

**MUNICIPAL DISTRICT OF MACKENZIE NO. 23  
SPECIAL COUNCIL MEETING NOTES**

**Monday, August 26, 2002**

**Council Chambers, Mustus Lake Centre  
La Crete, Alberta**

**PRESENT:**

Bill Neufeld	Reeve
Walter Sarapuk	Deputy Reeve
Betty Bateman	Councillor
John W. Driedger	Councillor
Greg Newman	Councillor
Joe Peters	Councillor
Wayne Thiessen	Councillor
Willie Wieler	Councillor

**ABSENT:**

Pat Kulscar	Councillor
Michael Nanooch	Councillor

**ALSO PRESENT:**

Harvey Prockiw	Chief Administrative Officer
Cora Klassen	Administrative Assistant
Gene Sobolewski	Operational Services Consultant
Allan Cronchite	Special Projects Technologist
Brenda Wiebe	Public Works Administrative Assistant
Doug Schuler	GPEC Consulting Ltd.
Gary Stone	GPEC Consulting Ltd.
Trent McLaughlin	J.R. Paine & Associates Ltd.
Darryl Quist	Knelsen Sand & Gravel

Introductions were made.

Doug Schuler stated that there is currently 770 meters excavated on 100 Street. A portion of the base and sub-base is soft. JR Paine and the Operational Services Consultant for the MD of Mackenzie completed a test last Friday and Saturday to determine how the soft section would perform. There was some deflection around the soft spot. This is not serious at this time, but it could get worse. Water was encountered around 101 Avenue but other areas are good. He understood that Council was not informed of the issues concerning frost heaving. The potential of frost heaving will be dealt with first, followed by structural issues. Frost heaving was identified in the design report submitted by JR Paine.

Trent McLaughlin stated that frost heaving is a capillary action when water is sucked out of the ground, like water in a straw. When the water freezes, ice lenses build up which results in frost heaving. There are three conditions required for frost heaving to occur, as follows:

1. Source of water
2. Soil that is susceptible to frost heave, and
3. Freezing conditions.

The soil along 100 Street has the potential for frost heaving, however J.R. Paine is unsure whether it will, as they have only done simplistic testing. This testing shows the potential for frost heaving. If soil is dense or loose, frost heaving will not occur. For example, sand and clay will not. All three conditions are present along 100 Street. Frost heaving results in the asphalt cracking and concrete lifting, which causes bumps on the road and uneven curbs.

Doug Schuler said the discussions at pre-tender meeting included the possibility of frost heaving and an additional cost of approximately another million or more to counteract frost heaving. The Director of Operational Services at that time decided not to deal with it due to additional costs.

Gary Stone discussed three ways to prevent frost heaving. If any of the three factors that contribute to frost heaving are eliminated, the possibility of frost heaving is significantly reduced. These factors may be eliminated by:

1. Changing the soil type. For example, to gravel, sand or clay. Excavate the soils to maximum frost depth, as in Whitehorse, to remove the unsuitable material. In Edmonton, Anthony Henday Drive was excavated and it still has signs of heaving.
2. Insulate the road to the frost depth. No matter how deep we insulate, frost will go deeper. Styrofoam insulation will cost approximately \$1 million for materials, plus approximately another \$1 million to dig an additional 1.5 meters of excavation and backfill. This cost could be reduced if using sand or clay. Insulating portions of the road with Styrofoam may cause problems such as icing because the road does not freeze uniformly. This problem could be resolved by tapering out the Styrofoam, which is an elaborate process.
3. Reduce the water table by draining sub-drains. If there is a clay layer between the sub-drain they may not drain, and they tend to work only in the vicinity of the pipe itself. This would be almost impossible because the storm sewer is 1.5 to 2 meters below the road surface and the sub-drains would be located 3 meters below the road surface.

Doug Schuler said that if Styrofoam is used, the Styrofoam must extend 1.2 meters beyond the curb to taper the distance between freezing and non-freezing. The insulation option is estimated to be \$2.7 million.

Gary Stone stated that due to the large cost, many northern communities have opted to deal with problem as it occurs. None of the other streets in La Crete are showing signs of frost heaves. Frost heaving and the road structure are two different issues.

Doug Schuler discussed options to strengthen the road structure, as follows:

1. Excavate an additional 300 mm depth and backfill with granular fill
2. Excavate an additional 500 mm depth and backfill with granular fill, however the 500 mm depth excavation is unnecessary unless insulating is done.
3. Soil cement on the existing or proposed granular base of 150 mm depth would strengthen the structure by better dispersing the load pressure over the entire base structure.
4. Geogrid would bind the two layers of gravel together and distribute the load to the bottom layer. To put geogrid on a soft sub-grade would be of no value.

To excavate and place gravel an extra 300 mm, the remainder of the project would cost \$188,000. To redo the portion already done plus the remainder of the project would cost \$442,000. Addressing only selective areas would cost \$20,000 per 100 meters. The 200 meters of road at the north has a good structure. It has gravel and salvage material and shows no sign of deflection. The next 1 km has selective areas of soft material. To apply soil cement to these selective areas would cost \$54,000. As the contractor works south, the soil appears to improve. Applying soil cement on the entire project would cost \$104,000. Deflection cannot be determined until the work is underway. GPEC has reviewed the possibilities of using geogrid for either the entire project or selective areas.

Doug Schuler asked Council if they had any questions.

Council asked why the original design is not sufficient.

Doug Schuler said that there is no real change to the original design but that, when the original design was brought forward, he had stated that there could be problems. There are provisions in the contract that allow for excavation problems that arise during construction at a total of 1500 cubic meters, or 500 square meters, for isolated soft areas.

Trent McLaughlin said that soft and saturated soil was found while drilling test holes in spring. These areas look better now. The design was developed to stay above soft soil because once you dig into the soft soil, you must dig through it. This approach has worked very well at the north end of the project. Going south, the soft areas were wetter than expected by a minimal amount. Test holes were done and deflection was minimal. The strength of these areas is borderline. J.R. Paine thinks these areas would hold up but has been told that everyone wants a higher level of comfort. This is why they recommend beefing up the soft areas. There may be cracking on the pavement if soil cement is used, or there may not be any deflections.

Gary Stone said that it is difficult to determine the full extent of soft areas until it is excavated. From station 0+360 to 0+400, the soil has some clay while other areas have more sand. From station 0+500 to 0+705 the subgrade has very soft and sensitive soil. From station 0+705 to 0+770 the subgrade has more clay in the soil. It is anticipated that more soft soil will be encountered at station 0+705 to 1+200 (98<sup>th</sup>). The soil is sandier and stronger south of Sarah's Diner.

Council asked how many test holes were taken.

Trent McLaughlin answered that there were 12 holes spaced approximately 200 meters between the test holes. Samples were taken in spring and they thought the soil was softer and wetter than what it is now found on the site. Only a foot of soft soil is not a problem. The proposed structure will hold for the north and south sections but the middle has soft soil higher than expected.

Council asked if the history for La Crete and status of other streets show the potential for frost heaving.

Doug Schuler said that, at the pre-design phase, there was not money to address frost heaves.

Council asked how high the potential is for frost heaving.

Gary Stone said that high-end freezing samples show the potential of frost heaving for those exact spots, but extensive and expensive research is needed for a complete picture.

Doug Schuler stated that they do not know the potential but if soil and water conditions are the same throughout the project, there will be equal levels of frost heaving.

Council mentioned that when businesses in La Crete put filter cloth on their parking lots, it was an indication that there were problems with the soil under the road. Council asked why the old road did not have frost heaving.

Doug Schuler said that the road is two meters above the ditches.

Gary Stone said that this road is one meter lower than the original road and the ditch is being raised half a meter.

Council asked for a recommended action.

Doug Schuler stated that if money were available, they would recommend insulation. When they originally met, the Director of Operational Services at the time said that there were no funds for insulation. He recommended carrying on with the original project. He suggested testing geogrid in bad areas and proceed with it if it stops the total deflection, or put the whole section in and apply soil cement on top. They would need to excavate an extra 300 mm depth and fill with granular today to stay on schedule.

These recommendations are:

1. Carry on, with extra 300 mm depth on selective areas that are weak, option 1c.
2. Do geogrid test sections to test for deflection, option 4b. They have enough material for 100 meters of road. If geogrid does not hold, weight must be distributed. Soil cement would then go on top and would work if they do not find anything worse than what they have to date. Soil cement is cheaper.

Council asked why soil cement should not be used if it is cheaper and there is no guarantee that geogrid would work.

Doug Schuler said if soft soil is hit, they could go deeper with geogrid. There is water in trenches at the end of the existing road and there may be a saturated isolated area.

Gary Stone said that one wet area was a sanitary sewer. These areas must be excavated deeper and put geogrid or extra pitrun in.

Gary Stone stated that soil cement would work.

Doug Schuler said that if they hit a bad area, they would have to dig deeper.

Council asked if options 3a) and 4a) would make a stronger road than 1b).

Doug Schuler answered that this comparison would be about equal, depending on the soils and their saturated level.

Trent McLaughlin said that the north end is very good and he would not recommend excavating it again. To increase strength, Council may consider soil cementing it although he does not think it is necessary. The design was intended to bridge over the soft soils. The geogrid quickly provides a bridge and soil bond in the soft areas and the remaining structure would gain compaction. This is easier during the construction phase. The soft soil would need babying if testing it. A load of gravel could be available tomorrow.

Council asked if the geogrid would affect the contractor's schedule.

Doug Schuler answered that it should not affect it too much.

Darryl Quist said that the curb and gutter is scheduled for after the long weekend but geogrid testing would push this to Wednesday. The schedule would be in jeopardy.

Trent McLaughlin stated that excavating deeper is difficult if the area has already been excavated. Digging the extra 300 mm deeper is a good solution if excavation has not already occurred. Using the Geogrid and soil cement is a good option for the existing excavated subgrade.

Gary Stone stated that it would waste a lot to redo excavation on areas already underway.

Council asked how to build a road that would last five years without problems.

Doug Schuler answered that either geogrid or soil cement would reinforce the north end. Soil cement is guaranteed to work and has been tried in the worst section.

The Operational Services Consultant asked whether the sub-grade under the soil cement would soften in the spring and disintegrate the soil cement.

Trent McLaughlin answered that the soil will probably not soften a great deal in spring because it is already soft. The sub-grade has not been compacted again. The soil should not soften more because the road is built on top of the soil that is already soft.

The Operational Services Consultant asked if a road ban would be necessary, as 100 Street is a heavily traveled road.

Doug Schuler answered that the MD would want to enforce road bans as on the other roads by and in La Crete. Spring is the worst time.

The Chief Administrative Officer discussed using soil cement and geogrid and the possibility of excavating in different areas. This may cost half a million for contingency costs.

Gary Stone said that if soil cement is chosen, that is all they would do. 10% contingency is usual, but this project has 5% contingency. GPEC has the funds to dig deeper. Black dirt should be excavated. GPEC is now down to about \$50,000 contingency.

The Chief Administrative Officer asked what the absolute maximum cost would be. What would happen if the road fails in future years?

Doug Schuler said that he does not think it will fail. JR Paine has been in business for years.

The Chief Administrative Officer asked what happens if the road does fail.

Doug Schuler said it **will not** fail. There may be isolated areas with problems but they would look for solutions to fix the road at that time.

Trent McLaughlin said if there are no deflections when the road is completed, it should not fail. The long term structure is sound but there is concern with frost heaving. An extra 300 mm of excavation would minimally address the frost heaving issue by only a hair. Unless Council spends approximately \$2 million extra, the chance of frost heaves would not be significantly reduced.

The Chief Administrative Officer asked who pays for the road if it does fail.

Doug Schuler said that there is a possibility of frost heaves or dips due to a missed trench, but not of the road failing.

The Acting Superintendent of Transportation asked if the type of base should be consistent. If soil cement were used throughout La Crete, would it crack?

Council asked if different soils cause the cracks.

Gary Stone said that there is soil cement from the SH697 corner to Buffalo Head Prairie and there are some differential settlements. Soil cement is rougher than pavement.

The Operational Services Consultant asked if additional gravel is needed under soil cement.

Gary Stone said that he does not know but there may be less cracking if an extra meter of pitrun is applied.

Council asked if geogrid would eliminate the concern of bumps and cracks developing.

Doug Schuler answered that geogrid should work well in really bad areas but testing is needed first. Soil cement is the best option, especially if it is sitting on gravel rather than clay. In High Level, soil cement was put right on clay and resulted in bumps. Applying soil cement for the entire area would cost \$104,000. There is 400 meters of wet sub-grade that is not open.

Council said that for a \$3.5 million road, they want assurance that the road will not fail and that this will be the last major restructure for 100 Street.

Gary Stone said that there is no 100% assurance. With a 20 year design, there is always a risk of failure. As more money is spent, the risk is reduced.

Trent McLaughlin said that the standard engineering values used throughout the province were followed for this design. Alberta Transportation uses these guidelines, but there is always a risk. The design passes all the checks but gut feeling says that the design should be beefed up to be sure.

The Operational Services Consultant said that pavement cracking might be due to frost heaving or structural failures. They are two separate issues and should be differentiated. If a guarantee is given that there will be no road failure, the guarantee would have to exclude frost heaves but the issue (of frost heave) would be a factor of consideration if a failure happens.

Council gave an example as follows: if a mechanic gives you a cost for repairs, you do not expect to pay double the quote or pay for the job to be redone a couple weeks later. The professional should know what the problem costs. Should engineers not work the same way? Do the ratepayers or professionals back up the project?

Doug Schuler said that the current design is on the borderline and this is why they came back to Council. This is adding to the project, not redoing it. There is not enough contingency in the contract to handle the extra cost.

Doug Schuler said that concrete will crack every 10 to 20 feet. A frost heave causes cracks in the winter but they are gone in spring because it expands and contracts. It is easy to replace curb. Cracking is worse where there is soil cement than where gravel is plentiful.

Trent McLaughlin said that soil cement is rigid and will crack, causing obvious cracks on pavement and curbs. Frost heaving causes bumps in the winter but

they will disappear in the spring. This may occur in a few areas, the entire surface, or not at all.

Council asked for a recommendation.

Doug Schuler answered that the recommendation is:

1. Use soil cement,
2. Try geogrid on a section of wet area, and
3. Excavate an extra 300 mm for the remaining section.

Council asked if 300 mm is enough.

Doug Schuler answered that they will know once they start excavating. There might be 500 metres of wet soil. The worst areas are wherever water was lying in ditches.

Council asked if option 1b) was approved, would the other options be necessary.

Doug Schuler said that 1b) is not recommended.

Trent McLaughlin said that the northern section has a good bridge in place and should not be excavated. But this aside, yes, the other options would not be necessary.

Gary Stone said that there is not enough time to excavate the entire project again. Options 1a) or 1c) would be better options.

Doug Schuler said that timing is important. The first level of asphalt is needed before winter.

Darryl Quist stated that Knelsen Sand & Gravel has done granular structures for businesses along mainstreet. The structure consisted of 600 mm pitrun over filter cloth and road crush on top. They are holding up and do not go below the frost. There is no soil cement on any of those projects but rather more flexible granular material.

Council said that they would like the engineers to make recommendations.

Doug Schuler said that option 1 is not better. If excavating, they need to start today. If they hit bad areas, they could dig another 300 mm and go back to the original design once they get past the soft soil. Gravel would be pushed aside and geogrid put in. It would cost \$100,000 for 1 km of geogrid. This would be better than soil cement on the whole area.

Council said that when the design was first brought to Council, it was a sufficient design. Now GPEC is saying that it was a borderline design to begin with. Soft material was discussed at the original Council meeting and all were aware that it could be an issue.

Council asked if options 1c), 3a), and 4b), would address both road structure and frost heaving.



Doug Schuler said no; they cannot counteract frost. More excavation will lessen the risk of frost heaving. Soil cement does heave, but frost heaving is more stable come spring.

The Operational Services Consultant said that past experience shows a reduced risk of frost heaving when the granular structures were deeper. La Crete has a solid base for soil cement. Curb and sidewalks have stood up. You cannot eliminate the risk of frost heaving.

Council went in-camera.

Council asked if GPEC and JR Paine could provide Council with a higher comfort level if Council approves \$500,000 more contingency.

Doug Schuler said yes, but he does not see a need for all \$500,000. He wanted to ensure that if they excavate an extra 300 mm and use geogrid, they might not need soil cement.

Trent McLaughlin said that, although geogrid is more expensive, it continues to provide a flexible structure while soil cement causes reflective cracking. The existing main street area has not cracked very much.

Council asked if GPEC has built a similar road to 100 Street with geogrid in the past.

Doug Schuler said no, and that is why they want to test it first. GPEC has used geogrid on railways and JR Paine has used it in Grande Prairie.

Gary Stone said that it is difficult to compare this soft sub-grade layer with Grande Prairie. Grande Prairie had a firm structure to build on and geogrid was primarily used to reduce the gravel thickness. This is a different application.

Trent McLaughlin said that geogrid is generally used on a fixed grade to thicken the structure without actually thickening it. Its original use was not to bridge soil but they have seen it work on other projects.

Council asked for a backup if the road fails.

Gary Stone responded that the structure will be stronger if they increase the structure.

Council asked for a written guarantee.

Doug Schuler said that the road **will not** fail.

The Operational Services Consultant asked what the \$500,000 additional contingency would pay for.

Doug Schuler answered to excavate 300 mm more for the remaining project and to try a test section with geogrid. If it performs adequately, GPEC will not use soil cement. There is already minor deflection.

The Operational Services Consultant asked what revised design are the engineers going to propose.

Gary Stone said that the contractor would excavate an extra 300 mm and fill it with gravel. Then it will be a more sound structure. Sections already constructed will be tried with geogrid unless Council wants a rigid section.

The Operational Services Consultant said that whatever structure being proposed by GPEC will be under their seal. GPEC makes the decision, not Council.

Doug Schuler said that if there is a problem with geogrid, it needs to be worked out with the contractor and not Council.

Council said that whatever option is selected, they want a guarantee that it will work. A letter of credit or bond would suffice to say that the additional \$500,000 will be enough.

Doug Schuler stated that they have an Errors and Omissions in their insurance.

The Operational Services Consultant said that it is fairly loose insurance and difficult to claim.

Doug Schuler said that it is sufficient for most government bodies. GPEC is guaranteeing that this road will work.

Trent McLaughlin said that JR Paine will provide a letter stating that this design is a recommended structural practice.

Council asked if GPEC will admit failure if the road fails in two or three years.

Doug Schuler said that they will not admit it out of their pocket, but that is why they have insurance.

Council said that they want a guarantee that this design will work – that the structure will not fail. This is excluding cracks in the road. The Chief Administrative Officer said that if the road fails, the MD would have to sue GPEC and go through the insurance company.

Doug Schuler said that they can design the structure, but if the contractor does not do their job, it is not GPEC's responsibility as they are not always there.

Darryl Quist said that one layer is passed by GPEC prior to permitting the next layer of construction. There is a two year warranty for materials and workmanship.

Council said that they want a letter of guarantee from GPEC stating that the structure will not fail, and that this be included in the Council motion.

Doug Schuler stated that their insurance does not allow them to write a letter of guarantee. They will write a letter stating that this is the proper type of structure and design with the proper seals.