



## **MIDDLE ISLAND GRAVEL ROADS OUTLINE OF OPTIONS AND ASSOCIATED QUESTIONS**

From presumably the least expensive to most expensive

### **Outline of the problem**

- The recommended SC DOT MLBC produced a very solid base but has too many large stones (1-2") that have come to the surface.
- Traffic has moved many of these larger loose stones to the side, but other areas have far too many larger stones for comfortable bicycling and foot traffic.
- Where there are no stones on the surface, the surface is often a bit cobblestoned from stones remaining in the matrix
- These embedded stones prevent use of the usual low-tech gravel road maintenance we have performed (drag harrow or box scraper).
- There are at least three sections of road with a significant slope that are prone to erosion.
- The roads have to serve low volumes of heavy construction and delivery vehicles, including articulated loaders and other vehicles that may turn their tires while stationary.
- In considering options, bringing new road materials is disproportionately expensive because of the limited capacity of the barge, the need for pre-positioning the material and then moving it a second time, and the cost of hauling given the extra time on the barge and island.
- If we select an option that does not surface the gravel road, timing of the dust control is a major problem. Southeastern Road Treatment probably can't make the trip to the island to apply calcium chloride after their dust season starts in earnest, probably in April.

### **Our goal is either:**

- **Get a less rocky and more easily maintained gravel surface OR**
- **Use the current MLBC as the base for chip seal or asphalt paving**

### **Option 1: Wet and re-roll with 30T vibrating roller (Cost: \$15,000 - Barnhill)**

- We would expect this to produce a good short-term solution. It may also be a necessary preparation for washed stone, chip seal, or asphalt.
- This option does little to remove the larger stones that will rise to the surface as fines wash away, although some may be crushed by the vibrating roller.
- Calcium chloride should follow the re-rolling.

- Results may last 3 months or 3 years, but repeated re-rolling without adding new fines is presumably not a viable long-term solution.
- It would get us through the current season, if necessary.
- Barnhill also felt this would be a temporizing step, and that the larger stones would continue to come to the surface.

This option was considered by the Board, who concluded that this option would provide only a short term fix and should only be considered as a component of a more comprehensive solution.

**Option 2: Physically remove the stones from the top 2-3” of the road (Cost modest – TBD)**

- If there is a way to do this, this would produce a surface that performs well for bicycling and walking – and is also suited to construction traffic.
- This surface would be relatively easy to maintain with standard maintenance.
- Although members of the Infrastructure Committee have considered linear crushers and road reclamation machines, these options involve a full-fledged road rebuilding process.
  - Linear crushers require that the top 4” of aggregate first be formed into a windrow in the middle of the road, then crushed, then re-graded with a motor grader, then rolled multiple times. While the crushers can produce material that is generally  $\frac{3}{4}$ ” of smaller, one experienced operator in the Pacific Northwest (where they have been used on gravel roads) acknowledged that the crushing may leave some larger stones. Bringing the machine east would entail substantial cost (perhaps \$60K for the week) and in addition there would be a lot of motor grader and roller time.
  - Road reclaimers are commonly used to break up asphalt pavement into fine grained material. They are generally larger equipment that may encounter some challenges on our gravel roads. When used on our aggregate, some larger stones may be left. Reclaimers tend to leave the material in place in the road, so it is likely that only light grading and intensive rolling would be needed. Road reclaimers are expensive.
- One option probably worth trying is a Harley power box rake that mounts on a skid steer (or trails behind a tractor) and/or a Rock Hound (also available as a skid steer attachment).
  - The top 2-3” of road would be broken up and deposited behind the box rake
  - The Harley (unlike the Cat version) has an adjustable discharge slot along the back of the box that retains stones larger than its opening, gathering them in the box until they can be left at a convenient point on the road.
  - The hydraulic version is quite adjustable and can do some degree of grading.
  - It appears to be a good tool for future periodic maintenance, removing potholes and washboarding, although it would need to be followed by rolling.
  - The advantage over a grader is the “screening” for stones larger than a given size. The screen is likely to retain most stones over  $\frac{3}{4}$ ” and almost all over 1”.
  - We haven’t seen how well this actually works in practice, but are inquiring.
  - Barnhill has no experience with this equipment.

- Some additional grading may be necessary, and some form of rolling would be needed, and calcium chloride should be applied.
- The cost cannot be accurately determined at this time, in part because we cannot be certain that this is a viable option – or how much equipment and labor time will be involved – until we have used the equipment on the western road sections to determine how well they deal with the larger stones. If effective, we will then estimate the cost to re-work the entire gravel road, and will also price the labor and equipment for wetting and rolling the resulting surface.
- **The Committee recommends a trial effort to remove the larger stones from the roadbed in the most westerly sections of the road using the landscape rake, water truck, and roller, with a budget to be determined and reported back to the Board for approval.**

**Option 3: Lay some form of washed stone on the surface (Not considered further – not priced)**

- Both the infrastructure members involved and Barnhill did not endorse the use of pea gravel.
- The only conceivable form of stone for the roads would be blue slate or similar angular washed stone seems to hold up well with low impact, slow speed traffic such as driveways.
- It would get displaced by turning and braking. It may cause significant safety issues related to skidding of vehicles when braking, especially on curves and downslopes. It would require continual grading and some addition of stone.
- This is probably not an appropriate option for a road with 20 mph truck and tram traffic.

**Option 4: Add approximately 3” of “stone dust” or similar to the existing road (Estimate \$200K)**

- An experienced chip seal contractor who could not do the chip seal work suggested the addition of stone dust to produce a maintainable gravel road without the larger stones by adding “stone dust”
- One consultant felt preliminary scarification would be unnecessary
- Pre-positioning of about 160 tons of material, followed by either deposition with a paving machine or grading, then wetting and rolling would be needed
- This scope and cost would presumably be only somewhat less expensive than the initial project to lay the SCDOT MLBC.
- There may be a difference of opinion about the type of roller needed to produce the necessary compaction.
- Calcium chloride would need to be applied.

**Option 5: Chip seal (\$374,300, subject to price adjustment based on oil costs)**

- Presumably the road would be swept or rolled and some problem areas such as the steep road sections addressed before chip seal
- Key durability questions:

- Once chip seal has cured, it is reasonably stable and wears well, except that heavy vehicles making point turns / turning their wheels while stationary and tracked vehicles are likely to scar the surface and may require repair.
- Cured chip seal may be particularly vulnerable to damage in the mid to late summer when average highs are in the low 90s.
- Barnhill's subcontractor expected a long useful life (>20 years) given our traffic mix, with the proviso that construction traffic, especially vehicles delivering construction materials, may scar the road at the delivery site in a manner requiring repair.
- Details:
  - Triple shot construction with two courses of 57 stone (3/4 minus inch, 400 tons) and one finish course of 78M stone (3/8" to 1/2", 150 tons) was strongly advised by Barnhill.
    - Note: all segments will carry construction traffic at some point except the last few hundred feet of Cape Creek Road before the gate.
    - Excluding sections of road does not produce anything approaching proportionate savings.
  - The question of CAMA permitting would need to be discussed with the Village. Barnhill's sub is providing the emulsion specs should that be pursued.
- Cost estimate
  - Gravel: Assuming \$38/ton for both types of washed stones; assuming the Heritage Trucking costs for RT travel to the barge (at \$15/ton), wait time on the barge and on the island (at \$65/hour); assuming ICE fees for two fleet trucks and barge fees for a total of 30 truckloads; acquisition and placement of stone would cost \$49,300, if the Association handled logistics.
  - Barnhill's estimate of \$325,000 would include:
    - all prep work by Barnhill to create a smooth surface (grading, wetting, and rolling) and to repair steep sections of the roads'
    - triple chip seal by the subcontractor;
    - and for all of the above, all equipment and labor, barge and ferry fees, contractor parking, etc.
  - Any permitting costs, such as CAMA, are not included.
- This would require a special assessment of approximately \$274,300, or \$3,190 for each forest lot, whether improved or unimproved.
- Annual operating costs would be reduced from \$33,000 to perhaps \$10,000. Contributions to reserve would remain at about \$11,500, covering bridge reserves and a 15 year addition of new layer of the chip seal. Although the effects on forest and beach lots would vary somewhat, dues would decrease about 16%.

**Option 6: Asphalt – roughly 11' paving of the existing gravel roadways; asphalt roads would remain private (\$680,000)**

- Barnhill would perform all necessary work, including preparing the road bed, paving, and protecting the asphalt edges where necessary with a stone shoulder.
- We assume a useful life of over 20 years with our traffic.

- Details:
  - We assume some form of CAMA permit will be needed.
  - We would use the same asphalt specs used for Village roads
  - Edges of the pavement would have stone
  - The savings from leaving some sections (such as) unpaved are far from proportional.
    - Any proposal to leave the section of Cape Creek Road parallel to Dogwood unpaved as a nature path would require approval of the Dogwood Road property owners.
    - Any proposal to delay paving the westernmost roads would be problematic; owners of those lots might well, at a minimum, insist on an escrowed fund to pay for the paving at a later date.
- Barnhill has provided a comprehensive price of \$680,000 for road preparation and for the paving work (including mobilization, equipment, materials, personnel, ferry tickets, and barge/ICE fees for the equipment.)
  - The estimate is comprehensive and includes placing some gravel on the road shoulders to protect the asphalt edge.
  - The roads would NOT meet Village standards for turnover – the paved width would not be 12’, the base course would not be 14’, and the cleared width would not be 16’, nor would any of the issues with the 20’ wide rights-of-way be addressed. The roads would remain private.
- This option would require a special assessment of approximately \$580,000, or \$6,744 for each forest lot, whether improved or unimproved.
- Operating costs would decrease, although the exact amount would depend on the remaining workload for David Ward. Maintenance of the roads would decrease substantially, although canopy and roadside maintenance would remain. The \$8500 cost of calcium chloride would end.
- However, contributions to capital would increase, depending on the assumed useful life of the new asphalt paving, perhaps to twice the current \$11,500.

**Option 7: Asphalt with roadway improvement to meet some of the requirements for turnover to the Village (\$850,000)**

- Barnhill would perform all necessary work, including preparing the road bed, paving, and protecting the asphalt edges where necessary with a stone shoulder.
- In addition, Barnhill would do the work necessary to widen the road to allow paving of a full 12’ roadbed.
  - The completed road would not necessarily meet the base course requirement of 14’ and the cleared width requirement of 16’ – deviations from road standards would presumably require a waiver by the Council.
  - NOTE: There are numerous other hurdles facing any plan to dedicate the roads to the Village, among them:
    - waivers of width and road elevation standards;
    - acquisition of an additional 5-10’ of ROW in the sections of the roads that were platted with only a 25’ or more commonly a 20’ wide ROW, through:

- abutting individual owners deeding the ROW to the Village;
  - the Association granting a ROW from Association land (such as the paved section of Cape Creek Road), which requires the approval of 80% of all association members; or
  - the Village exercising the power of eminent domain.
- Barnhill has provided a comprehensive price of \$850,000 for road preparation and for the paving work (including mobilization, equipment, materials, personnel, ferry tickets, and barge/ICE fees for the equipment.)
    - The estimate is comprehensive and includes placing some gravel on the road shoulders to protect the asphalt edge.
  - This option would require a special assessment of approximately \$750,000, or \$8,721 for each forest lot, whether improved or unimproved.
  - Dues would decrease substantially – probably 50% - depending on whether the Association tried to retain David Ward (our on-site Manager and maintenance crew). The higher hourly cost of contracting out maintenance tasks and landscape/canopy maintenance would offset some of that savings.