 25% Design Plan.*
- *There may have been changes to the diameter from concept plans presented prior to the 25% Design. Any changes are a result if current design standards and practices associated with roundabouts.*
- *The roundabout continues to be designed for a 20 mph design speed.*

c. Are there any minimum height standards for grade on the center island and are there maximum height standards for vegetation or other features in the center island? Is it correct that it is not necessary to be able to see directly opposite the center island, so tall vegetation can be acceptable?

MassDOT Response:
It is not necessary to see across the roundabout. The required sight lines are provided looking to the left along the approaches to the roundabout. In addition, sight lines are provided throughout the circulating roadway. The 2010 MCHRP Report 672 cites the Wisconsin DOT's recommendation of a minimum 3.5' to maximum 6.0' elevation of the center island. This can be accomplished through vegetation or grading. However, it is critical to maintain adequate sight lines throughout the circulating roadway. Currently we are proposing low lying (approximately 3') vegetation on the center island. (Shrubs etc.)

d. Show the existing and proposed layout together in a way that allows for clear comparison, such as with an overlay, that makes clear what areas that are now vegetated will become hard surface, and vice versa. (The comparison shown was misleading in that the aerial photo of the existing situation showed the roads in black whereas the proposal showed them in light grey, making them look more prominent.)

MassDOT Response:
A revised plan showing the roundabout as an overlay is attached.

e. What is the total area that is hard surface: asphalt, concrete, crushed stone, etc. (Please use the same limits for the three calculations)

MassDOT Response

	Existing	Proposed	No Bus Stop
Roadway	37,030 SF	40,424 SF	40,424 SF
SUP (Bike/SW)	7,655 SF	8,584 SF	8,584 SF
Sidewalk	-	3,749 SF	-
Bus*	-	3,749 SF	-
TOTAL	44,685 SF	57,166 SF* (53,417 SF w/o crushed stone)	49,008 SF
Change	-	12,481 SF 8,732 SF* change in impervious area	4,323 SF

**Note:* Bus Stops are proposed as crushed stone and are not considered a "hard surface" as they allow drainage.

2. Safety

a. The applicant presented information on many studies comparing the safety of roundabouts and traffic lights or generic intersections. Are there statistics specifically referencing four-way stops?

MassDOT Response:

While there is still limited data pertaining to safety improvements associated with converting a 4-Way or All-Way STOP controlled intersection to a roundabout, there have been some recent studies including the 2007 NCHRP Report 572 and the more recent NCHRP Report 672 that indicate that there is no statistical change in safety between a four-way stop intersection and a roundabout.

However, the 2010 NCHRP Report outlines a methodology to predict the number and severity of crashes between various control measures including 4-way STOP and roundabouts. Based on the methodology in Chapter 5 of NCHRP report 672 as well as the historical crash data and volumes at the study intersection the following safety improvements are anticipated with a conversion from the current 4-way STOP control to a modern single lane roundabout.

	All Way STOP	Roundabout	Change (#)	Change (%)
Total Anticipated Crashes	4.24	3.46	-0.77	-18.3%
Total Anticipated Injury Crashes	1.06	0.42	-0.64	-60.2%
Total Anticipated Non Inj. Crashes	3.17	3.04	-0.13	-4.2%

The above calculations were based on off-peak volumes and it would be anticipated that additional improvements would be recognized if summer volumes were utilized. Based on FHWA Crash Costs of $15,953/Non Injury Crash and $297,561/Injury Crash the anticipated ANNUAL ECONOMIC SAVINGS IS $192,532/yr by converting to a roundabout.

In addition, with a roundabout the potential for crashes is greatly reduced. With a four-way intersection there are 32 potential conflict points (merges, diverges, crossing movements, etc.) while a single lane roundabout only has 8 potential conflict points.

The NCHRP Report 672 also discussed pedestrian and bicycle safety at roundabouts vs. all-way stop control. A pedestrian crossing a single leg of a 4-way intersection has potentially 4 conflicts with vehicles (left, right and through movements from the intersection as well as the approaching vehicle). However at a roundabout, pedestrians are faced with only two conflicts crossing the entire leg. Furthermore, with the presence of the splitter island, the two conflicts are further reduced to a single conflict at a time. In addition, one of the most dangerous crossing movements of a STOP controlled intersection is eliminated with a roundabout. At STOP controlled intersections (or signalized locations with Right on Red), the driver of a vehicle turning right is often only looking for traffic approaching from the left and is not aware of pedestrians (or bikes) in the crosswalk to the right (or in the adjacent shoulder in the case of a bike) and will proceed to turn right into the pedestrian in the crosswalk (or into the adjacent bike).

3. Bus Stops and Sidewalks

a. What is the cost of providing bus stops and other improvements required by the presence of these bus stops, such as platforms, sidewalks, etc.?

MassDOT Response:
This issue was addressed in the August 26, 2011 letter to the MVC. The bus stops are still being designed. At this time the costs associated with the bus stops and associated sidewalks are approximately $50,000-$70,000 or about 5%-7% of the total construction cost.

b. Does GPI or MassDOT have examples of other roundabouts of similar size and settings where bus stops have been incorporated as proposed for the Oak Bluffs' facility?

MassDOT Response:
With over 2,500 roundabouts throughout the United States, there are likely locations where bus stops are present along the approaches to the roundabout. However, it is beyond this project to research this data. The current intersection functions as a major terminus and transfer location for the existing transit operations. Therefore, unless the Transit Authority has plans to significantly modify the bus routes and/or stop locations the design must maintain the existing service. Currently the bus stops have been designed as a crushed stone/gravel pervious material. This will reduce the pavement width and impervious area as well as maintain a consistent roadway gutter line along the approaches to the roundabout.

c. Some existing roundabouts in rural settings do not include pedestrian crosswalks. Even some signalized intersections to not have crosswalks at all approaches. If there were to be no bus stops at the proposed roundabout, what are the criteria for determining when a crosswalk is needed for a given approach? Can crosswalks be provided without providing sidewalks?

MassDOT Response:
The sidewalks are provided for two purposes. Primarily they are provided to provide ADA access between the bus stops. Secondarily, they are provided should the Town at some point pursue sidewalks along any of the other roadways. If the bus stops were relocated or not present at the intersection, the sidewalks could be eliminated. However, since the SUP runs along the southerly side of the intersection as well as along the westerly side of Airport Road, the sidewalk/SUP shown on the plans in these areas would remain as would the crossing of Airport Road.

As was previously stated in the August 26, 2011 letter to the MVC crosswalks cannot be provided without ADA compliant wheelchair ramps and sidewalks.

d. Instead of providing bus stops at the roundabout, primarily to allow transfers between lines, would it be possible to have the bus transfer point take place at or near the High School. This would appear to offer several advantages.

- Although this would involve a short detour for some of the buses on Barnes Road, it would provide direct service for people taking these buses to the main destinations in the area – the High School, Community Services, Y, Arena, and Island Elderly Housing – without people having to either transfer buses or walk about half a mile.
- Depending on the layout, it could let the transfers take place without anyone having to cross the street.
- It would take the bus stops and transfers away from the roundabout. This would avoid the need to expand the cleared area of the roundabout approaches for wider pavement and required sidewalks, which is counter to the aim in roundabout design of narrowing motorists' visual field to help slow traffic approaching and exiting the roundabout. Also, it would help avoid the impact on the potentially small-scale, rural character of the roundabout that would result from the bus pull-offs, associated sidewalks, granite curbing, extra signage, and possibly extra lighting.

MassDOT response
As has repeatedly been discussed, the bus stops are an existing condition that must be retained unless an alternative plan is in place and presented to MassDOT and GPI. Ms. Angela Grant of the Vineyard RTA has said the intersection is a natural place for passengers to switch routes and that relocating the transfers elsewhere is not practical from a scheduling and passenger convenience standpoint.

4. Shared Use Path (SUP)

a. How are cyclists on the SUP to behave when approaching and crossing the south crosswalk? Are they expected to walk their bikes?

MassDOT Response:
As with any at-grade crossing, cyclists are expected to walk their bikes across the road if they choose to cross Airport Road as a pedestrian through the crosswalk.

b. Some members of the public have advocated for a speed table at the crosswalk on the south approach to make drivers more aware of the presence of the SUP. Is the plan to incorporate a speed table in the Oak Bluffs roundabout? If not, why?

MassDOT Response:
Speed Tables and/or Raised Crosswalks are not typically used at roundabouts. Based on the 2010 NCHRP Report 672 "For pedestrians, the risk of being involved in a severe collision is lower at roundabouts than at other forms of intersections due to slower vehicles speeds. Likewise the number of conflict points for pedestrians is lower at roundabouts than at other intersections, which can lower the frequency of crashes. The splitter island between entry and exit also allows pedestrians to resolve conflicts with entering and exiting vehicles separately."

The report further states… "as drivers accelerate through the [all way stop] intersection the danger to pedestrians is greater at the far side of the intersection, whether drivers are going straight or turning. In addition, many drivers roll through stop signs at all way stop controlled intersections once they have perceived that there are no imminent vehicle conflicts. These drivers may occasionally fail to notice pedestrians crossing at the intersection."

As was previously stated, drivers on the roundabout will have a clear view of pedestrians in the crosswalks, as the crosswalk is directly in the line of sight of the driver as they either approach or exit the roundabout.

Based on the visibility of the crosswalk from the drivers perspective as well as the fact that vehicles will be slowing to enter or exit the roundabout, a raised crosswalk would not provide additional benefits. In fact, the raised crosswalk could present a mixed message to cyclists. Since the SUP and crossing would be at the same grade, it may not be as readily apparent to a cyclist that they are crossing an active roadway. The cyclists could potentially ride into the roadway without stopping. A change in grade and clear crossing would reinforce the need to stop and look for conflicting traffic before proceeding.

c. The purpose of pulling the SUP on the south side was to have it "in the woods" behind existing trees, to minimize the visual impact of the roundabout. The Land Bank's authorization of relocating the SUP is based on the assumption that most existing vegetation would be preserved. The current proposal seems to call for cutting all trees between the SUP and the roundabout, with "perhaps" the possibility of planting new trees later. Also, the shape of the path is very rigid. Could this be clarified? Is this needed for construction reasons or to provide adequate sight lines? Could the final alignment of the SUP be a smoother geometry that is adjusted to avoid as many trees as possible, and can all the existing trees between the SUP and the road be preserved? If not, it might be necessary to reconsider the alignment of the SUP.

MassDOT Response:
As was outlined in the August 26, 2011 letter, the path alignment is still being refined and every effort is being made to retain as many trees as possible. The plans do not call for cutting all trees between the SUP and the roadway. Only those trees that are directly impacted by the path relocation are proposed to be removed. Furthermore as the design and construction progresses every effort will be made to save as many trees as possible.

The shape of the path was revised based on comments from the MVC Staff to pull the path away from the road as much as possible. The alignment has also been modified based on a site visit and inventory of existing trees, in order to minimize the number of trees impacted by the path alignment.

d. A member of the public suggested that it might be necessary to later add traffic lights to the roundabout in order to provide adequate safety for pedestrians and bicycles crossing, which will turn out to be unsafe as presently designed. Is this a possibility? Are you aware of this happening anywhere?

MassDOT Response:
There is no data supporting the need to install traffic signals to provide safe crossing for pedestrians or bicycles at roundabouts. In fact, the recent NCHRP reports indicate that pedestrian crossings are generally easier and crashes between pedestrians are reduced at roundabouts.

The 2010 NCHRP Report 672 does discuss the need for traffic signals at roundabouts for pedestrian crossings. The following is an excerpt from that portion of the study…

"Signalized pedestrian crossings may be beneficial at roundabouts under at least the following conditions:

- *High vehicular volumes. In areas with high vehicular volumes and moderate pedestrian activity, the number of available gaps for pedestrians to cross (assuming no vehicular yielding) may be insufficient for the volume of pedestrian traffic. In these cases, a pedestrian signal meeting the traditional MUTCD pedestrian signal warrants may be beneficial.*
- *High pedestrian volumes. In areas with high pedestrian volumes, continuous or frequent pedestrian crossing activity can have a significant negative impact on motor vehicle capacity. In these situations, it may be appropriate to install pedestrian signals to meter the flow of pedestrians, allowing motorists to clear the crosswalks to enter and exit the roundabout.*
- *Accessibility at more complex crossing situations. At most roundabouts, most pedestrians have little difficulty crossing the roadway due to the pedestrian features provided (as described in Chapter 6). However, as the number of lanes increase, the task of crossing becomes more complex for pedestrians and potentially impossible for pedestrians with vision impairments (see Chapter 2). Signalization of crosswalks is one possible treatment for improving the consistency of motorist yielding and the ability of all pedestrians to identify that it is safe to cross, particularly those with vision impairments. The current draft PROWAG includes a requirement to install accessible pedestrian signals at all crosswalks across any roundabout approach with two or more lanes in one direction. The PROWAG requirement does not specify the type of signal except that it must be accessible, including a locator tone at the pushbutton and audible and vibrotactile indications of the pedestrian walk interval."*

None of these are applicable at this location.

5. Lighting and Landscaping

a. When are landscaping and lighting plans expected to be available for MVC review? The MVC sometimes approves a DRI with the condition that it approve the final landscaping and lighting plans by a specified date or before certain permits can be issued."

MassDOT Response:
As has been discussed previously, the Landscaping and Lighting Plans are being developed as part of the overall design. The 75% Design is currently being developed and is anticipated to be submitted to MassDOT for review in October 2011. As part of the review process, plans will be forwarded to the Town for review and comment. After the 75% submittal there are additional submittals and opportunity for review as part of the 100% and Final Design submittals.

b. Is there a possibility that in addition to the four lights at the corners, additional lights will be needed at the bus stops? If lights need to be added later to the bus stops, who would pay for them?

MassDOT Response:
There is a Lighting Engineer on the design team and formal lighting plans are being developed. The current design is to maintain the existing conditions to the maximum extent possible while providing sufficient lighting to illuminate the roundabout, and not to add additional lighting along the approaches or at the bus stops. If the Town or MVC feels that additional lighting is required, these elements can be added.

c. What is the landscaping budget? Will this be adequate to provide the kind of restorative native landscaping that would be appropriate here?

MassDOT Response:
There is no separate budget established for landscaping. However, there is a Landscape Architect on the design team and the landscape plans are being developed in coordination with representative from the Town of Oak Bluffs including Michael Dutton (former Town Manager) Duncan Ross, John Wojkielo (the high school's horticulture teacher), and Riche Combra.
The Town and MVC can comment on Landscape Elements as part of the Design Review. In addition, the plans will be reviewed by MassDOT's Landscape Section. MassDOT is committed to continue to design this project and will continue to solicit the comments from the Town and the commission on the design as it evolves.

6. Smart Lights

a. Several members of the public proposed using a "smart light", a traffic light that would be controlled by computers, cameras and road sensors – automatically changing the light so approaching cars would have a green light – as a better way to get traffic moving smoothly. Could a professional engineer comment on the feasibility of this proposal?

MassDOT Response:
Traffic signals have been "smart" for decades and are all designed to adjust signal times based on traffic demands. As has been repeatedly discussed, there have been numerous reports dating back for nearly a decade that examined this intersection and evaluated various improvement and intersection control options. Studies from MS Transportation as well as the MVC Staff and the GPI Functional Design Report all came to the same conclusion, that a roundabout was the best alternative for this intersection.

As was previously stated in the August 26, 2011 letter and September 1, 2011 presentation…

- *Based on the MUTCD Section 4B.04 Alternatives to Traffic Control – "Since vehicular delay and the frequency of some types of crashes are sometimes greater under traffic signal control than under STOP sign control, consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied."*
- *Furthermore, Section 4C.01 Studies and Factors for Justifying Traffic Control Signals states "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." "A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection."*
- *Based on National Cooperative Highway Research Program (NCHRP) reports roundabouts reduce collisions by approximately 60%-67% when compared to a signalized intersection.*
- *Therefore, it does not make sense to eliminate the "safest" improvement option in lieu of signals, which have been shown to have an increased crash rate.*

We consider our comments at the several hearings to be as valid as our written responses in these emails. The public hearings are recorded verbatim. We hope these responses clarify the benefits associated with the roundabout project. Should you have any questions or require additional copies of any of the above materials please contact call Mr. Thomas Currier, MassDOT Project Manager at (617) 973-7244.

Very truly yours,

GREENMAN – PEDERSEN, INC.

John W. Diaz, PE, PTOE
Vice President/Director of Traffic Engineering

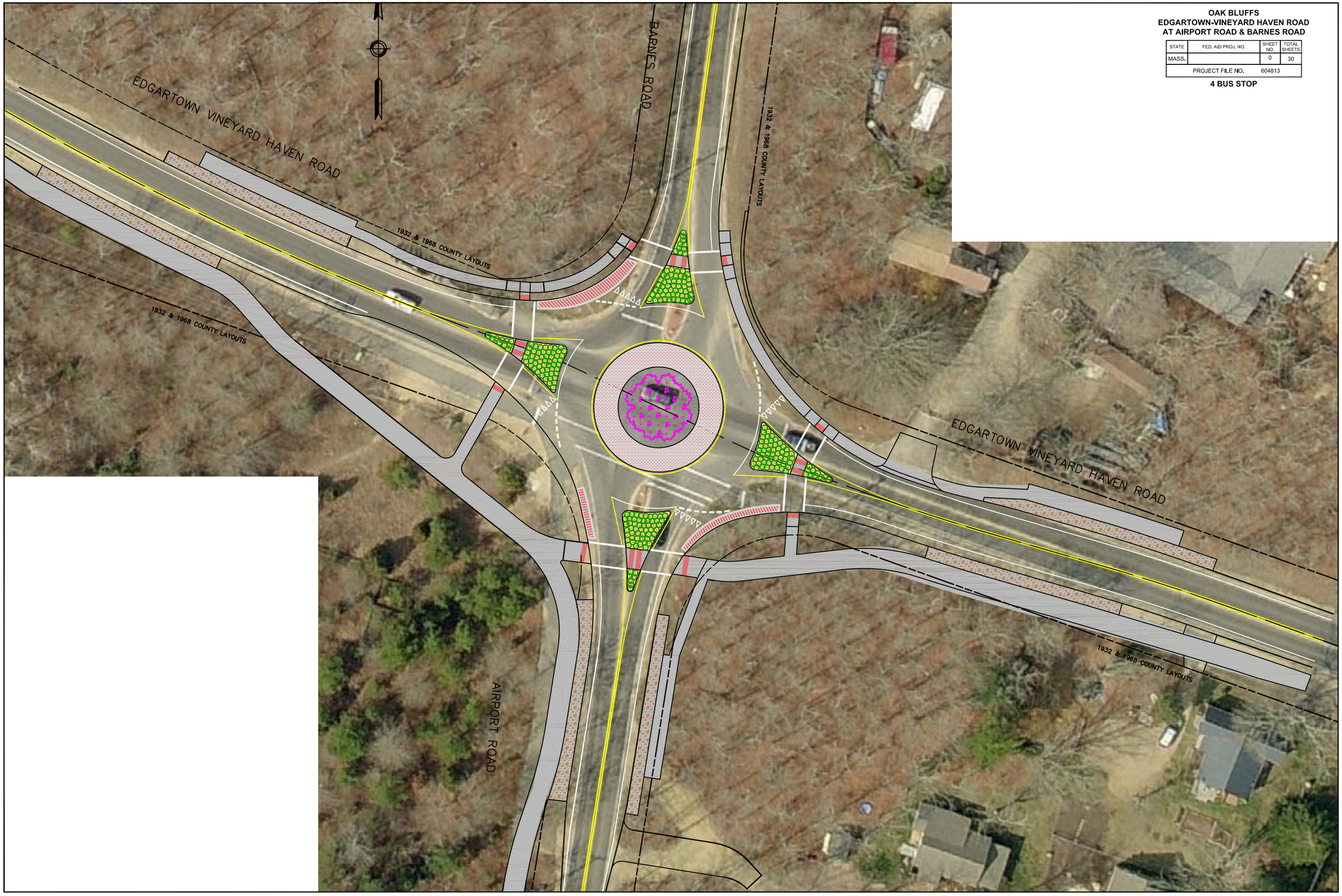
Attachments

c. Richard Combra, Town of Oak Bluffs (via email)
William Veno, Martha's Vineyard Commission (via email)
Paul Foley, Martha's Vineyard Commission (via email)

OAK BLUFFS
EDGARTOWN-VINEYARD HAVEN ROAD
AT AIRPORT ROAD & BARNES ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		0	30
PROJECT FILE NO. 604813			

4 BUS STOP



IN CHARGE OF JWD
DESIGNED BY JFO
DRAWN BY JFO
CHECKED BY GJH/JWD

Safety Performance Calculations* for Converting a 4-Way STOP to a Roundabout

*Based on Calculations and Methodology from NCHRP Report 672-Roundabout an Informational Guide - 2nd Ed. (2010)

Historical Data for Oak Bluffs Intersection

3 year crash data (2006-2008)

Injury Collisions:	3	Annual Growth Rate (%):	1.5%
Property Damage Collissions:	9	Existing Entering AADT:	15204
Total Collisions:	12	Future (2030) Entering AADT:	17485
Number of Years of Data:	3		

	All Way STOP	Roundabout	Change (#)	Change (%)
Total Anticipated Annual Crashes:	4.24	3.46	-0.77	-18.3%
Total Anticipated Injury Crashes:	1.06	0.42	-0.64	-60.2%
Total Anticipated Injury Crashes:	3.17	3.04	-0.13	-4.2%

Based on FHWA Costs used in NCHRP Report 672

Cost of Non-Injury Crashes:	$	15,953.00
Cost of Injury Crashes:	$	297,561.00

Annual Economic Benefit (Savings) : $ 192,531.61