Tenas Project: Water and Aquatics Sub-Working Group Meeting (MS Teams)

Thursday, June 23, 2022, from 9:00am to 12:00pm
Meeting Summary Notes

Meeting Participants

Environmental Assessment Office (EAO)
Heather Noble
Jillian Zavediuk
Jasmin Jackson

Ministry of Environment and Climate Change Strategy (ENV)
Sheldon Reddekopp
Todd Adamsson
Anna Akkerman
Rusto Martinka

Ministry of Energy, Mines and Low Carbon Innovation (EMLI)
Kelsey Norlund
Bruce Mattson (Lorax Environmental)
Morgan Dyas

Ministry of Forests (FOR)
Chris Schell
Sean Staplin
Ron Donnelly

Office of the Wet'suwet'en (OW)
Mike Ridsdale

Witset First Nation
Chief Barry Nikal
Dallas Nikal

Town of Smithers
Gladys Atrill, Mayor

Village of Telkwa
Leroy Dekens, Councillor

Telkwa Coal Limited (TCL) and Consultants
Ashleigh Bellevona
Dan Farmer
Samantha Barnes, SRK Consulting

Micheal Herrell, SRK Consulting
Kirby Ottenbreit, Consultant
Guy Gilron, Borealis Consulting

Meeting Objectives

1. For Telkwa Coal Limited (TCL) to present an overview of the following water and aquatics chapters of the Application:
    - Surface Water Valued Component (VC);
    - Groundwater VC;
    - Aquatic Resources VC; and
    - Fish and Fish Habitat VC.
2. For Working Group members to ask questions regarding theses chapters and the Application review process.

Welcome/territorial acknowledgment, agenda overview, introductions

- The EAO welcomed everyone, asked OW if they would like to provide territorial acknowledgment, led the round of introductions of meeting participants and provided overview of the agenda
- Advised that Meeting will be recorded and provided on the SharePoint site to working group members.

A. TCL: Surface Water Value Component Assessment

- Surface Water evaluated in terms of two Subcomponents: Quantity and Quality
  a. Quantity Indicators
     - Change in mean annual discharge using annual average flow relative to pre-mining conditions
     - Change in seasonal flow distribution, using monthly average flow throughout mine life and into post closure relative to pre-mining conditions
     - Change in low and high flows, winter low flow periods and high flow periods using simulations of wet years and considerations of extreme storm events
  b. Quality Indicators
     - Change in Modelled Parameter Concentrations
       - Parameters of water quality guidelines
       - Developed daily goldsim water and load balance model
     - Change in other measurable water quality parameters
       - Electrical conductivity, total suspended solids, pH, hardness
- Noted water quality model was compiled in terms of monthly average results from daily model predictions run from the start of construction (modeled as 2020 when model began) and ran through 2100 and looked at:
  - Change in project catchment
  - Change in project interactions within each stream the project discharges
  - Effects of discharge
- Selected series of prediction nodes derived through discussion with various groups and were located on streams adjacent to project area: Tenas Creek, Four Creek and Goathorn Creek, and included streams further downstream: Telkwa River and Buckley River
- 14 prediction nodes to evaluate changes, capture influences of project directly upstream and downstream of discharge locations
- Presented map showing extent of Regional Study Area (RSA) and Local Study Area (LSA)
  Local:
  - Includes watersheds of three streams surrounding project
  - Extends across rail infrastructure and Tenas access corridor

  Regional:
  - Full Telkwa River watershed
  - Segment of Buckley River watershed from slightly upstream of rail infrastructure area to confluence of Telkwa River
- Presented table summary of Residual Effects Characterization for Surface Water Quantity
  1. Mean Annual Discharge
     - Primary influence of project on Mean Annual Discharge is change in catchment area
     - Project occupies specific portion of catchment for Tenas and Goathorn natural catchment areas and some of catchment will be rerouted since discharge occurs directly into Goathorn Creek

- Some of catchment from Tenas and Four Creek is routed around to Gordon Creek resulting in reduction of stream flow
- Diversion channel between management ponds and open pit where clean noncontact water is routed back into Four Creek
- Residual effects for mean annual discharge used 10% threshold to identify whether there was designated effect to an area where node experienced a 10% reduction or increase in stream flow relative to pre-mining conditions
- Occurred primarily in sections of Four Creek resulting from diversion channel which increases flow
- Magnitude considered based on total affected area; evaluated to be low since effect is local to Four Creek, which occupies less than 5% of RSA
- Geographic extent was determined to be within the local study area since Four Creek catchment is within LSA
- Duration was long term since change in catchment area and change in flows is expected to continue through post closure
- Frequency is continuous because occurs in both summer and winter conditions
- Considered irreversible because continues throughout the long-term period up to 2100
- Context defined as moderate because there is natural variability expected in the flows and has happened historically, and this change in flow is within that natural variability
- Likelihood is likely because expect that changing catchment will result in change in flow
- Significance was determined to be not significant with a moderate level of confidence
- Proposed Mitigation Measures:
  - Limit project footprint and project area
  - Reclamation measures
  - Water capture measures

2. Seasonal Flow Distribution
    - Evaluated based on monthly flow predictions from the water balance model through 2100; change in monthly flows relative to pre-mining conditions
    - Similar to mean annual discharge, predominantly results of changing catchment area
    - Segments of Four Creek expected to see an increase greater than 10% for some months of the year
    - Potential change in winter flows resulting from changes to groundwater table from mining of open pit, thus sections of four Creek could experience reduction of more than 10% in the winter months
    - Magnitude defined as low because monthly reduction or increase in flow greater than 10% is local to Four Creek and effect is within geographic extent of LSA therefore affected (Four Creek catchment) area less than 5% of RSA
    - Duration is long term; change in flows occurs throughout the operations and closure period through 2100
    - Continuous frequency as occurs in winter and summer months
    - Irreversible as it continues throughout post closure
    - Context is moderate because of historical occurrences and natural variability

- Likelihood is likely because changes in catchments expect to produce changes in flow
- Significance is not significant with moderate confidence
- Proposed Mitigation Measures:
  - Seepage management measure
  - Water capture measure

3. High and Low Flows
   - Diversion channel that diverts water to Four Creek has potential to increase during high flow or flood events
   - Construct a control structure prior to discharge from diversion channel where large flow events would be discharges toward east management pond with overflow spillway before discharging into Four Creek
   - Change in high flow expected from the project discharge which would enter Goathorn Creek mitigated by designing the Tenas control ponds to maintain contingency storage volume for the 10-year flood event; thus during flood events the discharge would be attenuated prior to discharging into Goathorn Creek
   - Looked at consecutive wet years in water balance model to test one in 100-year annual precipitation regime and effects to discharge evaluated in terms of change to Goathorn Creek
   - Low flows similar to seasonal flow distribution where low is expected to be in winter months or in dry periods in summer
   - Seepage during winter months is expected or reduction in seepage or base float contributions to Four Creek and Tenas Creek as a result of open pit mining are expected to alter flow rates in the creeks
   - Change is expected to reside within Tenas Creek only, the geographic extent is local and the magnitude is low since expected to be less than 5% of RSA
   - Change in low and high flows would only occur for short periods of time and therefore duration expected to be short term. Also only occur during the operations phase when the controls are in place
   - Frequency expected to be infrequent, by the nature of these extreme events
   - Reversibility is expected to be partially reversible
   - Context is expected to be moderate since these types of changes are expected within the natural historical variability of the creeks
   - Likelihood is expected to be unlikely due to specific controls in place for high flows where we expect the engineered structures to help mitigate the effect of high flow events
   - Significance is expected to be not significant
   - Proposed Mitigation Measures:
     - Erosion and sediment control
     - Management of metal leaching and acid rock drainage
     - Blasting measures
     - Reclamation measures

- Presents table summary of Residual Effects Characterization for Surface Water Quality
  1. Change in Modelled Parameter Concentrations
     - Includes full suite of baseline monitoring metals and nutrients that are modelled in water quality model and additional measurable water quality parameters

- Use modelled concentrations to simulate or estimate changes in those parameters
- Modeled parameter concentrations used water quality predictions at each node and compared those concentrations to water quality guidelines
- An affected area or effect was identified where monthly water quality model prediction at any node was identified to exceed the water quality guideline and exceed the natural variability, which was designated the 90th percentile of the baseline monitoring data set
- Four parameters identified could exceed water quality guideline:
  - Selenium
  - Nitrate
  - Sulfate
  - Cadmium
- Identified these potential exceedances for Tenas Creek and Four Creek occurring on winter months resulting from seepage from management ponds entering streams during low flow months lacking in dilution potential
- Model results identified peak concentrations in management ponds during operations
- When water infiltrates into groundwater system, expect lag from time it leaves management pond before entering stream (evaluated in groundwater model)
- Identified same tendency or (temporal) relationship between peaks observed in management ponds that appear as peaks in streams post closure
- 20 to 25-year lag expected for water to reach streams at prediction nodes
- Expect change in water quality only in post closure from seepage and exceedances during winter month periods
- Exceedances occur for finite period of years at each node and each stream between 5 to 15 years depending on location in stream
- Expect exceedances to return below water quality guideline in long term
- Magnitude determined low because percentage of affected catchment area is less than 5% of RSA
- Geographic extent is local because exceedances of guidelines occur in the LSA only
- Duration is short because occurs for finite time period
- Infrequent frequency because occurs in winter months only (low flow)
- Effect is partially reversible because finite period in post closure and no longer occurs in the long term (at the end of model period)
- Effect is moderate in terms of context since short-term exceedances of parameters have occurred historically resulting from agriculture, forestry or mining in catchment area
- Likelihood is determined unlikely; main reason being model didn't include attenuation of modelled concentrations though groundwater pathway
- Significance is not significant with moderate level of confidence
- Proposed Mitigation Measures:
  - Erosion and sediment control
  - Management of metal leaching and acid rock drainage
  - Blasting measures
  - Water capture measures
  - Reclamation measures
- Overall control measure is submerging potentially acid generating rock (PAG) below water cover in perpetuity enabling control of concentrations in management ponds

    - Blasting measures in place to control release of nitrites and ammonia
    - Capturing and controlling water through various facilities for discharging into Goathorn Creek

2. Change in Other Measurable Water Quality Parameters
    - Includes total suspended solids (TSS), conductivity and total dissolved solids (TDS)
    - Increase in some metals expect potential increase in conductivity and TDs and short term increases in TSS
    - Mitigation measures include the Tenas Control Pond, main discharge station acting as large sediment basin to help manage TSS
    - Model predictions indicate increases in TDS and conductivity resulting from seepage in groundwater pathway during low flow periods
    - Magnitude determined low based on the area effect occupies is within the RSA and extent is local since it's Tenas and Four Creek
    - Duration is long term because changes to TDs, TSS and conductivity relative to baseline expected to continue through post closure
    - Infrequent frequency as only expected to occur during winter months
    - Reversibility is irreversible because it continues through 2100
    - Context is moderate because expect that creeks have experienced some of these changes from natural events and previous land uses, such as agricultural and forestry
    - Likelihood is likely
    - Significance was not significant with the moderate level of confidence

- Summary of water quality guidelines used to evaluate surface water quality indicators for measured water quality parameters
    - Water quality guidelines are tools to monitor concentrations of parameters in waters of interest to government agencies and the public
    - Not legally enforceable however are objectives intended to target the limits set by permits and standards which could be legally enforceable
        - Approved and working Water Quality Guidelines in BC for freshwater aquatic life
        - Drinking water guidelines
        - Irrigation guidelines
        - Canadian water quality guidelines for aquatic life

- Developed Site Performance Objectives (SPOs)
    - Predictive site-specific water quality objectives for a quantifiable receiving environment parameter or attribute
    - Developed by professional using scientific process with intent to guide management decisions and mitigation actions for a regulated activity at a specific location
    - Drinking Water Quality Guidelines used as ultimate limit; SPOs do not exceed those values
    - Must not result in creation of contaminated site as defined under Contaminated Sites Regulation
    - Initial list of SPOs were developed for: aluminum, cadmium, cobalt nitrate, selenium sulfate and thallium
- Conclusion of slides, opens for questions

Smithers Question: Asks to confirm scope of modelling until 2100 and whether predicted effects of climate change, such as melting ice, more water increasing variation, is included in modeling?

TCL Response: Included effects of climate change in a couple ways:

- Looked at change in temperature and change in precipitation expected from the global circulation models presented in 30-year periods.
- Included these rates of change to temperature and precipitation into our hydrologic model and the hydrologic model uses precipitation and temperature to derive stream flow
- Essentially using expected changes to those two parameters to drive changes to stream flow, to project flows, as well as in stream flows at each of the locations
- Also applied with an orographic gradient so that that accounts for the changes in catchments for each of these streams
- Similarly using change in temperature to develop change to expected evaporation rates
- Very important because must maintain water cover on PAG, must be considered through 2100
- Used 2100 as endpoint for modeling predictions because it's the extent climate change models currently provide

Smithers Comment / Question:

- Identifies that many residual effects characterization classified at medium confidence level, expresses some concern about the certainty of this level of confidence over time.
- Requests clarification on consideration of the 10-year flood event related to the ponds, and also asks consultant to speak to the 100 year flood event and how they're predicting that variation will be managed through the ponds, in cases of the extreme weather events which we are seeing more of?

TCL Response: Two pieces here:

- How they considered extreme flood events in the water balance and the water quality model; and
- How they considered short term, so 10 year, 24-hour storm or 72-hour storm and or 10 year to 100 year storm

Water balance and water quality model

- Apply 100-year annual precipitation to model to see how whole year performs to arrive at water balance predictions
- Looked at 100-year wet annual precipitation and how it's distributed throughout the months, how that changes monthly discharge rates
- Identified 100-year precipitation in historical record used to drive the model; most extreme that was experienced historically from Smithers climate records
- Generated water quality model results using that historical precipitation year

Short term extreme event

- The 10 year flood: 24 hour rainfall or snowmelt events that might occur in 10 year return period
- 10 year return period was used to size contingency volume for Tenas control pond
- Plan to keep space in Tenas control ponds to always store a one-in-ten year flood event
- The site can manage and control that flow for anything larger than a 10 year flood event, which is expected to happen within the life of mine.
- Engineered spillway, built according to Canadian Dam Association, dams must be designed with emergency spillways according to their consequence ranking
- Performed dam breach study to understand consequences of these dams failing, in terms of environmental and human risk, and various other parameters

- Designed spillway for a partial probable maximum flood, a statistical value that's developed to understand the worst-case flood expected for these sites based on historical records
- Dams are designed for 1/3 of that probable maximum flood, however make sure the spillways can convey the full probable maximum flood
- In event of larger than 10-year flood event, cannot store it on site but can expect to safely convey it through spillways into the creeks
- Hopes this clears up distinction

Smithers Response and further question: Yes, however generated other questions regarding spillways, dams and quality of water, but would like a different question addressed:

- There are many questions in the community about selenium and concerns about feasibility of its management, what are those levels anticipated to be over time, not just in the creeks but in the Telkwa and Buckley Rivers?

TCL Response:

- Model does provide expected selenium concentrations in the creeks, the Telkwa and Bulkley River
- Model results are monthly average concentrations and that's in line with the water quality guidelines being monthly average concentration targets looking at monthly average concentrations from construction, operation and post closure to 2100
- Based on model results, expect to exceed water quality guideline for selenium, (references slide and states guideline is .008 milligrams*** per liter)
- Do see exceedances of guideline in Tenas and Four Creek during winter months from seepage
- Due to exceedances of the water quality guideline, developed the site performance objectives (SPOs), which takes a closer look at the aquatic life and other studies specific to selenium and developed adjusted limit or target which is .008 milligrams per liter
- ***Corrects previous statement: Provincial water quality guideline is .002 milligrams per liter
- States that in all creeks throughout entire model, always below SPO limit of .008

Discussion re: whether is micrograms per liter or milligrams per liter; confirmed .008 milligrams per liter or 8 parts per billion, or 8 micrograms per milliliter

Smithers Question: Asks to please state what the provincial guidelines are, and do you exceed the provincial guidelines?

TCL Response:

- The provincial guideline for selenium is 2 micrograms per liter or .002 milligrams per liter
- The [project] does exceed the provincial guideline for selenium in some of the nodes within Goathorn and Tenas Creek for a period of years in winter months

ENV Question and comments: Asks to return to Residual Effects Characterization slide on water quality to confirm if residual effects characterization is based on a comparison to water quality guidelines.

TCL Response: That is correct. Didn't use the SPOs in the residual effects.

ENV Question: Why [TCL] would develop SPOs if this is the characterization?

- Further comments on SPOs: Seen in management of projects, administration of projects and implemented in permitting processes, but seems unusual order of operations [to include here

(at EA stage)]. Perspective that it will increase the amount of work, to review six or eight SPOs and the science that has been used to build them.
- Water quality guidelines are peer-reviewed and developed over decades of work and review by people from all over external to government and articulate a level below which we can reasonably expect no effect.
- Noted that it's good the residual effects characterization was done using the water quality guidelines.

- **TCL Response**: Oversaw development of SPOs and will let project manager speak to the strategy but noted a couple major reasons to consider the development of SPOs in a project such as this:
- Asserts that many water quality guidelines, both provincially and federally, are outdated, even though they are based on good science at the time they were published
- Often need updating and there isn't an opportunity to update them as frequently as needed because the science is developing
- Water quality guidelines are not site specific, they're quite generic and span a larger area
- Many of these chemicals and parameters can vary a lot site specifically
- Gone to the extra trouble of looking at hardness, pH and other parameters that influence toxicity, and considered those in the development of SPOs and these are proposed SPOs
- The process of developing an SPO and incorporating into a permit requires consultation with governments and First Nations
- Taken best science and applied to water quality guidelines to help make them more site specific and thus relevant to the project

TCL Response: (re: strategy): Provided context that up until q1 or q2 of this year, TCL was developing concurrent application for permitting and the EA. Upon request from various groups including Office of the Wet'suwetsen (OW), dropped the concurrent part
- Notes that much of the work for concurrent permitting was complete, so included aspects [in EA application] where it was believed to be far enough along to discuss
- Another reason is they knew the information would be presented to the public and anticipated questions to being over the guideline and thus developed SPOs in order to respond to questions and explain why using a different limit than water quality guidelines

ENV Comments: offers to provide some context for permitting process: under the Environmental Management Act (EMA), the effluent discharge permit may authorize SPOs and/or an initial dilution zone (IDZ)
- First, a best achievable technology study must be conducted and presented (ex. Consider water treatment and/or minimizing seepages) and whatever other technologies and practices might be available in order to meet water quality guidelines
- If project gets to permitting, a best achievable technology study must be presented with application in order for SPOs and the IDZ to be considered and assessed

TCL Comments: Wonders if ENV is referring to SBEBs or scientifically based environmental benchmarks, which are based on technical guidance. Best available technology (BAT) is needed to develop SBEBs, however SPOs don't necessarily attach themselves to the development of a technology. There wouldn't be a point of doing a new guideline for an active treatment, it would be treated to an achievable level.

ENV Response: Acknowledges that can't always treat to match guidelines and selenium is not easy to treat, but there may be technology that exists that could treat the discharge to produce an effluent

quality that's a little bit higher than the BC water quality guideline. At that point a SPO or SBEB might be considered in the permitting process.

ENV Discussion re: Interpreting SPOs to be effectively proposing permit limits or at least proposing receiving environment numbers that we would think are protective or don't create effect in the receiving environment.

- Proposing permit limits without actually proposing them in this EA application is problematic because it means team needs to check on getting into permitting level review before considering permit-proposed limits
- There are specific details, considerations and conversations that must occur during permit review, including understanding of those achievable technologies on site
- Apparent that a lot of work to support permitting has been done, but mixing in that work is challenging for [EA application] review
- Returning to the EA lens of residual effects characterization using water quality guidelines, need to understand:
    - Where TCL is planning discharges
    - What is being proposed for mitigation and treatment
    - Is there residual effect from what is being proposed compared to water quality guidelines

TCL Discussion: Acknowledges this meeting is about the EA process. Speaks to his experience with SPOs from working on number of projects across the province and offers rationale for why data was included

- Some SPOs that have been developed and put into permits have not scientifically derived those numbers
- The work [TCL] has done is from state-of-the-art science, i.e:
    - In case of selenium, based SPO on bioaccumulation model, which is based on data from this site and other sites across Canada, BC and Alberta
    - Derived a guideline similar to how one derives water quality guideline, versus assessment of what technologies can achieve, what the no effect levels are
    - Best guideline for selenium is tissue guideline not water guideline
    - Developed food chain models
- Intention was not to complicate the EA review, but provide level of confidence and scientific data as proposal of where to start in terms of looking at risk and science

ENV Discussion: Asks to speak to selenium piece:

- Reviewed bioaccumulation model and thinks its derived from an EC 10 (effect concentration)
- Using an EC 10 and then translating into a water column number is not as protective approach as a water quality guideline
- When developing water quality guideline, apply assessment/uncertainty factors to articulate a level below which we can reasonably expect no effect
- Development of a site-specific water quality objective goes through rigorous review from many places
- Including this data presents new receiving environment thresholds [to Working Group]
- Understands intention wasn't to make EA process onerous, but has concerns that it could and may have some resulting risk to how project is designed

OW Discussion and question:

- Looking at modeling, [TCL] mentioned model goes through to 2100 and is saying that is cumulative effects model but not necessarily looking at the one in 100 or 200 flood years. That modeling is only for 78 years; 2100 is not that far away
- Speaks to water diversion measures and notes in reality it's expected up to 30% on Four Creek, which will cause overwintering habitat where freeze rate may be solid to the bottom with probability of making it unsuitable for fish
- Pond discharge will contribute to downstream changes in water quality, depending on efficiency of operation because there is no water treatment
- Concerned about pond liners in application – are they expected to last forever?

TCL Response:
- Looked at range of liner options to choose one that keeps integrity long term
- Selected technology was bitumen clay composite
- Trying to mimic a clay or natural material that doesn't degrade with time like an HPE or other geosynthetic

OW Question: If mitigation options for leaking is to replace pond liners, how exactly is this achieved, and has it been done before?

TCL Response:
- Option to replace pond liner during construction of the liner, opt to use a different technology
- Won't be an opportunity to replace the liner once the rock has been placed
- Management ponds are built in sequence providing opportunity to learn from performance and incorporate learnings into subsequent ponds
- North management pond is built first; it is smallest, has less change or smaller seepage rate into creeks
- Monitor how liner performs to optimize and improve liner technology when moving into East management pond; same opportunity again with West management pond
- Idea of replacing is more like modification in learning through monitoring throughout operations

OW Response/ Question:
- Expressed concerns about the cost and how quickly this can be done once a breach has been identified
- Is there a specific location for the wastewater discharge?

TCL Response: The wastewater pond will discharge to same tributary as Tenas control pond; it will be mixed with Tenas control pond discharge into the Goathorn Creek tributary.

OW Question: There's no monitoring location directly below these discharge areas to assess impacts?

TCL Response: There would be a monitoring location once operation starts, but there is no prediction directly downstream of the pond in the model right now, but would monitor at the wastewater pond, at Tenas control pond, could monitor somewhere or bottom in that tributary as it discharges to Goat Horn Creek, thinks there's still some opportunity for that

OW Question: Asks so that information hasn't been supplied yet?
TCL Response: That's right, there is a water monitoring plan for the ponds and at existing monitor or stream locations. But at this point in that monitoring plan, there isn't a point where you would monitor

directly downstream of the wastewater pond and the Tenas control pond. But there's an opportunity to include if it's warranted.

OW Comment: In determining how much water quality change is acceptable, these changes will be permanent, last centuries and require careful consideration. Acid rock drainage in the groundwater, seepage from these tailing ponds, this will increase towards the end of life of the mine and waste accumulation and continues to increase. How much water quality changes are acceptable towards the end of life? Looking though application to determine exactly how much is acceptable.

ENV Question: asks to clarify understanding of project:

- The north management pond is built first?
- One or two other ponds built through the life of mine
- Seepage rates have been calculated for these ponds
- There is lag time from those ponds being built and those seeping to Tenas, Goat Horn and Four Creek
- At some point in mine life, control pond is built, which will start discharging later in mine life

TCL Response: Tenas control pond is built first and is main sediment control measure during construction. It provides sediment control throughout mine life and will be discharging throughout operation period

ENV Question: Is modeling node actually at confluence of tributary and Goat Horn Creek?

TCL Response: That's right.

ENV Discussion:

- Would normally start on a green site and thinking about the tributary as receiving environment of the mine
- Goat Horn Creek is kilometers (uncertain) downstream of actual proposed location for control pond
- Important to consider the tributary: what is the effect of discharging or building plan around modeling node discharging at confluence versus modeling back up in the creek or considering that as receiving environment
- Largely have SPOs on legacy, existing mine sites
- Wants to ensure starting a new mine within right context
- Will want to know through monitoring if liner is effective, and that a trigger action response plan for groundwater is implemented
- Advises to expect comments on conceptual groundwater model and numerical groundwater model
- Must ensure understanding of where and when water is leaving the ponds, when it will pop out into the streams and what it looks like chemically
- Considering the effectiveness of liners, important to think about what happens if it doesn't go well and how to respond to those learnings
- Question: Is there any possibility to change liners? May be groundwater trigger; actual response plan may be appropriate and will have conversation if goes to permitting
- Asks about Department of Fisheries and Oceans (DFO) involvement, whether it's progressing?
    - Their input may affect [Working Group] considerations and work

EAO Question: Asks for clarification on determination of "pre-mining conditions" – how far back a timeline is being used for pre-mining conditions?

TCL Response:

- For water balance model, running 2020 to 2100 with mine activities and in parallel running a no mining case simultaneously
- Stream flow predictions from 2020 to 2100 and that difference when in the operations phase in 2040
- Essentially looking at same conditions, same hydrology, whatever climate change in 2040, what the stream would be doing without a mine versus a mine in place
- Model and stream flow conditions were developed and calibrated using monitoring data in the streams from 2017 to 2019 and then in Four Creek at prediction node
- Emphasis on that monitoring and stream began in 2020 and then extended those local hydrometric records with regional stations, predominantly the water survey of Canada Station and Goat Horn Creek, estimates around 35 years of records
- Developed the model hydrologic conditions, calibrated to a synthetic record which was developed from those few years of monitoring in local streams extended with the Goat Horn Creek regional record

EAO Question: Understands talking about historical data and looking to hydrological records, but in terms of water quality pre mining, is there any data from 2017 or just running the model upwards of 2040, assuming no mining conditions?

TCL Response: Yes, should define pre-mining as type clarified in EA called no mining or the base case. Not specifically comparing the 2017 to 2019 pre-mining baseline data set, it's comparing against a no mining scenario.

EMLI Discussion:

- Commented presentation focuses on receiving area however review from mines is focused on project area
- Some pieces, like geochemical source terms, certainly affect outcomes of predicted concentrations in receiving environment
- In terms of review, advised to expect questions regarding development of some of those source terms and subsequently comments on certainty and magnitude of predicted concentrations

FLNR Discussion:

- References earlier question about quantity and how it relates to Water Sustainability Act (WSA)?
- In general terms, water diversion, use and storage require water licenses
- Part of evaluation for water license permitting process is consideration of health, how alterations will impact environmental flow needs
- Mine sites can be different, and some exemptions exist under Water Sustainability Regulation and schedule two of the Fisheries Act
- When contemplating flow alterations to water courses that may have high fish values, need to think about environmental flow needs component and what that may look like in permitting
- Difficult to comment anything more specific, suggests to proponent it will have to be considered for future water licenses for project

TCL Response:

- Developed environmental flow needs modeling for Goathorn, Tenas and Four Creek where flow diversions have highest potential for effects
- Used the provincial environmental flow needs policy and evaluated through stepwise process determining the level of risk for each of those creeks
- More detailed level of review of Four Creek because it's the smallest catchment and has larger proposed relative diversions of flow
    - Used software to model effects on fish habitat to see how it would affect various types of habitat for various species
- Provided summary in EA application and permitting stage would provide more detail

WG Break – 10 minutes, restarted at 10:45 am

TCL Comments:

- Wanted to respond to earlier comments and offers if there are items that don't need to be reviewed for the EA, then suggests not reviewing them
- Doesn't want it to be a distraction from aspects the Working Group should be focusing on

B. TCL Consultant Presentation: Groundwater Value Component Assessment

- Groundwater evaluated in terms of two Subcomponents: Quantity and Quality
    a. Quantity Indicators
        - Changes to groundwater level in area of the private wells
        - Change in groundwater discharge rates to creeks and rivers
    b. Quality Indicators
        - Changes to groundwater quality at private wells
            - Parameters of BC water quality guidelines for protection of freshwater, aquatic life and drinking water sources
        - Change in quality groundwater discharging to creeks and rivers
            - Electrical conductivity, total suspended solids, pH, hardness

- Presented map showing extent of Regional Study Area (RSA) and Local Study Area (LSA)
    Local:
        - Delineated by watersheds of Tenas and Goat Horn Creek
        - Includes Tenas Project area
        - Includes private wells located between project and village of Telkwa
    Regional:
        - Based on fish habitats in Telkwa River watershed
        - Tributaries to Buckley Rover that are crossed by the bypass road

- Presented table summary of Residual Effects Characterization for Groundwater Quantity
    1. Groundwater levels in areas of private wells
        - After implementation of mitigation measures, what remained was residual
        - Magnitude for changing groundwater levels deemed negligible
            - Neither drawdown cone or groundwater mound predicted to reach areas of private wells during operation or post closure
        - Geographic extent is local study area
        - Duration is long term as expected to continue post closure but with reduced spatial extent
        - Continuous frequency

    - Irreversible as effect cannot be reversed
    - Context rated as moderate
        - Private wells
        - Gravel beds, creeks and the rivers expected to transmit groundwater from upstream, limiting potential changes to groundwater levels in the valleys
        - None of the modeling scenarios predicted drop in groundwater levels in the areas of private wells, including a hypothetical scenario where ponds have been removed
    - Excluding influences of groundwater mound, determination was not significant
    - Moderate level of confidence (based on modeling)
    - proposed Mitigation Measures
        - Limit project footprint and project area
        - Management, control and water storage pond designs
        - Project use of water
        - Flooding of the open pit in decommissioning and reclamation, and post closure phases of project
2. Groundwater discharge rates to creeks and rivers
    - Magnitude rated as low
        - Higher order tributaries, Four Creek, Tenas Creek show low magnitude changes
        - Goat Horn Creek showed overall negligible change
    - Constrained to local study area
    - Long term effect predicted to continue post closure
    - Continuous frequency
    - Irreversible effect
    - Context rated moderate
    - Likelihood is likely
    - Significance determination is not significant
        - The change is not expected to alter integrity within ground or regional security to unacceptable level
        - Based on low magnitude and local geographic extent

- Presented table summary of Residual Effects Characterization for Groundwater Quality

1. Changes to Groundwater Quality at Private Wells
    - With mitigation measures in place, determined low magnitude residual effect
        - No constituents predicted to exceed BC water quality guidelines
        - Some parameters increased over baseline
    - Limited to local study area
    - Long term effect as continues post closure
    - Continuous frequency
    - Irreversible
    - Context is rated moderate
        - Alluvial aquifers in creeks and valleys expected to transmit groundwater from upstream and potential to mix and flush constituents
        - Predictions of particulate travel and contribution of mine affected groundwater to creeks don't account for potential diffusion and natural attenuation of groundwater system
    - Likely considering travel times and flow contributions of mine effective groundwater to create some riverbeds
    - Overall determination is not significant

        - Predicted change in router quality in the areas of private well users is not expected to result in a change that will alter the groundwater integrity in the original study area to an unacceptable level
        - Model predictions based on site-specific and public data available
    - Rated with moderate level of confidence
2. Changes to Groundwater Quality at Discharging to Creeks and Rivers
    - Magnitude low
        - Four constituents that exceeded BC water quality guidelines for freshwater aquatic life in higher order by a factor less than 2
    - Geographic extent is local
    - Residual effect is long term as continues post closure
    - Continuous frequency
    - Irreversible
    - Context is moderate
        - Assessment of magnitude is then conservative but doesn't account for attenuation of constituents in groundwater system before discharging to surface water
    - Likelihood is likely
    - Effect determined to be not significant

- Conclusion of slides, opens for questions

Smithers: Asks to confirm chemical components that were mentioned in the groundwater presentation but not identified.

TCL Response: RE: water quality discharge into creeks and rivers:

- Aluminum, cadmium, selenium and thallium exceed the BC water quality guidelines for freshwater quartic life in Tenas Creek and Four Creek
- Typically less than by less than a factor of two

Smithers: asks to confirm that quantity of the metals in groundwater plus surface water is captured somewhere in a combined total.

TCL Response: Yes, or at least the contributions from groundwater to the surface water streams has been accounted for in the surface water VC

ENV: Advises that ENV has comments on the groundwater conceptual model and numerical models, model decisions, assumptions and points to maybe missing information. Asks if anyone else from ENV wants to comment further

ENV: HydroGeologist with the Ministry of Environment, has several groundwater related comments but due to technical detail, will save for later conversations

Smithers: Requests clarity on the previous exchange regarding ENV providing comments to the application on technical pieces in their review

EAO: Explains that once the comments to the application are received, will look at organizing additional sub-group meetings to focus more on groundwater quality to work through the issues and resolutions

Smithers: One challenge for community representatives is how these conversations are translated back to the community level so there is understanding of what is being presented and the communication between experts is taking place, so the public knows how and where it ought to engage

EAO: Informs that the comments will be posted on EAO Public Information Centre (EPIC) with responses from TCL with hopes they are readable to public. Also post summary of [Working Group] meeting as well as additional sub-group meetings. Offers invitation to attend those meetings for a better understanding

ENV: Adds to discussion:

- Great deal of work has been done to arrive at the decisions on the residual effects characterization
- Technical comments they provide to ensure they understand how TCL and their team have come these characterizations of effects
- A lot of assumptions are needed to build models
- Ask specific questions to determine how they determined characterization
- Communicate what degree of agreement is shared
- Must understand assumptions and read through reams of paper necessary for a project like this

EAO:

- Comments also part of the referral package that goes to Minister
- An assessment report of everything reviewed and comments made on the application
- Working internally to ensure readability to the public
- Purpose of EAO documents is to undertake review of issues and issue resolution for public understanding: what issues were raised, how proponent responded and whether or not there are legally binding conditions, should a certificate be issued
- Report goes out for public review later in process prior to decision makers
- Another 30-day public comment period on referral package

EAO:

- EAO document includes similar tables as residual effects but takes characterization provided in application, considers all the information and issue resolution that's occurred and develops own conclusions
- May look similar or quite different
- Working Group meetings help inform this

ENV:

- Speaks to moving forward with further conversations, group meetings about surface water and groundwater quality
- Appreciates TCL's comment about filtering what is needed for EA review and will strive to do in clear and transparent way
- But discharge permits proposed based on SPOs are flags for moving into permitting, and remain a question as to why they are needed
- Predictions provided for selenium nitrate and other contaminates of concern look like they meet Draft Coal Mine Effluent Regulations
- But discharge permit limits proposed did not, they're much higher
- Don't have actual sites of discharge location which is part of permitting
- Try to tease it apart and focus on residual effects using water quality guidelines as threshold

- Flagging it may be an uncertain amount of work especially seeing the approach toward permitting

C. TCL Consultant Presentation: Aquatic Resources Valued Component Assessment and Fish and Fish Habitat Valued Component Assessment

- Aquatic Resources did not have subcomponent identified
- Indicators for Aquatic Resources:
    - Change in composition, abundance, diversity or periphyton and benthic invertebrates
    - Change in concentration of contaminants of potential concerns in sediments relative to toxicological benchmarks
- Subcomponents: Fish and Fish Habitat
- Indicators for Fish:
    - Change in fish health
    - Change in fish abundance
    - Change in fish conditions
- Indicators for Fish Habitat
    - Change in areal extent permanently altered, destroyed, disturbed or made inaccessible to fish
- Local Study Area
    - Encompasses aquatic habitats within Tenas project footprint area: Four Creek, Tenas Creek and Goathorn Creek downstream from mine site footprint 100 meters upstream to 300 to 1000 meters downstream on water courses crossed
- Regional Study Area
    - Aquatic habitats of Telkwa River watershed
    - Tributaries to Buckley River crossed by proposed bypass road
- Presented table summary of Residual Effects Characterization for Aquatic Resources
    - One residual effect: water quality
    - Potential effects on sediment quality and abundance in community structure of periphyton and benthic invertebrates
    - Residual effects were not identical after implementation of mitigation measures and best management practices
    - Magnitude for change in water quality is high
        - Level for some water quality parameters are predicted to exceed regulatory guidelines
    - Geographic extent is local
    - Short term duration
        - brief periods in winter months
        - during years 8 through 17 in the post closure phase of the project
    - Infrequent frequency
    - Considered partially reversible
        - Remain through to final phase of project
    - Context is moderate
    - Likelihood was unlikely

        - modeling did not consider potential for attenuation of loading through groundwater pathways, which is expected and would reduce amount of change in some parameter concentrations
    - Effect deemed not significant with moderate level of confidence
    - Proposed Mitigation Measures:
        - Limit project area and project footprint
        - Avoid sensitive areas
        - Reclamation measures
        - Project footprint boundaries
        - Transport measures
        - Seepage management measures
        - Erosion and sediment control
        - Water capture measures
        - Spill prevention and response
        - Water quality monitoring and reporting measures

- Presented table summary of Residual Effects Characterization for Fish and Fish Habitat
    - Fish subcomponent residual effects were not predicted with implementation of mitigation measures and management plans
    - Change in Fish Habitat
    - Magnitude is high
        - Habitat effects on important overwintering and spawning habitats for isolated resident fish population
    - Geographic extent is local
    - Duration is permanent, effect would last in perpetuity
    - Continuous frequency
    - Irreversible
    - Likely
        - Affected habitat for resident fish population is above barrier to fish passage, so the likelihood for a residual effect and change in fish habitat is likely to result in changes to fish habitat though habitat structure, change in water quality and change in base flows
    - Not significant
        - Habitat offsetting requirements
        - Habitat effect in Four Creek is high and that habitat loss associated with diversions will be offset (HADD: federal Fisheries Act – no work or undertaking that results in harmful alteration, disruption or destruction of fish habitat)
- End of slides, opens for questions

EAO question:

- Asks for clarification on what is considered and encompasses fish health? Tissue, reproduction?
- Also what fish species were considered and highlight species of concern in the area

TCL response:

- All Fish species in the Tenas, Goathorn and Four Creek were considered for EA
- Specifically: rainbow trout, steelhead trout, coho, pink, Dolly Varden
- Fish health is looking at baseline included measurement of fish tissue, metals, elevated levels of certain parameters in fish tissue

ENV question:

- Wondering about organic contaminant that might be present in the deposit
- BTEX and PAHs in particular
- Considered in the assessment and bioaccumulation potential

TCL response:

- Ask if looking for rationale as to why they modeled certain parameters versus others?

ENV response:

- Specifically those organic contaminants Btexs that's benzene, toluene, ethyl benzene, xylene and polyaromatic hydrocarbons

TCL response:

- What was modeled in the water quality model was parameters that had been captured in the baseline data set
- Focus specifically on parameters with water quality guidelines from there for any additional parameters
- Some of those elements that you just listed haven't been modeled specifically
- If need to look at them more in more detail, will start capturing them in the baseline data set

ENV response:

- Wondering about baseline data: some samples taken and analyzed for PAH's in the water samples, but not the sediment samples, where more likely to occur and be introduced into the food chain
- What the plans are for collecting some data to add to the baseline set before the project and to add monitoring for those organic contaminants moving forward should the project proceed

TCL response:

- Unsure if there is plan specifically to target those types of parameters, could be added if needed
- If it comes up in IR (information request), it might be something that we look at in more detail
- ACTION: TCL said they would look up parameters and inform ENV

Smithers question: Asked TCL to speak to habitat offsetting and has it been fully developed at this point?

TCL response:

- Offsetting plan is currently at a very conceptual stage
- Have an idea of amount of habitat offsetting that will be required

Smithers question: Wondering about significance rating. It is viewed to be local because for the local area, the effect of a Creek being rerouted or there's going to be mortality, that's significant in the small area. So I'm wondering about the low significance or non-significance? How is that determined?

TCL response:

- Due to HADD, the Fisheries Act, habitat productivity must be offset
- Offsetting habitat will be designed specifically to offset for the loss of that fish
- There won't be a net loss in fish productivity; that's where the significance lies

Smithers question: Related to earlier question, wonders where the cumulative effect of climate change is, how is that filed? Seems to be one of the major cumulative effects as we project what might happen with water temperature, water loss to the Telkwa and Bulkley systems, how is this factored into [analysis]?

TCL response:

- Refers to previous presentation and questions answered
- Factored into the modeling of surface water quality and quantity, two primary drivers for the habitat loss
- Diversion has been accounted for in the hydrology model which is used to model the loss of fish habitat in the system
- Within that system with the offsetting there won't be a net loss in fish productivity
- No residual, cumulative effect from this project to be carried forward
- Adds: in terms of climate change, like cumulative effects by definition is assessing the project's residual effects that may overlap spatially and temporally with residual effects from other projects and activities
- Climate change is not considered a project or activity, but changes to precipitation and temperature have been included in the modeling

OW question: Has a couple pieces but in terms of offsetting, has the fish production been measured in these streams?

TCL Response:

- Primary loss of habitat is in Four Creek, do have measure or estimate of the population size in that system
- For quantifying the HADD primary way to enumerate it is by loss of usable habitat as expressed in an area of square meters; that is how the offsetting would be implemented

OW response:

- Offsetting projects have been documented at 63% failure rate; doesn't want Telkwa Coal to be one of these
- The reason why we look at this is because it's a HADD thing, which is part of the Department of Fisheries and Oceans Canada
- DFO should be here, especially around these questions here on fish and fish habitat
- Especially with migrating salmon, such as cohos, steelhead, the pinks
- Need the federal side present to look at offsetting projects
- If looking at loss of production, don't know how much production is lost until it is measured
- Where are the numbers associated to measuring fish production?
- How much of an offset project are we looking at if we don't have the fish production measured?

TCL Response:

- Predicted loss of habitat for project are primarily or solely within either Dolly Varden or Rainbow Trout habitat
- Habitat being lost in Tenas catchment isn't fish bearing waters, just waters that report to Tenas creek

- Telkwa intends to offset for that loss of the non fish bearing habitat through modeling and environmental flow needs analysis
- There is going to be no predicted effect to the actual Tenas Creek mainstem that support those fish

OW Response:

- You can't see or look at the changes in those tributaries, unless sampling is done on them
- Tenas and Goathorn have the sampling locations further downstream, but if there's any changes in water quantity and quality higher up in the system, no ability to look at that availability for fish and fish habitat
- But since they're further down in the system, changes won't be so great because you've already got the accumulation of other tributaries feeding into it lower in the system

TCL Response:

- Asks if the concern is effects might be larger in upstream areas where the smaller tributaries are?

OW Response:

- Looking at Four Creek having something like 34% change in the over wintering
- Over the lifetime of the mine, permanent flow reduction on Four Creek would be like 25% of the low flows on the long term
- Can't determine effects upstream because there is no actual monitoring going on higher up in the system

TCL Response: Suggests another conversation to get into more details later

OW Question: Where is the critical steelhead spawning area in the project area and how will they protect them?

TCL Response:

- Some spawning in lower Goat Horn Creek and lower section of Four Creek
- There's potential very small amount of habitat in Four Creek at the very bottom end of Four Creek that could be affected

FLNR Question:

- Wonders if side channels to the Telkwa River were reviewed
- Concern for pathway of impact is primarily through groundwater
- These habitats are likely heavily used by Coho salmon
- Specifically thinking of juvenile rearing, overwintering
- During low flow periods, winters, likely a lot of groundwater flow into these channels
- Wondering if it's been looked at or considered from an impact standpoint?

TCL Response:

- Acknowledges those systems and small tributaries are important for coho
- Don't believe there are predicted changes in any case
- Don't think the groundwater model covers any of those small tributaries
- Could add prediction points to look at different tributaries if requested

TCL comments:

- Provides high-level explanation of how fish loss was calculated
- Asserts could model changes for non-fish rearing habitat that was lost in Tenas Creek due to mine footprint, but those systems are considered completely gone because built over
- Just provide flows, no fish in those systems

OW comments:

- Small side channels do feed into the systems, they supply invertebrates for fish
- Supply temperature changes, regulation changes and hiding habitat for smaller fish from larger fish
- May not hold fish but provide fish availability in terms of food and safety

TCL response:

- Agrees inputs of food and nutrients from flows into system are critical part of fish habitat
- Committed to offsetting those habitats as well

EAO: Any other questions?

OW question: On expert panel that reviewed the Mount Polley disaster, there was a recommendation that all future minds in BC use the best available technology or BAT by eliminating contaminant ponds. Why didn't Telkwa use the BAT?

TCL response:

- The best available technology for ARD (acid rock drainage) is submergence underwater, which is the technology being used

OW comments / question:

- As stated before, acid rock drainages, groundwater seepage into the tailing ponds, increase towards the end of mine life or waste accumulation continues for centuries
- The modeling takes you 78 years but there is increase over time
- Who manages the water quality and the structures after 25 years post closure?

TCL response:

- The bond put forward would be required to manage it for whatever length of time is determined by the regulators; typically 100 year time frame
- Bond must be capable of supporting whatever monitoring, maintenance or other requirements to meet that 100 year time frame at the end of mining
- If you look at report, you'll see all elements do increase, but then they decrease
- Reviewed all the graphs and don't see any elements that are still increasing at the end of 2100
- They don't increase forever; they go up to a peak and then decrease over time, particularly on the four mentioned previously: nitrate, cadmium, selenium and sulfate
- These elements peak before end of model, so have reason to believe if monitored will see the peaks and see the decreases happen over time

EAO – Further questions for TCL?

TCL comments:

- In process of assembling application to DFO, expect to submit this month

- Hoping to have feedback sometime in July in terms of next steps

OW response:

- Appreciates the update from TCL
- Has concerns for Working Group success if proper subject matter experts are not at the table to answer specific questions about effects

EAO:

- Advised they have reached out to DFO to understand their participation in the project and Working Group
- DFO would look specifically at water quantity if they were to be involved in process for provincial project
- If not, then during the permitting stage
- Perhaps EAO and OW can have a discussion with specific concerns related to water quantity and EAO can pass the information to DFO for review and comment

OW response:

- Top of mind are the coho and the pink fish production
- Like to look at how fish production is measured and how they offset for that production if don't have the measured numbers

TCL Comments to ENV re: previous question about detects and pH baseline in water sampling. ENV responds the question was pertaining to sediment where contamination would be more likely to accumulate

Closing and next steps

Smithers question: Describe next steps after the meeting?

EAO:

- Still looking for Working Group comments on the application, which will be provided to TCL for comment
- Will look at having additional sub-working group meetings on issues
- There may be information requests that result from the comments
- Then work toward issues resolution through two or three comments periods to address comments provided on application
- Speaking to timelines: expecting first round of comments, then there will be second round and potentially a third round
- Currently in the 180-day legislated timeline application phase
- Public comment period is underway that will end on July 3rd
- EAO will write an assessment package report based on review and working through issues resolution with working group
- Expect within 180 days will be approximately October that would be posted for public comment
- Will post this meeting notes on EPIC, and post recording on SharePoint

Question: Is the second and potentially third round of comments, and issues resolution have to be completed within the 180 days? What is the date for the conclusion of the 180 days?

EAO:

- Unsure of precise date, sometime in the middle of November
- Started the 180-day legislative time period on May 11
- Thanked everyone for taking the time to attend

Meeting ended.