

October 7, 2013

R. Alan Holbach, Director
Charlotte County Public Works Department
7000 Florida Street
Punta Gorda, FL 33950

Dear Mr. Holbach,

The following is a summary report of my September 11, 2013 site visit to assess the unpaved Charlotte County roads of Don Pedro and Knight Islands, with recommendations for future maintenance. It was a pleasure to visit the County and this portion of the southwest Florida coast and to meet with representatives of the County, the MSTU Advisory Board, and the contractor currently responsible for performing road maintenance on the islands. It is my belief that much has already been accomplished to get all of the stakeholders on the same page, and the test strip installed on Bocilla Drive, where alternative material was used, is an example of this progress. As I am sure that you are aware, the circumstances that exist on this group of barrier islands with the typical flat topography, dense residential development, a privately controlled water crossing, as well as a lack of locally available quality road aggregate, make the maintenance of these unpaved public roads a challenge. As I mentioned to Mike Dallenbach during the morning road tour, to a large degree the situation here is pretty much the opposite of "road maintenance 101."

As mentioned previously, aside from the materials and practices presented in this report, a significant consideration to note when making recommendations for public road maintenance is the importance of open dialogue with an attempt to get all the stakeholders on the same page. This most often generates maximum "buy in" to the work being performed and satisfaction with, or at least an understanding of, the results. If my visit did nothing more than initiate dialogue, and possibly the test strip on Bocilla Drive, it is likely time and money well spent.

Per my notes, those present on the day of the site visit were Tim Malone, Vice Chair of the DP and KI MTSU Advisory Board, Dawn Harrison, Municipal Services District Rep. for CCPW, Tim Howard and Jean Matz with General Contracting Services, Inc, who presently hold the contract for the island road maintenance, Mike Dallenbach, Maintenance and Operations Road Superintendant for CCPW, and Ray Slade, Contract Foreman/Inspector with CCPW. Initially the basis of our discussion focused on the material recently used to resurface the island roads during previous maintenance cycles, specifically the material that was used earlier in the year that was referred to as both silt and morrow and the washed shell and sand more recently placed on Bocilla Drive. From my discussions and review of documents, it was the use of the finer grained silt or morrow and the resulting pot holes, ponds and dust that spurred complaints from the island residents. This initiated a change order to the maintenance contract to install a test strip of an alternate surface of washed shell with a finer "beach sand" top course. A detailed specification was not available for the silt that was used, but it is important to note that this material has a considerably finer texture than both the shell and sand being tested, and while it may be predominately silt, there is a reasonable possibility that a significant percentage of clay is also present in the mix. The presence of finer silt and clay particles in a soil will slow the infiltration rate of water passing through the material and increase surface water retention time when compared with an open graded material such as sand or washed shell. This distinction becomes important when considering how these island roads must function as both travel ways and drainage basins (i.e. leach beds), unlike other municipal roads and streets with asphalt or concrete pavements and integrated drainage systems.

Aside from the considerations involved in selecting a base and/or surface course for the maintenance of the island roads, the group also discussed and assessed processes and practices that have the potential to improve storm drainage within the road corridor, lengthen or more effectively time maintenance cycles, reduce the cost of cyclical maintenance, and spread road improvements equitably across the MTSU, with the goal of a satisfactory road network for island residents. The following are specific recommendations that came out of the discussion and observations during the meeting:

- Continue to use the washed shell and “beach sand” specifications in the same cross section design as was utilized on Bocilla Drive, which according to Addendum No. 2 of the Knights Island Road Grading bid document is a 4” to 6” deep placement and according to Tim Howard of General Contracting Services, Inc. is a 4” lift of washed shell topped with a 2” lift of “beach sand.” The washed shell was described as a “single washed shell” versus a “double washed shell” that is commonly used on golf course cart paths, implying that this is a dirtier product with more fines retained in the mix. This is acceptable, and may even be preferred over a cleaner shell mixture, as it will provide both porosity to absorb water until leaching and evaporation can occur as well as increase interlock in the base course making it less likely to deform under heavy traffic loads such as construction equipment and garbage trucks (vs. a cleaner shell). The “beach sand” is acceptable whether or not it meets the 250 Sand specification, so long as it “chokes” the underlying shell base to prevent excess movement under traffic and creates a smooth driving surface that can be graded to the desired road shape. Generally I would recommend the use of the hardest shell available, but it has come to my attention that the use of certain gradations of very hard shell can result in punctures of golf cart tires. The best that I can suggest is to locate and use a source of the hardest “fossilized” shell possible, short of being a tire liability.
- To promote storm water infiltration and to avoid contamination of newly imported material, remove any notable deposits of the bank-run silt material to the limits of the right-of-way. A notable deposit is defined as any area where a crust of this material is observed on the road after drying of the surface. To limit costs involved with the removal of the silt, permission might be sought from the Gulf Intracoastal Waterway authorities to waste the removed material on their island properties, or possibly dispose of this material on another public site on the island. If this is not possible, the dirt could be back-hauled to a site on the mainland during transport of new material to the island.
- To further aid in infiltration, scarify all potholes within the right-of-way to a depth of 1” to 2” below the base of the hole. A carbide toothed grader blade will perform this function on shallower potholes. However, with the dimensions of some of the holes observed on the island, a grader mounted scarifier, or the scraping of individual holes with a backhoe or excavator may be more appropriate. This process should be done prior to grading/re-shaping of the roadway.
- Define the limits of the cartway (road surface to be utilized by vehicular traffic) during the grading and replenishment process. For these island roads a maximum cartway width of 18’ is very reasonable. Shaping of the cartway and the placement of new shell and sand should occur down the middle of the road, using the edges of the road (shoulders) to harvest material to build and shape the road grade. More on this process is outlined in the following bullet points. Proper road shape with positive drainage is more difficult and more expensive to maintain the wider the road gets. Some road departments utilize vegetation and other physical barriers to control the portion of the road corridor which traffic can access. However, with the popular use of small and easy to maneuver vehicles on the island and the requirement that equipment be able to access the full width of the road corridor to recover displaced road material during

multiple maintenance cycles annually, a physical barrier option is not feasible in this situation. The goal is to elevate the 18' cartway higher than the road shoulder and create a free draining base, so standing water is eliminated from the travel way and the road resists deformation, encouraging vehicles to stay on this portion of the corridor.

- To elevate the road and define the cartway, existing suitable material should be harvested within the road right-of-way, which I understand to be 50' on all the county sand roads on the island.
- Remove any sandy berms that have developed along the roadside to encourage potential sheet flow away from the road corridor and reuse this material to build the cartway alignment. Grade shallow roadside swales along the periphery of the road shoulders by removing roughly 2" of existing sandy material and add this to the cartway alignment also. With the cartway comprising approximately 1/3 or less of the available right-of-way there should be a reasonable amount of space to allow for discretion regarding the depth and width of cut in creating the swales to generate material and to form street side infiltration basins. Note that the infiltration swales are located in the road cross section where the typical parallel road ditch would be. However, the swales are shallower and need not have linear grade as the main purpose is to percolate drainage rather than transport it to an outlet point. I had the opportunity to witness a storm event with rainfall in excess of 1" during the early part of my stay and I believe that if the swales remain native sand and are kept free of undesirable material the large majority of storm events will infiltrate well within the 72 hour period for allowable standing water. This assumption is supported by conversations with island residents.
- During the creation of the cartway and swales the linear grade of the road should be smoothed where notable undulations have developed. This is especially evident on South Gulf Blvd.
- My suggestion is to build and maintain the cartway to a center-crown road shape with a 4% side slope (roughly 1/2" of fall per foot of road width from the centerline). Once the road is shaped, follow up with vibratory roller compaction using a smooth drum roller (of the cartway only). Place and grade roughly 4" of the washed shell base to reflect the center-crown shape built into the subgrade. Cap the shell with a 2" lift of "beach sand" or the 250 specification, continuing to reflect the center-crown during the grading process. Set the top course by compacting (static only) the entire width of the cartway (cartway only). Begin along the outside edge and work up to, but not directly over, the centerline (allow the drum to extend over the centerline a few inches with free air space below). Note that the 4% side slope is approximately twice the crown used on asphalt or concrete pavements.
- On the narrower island roads, such as the southern end of Kettle Harbor, use berm removal, material harvesting and imported road material to fill to the extent of the existing road edge, so that drainage sheet flows off of the road completely.
- Use innovative practices to control traffic and vehicular access to reduce the total area requiring cyclical maintenance and to increase infiltration potential. An example would be to narrow the turn radius at an intersection such as the one at Bocilla Drive and Kettle Harbor Drive by changing the location of the street sign from the north side of the intersection to the south side and placing a stone or stump behind it to prevent traffic from short cutting the turn and continuing to widen the road in this area. By first removing the significant layer of silt, or morrow, which is currently lining the bottom of a large pothole that has formed here and scratching the bottom of the hole, the area that is placed off limits to traffic can be utilized as a drainage infiltration basin. Similar areas might be developed/set aside where the roads have widened dramatically as a result of unconstrained traffic swerving to avoid potholes on the travel way.

- Because both the native island sand as well as the imported sand and shell lack significant fines to fill the air voids of the composite mixture (i.e. – create tight interlock or act as a binder), these roads will never reach maximum density and they will be more subject to displacement and deformation by traffic and erosion. This is the trade off that allows for a porous corridor that must function as both a road and a stormwater basin. Therefore, these roads will require more frequent and/or more effectively timed grading cycles than a compacted aggregate surface with a well-graded particle size distribution. Rather than performing a set number of grading cycles fairly evenly spaced throughout the year, a more effective approach might be to grade more often during those times when the road is stressed (potentially during seasons when the roads see more traffic, or during rainier periods) and less often when there are fewer factors converging that affect road stability. Although it is not specifically spelled out in the ordinance that established the MTSU Advisory Board, might it be possible to add the responsibility of recommending the timing of grading needs to the Board’s mission (maybe it is already in force under Issue no. 1 of the recommendations section?)? Additional grading/replenishment cycles could be another approach, at a greater maintenance expense, should this be desired and approved within the taxing unit.
- The relatively low density of the sand roads is often most evident where these roads interface with asphalt surfaces, which is most common at intersections. Vehicles leaving the dense paved surface onto the sand experience varying degrees of “axle hop” which causes accelerated deformation of the sand surface at the interface. When potholes or washboards form and retain water, even for a short period, the deformation is further exaggerated. This results in increased bouncing and the cycle continues. Vehicles accelerating from a stop add to the mix. It is therefore important to ensure that the interface seam is maintained to be as smooth as possible and the area is free draining. Storm water should flow away and not toward this point. The elevation of the sand surface at the interface should be level with or slightly higher than the asphalt surface and drainage should not be allowed to leach in laterally if at all possible. If these practices are employed and problems still exist, consider installing ballast rock or geo-cell confined AASHTO 1 one foot below the road surface for the width of the cartway in the first 20’ of the sand road.
- With the relatively thin surface layer of sand that is being applied, it will not be long until traffic and/or maintenance activities comingle the sand surface and shell base. If the exposed shell is deemed undesirable as a driving surface, replenishment of the sand top coat will be required. On certain roads that receive heavier daily and construction traffic, the shell may need to be replenished more quickly as well. From a time and economic standpoint, it may be beneficial to stockpile road material somewhere on the island (possibly the same locations noted for spoiling the silt material). Any methods to reduce heavy traffic loads, limit the use of knobby off-road cart tires, or slow traffic speeds (which tend to increase with better roads) will also slow road wear and lengthen maintenance cycles. The MTSU Advisory Board may be able to help educate residents regarding these factors.
- For interim blading work done between grading cycles, a tractor mounted box blade or road drag may be suitable, so long as this work is done before traffic has eliminated the crown from the road (at which time grading is the better option), and so long as the operator is aware of the desired road shape and works to maintain this to the best of the equipment’s ability. During the site visit the group discussed the potential of keeping a tractor and box blade (or drag) on the island to use for these interim blading cycles. This may be something that the County or the contractor might look into. Depending on the cost of the equipment, this option may be more economical than paying barge fees to move equipment on and off the island. If this option is considered, I would suggest that the tractor be equipped with a front end loader,

so that stockpiled material can be moved by the operator when minor holes and deformations form. I would also recommend that the County or the Advisory Board implement some control over who is permitted to blade, or drag, the roads. To date it has been somewhat acceptable, and maybe even encouraged, that residents level off ruts and holes on their own accord. I would suggest that this either be discouraged, or that those residents that are inclined to do this work be part of the discussion for maximum "buy in" to the new maintenance scheme. Education and training about crown, the type and purpose of the new materials and the goals behind these changes will be important. Neither myself nor the Center for Dirt and Gravel Roads represents or recommends specific commercial products or equipment. However, the following web links may help to clarify the type of equipment presented here:

<http://www.tractorboxblades.com/>

<http://www.bonnell.com/bonnell-products/road-maintenance/road-drags>

- Residents are currently researching the possibility and cost of dredging the island channels, and one of the last subjects discussed during the site tour was whether or not material harvested from the dredging could be used to build up or surface the island roads. I was not able to inspect local material from previous dredging operations. Therefore, I hesitate to approve this practice as I have no knowledge regarding the quality of the material for road use. The material may be acceptable and have the potential to save significant money as compared to barging in hundreds to thousands of tons of sand and shell. However, it may also have organics present and lack the desired gradation of a workable road material, among other potential concerns. If the County or the Advisory Board desires to further research this, the folks at the Tampa Bay Estuary Program may have pertinent information on the beneficial reuse of dredged material - <http://tbep.org/tbep/stateofthebay/dredging.html> .
- Relating to the importance of maximum "buy in" of the stakeholders affected by the maintenance of these roads, it would probably be wise to either develop a list of roads or road sections to be addressed that is ranked by priority and based on a defensible set of conditions (i.e. – amount of standing water, duration of standing water, arterial road, etc.), or to spread the work and the "wealth" by implementing "test strips" throughout the island so all residents can travel improved sections sooner rather than later.
- Once a material and placement specification has been accepted I would advise that it is incorporated into the bid specifications during the next bid cycle and a change order be made to the current maintenance contract (if this is consistent with the laws and policies under which the County operates).
- Although it may already be the case, I would suggest that a representative of the County with knowledge of local materials, road maintenance, excavation, or construction be present during larger road maintenance projects on the island (i.e. – major road grading and replenishment projects) or when new practices or equipment are utilized. Periodic checks should be performed during other interim maintenance activities as well. To foster a working relationship with the contractor and to develop site specific knowledge of the roadways, it would be ideal if this was the same representative each time.

As previously mentioned, the maintenance of the sand roads on Don Pedro and Knight Islands is just about the opposite of "road maintenance 101", where the goal is to elevate the road higher than the surrounding terrain and shed drainage from the road corridor to create a dry and stable road bed. The relative lack of grade, a lack of drainage corridors or right-of-ways, the dense residential development, and the lack of desire of the residents to have road drainage enter their properties creates a situation where the road corridor must function as both a travel way and a drainage basin. This uncommon

these roads.

In conclusion, the basic premise behind the suggested practices and design is to create a designated travel way and an area off to the sides where temporary surface water can infiltrate. This design should minimize saturation of the road base and encourage motorists to utilize the cartway by eliminating the need to circumvent large potholes and ponds in the middle of the road. The elevation offset need not and should not be drastic, as the shoulder area must remain drivable for easy residential access. In light of the significant barge fees, the plan is also fiscally responsible for the taxing unit by limiting the surface area that the County must maintain with imported material. The key is to use site specific practices and to be innovative in the design. It is certainly acceptable to use all, some, or none of these recommendations, as long as an acceptable and long term solution to the current situation is implemented.

I want to thank you again for the opportunity to visit Charlotte County and for the chance to work with your staff, the representatives of General Contracting Services, Inc., and the concerned citizens of the Don Pedro and Knight Islands MTSU Advisory Board in striving to resolve the maintenance challenges of these unique island roads in this little corner of paradise.

Sincerely,

Tim Ziegler