Ottawa Light Rail Commission

Lowell Goudge
on Wednesday, April 6, 2022

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OTTAWA LIGHT RAIL COMMISSION

ALSTOM TRANSPORT CANADA INC. - LOWELL GOUDGE

APRIL 6, 2022

--- Held via Zoom Videoconferencing, with all participants attending remotely, on the 6th day of April, 2022, 9:00 a.m. to 1:01 p.m.

COMMISSION COUNSEL:
Christine Mainville, Co-Lead Counsel Member
Fraser Harland, Litigation Counsel Member

PARTICIPANTS:
Lowell Goudge: Alstom Transport Canada Inc.
Michael Valo and Charles Powell: Glaholt Bowles LLP

ALSO PRESENT:
Helen Martineau, Stenographer/Transcriptionist,
Laila Butt, Virtual Technician

--- Upon commencing at 9:00 a.m.

LOWELL GOUDGE: AFFIRMED.

CHRISTINE MAINVILLE: Good morning. So the purpose of today's interview is to obtain your evidence, under oath or solemn declaration, for use at the Commission's public hearings.

This will be a collaborative interview such that my co-counsel, Mr. Harland, may intervene to ask certain questions. If the time permits, your counsel may ask you follow-up questions at the end of this interview.

This interview is being transcribed and the Commission intends to enter this transcript into evidence at the Commission's public hearings, either at the hearings or by way of procedural order, before the hearings commence.

The transcript will be posted to the Commission's public website, along with any corrections made to it, after it has been entered into evidence. The transcript, along with any corrections later made to it, will be shared with the Commission's participants, and their counsel, on a confidential basis before being entered into evidence.

You will be given an opportunity to review your transcript and correct any typos, or any other errors, before the transcript is shared with the participants or entered into evidence. Any non-typographical corrections that you make will be appended to end of the transcript.

Pursuant to section 33(6) of the Public Inquiries Act 2009, that section provides that a witness at an inquiry shall be deemed to have objected to answer any question asked him or her upon the grounds that his or her answer may tend to incriminate the witness or may tend to establish his or her liability to civil proceedings at the instance of the Crown, or of any person.

And no answer given by a witness at an inquiry shall be used or be receivable in evidence against him or her in any trial or other proceeding against him or her thereafter taking place, other than a prosecution for perjury in giving such evidence.

As required by section 33(7) of the Public Inquiries Act, 2009 you are hereby advised that you have the right to object to

answer any question under section 5 of the Canada Evidence Act.

So with that being said, we may begin, if you're ready?

LOWELL GOUDGE: Okay.

CHRISTINE MAINVILLE: Could you first speak to your involvement with the Ottawa LRT, Stage 1, more specifically?

LOWELL GOUDGE: Okay. My involvement began effectively with the notice to proceed for Alstom on the vehicle contract in -- and I forget the exact date, but it was either mid-February or mid-March 2013. And I was involved full time from that date until the 1st of August 2020, when I transitioned into a new role within the company.

My principal roles were as the Senior Train System Engineer on the project overseeing all of the train system integration and also the Safety Certifier for the project, for the vehicle side.

CHRISTINE MAINVILLE: And just to be clear, you -- which company do you work for?

LOWELL GOUDGE: I work for Alstom Transportation.

CHRISTINE MAINVILLE: And in terms of your background and experience, could you give us a bit of a sense of that?

LOWELL GOUDGE: My background, starting with university, was in power engineering, so it covered all aspects of power engineering from generation to power semi-conductor systems to control systems, et cetera.

I spent two and a half years working in high voltage research for a separate company, and in the process of that was also doing my masters degree part-time. That was terminated due to the economic collapse in 1982.

I joined with GEC Canada, which was a predecessor company of Alstom, in late 1982 and have worked in the transportation sector exclusively since November of 1982. That includes quality management, engineering management, test engineering, reliability engineering, profit centre management. Then taking on a much larger role as GEC and Alstom merged and involved in the marketing of the European products into North America.

I spent two years living in France

responsible for tenders into the North American market. And when I returned back, I oversaw the technology transfer of multiple projects from Europe into the North American market.

Spent, in total, about 11 years largely involved in multiple projects in New York City on the metro system there. Spent a year as a technical bid manager and then joined the Ottawa project.

CHRISTINE MAINVILLE: And on the Ottawa project, Alstom was contracted to deliver the trains, or the rolling stock, correct?

LOWELL GOUDGE: That's correct.

CHRISTINE MAINVILLE: And that contract was with OLRTC?

LOWELL GOUDGE: That's correct.

CHRISTINE MAINVILLE: And Alstom also signed a maintenance contract, correct?

LOWELL GOUDGE: Yes. I was not involved in the maintenance contract directly, but I was aware it was signed.

CHRISTINE MAINVILLE: With RTM?

LOWELL GOUDGE: I presume so.

CHRISTINE MAINVILLE: Okay. Can you speak to how Alstom came to be selected on this

project as it relates to the delivery of the rolling stock?

LOWELL GOUDGE: Only with indirect comments, or what would be considered as unsubstantiated comments, because I was not directly involved prior to the signature of contract.

My understanding is that the project Request for Proposal was let and multiple proponents joined consortium to offer complete turnkey systems. Alstom was one of those companies, but was not selected for best and final offer. So that took all of our products and services out of the picture.

At some point, and I don't know when or how, I believe that OLRTC was selected as a preferred proponent, but the City did not like the vehicle supplier that OLRTC had partnered with and that opened a door for us to offer our vehicles separately from any other consortium, and that was ultimately selected as the package.

I don't know the mechanics behind it. That's my understanding of how it happened.

CHRISTINE MAINVILLE: Fair enough.

To the extent that you know, would

Alstom have initially put forward their own signaling system for the trains?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And do you have -- and ultimately the contract only related to the vehicles, correct, and not the signaling system?

LOWELL GOUDGE: That's correct.

CHRISTINE MAINVILLE: Do you have any understanding of why Alstom was not selected to provide the signaling contract in addition to the trains?

LOWELL GOUDGE: The only thing I can suggest, and I don't know absolute, is my understanding of the way that the proponents organized themselves is each of them signed exclusive contracts with their suppliers.

So if you had -- let's -- if we take a broad brush of companies that do signaling, you might have Alstom, you might have, at the time, Bombardier, you might have Siemens, you might have AnsaldoBreda, which is now Hitachi, and you have Thales.

If you took some of those signaling companies, each of the proponents may have

signed secure contracts, on a win-win basis, and the same I believe happened with vehicles, which is why there were very few vehicle suppliers from OLRTC to choose from when theirs was rejected.

Everybody partnered up, signed up, signed exclusive and took a package forward. That's my understanding.

CHRISTINE MAINVILLE: And just so I'm clear, how would that connect to Alstom's signaling system not being part of that -- part of its package?

LOWELL GOUDGE: My understanding is that OLRTC and Thales signed an agreement as part of the bid, because Thales has, quite obviously, a very large Canadian footprint and, aside from anything else, gives it an advantage from a content perspective.

CHRISTINE MAINVILLE: And so Thales ultimately did supply the signaling system to be integrated into Alstom's trains, correct?

FRASER HARLAND: They supplied it, but it was under separate contract to OLRTC and not Alstom.

CHRISTINE MAINVILLE: Do you have an

understanding of whether the system that Thales provided is a standard system for them?

LOWELL GOUDGE: I believe it's -- what's been provided is a newer version or newer standard to what they would normally provide, based on the documents that I'd seen.

CHRISTINE MAINVILLE: So something adapted to -- a standard system potentially adapted to this particular project?

LOWELL GOUDGE: I believe a new architecture.

CHRISTINE MAINVILLE: And what do you mean by a "new architecture"?

LOWELL GOUDGE: The first documents that I saw on the project referred to an architecture called "two out of two". What that means explicitly is that on the vehicle side, the equipment has two microprocessors, each of them carries out a vital function, and the two of them must agree for the system to proceed in a safe manner. That would require, on single car, two VOBCs -- complete VOBCs such that if one failed, the other could carry on reliably and safely.

At some point, Thales' architecture

changed to what they called "two out of three". So each VOBC now has three computers of which two must agree. That allows them to reduce the number of installed VOBCs on a single car from two to one because you can still withstand one failure and carry on. So it gave a more reliable and perceived less costly, but that's a guess, system. And it is a newer approach to other Thales systems that I've been involved with in previous contracts that were two out of two.

CHRISTINE MAINVILLE: And do you know whether that was the result of a particular requirement that the City had or OLRTC had on this project?

LOWELL GOUDGE: There would be nothing other than cost and reliability that would drive the decision. To my knowledge, there's nothing in the spec that says it must be this architecture. The spec is more performance based.

CHRISTINE MAINVILLE: And being a newer system, did that have any implications in terms of the risk to the project?

LOWELL GOUDGE: I can't answer on

that.

CHRISTINE MAINVILLE: In terms of the trains that Alstom supplied, I understand that the Citadis model is one that Alstom has used elsewhere in the world?

LOWELL GOUDGE: Not directly, no. The -- what we call Citadis Spirit in North America is a -- or was, I guess now, because it's 11 years ago, was a development project at the onset to bring low-floor technology to North America.

The product is very closely aligned in its physical structure, the vehicle -- the bogies, et cetera, to a product that's sold in France under either Citadis Dualis, which is the commercial name, or what's commonly referred to as TTNG, for Tram Train New Generation.

The electrical architecture, the systems, system integration is largely the same as all Citadis vehicles. So it's the electronics communications networks, et cetera, of most of the Citadis vehicles in a car structure that is more compliant with the requirements of North America.

CHRISTINE MAINVILLE: And so this was

adapted for North America and it was a first then for Alstom in North America, correct?

LOWELL GOUDGE: It was adapted for North America and Ottawa was the first commercial win for the product.

CHRISTINE MAINVILLE: And what would be the implications of that?

LOWELL GOUDGE: In terms of?

CHRISTINE MAINVILLE: In terms of -- well, let me put it this way: This was not a proven vehicle at that point?

LOWELL GOUDGE: All of the elements were proven. And this is a common practice in North America when suppliers -- or customers go out for proposal, they ask for "service proven".

Everything can be traced back to individual elements proven on other systems or large portions of things proven, but there's all always a degree of customization. The largest portion of customization is the setting up of the supply chain in North America. So you have potentially all new vendors of some of the material. And, again, because of Canadian content, you're setting up supply chain.

CHRISTINE MAINVILLE: But this was

effectively a new train design?

LOWELL GOUDGE: If you said yes to show me a part that's used on a different car, there would be some changes to virtually every part on the train, but the overall design architecture, and the structure of the train is very similar to other trains supplied in Europe.

It's been adapted for local production and for the supply chain and for slight differences in vehicle strength requirements, et cetera.

CHRISTINE MAINVILLE: What would be the key differences between the trains in Europe and in North America?

LOWELL GOUDGE: With the normal -- what people might consider an LRT or light rail vehicle in Europe, the normal service speed is 70 kilometres an hour and the structural integrity for crash is not the same. This is partly why TTNG, or Citadis Dualis, was chosen as the structural basis for the design.

That's a train that is designed to operate in two modes. One is between reasonably close cities, maybe 60, 80 kilometres apart, and operate on the French main line track, as well

as come into the city streets and operate like a tramway. And it operates at speeds up to 100 kilometres an hour. It more fits the kind of North American definition of a light rail vehicle.

CHRISTINE MAINVILLE: Are there any particularities that relate to winterization or the winter conditions in North America?

LOWELL GOUDGE: We have some in terms of -- some of the roof design to keep snow from accumulating. We have special filters on the input to the heating and ventilating system so we don't draw snow into the car. The materials, gaskets on doors, et cetera, are all chosen to work down to -40. We have a heated floor so that we don't have the possibility that the floor can slip and freeze -- or freeze and create a slip hazard. There's a lot of things like that that are done.

CHRISTINE MAINVILLE: And that were new for Alstom because this was the first train or LRV designed for a North American city?

LOWELL GOUDGE: Those technologies are -- none of those that I mentioned are new. We supply trains into Sweden. We have equipment

in Kazakhstan in the mountains. We have some equipment that we've sold into Russia.

So there are specific materials that you choose to meet the temperature range. Every city has a different temperature range. Some of them can be lumped together into a group, but you have areas where there's low temperature, you have areas where there's high temperature. There are cities that never see freezing in the world. So that is a materials option that is chosen based on where the train is being deployed.

CHRISTINE MAINVILLE: So do I understand that the City, in this case, asked for a service-proven vehicle?

LOWELL GOUDGE: My understanding is they asked for something to be service proven. And somewhere, I don't know where because it was in the bid phase, there was a presentation made of the Citadis family and it was considered that Citadis was service proven.

CHRISTINE MAINVILLE: It was considered by whom?

LOWELL GOUDGE: By the City.

CHRISTINE MAINVILLE: And was that

Alstom's representation as well? That -- or Alstom's position that it was service proven?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And is that --

LOWELL GOUDGE: Again, to my understanding because I wasn't involved in the bid.

CHRISTINE MAINVILLE: Right.

And -- but from your perspective, it was service proven?

LOWELL GOUDGE: The -- globally virtually everything on that train had been done somewhere else. All the technologies themselves were largely service proven. So, yes, it would qualify as service proven.

As I say, it's something that you get on every contract where people come in and ask for service proven, and they also ask for the latest and greatest of technology.

CHRISTINE MAINVILLE: Right.

And on that, can you speak a bit about what was specific to the Citadis Spirit as a result of North American standards and requirements as opposed to requirements that the City had in respect of the trains? So what was

adapted in terms of the Citadis model because of the city's requirement as opposed to simply adapting to meet North American standards?

LOWELL GOUDGE: In terms of the City's requirements, the only thing that would be explicitly, I think, in the project agreement is that we had to have a certain number of full dual-panel doors per length of train. And I think the -- it was something like one full set of doors for every seven metres of train length. And placing doors can become difficult.

So that was one that was, to my knowledge, a city requirement.

The bulk of the other requirements in the project agreement, the bulk of them are things that are standard in North American trains.

The only other one that might be somewhat unique would be the requirement to have the ability to view the platform from monitors within the train through a Wi-Fi network.

CHRISTINE MAINVILLE: And what about the -- I understand there was a requirement for a hundred percent low floors?

LOWELL GOUDGE: I need to look if it's

a hundred percent low floors or a hundred percent within a certain floor height range. But I think, yes, it was meant for low floor, because somewhere in the future planning there was an option that could be exercised to run vehicles in the streets where a low floor at the entranceway was required. I don't believe it was a hundred percent low floor. I believe it might have been 70 percent, but it had to be a hundred percent level access.

CHRISTINE MAINVILLE: And what does that mean?

LOWELL GOUDGE: It means that all of the doorways have the same relatively low step-up from the top of rail.

CHRISTINE MAINVILLE: And was this a city requirement that was specific to this project that was not -- would not otherwise have been required?

LOWELL GOUDGE: No. I think most 70 percent low floor light-rail vehicles would also be -- would also suit the application. But it's much -- it's much cleaner to be able to walk into and within the LRT without having steps; it's much more accessible.

CHRISTINE MAINVILLE: Did this create any particular complications for Alstom during manufacturing?

LOWELL GOUDGE: During manufacturing, no. But the whole geometry of the car gets driven by all of the limits of the AODA legislation, and the -- what gets referred to back to back as Americans with Disabilities Act legislation where you have -- every entrance ramp, flat floor section ramp within the car, et cetera, has to comply with geometry requirements of slopes for changes in elevation, et cetera.

So it's an interesting challenge to get everything compliant, but that's -- and that drives some of the geometry of the train. But it wasn't city-specific as such.

CHRISTINE MAINVILLE: And was there a requirement for a particular speed? I think you mentioned 100 kilometres an hour?

LOWELL GOUDGE: Yeah. The project agreement requires that the vehicle be fully capable at speeds up to 100 kilometres an hour. And that means that we actually -- if the track would permit it, we have to actually qualify the vehicle to 110.

CHRISTINE MAINVILLE: And was this not a particular city requirement that would not otherwise have been mandated?

LOWELL GOUDGE: No. The vehicle was always planned to be 100 kilometre per hour vehicle. That's quite a common maximum speed in North American LRV procurement specs.

CHRISTINE MAINVILLE: Was it common for Alstom?

LOWELL GOUDGE: It's also the service speed for TTNG. Which, again, that comes back to why that project was considered as the sort of reference arrangement because the vehicle speed, the arrangement of the vehicle, the structure and structural strength of the vehicle were all closely aligned to what we needed for the North American market.

CHRISTINE MAINVILLE: So what, if any, aspects of this project did Alstom see as involving added complexity and potentially risk?

LOWELL GOUDGE: Well, I think the localization is probably one of the risks. And because Alstom at the time had not done a lot with Thales on the signaling, there was an aspect of risk there.

And the other area of risk that we had was that there was a yet-to-be-defined free issue radio from the City. So obviously if it's not defined, how do you design for it?

And for the ATC, and for the radio, somebody had provided, in the negotiation of the contract, that there was a cut-off date where if we did not receive full specification by, I think it was April 26, 2013, we could proceed with our own design and our own design assumptions.

CHRISTINE MAINVILLE: And I'll come back to each of those pieces. But you made a reference to clients often wanting the latest technology and design. Was there a desire here from the City for -- to be leading edge on technology?

LOWELL GOUDGE: I don't think at the time, but we did have some questions as we went through design reviews why couldn't we have certain things. And although it was something that you could use for, say, Internet in your home, it was something that was not yet proven for transit, et cetera. There is always questions about that, especially on information

systems.

CHRISTINE MAINVILLE: So nothing that created more risk for Alstom in terms of being a first?

LOWELL GOUDGE: No. In terms of that, virtually everything we were integrating into the vehicle we had done before.

As I say, the one exception that was not as common was the wayside platform cameras. Normally those cameras are vehicle-mounted.

FRASER HARLAND: Can I just jump in here? You mentioned the requirement for the doors per length of train. Did that -- and you said that placing doors can be a challenge. So what were the implications of that requirement on train design?

LOWELL GOUDGE: Well, really, that was worked out in the geometry at the bid phase to make sure you had the spacing.

But you have -- with the Citadis vehicle, we have some slight changes in floor height as you move through the vehicle, it's not perfectly flat. So you have to step up a little bit or go up a ramp a little bit where the running gear is located.

So to get the number of doors, you have to have the 1.3 metres of the door, plus enough space between doors that you can open the doors in between and not have the two door panels run into each other, et cetera, et cetera. So you have to place the doors on the train. So that can be, depending on the vehicle arrangement, problematic because some vehicle designs don't have the space between running gears to put multiple door sets.

As I say, this vehicle best suits the North American approach, and that's part of the overall design, is to have a high number of doors. It's part of the geometry. It's not a huge challenge for our vehicle architecture, but there's some architectures that it might exclude or disqualify because their arrangement is different. It partially drives the arrangement of the train.

CHRISTINE MAINVILLE: Do you know why the City had that particular requirement?

LOWELL GOUDGE: The more doors you have, the faster you can allow for ingress and egress. And passenger flow and system capacity was one of the requirements they had at the

system level, and obviously those system level things reflect into the vehicle design.

CHRISTINE MAINVILLE: And I understand there was an automatic leveling requirement for the stations. Did that have implications in terms of what Alstom needed to design and supply?

LOWELL GOUDGE: There is a requirement, you're correct, for -- again with the AODA requirements and the Americans with Disabilities Act. There is a requirement that the maximum step up or down at the door threshold is within -- I think it's plus-minus 16 millimetres. Something in that range.

That does drive some technical decisions in terms of how you provide suspension to a vehicle and still achieve the platform height, but it was doable within the technology that we had. It didn't really require new technology development.

CHRISTINE MAINVILLE: Did it require the design of a new bogie?

LOWELL GOUDGE: The bogie was always an adaptation from a previous bogie for the North American market. It did drive some design

decisions on the bogie in terms of its overall arrangement because, again, you have to control for things that you can compensate for and things that you cannot.

So we can't compensate a hundred percent for the wear of the wheel, so you have to, in your adjust of that plus or minus 16 millimetres, allow for mechanical adjustment for the wheel wear. There's things you can't adjust for in the primary suspension, but you do have adjustment on secondary suspension.

So we had a budget that we worked through, gave our control range, and also had to allow for a construction tolerance to the platforms.

CHRISTINE MAINVILLE: There were supply issues relating to the bogies, right?

LOWELL GOUDGE: There were, to my understanding, supply issues related to the bogie more with respect to the localization and the company that we had selected to do the castings.

CHRISTINE MAINVILLE: So let's speak first generally about the localization. You're referencing the Canadian content requirement?

LOWELL GOUDGE: Yup. Canadian or, within the product strategy, North American. Because, again, the product was developed to be sold in multiple cities across North America.

So although it had to contractually meet the Canadian requirements, we also had objectives that we were monitoring to make sure that we were secure within North America to meet a much stricter buy-America requirement.

CHRISTINE MAINVILLE: And, sorry, is that a requirement or was that just a --

LOWELL GOUDGE: It's an internal requirement because we were developing it for a large customer base in two countries.

CHRISTINE MAINVILLE: And so what were the implications of these localization requirements?

LOWELL GOUDGE: You have to search out new suppliers, you have to qualify new suppliers, sometimes you have to change the design slightly to adapt the -- what a supplier can give.

I wasn't deeply involved in the localization aspects of it so I don't know the total touch of that, but it was part of the

issue.

CHRISTINE MAINVILLE: Do you -- understanding that you weren't that close to it, do you have any examples of changes to suppliers that -- in particular that may have affected the project either from a scheduling perspective or a quality perspective?

LOWELL GOUDGE: Well, the bogie you mentioned, because, again, it was a supplier that we'd not used on European supply previously. The roof structure, because it's a -- the roof itself is a large welded assembly of multiple aluminum extrusions that required some work, and I believe in the end we dual sourced it because we had problems with one supplier.

Other than that -- and obviously some companies where they set up either with partners or other subsidiaries to do local assembly of their products to get Canadian content. That's about all I can remember in terms of being issued.

Some parts may have been more difficult to purchase because there were certain parts that had to come from Europe, just from

the technology choice and the supply chain for those was a little more difficult to get into Canada as opposed to the normal supply. But, again, I wasn't all that close to the procurement side of it.

CHRISTINE MAINVILLE: And do you know if there were any supply issues in relation to the brakes or the calipers?

LOWELL GOUDGE: In terms of local supply procurement, not really. In terms of some other problems, yes. But I don't think those were things that were a function of supply in terms of sourcing as such.

We had -- really with the calipers you mentioned, we had a fundamental problem that they failed their life endurance test and had to be redesigned from scratch to meet their life cycle requirements.

CHRISTINE MAINVILLE: Do you have an understanding of what was the cause of that?

LOWELL GOUDGE: In terms of what the global cause was, I didn't get into the structural aspects of the calipers, as such. But they had failed the mechanical cycle test several times. And at the end, and also through

some acquisitions that the brake supplier had made, they had availability of a different caliper. And at some point the decision was made to cut clean and go with the new caliper as the way forward. And that was done by the supplier and we supported the decision.

CHRISTINE MAINVILLE: Was this one of Alstom's regular suppliers then?

LOWELL GOUDGE: There's only in Europe and North America about four or five brake suppliers. There's not a huge list.

You wind up where -- you choose, for a range of vehicles, a base supplier at some point in time as you develop the vehicle. So we chose -- on this case, we chose Wabtec as the overall supplier because, again, Wabtec has a footprint in North America, which is important for going forward in the product development.

We chose Wabtec -- they used a caliper that they had used on previous LRVs, but when it came to the full integration of the caliper into the bogie and the final design of the caliper, it could not, in their view, ever meet the mechanical stress requirements. So at some point, they made a decision, which was probably

a correct one, to say, Stop. Give up on this approach. Take another caliper that is similar, and that was from a company that Wabtec had purchased in between when we started the project and when the decision was made. So they had a technology available that they could adapt easily and that was the decision. In the end it was the right decision.

CHRISTINE MAINVILLE: Did it have repercussions on the schedule and otherwise on the project?

LOWELL GOUDGE: It had some minor repercussions in terms of schedule because we had to retrofit a large number of vehicles. But the functioning was kept the same such that the new caliper did not change the way the vehicle braked. We still qualified the vehicles in the exact same way with the exact same criteria. The same performance requirements were made.

And in this respect the two could operate transparently, although the differences in the caliper required some different valving in the hydraulic pressure unit and in the controls. So the retrofit had to be phased such that you changed the HPU, the caliper and the

software, from the old version to the new version in one step.

So it's a logistics problem, but I don't believe it caused that much of a delay in the overall scheme of things, other than it was extra work that nobody ever wants.

CHRISTINE MAINVILLE: And the bogies caused more delay, is that fair?

LOWELL GOUDGE: I don't believe the bogies caused delay as such. The issue that we had with the casting supplier was a quality and control of process issue. There was a number of castings that were condemned outright. There were a number of castings that were viewed as not fit for the full life of the vehicle. And those were called back in a retrofit systemically within the first couple of years of service to take them out. But they were not deemed at risk of imminent failure, but they would potentially fail at some point in the later years of their life so they were replaced in an overhaul.

CHRISTINE MAINVILLE: So you don't see those as having a significant impact on the timeline for the delivery of the vehicles?

LOWELL GOUDGE: I can't really answer that. I wasn't that closely attuned to the schedule as such.

CHRISTINE MAINVILLE: You spoke about the impact of the localization requirements on the chain of supply. Were there other implications in particular in terms of where the trains were to be assembled?

LOWELL GOUDGE: There's a serious dependence on OLRTC in terms of delivering the MSF, fully completed, such that we could build the vehicles there.

Because the plan was that you would build the maintenance facility, do the assembly of the vehicles in the maintenance facility, and then turn it over to the City to run the trains afterwards.

I think there were probably two things that we -- that are really critical in that thinking. One is, for the facility itself, we were wholly dependent on OLRTC to meet schedule and hand over the MSF to us. And the second one, which I don't think people thought of properly, is as we began running trains, you now have one facility that is expected to be vehicle

assembly, but you're also trying to run trains and support trains out of the same facility. And I don't think that was adequately considered in the planning.

CHRISTINE MAINVILLE: And just to take a step back, would the trains have been manufactured at the MSF were it not for the Canadian content requirement?

LOWELL GOUDGE: I can't really answer that. I've seen that model used in multiple cities. I've also seen companies take on their own leased manufacturing space. That would be a business model decision and I didn't have involvement in that. I don't know how that was worked out. I believe it was part of the original Phase 1 contract that that was the plan.

CHRISTINE MAINVILLE: But do I understand that the MSF was not your typical production facility?

LOWELL GOUDGE: The building design was done based on the service requirements and reviewed and adapted to make it a production facility, but the problem is that you can't have both production and running maintenance in the

same facility.

CHRISTINE MAINVILLE: And so from a production perspective, at least before there was maintenance, was it a suitable facility, from your perspective?

LOWELL GOUDGE: I think we'd have to say yes. We built 48 cars.

CHRISTINE MAINVILLE: But did Alstom face any challenges that it wouldn't normally have faced?

LOWELL GOUDGE: From a facilities -- it's hard to say. I can't say whether it was the cleanest manufacturing flow or not. But, again, people had the tooling, built the cars. So from a space allotment, it worked.

I mean, the production line sort of was folded on top of itself where cars were built, they moved along the outside, transitioned across, moved back the other way, transitioned into the middle and were complete. So the cars moved around a bit in the process but, as I say, we ultimately built 48 cars there, so it made logical sense.

FRASER HARLAND: Just to take even a further step back, you mentioned that you've

seen other companies use this model before. So have you used this model before in other projects that you've worked on?

LOWELL GOUDGE: In other projects that I've been directly involved with? I think no.

I know it was done by what's now Alstom, but Bombardier for the Millennium Line and SkyTrain were the vehicles -- a large number of them were built on the west coast.

I know that Kinkisharyo who supply LRVs in the US, or were supplying them, did not have a US factory but rented space to do their projects; shipping components to the car and building the cars somewhere local to wherever the City was.

It's generally more of a function on the smaller projects where people want local content. And local content varies highly contract to contract. I mean, you might have people say that they want X percent state content or city content.

I know the Detroit People Mover, to do the civil work, you had to be a company physically incorporated in the City of Detroit

proper to be allowed to even bid on work.

So every project has different constraints that way.

CHRISTINE MAINVILLE: Did it have implications on the workforce on Alstom's usual labour staff?

LOWELL GOUDGE: The model that was chosen was to use a mix of Alstom employees and contracted through a third-party company called Randstad to supply labour.

That can be a challenge because at the time, you have to remember we had one contract for 34 cars originally, and it becomes very problematic to cycle up a workforce of 100 to 150 people for 18 months to two years, or whatever the build phase is, and then say, Goodbye, we don't need you.

So you work with a mix of some experts that you bring in from factories worldwide and you take local people for contract. That's the model that was used.

CHRISTINE MAINVILLE: So did -- were there challenges in that respect then in terms of locating -- whether a sufficient number of people or sufficiently experienced people to

work on the trains?

LOWELL GOUDGE: I don't think it was a limit as such because of the design of the train. The fundamental design of the train is such that it can be built anywhere. It does not require any special processes, and I'll qualify that as welding, painting, cutting, machining, drilling, or other things that would be associated with fabrication of parts.

The vehicle is a vehicle that is bolted together, screwed together. All the parts come in and it's assembled. There is virtually nothing, other than nuts and bolts work, although some of those fasteners themselves have special processes, but those processes are well documented and defined.

So the objective is that it's a vehicle that can be built with a minimum amount of tooling and a minimum amount of specialist work at the assembly site. All the specialist work is done and controlled at subcontractors that are qualified.

CHRISTINE MAINVILLE: So you don't see this as having had any potential implications for either the reliability of the system or

having had impacts on schedule?

LOWELL GOUDGE: On schedule, I don't think it was a problem.

On reliability or maybe quality, you may not have people that understand fully what they're doing because they're following a procedure, but they've not built a railcar before.

And there may be a problem, but again it's not my area of real expertise, in the engagement of the employees because they're temps. They're working for a temp company. They may not have the same vision of the future with the company as if they were employees.

CHRISTINE MAINVILLE: So the bulk of the fleet was to be built at the MSF in Ottawa, but am I correct that the first two LRVs were initially to be built in France?

LOWELL GOUDGE: I've heard multiple different schedules. I believe, yes, at some point in time the plan was to build the first two in France, but that then -- that was viewed as a logistical problem from the onset and a procurement issue.

So at some point the decision was made

to build the first vehicle in -- I don't know if it was the first or the first two, in our facility in Hornell, New York, because that facility was planned to be the owner of the design in the long term for future projects and, therefore, had to support it anyway.

As things evolved, they started building one LRV. I think they ultimately decided one LRV in Hornell and one in Ottawa, because it was viewed that we needed to get the skills in place in Ottawa as quickly as we could to follow on with the rest of production.

So ultimately they built the first LRV in Hornell and started some of the qualification tests with that LRV in Hornell. And they built the second LRV in Ottawa and that became the LRV that did the bulk of the vehicle dynamic testing.

CHRISTINE MAINVILLE: Wasn't the vehicle that did the bulk of the dynamic testing LRV5?

LOWELL GOUDGE: No. It was LRV2.

CHRISTINE MAINVILLE: Okay. Did these changes in location have an impact on the validation testing or the prototype testing?

LOWELL GOUDGE: To some extent, yes. Hornell does not have a test track that can allow it to get to 100 kilometres an hour, so we would have to do testing elsewhere when we switch to the Hornell site. So that was a limitation and that was something that was discussed, and we had looked at alternate possibilities for testing. And really the only two possibilities for testing were to go to the Transportation Development Centre in Colorado, or to test on the main line in Ottawa, if it was available in time.

So as we were discussing testing, the -- some of the procedures even were written, testing will either be in Colorado, in Pueblo, or in Ottawa, simply because we hadn't made the decision at the time we had to start developing the test procedures.

CHRISTINE MAINVILLE: And am I right that it did not take place in Colorado ultimately?

LOWELL GOUDGE: Ultimately, no.

CHRISTINE MAINVILLE: And so the plan eventually became that the validation testing would happen in Ottawa?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And can you explain when that happened ultimately?

LOWELL GOUDGE: Sometime between February and maybe April or May of 2016.

CHRISTINE MAINVILLE: That would have only been on the test track?

LOWELL GOUDGE: That was -- at that time, we were led to believe that we would have, by September of 2016, four and a half kilometres of fully electrified main line available for doing testing.

CHRISTINE MAINVILLE: But you did not?

LOWELL GOUDGE: No, we did not.

CHRISTINE MAINVILLE: Can you tell me a bit about how that unfolded?

LOWELL GOUDGE: I'm trying to think of the exact timing. Somewhere around November of 2016, we had LRV2 moving in the yard and we were performing driver training in the yard up to speeds of about 20.

I'd have to look back and see when we did the first walk on the main line, but I think it was in January of 2017 where we did a walk down of the entire main line from the connector

tunnel all the way to Blair to look at it, inspect it, and look at obvious things.

Sometime in January, around January 2017, we got access to the main line, but it was not all of that track. It was the eastbound track only and we were restricted. We did not have the full four and a half kilometres. We only had a portion of the section between Blair and Cyrville, but not in either of the stations because the stations were still under construction.

And we were not able to bring the train back to the MSF on a nightly basis to do anything. It had to be shut down and left. And we could only do testing a portion of the time because the catenary could only be energized a certain amount of time to allow construction to continue on the rest of the system.

CHRISTINE MAINVILLE: So what were the implications for testing?

LOWELL GOUDGE: If you assumed that you had a test track 24/7, and you only had it for one shift, not counting the time to get permission to energize and the time that you had to deenergize to leave it for the other two

shifts for construction, we were trying to compress 24 hours of available time into a realistic five to six hours a day maximum.

FRASER HARLAND: Just to clarify in terms of timelines, you mentioned that testing happened, you were saying, February, April, May 2016. But just to understand, do you mean that's when the testing started? Because now you're saying into 2017.

LOWELL GOUDGE: We discussed the location of the test track February to May of 2016.

FRASER HARLAND: Okay.

LOWELL GOUDGE: Actual testing began around January 2017 on the main line.

FRASER HARLAND: And is this validation testing or serial testing or both?

LOWELL GOUDGE: The bulk of serial testing is done statically in the shop. Because the dynamic testing had not been fully done, obviously on the first vehicle you have to make it move before you can do anything.

We did a limited portion of dynamic testing to make sure that the train went forward when you select forward, reverse when you went

reverse, and it accelerated and braked up to and down from 20 kilometres an hour safely in the yard, such that we could begin expanding the speed out on the main line when we got the main line.

Then you do all of your validation testing, your performance testing, any tuning of performance. That then sets the process for the rest of the fleet for the routine testing, which is not as in depth as the qualification testing.

FRASER HARLAND: So I just wanted to close the loop on that by asking if you're able to tell us approximately when validation testing was completed?

LOWELL GOUDGE: Full and final validation on everything? Sometime towards the end of 2018.

FRASER HARLAND: And am I right that given that the expected process would have been that the prototypes would have been completed elsewhere and validated there, that that timeline was much later than would have been ideal for Alstom?

LOWELL GOUDGE: For some of it, yes. For some of the validation testing it could only

be done on the main line.

We had a ride quality requirement. Irrespective of where you do that, the ultimate ride quality test must be done on the city tracks because that's a system requirement.

The main tunnel was not open until September of 2018, so obviously ride quality was not complete. And even when we had access to the tunnel, it came with a speed restriction of 20 KPH because it wasn't fully validated and released for service.

So we didn't -- we actually had to come back and do ride quality again because the facilities weren't ready, even in 2018, to do that portion of the test.

The same has to do with the platform viewing system. Until 2018, we did not have the ability to do anything in the tunnel or west of the tunnel because the tunnel was not open. So we couldn't test that system in total until the whole system was opened in the fall of 2018, in terms of accessible for us to run vehicles through it.

CHRISTINE MAINVILLE: And you said validation testing on everything was completed

at the end of 2018, but what about complete validation testing on the one vehicle, the first prototype?

LOWELL GOUDGE: That was done, I think, somewhere in the summer of 2018. I would have to go back and look at things.

CHRISTINE MAINVILLE: As of when approximately would it have been possible to go a hundred kilometres an hour and test the right speed?

LOWELL GOUDGE: We never got there.

CHRISTINE MAINVILLE: Why is that?

LOWELL GOUDGE: We were very close. We got to 97 kilometres an hour, that's the fastest we ever got to. The track alignment on the east end of the track did not permit it.

And when they opened the track in the western portal, we asked for the -- and we were going to be doing a ride quality and have all the instrumentation to prove train stability, which is largely what you're doing at the higher speeds. We asked for the permission to do that testing up to 110 kilometres an hour on the western part of the alignment, which is virtually straight and flat, for the last two or

three stations. That was refused because nobody had got insurance to go beyond 100 kilometres an hour. Even though it was known that to validate for 100, we had to go to 110, there was no insurance and it was actually refused by OLRTC because they would not have insurance.

CHRISTINE MAINVILLE: Would they have been responsible for that insurance piece?

LOWELL GOUDGE: I would assume, as the system integrator, that all insurance -- if they're offering a track to do testing and they know that the speed that you need to test, I would assume that it's in their scope to have the facilities insured.

CHRISTINE MAINVILLE: After RSA, were the vehicles able to go up to 100? Was that resolved?

LOWELL GOUDGE: We've never been really allowed to go beyond -- other than one time in March of 2017 where we got to 97 KPH, we've never been allowed to go at maximum speed. And the system speed limit in operation today is 90.

All of that testing is deferred to Phase 2 where it's perceived we'll get a long

enough track to get to 100 and do all the qualification. That's been deferred.

CHRISTINE MAINVILLE: So you said the actual testing began around January of 2017, but given the restrictions, including the fact that the stations were still under construction, am I right that there was no ability to do the full validation testing at that point in time? When did it become possible to do complete validation testing.

LOWELL GOUDGE: As I say, from the -- just the ability to put trains through the system, that wasn't even possible until September of 2018 because the tunnel was not open.

CHRISTINE MAINVILLE: Right.

LOWELL GOUDGE: On the wayside communications, I don't know when they actually installed all the equipment at every station. That was a separate option in the contract because that was not at the signature of the contract designated to necessarily be Alstom as a supplier.

CHRISTINE MAINVILLE: And is it fair to say that the validation testing would have

been -- is very significant for Thales, Thales' systems as well?

LOWELL GOUDGE: It's also for Thales as well, yes, because clearly their system -- they need the physical stuff installed on the track because it's the signaling that controls safe separation of trains. So if you don't have the track, you can't do their portion of validation either.

CHRISTINE MAINVILLE: And am I describing validation testing properly when I say that its purpose is typically to validate a prototype before you build the entire fleet?

LOWELL GOUDGE: For the train, yes, for the signaling, no.

CHRISTINE MAINVILLE: What's the distinction?

LOWELL GOUDGE: The train you validate because you want to prove, with the prototype vehicles, that the train performs as specified. Once you've done that, then your production tests are the train is built as designed. So there's a distinct split.

With the signaling equipment for the vehicle, you've got a certain amount of

signaling equipment, but it requires track installation to validate the vehicle equipment works. But for the wayside portion of the signaling, that is a huge computer network with Wi-Fi access continually along the whole alignment that you have to validate all the way along for the whole system to run.

So for them, the validation test is the same as production test because you're building one, you're building one system.

CHRISTINE MAINVILLE: I take it that given the delays in the validation testing, the -- most of the trains were, in terms of the rest of the fleet, were already built or close to being --

LOWELL GOUDGE: Yeah. I don't have the exact production numbers as to how many vehicles by date. I could go back and kind of recreate it from when I approved safety, et cetera, on each vehicle and approved the dynamic test on each vehicle. But I don't have the exact numbers for when, but, yes, there were a large number of vehicles built before all the validation was done.

CHRISTINE MAINVILLE: And so what were

the implications of that? What was the impact of not doing any early validation testing?

LOWELL GOUDGE: Well, on the signaling side, the design was not yet complete, stabilized, finalized, so there was a very large retrofit to be done to make the signaling work because very clearly the signaling interface wasn't defined and frozen in April of 2013. It wasn't designed and frozen until -- just a wire-to wire perspective, it wasn't designed and frozen, and the final spec issued, until -- I might be wrong by a year, but it was either December of 2016 or December -- I think it was December 2016, but by then we had already committed to a large portion of all the cabling and all the wire installs with our vendor.

So the cut-in was something very high up in train numbers on the base contract. So everything before that had to be retrofitted with a very substantial mod.

CHRISTINE MAINVILLE: So there was a lot of work to be done in a compressed timeframe at the end?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And how long

would you normally want to do validation testing for?

LOWELL GOUDGE: Not as long as it took. Normally you would -- I would like to see about six months as a validation for the vehicle through all phases.

CHRISTINE MAINVILLE: How does that compare to what happened here?

LOWELL GOUDGE: It was definitely longer here.

CHRISTINE MAINVILLE: You mean it was -- it stretched out because you could not -- you didn't have everything you needed to complete it?

LOWELL GOUDGE: On our side I say it stretched out because we didn't have everything we needed.

The signal interface wasn't fully developed and finalized to let the trains operate for quite some time after we'd committed to manufacture, so we didn't even start the validation of that right away. So there were a lot of things that got delayed out.

Even though we were running the train and doing the train validation itself, the

integration of the signaling, the integration of the radio, and some of the things that require the full system, we couldn't do.

CHRISTINE MAINVILLE: And is it fair to say that a number of performance issues arose during that validation testing?

LOWELL GOUDGE: We had some performance issues in terms of the adjustment of the speed profile, the -- making sure we had the braking profile correct. You have some software bugs that you have to work through.

These are all things that happen sort of normally as you go through the process. We had to repeat some validation because we had done the braking validation with the old calipers and then had to repeat it for the new calipers.

So there were some things, problems, inefficiencies, et cetera, but whether it's more or less than normal, it's very hard to say.

CHRISTINE MAINVILLE: But they were discovered late in the day?

LOWELL GOUDGE: Some were discovered late in the day. I'd say the caliper was one that we'd made the decision I think in 2017,

mid-summer 2017, to do the change. So that's rather late in the day because we'd been running the train for eight months already when that decision was made.

Other aspects of it, for example, with the signaling, because that wasn't frozen, really there were a lot of changes that had to be made because of that. Again, that comes back to the interface not being defined when it should have been.

CHRISTINE MAINVILLE: And I'll get to the interface shortly.

In terms of that sort of compressed schedule to the end, what, if anything, was put in place to mitigate the delay and the resulting risk?

LOWELL GOUDGE: What we did on the validation phase is that we started to increase the number of vehicles to be used for validation because the plan originally said you build two, validate everything, and go on.

At the end of it I think we used seven trains to do different parts of validation so that we were running things in parallel.

Train one was built in Hornell and

some of the initial validation was done there statically.

Train two was used for the dynamic testing.

Train three was split in half and half of it was sent to NRC Canada to do the environmental testing and climate room.

I forget what train four was used for.

Train seven was used for the static air flow tests and for the Thales testing.

I forget the whole list now, but we split up the functions and had multiple tests going on concurrently just to try and compress the schedule back.

At that time, we did not have a shortage of trains. We had trains that were sitting completed so we could do other testing with those trains.

CHRISTINE MAINVILLE: And did it lead to some of the issues identified late in the day not being resolved prior to RSA?

LOWELL GOUDGE: Some of it, yes.

CHRISTINE MAINVILLE: And there were -- can you speak to that? I think there were categories of retrofits and other fixes to

be done, some that were deferred post RSA. Can you speak to that?

LOWELL GOUDGE: I can speak to some of it. I wasn't involved in all the discussions, but I think there were things that were functionally necessary to make the train work as a revenue service vehicle. There were other things that were not necessarily functional, but could have impacted safety, which I was involved in directly. Then there were other things that were nice to have, or might impact the reliability, but not impact the ability to move people.

And it was split into some categories. So the ones that were necessary for service had to be done. There were nine safety waivers that we raised for different things that were found that were noncompliant, or would be a problem long term, but could be managed and mitigated in the short term. And we generated waivers with mitigations on how to do that, and those were all, at the end, signed off by the City and accepted. A large portion of those have now been fully completed. I don't know the exact number.

And all of this was documented on what was called the "Minor Deficiency List". As I say, I was specifically concerned about the ones where safety was an issue or there was a noncompliance related to a safety requirement and how those were managed.

CHRISTINE MAINVILLE: And can you speak to how those were managed?

LOWELL GOUDGE: Yeah. There's -- I forget the whole list off the top of my head, but we had two that were related to long-term fire safety and the fire withstand of the vehicle.

One of those was in the area over the bogies where some additional insulation had to be added and a fire resistant paint had to be added, stroked (sic), improved upon. That was something that was taken on and accepted on the basis of the amount of heat that was available from the materials in that area and the fire withstand testing that we had done.

The other portion, under the low floor section, was not viewed as a significant risk, at least for Phase 1 where we were absolutely certain there was no way to introduce a large

heat source under that portion of the vehicle. That was not as clear in later stages, so it was decided that that had to be completed before any new phases opened, and that one is largely done. I think there is one or two cars left for that to be done.

We had an issue with the light in the cab where it was designed to spec with the dimmer, but there was no facility to turn the overhead light off. And even at 10 percent intensity at night, it produced glare on the windshield. So the decision was made that the breakers would be turned off on the cab light so that it would not produce glare. That retrofit is complete. I think that was done fairly early by about the end of 2019.

There was two issues related to the cab door. One issue was the original glass door had a tendency to shatter or break so we replaced that with an acrylic door. The acrylic material itself is not the best material to be used in large volumes because it burns, so we had a waiver on that specifically.

There was a secondary issue that was raised by the City with the lock on the cab

door, where although the City chose the lock and approved the lock, they then came back and said that it was too easy to buy on the open market. They wanted something that was unique and single-sourced so that it couldn't be bought by somebody, because it posed a threat to the driver.

And our perspective on that was that that was a potential long-term risk, but in the short term wasn't a risk because anybody that is angry with the driver is not going to go on to Amazon, order something, wait three days for it to come in the mail before he attacks the driver. So that threat is something that really required a much more premeditated security risk, which is actually outside the design constraints of the vehicle.

So those were the kinds of things that were on the safety list. There's one that was on the safety list for what's called the gangway or the bellows between the car body sections, where the specification at the onset required a completely flush gangway.

We took exception to that at the onset and presented, in all the vehicle designs for

the vehicle design book, a recessed gangway. And presented that, discussed it. There were discussions from the City, and from others, whether that gangway being recessed was identifiable as different than a door for visually impaired people. It was decided that the colour was such that it was a grey between white and black, was visually identifiable and, therefore, did not pose a risk of a visually impaired person choosing the gangway over a door as the entry point, and the design was approved.

At some point later we were asked to formalize all this with a waiver, which we presented. And the City rejected it on the basis that the specification required flush and they wanted flush, even after they approved the exterior design with the recessed gangway.

So we went back and forth with that because it really should at that point have been a change. We presented it openly at the front, they approved it and then withdrew approval and said that it was a safety risk for people, they could fall into that space.

So at the end I don't know the commercial status, but we agreed to add a third

bellows to the side of the vehicle to bring that out, to mitigate the risk of a fall hazard between the car body section.

The safety analysis had already been done for the recessed gangway by OLRTC, so they submitted that safety analysis and everybody understood the risk.

And that retrofit is in process. I don't know the extent of coverage at this point.

CHRISTINE MAINVILLE: And the waiver, just so I'm clear, you mean that Alstom would be prepared to waive --

LOWELL GOUDGE: The waivers for safety were that we were requesting the City waive the implementation for a period in time, but allow the vehicles to go in revenue service on the basis that everybody understood, not just Alstom saying we want this, but everybody understood the risk and the mitigations that were in place.

For example, on the gangway, if somebody fell in, you have the platform viewing system. You have people on trains that can press an emergency button, et cetera. So the risk of somebody falling into that space was very little. The risk of them falling in and

not being observed was even much less, and it was deemed acceptable to start service.

So it was only a permission to have a temporary noncompliance, not a permanent waiver as such.

CHRISTINE MAINVILLE: Did you -- well, let me -- did Alstom have any concerns about the readiness of the systems then at the time of opening?

LOWELL GOUDGE: I can't say for Alstom globally. I mean, a new system is a risk and a concern because it's something you have never done before. It's different than a system where you're supplying vehicles into an existing infrastructure.

I think everybody thought the schedule and the operating tempo was aggressive. There was virtually no time to really test the operating tempo in advance of the whole system.

CHRISTINE MAINVILLE: Sorry, the operating temple?

LOWELL GOUDGE: Tempo. The frequency of trains, the number of trains you're running.

The whole system, up until somewhere around May of 2019, up until that point in time,

irrespective of the number of vehicles that were built, finished in a state that might permit use, up until around May of 2019, there was never more than one train on a track at any one time. Or if there were more than one train on a track, that two parts of the track were physically separated with barriers and devices to prevent trains from passing between them.

So up until May 2019, we had never run more than a couple of trains at any one time. And from May to September, they cycled up to the full service availability by doing different types of simulations, et cetera. But there was very little time to bring the system up to full speed.

CHRISTINE MAINVILLE: And that was not the way Alstom would typically go about that phase in the --

LOWELL GOUDGE: I don't know how Alstom, as a project company, would have done it. My experience is you generally don't go boom on day one with that, with very little time. It was a very accelerated, in my view, go-to service.

CHRISTINE MAINVILLE: And would you --

in your experience, what you've seen, is there what you would call a burn-in period?

LOWELL GOUDGE: Normally on projects I've been involved in, burn-in is not a specific thing.

Normally trains go into service and -- especially on an existing fleet, you would introduce trains into service. There might be a period in time where failures are not counted against fleet reliability to weed out, you know, minor production errors or infant mortality, things like that.

Sometimes you see a period where the first X thousand miles, or kilometres, or hours, whatever the contract is measured in, are not counted. But it's not as common to see a period where you have to do a certain number of kilometres per train as a true "burn-in".

CHRISTINE MAINVILLE: It's not an industry standard necessarily?

LOWELL GOUDGE: I don't think there's really a standard on service requirements before acceptance, to that extent.

CHRISTINE MAINVILLE: And just to be clear, by "infant mortality", do you mean

unexpected events or issues?

LOWELL GOUDGE: Unexpected or things that are predominant due to -- for lack of a better definition, unexplained stresses that are put on things during production that lead to a very early failure.

If you study reliability statistics, virtually every kind of device has what they call a bathtub curve. You have a very high failure rate in a very short period of time, followed by a low and sustained failure rate during it's global life, and then the curve goes up at the end of life as end of life failures take on.

So infant mortality defines that period of time -- it may not be politically correct even today as a term, but it defines a period in time immediately after production where parts have demonstrated, historically, a higher than normal in-service failure rate.

CHRISTINE MAINVILLE: And in terms of the concern about going -- having a full start, and aggressive start, can you speak to whether, in your experience, it's more common have a soft start?

LOWELL GOUDGE: On existing fleets, it's always a soft start because you deliver trains serially. On new start systems, it's a much harder and much sharper start because you start from nothing and all of a sudden you go.

And a lot of times the -- there's a lot of fanfare with a new start system. Usually rides are free, for example. It's kind of the ploy. Let's get people out, give them a ride for free for a week. So you can have some very hard times.

I mean, the first new start I was involved with was in Vancouver. And the vehicles were just absolutely packed, crush loaded on the first day because everybody was on for free.

CHRISTINE MAINVILLE: So what was -- is it fair to say that what was more concerning to you, or Alstom, was less that it was a hard start, or a full start, but more about how much it was accelerated?

LOWELL GOUDGE: I think the compression from when you only ran a single vehicle to full service capacity was the bigger issue.

CHRISTINE MAINVILLE: And can you speak to what informed that acceleration in terms of why there was not an ability to get more time?

LOWELL GOUDGE: I think that's largely something that was driven by the politics in the City.

The original -- there was never -- in the project, there was never a start date for the system. There was only a handover-to-the-City date.

But one would logically assume that the handover to the City would be followed by some period in time with the start. I mean, it's not a big issue, but there was never a clear, this is the deadline for start of service.

But the politics were demanding. The system is late. The system is late. When's it going to start? So there was always a pressure at some point to get a start.

CHRISTINE MAINVILLE: Did Alstom expect then that the vehicles were going into service shortly after RSA in September of 2019?

LOWELL GOUDGE: By that time I think,

yes, we did. I think it was pretty clear that the handover would happen, the City would run for a minimum of 12 or 14 days, or something like that, and then go into service. That was understood by that point in time.

CHRISTINE MAINVILLE: Was it understood long before in terms of the significance of the RSA date?

LOWELL GOUDGE: That I can't answer.

I think everybody knew that everybody was late, but I don't think the real service date was known long in advance. I think at some point there was, for lack of a better expression, a line in the sand was drawn and everybody understood that that was the date they were working to at that point. But that date was never -- it clearly -- when the original RSA date of May of 2018 was passed, that had never been committed properly or acknowledged that the system was going to be late until it was late.

I mean, if you look at the original RSA date in the contract, it was in May of 2018; the tunnel didn't open until September. I mean, you knew it was going to be late, nobody perhaps knew how much. But nobody was willing to say,

this is what it is and adjust your schedule accordingly. We were always held, make it now. Make it now. We want to start now. We want to start now.

So you couldn't plan -- even knowing the system was late, you couldn't plan that it was late and rearrange your schedule to do things more logically because nobody was willing to commit. So everybody was towing the line of, Oh, everybody's on time. Kind of like a liars' poker.

CHRISTINE MAINVILLE: We'll speak more about the delays, but I guess that's my question. Did the RSA date ultimately come to lose some meaning or significance for Alstom?

LOWELL GOUDGE: I don't think it lost meaning or significance to us. If you take the original RSA date of May 2018, yeah, that was -- by September 2018, that was viewed as completely insignificant.

The bigger problem was more frustrating because we never had a workable date and could never have a proper dialogue of the fact that everybody is late, everybody is impacted, what is the proper date? What should

we plan for? So we were trying to meet unrealistic dates all along, and that became frustrating because the target kept moving.

FRASER HARLAND: And was that, would you say, despite Alstom trying to have that dialogue? Or, like, what was Alstom's role in changing the RSA date and what was the response?

LOWELL GOUDGE: I can't speak to that dialogue. That was a commercial discussion that I wasn't privy to.

FRASER HARLAND: And so is that more a project manager type person who would be involved?

LOWELL GOUDGE: That is a project manager type person. But I know from an off-the-record discussion I had with one of my counterparts at Thales, and one of the counterparts at OLRTC, walking out of the building after a long day, one of them turned to another and said, Is it only me or is everybody really late on this?

At the working level, we all knew it was late.

CHRISTINE MAINVILLE: Okay. We'll pause here and take a break.

-- RECESSED AT 10:43 A.M. --

-- RESUMED AT 10:55 A.M. --

CHRISTINE MAINVILLE: We could speak now about the interface between the Thales and Alstom systems.

Could I first ask, how was your relationship with Thales defined in terms of whether there was something in place, a Memorandum of Understanding, or any other parameters for the relationship?

LOWELL GOUDGE: My understanding, although it may be incomplete on the contractual side, is that we had no relationship whatsoever with Thales. We had a requirement, I believe, to offer support to all OLRTC with respect to the development of a mutual interface with Thales. But other than that, there was no contractual requirement directly between us and Thales.

Thales, in terms of what Alstom would view it as, would be a free issue component by our customer.

CHRISTINE MAINVILLE: Being OLRTC?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And what

experience does Alstom have working with Thaless' systems prior to this project?

LOWELL GOUDGE: We might have one or two projects in Europe. And then I had been involved very early on in three projects on a vehicle with Thales equipment installed in the 1980s, that being the Toronto SRT, the Detroit People Mover, and the BC Transit Expo Line for SkyTrain. A little bit of work, but not much with the Bangkok project, again with Bombardier at the time.

CHRISTINE MAINVILLE: And was this an integration of Alstom trains and Thales signaling systems?

LOWELL GOUDGE: No. The Bombardier projects, it was a Bombardier, or before Bombardier, UTDC, vehicle where GEC, or now Alstom, was supplying only the traction equipment.

CHRISTINE MAINVILLE: So was this the first time that Thales' signaling system was being integrated into Alstom trains?

LOWELL GOUDGE: First or second. There might have been one in Europe. I don't know exactly.

But the integration itself shouldn't be a difficult function. The Thales equipment only has to supply a certain number of signals to the train for the train as a whole. And I don't believe those signals changed significantly from one project to another, so it's more a question of them not having that whole definition at the onset.

CHRISTINE MAINVILLE: What do you mean by the "definition"?

LOWELL GOUDGE: Well, to be clear, the train receives an effort or thrust demand, a motoring and brake train line, door control commands, and then there might be one or two other signals, but it's a very limited function. The ATC system is designed to take the train from A to B with no other inputs. So it shouldn't be a significant issue.

The one thing that Thales was requesting, that we never understood and never got a full answer to, was their requirement to have a separate set of lines to look at train integrity instead of deriving the integrity of the train from the existing system. And I believe that was a capacity problem or a

computing problem on their part and, also, we do it this way so we want this irrespective of if it's necessary.

But the thing was that the full system design, as I say, was not available in 2013 when it should have been. I don't know -- I don't know whether that was Thales' requirement to OLRTC or not. All I know is that that was the date it was guaranteed to us.

CHRISTINE MAINVILLE: You mean Thales' specifications?

LOWELL GOUDGE: Yes, their interface specifications. I have no idea what their deliverable time scale was to OLRTC and whether the schedules actually aligned.

CHRISTINE MAINVILLE: Right. Did you come to understand that Thales' design process is an iterative one?

LOWELL GOUDGE: By iterative you mean serial in terms of one built upon the next?

CHRISTINE MAINVILLE: In stages. To be designed in stages with a preliminary design working -- interfacing with Alstom to eventually get to a final design?

LOWELL GOUDGE: It became obvious that

that is what was happening, but that's not what we were expecting.

CHRISTINE MAINVILLE: Right. Alstom's contract provided for Thales to -- or OLRTC, to be more accurate, to provide to Alstom a finalized CBTC specification by April 26, 2013, correct?

LOWELL GOUDGE: Correct.

CHRISTINE MAINVILLE: And in terms of your experience I take it, with other signaling systems, is it not -- is it not typically an iterative process? What's your experience in that regard?

LOWELL GOUDGE: For me it should not be an iterative process.

If you look at New York City, for example, on the R160 fleet, which is the last project I worked on with New York, it required that the trains be CBTC ready, which meant you drop a box in, hook up the components and it should work. And aside from a couple of wiring errors and an antenna cable that was bent incorrectly, when we put the Siemens equipment on for one of the lines in New York, the vehicle interfaced cleanly with the ATC as a drop-in,

having had no meetings.

CHRISTINE MAINVILLE: Isn't there a need to integrate different train behaviours from Alstom and Thales and make sure that they align?

LOWELL GOUDGE: There's a little bit of tuning, and it's really only the tuning when you want to place the train at a platform. Because you're attempting to hit a target that I think in Ottawa it's something like plus/minus one and a half metres, with a basically 100 percent accuracy.

I've seen in other systems that use different technology it be plus/minus 30 or 40 millimetres with a 99 percent reliability rate.

So, again -- and that's a technology choice. The current technology has a wider margin because it's not as accurate as, for example, the SkyTrain technology, but that's hugely expensive on the infrastructure.

But aside from tuning the stopping point, and stopping on the platform, basically the system runs autonomously. It shouldn't -- it doesn't need to know everything about the vehicle to make it run.

FRASER HARLAND: Just on that point, is it your position then that Thales had everything that was required -- that it required in order to produce a finalized CBTC spec? I understand there were issues even related to space and train geometry. So if Thales didn't know that, then how could they possibly have a final spec for Alstom?

LOWELL GOUDGE: They knew from the beginning, and they told us in one of the very first interface meetings what the maximum envelope of their equipment would be. And I think it was 1013 millimetres in height by a width by a depth. And that was defined absolute because we needed that number so that we could do the cab design, because the equipment is fit in the cab.

And they knew all the components they were integrating into their equipment by that time. They had the data sheets for every rack that went into the equipment.

They knew what they had to integrate by that time so there shouldn't have been any real issue about them not knowing the volume.

CHRISTINE MAINVILLE: Did Alstom not

change its train design, including in respect of where -- whether this system -- the CBTC system would be in the cab or outside?

LOWELL GOUDGE: Our design was this would always be in the cab.

CHRISTINE MAINVILLE: Could --

LOWELL GOUDGE: Having said that, at one point, and I think it was OLRTC that actually asked, if we could put it on the roof. And we looked at that. In the end that was decided by others not to be followed, but it was something that was -- we were asked to look at, if we could put it on a box on the roof.

CHRISTINE MAINVILLE: And what was the reason for looking at that possibility?

LOWELL GOUDGE: I think some of it was to do with the volume of their equipment. Which, from talking with others since, is the largest of anybody's ATC equipment.

Some of it was concerns over the amount of space that the cubicle took in the cab potentially restricting the driver's ability to look backwards on that side on the cab.

The cab is cramped. It's very tight to fit everything that's in the cab and

accommodate even the largest person that might get in the cab. It's cramped. But in the end, the decision was to stay with the equipment where it was.

But it was reviewed at one point to look at putting it on the roof.

CHRISTINE MAINVILLE: So that was not initiated by Alstom?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: No?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: Would an unfinalized train design by Alstom have prevented Thales, though, from being able to finalize its ICD?

LOWELL GOUDGE: It should not have been. As I say, they know the signals that they require. And from the perspective of how the ATC equipment goes into the train, it should not have.

I think the fundamental problem with Thales, and I don't know where the problem -- where the cause of the problem began, but the fundamental problem with Thales was that their expectation in the contract was to deliver a kit

of parts that somebody else would assemble. Our expectation in the contract is we would receive a fully-tested rack that would install -- it was self-contained and installed in the vehicle. Yes, there were some other peripheries that had to be installed separately, but the bulk of the equipment was one big rack fully tested.

CHRISTINE MAINVILLE: And is that because that's Alstom's experience in respect of other ATC equipment?

LOWELL GOUDGE: That's our experience with our -- as a car builder in receiving our own signaling.

And, as I say, in New York where there was a space and mechanical outline, and with the exception of a little bit of tolerancing on bolt holes, the box just dropped straight in, it screwed down to the car, and that was it. You hook up the connectors and you're done.

So our expectation was to receive a drop-in unit. And I don't believe that's -- and fully tested. And I don't believe either of those things is outside of industry norm.

CHRISTINE MAINVILLE: And Thales eventually was required to provide personnel to

assemble and test the rack, correct?

LOWELL GOUDGE: We received them assembled. I don't believe we received them tested ever, and their -- what they call PICO, or preliminary installation and check out, required us to do a lot of measurements internally, that would only be necessarily on the premise that the equipment was not fully tested when it was sent.

I don't know who did the assembly and who did what level of testing they received.

CHRISTINE MAINVILLE: So you don't know whether Alstom ultimately did the static PICO testing relating to the vehicles?

LOWELL GOUDGE: We ultimately did the static PICO testing to a mutually-agreed procedure. I know it was not everything that Thales was asking for. And, as I say, I do not know who did the assembly and whatever testing was done on the Thales components. It was not Alstom.

CHRISTINE MAINVILLE: Okay. Did -- I take it Alstom came to understand that -- fairly early on that Thales was going to be delivering something in parts not the way that Alstom

expected it, correct?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: No?

LOWELL GOUDGE: We didn't know it was going to come in parts until we received the -- a package of documentation. And I don't recall when it was, sometime between November 2015 and of August 2016, that included their installation instructions, which started at "all the individual parts". And it was at that point that it became aware that Thales' contract and ours were not aligned because they were delivering a kit of parts and we were expecting a fully-assembled tested rack.

CHRISTINE MAINVILLE: Right. And so if we can go back a little bit. Was there any early thought put into the systems integration, the Thales and Alstom systems integration?

LOWELL GOUDGE: Due to the lack of a spec, we started pushing for meetings. And the first of those happened in about June of 2013, because we didn't have a spec. So we started having meetings and discussions at that point in time.

So that's when we started getting

things defined at least to work with, like, how big is it? What's the size of the rack? That kind of thing.

But -- and they went through one or two evolutions of the specification up until about August of 2013. And then we never got a formal release of the specification after that for several years.

CHRISTINE MAINVILLE: Should there not have been, though, even prior to that, planning around the systems' integration piece at the contracting phase or the design phase?

LOWELL GOUDGE: Well, as I say, we'd started -- because we didn't have a spec, we started having meetings in 2013. I don't know what was, in total, conveyed, understood, whatever, about the volume of the equipment prior to contract. I was not party to those discussions.

I'm sure something took place. I don't know what the something really in total consisted of.

CHRISTINE MAINVILLE: Do you know what the plan was in terms of who was to oversee this integration?

LOWELL GOUDGE: My understanding was that because Thales was subcontracted to OLRTC, and Alstom was contracted to OLRTC, OLRTC was responsible to do the integration.

We had no contractual relationship whatsoever with Thales.

CHRISTINE MAINVILLE: Did OLRTC fully perform that role?

LOWELL GOUDGE: No. They hosted the function, but they didn't drive the function as such. It basically -- if I was to sort of metaphorically describe how it happened, their concept of system integration was put the two suppliers in the room and they'll figure it out.

CHRISTINE MAINVILLE: And there started being meetings and workshops between Alstom and Thales, correct?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: What was OLRTC's role in those workshops?

LOWELL GOUDGE: For the first three months, they had a contract administrator.

CHRISTINE MAINVILLE: Which is not a systems' integrator?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: And who was that?

LOWELL GOUDGE: Alex Turner.

CHRISTINE MAINVILLE: Did OLRTC understand that there was a need for an actual systems' integrator?

LOWELL GOUDGE: Ultimately, yes, but they didn't fill the position of Director of System Integration until January of 2014.

CHRISTINE MAINVILLE: Do you know why that was?

LOWELL GOUDGE: I know why they filled the position, they realized they had a hole. But I don't know why they didn't realize beforehand they needed somebody to look at it.

I think, from a speculation point of view, given the bulk of the work at the time was already entered toward construction, they didn't perceive perhaps that the system integration work had to be done on the vehicle, even though the vehicles weren't due to be started for a few years. They didn't appreciate the timeline necessarily, but that's only speculation.

CHRISTINE MAINVILLE: And did Alstom raise concerns or requests about systems

integration prior to then?

LOWELL GOUDGE: There were, I believe, lots of letters contractually with respect to the failure of having a final spec in time. There were multiple change orders put in that were escalating over time for the first two years of the project, due to the failure to have a spec to integrate to on the 26th of April, 2013. It was an ongoing claim.

CHRISTINE MAINVILLE: And how did OLRTC resolve that delay in terms of Alstom receiving the specs it needed?

LOWELL GOUDGE: Not really all that well. As I say, they just assumed that we would take -- if you had a meeting, even if there was a commitment to come out with a new version of the specifications such that we could look at the evolution and work to that, we never got them. We got draft after draft after draft with no commitment of a finalized spec for two to three years.

They just didn't appreciate that we needed something that didn't say "Draft" to design to.

I don't know if that was a contract

problem with them or what it was, between OLRTC and Thales, I don't know.

CHRISTINE MAINVILLE: You were the main person at Alstom's side at these workshops and meetings, correct?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: So was that conveyed that you were waiting on a finalized ICD?

LOWELL GOUDGE: All the time.

CHRISTINE MAINVILLE: Were agreements arrived at in the context of these meetings that the parties expected would be acted upon?

LOWELL GOUDGE: We would come to technical understandings where they would say, This is how we're going to do something to -- at one point they requested that everybody that was at the meeting sign the minutes, as trying to impose it as a contractual, This is how it's going to be done. But we never ever got documentation to substantiate that in follow-on releases of the specification.

So they were trying to force us to work with minutes of meetings as the only traceability to requirement specifications.

CHRISTINE MAINVILLE: And did Alstom convey concerns about that?

LOWELL GOUDGE: I believe so.

CHRISTINE MAINVILLE: Well, --

LOWELL GOUDGE: In terms of the lack of a final spec. It was -- as I say, we received four different revisions of Rev3 of their spec. How do you work with four different versions of the same document?

CHRISTINE MAINVILLE: How would you describe Alstom and Thales' collaboration?

LOWELL GOUDGE: Frustrating.

CHRISTINE MAINVILLE: Would earlier systems integration planning have largely facilitated that or addressed those issues, do you think?

LOWELL GOUDGE: It should have. It probably would have, but, again, I don't know and I really don't know what Thales was contracted to do.

CHRISTINE MAINVILLE: Right.

LOWELL GOUDGE: There were -- in off-the-record discussions, there were comments about the fact that they only ever owed three versions of their specification.

Well, if it's not developed and they keep doing it piecewise, that might suit their contractual requirements to release, but that doesn't help us. I don't really think the two contracts were aligned.

CHRISTINE MAINVILLE: And Alstom didn't have visibility into what Alstom's own expectations were based on their subcontract, correct?

LOWELL GOUDGE: We knew what our expectations were. We had no visibility of what Thales' were.

As I say, it was rumoured they had a completely different set of terms and conditions, but that was something that was commented by the Thales project manager over a coffee in between sessions of the meeting, not something that was tabled.

CHRISTINE MAINVILLE: So how did Alstom work with OLRTC to resolve these issues?

LOWELL GOUDGE: We put in claim after claim after claim for change. That's all we can do.

CHRISTINE MAINVILLE: And do I understand that Alstom, not having a finalized

spec, reverted to either the first iteration of the ICD or its --

LOWELL GOUDGE: I believe we froze everything to the Rev2.

CHRISTINE MAINVILLE: ICD Revision 2.

LOWELL GOUDGE: Yes, ICD.

CHRISTINE MAINVILLE: Was that clear to OLRTC and Thales that Alstom was -- pending a finalized ICD, it was working towards those specs?

LOWELL GOUDGE: I can't honestly say whether it was as clearly as you've stated put to them or not.

CHRISTINE MAINVILLE: You did not -- you don't recall personally expressing it directly in that way during the workshops and meetings?

LOWELL GOUDGE: We always requested, when are we getting the final version? But I don't think -- I don't know if we said, We're not working at all, explicitly.

We came to understand technically what they were doing, with the full expectation that after the meeting, a revision was coming.

And the problem was you'd go to the

meeting in good faith and get nothing back.

CHRISTINE MAINVILLE: Did you understand that Thales was at least at times waiting on information or data from Alstom?

LOWELL GOUDGE: They were probably at some point in time, but that was much more a later issue in terms of -- when you look at the system, you have the electrical interfaces. How many wires, et cetera? How big is the box? The mechanical, and then you have the communications. Communications is all done by software.

So at one point we gave them all of our standard protocols for the network they were communicating over, and we gave a first copy or a second copy of the interface controls that we thought we were getting, and in which message those variables would be passed back and forth, et cetera.

And that went through, I'm not sure if it's four or five revisions over time as things were consolidated. We were going to -- we asked for things. They said, No, we can't give that. We can give something else, et cetera. So there was some give and take there, but that was all

on the software side.

The hardware, as I say, we needed to have that absolutely finalized and that wasn't finalized until the summer of 2016.

And the document we received that reflected that was, I think, in November of 2016.

CHRISTINE MAINVILLE: And do you know why Thales was delayed on this?

LOWELL GOUDGE: Other than they hadn't finalized their design, no.

CHRISTINE MAINVILLE: So you didn't know why they hadn't finalized the design?

LOWELL GOUDGE: No, I don't. The only thing is that really I guess they were not accustomed to defining absolute, at their outputs, everything that they needed.

We had -- at least once or twice, we had signals either added to or removed from, the signals that we were going to get from the ATC, and they reassigned relays within their equipment to different function.

In the end, my sort of cynical view of it was that they designed their kit, but all the wiring to get it to work was done on our side of

the train.

So they gave a bunch of uncommitted relays and then we did the connections on our side through terminals and put it back in instead of them wiring the function. It made their rack more complex, it made the train wiring more complex, but allowed them to do what they called their first article inspection in 2014 and say, Here's the rack, but the functions weren't defined yet. Because all the functions were wiring that they hadn't yet worked out, but had to be done on our side of the train.

So their schedule was completely misaligned because they had their first article equipment in November of 2014 to a finalized spec that wasn't released until November of 2016.

CHRISTINE MAINVILLE: So how did Alstom mitigate these -- or plan --

LOWELL GOUDGE: We couldn't. We couldn't. How do you plan for something you don't know for two years?

CHRISTINE MAINVILLE: Was there information or data that Alstom was reluctant to provide to Thales?

LOWELL GOUDGE: To my knowledge, no.

CHRISTINE MAINVILLE: Were there any implications of Thales being a competitor to Alstom?

LOWELL GOUDGE: Not that I was aware of. I mean, at one point one of Alstom's parent companies owned Thales, so I don't know how they viewed the competition perspective of it.

CHRISTINE MAINVILLE: If I can give you an example of the IO signal diagram, is it accurate to say that Alstom did not incorporate Thales' changes to the ICD in its own design as it relates to that?

LOWELL GOUDGE: We didn't incorporate the changes until we got the final specification.

And at that -- the fundamental problem with their IO diagram, aside from the train integrity line, which was something we never understood why they couldn't determine in another method.

The fundamental issue was in their IO diagram they specified that we gave them X number of DC power feeds. I think there's, in total, 7 circuit breakers that we have dedicated

to the ATC equipment. If you supply 7 circuit breakers, you expect to give 7 power and seven return. You don't expect to wire the 10, 12, 14 points daisy chained in your side and take 14 separate wires to the rack for them. You expect all that connection done on their side. They didn't. They expected us to do all that connection. It added hundreds of wires into our rack.

CHRISTINE MAINVILLE: You said that OLRTC brought in a systems integrator in January of 2014, that being Jacques Bergeron, correct.

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And how did he facilitate the integration then as of that point in time?

LOWELL GOUDGE: Jacques Bergeron to give him credit, tried to get things moving and ultimately made decisions based on what he was presented with on both sides.

A large number of the times the cost of -- at that point, accommodating Thales versus us wound up with us having to do the changes irrespective of who was responsible. Only because Thales would raise their flag and say,

Oh, this was -- this is in a past safety case. We don't want to change it or we have to redo that, and they would have an exorbitant price. Therefore, it always became our job to do the changes, but he, at least, attempted to move things along.

CHRISTINE MAINVILLE: From that point in time, did OLRTC take the system integration responsibility more seriously?

LOWELL GOUDGE: They took it more seriously, but I think it was handicapped by whatever commercial agreement they had with Thales, and, again, that's only a speculation.

I just think that they were stuck in a position where they had Thales on one side claiming delays, and us on the other side and they chose the lesser of two evils.

CHRISTINE MAINVILLE: It appears, based on what you know, a fundamental flaw at the outset of the process, correct?

LOWELL GOUDGE: Yeah. To me somewhere the two schedules were just wholly misaligned and the requirements were misaligned.

CHRISTINE MAINVILLE: Did OLRTC have the experience necessary to do the systems

integration?

LOWELL GOUDGE: I don't know all the people involved at the RTG level well enough, because it starts with Rideau Transit Group.

Every one of the new phase of transit developments is going under the 3P, private-public partnership sort of motto where you hire a company to design, build, operate, or not, for a portion of time, maintain, and then transfer to the original purchaser.

Every one of these projects is a mix of companies each with a skill set. OLRTC was a company formed to execute that portion of the contract for RTG, so it was a new entity itself.

And every new 3P partnership is a new mix of players because you work with somebody, then you do a project with them, then you start new partnerships, or whatever, with another team. You bid the next one.

So you wind up with a large number of companies that are good at some portions, like SNC is a reasonably good engineering firm, so they're part of the RTG makeup, but how they support it? I don't know how they viewed that overall.

CHRISTINE MAINVILLE: Do you know if SNC was the entity responsible for providing a system's integrator?

LOWELL GOUDGE: SNC was the engineering portion of the RTG project, to my understanding.

CHRISTINE MAINVILLE: Do you know if they were to fill that role, or sought to fill that role?

LOWELL GOUDGE: Not really.

CHRISTINE MAINVILLE: Did Alstom interface with RTG, EJV, and I don't know to what extent you would have distinguished them, but they were the design engineers on the project?

LOWELL GOUDGE: We dealt with one or two people, or at least I did, that were RTG, but mostly we dealt with people that wore the hat of OLRTC, whether they were seconded from SNC or whether they were OLRTC employees, I don't know, but they were representing largely as OLRTC.

CHRISTINE MAINVILLE: Could you speak to OLRTC's management of the project generally?

LOWELL GOUDGE: Not really. For me

it's really hard to say how much they managed or whether they just acted as a post office box, a letter came in and a letter went somewhere. I didn't really see much of a management style other than that.

Now, I didn't go to all the meetings. I didn't go to all project meetings, et cetera, so I can't say whether that's a fair assessment or not.

But they seem to act more as a mailbox and they would disposition letters out, or just outright say, no, and play the -- respond contractually, but not substantively on a technical issue.

CHRISTINE MAINVILLE: Do you have any sense of whether they appeared to be sufficiently resourced?

LOWELL GOUDGE: My impression is under-resourced.

CHRISTINE MAINVILLE: Is it accurate to say that Alstom and Thales ICDs never ended up fully speaking to each other? Being fully integrated?

LOWELL GOUDGE: No, they are fully integrated. The trains go down the track, the

doors open and close, the trains are operating within their safety requirements, et cetera. So, yes, they ultimately got integrated.

CHRISTINE MAINVILLE: Is it possible though that some behaviours may not be reflected in, for instance, Thales' ICD if they're unaware of them?

LOWELL GOUDGE: Oh yeah.

CHRISTINE MAINVILLE: And am I right that this -- there's some example of this happening, for instance, in terms of the emergency brake tests, which over time it was identified and required a change in the software?

LOWELL GOUDGE: It's no so much an emergency brake test. If I understand what you're asking specifically, Thales programmed in a periodic testing of their equipment, which includes testing the response of the system to emergency brake as part of their safety validation.

I think the first time that that was discovered the train was actually on the main line and it disabled the train. Because they asked for, ultimately, five emergency brake

applications within two minutes, and on our power scheme if you open the circuit breaker more than three times in ten minutes it locks out because there's a risk of a much worse event happening due to the gases that can build up in the circuit breaker. And it's a standard industry practice to have that kind of lockout.

We didn't know they were doing the EB test until the train locked out on the main line. That's still not resolved. It's being managed by leaving the train parked every night in emergency brake.

CHRISTINE MAINVILLE: Was this around -- during the testing phase that this arose?

LOWELL GOUDGE: I don't recall if it was in the system testing or if it was in the first week of revenue service. It was around that time.

CHRISTINE MAINVILLE: It may have led to some performance issues?

LOWELL GOUDGE: Well, it led to a delay on the main line because the train was stranded. And, as I say, there's nothing even today in Thales' document to say that they

implement an auto test and that this is what we're doing on the train lines.

CHRISTINE MAINVILLE: Do you recall another issue about a software issue that led to a passenger being momentarily trapped in the door?

LOWELL GOUDGE: Yup. The -- I think it was version 7 of their software, or what they call Build 7, and I think it was Build 7. Where I don't know what they were attempting to achieve but they changed the functionality of the doors. And -- the ATC system controls the doors, and there's a reason for that. The ATC system knows, to a very high safety level, where the train is all the time, it knows to within a metre or so all the time on the track everywhere where the train is. It knows the platform it's at, it knows which side of the doors are safe to open. So they control the doors, the door enable, everything.

In Version 7 instead of holding the door enable when the driver leaves the cab to change ends, they changed it to they took the door enable away when the driver took the driver's key out. And when you take away door

enable the doors closed and they closed on a passenger. Now, they closed and they stopped but the passenger was still kind of stuck in the door, not in physical harm but just plain stuck.

CHRISTINE MAINVILLE: It's fair to say that the integration of the two subsystems was ad hoc?

LOWELL GOUDGE: Yup.

CHRISTINE MAINVILLE: And were there any, what you might call, unnatural divisions of responsibility as between Thales and Alstom in the contracts?

LOWELL GOUDGE: I don't know what Thales' divisions and responsibilities are so I can't answer that.

My perception is that both Thales and Alstom are attempting to do the same thing from time-to-time, in terms of safety, and that leads to some problems.

Thales believes they're responsible totally for safety; Alstom believes we're responsible totally for safety, to some extent. So both parties try and do things. And doors is a great example of where that conflict comes in.

Thales is responsible to enable the

doors. Alstom is responsible to make the train, as a whole, safe, which includes things like not moving with doors open. Irrespective of who is responsible for enabling the doors we don't let the train move if the doors are open.

But Thales also are looking for a change of door status to say the train is safe to move, so they're trying to do the same function we're doing. And that's, I believe, partly because some of their historical documents and their safety case are built around certain functions that may not be the same as what they're installing into today.

CHRISTINE MAINVILLE: Was there -- I mean, there was concern on Alstom's part about it being responsible for installing Thales' equipment, was there not?

LOWELL GOUDGE: There was some concern expressed in terms of not so much installing their equipment but doing what we consider to be factory testing of their equipment, that's a concern because we're not the supplier.

And we shouldn't be -- in the vehicle phase of installing equipment we shouldn't be having to test inside their equipment, so that's

a concern.

CHRISTINE MAINVILLE: And was that in Alstom's subcontract that it was to do that?

LOWELL GOUDGE: I don't know if that's clearly enough defined. As I say, our expectation at the vehicle level is we received a fully-tested piece of equipment. We knew that we would do some static -- what they call static PICO testing to make sure that we're hooked up correctly, but the detail of what Thales was asking us to do in the static PICO is well beyond what any other signaling company would expect a vehicle builder to do.

And I'm basing that on my experience in New York with Siemens and my knowledge of how we work with our own signaling equipment.

CHRISTINE MAINVILLE: So there's nothing else that you recall in terms of, you know, looking at the contract and what Alstom was expected to do that jumped out at you as not being something that you thought Alstom should be responsible for?

LOWELL GOUDGE: With Thales? No, I don't think so.

CHRISTINE MAINVILLE: Please speak to

testing and commissioning. Can you talk about what the original plan was for that?

LOWELL GOUDGE: To the best of my knowledge, yes. I wasn't involved in the detail of the planning or testing and commissioning, but my understanding was that the initial plan for the qualification testing, as I said, it was originally to be done in France because the vehicles were going to be built in France.

When it moved that was then split to some testing on the first vehicle in Hornell and then the testing in Pueblo, Colorado, or at the Ottawa site, and ultimately it was the Ottawa site.

From the production testing, given that the plan was to always build the production vehicles in Ottawa, the production testing was always in Ottawa.

CHRISTINE MAINVILLE: Were there changes to the production testing plan?

LOWELL GOUDGE: There were evolutions over time but, largely, no. It was -- I mean, other than building it up -- the plan itself was always it would be tested in Ottawa because that was the production area.

There were changes in the procedure from time-to-time as, for example, the schematic change, so if we did a change in the schematic you had to implement some changes in test.

Remember what I said initially, production testing is testing that the product is as designed. If you change the design you have to change production tests.

But in terms of global planning, no, the planning was always in Ottawa.

CHRISTINE MAINVILLE: Did the schedule for it change? The testing and commissioning schedule?

LOWELL GOUDGE: For the qualification testing, yes, there were regular updates to show the status of what would be done, et cetera; for production, I don't know. I don't know in detail the production schedule. I wasn't really involved in that.

CHRISTINE MAINVILLE: Do you know what consideration there was for seasonal conditions in the testing and commissioning plans?

MICHAEL VALO: Sorry, Christine, I don't meant to interrupt. I just want to make sure that you and Lowell are talking about the

same thing. I hear you asking about testing and commissioning, and I hear Lowell talking about qualification and serial testing.

Are you talking about testing and commissioning of the system or just the vehicles?

CHRISTINE MAINVILLE: Of the vehicles.

MICHAEL VALO: Okay.

LOWELL GOUDGE: For the vehicles there wasn't a lot in terms of seasonal conditions that impacted qualification testing. And even production testing, as long as it's not a blizzard when you go out so that you can test the acceleration rate, because you're reliant on the adhesion of the wheel to the rail.

Aside from that there was very little in terms of restrictions on seasonal testing. We tested in the dead of winter. We tested in the summer.

CHRISTINE MAINVILLE: So is it accurate to say that the vehicles were running in the winter prior to RSA?

LOWELL GOUDGE: Yes. The vehicles were parked in the winter and sometimes they had to plow the track around the vehicle to get it

out of the snow drifts.

I mean, the vehicle -- the vehicle went out -- usually it was sent out on a Monday morning and came back on Friday night and was parked on the testing area in between, unless there was something that necessitated it to come back sooner.

CHRISTINE MAINVILLE: Would you consider that there was enough testing done as it related to winter conditions then?

LOWELL GOUDGE: From the perspective of what is testable I think there was enough.

We went through all of the prescribed testing that was not only in the contract but typical things that are done for winter environments. It's -- if I sort of look at where you're headed with this, and the fact that we did have problems with some winter conditions, clearly there were things, especially in terms of system operation, that would have been better to spend more time in the winter.

There was some obvious misses that appeared after the second winter, or the first winter of revenue service, that we always look

at when you have a problem or a failure and how did we miss it? What went wrong on our qualification, et cetera? That's part of the normal process. But it wasn't for lack of trying to do and follow the standards.

But we found issues, some of them site specific. The environment and the amount of salt that we get exposed to from the roadway that we run parallel to, or bridges. That they plow the road directly on to the guideway.

We're exposed to some environments that may have surprised us a little bit, but we've worked through those and dealt with them largely.

CHRISTINE MAINVILLE: Did it -- I understand it went through some winter simulation -- the rolling stock went through some winter simulation with the NRC?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: Do you know what the outcome come of that was?

LOWELL GOUDGE: There were two aspects of that, and those were more about cold temperature and a bit of ice than they were about winter performance as such.

The climate room testing -- there were two things, one is, does the -- do the doors open if they have a layer of ice over all the seals, et cetera? Do the windshields defrost? And whether the train leaks or not, or how badly the train leaks, whatever, as one side of the climate performance.

The other side of the climate performance is all about the heating and cooling system and the interior temperatures as a function to the specification requirements.

So in Ottawa the interior climate control is defined as between the 1st percentile and 99th percentile of a heating and air conditioning standard as the temperatures for the Ottawa region.

So that means minus 21.8 and plus 31.8, I think it is, as that's when the temperature in the interior of the car has to be between 19 and 22 degrees, or something like that. And that defines how much heating and cooling power is installed in the train.

That's different from in a hurricane, with a ridiculous rainfall, does the train leak? Which was the other part of the climate testing.

So there was one that was, do the systems start at minus 40 or minus 25? And can the doors open when they're coated with ice, et cetera? That was one part of the climate. And the other part, as I say, was the heating and cooling for the passengers.

In general the vehicle, at the onset, did not perform adequately for heating and cooling and we did duct modifications, and prototyped those modifications in the climate room and demonstrated the improvement.

On the exterior side there was some concern over the defrosting of the windshield and how fast -- or how long it took, but there's no real standard for railcars in cold soaking and defrosting because the railcars are not cold soaked at minus 20 and covered in ice, they're sitting heating at plus 4 all the time.

So there was -- there's gaps in the test method versus the real environment. And there was some water leaks in the train so we had a problem. The biggest problem we had was with the cab window, which was not resolved until the Phase 2 cars, and is being retrofitted.

CHRISTINE MAINVILLE: On the Phase 1 cars?

LOWELL GOUDGE: Yeah.

CHRISTINE MAINVILLE: Overall could you -- are you able to speak to how testing and commissioning was impacted by the various delays on the project?

LOWELL GOUDGE: I think basically it was pushed late. As I say, I don't know if other than the delays and moving later and later, which we attempted to compensate by including more vehicles in the scope of commissioning, I don't know how much else it would have impacted.

The only other thing that the delay really impacts is the amount of work, because it's more retrofit than it is built in from the onset. So there's a delay that you build up because it takes time to retrofit, and retrofit is never as efficient as new build.

So the delay in testing commissioning pushed more into retrofit scope than was perhaps expected.

CHRISTINE MAINVILLE: And are you able to speak to the plan for a trial running?

LOWELL GOUDGE: Not really, other than I knew it was happening.

CHRISTINE MAINVILLE: You're not aware of what changes there were to that process, if any, along the way?

LOWELL GOUDGE: The only part of it that I was involved with was what was -- again, it came into the modifications. What was necessary for vehicle mods to be done for trial running, i.e., simulating the service condition. Because obviously the vehicles had to be in a service condition state to do trial running.

CHRISTINE MAINVILLE: Could we spend a bit of time talking about the derailments and some of the breakdowns?

LOWELL GOUDGE: Okay.

CHRISTINE MAINVILLE: So in terms of derailment number 2 in September of 2021, can you speak to the causes of that derailment?

LOWELL GOUDGE: That derailment was a quality miss where there's a requirement to bolt the gearbox, or the hub of the gearbox to the axle. And the final step of the bolting and torquing process was not done. And quite simply

the gear box fell off and we ran over it and derailed the train.

CHRISTINE MAINVILLE: And that was a quality issue within Alstom, correct?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And what would you say the root cause of that was?

LOWELL GOUDGE: I think there's a bunch of causes. Clearly there was a miss in the application of the torque and the failure to detect it. Some of that was preventable. If the torque machine had been reviewed and the result reviewed prior to release from service, because it would have shown that it didn't do the torque process.

The other part of it is that that was in a cycle-up time from 7 trains per day to 11 trains per day. And that cycle-up time was based on the -- or the 7 trains per day that we were running at that point in time was based on the fleet that we felt we could sustain, following the first derailment, with the safety inspections to ensure the first derailment cause never happened again.

So I don't know, because I was not at

the site to see the real environment, but I can understand that there would be an incredible amount of pressure to increase the fleet, reduce the time for turnaround.

And cycling up from 7 trains to 11 trains in service when you have a passenger utilization of maybe 10 or 15 people on a train, that can hold 600 in service, didn't seem to be necessary but it was requested by the City.

CHRISTINE MAINVILLE: Is there any connection to the bogie design?

LOWELL GOUDGE: In terms of previous problems with the bogie? No. In terms of the fact that the gear box mounts on the bogie, obviously it's related to bogie design. But in terms of previous issues, no.

CHRISTINE MAINVILLE: Did this particular bogie design require any particular torquing or very accurate torquing that is maybe unique or not as --

LOWELL GOUDGE: It's the same gearbox interface as on TTNG exactly, so it's not a new step. It's not something that was invented for Ottawa.

CHRISTINE MAINVILLE: And are you

aware of the quality control issues raised by the TSB in its rail advisory letter relating to this derailment?

LOWELL GOUDGE: I don't know if I've read that one in full detail.

I know there's concerns with the quality. And we've made a tremendous effort in terms of improving the traceability of quality through the maintenance and retrofit process.

We've -- after this quality issue we took a standdown and looked at all the safety critical bolts on the vehicle and reviewed all of those applications, did a complete fleet check on all of those, plus other areas where we had known issues, and people would be unbolting or removing parts, and checked all of those and did a complete sweep of all the process to make sure that we were secure.

We strengthened a lot of areas, but a lot of this was managed through the Service Quality Department directly not through engineering.

Engineering helped identify the critical bolts and then it was left up to service quality to go through, set up the

process, the inspections, et cetera, to make sure there were no more misses.

CHRISTINE MAINVILLE: Now, can you speak to the first derailment in August, 2021?

LOWELL GOUDGE: Yup.

CHRISTINE MAINVILLE: What would have been the cause of that, to your understanding?

LOWELL GOUDGE: The cause of that, what we call a "cartridge bearing assembly" that holds the wheel bearing, the hub, and it's very much like an automotive application product for the low-floor vehicles. That bearing assembly failed.

It appears that it failed in a process where the nut that keeps the load on the bearing released the load, allowed for a large increase in the play of the bearing, ultimately metal to metal contact with other parts and a complete failure of the hub in that process. And when the hub failed we lost a wheel.

CHRISTINE MAINVILLE: And that was because it overheated, correct?

LOWELL GOUDGE: The overheating is a results of the failure not a cause. The cause of the failure is that the nut for the bearing

came undone.

CHRISTINE MAINVILLE: And do you understand what the root cause of that is?

LOWELL GOUDGE: That is still under investigation with Le Creusot and their supplier, Texelis in France. Le Creusot is our bogie company internally.

I don't have the full details of where they are in the investigation today in terms of why this design failed. Again, this hub is identical to what's on TTNG.

CHRISTINE MAINVILLE: And so the overheating would have simply -- potentially allowed for detection of an issue if the heat had been detectable?

LOWELL GOUDGE: That is also subject to debate. The normal bearing detection for overheating, if you're using wayside detectors, or even built-in vehicle detectors, is for temperatures around 110 to 115 degrees centigrade.

There were nylon or plastic plugs in the axle that slumped and partially melted, and their melting temperature is 110. Whether it would be detectable or not is highly

questionable.

And we did have some failures similar to this on TTNG where they do have on-board hot axle detectors. And although we've never had the parts separate, but the rest of the symptoms and metal-to-metal contact, et cetera, took place and the 110 degree axle detectors did not activate.

So whether it would be detectable by what is considered a standard application is highly debatable.

CHRISTINE MAINVILLE: I'm right to say that there was no heating detector system installed on these trains?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: No there wasn't?

LOWELL GOUDGE: No, there was not.

CHRISTINE MAINVILLE: And what would be the reason for that?

LOWELL GOUDGE: It's not a standard approach on light rail vehicles, or for even metro vehicles. It's generally an approach for trains that do not come back to the workshop on a periodic basis, they might be around the country. Or if you take freight cars in North

America they could be between two countries and thousands of miles away from their home base. They may never get to their home base.

Or in Europe with intercountry transportation they might go back to their home depot once in a while but they're inspected elsewhere. So -- and they go much larger distances.

Also, most of the -- not all but most bearing detection schemes are mounted physically on the wayside. And even with those schemes there's probably 20 or 30 major derailments a year of trains that have overheated bearings after having passed within the last minute a bearing detector, So it is not a 100 percent guaranteed mechanism.

CHRISTINE MAINVILLE: And TSB's rail safety advisory letter suggests that OLRT may wish to ensure that it has heat detection systems in place to monitor temperatures of LRV cartridge roll bearing assemblies. Is that something that has been followed up on?

LOWELL GOUDGE: We have done some preliminary investigations. We've not -- I don't know if we have an instruction from OLRTC

to do it.

But we have done some preliminary investigations of different bearing schemes, temperature is one. But in our own perspective temperature is not an effective means.

We've dissected the timeline of the first derailment, based on everything we know, including maintenance records, the behaviour of other vehicles, et cetera. We believe this condition could have been detected 90,000 kilometres before the derailment, roughly, based on measurements we know from other maintenance equipment in the shop.

And the containment process we're doing is aimed at picking it up by doing a safety inspection every 7,500 kilometres, picking it up very early in the phase before it can propagate to a problem.

The derailment itself, when the bearing came apart, when the other parts then overheated from high metal-to-metal contact, it happened within 5 kilometres of the derailment.

So, from our perspective, a warning that gives you 5 kilometres of advance notice compared to a warning that gives you 90,000, is

inadequate.

There are other possible means of detection. For example, vibration, noise, et cetera, that we've also explored that might be able to give us somewhere in the 40 or 50,000 kilometre range before the ultimate failure happens. That would be a much more logical approach than something that gives you five minutes warning, and much less maintenance intensive, that gives us the 70 or 80 or 90,000 kilometre warning.

So we've explored some of those things but not to a point that anything can be implemented. We've looked at what is possible and what the objectives need to be. And, from my perspective, something that gives you five minutes' warning is useless.

CHRISTINE MAINVILLE: So is this process ongoing?

LOWELL GOUDGE: It's ongoing but I don't think there's been any clear direction given to us as to a need yet. I know there's been some questions asked as to what we're looking at, but it's background activity. It's not a -- at this point it's not a top activity,

because our expectation is when we resolve the issue it's done. And it's much more viable to solve the issue than to try and find methods to detect something that is not going to be a long-term problem.

In general, on light rail and metro applications, axle bearing failures are not a problem. If you have a problem you deal with it, it's gone. And installing a detection system for a one-off event is not a viable engineering approach.

CHRISTINE MAINVILLE: So you're saying this would not have been seen as a risk ahead of --

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: But we don't know why it happened then as a one-off?

LOWELL GOUDGE: We don't have the why of why it happened. We have some very good ideas but it's part of the failure investigation to get the final details as to exactly why and exactly what needs to be done to prevent it.

As I say, at this point we have a very reliable but maintenance-intensive way to ensure it doesn't happen again.

CHRISTINE MAINVILLE: I don't know if you recall seeing this in TSB's rail safety advisory letter, but it spoke about a consolidated safety file for the OLRT documenting potential hazards, one of which identified locked and unlocked axle as a hazard?

LOWELL GOUDGE: Yes. This axle never locked.

CHRISTINE MAINVILLE: Right. And the letter points out that it doesn't specifically reference a risk of overheating.

LOWELL GOUDGE: No. A locked axle is something that's always considered. Because when you lock an axle you drag the wheel and you develop a very deep flange where it's dragged and locked. And that goes -- and can hit the switch and lead to a derailment at switches. So a locked axle is always a standard consideration.

CHRISTINE MAINVILLE: So from your perspective there was nothing missing there from the potential hazards that could be anticipated?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: Are you aware of what this file is, a consolidated safety file?

LOWELL GOUDGE: Yes. I wrote a large portion of it.

CHRISTINE MAINVILLE: Who has input into that?

LOWELL GOUDGE: That file takes -- it's starts with our safety assurance management plan and it basically is the chronological application of our safety assurance management plan.

It describes generally the vehicle systems; it describes all of the safety processes that we went through; the outcome of those safety process; it references all of the individual safety studies and documents; highlights all of the areas of risk; it highlights the mitigations transferred to other people; it lists all of the waivers for entry into service; and the final consideration that the design of the vehicle is safe.

CHRISTINE MAINVILLE: So is it only produced by Alstom?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And how did the City's safety regulations fit into that?

LOWELL GOUDGE: What safety regulation

specifically?

CHRISTINE MAINVILLE: So my understanding is that the federal government typically would regulate the safety standards for this type of vehicle, but they were delegated to the City.

LOWELL GOUDGE: I don't know exactly how the process works, but my understanding of the process is that the operation of transit systems themselves are not automatically a federally-regulated function. It's only federally regulated when they cross political jurisdiction boundaries.

And there is a specific list of federally-regulated railways. I don't know if it requires an act of Parliament or only a memo of Cabinet to modify the list.

That list covers the original O-train even though the vehicles don't meet the railway standards for federally-regulated railways, because the O-train runs on track that is under the Federally Regulated Railways Act. It also covers GO Transit but not Toronto transit.

So it's very specific and it's really oriented towards the main line freight and

intercity passenger travel but not mass transit.

None of the vehicle standards meet the requirements to run on federally-regulated railways.

CHRISTINE MAINVILLE: Are you aware though of city-based safety standards?

LOWELL GOUDGE: I'm not aware of any city-based safety standards that apply to rail vehicles.

CHRISTINE MAINVILLE: Or regulations?

LOWELL GOUDGE: Or regulations.

And when we originally started this contract we were not aware that the Transportation Safety Board and Transport Canada were part of the regulatory authority for the City of Ottawa. In fact, at one point it was mentioned in a meeting that they were not involved. The involvement is something that the City appears to have done with the TSB separately.

CHRISTINE MAINVILLE: Could you speak to the wheel cracks that surfaced?

LOWELL GOUDGE: Yup.

CHRISTINE MAINVILLE: Is it fair to say that it's unusual? An unusual occurrence

for new trains?

LOWELL GOUDGE: Yes, it is. It's an unusual occurrence for any train.

CHRISTINE MAINVILLE: Do you know whether a similar issue happened in France on Alstom trains?

LOWELL GOUDGE: My understanding is it's not happened elsewhere.

CHRISTINE MAINVILLE: And is it accurate to say that it was -- this was not a new -- that the wheel supplier, first of all, was Lucchini, an Italian company?

LOWELL GOUDGE: Yup.

CHRISTINE MAINVILLE: And it was not a new supplier for Alstom?

LOWELL GOUDGE: I don't know their total history with Alstom so I can't answer that.

CHRISTINE MAINVILLE: But the issue resulted from a new process that it followed for shipping the wheels? Well, for preparing the wheels for maintenance and then shipping?

LOWELL GOUDGE: My understanding is that the initial wheels that we received did not have a specific threaded hole plugged and

protected from corrosion.

That hole is used to assist in removing the wheel from the hub. As with a car, I think if you've changed tires on a car sometimes you find that wheels can be almost seized on to the hub or axle and they're very hard to get off. Given the extremely tight fit of the wheel onto the hub that's something that's quite expected on the railcar.

So there are threaded holes in the wheel that are to be used by pushing screws in to sort of jack the hub, or the wheel off the hub. The initial wheels, and I think even some of the spare wheels that were in stock, did not have anything plugging those holes so they were prone to corrosion.

That was noticed and at some point it was requested that Lucchini put the jacking screws into the wheel. And the correspondence back-and-forth included the fact they had to make sure that those screws, when they were installed, did not the stick into the hub and interfere with installation of the wheel.

At the end of the day, when we discovered the wheels cracked it was during the

bogie overhaul, that I mentioned earlier that was, among other things, taking some of the questionable bogie frames off. It was covered during the bogie overhaul process that there was a wheel crack and that those screws were in fact interfering with the wheel sitting flush on the hub.

CHRISTINE MAINVILLE: In its rail safety advisory letter the TSB suggests that OLRT and Alstom expedite the removal of all Lucchini resilient wheels that were originally installed and equipped with jacking crews. Do you know whether that's been done?

LOWELL GOUDGE: It has been done on all revenue vehicles, with the exception of one that was damaged in a derailment. It's called up as a work order to be done before that vehicle is repaired and returned to service.

And there are one or two vehicles where the bogies had been made prior to the discovery of the issue that have not yet been sold to the city. And, again, it's been called up on a work order to be done before those vehicles are sold.

CHRISTINE MAINVILLE: So how many

vehicles were taken out of service following this issue?

LOWELL GOUDGE: When we found the issue we did an emergency inspection, and we were then doing inspection every one or two days on every vehicle to ensure that there were no cracks.

Anything that was suspicious we had an external, nondestructive testing company come and do a test to say whether there was a crack or not. And that inspection process carried on until we could start cycling wheels through and replacing wheels and/or wheel centres that were subject to crack, based on being stressed, over about an 18-month period.

CHRISTINE MAINVILLE: Was there any impact of the cracked wheels on the operational performance of the trains?

LOWELL GOUDGE: Other than availability of vehicles due to the inspection, no.

CHRISTINE MAINVILLE: And do you know how the issue could have been prevented, the issue of substandard components, how it could be prevented in the future?

LOWELL GOUDGE: On this issue it's a miss at the supplier quality, so it would require more surveillance at an already ISO9001-certified supplier, because that's the only way that you can do it.

If you get a miss you have to go back and revisit their processes. But you're reliant on them being certified to ISO9001, to follow what they write and write what they follow.

CHRISTINE MAINVILLE: In terms of the wheel flats, I understand they were, at least in part, due to too many emergency brakes?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And that was linked to the system operating at the same level of performance in bad weather, including winter conditions?

LOWELL GOUDGE: Yup.

CHRISTINE MAINVILLE: And is it also accurate to say that it was linked to the train speed profiles not suiting Alstom's braking mechanisms?

LOWELL GOUDGE: I think that would be an inferred rather than a direct conclusion.

The fundamental problem is that the

vehicle specification requires the braking to be done a certain way, which is to be done as much as possible through the traction motors so that the vehicle can regenerate energy. As a result it requires all the braking to be done on the motored axles, so six out of ten axles.

If the vehicle had been designed to a different approach, which was to say, make sure that you can use as many axles as possible for braking and use all ten axles, you could have alleviated some of those flats but not all of them.

The fundamental problem at the onset was the City was trying to run a performance level that exceeded the design intent of the vehicle in winter conditions.

You cannot sustain the operating speed profile that's in the ATC system in bad conditions with the vehicle; it's a nonsustainable performance.

CHRISTINE MAINVILLE: Is that a -- does that link to Thales' piece more than Alstom or is it an interface issue?

LOWELL GOUDGE: I think it links to a lack of understanding by the City as to how to

run a train, more than Thales or Alstom specifically.

The vehicle is capable, in perfect conditions, of meeting performance requirements.

The vehicle alignment, or the train alignment on the track, and what we were given, requires the vehicle to operate under a certain level of performance to make the schedule, that's just physics. You have curves, you can only go so fast on curves, and there's a lot of curves in the Ottawa system.

So the ATC system is programmed to try and meet that schedule. That's fine when it's not raining or snowing or cold, but if you have adverse weather conditions you have to take the performance down.

The City, having never run really a rail system before, didn't have that understanding so they were trying to run the fastest schedule possible in extremely bad weather conditions, and that led to overspeed, station overshoot, a lot of emergency brake events, a lot of use of sand and a lot of spin slide events simply because the track was too slippery to meet the performance.

And the ATC system is designed with three levels of performance so that you can turn the performance down with the push of a button, essentially, to say, I want less because the system can't work to that.

Now, whether that's lack of familiarity with the system, lack of training, I can't answer. But clearly they didn't understand it for the first year.

CHRISTINE MAINVILLE: But was that agreed to in the contracts, whether by Alstom or Thales or both?

LOWELL GOUDGE: There was an ultimate level of system capacity, but I don't really think that anybody understood -- or at the specification writing point, that that capacity can't be met in a blizzard, for example. The City was trying to run it all the time.

FRASER HARLAND: Just very practically, would it be the train operator who would switch it from 3 to 2 to 1? Who in operations --

LOWELL GOUDGE: It's in the control centre. The system is -- this system does not require a train operator.

FRASER HARLAND: Right.

LOWELL GOUDGE: In fact many of the systems where Thales has got their equipment there is nobody on the train at all. So it's done in the main control centre.

FRASER HARLAND: Okay.

LOWELL GOUDGE: And they're supposed to be looking at the weather. There is supposed to be a weather management plan so that you deal with the forecast and plan your service according to the weather forecast.

I don't know how that was ultimately developed between OLRTC, RTM and the City, but clearly it wasn't understood. Even though the Thales system provided for reduced performance easily, I don't believe anybody had set the parameters for how to do that in terms of what conditions you do, et cetera.

And it wasn't until we got into the wheel flats issue and the investigation, and looked at the propensity to slide as a function of weather, and presented to the City the worst case scenarios when things were happening, how much worse it got when the temperature was at, say, minus 5 or minus 10 compared to zero,

compared to rain, compared to sunshine.

And we presented all of that data as part of the investigation, and they're now using some of that data to operate the trains, but nobody had looked at that prior to the issue happening.

CHRISTINE MAINVILLE: The schedule for Alstom changed in May 2016 as a result of Alstom submitting a schedule revision, correct? Which was accepted by OLRTC, which became the V5 schedule?

LOWELL GOUDGE: I've heard about the V5. Again, I wasn't involved intimately in the schedule. I'm aware that there were multiple schedules. I don't know whether there was ever one accepted or not. V5 is the one that most people talk about.

CHRISTINE MAINVILLE: Wouldn't you, as an engineer on the train, know what schedule you're working towards?

LOWELL GOUDGE: My responsibility was not commitment to schedule, mine was technical integration. There's a difference in Alstom. We have a train system engineer that's responsible for integration, and my role was

oversight of that function not directly doing it, and also the safety certification.

You have a train engineering manager that's responsible for cost, quality, delivery. It's the train engineering manager's responsibility to manage the schedule and make sure things get done.

Mine was predominantly an oversight, review and approve. So when things came I dispatched them as expeditiously as possible.

CHRISTINE MAINVILLE: Who was the train engineering manager?

LOWELL GOUDGE: It started off as an engineer in France, Alexander Shawari, because the bulk of the initial train design was done in France.

That position was transferred as -- he had a deputy in Hornell, who then moved to Ottawa, Luc Monteyne who ultimately became the engineering manager in Ottawa.

Then that function changed when Luke's ex-patriot contract ended and another ex-pat, Frederick Millien came in and took that position, and he's now departed.

And that changed from France to Ottawa

as a function of the shift in the work. When you're in production it's better to have your engineering manager at the production facility not at the design facility any more, because more of your demand for time and resource comes out of production as opposed to design.

CHRISTINE MAINVILLE: Would you be asked to implement mitigation plans for -- to mitigate the delays?

LOWELL GOUDGE: I was not, no. The only time I was involved in some of the mitigation plans was when it came to, for example, the decision to move the testing to Ottawa.

In terms of assessment of how much track do we have? Do we think we can do everything, et cetera? But not in the details of the mitigation plan. That was out of my purview.

CHRISTINE MAINVILLE: And what was your assessment on the move to Ottawa? Is it fair to say that you -- the bottom line was you had no concerns provided access to the track was made available by a certain time?

LOWELL GOUDGE: Yeah. My view is that

it was a positive move. You had the vehicles there, you had people that knew the vehicles and built the vehicles there to support it if anything went wrong. You had all the parts there to do it. You didn't need a logistics train or chain to support a vehicle at a site where there was nothing.

So it was -- in my view it was a positive view and it was on the real track.

CHRISTINE MAINVILLE: Do you have any view or understanding as to whether Alstom was operating on a tight budget for what it had to deliver?

LOWELL GOUDGE: I don't even know the selling price of the train.

CHRISTINE MAINVILLE: Okay. One question, the contract provided for the entire energized Confederation Line track to be available for integration testing by the RSA date of May 24th, 2018, if I'm not mistaken. How does that align with the start of operations if it's only to be made available for integration testing as of the RSA date?

LOWELL GOUDGE: I wasn't aware of that actually until you just said it.

My understanding was that to meet the RSA date the track had to be available long before that.

CHRISTINE MAINVILLE: Right. And when was integration testing done, if you recall?

LOWELL GOUDGE: The full integration I would have to say somewhere in the summer of 2019.

CHRISTINE MAINVILLE: Was that compressed?

LOWELL GOUDGE: Yup. I mean, as I say, it's -- at that point my major effort was to make sure that the consolidated safety file was complete and we could issue the safety release for what was the pending start of revenue service.

So I was much more at that point chasing all the safety documentation and making sure the safety file was there to stand behind the train was safe.

CHRISTINE MAINVILLE: So did you have concerns, from a safety perspective, in terms of when -- in terms of whether the trains were ready by the RSA date?

LOWELL GOUDGE: We had, as I say, a

list of safety issues that we were cognizant of and aware of in terms of certifications on the train.

One of the other ones that I didn't speak about earlier, but remember I said there were things that would improve operational reliability but weren't safety issues. We had a door software version that was in -- expected to be certified sometime in the end of September, October. We did not start service with that because it wasn't certified. But that improved several reliability functions in the previously-certified software. So we started with a degraded door system only because we didn't have the software certified for the final system. There were things like that.

But I didn't have any real concerns on the system as far as safety -- the system is largely designed that it won't move if it's not safe.

CHRISTINE MAINVILLE: Right.

LOWELL GOUDGE: So I had concerns about reliability and things that would stop it from moving, but I didn't have concerns about safety.

CHRISTINE MAINVILLE: So A bit more about reliability and performance in terms of potential -- well, in terms of your concerns regarding readiness for operations, is that fair?

LOWELL GOUDGE: Yeah. I mean, we'd noticed some things that were -- even in the limited time that we had we'd noticed some things that required effort or repairs to bring them up to a level of reliability that would suit the ultimate needs of the contracts, but they weren't stopping the trains from starting the revenue service.

CHRISTINE MAINVILLE: Did you convey those concerns, if you want to call them concerns, or potential issues, either to OLRTC directly or to anyone responsible for those communications?

LOWELL GOUDGE: Those concerns were, I think, pretty openly discussed. As I say, the door software is a great example. We noticed several issues with the door system that new software would resolve, but the software wasn't through its safety certification process, that takes about eight weeks. So we started with an

older version of software that was certified, just not as reliable.

So those were openly discussed. That's why there was a list of, for example, modifications that were blocking for revenue service and other ones that would be done at some later date because they didn't stop service from starting. That was part of what was discussed, I believe, with the minimum deficiency list and with the different configurations of the train.

CHRISTINE MAINVILLE: When you say openly discussed do you mean with OLRTC or also with the City?

LOWELL GOUDGE: My understanding is between OLRTC, the City and Alstom's contract management.

CHRISTINE MAINVILLE: And in your opinion is the level of post-opening improvements or rectifications -- deficiency rectifications that would be required a normal level?

LOWELL GOUDGE: Some of it I think was exasperated by the compression of the schedule and qualification, versus production time and

the large number of retrofits that had to be done. So there was a portion that is abnormal in that respect.

It's normal, in my experience, virtually with any project that there are retrofits and changes that get done and things that get borne out because something doesn't work as you expect it, or doesn't work as it did on a previous system and you have corrections to it. That's part of the normal process and a reliability building -- or growth program.

I would say ours is a little heavier than some because of the compression of some of the schedule, but it is not totally outside the norm for a new system and a new build.

CHRISTINE MAINVILLE: And it's fair to say that from the outset there was a decision made to start production knowing there would be design changes resulting in retrofits, correct?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: That was to avoid schedule delays?

LOWELL GOUDGE: That was to avoid schedule delay.

CHRISTINE MAINVILLE: So the original

plan did include late retrofits but there ended up being significantly more, right?

LOWELL GOUDGE: I think the amount of work was much higher than the original plan because of how late some of the issues were ultimately imposed and how many vehicles were built prior to the integration of that design.

CHRISTINE MAINVILLE: And would that be primarily as a result of the Thales interface?

LOWELL GOUDGE: That was one of the largest batches of work that had to be done, and that had to be done to start revenue service, because obviously you can't run without the signaling system.

CHRISTINE MAINVILLE: So how was that mitigated, the lateness of resolving those issues?

LOWELL GOUDGE: Just with a lot of manpower. I mean, at that point it becomes manpower and resources.

I wasn't involved in the planning of it. There were other people that were directly tasked to running the retrofits that were necessary for service.

Basically engineering is the what, not the how, the when and the resources that get thrown at it.

CHRISTINE MAINVILLE: And part of it, am I right, had to do with late City decisions on some items?

LOWELL GOUDGE: There were some that were late City decisions. I mean, the driver radio, if you got back to that magic date of April 26, 2013, the driver radio -- I don't even believe the City had elected the supplier at that point.

And this is the thing you have to understand, the City had a capital project that was in the planning phase to revamp their entire radio system. That system covers police, fire, ambulance, garbage collection, all the City trucks, buses and the transit system and the new LRT.

The first meeting we had on the City radio, I think it was sometime in 2016, where we had -- we had the City and most of their proponents. It was still kind of at the sort of ad hoc committee meeting. The first meeting we had with their supplier, Bell, when they

asked -- and I think it was in 2017 they asked, When do we need the documents? And Jacques Bergeron said, April 26, 2013. And the response was, Oh, we're a bit late.

That one, again, the City had a requirement and they weren't managing that requirement at all to be consistent with the delivery of the vehicles.

CHRISTINE MAINVILLE: And so how did Alstom deal with not having those specifications and the information in due time?

LOWELL GOUDGE: We designed based on the radio from the past Citadis projects, which did not have any of the implemented functions that were required ultimately by the City, and there were changes to the wiring that were necessary as a result.

Now, what we did do is we put some spare wires in place that ran from logical points of the train to the radio as a kind of anticipation, and then we just run and left unterminated.

But we had equipment that we still had to install. We didn't have an interface defined until very late. So there was still retrofit to

be done.

CHRISTINE MAINVILLE: Which had to be completed before RSA?

LOWELL GOUDGE: Yeah.

CHRISTINE MAINVILLE: And that was done through manpower again?

LOWELL GOUDGE: Yes.

CHRISTINE MAINVILLE: And then did -- were there late decisions to the design book that impact Alstom's schedule?

LOWELL GOUDGE: The design and style book was really only the interior appearance and the outside appearance of the train.

The process went on longer than it should have. I wasn't involved at the onset in just the style aspects, but my understanding was that we owed them three designs, of which they would pick one. So we can't -- and there was some general guidelines given to the industrial designer at the time to include things like the sort of maple leaf logo of the City on the trains.

There were some different paint schemes, colour schemes, front cab arrangement, et cetera, that were given.

My understanding is we were obligated to give three and they would pick one. So we gave three; they asked for five variants on one of them. So we gave those; they asked for further variants.

I think that aspect of it led to some delays at the beginning just in the overall shape of the train because it became sort of a Pandora's Box. It was never you delivered one and that was it. You delivered one, they want variants on it. You deliver another, they want variants on it, et cetera, et cetera. And that went on much longer than anticipated.

I don't know how much that can be attributed to total delay. As I say, the biggest issue we had through the design and style process, as I mentioned earlier, was the gangway and the flush bellows, where we exposed right up front that it was going to be recessed. It was reviewed, it was assessed, it was approved. Then when we got asked to put the formal submission in for that approval it got rejected, but we had proceeded on good faith.

And we still haven't, I don't think, completed the retrofit of that bellows to make

them all relatively flush to the vehicle, because it happened two or three years after approval was given for the outside design.

CHRISTINE MAINVILLE: Have there been obstacles to Alstom's ability to get retrofits done?

LOWELL GOUDGE: I think the biggest obstacle to get retrofits done is the lack of vehicles available for retrofit, because of the requirements to support a large service fleet even throughout the pandemic.

CHRISTINE MAINVILLE: You mean make a requirement to make vehicles available -- or certain level of service available to the ridership?

LOWELL GOUDGE: I think there were two things -- the original plan was to try and introduce Phase 2 trains so that we could -- because they'd be at a much later build state. We could then withdraw some of the Phase 1 trains and run them through the retrofits.

But between Phase 2 acceptance being somewhat blocked, and I don't know all the reasons for that, and the service and the operating tempo that the City wanted to run even

with the pandemic, we could have taken a lot of trains out of service and ran them through retrofits and still made a service that made sense for the ridership with a much smaller fleet.

CHRISTINE MAINVILLE: Was there not in fact an ability to slow the service down at least at some point during the pandemic to deal -- and perhaps it wasn't for retrofits but more for maintenance purposes?

LOWELL GOUDGE: It could have been -- pick a reason to say reduce the fleet. We're running multiple units, so two coupled LRVs. Each LRV has a capacity of 300 people for the service capacity, it can actually hold more than that but the service capacity calculation was based on 300 people per LRV. We're running multiple units of two so we can hold 600 people. If you take the September derailment as an example, there were 13 people on a train that could hold 600.

You could have run single unit. You could have saved on wear and tear. You could have eased maintenance. You could have allowed for a fleet of vehicles to be withdrawn for

retrofits. You could have done a lot of things. But they've never run a single car, even though the original service plan was to run single cars at some times.

CHRISTINE MAINVILLE: Do you know why that is? Why that level of service availability is being maintained?

LOWELL GOUDGE: Nope.

CHRISTINE MAINVILLE: Could it be impacted by the fact that the City is not responsible for maintenance under the contract?

LOWELL GOUDGE: It could be. I don't know the conditions of the maintenance contract and what they're paid for versus -- in total. So it may be, Oh, well, we're paying this much for service we'll get the service irrespective of whether we need it. I don't know.

But certainly there's no need, or there was no need during the pandemic to run the service they were running.

CHRISTINE MAINVILLE: Do you have any knowledge of the post-opening change in management to RTM?

LOWELL GOUDGE: I know there's some different people there but I don't know a lot of

the details about an overall structure of RTM.

CHRISTINE MAINVILLE: You weren't involved in that transition?

LOWELL GOUDGE: No.

CHRISTINE MAINVILLE: Did you have any concerns relating to the readiness of OLRTC generally at the time of opening of the service?

LOWELL GOUDGE: I had a general perception that neither RTM or the City were ready to start service when it started.

CHRISTINE MAINVILLE: What is that based on, or what is that perception?

LOWELL GOUDGE: Leading up to the start of service we were discussing, in some meetings with John Manconi and others, about the readiness and the safety certification, et cetera. We had a discussion about the system that's used for viewing the side of the vehicle. And I made a comment about the fact that I didn't understand why they weren't prepared to have a spotter on the platform, because even in the safety studies it was predicted that the system could go down from time to time and you had to have spotters on platforms at certain times. And it was like a lightning bolt from

the heavens in that nobody had considered -- and the example I use is, let's say a guy takes a steam shovel and digs through the fibre optic backbone for the network; the whole thing stops.

How do you maintain service when that network goes down if you don't have a plan to put spotters in place?

To my knowledge today they still don't have that plan in place.

CHRISTINE MAINVILLE: Right. So there never were spotters?

LOWELL GOUDGE: Initially there were never spotters, because Alstom had technical problems with the system we paid to put spotters on the platform, but there was never a plan to have spotters. Even a roster of people to draw from in the event of a system outage to keep the system running; never planned. And to my knowledge it's still not planned.

CHRISTINE MAINVILLE: And is your view of -- sorry, Fraser, did you have a question?

FRASER HARLAND: I was just going to clarify. To your knowledge is that -- the spotter contract is that something that the OLRTC took over from Alstom? Do you have

knowledge of that?

LOWELL GOUDGE: I believe OLRTC took the cost over from Alstom at some point in time when we demonstrated a specific level of reliability.

And I believe they're still in place. I think people are trying to remove them at some point. But, as I say, even if you remove them as a full-time job you still have to have the ability as an operator to deploy a mitigation if, for whatever reason outside your control, the system goes down. As I say, the example is a guy digs through the cable.

FRASER HARLAND: And so the contract that they took over is not -- is different to you than having a proper plan in place for spotters?

LOWELL GOUDGE: The contract that was taken over was a mitigation to an extremely low reliability that required people at every platform, because the system did not work well enough and reliable enough to open the system without a physical spotter there. That's different than the condition of today, and is different from a planning for having the ability

to supplement should something happen and the system go down either at a station or globally.

Because this is a large, interconnected network. Not all of it is Alstom's responsibility for the construction of.

And as a whole network we're only tapped in to the platform cameras, we're not responsible for the platform camera system.

So you could have a station go down, you could have the whole network go down, et cetera, and those need mitigation irrespective of how the vehicle system works; and that's not planned.

FRASER HARLAND: And that's helpful. Thank you.

CHRISTINE MAINVILLE: Is your view of the City's readiness for operations tied to these same issues or is that based on something else?

LOWELL GOUDGE: Globally I think they were not ready. As I say, when we talk about people being late my view is the project was late but the City was also not really ready to take it on.

I think they should have had more

time, more training and a lot more people involved in how the trains worked and how the system worked than they did. But that again is a feel more than anything else.

CHRISTINE MAINVILLE: And is that OC Transpo or broader than that concerning the operators?

LOWELL GOUDGE: I think it's OC Transpo. I don't know how OC Transpo works with the City.

CHRISTINE MAINVILLE: Well, in terms of readiness of the operators specifically did you have a view as to that?

LOWELL GOUDGE: Well, I think readiness of the operators -- as I say, they only had two weeks of operating the system really at full operating tempo before they went into service.

CHRISTINE MAINVILLE: Prior to that were they only training on the test track?

LOWELL GOUDGE: As I say, when you look at the -- and there's two parts of operators. There are the operators in the control centre that really only had two weeks.

CHRISTINE MAINVILLE: Okay.

LOWELL GOUDGE: And you have the train operators, what they call electric rail operators or EROs, those people -- up until May you the probably only had one or two people a day moving a train around on the main line. Because up until May we only ever had one train or two trains on a main line on a day. So they were operating the trains for testing purposes for other things, but not really driving the trains or operating the trains as they should.

And it wasn't until after they started in May of 2019 increasing the number of trains that were operating and trying to different operating tempos that you really had more than just a couple of people driving trains.

It probably wasn't until we go into sometime in August, and for four to six weeks from August through mid-September that they really had a full compliment, and even then it wasn't all day necessarily. I think it was only the last two weeks where they really ran an attempted schedule.

CHRISTINE MAINVILLE: Thank you. I know we're at the end of our time. Maybe I can just ask, is there anything you think,

Mr. Goudge, that you want to add before we wrap up?

LOWELL GOUDGE: I'm trying to make sure before I put my foot in my mouth how to extract it.

No. I think from a point of view I think we've about addressed it, at least based on what I saw the topics were and your questions.

CHRISTINE MAINVILLE: Okay. Michael, anything you need to ask?

MICHAEL VALO: No, I don't think so. I think there's -- there are a few questions you asked that I think we can help direct you to in documents if it was helpful, but I don't think it would require Lowell or anything like that.

CHRISTINE MAINVILLE: That would be helpful, yes. We can go off the record.

--- Concluded at 1:01 p.m..

REPORTER'S CERTIFICATE

I, HELEN MARTINEAU, CSR, Certified Shorthand Reporter, certify;

That the foregoing proceedings were taken before me at the time and date therein set forth;

That the statements of the presenters and all comments made at the time of the meeting were recorded stenographically by me;

That the foregoing is a certified transcript of my shorthand notes so taken.

Dated this 7th day of April, 2022.

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PER: HELEN MARTINEAU
CERTIFIED SHORTHAND REPORTER

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