

Aiken City Council Minutes

WORK SESSION

August 3, 2015

Present: Mayor Cavanaugh, Councilmembers Dewar, Diggs, Ebner, Homoki, and Price.

Absent: Councilman Merry

Others Present: John Klimm, Stuart Bedenbaugh, Gary Smith, Sara Ridout, George Grinton, Rich Decker, and 11 other citizens from the Gem Lakes Extension subdivision, and Michael Ulmer of the Aiken Standard.

Mayor Cavanaugh called the work session to order at 5:01 P.M. He stated the purpose of the work session was for Council to discuss the Gem Lakes Extension Roads Report and to answer technical questions regarding the report.

Mr. Klimm stated on July 27, 2015, he received the final Report of the Pavement Evaluation of the Gem Lakes Extension Roads from Mr. Rick Toole and Wilmer Engineering, Inc. dealing with the challenges we are facing in the Gem Lakes Extension Subdivision. He said it became very clear to him in the staff review of the report and with the numerous inquiries and questions he was receiving from the community that it might make sense to hold an informal work session. He said Mr. Toole and Mr. Owen were present to explain in more detail their findings and also to respond to the numerous inquiries that were received from the community. He thanked the members of the community who have taken the time to review the report and indicated to city staff some of their questions and concerns. He pointed out Mr. Decker had put together a summary of the inquiries received. He said that would be the document that we would be working from at this meeting. Mr. Klimm stated there are time commitments for some of those present so the meeting will probably be limited to two to two and one-half hours. He said there is no expectation that a decision will be made by Council at this meeting and there may be a need for additional meetings. He said he joins with Council with an earnest desire to get to the bottom line and come to better understand what challenges we face in the Gem Lakes neighborhood and what we might be able to do to assist the neighbors in the area to bring some resolution to this issue. He said unless there are some questions of Council he would turn the meeting over to Mr. Rick Toole and Mr. Reid Owen to answer the list of questions.

Mr. Rick Toole stated he would like to review their approach and what they would like to do and how they would like to proceed in order to make it efficient and still leave time for questions and answers at the end. The first thing they would like to do is begin by presenting the report itself, talk about the objectives of the report, how the data was obtained and where, provide some overview of the assessment of the information, look at what their directive was to evaluate the causes and failure, and to provide recommendations on types of repairs that may be considered in the future. He said the second item they would like to do is review the observations they had personally made as they were there when the pavement collapsed and the proof rolling truck dropped an axle and wheel in the middle of the street. The third item would be to address the list of questions. He said they would try to review them in the order of the document prepared by Mr. Decker. Finally, he would give a status of pending information that has been requested and how long it will take to get that. Then they would take questions and answers.

Mr. Toole stated he would let Mr. Owen talk about the report. The objectives that were placed before him when they were asked to look at the roads were basically to obtain data relative to the soil and pavement in the Gem Lakes Extension Subdivision on Moultrie and Huron Drives and to assess the reasons for failure and to provide recommendations for repair. He said that is what they have based all of their information on in their approach to this particular issue. He said they were not asked to evaluate city standards

or specifications, so that is not part of what they have done. They were not asked to evaluate or comment on the construction sequencing or methodology or results of what the contractor did. He said frankly they were not there, and there was no way to make comments on something on which they had no personal or direct oversight. They were to report on verifiable data that they could establish through testing and field exploration. He said their focus at this meeting is to present Council with actual data that was collected during the investigation and tell Council what they have come up with as potential reasons for failure as a result of the information they found. He said he would ask Mr. Owen to review the report quickly.

Mr. Owen thanked everyone for their interest in the report. He said the objective of the report was to cut pavement cores to look at the pavement thickness and to provide access to the underlying soil base and subgrade soils. Once they cut the asphalt and removed it, they performed a Kessler Dynamic Cone Penetrometer test on the subgrade and subbase materials to get ideas as to what its strength characteristics were and then went back and performed soil test borings at all of the locations selected. They also performed some limited laboratory testing on representative samples that were obtained. There were three sets of laboratory tests performed on selected representative samples. They also reviewed some of the city's records that were available to them to get an understanding as to what had transpired during the construction process. From that they reviewed the data and then prepared the report.

Mr. Owen said basically what they found from the soil test core information was that the subgrade conditions were generally very favorable based on the standard penetration testing and dynamic cone penetrometer results. The laboratory CBR was a little low for the type of materials that were encountered. He said they were expecting something a little higher, but those results were very consistent among the samples that were tested. He said the California Bearing Ratio test is a test procedure in which they compact the sample in a mold. They saturate it back to about 95%. He said that is what they did with the three samples they tested. Then they take a 3 inch piston in that surface area and load it into the sample. The sample is saturated for 96 hours. It is put under water and saturated for 96 hours, and then we pull it out and take a 3 inch piston and load it and record the load and then process those results. It is a percentage of a standard value. Mr. Owen stated the test gives the support characteristics, the California Bearing Ratio for that soil. From that we go into a correlation and come up with a subgrade support value for the material. Then the pavement design is based on that.

Councilman Dewar asked Mr. Owen what the overall conclusion was about the roads. Mr. Owen stated there were multiple failures, multiple overlays, multiple patches done out there and continued ongoing failures and patches. He said in reviewing all the information available, they feel that the subgrade conditions and underlying conditions are favorable. As far as the ground water table, they encountered ground water at one location. At the time of boring the water was at a 9 foot depth. After about 18 hours it had moved and raised to 6 feet 8 inches below the ground surface. He said he got a subsequent water level measurement Saturday a week ago and that was at 8 feet 8 inches below. It has dropped a little bit. He said some of that could have been impacted by an irrigation system which could have raised it after the initial test.

Councilman Dewar stated one of the reasons Council wanted the test was to get a sense of why we were having the failures. He said he was not an engineer. He said what he was hearing from what Mr. Owen just said was that the soil itself seems to be fine if you are not finding water until under 9 feet. He said then as an engineer what would account for all the failures. Mr. Owen said what they had seen in researching the data is that the lots were graded individually and there was a pretty substantial amount of grading required for the lots which would require loading dump trucks and transporting the soil. He said they feel that combined with some of the other construction traffic out there allowed the pavement to flex and start cracking. With those cracks water was allowed to infiltrate into the underlying subgrade and saturate a thin surface underneath the pavement which caused the failures to continue.

Councilman Dewar pointed out that some of the failures occurred before they had construction. Mr. Owen stated he did not know what the extent of those failures was. He

said he did not know if they are similar to alligator cracking, if there pavement marks, or what those failures were. He said there were sub-basins out there that had to be cleaned out during construction which would have required heavy truck traffic there. He said he understands there is a waste water pump station that the road may provide access to that would have required some heavy truck traffic going through this area. He said it is those types of traffic that could have caused a problem. He said as far as the houses that were built out there he does not know how the contractor staged his equipment and supplies in building the houses.

Mr. Toole stated he thought there were probably several mechanisms that work in different areas. He said on Huron Drive, at the lower part where they had read information provided by the owner's engineer, some failures occurred there before anything started, but they installed some French drains and some water collection devices to collect ground water. He said that area was along what was previously noted, even on their drainage plan, as a wet area, a creek or a similar type stream. It may have had water at different times. He said there could have been failures in that area as a result of that water prior to them installing subsurface drainage or some type of French drain to collect and move water through that area. He said the road was there for a good bit of time before anybody moved into the area. He said there are two things you are looking at in designing a road, or if you are looking at how a road will react. One is the loading on the road and the second is the soil subgrade characteristics. He said it is a flexible pavement system, and it is that way for a reason. There are components, and each component has to work like a chain. If one member of that chain breaks down, it dies. He said if you look at the amount of dirt, there were places where there were 15 to 18 feet of soil moved off some of the lots. In fact, one of the questions asked related to a level of ground water, or a level of water seeping out of the hillside in one of those major cuts. It is a major cut. All of that material had to be moved. He said he did not think it was hauled off site. Generally you balance it because the contractor cannot afford to haul everything off and haul some back on. So usually they move it around. There was a lot of fill in the roadway. There is fill on the lots on the south side of the road on Moultrie Drive and the east side of Huron. A lot of fill was removed back in there. He said a lot of fill was moved with heavy equipment. Any time you use grading equipment, it is heavy. He said dump trucks are heavy. He said a dump truck is probably equivalent to more than 1,000 car passes on the same road. He said if you start doing that on lot after lot, all of a sudden the number of traffic applications start multiplying.

Councilman Dewar stated then based on what Mr. Toole and Mr. Owen are saying the ground was not too wet for the road, and the problem essentially was caused by too much traffic.

Mr. Toole stated they could not say whether the ground was too wet when it was paved. Without being there to test that, there is no way to know. He said one reason you can't test it with a core is that the cores are done wet. A wet drilling method is used because it is in a hard steel shell and an 8" diameter core. That 8" core has water spraying around it to keep the bit cool while they drill through. That water immediately gets into the top layer of material. There is no real way to tell. He said if you had had construction traffic, and wet subgrade, maybe some of it was wet, and you allowed that asphalt to flex and begin a crack, then you have introduced a location for surface water to get into that base and subgrade material. Once it penetrates and gets into what is called a smear zone, which is right at the interface, then it does not take much to allow the pavement to start to flex and then those cracks begin to spread and become alligator cracks. An alligator crack is not showing distress. An alligator crack is showing that it has already failed. That is the result of a failure. He said once you see an alligator crack, everything in that system has failed. For whatever reason that system has failed—any one of the components.

Councilman Dewar asked if it would make any difference if they were to take the soil core samples after three weeks of no rain or two weeks with rain. He asked if that might make a difference in what is found. Mr. Toole responded it would not in a core sample itself as you have to wet drill it. The water will potentially get in there by virtue of the process you have to go through. You might be able to go in and saw cut a large square out and then do some undisturbed samples in the middle of the square. That is a quite

lengthy and expensive proposition to do, but that would be the only way to tell what the existing water content would be.

Mr. Sean Derrick pointed out that during construction they moved soil from Lot 5 and moved it to Lot 4 and 3. The dirt never hit the grade. The road failed in front of his house before they started any construction on Lots 1, 2, 3 and 4. He said there was no construction traffic, no garbage truck traffic, and no traffic on the road. He said he watched them move the dirt. He said he is home all day.

Mr. Toole stated he did know that other parts of the subdivision required fill. He said he did not know exactly where all the soil went, but he knows that it did not leave the subdivision.

Mayor Cavanaugh stated we all have questions, and we want to hear everybody's points of view. He said he wondered if the best way was to go through the presentation, and then have the questions after the presentation with the person coming to the podium. He said it can be done any way.

Mr. Decker stated he felt if we could stop along the way and have people ask questions. He said there are some comments that he does not understand the basis of where those comments are coming from.

Mayor Cavanaugh stated it was fine to do it that way; he just wanted to make sure everyone agreed to do it that way. He said it probably is the best way at the point in time when something is said that a question be asked or a comment be made. He pointed out that we need to get the comments recorded and the person who wants to speak should come to the podium to speak.

Mr. Toole asked if they could review some of the data they collected. Mayor Cavanaugh pointed out that was the purpose of the meeting and Mr. Toole and Mr. Owen did need to get through what they need to tell Council.

Mr. Toole stated he would like to ask Mr. Owen to cover some of the soil borings and the material they found out there. He felt that would tell them something. He said they could comment on even the moisture content that Councilman Dewar asked about that they were able to recover in the materials.

Mr. Owen stated typically what they found out there was a fill material that varied in depth. It was a slightly clay medium defined sand which is generally a good subgrade material or fill material that was under laid by coastal plain deposits. The standard penetration resistance they got were pretty much all in excess of 15 blows per foot which is high, and it is a medium density type soil. That would indicate that the materials were well compacted. He said he could not say 100% compacted or 95%, but they were well compacted materials. Underlying that there were coastal plain deposits which were generally sandy. There was some clay in a couple of areas just randomly throughout the roadways. He said they did hit water in one of the borings in 7 at a depth of about 9 feet at time of boring. The subsequent water levels were 6.8 feet, and then it came back down to about 8 feet 8 inches. The pavement thicknesses ranged from 4.75 inches at one location and down to 1.2 inches with an average pavement thickness of 2.9 inches. He said the pavement design that was spelled out on the plans was 1.5 inches of asphalt. Most of the locations they tested exceeded that 1.5 inches. He said he thought there were only four that were 2 inches or less out of the 22 locations they cored. The average thickness of the pavement was 2.9 inches. At six locations they found a graded base course underneath the pavement. That is relatively a thin range in between about 1 1/4 inches up to almost 3 inches at the locations tested. There was an average of 2.6 inches of base course. With regards to moisture contents, the moisture ranged between approximately 10% and 20% on the material obtained at a depth of 1.5 feet below the subgrade with most of those results near the optimal moisture content which would be where you want it to compact the fill for the best compacted effort. Most of them were very close to that optimal moisture content. Some got as high as 20% but they generally were close to the optimal moisture. Plasticity and expansive characteristics, generally the

soils were low plastic soils, and they did not exhibit an expansive characteristic from the CBR test results. The laboratory tests which were on materials near the pavement subgrade elevation were all classified as sand with only about 30% or less passing a 200 sieve for making silt or clay.

Mayor Cavanaugh asked how they would say overall--good or bad—for the road material. He said everything they had said sounds like the material was pretty good. Mr. Owen stated that is correct. He said that is not what they would have expected. Mayor Cavanaugh asked if that meant it was good. He asked if any of the spots they looked at were cracking or had they been cracked. Ms. Owen stated there was an array of different matters. He said some were in patched areas, some were in overlaid areas. It was an array of different issues. He said they found such a variable condition out there with the proof rolling. He said they may see some deflection for five feet and go another ten feet and not see any movement. He said they may see deflection on one side of the vehicle and not on the other side. He said it was very sporadic as to how they seeing movements. He said to get a general feel for the conditions they discussed and decided to select the boring locations based on random numbers, and go out and measure randomly where those locations were so they would not be biased by a patch or failed area. Typically you don't want to go to the failed areas because you know you are going to find unsuitable conditions. You want to get something more representative of the general condition rather than specifically where a failure had occurred.

Mayor Cavanaugh stated he was trying to understand. He said from what Mr. Owen said it sounds to him to be pretty good and that we should be able to run on that and have no cracking. He said it does not sound like what it is. He asked if Mr. Owen would expect that area to be alligator cracking at some point, or is it already doing that.

Mr. Owen responded that the roads are already alligator cracking, and the areas had been patched. He said what can happen with the loading conditions, is that it can take several years for it to finally come to the surface as the pavement deflects.

Councilman Dewar stated he did not understand that. He said he understands they are saying the condition of the compaction is good. He said he did not understand if it is so good how it could move. He asked what caused the cracks if the compaction is great and it does not have a lot of water in it. He asked how did we get to where the roads are now. Mr. Owen stated when you load the pavement the soil underneath, the sub-base and the sub-grade will deflect. The pavements are designed for a certain axle loading condition. If you exceed that, you quickly get failures in the pavement system. He said that is what they believe happened. He said there are references and documents that they saw that indicate that the material was hauled from site to site across the roadways.

Mr. Toole stated we can pay chicken or egg on it, but if you have an inch and a half of asphalt and that is the strongest layer in the pavement system, under that is the base course and underneath that is the sub-grade. That is a fairly typical residential type of construction. If in fact you have equipment that causes the pavement to flex to a degree, it puts it in tensile strength in the bottom. As it deflects it puts tensile strength on the bottom. Asphalt has no tensile strength. If it starts a little crack at the bottom, they say a crack may propagate about an inch every year with time. If you have a little crack down there, it may take a year or longer for that crack to get to the top and actually come through. Once it comes through, and once there is a crack, and once there is an absolute failure in some component water can penetrate. Any time you have a cracked surface water can penetrate that crack and get into the underlying materials. In the case of this area of South Carolina, as well as the area south of Augusta and all the area in the Coastal Plains area, sand clay is the acceptable base materials utilized because it is abundant. In order to get a graded aggregate base you have to haul it from a Piedmont area quarry. Both Georgia and South Carolina recognize sand clay as a legitimate base construction material. The material in the Gem Lakes Extension area is pretty much the same clay you will see, not only in embankment construction, but also for the base. The problem with sand clay is that once water penetrates, if it has any silt or clay in it, and this does, it is less than 30% but it still has some, you will get a softening of that material right at the interface and that accelerates the failure mechanism tremendously. If you do have one

vehicle that exceeds the weight capacity of what the pavement was originally designed for, you may have some failures in pavements. He said in talking with Mr. Owen earlier when he was in the private sector side of building, they estimated 15% failures during construction of 1 1/2 inches of material. He said once you get water to penetrate the pavement and get between the interface, between the pavement and the base, you will have multiple failures. There is no way to get around it. It does not take much to start that propagation if you get in a condition where you can have failures, whether it be settlement of backfill, or sewer lines, or whether it's compaction that wasn't quite up to speed, moisture in the subgrade or the base material, as the engineers reported they had wet base and wet subgrades. He said he did not know what they were referring to, but they said they had wet subgrades when they put stuff down. He said he did not know how wet it was; if they could see water, or if the moisture content was high. Anything that would allow deflection of the pavement when it started would allow the crack to form and propagation of that crack up to the surface. He said that could take up to a year or it could take up to two to three years. In places where they have patches that are four inches thick, it could take two to three years for that propagation to come up unless it is a really serious type deflection that allows it to move faster. He said it is a chicken or egg. Was it too moist when they put it down? He said he does not know the answer to that, and there is no way to determine it. He said the material itself, based on the characteristics that were found in the soil test borings, it is suitable material for both subgrade and base material if it is put in correctly at or near optimal moisture content. He said the moisture contents were measured in their investigation at 1 1/2 feet to see what the moisture was. Some were a little on the high side of optimum, but none of them strayed too far. It really was not what he expected to see based on what he had heard from various individuals, talking with Mr. Decker, from walking the site, and from looking at it and looking at water coming up through cracks while they were out there. He said with all those things, he expected to see shallow ground water and water movement right under the surface, but it was not. The ground water tables were different. He said what they are saying is that the boring data reflects that the material itself is not poor material. He said they were not saying that the moisture content was not too high when they put it down, and it led to premature failure. He said they are saying in absence of shallow ground water right up next to the pavement, then you have to look for other mechanisms for failure. He said it becomes the chicken or egg situation. Did the pavement fail first, and the moisture get in and create the failure, or was it wet enough that they started the failure and additional moisture got in. Regardless the failure is over material that could be utilized suitably for construction of pavement systems.

Councilman Ebner stated the thing that is interesting is there is an addition right across the valley. Those roads have not failed, and this is not the only area in that side of town or other areas of town that they hauled heavy loads over the roads. He said these standards which come from SCDOT were incorporated in the City Codes in 1987. He said he felt the question might be on that side of town or area why the other roads were not failing in the same manner. He said there is some logic here that says something happened. He said in the neighborhood where he lives, they moved dirt from one street to the next street, and the roads have not failed yet after 12 to 15 years. He said maybe that is the failure mechanism, but why would it just be in 3,300 feet of asphalt. He said using his logic looking around the neighborhood why have other roads not failed.

Mayor Cavanaugh asked about the spray fields that were mentioned in the literature and comments regarding the seeping. He asked what effect that could have had early on. Mr. Owen said part of that comment was that there were springs. He said if you look at the soil conservation map and information, it specifically says this material does not perk well or have good permeability characteristics. He said the question would be why would you put a spray irrigation field here. He said he did not know that we could have gotten that approved as a spray irrigation field, because the ground does not want to accept that moisture. The second thing is that there are springs out there and you have a certain minimum separation in the ground water level and the spray application level in order to have it as a spray application field. He said the springs would have disqualified it from being a spray application field.

Mayor Cavanaugh asked what effect that would have had on it initially if we go way back to the beginning of this whole project. Mr. Toole stated with the sandy nature of the soil

there, there is some clay content, but it is still predominately a sandy material, it should not have in perpetuity held moisture. That moisture would have wicked through down to the ground water level.

Councilman Homoki stated he knows we are in South Carolina, but how far down does it freeze. He said we have had some good winters. He asked how far down does it freeze underneath the soil. He said water freezes, expands and contracts. Mr. Toole stated our freeze depth, when we design things, we use a 6 inch frost line even though usually the frost is only 2 to 3 inches and includes a safety factor. Councilman Homoki asked if that was underneath the surface. Mr. Toole stated he did not know that he had ever seen a freeze underneath the pavement. Mr. Owen said a pavement is dark in nature so whatever sunlight gets through it will produce heat and there will be a certain amount of residual heat. He said he could not think of a situation where he had seen it frozen underneath the pavement. Mr. Toole stated not here, but certainly up north where it freezes down 4 or 5 feet. He said just penetrating the pavement would be about the limit of the freeze or frost depth.

Mr. Decker said he had a couple of questions. He said they had said the base was wet, but they don't know how wet. He said the City Engineer has said that the streets are continuing to tear up because they were installed with a wet subgrade base. The City Engineer said that they were paved when the sub-base was wet. At least one eye witness, Councilman Ebner, was present and observed these roads being paved when they were wet. He asked what effect that would have on the life expectancy of the roads and would that account for the early failures before any truck traffic was on those roads. He asked if the City made him aware of this.

Mr. Owen said there has to be a load on the pavement to cause the structure for the pavement to actually fail. Just because the subgrade was wet would not cause the type of failure that has occurred. There has to be a load going across the failure. Increased moisture in the subgrade could cause more deflection in the pavement which could accelerate that cracking and failure. As far as their stating that the subgrade was wet, there was moisture content. He said he had not seen documentation in any of the paperwork that he has reviewed about the wet subgrade other than hearsay. Mr. Decker stated that was not hear say; and stated that was from emails from the City Engineer. He said he could provide those documents to Mr. Owen, but the City has those emails and could provide them to Mr. Toole and Mr. Owen. He said he was surprised Mr. Toole was not provided with those emails. He felt they should be provided that information to be able to make their conclusion. He said his understanding is that paving on wet subgrade is not the best of ideas and could cause further problems. Mr. Jim Williams asked if Mr. Owen could answer that question which is "If it is a good idea to pave on a wet surface?" Mr. Owen responded that it is not.

Mr. Toole responded that there was no way for them to tell if the original subgrade was wet. He said they do not know how wet the subgrade was when they started. He said there was no data that has been provided. He said visual affirmation of wet subgrades does not mean a lot. He said we would have to have some type of testing in order to define and quantify what is wet and whether it is outside the limits. He said he did not know the answer to that. He said, however, you do not pave on wet subgrade. Mr. Decker stated that is basically what he was getting to. He said Mr. Toole was not there, and he could not know how wet it was. He said the City Engineer said it was wet and that the roads were tearing up because it was paved when it was wet. He said Mr. Toole had confirmed that paving on a wet subgrade is not a great idea and could cause further problems.

Mr. Decker stated he was referring to question 33 of the listing he had prepared. He said the water they did not find was found by other people with radar testing. It was found by CSRA core boring in the road. He wondered if Mr. Toole had those test results when they were determining their results. Mr. Owen stated they did not have the radar data, but saw where they did coring. He said you would get water in the coring procedure. He said you use water on the diamond bits in order to keep them cool while you bore. He said water will get in there as a result of the coring. He said with regards to the radar

depth, they are 6 to 8 feet and that is consistent with the water level that they had seen out there. Mr. Decker stated there are people who walk these roads on a regular basis who could tell you that there is water coming out of the pavement at times. Mr. Decker stated when they were doing their testing recently was a time when there was not a lot of rain so he would anticipate there would be less water. Mr. Owen stated there are two waters—the ground water which is deep seated and from 6 to 8 feet. The other is surface water infiltration. If you have a crack up the road and water gets into it and a crack down gradient, water will come out of that crack. It will travel along the base to come back out. He said he could see water coming out during a period of rain. If it happened that is how some of the water could get under there.

Mr. Decker stated it had been stated in their report that the subgrade was to be compacted to 100%. He asked if there was any data from the City that indicated the testing had substantiated that it was compacted properly. Mr. Owen stated they saw that there was some density testing performed. Mr. Decker stated they have not seen the data. He said they have not seen proper compaction testing data. Mr. Owen stated as he recalls it was very limited. Mr. Decker stated as a matter of fact what happened is that there was a period of time and a number of emails that went back and forth on that about how there was no test data available, and that they would get the CSRA Testing to write a blanket letter saying they did the testing and everything was okay which they did and the letter was accepted, but there was no proper test results which were supposed to be there. Mr. Decker stated to the best of his knowledge there was never any testing to establish whether the pavement itself and the macadam tested to see that it met type 3 which Mr. Toole had indicated is an obsolete standard. He said there is no testing of the macadam. He said when they were provided information were they provided satellite pictures of the road prior to the housing going up. Mr. Owen stated he thought they had one picture that was after the first house was built. Mr. Decker asked if he was able to observe that there was multiple patching and a lot of patching on the roads at that point in time. Mr. Owen said not in the picture they had. Mr. Decker stated the pictures that he supplied to the City certainly showed that. Mr. Decker stated what he was trying to establish was whether they were given enough information with what information they were given to be able to reach their conclusions. He said they are concluding that the roads were failing primarily due to construction traffic. He thought everyone in the Council Chambers had seen emails that he sent out with pictures of the patching that was on the road prior to just one house and prior to that there were several reports on the road failing before there was any traffic on the road. He said within six days of the pavement going down, six days, they were already in there repairing the road.

Mr. Owen asked what the extent of the repairs was. He asked what type of repairs were they doing. Was it a growing mark in there. He said one of the things that can cause cracking is simply the rolling patterns that you use. If you don't properly compact and properly roll it, you can get cracking in the pavement surface. Mr. Decker asked if that information would have assisted him in determining what the cause was if he knew what the problems were. Mr. Owen stated the more information he has the better it is to determine the cause. Mr. Decker stated he asked for that information to be presented from the contractor so the amount of patching and the amount of repairs and the time sequence of when the repairs happened so we could establish that the road was actually breaking up long before any construction was made. He said he was not an engineer, but he concurs with Mr. Toole and Mr. Owen that putting construction traffic on a road would be bad, but on a defective road that is already breaking up and has patches is a disaster. Mr. Owen stated he thought the pictures that Mr. Decker sent out in the past couple of days showing the google satellite photo showed the patches near the sediment basin in the lower portion of the site. He said that was an area where some of the communications they had seen indicated along Huron Street that they had installed another drain system. He said that could have been a high ground water table which was needed to pull the water table off plus also it is adjacent to the detention basin. He said that detention basin requires certain maintenance and clean out which would have required bringing in heavy equipment and mucking that out and hauling off material from that basin which all would have been heavy truck traffic loading on that pavement before home construction. He said the site set there for two years, and the basins would have been in there for two years and would have required periodic maintenance.

Mr. Toole stated there were also the sanitary sewer lift stations that require continuous maintenance and those trucks are not light. They are not little trucks, the ones that pull the pumps. He said he did not know the exact truck they used for that particular location, but both systems do require constant maintenance and over a two year period there will be traversing of equipment there. There is also the construction traffic of the road itself. It is all construction traffic. There are things that contribute, but he would go back to what Mr. Owen said earlier, you can build a pavement anywhere you want to but until you put a load on it, it will not fail. It will set there and may grow grass, but it won't fail until you put a load on it. He said something had to exert a load in order for it to fail. He asked did it fail prematurely? He said if it failed within six days after they paved the road, obviously it failed prematurely. Mr. Decker stated it was failing six days after it was paved. Mr. Toole stated then obviously it failed prematurely, but it had to have a load on it in order for it to fail.

Councilwoman Diggs asked if the problems with the roads had been going on since 2008. Mr. Toole responded yes. Councilwoman Diggs asked how many houses have been built on the street since that time. Mr. Toole stated he did not know when they built the houses. Councilwoman asked if anyone knew when the houses were built. Mr. Decker responded that he thought the first house was built in 2011. Councilwoman Diggs stated she was in the area a few weeks ago, and the houses are beautiful, but the patches on the road are atrocious. She said she was wondering if there would ever be a solution to the problem with the roads. She said she would not buy a house there because she felt it would have an impact on the property value if you try to sell the house again.

Mayor Cavanaugh stated we certainly want a solution to the problem. He said that is what we are all working toward, and we are all working on.

Mr. Toole stated six options have been recommended, each with their level of risk. He said you can't give a guarantee on how long a road is going to last, and will never be able to. He said even pristine roads that go down, they expect to repair and make some patches not to the extent of the roads in Gem Lakes Extension. He said those roads are atrocious, and he agrees 100%. He said he had been practicing 36 years now in the Southeast, and he did not think he had ever seen a roadway with that much patching and repair work. Mr. Toole stated he does agree wholeheartedly. The options were limited to "do nothing" which is always an option. You don't have to do anything. The roads will continue to look the way they are and continue to deteriorate and you can continue to patch. He said the options continue all the way down through different mechanisms for removing and repairing the subgrade and replacing it. He said it is all a level of risk. You have a high level of risk if you do nothing. You will continue to patch and pave. You have a lower level of risk if you do some of the full depth reclamation projects of removing and replacing the subgrade. He said someone wanted to know the guaranteed life expectancy. He said there is no guaranteed life expectancy. He said there is no guaranteed life expectancy with any of the solutions; however, you would be reducing the risks that you will have to go back and make repairs within a period of time.

Mr. Toole stated the other thing is that construction has ceased in the area now, and there should not be any more construction traffic except for the groups coming in to clean out the sediment basins and the groups that are accessing the sanitary sewer lift station. They are construction traffic. He said it might be wise for those to take a look at the CBR value that was recommended based on the test results and look at what type of pavement or asphalt system would be best suited for the conditions and for that type of loading.

Councilwoman Diggs asked if that would reduce the possibility of that happening again. Mr. Toole stated every time you do something, you would be reducing the possibility and would be mitigating the amount of liability you have for continued failures.

Councilman Ebner stated he guesses he understands their logic and what they are saying, but why is this not happening within sight of this area and other areas of the city. He said the same traffic goes to clean out the sediment basins in other areas. There are places where they have moved hillsides to build houses with the same specifications the roads are built with. He said it is also odd that in this 3,300 feet of road that all of a sudden we

have a little place in the city or county that fails in this mode. He said it is just simple logic for 3,300 feet out of 260 miles of roads. He said it is hard to believe the failure of the roads in Gem Lakes Extension is a loading problem.

Mr. Toole stated the failure is not ground water. He said that is the one thing they can say. He said they can also state unequivocally that the soils themselves are not unusual soils for subgrade construction for roads and/or the subgrade for the houses. The soil themselves are not bad soils. He said he was absolutely shocked at what he read in the report because it is not what he anticipated. He said the fact of the matter is that the data itself was pretty consistent throughout the length of both road basins. The materials were very similar. He said those similar materials indicate materials that meet South Carolina DOT road construction materials. He said the densities, even though he does not know it was 100% because we don't have any tests to prove that. The densities which were measured both by the standard penetration testing and the soil boring and the Kessler Dynamic Cone Penetrometer indicate a fairly consistent density soil which is fairly good.

Councilman Ebner pointed out that in the early part of the report, Mr. Toole indicated that they did not make any of the test borings at the entry ways to the neighborhood because it had rocks underneath the road, etc. He pointed out there are a couple of 100 feet on each entry to the Gem Lakes Extension roads and there is no failure. The road looks like the rest of the roads in the neighborhood.

Mr. Owen stated the entrances are in good shape to a certain distance. Councilman Ebner stated once you get to a certain point, it rather obvious where the conditions of the sub-base changed.

Mr. Toole stated he is a proponent of graded aggregate base over sand clay. He said he gets a better product out of it. He said what you are looking at is when you use rock under pavement, it reacts differently.

Councilman Ebner stated he guesses the next question would be the specifications they used, as Mr. Toole said and as he had read also, are to SCDOT specifications. The difference would be the thickness of the asphalt. Mr. Toole stated he did not think that SCDOT allows 1 1/2" of asphalt to be placed on anything. Mr. Owen stated SCDOT does not really address residential streets in their pavement design. Theirs is heavier. They do mention trying to avoid the use of the sand clay base. He said they say you can make the structure more reliable when you design a pavement based on soil support values and reputation. There is a certain amount of pavement design that you put a reliability number on the pavement system. He said you don't design a pavement system to be 100% reliable. You could not afford a 100% reliable pavement system. Typically it may be 95%. It may be 90%. What you are saying is that at the end of the design life of the pavement, you are expecting, if you use a 90% reliability, that 90% of that pavement is intact and ready for resurfacing, but 10% has failed. If that goes into it as well as the traffic loading conditions, you can have a structural number from that.

Councilman Ebner stated he understands all he is saying. He said he does construction management, and they use BLE out of Spartanburg and Atlanta for all of their tests on the work he is doing. He said Mr. Toole and Mr. Owen are saying truck traffic is what damaged the roads. He said, however, then he looks around the city, and he spends a lot of time on the roads in different neighborhoods such as Springstone, Stratford Hall, etc., and they moved a lot of dirt on those lots, and those roads are not falling in. He said you can look at the lay of the land and see a house that was cut into the side of a hill. Mr. Owen asked if the dirt work was done before they paved or after they paved. He said he had done development himself. Councilman Ebner said he understands what Mr. Owen is saying, but when a developer does this or the engineer does it they would have some idea of what they are going to do. He said if you go in and build your road first, and then tear it up you have what we have. He said somebody has to fix it.

Mayor Cavanaugh stated it sounds like even before houses were built, there was failure of the roads even before the first year. He asked if that failure from the early period of time still making a problem that we see today. Mr. Toole said he would say yes, because

it allowed the introduction of surface water into the subgrade and then it infiltrated into all of the base. Mayor Cavanaugh asked exactly what the failure was initially. Was it something that was not done properly or whatever.

Mr. Owen stated we are all talking about failures that occurred. He said the failures that occurred that he sees in the photographs that Mr. Decker provided were all near the sediment basin after the first house was built. He said that is an area, based on some of the information they have had since, where they installed some under drainage in that area because they were having some problems.

Mayor Cavanaugh stated he thought there were failures even before the first house was built. He asked when the first house was built. It was stated the first house was built in 2011. Mayor Cavanaugh asked when the road was built initially. Mr. Decker stated the roads were 66% completed by Mr. Kisner on December 3, 2008. Mr. Decker stated then on December 9, 2008, Mr. Myers from the City Engineering Department stated roads in various areas have areas of failure in the asphalt surface. He said that was six days after the roads were paved.

Mayor Cavanaugh asked if this was still our problem today. He said it sounds as though it started then, and we are still living with it because of whatever reasons. Mr. Toole stated he would say yes, that is part of it.

Councilman Dewar stated if it was not a soil problem, we are saying heavy truck traffic caused the roads to crack and once that happened that was the source of all of the issues that have been faced since then. When the water goes into the sub-pavement, down the road it will cause other areas to crack. Mr. Toole stated he was not saying that subgrade wasn't wet when it was paved originally, but until loads were applied to it, it wouldn't fail. If it failed because the subgrade was wet, it accelerated and from there it was Katie bar the door once you started getting cracks. There is no way, at this point in time, to tell if that material was wet when they paved. The moisture contents they are able to retrieve now, and granted they are at 18 inches because of what they can effectively measure, the water contents are not high enough to indicate to him that the overriding factor was the overall pavement system being too wet or the subgrade being too wet.

Councilman Dewar asked about the quality of the pavement. He asked if they are able to look it. Mr. Toole stated he is not sure how much of the pavement out there is original. He stated it looks like it has all been replaced. Councilman Dewar asked if there was good pavement there. Mr. Owen stated based on what they have seen out there, they have not seen an indication that it is paving. It is not a stripping issue or segregation. He stated generally the paving appears, on visual observation, to be reasonable, nothing really to indicate a pavement breakdown. Councilman Dewar asked if he would know if the pavement was bad or not thick enough. Mr. Owen stated they cut the cores to determine the thickness and measure the thickness and it was 1 1/2 inches. Councilman Dewar asked if 1.5 was okay as far as he was concerned. Mr. Owen stated it is a thin section. He stated he did some research of other municipalities in this area. He looked at Columbia and Augusta. They recommend a minimum of two inches. He stated as you get more up into the Piedmont, toward Charlotte and Greenville, they require a minimum of three inches. Those three inches are usually put down in two layers. He stated you do not pave until you finish the lot grading because of the weight in particular.

Councilman Dewar stated he did not understand that because he was told that before you issue a Certificate of Occupancy to a house you have to have the road done. He asked if that was true. Mr. Toole stated that was true, but mass grading is what Mr. Owen was referring to. They are not talking about box spreaders moving around a foot of soil for a house. They are talking about cutting 15-18 feet of soil out and moving it to another location. The type of equipment used for that type of grading operation is different from what a contractor normally uses around a house to level out a lot for construction or final landscaping. It is different equipment with different weights, capacities, and uses. Councilman Dewar asked if there was anything about the sprinkling system or flow of water if the water is coming down from the house into the street or the sprinkler systems are operated too often, or if any of these peripheral things were part of the problem. Mr. Owen stated once you get the cracks down the seams, as long as there is a path for that

water to get up underneath the pavement, it is inducing water into the pavement system and it is going to create a softening of the subgrade. Mr. Toole stated if you have grading to the back of curb where you allow ponding of water at the back of the curb, it will follow that interface along the curb and go right up under the pavement. So if you allow sprinklers to run incessantly along the edge of pavements, even between the lip of the gutter and the asphalt, if it sits there, it will go down in there and it will cause a premature failure. Columbia County, Georgia has experienced that severely by virtue of sprinkler systems.

Councilman Ebner stated we have this condition all over the City. He stated he is hung up on why this 3,300 feet is in such bad shape when he can go down just about any road and will see hairline cracks down it. He said he understands the hairline cracks did not start at the top, but at the bottom. For some reason the water must drain out under them when they are building houses. There are a lot of roads in neighborhoods that are still going to have dirt moved on them. Mr. Toole stated over 15 years ago he put in roads that have not had the first cracked sealing. They were on eight inches of sand clay and two inches of asphalt without any problems whatsoever. He knows exactly what Councilman Ebner is talking about. They have designed a bunch and that is a standard over in Richmond and Columbia counties. They work for a lot of reasons. One is the material is absolutely pristine that they put in. All the compaction techniques were handled appropriately; the material was at the optimum moisture content; the pavement was put down appropriately; the stormwater drainage for the pavement surface and the surrounding lots was handled appropriately, and they have not had any problems.

Councilwoman Price stated she had a series of questions and concerns. She asked if the roads are repairable. She was told yes. She asked what it would take. Mr. Toole stated a lot. He stated he has not gone through all of the options and applied costs to them yet, but it depends on what level of risk the City is willing to assume or the developer is willing to assume on the roads. We could do nothing to replace all of it, take up the base and some of the subgrade, and go back in and make sure the materials are at the proper moisture content, compact it, and put in a new base. They recommend a graded aggregate base with two inches of asphalt.

Councilwoman Price stated that is where she is leaning now. She stated they had met with them at Gem Lakes and toured the area. She stated the Gem Lakes residents live this problem every day. They do not ride down the street without realizing there is a problem. She stated the City can do nothing and let the residents come to meetings every month and listen to them, or we can do something, which would be sharing the cost with the developer. She stated she doesn't want to end up in litigation with this. That is where this is going to eventually lead. She asked how can we work together to make this work. We are getting data on top of data and having discussions on top of discussions. She stated she doesn't know if they are tired of it or not, but they live with this and certainly they are at the point of trying to figure out who is responsible and how can it be worked out. She stated there is a bigger question because there are other areas that need to be dealt with. If we do this, are we leading to other concerns that may get us in the same box we are in right now. It is a bigger problem than what we can imagine at this point.

Councilman Dewar stated that the report, as it is summarized, says they cannot go back and say whether or not the ground was wet when the pavement was put down. If you cannot do that then you have to deal with what you have. He stated what we have is a road that is unsatisfactory for a lot of reasons. He doesn't know how you go back to the developer with that because nobody can prove the condition of the road when he put the pavement down. The liability comes to City as far as he can tell. It needs to be fixed. It certainly not the residents fault. Councilwoman Price agreed and stated they are just living with the problem every day. Councilman Dewar stated if they live with it, then they should not have to pay for it, but who is going to pay for it. Unfortunately, it cannot be proven that it was the developer. The report does that in his mind. The only thing he heard Toole Engineering say that could be the developer's fault is if they put the pavement down when it was wet. Nobody knows, and there is a lack of a City inspections report that says that.

Mayor Cavanaugh stated what we do know is that there were failures two or three years before there was a first house. Councilman Dewar stated there was a gentleman in the audience that wanted to address that.

A gentleman spoke from the back of the room and stated Mr. Toole addressed his concern which was if an inch and a half of pavement was used, and with all the traffic going over it for construction and to get to the drainage pond there, wouldn't the pavement have to be better than what was originally designed.

Mr. Decker stated he, Councilman Dewar, and Mayor Cavanaugh had a very spirited discourse earlier in the day on moving forward and how to move forward with this. He thinks there is plenty of blame for everyone – the City for not doing the compaction testing, and the city for not faulting that construction when they were paving on wet subgrade. The fact that Gaul and Kisner did one house and then sold the lots to another contractor and then allowed the contractor to use his roads with his heavy equipment, puts him in the middle as well. He had every option to tell them to stop and not allow them to tear up the roads. He did not do that. He stated there are all these things going around, and Councilman Dewar felt that we should work towards an objective of solving this problem, and he agrees with him. That is essentially what needs to be done. The question he has in terms of the timeline on this is establishing how do we proceed from here. He stated if you are telling him that improper compaction, paving on a wet subgrade, and a minimal amount of macadam was done and all of these were present, you have to establish what is going to fix this. Will just milling up the top two inches of macadam and putting on a cap is going to do it when we do not address underneath? He stated he just traveled that road two days ago and sent the pictures to them, and within three days of the last round of repairs, there are massive failures on Moultrie and Huron. There are already sections where it is alligating and collapsing again. To say we can then somehow maybe just patch what is there and put a two inch overlay on it will not work. These roads have had overlays all over the place. Nobody knows where all of the overlays are any more, which is why he requested that data from the contractor so they would know what they were dealing with. If we put a two inch overlay in and not solve what is underneath then it will not have a good foundation. He stated his concern is to address this and not try to run away from the conclusion that he made that there are serious issues underneath this road that have caused this road to collapse for seven years. There has never been a period of more than a month or two when that road was not in some sort of failure.

Councilman Homoki asked if City roads are load limited. Mr. Grinton stated he is not aware of any limits on weights, except the State has some bridges with weight limits. Councilman Ebner stated Mr. Toole can verify that to his knowledge the design used is a light weight HC20 from SCDOT. Mr. Toole stated he doesn't think it's even meets HC20, but it is a light weight design.

Mr. Decker stated the other way the City was culpable in this disaster was that performance bonding is put in place on a City road or construction project to ensure that the citizens, not the City, are protected against a contractor who abdicates on his responsibility. There was no bonding. When there is no bonding, this puts a severe constraint upon City employees on what course can they follow. The roads are not there, but they cannot take them over. The deal is that when the bonding goes in, the City is required to give an inspection this road, give the contractor 90 days to make any repairs necessary if there are deficiencies, and then they can release the bond. He asked why there was not a bond. There was no performance bond on the roads. The maintenance bond was released.

Councilman Ebner stated there were no bonds in Woodside either. Mr. Decker stated this is State law that you have a bond of 125% of the value of the infrastructure improvement. He stated City Attorney Gary Smith can confirm that. He stated when they got to the end, there was an interesting email from Mr. Kisner to the extent of asking if he needed a bond before the final inspection. The bond goes before the place is ripped up so that you have that bond in place so when the contractor doesn't get the job done, the City is to take over the road, take over the project, and use the proceeds from the bond to do the

repairs. That is the whole point of having the bonding to protect the citizens. As far as the rest of it goes, this road is illegal as it stands. It is not to regulations as it stands because the City does not permit a private road to be in the City of Aiken. This road is still a private road seven years after it was built. If the City doesn't fix the road, and if Gaul and Kisner say they are done and declare bankruptcy, then the citizens on the road are responsible for whatever it costs to take care of the road and maintain it. He stated he did not sign on for that. There is no HOA in that development. He said he doesn't want to see litigation either, but he is ready to do it. He stated Mr. Klimm has over 165 pages of documentation, and he has more and he is ready to proceed forward because he is tired of it.

Councilwoman Price asked what it would cost to fix the road. She stated Council would not hold them to it on record, but she wanted an estimate. Mr. Toole stated he had just started putting together the cost estimates when the barrage of questions started coming in and the request for information and he had to put everything down to respond and he still owes Mr. Klimm some information. He stated he guess we are talking about slightly south of \$1 million. Councilman Ebner stated the general report that was given almost three years ago was \$1.2 million to fix it. He stated he doesn't think if you took off the asphalt that is there and put two inches down on top of what is there, even though the test is showing, it will crack too. It needs the whole thing fixed. There are too many fissures down there and too many cracks have already happened all through the road. Councilwoman Price stated it will take taking everything up and starting all over again. Councilman Ebner stated the tests show that. They were too varied across there, and if we do even more tests and took some cross-sections every so often with two or three tests, it would show a variance across the face of the road. He stated in the work he does, that is what they do it. They do it on a six foot center. It is an industrial foundation and you spend the money to do it. He is not recommending to do that here, but the data definitely says there is some fissures down through the backfill without a doubt.

Mr. Decker stated it has been said in the past that Mr. Decker wants the roads ripped up and replaced. He stated Mr. Decker wants nothing of the sort. He loathes the fact that they will go through a year or more of absolute chaos out there if the roads are ripped up. He would be more than happy if they could just put some patches in and overlay on and solve the problem, but he doesn't think that will do it and that is his concern. He pointed out that in the report that the first four options all of them say ongoing maintenance. He asked what that meant when it is defined as ongoing maintenance. He asked if that meant every six months we will have more failures, and we will have crews fixing the roads again.

Mr. Owen stated with those options there is an element of risk there because they have not eliminated everything and gotten to the base, repaired it, and brought it up. As long as you don't do that, you have that risk. It's hard to assess and give a specific dollar amount.

Councilman Ebner stated following up on what Councilwoman Price stated, there are some other areas of problems, but the good news on other areas is that it is only on top of waterlines that were not compacted. The sides are pretty good. Here, the whole base has failed. He has come from the ground up on working with this stuff. He has talked to a number of people in relation to this, and there are some legal people living in that neighborhood that have prosecuted this type thing and have recused themselves. He personally has been to the LLR and Attorney General about this, and it is an internal problem. He thinks they have to come up with a solution. There are people that have tried to sell their house and the appraisal has a deduction on it for the quality of the road. It is really getting in their pocketbook. The LLR will tell you that once you are damaged, using the word damage to the person, you are in a whole different ball game. He stated the City Attorney can attest to that.

City Attorney Gary Smith stated he wasn't sure what Councilman Ebner meant by LLR. Councilman Ebner stated Labor, License, and Regulation Board. Mr. Smith stated he understood that, and asked if he was talking about a claim against Gaul and Kisner. He stated LLR has no authority over the City of Aiken. Councilman Ebner stated they are at

fault, but yet, all along, everything they have done has been pretty well approved by the City. He stated then you get into not having the bonds and other things that were not done. There is a lot of blame to spread around. Mr. Smith said he doesn't disagree with that. Councilman Ebner stated the LLR, which everyone has to deal with, when it comes to a quality issue of an installed item by a municipality and you can trace the quality back to day one, it has to be fixed by somebody.

Councilman Dewar stated he slightly differs. He thinks we cannot prove it was wet when they put the pavement down. He stated he understood that one and a half inch was done, but asked if there was a rule stating it was bad. He was told that is what was on the plans. Councilman Dewar stated he doesn't know how you get into the developer in that particular issue.

Mr. Toole stated he attended a meeting back in 2013 on behalf of the City with the then City Engineer Larry Morris, George Grinton, and Richard Pearce with the developers and their engineer and a representative from CSRA Testing. Tilden Hilderbrand prepared a memo after that meeting and forwarded it to Steve Kisner and Todd Gaul. He stated it was provided to him by the City Engineering Department. It basically said after visiting the site and as a follow up to their meeting last week with the City Engineering staff, Rick Toole with Toole Engineers, and Jeff Polk with CSRA Testing offered the following. A discussion was held on each of the following topics: cause of failure, testing and review of conditions to date, evaluation and repairs to date, and future plans. He stated under the first one, cause of failure, and this is from Tilden Hilderbrand, it is apparent that the pavement has failed in various locations based on excess moisture in the subgrade. The specific source of this moisture has not been determined. The subgrade has been moist but not saturated in the core samples that have been examined. It was theorized that the moisture near the surface at some point in time was exacerbated by heavy truck traffic moving soil from lot to lot. He stated it was recognized early on and even admitted to by the engineer for them that the subgrade was wet, and they were attributing some of the failure or the failure to that and the excess heavy traffic. Councilman Dewar stated that changes the complexion. The City does have legal recourse.

Councilman Ebner stated if you are building something and you know it is wrong as you go along you are supposed to fix it, both by ethics and being a professional engineer, of which he is one. He stated he knows Tilden Hilderbrand very well from working with him over the years. He stated the City needs to come together with a solution, and unfortunately it is solution number five or six to get any kind of life out of the road at all. He stated around town they would say a road that lasts 15 years is okay, but you are looking at 20-25 years for a typical road. You can get 10% patches or so, but he guarantees if someone says they have a road failure, he will go look for the low spot in the road because that is where it will fail. We have an area here where there is guilt but we need to come up with a solution.

Mayor Cavanaugh stated he felt there is no doubt we need to come up with a solution. He said we have talked about this in all of our many meetings, and he thinks we all know that. He stated we want this road fixed. If the City has to do it, then we will have to do it and make it right as far as he is concerned.

City Manager John Klimm stated one of the points Mr. Decker made, and that is whether or not we have our finger on the real cause of this failure. He stated obviously someone is going to spend a lot of money, whether it is the developer, the City, or someone else or a combination. He stated we would look even more foolish if five years from now we were having a meeting, having repaired the road, to have it fail again. His question is what is the engineer's level of confidence that they have put their finger on the cause? He doesn't want to solve a problem without understanding what the problem was. He thinks that is what Mr. Decker was getting at. He stated he needed to ask that. He said we are talking about spending real dollars, and he wants to feel some level of confidence that we have a fix on this thing before we spend a lot of money.

A citizen asked if the answer to his question could be linked to the options. He asked that whatever the answer to his question is that it be reflect back to option 1-3. He asked what the best solution was.

Mr. Toole stated he had not had an opportunity to go through and assign those levels of risk or to articulate a level of risk plus cost. He said he would like to defer that question until he has time to do so. Mr. Klimm asked if he felt when he has been given sufficient time that he will make a recommendation to Council with a high level of confidence that he has his finger on the pulse of what caused this so that we are not solving a problem without understanding what the problem was. Mr. Toole answered yes. Mr. Klimm stated if the testimony we have received is accurate, and he believes that it must be, that this road failed after the first house was built, how anyone can sit here and say that it is not the developer's responsibility is beyond him. Councilwoman Price agreed.

A citizen stated he had a question that might relate to what he was talking about. He heard them talk about the fact that they did not know what determined this. He asked when they took the core sample if they were able to determine the lower bituminous material was a more aggregated and the top was finer. He asked if they were able to see that in the core. He was told no. He stated their thinking was it was done in one lift and in some areas they showed 3.1 inches, which in fact is rolling at least four inches of black top. He stated in his view that is not an acceptable way to roll. Especially when they are pulling a hill, it looks like they are going over a mattress when the black top is too thick. Typically, a contractor will vary the thickness to try to do a final grade, which to him is a very expensive way to go. He stated he is curious as to why he didn't do a better job initially to prepare so he didn't have to pay for so much black top. He asked if they ran tests on the core to see if the core actually could have failed as well as the actual black top. The response was no. He stated we could possibly not be looking at the real problem. He stated he knows if they are tamping, even with a big vibrating tamper, and typically you do that without the vibrator the first time and then go back and do it. If they are putting it over wet soil or sub-base, that is going to cool that product down a good bit underneath and additionally you cannot tamp 4-5 inches of black top successfully in one try. He stated where he had some experience was in parking lots and stuff like that where they definitely did it in two lifts. The stated this obviously wasn't speced that way and was done in one lift. There are a lot of spots that are very thick. He was told those are all patches. He asked if they were able to find any original paving. The response was they overlaid the patches.

Mr. Decker stated if they are all patches then we really do not know if the macadam that was laid originally is to standard. He stated he is being told it is supposed to be an inch and a half but we have two, three, and three and a half inches. Mr. Owen stated there are some areas that are an inch and a half. Mr. Decker stated we have some areas, but we do not know all areas. We have some areas that are not an inch and a half, and we have patches on top of that so we do not know the original depth.

Mr. Toole stated if it was a patch, they took out the original pavement and came back with asphalt. He stated he does not know if they did an overlay. He saw some areas that had overlay, but he doesn't know if they patched anything during that overlay period. He stated he was not out there and has no information about how they did their patches or overlays and what they did in that process. He stated he was correct. He would not put down four inches unless SCDOT required him to. He thinks the only thing they can offer is it is a patch, so it was added asphalt. Secondly, there was no evidence of ravelling, stripping of aggregate, segregation, or any type of aggregate accumulation on the bottom of any of the cores based on what was indicated to him.

The citizen stated Mr. Toole's assumption is that it was rolled properly. Every patch they took up was good. Mr. Toole stated it was not full of air voids or he would have called him and said we need to check it. It was stated that rolling could create some of those initial cracks that allow water in the streets.

Mayor Cavanaugh stated they had gotten off track with the questions. He feels Council needs to go through the questions. Councilman Dewar stated it seems to him that we

have made great progress at this meeting and what we now need from Mr. Toole is his level of confidence on the options that are in the report and the cost element of that. Then Council will have to decide what the next step will be. He stated we can go through the questions, but he thinks everyone knows what we need to know to go to the next step. We need to know how confident Mr. Toole would be with the options he has listed in the report. Whether he feels options five or six would be the only viable ones. Council needs to know how much they will cost. Then as a body Council needs to decide their next action. Mayor Cavanaugh stated he agreed. Mayor Cavanaugh stated they may not need to go through the questions unless someone has some questions. Councilman Ebner stated not unless Mr. Decker wants to, as a lot of them have been answered in a general format. He doesn't see the value in going through all four pages.

A citizen asked what happened to all the dirt that was in the hole. Mr. Toole stated it ended up in the sediment basin and the stormwater sewer detention pond. The citizen asked if it moved from underneath the road and asked if it could happen again in another spot. Mr. Toole stated anything is possible when you are dealing with a leak, and you have a storm drain or sanitary sewer with leaks that would allow infiltration into it that can allow material to move. It takes a long time, but it can happen again. The citizen asked if there were any other leaks or any way to check for that. Mr. Toole stated the city tries to check for those leaks, but he doesn't know how they do it. They depend somewhat on owners to let them know if they have a leak or problem. A citizen stated when the roads are initially developed and engineered do you need to do the CBR testing on properly engineered roads. He asked if there was any evidence that CBR testing was done on the roads. Mr. Toole stated it appears they used the standard City specifications for the road. Mr. Decker stated that CBR testing is not necessary for a properly engineered road. Mr. Toole stated that is a correct statement. Mr. Decker stated they did not do any CBR testing and used an out of the box sort of design. He asked how anyone can be assured that if the CBR testing hasn't been done that you are coming up with the proper design. On one hand they are saying you need the CBR testing to have a good design and on the other hand you are saying they didn't do CBR testing.

Councilman Ebner stated the original specifications were approved in 1987, and he thought it was ASTM D 683 or 638 which is tried and true proven. It specifically states you go at 95% proctor at a certain percent moisture, and then for the base you go to 98%. That is in the specifications for the City and the State. He stated by the Freedom of Information Act and by a City Councilman and professional engineer asking for those tests, none have shown up. He doesn't believe any tests were made, at least not documented tests. If the original specifications are properly used, and they are used in industry also. Mr. Decker said he was saying if City Engineering is saying that if someone is going to submit a plan for a road to Engineering, would it not be logical or proper to ask for the CBR testing so they know the road was designed properly for the conditions on site. The out of the box plan works in 90% of the situations. It did not work here. They used an out of the box cross-section and design. It is the standard thing we use everywhere. It is a sand clay base, etc. It was used here, and it did not work. You do not want to repeat this on another project in a couple of years. He asked when the City will look at the situation and say it is not being done correctly and we need to examine how we track these applications, how we proceed, and how we test. He said we need to review all of that so we don't end up here in another few years with the next project.

Councilman Ebner stated in 2007 he was speaking to Council stating to the City that the roads were failing because compaction tests were not being done. He stated he was brow beat pretty hard by the City Engineer as well as the City Manager, because both of them are civil engineers with professional engineering licenses. All of a sudden they passed using an Engineer of Record to verify the test. The Engineer of Record will do nothing but read the City specifications and we have been using them since. He stated before that they did not use the city specifications, and in April of 2014, City Manager LeDuc specifically said that in the early 2000s we relieved the compaction specifications for City roads. Councilman Ebner stated he will hang his hat on that as we go through this, and it will hang pretty heavy on his and Mr. Decker's head because they have documented all of this. He stated he has been doing this since 2005 when his road fell in front of his house for the same reason. That is how we got to where we are.

Councilman Dewar stated compaction is not a problem with this. Councilman Ebner stated if he would run some cross-section on this road he would see some fissures between the different elevations in the road base itself. The only way to fix them is to dig them out and get a uniform cross-section and there are other words that are used like angle repose and the shear angles that he has to deal with. That is how you get a foundation. He stated he is doing that on the project he is working for. They go through those same numbers. They use BLE.

Councilwoman Price asked Mr. Toole to address Item 25. Mr. Toole stated he had not had time to prepare a visual that he could show on that. He stated if you make a deep cut, you can in fact intercept the ground water elevation with that cut. It sounds like that is what has happened. They have intercepted the ground elevation. It normally follows on rivers, somewhat the surface elevation of the ground. If you come in and cut down, you can intercept that, which means that some portion of that ground water will seep out onto the ground surface because the ground water is still moving in the same direction and wherever that surface went through that cut, hypothetically it is still there so when it comes into the other side of the ground it is still going and will dive back down to its normal elevation without that cut.

Mayor Cavanaugh asked if there were any other thoughts or any other things that people wanted to see. Mr. Decker stated what they are saying is you are cutting down the side of the hill then water is going to come out of the side of the hill because it has nowhere else to go. It will run into people's yards and that wouldn't be a good way to develop a neighborhood. Mr. Toole stated it is done a lot, and it is not something he encourages people to do, but you can use French drains, slope drains, down drains, or anything to intercept it to keep it from coming into someone's yard and take care of it effectively. If it is coming out of the bank, nothing was done to address that situation in this case. Mr. Decker stated Mr. Toole had indicated that water is running off the properties and running onto the road. He said that is right because every property there, by City ordinance, has to have a swale to stop the water from going down the hill and channels it out to the street and in addition to that we have French drains that are putting water out onto the street and going behind the gutters and everything else. Mr. Toole stated the French drains are perfect if they put the water in the gutter, and the gutter allows that water to travel to a catch basin storm sewer system. If the swales actually dump the water over the curb into the roadway itself into the gutters then that is correct. That is proper and standard. What they do not want is a low area behind a curb where water sets. If a French drain gets stopped up, and it starts backing up along that curb, it will come out of that area and follow the path of least resistance which is generally an interface between two dissimilar materials like concrete, asphalt, and soil.

Mr. Decker asked if Council would have a report at the Council meeting on August 10. Mr. Toole stated he did not know if he could have the recommendations, level of probability and cost prepared ahead of time. He might be able to have them by that night and will do everything he can to prepare for them.

A citizen stated his concern is moving forward from here. He said we are looking at the recommendations, and the results you have show what is underneath the asphalt is good and what is under there now is sufficient and results show nothing is wrong with what is there. Mr. Toole stated the material itself meets specifications and is considered suitable material. The condition of the material is not good. Councilman Ebner stated that is the key to the whole thing. Mr. Toole stated the properties of the material itself are good and are suitable according to SCDOT and any engineering practice. The condition of the materials is not good. Surface water seeped in and contaminated that upper material and has caused that rapid failure and continued failure that is being seen in patches and other areas.

Mr. Bill Busser stated he is not sure they even need to look at Option 1. He stated you have to have some repair to this. Mr. Toole stated he did not disagree with him, but it is his responsibility to provide all options and do nothing is an option. It may not be a good option, but it is still an option unfortunately. Mayor Cavanaugh stated he doesn't agree

with that either and he doesn't feel anyone at the meeting agrees with that. He stated he wants this road fixed properly. How we get it done is still in question. He stated we will not be ready to make that decision at the next Council meeting either. He doesn't want anyone to think we will. There will be some information, and Mr. Klimm has it on the agenda, but he would say he felt we will be ready to make a decision. We have some talking to do and some things to think about. He stated Councilman Dewar put it wisely and right when he made his comments about steps forward. We do want to move ahead and get this done, but there are some questions to answer.

A citizen asked how the repair people are chosen. She asked if there will be bids going on. Councilman Dewar stated we will go out to bid. That is the normal process. Mr. Grinton stated we will follow City procurement procedures and once a solution is selected and designed, it will go out for public bidding.

Mr. Jim Williams asked if Council could come up with more of a progressive timeline to come to some decision other than Council is not going to vote on the issue at the next Council meeting. He wondered if there could be some timeframe that they could look forward to. He understands it needs to be discussed, but he wants some lines in the sand so they have some benchmarks to look forward to. It has been talked about for a long, long time. Councilman Dewar stated he expected that Council will not be able to do anything at the August 10 meeting, but he expects they may be able to be more specific by the first meeting in September. Councilwoman Price stated she would say before October. Councilman Homoki stated we have to determine why the failure happened as Mr. Klimm said earlier. Otherwise we can devote all of our resources to it and dig it out and find out we are not solving the problem. He asked if along with coming up with costs, is there any way Mr. Toole can come up with the failure mode as opposed to going back to scratch and start compacting again. Mr. Toole stated he wished he could give Council a definitive answer. Off the top of his head based on the information he has seen and the proposed options that Willmer Engineering has put forth, his guess is if Council is trying to look at, and the primary concern is rightfully so placed on the subgrade construction, would be a removal of the base and paving, an inspection of the subgrade and removal of subgrade that has to be removed as a result of moisture intrusion or contamination. That needs to be monitored and directed in the field by a geotechnical engineer who knows what they are doing. Councilman Homoki asked if that was Option 6. Mr. Owen stated Option 6 was complete removal and reconstruction of the road. Councilman Homoki asked how deep are we talking about. He asked if we are talking about digging down to the water table. Mr. Toole stated no, they are talking about removing base and pavement, which is the two to four inches of pavement that is existing, the eight inches of base that is underneath that and then evaluate the material under there to decide what needs to be removed and replaced. He stated it shouldn't be more than 12 inches.

Mr. Decker stated one thing that concerns him about all of this is we are not kicking the can down the road as in the past, but we are still kicking the can somewhat down the road. He said he is being told and everybody agrees that there is a problem. He said there will be an election in November and a new Mayor, but he feels we need cut this off and have a resolution if the City is going to be responsible to fix this and do what needs to be done to fix this. He asked what is being done in terms of narrowing it down. Councilman Dewar stated Mr. Decker is trying to pin Council down and we are not going to be pinned down. Council needs to know how much money. We need to know how much money it will cost and what the options are. Council is moving forward. Mr. Decker asked what will be done if it costs too much money. Councilman Dewar stated Mr. Decker will not get a definitive statement from Council tonight as to exactly what is going to be done to solve the problem. He stated Council said they would be moving quickly. We cannot have it at the August 10 meeting. It is possible, but not likely that we could have the report from Mr. Toole at the August 10 meeting. If we don't have it then, for sure we will it at the first meeting in September. He expects this issue to be on the agenda for almost every Council meeting until there is a course of action. He asked that Mr. Decker ask Council for information they can't give. Mr. Decker stated what concerns him is it has been talked about and dealt with and said something would be done for several years but they need to have some sort of date certain that a decision will be made on this. Councilman Dewar asked what could be said to make Mr. Decker happy.

Mr. Decker wants a decision before the election. Councilman Dewar stated the election has nothing to do with it. Only one person will change with the election.

Mr. Jim Williams stated what they have asked for is not to vote or make a decision tonight, but what has been asked is to come up with a timeline and live up to it instead of saying they are going to keep going and going. He asked how many years and how many times has he stood in front of Council asking questions. He stated they are asking that Council draw a line in the sand and agree to work in a time frame they can work within and commit to delivering. He stated the residents go home and deal with this every day. It is not a Council meeting for them. There has been a lot of time and effort put into this, but they would like to see a resolution or they will take plan B. They do not want plan B, but they all know what that is.

Councilman Dewar stated he thinks they should be pleased with what Council did tonight. Mr. Williams stated he is not displeased. He stated the last time he met with the Mayor and Mr. LeDuc, he said if they want their patience then give them some information. He asked how many letters they had gotten. He said it had been over a year now since they had received a letter. Councilman Dewar stated Council has given them a report that pretty well highlights what it is. Mr. Williams asked how long ago they received the report from Mr. Toole. Councilman Dewar stated the report was received last week. Mr. Decker stated he was referring to a report that was done about a year and half ago. Mayor Cavanaugh stated Council will give a time line as soon as they can. Mr. Decker stated he was referring to a report from a year and a half ago that had four options with the \$1.2 million being the cost and it went nowhere. Here we are a year and a half later and we are back to having a report and no figure.

Councilwoman Price stated that she probably is not at the point that they are because she is not in the neighborhood every day. She stated, to be blunt, she is tired of hearing about this. She wants a resolution to it. She stated it is not because she running for Mayor, but she wants a resolution for this. Secondly, the residents need to have some patience with Council. She knows they have been patient already, but give Council a couple of months. She would hate to come back and the citizens of the City say that Council did not do their due diligence and did not study enough. She stated the residents may think we have studied enough, but Mr. Toole has some more information to do and get back to Council. She stated she surmises they will have something for the residents before October.

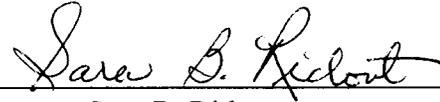
Councilman Ebner asked who will start looking for the money. He said this will take some dollars. He asked if this is between the City Attorney and Mr. Klimm. Councilman Ebner stated somebody has to start looking in the pockets. Mayor Cavanaugh stated he felt they could talk about that, but he doesn't know an answer and he does not think there is a specific answer as to who will be doing that, but they will do it. He stated obviously it will cost money. Councilman Ebner stated that once we say we will fix it, we should have a solution for the dollars and it is not going to be small. He stated the reason he asked the City Attorney is because there are multiple parties involved here, and he feels that at either the August 10 meeting or the September meeting they should be looking at where the money will be coming from.

Councilwoman Price stated when she said she is tired of hearing about it, she is tired because the residents are tired. She stated she knows they are tired and want a resolution so Council has to do something within the next few months so they will know where they stand. If they do not like Council's response then they know what to do next. Mr. Decker stated he is tired. He said he has hundreds and hundreds of hours on this project. He stated it should be morally and ethically resolved for the citizens. He stated even though there are not a large number of citizens at the meeting, every citizen in the development is very tired and frustrated by this because it affects their lives. Councilwoman Price asked Mr. Decker if the City decides to proceed further with a remedy for this situation, will they hear complaints from the citizens about the length of time it is going to take to do what it will take to get it right. Mr. Decker stated he cannot answer for everyone, but as for himself, no, he understands that a project of this nature is going to take a long time and will be terrible, but it has to be done.

A citizen stated the longer it takes to fix the roads they will continue to deteriorate. He asked if the cost would go up. Mr. Toole stated it depends on the option. If it is full replacement it will only go up by virtue of the cost of materials and contractors availability. Mr. Toole stated asphalt is \$85/ton, and it is going up quickly.

ADJOURNMENT

There being no further business, the meeting adjourned at 7:02 P.M.



A handwritten signature in cursive script, reading "Sara B. Ridout", is written over a horizontal line.

Sara B. Ridout  
City Clerk