Yukon
Environment
Box 2703, Whitehorse, Yukon Y1A 2C6

July 25, 2008 **Application Number: QZ07-078**

Yukon Water Board Secretariat
Suite 106, 419 Range Road
Whitehorse, Yukon
Y1A 3V1

Attn: Kelly Boutilier, Licencing Officer

Re: Intervention for Type B Water Licence Application QZ07-078, Alexco Resource Canada Corp.

The Yukon Department of Environment has completed its joint review of this Type B water licence application in conjunction with representatives of the departments of Executive Council Office, Justice and Energy, Mines & Resources. On behalf of Yukon Government, we are not requesting a public hearing to make representations in connection with this intervention, however we will participate if a hearing is convened by the Yukon Water Board.

Background
Alexco Resources Canada Corp. (ARCC) is proposing an underground exploration project at the abandoned Bellekeno property. The project includes:

- water use and deposit of waste from dewatering the existing Bellekeno 625* adit, use of an existing treatment facility and deposit of effluent into Lightning Creek
- construction of a new adit at Bellekeno East connecting with the 625 adit, storage of water in a settling pond and deposit of effluent into either Thunder Gulch or the existing 625 water treatment system

The assessment phase of this water use application was conducted by the Mayo Designated Office under the Yukon Environmental and Socio-economic Assessment Act (YESAA) – project #2008-0039. After concluding the assessment of the project, an Evaluation Report with recommended terms and conditions was prepared by the Designated Office and issued on April 24, 2008.

* Note: *Bellekeno 625 is also historically known as Bellekeno 600. The actual elevation is 625. References to Bellekeno 625 and 600 are references to the same structures, and in this document are made as Bellekeno 625*.

The Decision Body under YESAA for the application is Yukon Government, Department of Energy, Mines & Resources. Yukon Government varied the recommendation from the Evaluation Report and issued a Decision Document on May 23, 2008.

The following recommendations with rationale for this water licence application are presented to the Yukon Water Board and are cross referenced with the recommendations found in the YESAA Decision Document where appropriate.

1. Water Treatment System

YESAA Decision Document Recommendations #12, 16

Bellekeno 625 water treatment system

The existing wastewater treatment system at the Bellekeno 625 adit is authorized to operate, store water in settling ponds and deposit treated effluent that meets discharge standards into Lightning Creek under Water Licence QZ06-074. This same water treatment system is proposed for use by ARCC.

Yukon Government has some concern about the ability of the present and planned infrastructure to remove ammonia should this build up in excess, as this compound is difficult to remove from effluent. Natural processes of nitrification do not function well under cold temperatures, and the retention time of effluent may have to be managed to ensure ammonia levels are attenuated. Metal mines utilizing ammonia tend to rely on 'best practices' underground in the use of ANFO as the main preventative tool for reducing the resultant levels in wastewater.

Recommendations:

- Construct and or maintain water treatment and retention infrastructure in order to release only compliant water into the environment
- The water treatment facility at Bellekeno 625 requires sufficient and demonstrated capacity to treat effluent from the existing 625 adit during dewatering simultaneously with any underground water at Bellekeno East that may require treatment during peak flow.
- The proponent shall be required to demonstrate how they will address treatment for ammonia and increased metal loading prior to actual treatment.

2. Effluent Quality Standards

YESAA Decision Document Recommendation #5

ARCC has proposed that effluent quality discharge standards from the wastewater treatment system at Bellekeno 625 and the settling ponds at Bellekeno East be consistent with QZ06-074 with the exception of the addition of the parameter for ammonia, including total ammonia. Sampling of wastewater for ammonia will be a requirement in this proposed Licence for underground exploration due to the use of ANFO during blasting.

Recommendation:

- Effluent quality standards from Bellekeno 625 and Bellekeno East to be the same as QZ06-074 (zinc being the primary contaminant) with the exception of the addition of ammonia as described below

Table 1: Effluent Quality Standards

Parameter	Maximum Concentration in a Grab Sample Measured in mg/L
pH	6.5 to 9.5 pH units
Suspended Solids	25 mg/L
Ammonia Nitrogen	5.0 mg/L
Arsenic (total)	0.5 mg/L
Cadmium (total)	0.05 mg/L
Copper (total)	0.3 mg/L
Lead (total)	0.2 mg/L
Nickel (total)	0.5 mg/L
Silver (total)	0.10 mg/L
Zinc (total)	0.5 mg/L

3. Water Quality Monitoring Program

YESAA Decision Document Recommendation #6

The environmental monitoring program including water quality monitoring is described in Section 5.0 of the Project Description Part B (Exhibit 1.2.4) which includes a table of monitoring sites (Table 5.1) and a map (Figure 5.1). A schedule of water quality monitoring stations and monitoring frequency is included in Section 6.0 and in a draft Water Licence prepared by ARCC for the Yukon Water Board (Exhibit 1.3).

See Table 2 below for a listing of monitoring site names and locations.

ARCC proposes to relocate water quality monitoring station KV-65 upstream of the Bellekeno East portal. Relocation of this station will not contribute to the overall understanding the effects of potential direct discharge from the Bellekeno East settling ponds. A preferable alternative would be to retain KV-65 in its current location and establish a new monitoring site on Thunder Gulch upstream of the Bellekeno East portal. This would serve to provide water quality information specific to the effects of direct discharge to Thunder Gulch from the Bellekeno East portal.

Baseline and project-related data collection is critical to understanding if water treatment infrastructure is successfully mitigating effects to aquatic resources. Retaining the K-65 sample station and adding a sampling station upstream of Bellekeno East allows for proper evaluation of the effects of dewatering from Bellekeno East prior to the adit connecting with the Bellekeno 625 underground workings.

The proponent is planning to place potential metal leaching rock in the vicinity of the Onek pit. While the Onek adit below the pit is being monitored under QZ06-074, the exploration license will exceed the term of the present care and maintenance license. It is reasonable to carry over

the Onek adit monitoring requirements into the current application. The company also refers to monitoring the waste rock storage area but does not give any further details on this and the site is not referenced in monitoring schedules. Further details should be requested of the applicant on metal leaching potential of the waste rock and potential downstream affects, as a pathway to Christal Creek can be expected though it has not been shown.

Recommendations:

- Adopt proposed monitoring station locations as proposed by ARCC with the exception of KV-65 which should remain at its existing location.
- A new sampling location should be established upstream of the Bellekeno East portal to determine background water quality of Thunder Gulch during adit development.
- Include the Onek adit discharge as a monitoring requirement in QZ07-078.
- Include the Onek waste rock storage area as a monitoring location for new waste rock materials. The sampling site shall be determined by the proponent and the regulator for sampling when water is present.

Table 2: Monitoring and Surveillance Sites

Monitoring Station	Site Description	Easting	Northing
KV-37[1]	Lightning Creek u/s Hope Gulch	490343	7087765
KV-38[1]	Lightning Creek u/s Thunder Gulch	488188	7087345
KV-41[1]	Lightning Creek u/s bridge at Keno City	485382	7086748
KV-42[1]	Bellekeno 625 adit	487428	7086944
KV-43[1]	Bellekeno 625 Treatment Pond decant	487419	7087052
KV-45[1]	Onek Adit	7087288	485101
WRSS	Onek Waste Rock Storage Sump		
KV-65	Thunder Gulch Upstream of Bellekeno 625		
KV-65a	Thunder Gulch Upstream of Bellekeno East Portal		
KV-74	Bellekeno East – Adit		
KV-75	Bellekeno East – treated		
KV-76	Thunder Gulch d/s Bellekeno 625 adit		

1 These sites are contained in QZ06-074, although some frequency changes are recommended here, which satisfy the requirements of the existing license (i.e., are not less than)

ARCC proposes to sample water quality at treatment sites on a monthly basis. We recommend more frequent sampling, with some variability between sites, to deal with situations where the predictive capability is more limited and quicker turnaround times are required (e.g. metal concentrations encountered in 'stale' underground water, blasting impacts). This will provide quicker response time for site managers to adapt when effluent concentrations change and will give regulators greater assurance that site variabilities are being accounted for. While the proponent refers to daily sampling in its application (Exhibit 1.2.4), the proposed monitoring schedule in Exhibit 1.3 (proposed license) does not contain this requirement (specifies monthly).

During the dewatering period of the Bellekeno adit, when there will be some uncertainty about the metal concentrations that will be encountered, it would be preferable to have daily samples.

Similarly, during the operational phase when ammonia and variable metal concentrations are expected, there will be reason to have timely and exacting information on acidity and zinc concentrations. The presence of ammonia has been shown to reduce the precipitation of zinc unless the pH is raised to higher levels than would be required without the ammonia present. If ammonia is added during the dewatering process then it will be more challenging to treat the effluent to licence standards. Metal removal efficiency is largely based on maintaining the appropriate acid/base accounting, and automated pH analysis – lime dosing equipment is available for these purposes. There are also various ways to deal with on-site analyses that can be beneficial for site managers (atomic adsorption equipment, ion-specific sensors for metals and ammonia) or automated composited samples can be taken hourly or daily and sent to a lab at some interval.

Table 3: Monitoring Schedule (Onsite)

	Parameter	pH	Temp	Conductivity	Total Suspended Solids	Total Ammonia[1]	Total Zinc	Flow
Monitoring Stations								
KV-42	Bellekeno 625 Adit Discharge	D	D	D	D	D	D	C
KV-43	Bellekeno 625 Treatment Pond Decant	D	D	D	D	D	D	C
KV-74	Bellekeno East Adit Discharge	D	D	D	D	D	D	C
KV-75	Bellekeno East Treated	D	D	D	D	D	D	C

[1] Follows commencement of blasting and thereafter

Table 4: Monitoring Schedule (External Lab)

		Total ICP Metals	Dissolved ICP Metals	Hardness	pH	Conductivity	Total Suspended Solids	LC 50
Treatment Sites								
KV-42	Bellekeno 625 Adit Discharge	W	W	W	W	W	W	
KV-43	Bellekeno 625 Treatment PondDecant	W	W	W	W	W	W	M
KV-74	Bellekeno East Adit Discharge	W	W	W	W	W	W	
KV-75	Bellekeno East Treated	W	W	W	W	W	W	M
Surveillance Sites								
KV-37	Lightning Ck. u/s Hope Gulch	M	M	M	M	M	M	
KV-38	Lightning	M	M	M	M	M	M	

	Ck. u/s Thunder Gulch							
KV-41	Lightning Ck. at Keno City	M	M	M	M	M	M	
KV-45	Onek Adit	M	M	M	M	M	M	
WRSS[1]	Onek pad sump	M	M	M	M	M	M	
KV-65	Thunder Gulch u/s of Bellekeno 625 Portal	M	M	M	M	M	M	
KV-65a	Thunder Gulch u/s of Bellekeno East Portal	M	M	M	M	M	M	
KV-76	Thunder Gulch d/s of Bellekeno 625 Portal	M	M	M	M	M	M	

C: Continuous D: Daily W: Weekly M: Monthly

[1] Sample point for Onek waste rock storage pad if water present

Recommendations:

- Effluent quality parameters are to be sampled at the frequencies noted in Tables 3 and 4 above.
- Where frequencies vary, daily/weekly/monthly samples shall be taken on the same days (i.e., a monthly sample would coincide with a day when daily and weekly samples are taken).
- Data collection and analysis shall be conducted in accordance with 'Guidance Document for the Sampling and Analysis of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/5), Minerals and Metals Division, Environment Canada; and, 'Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/4), Minerals and Metals Division, Environment Canada.
- Effluent quality parameters are to be reported monthly and should also include chart or graph portrayals of data including licenced threshold levels.
- If water flow and quality parameters are determined by YG Water Resources to require more frequent reporting during specific critical periods, such as during the dewatering process requiring weekly or biweekly reporting, these shall be identified to the proponent and reported on as required.
- Monthly reports are to be submitted to the Yukon Water Board, YG Water Resources and to the Chief of Mining Land Use (with respect to overlapping LQ00240 requirements).

4. Water Flow Monitoring

YESAA Decision Document Recommendation #8

Monitoring of flow is to be carried out in accordance with the Decision Document and in standards described in the Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001.

Recommendations:

- Continuous water flow rate measurements from Bellekeno East adit during underground development
- Continuous water flow rate measurements of discharge from Bellekeno East settling pond either directly to Thunder Gulch or Bellekeno 625 treatment pond
- Continuous water flow rate measurements from Bellekeno 625 adit

5. Settling Ponds

YESAA Decision Document Recommendations #13, 14, 15

The settling ponds at the existing Bellekeno 625 treatment system are currently lined in order to prevent release of non-compliant wastewater to groundwater and Lightning Creek. The new sediment settling ponds at Bellekeno East should also be lined.

Sufficient freeboard should be maintained in settling ponds to prevent overtopping of non-compliant effluent during spring freshet, precipitation events or unforeseen adit flow increase. Settling pond freeboard for the treatment ponds in WL QZ06-074 is 0.4 m.

Recommendations:

- Install impermeable liners in settling ponds at Bellekeno East in order to eliminate seepage of non-compliant adit wastewater to groundwater and Thunder Gulch.
- Maintain sufficient freeboard in settling ponds to prevent overtopping.
- Conduct daily site inspection of physical infrastructure.
- The proponent should create be an inspection and reporting plan for any and all engineered water retaining and conveying structures, and the information reported in the monthly and annual reports. Issues noted should be acted upon immediately, reported and remedial actions to prevent recurrence explained.

6. Sediment/Sludge Management

YESAA Decision Document Recommendation #19

The settling ponds at Bellekeno East will require the removal of sediment periodically in order to obtain efficient settling of solids. Sediment (sludge) removed from the settling ponds may be contaminated with elevated metals and will need to be disposed in an appropriate location.

The existing treatment system at Bellekeno 625 currently requires settling pond desludging 1-2 times per year. During dewatering of the 625 adit, the treatment system will experience increased water volumes requiring greater lime addition for treatment. After dewatering, activities associated with underground exploration at 625 will result in adit wastewater with a higher sediment load than is presently occurring under care and maintenance. Dewatering and underground exploration will result in a greater sludge/sediment deposition in the Bellekeno 625 settling ponds. Additional sludge volumes are estimated at 23 cubic metres per year.

Desludging of the Bellekeno 625 settling ponds is currently done with a vacuum truck system. Once the truck is filled, it transports the sludge to the Valley Tailings Area for final deposition in a sludge holding cell. This procedure is authorized under the Sludge Management Plan for Water Licence QZ06-074.

Recommendations:

- Sediment from the settling ponds at Bellekeno East and sludge from the treatment ponds at Bellekeno 625 is to be transported to the Valley Tailings Area and deposited in the existing sludge holding cell or approved areas as per Quartz Mining Land Use approval LQ00240.
- An inspection and monitoring plan for the valley tailings area, and a Sludge Management Plan should be submitted and implemented, including annual inspection and monitoring to ensure the dams do not pose a hazard to the downstream environment.

7. Waste Rock Storage Area

YESAA Decision Document Recommendation #33

AML waste rock from Bellekeno East and the 625 adit is to be placed in an isolated stable location above the Onek pit.

Recommendation:

- The proponent shall provide the Yukon Water Board with a copy of the Waste Rock Storage Plan, and any updates to the plan, that have been approved by the Chief of Mining Land Use as required under Quartz Mining Land Use approval LQ00240.

8. Adaptive Management Plan

YESAA Decision Document Recommendation #67

Water Licence QZ06-074 was issued to Elsa Reclamation and Development Corporation for the Keno Hill Minesite in 2007 and required the submission of an Adaptive Management Plan (AMP) as a Licence condition. As there was no other permitting required for that "Care and Maintenance" licence, it was appropriate to place all aspects of the AMP entirely within the Water Licence.

The Bellekeno underground exploration project will require both a Water Licence and a Class 4 Mining Land Use Approval in order to dewater the 625 adit and excavate the Bellekeno East decline and conduct other surface and subsurface activities. Class 4 MLU Approval LQ00240 was issued on June 17, 2008 and a copy is attached as Appendix 1 for reference. The Approval requires the submission of an AMP, and notes that recommended contents of the AMP will be provided to ARCC by the Chief of Mining Land Use. It further states in clause 118:

> *"Proponent to submit an updated AMP to the Water Board to update the existing plan so that one consolidated AMP exists for the site"*

The intent of the clauses in the MLU Approval is to have a single AMP for the entire site that is consistent between the C&M water licence (QZ06-074) and the underground exploration water

licence QZ07-078. This is particularly important where common effluent discharge points and treatment facilities are under separate Licences, such as the Bellekeno 625 adit and water treatment system.

Recommendation:

- The proponent shall submit the Adaptive Management Plan that has been approved by the Chief of Mining Land Use for review to the Yukon Water Board.

9. Environmental Monitoring

YESAA Decision Document Recommendation #4

Environmental Monitoring at the Keno Hill Mine site is currently ongoing and is acceptable to regulators.

Recommendations:

- Adopt and implement the Environmental Monitoring Program as proposed in the proponent's application (Exhibit 1.2).
- The proponent shall conduct an annual review of their Environmental Monitoring Program and report any changes to the regulators.

10. Licence Term

The Class 4 Mining Land Use Approval under the Mining Land Use Regulation for this project was issued June 17, 2008 for a term of ten years.

Recommendation:

- 10 year licence term consistent with LQ00240 Class 4 Mining Land Use Approval.

11. Decommissioning

Recommendations:

- Provide to the Board a copy of the Mining Land Use Final Reclamation and Closure Plan once it is approved by the Chief of Mining Land Use.
- Any updates to the plan will be provided to the Board once approved by the Chief of Mining Land Use.

12. Plan Submission

Plans submitted by the proponent under this Licence should undergo a review by interested parties, including Yukon Government. This will allow for input and revision of the plans by those parties to ensure that the plans are appropriate and consistent with Licence conditions.

Any plans that are required under the Mining Land Use Approval LQ00240 will be updated as required under that approval. Should this property go into production in the future, then a Quartz Mining Licence will be required that will have a number of plans that the proponent will have to submit for review and approval. Production is not part of this application.

Recommendations:

- Provide opportunity for input and review of plans required by interested parties prior to submission of those plans to the Yukon Water Board.
- Plans shall be updated every two years, and earlier if the project goes into the production phase.

13. Security

Yukon Government will be examining security amounts in consideration of terrestrial and water issues, and intends to collect and deal with security through the Yukon regulatory regime and the Quartz Mining Land Use Approval LQ00240.

Yukon Government has requested and received security in the amount of $297,493.00 to date from the proponent. We are currently working with the company on determining the appropriate total security amount, and will also be reviewing security amounts further once we receive their reclamation and closure plan.

Given the above, the Yukon Government makes no submissions respecting security to be furnished and maintained by the company pursuant to the *Waters Act.*

Thank you for the opportunity to review and respond to this application. As required by the Board, a copy of this intervention has been forwarded to the applicant and a copy in electronic format forwarded to the Board. Any further correspondence may be forwarded to the undersigned

Sincerely,

Original copy signed

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Randy Lamb
Manager, Environmental Affairs

Attachments
Appendix 1: Class 4 MLU Approval LQ00240

Copy: Alexco Resources Canada Corp.
Environment Canada