

## CanZinc Road video showing notes

February 23, 2017

### Teleconference Participants:

Maureen Flagler (INAC)  
Ernie Kragt (AllNorth)  
Allison Stoddart (PCA)  
Jamie Van Gluck (Arktis on behalf of PCA)  
Shannon Moore (CPAWS)  
Jonathon Tsetso (PCA)  
Doug Tate (PCA)  
Audrey Steedman (PCA)  
Rachelle Besner (NRCAN)

Dave Harpley (CanZinc)  
Steve Gooderham (ENR-Dehcho)  
Nick Larter (ENR-Dehcho)  
Carl Lafferty (ENR-Dehcho)  
Yongshu Fan (INAC)  
Wilbert Antoine (CanZinc)  
Gilles Lussier (PCA)

### Participants in MVEIRB board room:

Chuck Hubert (MVEIRB)  
Robyn Paddison (MVEIRB)  
Catherine Fairbairn (MVEIRB)  
Umar Husany (NPMO)  
Adrian Paradis (NPMO)  
Kate Mansfield (MVEIRB)  
Jessica Taylor (DFO)

Debbie Mills (GNWT-Lands)  
Tamika Mulders (GNWT-Lands)  
Dave Nickerson (CanZinc)  
Andrea Patenaude (GNWT-ENR)  
Monica Wendt (GNWT-ENR)  
Mark Cliffe-Phillips (MVEIRB)  
Brett Wheler (MVEIRB)

### Introduction: Chuck Hubert (MVEIRB)

Participants introduce themselves around the room, followed by phone participants

Some technical difficulties to be resolved; video start is delayed to 10:25.

Review Board staff will take notes, record questions and answers. Video and notes will be posted to the registry for parties.

### Video Presentation: Ernie Kragt (AllNorth)

- Introduction to video, video will be stopped at various times to answer questions if necessary.
- Please state your name for the record if asking questions

- Video begins at the Nahanni Road (kp 170) and works its way towards the mine. Video was taken at several different time periods and stitched together. Areas with no or poor video coverage have photo representation.

Kp 170- heading to Liard crossing, classified as Type 9 [conventional new road construction with 25% considered overland (over wet sections)]. Overland construction cross section image shown, to demonstrate approach for areas considered to be wet or permafrost (road is elevated over top of the section, either by using corduroy log approach or geotextile to create a “floating road” that doesn’t disturb the surface.

As video progresses, see forestry cut blocks. Comment that at times video is skipped along in long areas of similar terrain. Type 9 extends from kp 170-140. Consists of very flat terrain, follows river valley bottom. Predict excellent line of sight, with straightforward overlanding approach used for wetter sections. 40km/hr design speed with 5m wide running surface, 1-3 turnouts per km.

Side-by-side image shown with projection view at kp167 on L and example of similar road near Fort Nelson on R.

Projection view with Nahanni access road in background at proposed crossing of Liard River. Second projection view shows how proposed river crossings differ between winter (ice bridge) and summer (barge) for ice stability purposes.

Video continues; shows barge landing and road alignment. Liard crossing is considered the switch point between mine hauling and material continuing to Fort Nelson. Road continues, with 25% overland, plan is to bridge gap between mature timbers and wetter terrain. Forested landscape continues to kp140-145 when scrub landscape becomes more dominant. Rolling terrain through this section, grades between 0-5% (possibly some short pitches up to 8%). Proposed turnaround locations at the Liard crossing, kp147, kp136, kp129 and kp121.

Projection view at kp148 looking north to kp147 includes picture of example road similar in ROW, road standards, terrain, etc. Borrow pit 151 (gravel source and potential camp location) at kp147.

Video continues; shows similar terrain continuing. Road design is contoured through the mature timber type that offers most stable and dry conditions for the road. Alignment through this section will be good with good line of sight, generally wide corners.

Q- What time was this taken? (Jaime Van Gaulk)

A- Video was taken during the mid-September (at this point, although changes throughout video)

Photo illustration near kp139 (some sections of road were clipped out) to show similar road standards

David Harpley points out that this marks beginning of road type 7 (starts at kp140) and continues in 10 segments until kp39. Doesn’t cover silent hills slope. Type 7 is classification to which Oboni Riskope attached highest probability of accidents.

Ernie notes no operational difference between Type 7 and 9; only difference is difference between mature stands of vegetation (Type 9) and patchier, scrubbier vegetation (Type 7)

Video continues; paused to show where road enters wetter gully and crosses upland again. Terrain here again is rolling terrain, 0-5% grade with some pitches up to 8%.

Projection image at kp133 looking towards the mine. Vegetation is now sparser, scrub and brush.

Video continues; road location captures slight ridges to try and elevate road, keeping it above potential wet zones. Due to scrubbier nature of vegetation, ROW is less wide than type 9 (mature timber). Line of sight here is good, straighter sections of road with wide curves. No expectation or large cuts or fills, as terrain is fairly rolling with road contouring along slope. Some fills might occur in some streams to go above stream bottom.

Projection view at kp129, looking away from the mine. Small stream crossing as example of minor fill and culvert crossing.

Video continues; rolling terrain with few challenges for the road other than wet pockets which will be overlanded (kp129-130). Note that road alignment is under the helicopter; what you can see is representative of the terrain.

Skip to kp123 (Type 8 classification). Photo shown of projected Grainger river crossing; 24.4m bridge span. See evidence of old road alignment.

Video continues; old floodplain is proposed as significant borrow pit for gravel (pit 124). Old road alignment will be followed. Short section of Type 4 road. Old alignment is continued for ~1kp until new road pulls away from old road alignment, moving towards proposed Grainger camp and borrow pit 123. Road continues along base of hill. View of wide tributary to the Grainger River; may experience flash floods during thaw periods but usually dry.

Projection view shown kp118, road alignment skirts base of hill. Mild grades (0-5%)

Video continues; Type 7 classification from Grainger camp to ~kp101. Proposed road alignment is along the base of foothills.

Photo shown of projection view of road alignment (kp115 and 116) and example road.

Video continues; predict good line of sight, 40km/hr design speed.

Kp112; shows map overview. Significant gravel borrow at kp 112.3 (fan coming off side of mountain) will offer good turnaround location as well.

Photos from kp112-103. Road crosses large meadows and wetlands, but location is generally good, going through pine/spruce mix offering reasonable ground to work with. Photo at kp107 shows large wetlands, road alignment tries to stay above wetlands. Anticipate some permafrost along N/NE aspect slopes; will use overland construction approach in these areas. Kp105-106 shows series of ridges; road

will follow along bottom edge. Several borrows have been identified along ridges (exposed limestone). Rolling terrain, no grade elevational changes (0-5% gradient).

Video picks up around kp103; projection view at kp103 close to Wolverine pass. This stretch of road will have grade of 7-8% as it descends down into valley. Video continues; evidence of old road alignment can be seen. Another camp location identified at kp102, which is also a potential borrow (borrow 102).

Video jumps over Wolverine gap, into switchbacks and into NNPR (boundary at height of land). Road traverses down ~2 switchbacks into lower valley; one switchback is very wide, other is more conventional. Road section classified as Type 10 (distinguished by geotechnical considerations), likely would see lots (75%) of overland construction method. Two major borrows to facilitate overland construction at kp101 and kp96, both of which provide good turnaround locations and pullouts for chaining up during winter. Dropping 300m in elevation over this section, with grades of 5-8%, with some short pitches of 10%. Because of these grades, area will operate at a reduced speed (20km/hr for loaded trucks and 30 kp/hr for empty trucks), but will be designed for 40kp/hr speed (integrated safety margin). Original winter alignment had 4 switchbacks in previous section; updated road alignment improved to only contain 2.

View projection at Wolverine pass (kp100), with example of similar road.

Video continues at kp95-96; borrow identified. Short section of type 8 (100% overland). Fishtrap crossing shown. Road pulls away from original alignment, to avoid wet/boggy terrain. Projection view at kp94. Terrain is flat, boggy terrain punctuated by dry mounds. Road design attempts to skip along mounds, likely more rolling terrain to accommodate the mounds, with short pitches of grades up to 8%. Road passes back into Type 7, rolling terrain with overlanding through unavoidable wetter sections. Dry mounds can be used as borrow sites (fine sand material) for subgrade material.

Projection view at kp91, old road visible in boggy areas. Video continues at Tetcela crossing (kp90), goes through mature aspen stand. Crossing sticks with old alignment. Photo shows example of similar bridge at Tetcela crossing.

Video continues; short section of type 5 (kp 90-86) identified as high consequence by Oboni, primarily uses existing ROW. Road travels along valley bottom. Video paused at example of where overland method would be used (wetter area). Second crossing of Tetcela (a tributary), example bridge shown, projection shows diversion from original road alignment to more preferable location upstream. Proposed camp location (camp 87) and borrow location with potential turnaround location. Kp86 is back to Type 7, extends to kp80. Old alignment at kp86 is quite boggy, so new alignment avoids this location. Other advantage is reduced grades (8% down from 12%) as road moves up slopes. Predict good line of sight and wide corners throughout.

Projection view at kp 85. Road is contouring along the slopes in this section – in dry aspen areas, avoiding black spruce swamp areas Old winter road went through lower areas, still somewhat visible. Grades here may be up to 8% (descending for loaded trucks) with wide corners. Returns to original alignment towards top

Projection view at kp79. Now up on the plateau, rolling terrain with short pitches at 8%, but good line of sight and good alignment. Can operate at design speed of 40km/hr. Now in Type 6 classification: new construction in existing ROW, sandy/silty area, mild side slopes, 25% overland construction. Section is mostly straight, with road at the height of land. Some wet pockets, but expect few streams/water issues.

Projection photo at kp70, including another example of a similar road. This area has a series of borrow locations with good turnaround options.

Projection photo at kp65; tight corner. Hope to improve line of sight during detailed design phase (here and elsewhere wherever possible). Section contains very straight sections, some areas clipped out.

Kp 63-58 is series of photographs. Proposed camp location and turnaround at kp65. View at kp62, and example of road through similar terrain. At kp59, new alignment pulls away from old road onto flat plateau 1-2kp long, before working towards polje terrain. Descent should have grades of ~8-9%. Return to Type 7 road classification, very few operational differences between type 6 and 7 other than short sections of steeper grades. Projection view at kp57 of road as it gains elevation up to plateau. Projection view at kp56 as it contours into horseshoe drainage. Borrow identified at kp56, location for turnaround/pullout as well. Projection view at kp 54 towards polje creek. Several borrows identified on ridges captured in the image.

Video continues at Polje creek crossing; road skirts around potential slide area that had more detailed geotechnical investigations. Mostly overlanding, so limited disruption of soils. Photo shows example of alignment approach for Polje crossing (although actual bridge is longer than example).

Section past Polje identified as Type 8 (100% overland) as it is quite wet; series of borrows identified at kp51 and 53 to support overland construction. Very flat terrain, good line of sight. Approaching borrow 51, on higher ground. Some small stream crossings in this area, design for larger fill (4m) to accommodate grade coming off the hill (Short period of 10% grade). Switch to Type 6/7 from here to kp39 (difference is that type 6 is within existing ROW, type 7 is new construction). Stream crossing, then 8-10% climb up to plateau. Extensive on the ground investigation here, recognizing tight grades that needed to be confirmed.

Projection view at kp49 showing steeper grade and example road.

Q- Which water body is adjacent to kp49? (Jessica Taylor, DFO)

A- Tributary or main stem of Polje creek

Jump to kp47, projection shows tighter corners (45m curve radius) that necessitate speed reductions. New road will follow existing ROW. At kp47, there's also a borrow site on the other side of the creek which will only be accessed during winter under frozen conditions, that can be turnaround location.

Q- Borrow pit is under the creek? (Jessica Taylor DFO)

A- No, on opposite side of the creek from the road. Pit #47. Will require temporary access road to cross during winter under frozen conditions.

Section contains some tight corners, but mostly good line of sight rolling terrain (0-5%). Projection photo at kp45 shows planned road cut through ridge (through sand material, so easy). Another example is shown of a tight corner that will be straightened out to reduce the corner (~kp45)

Jump to kp43; projection view of road. Video continues. Shown tributary of sundog, which is not fish bearing due to migration barrier downstream. New alignment deviates from old to avoid water issues. Approaching cat camp at kp40, road will primarily use original alignment. Small deviation to avoid stability issues following terrain analysis. Gently rolling terrain as you approach Sundog Creek. Cat Camp is designated camp location, with borrows as well, occupies old floodplain.

No video from kp40-30. Type 4 classification from cat camp to lower sundog. 42m bridge span over one of the tributaries. Photo of existing road (kp5.2) to illustrate similar design plans for cut slope. Photo from kp4.1 shows example of road proximal to Prairie Creek that would be similar to Sundog.

Q- Would there be additional controls on speed here? (Jamie Van Gaulk)

A- Yes, anytime there's a curve radius below the design spec (i.e. 40kp/hr, 5m running surface) there will be speed reductions in place. In this, more challenging, section of the road, road was designed to 40km/hr although assume loaded trucks will only be going 30-35km/hr so we will be operating below design speed to which road will be built.

Photo at kp35, road pulls away from active floodplain. See rockbluffs, so anticipate blasting and rock cuts. Will design road to 5m running surface. Photo at kp36.2, road comes off of active floodplain, climbs up onto rock bluffs. Evidence of original alignment through floodplain. Road will occupy side of present active channel. Another photo around kp36, realignment of sundog will occur here to a secondary overflow channel (previously the main channel). Photo from kp3.6, but good example at what we expect for lower sundog area (similar slopes, and proximity to water). At 34.8, road goes along old floodplain for ~600m, skirting edge of talus. Portion of road will be on old floodplain (example photo from kp4.5). Aerial view from kp33-32, road primarily uses old alignment.

Q- Why no video of this section? (Jessica Taylor, DFO)

A- We knew the road would be more accurately designed based off of Lidar primarily, no need to spend lots of time getting video of this area.

Q- Earlier mentioned poor quality or bad weather for reason as to why certain sections had no video.

A- Since we were in such confined valley, and we could use Lidar data more effectively, we didn't have a need to take video. We had large area to look at and didn't put effort into spending much time here due to the nature of the constraints working in the valley (limited options for alternate routes).

Q- You make a point of being at toe of talus slope. Curious about debris catchment plans for this area? (Gilles Lucier, PCA)

A- Plan to use gabion baskets to stabilize and secure slope. Can be used on both sides of road to catch debris (will require periodic maintenance to make sure capacity isn't limited). Can also use specified heavy armour rock.

Q- Will this be established during detailed design?

A. Yes.

Q- What Allnorth document is that (containing photos of gabion baskets)?

A- [PR#178](#)

kp31-30, grades of 0-3% as road follows stream grade. Kp40-mine is considered to be high maintenance section in terms of snow removal, sanding, rock removal, etc. so will be under high scrutiny during operations.

Jump to kp29 where new alignment pulls away from original road to avoid crossing the river. In doing so, need to skirt toe, so anticipate blasting, then climb up onto bench at kp28 where road maintains elevation above sundog. Special consideration for this section, since coming off the bench requires 8-10% grade (300-400m long) so have speed restrictions to 30km/hr in place. Preliminary design also included 600m of 4m wide running width due to heavy rock construction, however upon further evaluation, can be dropped down to 150m (example of improvements possible during detailed design). Very good line of sight here.

Photo at kp27 shows road travelling along elevated bench. Section represents grade of 4-5%. Kp26 is construction type 4, mixed with some 2 and 3. Road continues along bench as it approaches major crossing at kp25.4. To meet appropriate grade for crossing, will do a "cut-through" (full bench cut) with goal of not allowing spill of material to outside of road. Projection view of ~64m multispan bridge, anticipate heavy rock work (blasting), intend to do full bench cuts where required to prevent spillage of materials. This section also had 1km of 4m wide running surface due to rock cuts, but can likely be cut down to 150m during detailed design phase. Speed restrictions (20-30 km/hr) would also apply through this whole section. Site is preliminary design; expect improvements during detailed design.

Alignment connects with old road ~kp24. Grade of ~4-5%. Original road in this section is ~2.5m wide, new spec will have 5m running surface. Photo shows example of a cut through approach. Example shown of bridges similar to what will be at kp23: canyon with heavy rock elevated well above channel. Projection view shown for crossing at kp23. Original alignment shows deviation into canyon, new

alignment is much straighter, although will contain segments up to 10-11% grade, and will therefore have speed reductions. This section was also identified for 700m of 4m width, believe can get this down to 100-150m of 4m wide road.

Video resumes past crossing. New road follows old road alignment. Can now see more examples of rock slide slopes where gabion baskets will be used. More serious cases will require some kind of fencing to help limit loose rocks. Grades of 3-6%, following same drop as the stream valley. Proposed large culverts for stream crossing at kp20. Turnaround locations at cat camp (kp40), kp25 and camp at kp23. Section from kp16-40 will operate speeds below design spec to increase safety margins.

Kp17 shows example of tight corner that will be smoothed in new alignment, but may still require speed reductions. Video moves towards height of pass at kp16, exiting park boundary. Can see lots of sections of loose rock above road, so gabion baskets will be highly applied. Projection view photo shows series of switchbacks approaching pass at kp16, compares old to new alignment (new alignment improves it considerably, lower grades and wider turns). Borrow pit 16 at switchbacks has good gravel material, but will also be a good turnaround location and chain up/chain down location. Mandatory chain up policy in place during winter from 0-29kp. From kp0-16, will apply 20km/hr speed limit for loaded trucks and 30kp/hr limit for empty trucks to increase safety margin (road designed to 40km/hr). Video here makes slopes look steeper than they are because of the angle it was taken at (picture at kp 15 more representative of grades).

Photo showing example of road at kp14, road grade runs ~6-8%, will require extensive use of gabion baskets along toe of slopes.

Corner at kp13.6 approaching hairpin turn is recognized as a challenge, intention is to widen the corner and have barriers on outside of road. Not a concern really for loaded trucks, more for empty trucks travelling down-grade. Switchback corner at kp13 is within standards and specs, although final detailed design will likely include improvements. Use of barriers is planned along outer side of slopes, around corner at kp13.6. Grade of 5-10% throughout section. Will require heavy maintenance, i.e. sanding, especially during winter.

Rest of alignment from this point to the mine follows original road. Video continues along funeral creek. Approaching kp11, there is opportunity for a wide turnaround and pullout. Photo of existing road at kp7.7, corner at kp7.5 is tight radius; will have speed restriction and widen it, would also consider use of barriers on outside. Type 2 road classification (existing road alignment but needs to be widened).

Video continues to flats approaching kp6.2 crossing of Casket creek. Photo of crossing shows projection of alignment, road alignment straightening.. Video paused to show ponds built to compensate for habitat loss when road was repaired previously. Road had some wash outs from floods since Cadillac didn't armour it when built. Ponds are sustained by groundwater flow through alluvium so they're good for overwintering.

Q- Offset from the old road? (Jessica Taylor, DFO)



A- Authorization from 2008 or 2009, when existing road was rebuilt due to erosion along sections of Prairie and Funeral creeks.

Video continues in Type 1 classification (road is already in operational condition for the most part) with road grades of 0-5%. Photo at kp5.4 has short section of 4m wide running surface, think this will no longer be necessary following detailed design.

Q- DFO Will the road encroach on the channel here?

A- No.

Video continues, shows existing borrow at ~kp2.

Meeting ends at 12:53pm