

CONFIDENTIAL MINUTES
COLLIERY DAMS TECHNICAL COMMITTEE
TUESDAY, 2014-MAY-20 AT 9:00 A.M.
BOARD ROOM, SERVICE & RESOURCE CENTRE, 411 DUNSMUIR STREET

PRESENT:

Snuneymuxw First Nation:
Chris Good (10:15 a.m.)

Colliery Dam Park Preservation Society:
Jeff Solomon
Geraldine Collins
Lorne Gale
Leon Cake

Golder Associates:
Bruce Downing, Principal
Herb Hawson, Director of Special Projects

(Provincial) Dam Safety Section:
Wenda Mason, Manager, River Forecast Centre & Dam Safety
Bruce O'Neill, Sr. Dam Safety Eng., Dam Safety Section
Scott Morgan, Head, Dam Safety Section

City of Nanaimo:
Toby Seward, Director, Social & Protective Services
Holly Pirozzini, Recording Secretary

Executive Committee:
Ian Howat, City of Nanaimo (10:10 a.m.)
Ted Swabey, City of Nanaimo (10:15 a.m.)
Raymond Lamont, SFN (10:15 a.m.)

Katherine Gordon, Facilitator

1. Call to Order

The meeting was called to order at 9:20 a.m.

2. Review/Approve Agenda

Agenda approved as presented.

Agreed: To discuss the *Approach to Middle Dam and the Approval Process* issue prior to Golder Associates' presentation.

3. Approve Minutes (2014-Apr-10 and 2014-May-12)

Deferred approval of the minutes to a future meeting.

4. Discussion about Approach to Middle Dam and the Approval Process

Q: Will more seismic analysis information be provided?

A: GA responded that there will be more information after the meeting on Friday, May 23 with the structural engineer. We can address the seismic issue with the hardening option for the Lower Dam and a contingency has been provided for this in the cost estimates. No seismic analysis has been done for the Middle Dam.

City:

- Golder Associates (GA) has come up with a risk approach that contends that work is not needed on the Middle Dam, but Dam Safety Section (DSS) has challenged this.
- We are going to push back on this with DSS because we believe that remediation of the Lower Dam is satisfactory from a risk approach.
- We will require a report from GA that supports the rationale to do no improvements on the Middle Dam.

GA:

- DSS is having difficulty accepting a dam that is in a failure mode position.
- DSS needs to understand that the dams are a “system”.
- It’s not practical to spend a substantial amount of money to reduce the risk a little bit.
- The risk assessment was done to be able to make a judgement decision based on cost to the community.
- The information (FN curve) has changed from what was known on March 4 to April 24 when the risk assessment workshop was held.
- Now believe that DSS is expecting the City to make a case for not adopting the full requirements.

Colliery Dam Park Preservation Society (CDPPS):

- The Committee accepted the risk analysis and focused on remediation of the Lower Dam.
- GA has said that coring done in the Lower Dam indicated concrete with steel, which is presumed to also be in the Middle Dam. This is important because it will allow bending.
- Council previously voted to remove the dams based on information that the concrete is of poor quality. They need to be advised that due to further analysis, we know that both dams are well built with rebar in the concrete.

Q: From GA’s perspective, is there validity in approaching DSS with rationale to not do any work on the Middle Dam?

A: GA responded that this is unprecedented. If DSS is reluctant, it’s because they have no prior experience with a risk assessment analysis. They want to have criteria that they can apply to the next project. The Canadian Dam Association (CDA) Guidelines don’t provide any guidelines of what’s reasonably practicable. Instead of using this as a precedent, DSS may be able to make a dispensation because this is a unique situation.

CDPPS stated that DSS was approached at the April 24 risk assessment meeting and asked if there are any exceptions to the classification requirements standards? DSS did not answer yes or no.

GA stated that the email received by the City from Scott Morgan, DSS, respecting *Middle Chase River Dam and Lower Chase River Dam – consequence classification* refers to

using a risk informed approach (Table 6-1A of the CDA Guidelines). DSS may want to use the risk assessment to provide justification for variation from using the Standards Classification approach. DSS is asking the City to come back to them with rationale.

Agreed: There is consensus that there should be a strong push back on doing any work at the Middle Dam. Need to discuss how to make this argument, steps and timeline. Focus on the Lower Dam now and ask DSS for time to review the Middle Dam over the next year.

Q: What's the purpose of DSS attending today's meeting?

A: Facilitator responded that DSS will be present to answer questions about how they reached the reclassifications of the two dams and remediation options for the Middle Dam.

Q: Why do DSS need to hear the options for the Lower Dam, as either one should be acceptable to them?

A: Facilitator responded that DSS has to authorize any amendment to the dams and it will be useful to hear from them as it may influence which option you choose.

GA:

- There has been a change in DSS' historical role; they now want to hear everything about dams and want to take some responsibility for their design.
- They are more involved with the details of the dam and are asking technical questions.

City stated that DSS needs to hear the Committee's presentation on closure for remediation of the Lower Dam and that seismic is a non issue with respect to fatalities downstream because we now know that the dams are not going to crumble quickly. A Probable Maximum Flood (PMF) is the issue.

Ian Howat arrived at the meeting (10:10 a.m.).

Q: How does GA feel about DSS being present today?

A: The responsibility comes down to DSS, who is the regulator and they have to be on board with the work on the dams that you are proposing.

CDPPS expressed concern that DSS may steer the Committee in a different direction, even though GA wouldn't have provided options that aren't viable. GA responded that the main thing we want to hear from DSS is that they accept the two-step process: (1) remediation options for the Lower Dam; and (2) defer discussion about remediation options for the Middle Dam until later. It's better for DSS to hear the options for the Lower Dam sooner than later, even though the Committee will be making the decision.

Ted Swabey arrived at the meeting (10:15 a.m.).

Raymond Lamont and Chris Good arrived at the meeting (10:15 a.m.).

5. Golder Associates - Presentation on Remediation Options for Lower Dam

GA provided a ppt presentation respecting the designs, construction schedules, risks, costs, and a comparison of the two options. **[Hard copies of the presentation were provided to the Committee].**

Two options:

- (1) Labyrinth Spillway Plan (12m and 18m wide spillway) – approx. \$8.1 million (10% contingency); and
- (2) Overtopping Grading Plan – approx. \$7.3 million (30% contingency).

Construction schedules:

- (1) Labyrinth option (12m or 18m wide spillway) – 3 to 4 month construction period. Begin July 1 and end October 26 with work in the channel completed by mid-October.
- (2) Overtopping option – 3 month construction period; best done during summer months.

Possible Risks:

- (1) Labyrinth option – unexpected foundation materials, flooding and possible fish salvage during construction.
- (2) Overtopping option – on-site materials are not reusable, difficult to access the site and encounter unexpected materials during construction.

Wenda Mason, Bruce O'Neill and Scott Morgan, Dam Safety Section representatives, arrived at the meeting (11:05 a.m.).

6. Discussion with Dam Safety Section

Everyone introduced themselves and the Facilitator stated the following items will be discussed:

- Dam classifications: rationale, clarification
- Next steps and timing to confirm classification and remediation plans for Lower Dam
- Middle Dam: process and timing

Dam classifications: rationale, clarification

Q: What is the rationale for the classifications of the two dams?

A: We have decided to lower the consequence of both dams, pending a written report from your consultants (Golder Associates). We will officially lower the classifications based on field investigations by GA and using regulations for what is downstream. The Middle Dam will be lowered from *Extreme* to *High* and the Lower Dam will be lowered from *Extreme* to *Very High*, based on GA's recommendations and reports. The probability is still there, but the consequence has been lowered to a Level 2.

City stated that a written report will be submitted by GA by the first week in June. GA offered to submit portions of the overall report (hydrology and risk assessment) earlier.

DSS stated that it will expedite the review process if they can receive portions of the overall report earlier. It has been helpful to be involved all along in the process, which should make the review process to go smoothly.

Q: After you receive GA's reports and formalize the dam classifications, can you provide a rationale for the dam classifications?

A: We are confident in our classifications. We are in agreement with GA on the Middle Dam classification. We did not agree with GA on the Lower Dam classification. We look at seven different criteria when we classify dams: population, risk, loss of life, fisheries & wildlife, unique landscapes, economic losses and impact on infrastructure (Schedule 1, Dam Safety Regulations). Any one of these factors will drive the classification. *Very High* is based on some destruction or some severe damage to residential areas. *High* is based

on scattered residential areas. If the Lower Dam fails, it will impact a subdivision area and it is clearly not scattered population. There is judgment involved in the classification. We compared these dams with other dams in the Province that have been classified as *High* and *Very High*. We have a duty of fairness in classification of dams in comparisons. It's not just about the loss of life if an event occurs; that's only one of the seven criteria that apply. It's also a question of how much deeper the inundation zone and how much velocity.

GA stated that they placed the Lower Dam classification in the upper end of the *High* and one scenario pushed it above, so can see the rationale DSS used for a *Very High* Classification.

Q: Is there any significance in the acceptable remediation measures for the Lower Dam if DSS reduced the classification from *Very High* to *High*?

A: GA responded that there would be a small difference in the requirements, but doesn't affect the cost significantly to build additional spillway capacity. We would have come to the same conclusions.

Q: Are DSS comfortable with communicating the news about the classification to the public?

A: Yes.

Q: For our communication to the public, is the classification pending a report from the consultant?

A: Yes.

Q: Can you clarify the wording in the email to the City from Scott Morgan, DSS: "proposed design hazard frequency levels that are appropriate for the design"?

A: A design hazard frequency level in the CDA Guidelines refers to the level you are going to design to (for earthquake/seismic events). City stated that we are focusing on designing for a storm level contributing to a PMF.

Q: After the thorough analysis by GA of the Lower Dam, why does the classification stay at *Very High*? Can DSS be requested to reconsider the classification and reduce it to *High*? The loss of lives in the inundation area has been reduced to .00135. If the classification in the Harewood area will not affect insurance, land values, assets, then it doesn't matter.

A: The classification is based on seven different criteria and loss of life is not the only one. The Lower Dam, being in good shape, mitigates the failure and consequence of the Middle Dam. There is nothing downstream of the Lower Dam that mitigates its failure. The Lower Dam has the higher consequence. Whenever there is water downstream that's a foot deep or more where there's a population at risk, then there is the possibility of fatalities.

Q: Why doesn't the Lower Dam almost fit the *High* classification?

A: There is a subdivision downstream in the inundation area and not scattered residential.

Q: Why is it a major issue for the classification to be changed from *Very High* to *High* if it doesn't affect the mitigation measures that the Committee will adopt?

A: We shouldn't be classifying the dam based on the public's perception of the risk, but on the actual risk.

Q: Why not pursue the lower classification if we are only one parameter off from achieving this? The classification may impact homeowners' insurance, land values and assets.

A: The bigger impact to homeowners is a published inundation map showing their home in that area. Unsure if flood insurance is available for homeowners.

City advised that the Assessment Authority assesses homes based on other homes in the same area. He is not aware if home assessments in the inundation area will be affected.

Q: In their report to DSS, could GA state that the Committee and GA feel differently about the classification of the Lower Dam and request further review by them?

A: It doesn't make much difference because we will still be designing to the same life safety requirements.

Q: Should the classification be challenged when in GA's professional opinion, there is substance to the conclusion reached by DSS?

A: GA responded that it is subjective and won't accomplish anything because DSS is the regulator.

DSS stated that they have years of experience in reviewing dams for classification, based on historical information and they try to be consistent across the province.

GA provided a ppt presentation respecting the designs, construction schedules, risks, costs, and a comparison of the two options for remediation of the Lower Dam, for the benefit of DSS. **[Shown to the Committee previously in this meeting].**

DSS stated that they are more comfortable with removal of the soil, mixing it off site and bringing it back on site in the overtopping option, than the soil being mixed on site. This option will require that a low flow outlet be included in the design. Haven't seen or worked with overtopping before; will need time to review it thoroughly; couldn't be expediently approved if you have a tight timeline. May bring in an expert to review the overtopping option.

GA provided statistics on 47 overtopping projects completed in the USA today. DSS asked GA to provide this information in their report or advise them of where they can review these projects.

Q: Is a low level outlet in the Lower Dam needed to control the water flow?

A: DSS responded yes, it will be needed for fisheries release and is standard on any new design.

Q: Can a low flow release be added to the overtopping option?

A: GA responded yes, but we haven't sized it or designed it.

Next Steps and timing for remediation plans for the Lower Dam

Q: What is the timeframe to receive approval from DSS for the overtopping option? If we miss the fisheries window this year, can the work be done next year?

A: Can't answer this at this time.

Q: How long would it take for DSS to make a decision after receiving GA's report?

A: We are unsure about the timeline.

Q: What else does DSS need from GA?

A: New design documents, case histories, and information from the Federal Emergency Management Agency (FEMA) that GA has in their possession. Better quality control and a more uniform product will be achieved with excavating, mixing the soil and putting it back instead of mixing the soil in place. GA has done a good job improving the overtopping concept.

Q: Who will do the overtopping work?

A: GA responded that many contractors can do the labyrinth work, but overtopping is a sophisticated process and may have overruns in cost unless the process runs smoothly. The work can't be done in the wet season.

Q: Are there more companies capable of doing the overtopping now that the soil will not be mixed in place and will different soil mixing equipment be required?

A: GA responded yes, but it's a difficult earth-moving project. Quality control is important and soil that is not up to specifications will need to be removed.

LUNCH BREAK 12:45 p.m. – 1:00 p.m.

SFN stated that if the outcome is one SFN can support, then they will do everything to expedite the process.

Facilitator – Permitting from DSS, DFO, MoE, and Archaeological Branch will need to be addressed. City stated that the permitting, design and approval processes need to run concurrently in order for the work to be done this year.

DSS stated that it doesn't appear physically possible for a solution to occur this year. You have put monitoring and evacuation protocols in place, but you may need to go through another year of risks. There is no point in rushing the remediation work. Your presentation to us would be around scheduling and what happens if there are delays, and what measures will be taken in those circumstances.

Facilitator – The original timeline was for a plan to be in place for work to be done in 2015, but if possible, then in 2014. City stated that we won't pre-judge the timing and solution; the Committee will decide this in the next couple of weeks.

Middle Dam: Process and Timing

Q: What are DSS' expectations for the Middle Dam?

A: That the spillway will be upgraded to an acceptable design level. We understand the risk analysis and it helps identify which dam needs to be addressed first, but we are expecting a Middle Dam spillway upgrade.

Q: If it's unachievable economically to do upgrades to both dams, would DSS support a longer timeframe for upgrading the Middle Dam?

A: Yes, we have agreed that Lower Dam work could be done this year and Middle Dam next year or over a number of years.

Q: Will the Lower Dam accept a 1 in 2475 year flood?

A: GA responded that this could trigger overtopping of the Middle Dam and if the release of water is fast enough, it could exceed the Lower Dam.

Q: Is it best to spend our money on the Lower Dam design to handle an unusual increase in water flow?

A: GA responded that it is not recommended to design for minimum requirements for the Lower Dam when a larger spillway could be constructed for not much more money.

CDPPS stated that the Committee believed that work on the Lower Dam was going to be enough, based on the risk analysis. Requested that GA include in their final report that Middle Dam work would cost a lot more money for very little benefit.

DSS stated that overtopping has already occurred in past at the Middle Dam.

City stated that to do work on the Middle Dam will cost an additional \$4+ million (total of both dams approximately \$12+ million) and this is not affordable or deliverable from the community's perspective.

Q: We have been provided with a report from Dr. Bill Roberds, one of the world's greatest authorities on risk assessment. As the dam owner, will the City be in a non-compliance position if it stands firm on its position to not do any work to the Middle Dam?

A: DSS responded they would review all documentation, ask further questions and may also hire an expert to review the material (at City's cost). It is premature to guess at this time if the answer is yes or no.

Q: On what basis has DSS reached a conclusion that upgrades to the spillway on the Middle Dam are required?

A: We do not agree with the assertion that it's an acceptable risk to allow a high consequence dam in BC.

Q: Can DSS look at the dams as a system and with some subjectivity because a lot of money has been spent on consultants who have told us that we don't need to do any work on the Middle Dam? We won't get any benefit from spending millions of dollars to prevent less than one life for an event that may never happen.

A: We have lowered the consequence classification based on the risk analysis. The dam is still rated as *High* consequence and is located in a major city with residential downstream, which is unacceptable to the province.

Q: We know the Middle Dam spillway is undersized, but we will do work on the Lower Dam to address it. Could we get a second opinion, another party to review GA's findings, which will allow us to proceed without the Middle Dam upgrade or with a planned upgrade within 10 years?

A: DSS responded that you could present that plan.

Q: Can the signage be reduced because they depict a large wave? Even without doing any work on the dams, the inundation has been greatly reduced because we now know that it will be a slow failure. The water will rise in a flood situation instead of there being a large wave.

A: DSS responded that we now no longer believe that the dam is going to disappear in 3 minutes; instead there will be a rapid rise in water and not a 3m wall of water. The warning system and its effectiveness have been factored into Dr. Bill Roberd's risk analysis.

CDPPS stated that there was no previous indication from DSS to the City that the Middle Dam spillway would need to be increased. Discussion occurred about the approach to take to give DSS enough comfort to accept GA's report based on the risk approach that if work is done on the Lower Dam, then no work is required on the Middle Dam because it isn't cost effective.

Q: What position would DSS take if the City said they can't do any remediation work this year?

A: You've reached a conclusion that there is a strong probability that you won't be able to do anything this year. You would need to discuss whether you have a sufficient system in place or whether there is anything else you can do practically to further lower your risk.

Q: Can GA summarize the two worst case scenarios for seismic and PMF and the likelihood of those two events occurring? In a seismic event, the two dams would shake and in the worst case, they would crack and water would leak through. What would happen in a PMF event?

A: GA responded that the effect of a PMF on these reservoirs, the capacities of the spillways would be exceeded, then reservoir levels would rise and overtop the dam, and the dam would be taken out between 10 minutes and a few hours.

Q: How long would it take for the water to cascade over the dam in a PMF?

A: GA responded that they would have to review the hydrographs, but once the dam starts overtopping, it would be in the range of $\frac{1}{2}$ to $\frac{3}{4}$ meter.

Q: Does DSS understand the two worst case scenarios? We have paid GA to look at every facet of these. The PMF is a 1 in 50,000 year flood event and a 10% probability of the dam failing in 10 minutes; it's likely to be a much slower release of water. This is a highly unlikely event.

A: DSS responded that normally a *High* consequence dam has a low probability of failure at the design level. There is the chance that this dam could fail at the 50 year or the 100 year, but 0% chance of failure at the 2,475 year because it will have failed before that.

SFN stated that the best we can achieve today is that DSS requires more information to be convinced that the Middle Dam requires no remediation, but is willing to consider this as a possibility.

DSS asked if you convince us to support work being done at the Lower Dam now and in two or more years you are told that you need to upgrade the Middle Dam, will you be able to go back to Council for additional financing?

City stated that we would start budgeting for that possibility and it would be explained in our presentation to City Council and SFN Council that there is this uncertainty. We don't want to have to do work in the Middle Dam immediately after doing work on the Lower Dam.

DSS stated that they're not in a position to say that the work won't have to be done at the Middle Dam next year, but it makes sense to concentrate on the Lower Dam first.

Wenda Mason, Bruce O'Neill and Scott Morgan left the meeting (2:20 p.m.).

7. Lower Dam: Review of Options / Selection of Option(s) and Middle Dam: Review Discussion with DSS, Approach, Next Steps

Q: How will this be presented to City Council if we don't have an answer from DSS respecting mitigation options for the Middle Dam?

A: City stated that we will present the options to Council for mitigating the Lower Dam. We will ask GA for an order of magnitude costs for the Middle Dam improvements. We would advise Council that there are 3 scenarios respecting the Middle Dam: GA could convince DSS that no improvements are needed; or improvements will be needed in 3 to 10 years; or DSS will make us do the work immediately.

Golder Associates Q & A

City:

- There is uncertainty with the Lower Dam overtopping option. In a seismic event, could it crack because it's an unreinforced product? GA responded yes, it could crack and will have to do some repair, but repair will be required after any seismic event.
- Will drainage pipes be needed if the dam cracks and water gets underneath the hardened section? GA responded that we would have to design it for that occurrence.
- Once we cover the hardened surface with a matt overtop, there is no way to look at it to see how it's holding up. GA responded that cracking wouldn't go all the way through the 3m layer; the problem will be post earthquake.
- How will it be possible to review and maintain the overtopping to determine if it is holding up? GA responded that overtopping was done in a dam in Nakusp in 1969 and there are more temperature variances there. It's as good now as when the work was first done.
- Expressed concern about the possibility that the spillway may deteriorate and have to be replaced in 5 to 10 years after doing the overtopping now. GA responded that the Middle Dam spillway was inspected in 2002, but suggested that it be reviewed by a structural engineer because it is 100 years old. CDPPS advised that Herold Engineering conducted a structural engineer review. City will obtain this information from Herold Engineering.

CDPPS (Jeff):

- The advantage in the overtopping option is the cost. Are concrete mats an option? GA responded no, the slope is too steep. The mats won't stand the velocity and won't stay in place. What about huge rocks? GA said no.
- Is there a problem going with the 12m labyrinth vs. the 18m? GA responded no, there would be no problem going with the 12m and it's less intrusive.
- Do we need the port cofferdam for the labyrinth? GA responded that the Contractor decides on this and whether to take the risk to go without it. If a flood occurs while the work is being done and you don't have a cofferdam, this could cause delays and cost overruns.
- For the labyrinth work is it necessary to reduce both reservoirs by 5m? This would be a huge impact to the park. Does the Middle Dam reservoir have to be reduced when the work is being done on the Lower Dam? Can the Lower Dam be taken down lower and not impact the Middle Dam? GA responded that pumps would be needed at the Lower Dam to siphon the water down, which would require maintenance and this would cost more overall. Another option would be for the Middle Dam flow to be diverted into the creek and leave the Lower Dam, but it would be cheaper to reduce both dams.
- For both options, the costs and the impact to the park are way more than anticipated.

SFN:

- With the overtopping option, what factors would prevent you from using that fill and if it can't be used, is that covered by the 30% contingency? GA responded yes, the 30% contingency assumes that slightly less than half of the fill can be used. We don't know for sure if the sand and gravel at the bottom of the dam can also be used.

GA stated that MSE (mechanical stabilized earth) lock block walls are an alternative to a conventional cantilever wall in the labyrinth option and there might be a significant cost savings, if the City is willing to pursue it. Excavation costs will be the same; there is a slab instead of footings, which would reduce the costs to one-half. It's a geotechnical design. Need to look at the hydraulics of the system and have to make the lock blocks watertight. They perform well in an earthquake. City stated that the only concern with lock blocks is with the lowest lock blocks and what they can withstand. They are used extensively at highway overpasses. GA stated that you can replace a lock block after distortion from an earthquake.

CDPPS suggested that the MSE wall type be pursued because it has a history of working and it's cost effective.

Q: What ongoing maintenance is required in the overtopping option?

A: There will be very little maintenance.

Q: Is construction faster using MSE walls?

A: Yes, it may still take four months, but it's earth moving work instead of pouring concrete. The sheet walls will still have to be built at the front.

Q: How do the footprints for the labyrinth and MSE compare during construction and afterwards?

A: They are the same.

Q: What is the overtopping footprint?

A: It will be more than for the labyrinth.

Q: Where is the walkway path on the south side in the overtopping option?

A: The 1m raised path in the previous concept is not needed to that same extent now.

CDPPS: (Lorne)

- How will the increased spillway look in the labyrinth option? It's a 20 ft drop from the top of a new bridge to a small amount of water in the concrete channel below, which may be a large public hazard. How do we deal with swimmers not jumping in?
- Overall look of the weir is a big concrete channel?
- What is the thickness of the wall? GA responded that .5m thick is the standard design for the cantilever wall.
- What are the bridge costs for either option? GA responded \$400,000 for the access roads, plus bridge is \$200,000, plus \$1,000 for landscaping.
- The bridge has a heritage component. Can it be raised and reused? GA responded possibly.
- How do you account for the difference in the contingencies for the two options (10% vs. 30%)? GA responded that the higher contingency in the overtopping is to account for the lack of knowledge with this option. The cost could be less in the end.

- What will the erosion control mats be like? GA responded that they will be mats that will have grass growing up through them and will cover the full landscaping of the dam.

Q: Will the disturbance in the overtopping option be less visible because landscaping will disguise it?

A: Yes.

Q: Is there a new bridge on the overtopping option?

A: There'll be new bridges on both options.

Q: Do the bridges look similar?

A: The bridge will be higher on the overtopping and wider on the labyrinth.

Q: Will there be a low level outlet in the labyrinth and a siphon in the overtopping?

A: GA responded that a siphon can be added to the overtopping so that both options are comparable. CDPPS stated that if water is siphoned from the Lower Dam in the middle of the summer, then may never get the water level up again because there isn't enough flow.

SFN stated that it is absolutely critical that a siphon be added to the overtopping option. We are not interested in the overtopping option if it doesn't have a siphon.

CDPPS stated that there are other ways to draw water from the lower reservoir to supplement the creek without adding a siphon to the overtopping option.

CDPPs stated that the overtopping offers infinite flood control, so appears to be the holistic solution.

CDPPS: (Geraldine)

- Where can money be saved in the costs for either of the options?

Q: Are there other options to consider now that we have the time from DSS?

A: Earlier options were eliminated for various reasons. We've estimated costs for the two options.

City stated that we have already overspent on the engineering consultants' budget, pending further discussion with the EC, we don't anticipate any further work from them, other than the final report to DSS.

Q: In the labyrinth option, can you lift the stop logs if maintenance is required?

A: Yes, it's advantageous because you can lift them out if you need to draw the water down.

Q: In the overtopping option, could the water that is channeled over through the hardened section create velocity and wipe out what's downstream?

A: Yes.

Q: In the labyrinth option, what would be the environmental impacts in a PMF?

A: City responded that the spillway is designed to handle it and there wouldn't be environmental damage. GA added that the creeks and rivers would be flooded. CDPPS added that in the 12 m labyrinth version, the water would eventually overcome the spillway capacity and could lead to failure in the dam.

Q: In the overtopping option, is there more certainty to get a lump sum price for excavating, hauling the soil away and bringing the soil mix back?

A: It will depend on what is in the excavated material.

Q: In the labyrinth option, will the 18m design help to win the argument with DSS to not have to do work at the Middle Dam (\$200,000 cost)?

A: Yes it may help, but may not be enough to avoid Middle Dam work altogether. Suggested a minimal overtopping protection or slabs or armouring for the Middle Dam, as well as work on the Lower dam.

Q: Will the labyrinth need to be fenced and caged for public safety?

A: City responded yes, a chain link fence could be installed along both sides.

Q: In the overtopping option, what's the drop and will a guardrail be needed?

A: It will be 5m above what's existing and there will be landscaped berms on both sides.

Q: The aesthetics in the park is important and the labyrinth will look like a big cage. Is it possible to reconsider the swale option again with decent landscaping? It was the most affordable option. The two options being considered may not be achievable this year.

A: City responded that GA would have to be engaged to review it. GA stated that there was an acre of clearing required for the swale.

Q: Today's discussion with DSS was respecting two options. Why was the swale option dismissed earlier?

A: CDPDS responded because it created a large footprint in the park and it was very close in cost to the overtopping option, which would be less impact in the park. City added that the two options the Committee agreed to review have come back more expensive. The swale option's costs may come back higher too.

Q: What are GA's thoughts on reconsidering the swale option?

A: The area would be much more impacted and there are uncertainties about ground conditions (rock).

CDPDS suggested that the swale option be reconsidered because it will cost less to maintain it and it would be less invasive in the park. We rushed when we selected two options based on the costs. GA added that site grading will be required, but the swale could be combined with a park redevelopment program.

City stated that a solution needs to be decided this year, even if it's not built this year. SFN agreed that the solution adopted needs to be something that can be implemented.

Q: Can we assume that the swale option costs will have increased?

A: We will have to review them.

Q: Would the swale be more acceptable to DSS than overtopping?

A: Yes, because DSS is unfamiliar with the overtopping option. Risk assessment and overtopping are both brand new to DSS.

Q: Does the labyrinth spillway have to be open?

A: A large concrete slab could cover it, but it will be expensive.

Q: Can you explain the purpose of the cofferdam again?

A: It is for the protection of the workers and their equipment while doing work on the dam in the event of a massive flood occurring. The Contractor will decide to accept the risk or not (cost of the cofferdam is \$700,000).

City stated that an alternative to the cofferdam would be a lock block wall with a membrane behind it, which would be much cheaper.

CDPPS summarized:

Labyrinth is well engineered, but not park like and has public safety issues;

Overtopping is constrained by the cost; and

Swale has a large loss of trees, but it could be made into a park.

Facilitator – Need to consider the costs and benefits of reviewing another option at this point. In the swale option, an archaeological study will be necessary and the results will have to be addressed. How does the swale option improve the dam situation? Consider this tonight and discuss tomorrow.

GA stated that what they heard from DSS today is that there is time to consider the options; it is not an extremely tight schedule as originally thought.

CDPPS stated that the victory today was that DSS accepted the risk analysis and reclassified the dams.

8. Next Meeting

Wednesday, 2014-May-21, at 9:00 a.m. in the Training Room, City Hall.

Agenda for tomorrow's meeting:

- Review two known options
- Is there a third option? Ramifications of this?
- Discussion about recommendation for Lower Dam and Middle Dam
- Next steps/ Timing / Recommendations to Executive Committee
- Public Information Update

9. Conclusion

The meeting concluded at 3:50 p.m.