Appendix G3

EEM Cycle 2 Interpretive Report ECCC Comments and Agnico's response

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Environmental Protection Branch-Prairie and Northern Region
9250 49 Street NW
Edmonton AB
T6B 1K5

January 20, 2017

via email to:stephane.robert@agnico-eagle.com

Stephane Robert
Environmental Superintendant
Agnico-Eagle Meadowbank Division
10 200 route de Preissac
Rouyn-Noranda QC
J0Y 1C0

Dear Mr. Robert:

Subject: ***"Environmental Effects Monitoring Cycle 2 Meadowbank Mine Interpretative Report"***

This letter is to advise you that Environment and Climate Change Canada has reviewed your Environmental Effects Monitoring (EEM) biological interpretive report entitled, "Environmental Effects Monitoring Cycle 2 Meadowbank Mine Interpretative Report". The review of interpretive reports takes into account information requirements in the *Metal Mining Effluent Regulations* (MMER) of the *Fisheries Act* and also offers comments on the study based on the EEM Technical Guidance Document and generally accepted standards of good scientific practice.

The review comments are appended. Comments referring to *Metal Mining Effluent Regulations* requirements are in bold and require a response.

Although not required by the MMER, submitting both electronic and hard copy versions of documents would help the Department in managing all the received regulatory information. Please send future electronic copies to Susanne Forbrich (susanne.forbrich@canada.ca)

Canada

Please be reminded that an EEM Study Design must be submitted in writing at least 6 months before a biological monitoring study is conducted. Should you have any questions or concerns regarding the EEM program please do not hesitate to contact Paula Siwik at (780) 951-8824 or paula.siwik@canada.ca.

Sincerely,

Susanne Forbrich
Regional Director
Regional Authorization Officer

Enclosure - Appendix 1 - Meadowbank Phase 2 IR comments

cc:	Paula Siwik	Environment and Climate Change Canada, Edmonton
	Cristina Ruiu	Environment and Climate Change Canada, Regina
	David MacDonald	Environment and Climate Change Canada, Iqaluit
	Amanda Winegardner	Indigenous and Northern Affairs Canada, Iqaluit
	Karen Kharatyan	Nunavut Water Board, Gjoa Haven
	David Hohnstein	Nunavut Water Board, Edmonton

Technical Advisory Panel Review of "Environmental Effects Monitoring: Cycle 2, Meadowbank Mine Interpretative Report" –June 26, 2015

The following comments and recommendations are based on a review of the report by a Technical Advisory Panel (TAP) consisting of representatives from the Nunavut Water Board, Indigenous and Northern Affairs Canada and Environment and Climate Change Canada.

MMER Requirements

1. **Section 4: Schedule 5, subparagraph 16(a)(iii) of the MMER requires calculation of the mean, median, standard error, standard deviation, minimum and maximum values for the benthic invertebrate and sediment endpoints. Please provide that information.**

2. **P. 71: Schedule 5, subparagraph 17 (j) requires that the date of the next biological monitoring study be included in the Interpretative Report.**

General Comments

3. p. 35: Please comment on the age correction factors from cycle 1 and cycle 2. Are they similar?

4. p. 41: A fish study is required for the next EEM biological field work. TAP members are supportive of a lethal study on 20 lake trout. The TAP recommends that both fin rays and otoliths be collected and used for aging as further development of this dataset could be of use over the longer term. The TAP also recommends that non lethal measurements (weight, length, fin rays) be collected on lake trout already caught in the nets after the 20 lethal samples have been collected.

5. The TAP would like to discuss the use of one or more reference lakes with the facility at the study design phase.

6. p. 55: There does seem to be more variability in sample station substrate in Third Portage North relative to Inuggugayualik Lake and Pipedream Lake. TPN station 2 and 5 stand out in a few metrics.

7. p. 55: Does percent total organic carbon (%TOC) in Third Portage North differ significantly from the reference lakes?

8. P. 57: While not strictly required under MMER, an analysis that could be useful would be constrained ordination or direct gradient analysis (as opposed to the indirect analysis using NMDS) to look for relationships between invertebrate community composition and sediment/substrate characteristics. While the interpretive report has noted that there has

been no impact of effluent on invertebrate communities, a better understanding of location-specific drivers of invertebrate composition may be useful in interpreting future studies (especially considering that there have been observations of some differences in substrate between the three sites- comment 6 above).

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February 20th, 2017

Susanne Forbrich
A/ MMER Authorization Officer
Prairie and Northern Region
Environment Canada
9250 49 St. NW
Edmonton, AB, T6B 1K5

Re: Environmental Effects Monitoring (EEM): Cycle 2 Meadowbank Mine Interpretative Report Environmental

Dear Ms. Susanne Forbrich,

On January 20th, 2017, Agnico Eagle received comments on report entitled "Environmental Effects Monitoring (EEM): Cycle 2 Meadowbank Mine Interpretative Report" submitted by July 1, 2015. You will find, attached with this letter, responses to these comments addressed in the form of a simple addendum to the 2015 Interpretative Report.

Should you require any further information or questions please contact the below via email or by telephone.

Regards,

Erika Voyer
Environment General Supervisor Nunavut
Erika.Voyer@agnicoeagle.com
819-759-3555 ext.6980

Robin Allard
Senior Environmental Coordinator
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CC: Paula Siwik, ECCC
Cam Portt, C. Portt and Associates
Jamie Quesnel, Agnico Eagle Nunavut

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MMER Requirements

1. **Section 4: Schedule 5, subparagraph 16(a)(iii) of the MMER requires calculation of the mean, median, standard error, standard deviation, minimum and maximum values for the benthic invertebrate and sediment endpoints. Please provide that information.**

   Agnico Eagle's response:
   The omission of the summary statistics was an oversight. They are provided in Appendix A of this document.

2. **P. 71: Schedule 5, subparagraph 17 (j) requires that the date of the next biological monitoring study be included in the Interpretative Report.**

   Agnico Eagle's response:
   When the Cycle 2 Interpretative Report was submitted on June 26, 2015, there was some uncertainty on the part of Agnico Eagle regarding the nature of the Cycle 3 EEM study design due to the cessation of effluent discharge (Portage Attenuation Pond) to the exposure area (Third Portage Lake) that was used in Cycle 1 and Cycle 2. Agnico Eagle entered into discussions with Environment Canada regarding the location and timing of the Cycle 3 EEM studies shortly after the Cycle 2 EEM interpretive report was submitted. As discussed, the Cycle 3 EEM study is scheduled for the latter part of August 2017 at the Vault Attenuation Pond discharge into Wally Lake. More details regarding the Cycle 3 can be found in the EEM Cycle 3 Study Design submitted to ECCC on February 17, 2017.

General Comments

3. **p. 35: Please comment on the age correction factors from cycle 1 and cycle 2. Are they similar?**

   Agnico Eagle's response:
   The age correction factors are actually quite different in the two cycles. In Cycle 1, the otolith-based age was greater than the fin-ray-based (PEC-based) age for most of the fish and there was considerable variation in the otolith age versus fin ray age relationship, even for young fish. There was much better agreement between fin-ray-based ages and otolith-based ages in Cycle 2 in general, and agreement was particularly good among for young individuals. Based on our experience, this is more typical of comparisons of fin-ray-based and otolith-based ages; the ages tend to diverge for older individuals. Information regarding the relationships excerpted from the Cycle 1 and Cycle 2 EEM interpretive reports is provided in Appendix B.

4. **p. 41: A fish study is required for the next EEM biological field work. TAP members are supportive of a lethal study on 20 lake trout. The TAP recommends that both fin rays and otoliths be collected and used for aging as further development of this dataset could be of use over the longer term. The TAP also recommends that non lethal measurements (weight, length, fin rays) be collected on lake trout already caught in the nets after the 20 lethal samples have been collected.**

   Agnico Eagle's response:
   Agnico Eagle is pleased that Environment Canada agrees with the proposed lethal study on 20 lake trout. Based on comparisons of the relationship between fin-ray-based ages and otolith-based ages in Cycle 1 and Cycle 2 (see response to Comment 3), the creation of a database that contains both fin-ray-based ages and otolith-based ages may not allow 'standard' correction equations to be developed because of differences between studies and possibly also differences between lake trout populations. In general terms, the difficulty in determining ages accurately increases as growth rate decreases. Consequently 'correction factors' might be expected to vary with growth rates.

   Agnico Eagle agrees that weight and length will be determined for additional lake trout that are already caught. Agnico Eagle does not support removing fin rays from Lake Trout that are released. Based on observations by our consultant (C. Portt) during Cycle 2, the removal of the first pelvic fin ray is not inconsequential in terms of discomfort that the fish experience. The removal of this fin also exposes the fish to possible infection after release.

5. **The TAP would like to discuss the use of one or more reference lakes with the facility at the study design phase.**

   Agnico Eagle's response:
   This was discussed during a telephone conversation between Paul Siwik (Environment Canada), Ryan Vanengen and Robin Allard (Agnico Eagle), Cam Portt (C. Portt and Associates) and Bruce Kilgour (Kilgour & Associates) on January 25, 2017. Agnico Eagle and its consultants indicated during the conversation that it is their intention that the Cycle 3 EEM fish study will utilize two reference areas.

6. **p. 55: There does seem to be more variability in sample station substrate in Third Portage North relative to Inuggugayualik Lake and Pipedream Lake. TPN station 2 and 5 stand out in a few metrics.**

   Agnico Eagle's response:

Environment Canada is correct, substrate texture at TPN was more variable than in the reference lakes. The percent of the substrate that was sand varied from about 10 to 80% in 2014 in TPN compared to between about 5 and 15% in INUG and PDL.

7. **p. 55: Does percent total organic carbon (%TOC} in Third Portage North differ significantly from the reference lakes?**

Agnico Eagle's response:

Yes, TOC was significantly lower in TPN relative to what was observed in INUG and PDL.

8. **P. 57: While not strictly required under MMER, an analysis that could be useful would be constrained ordination or direct gradient analysis (as opposed to the indirect analysis using NMOS) to look for relationships between invertebrate community composition and sediment/substrate characteristics. While the interpretive report has noted that there has been no impact of effluent on invertebrate communities, a better understanding of location-specific drivers of invertebrate composition may be useful in interpreting future studies (especially considering that there have been observations of some differences in substrate between the three sites- comment 6 above).**

Agnico Eagle's response:

Agnico understands that the Cycle 2 study design indicated that we might explore the potential influences of habitat variables, potentially using graphical methods and/or multiple regression. The absence of variation in the benthic community among sampling areas in 2014, and the occurrence of a diverse and 'usual' assemblage of benthos in TPN, in our opinion made any examination of habitat influences on the benthic index values somewhat moot. Figures 1 and 2 are offered below to indicate the lack of obvious influence of TOC or grain size (percent sand) on the benthic indices that were evaluated in the 2014 interpretive report.

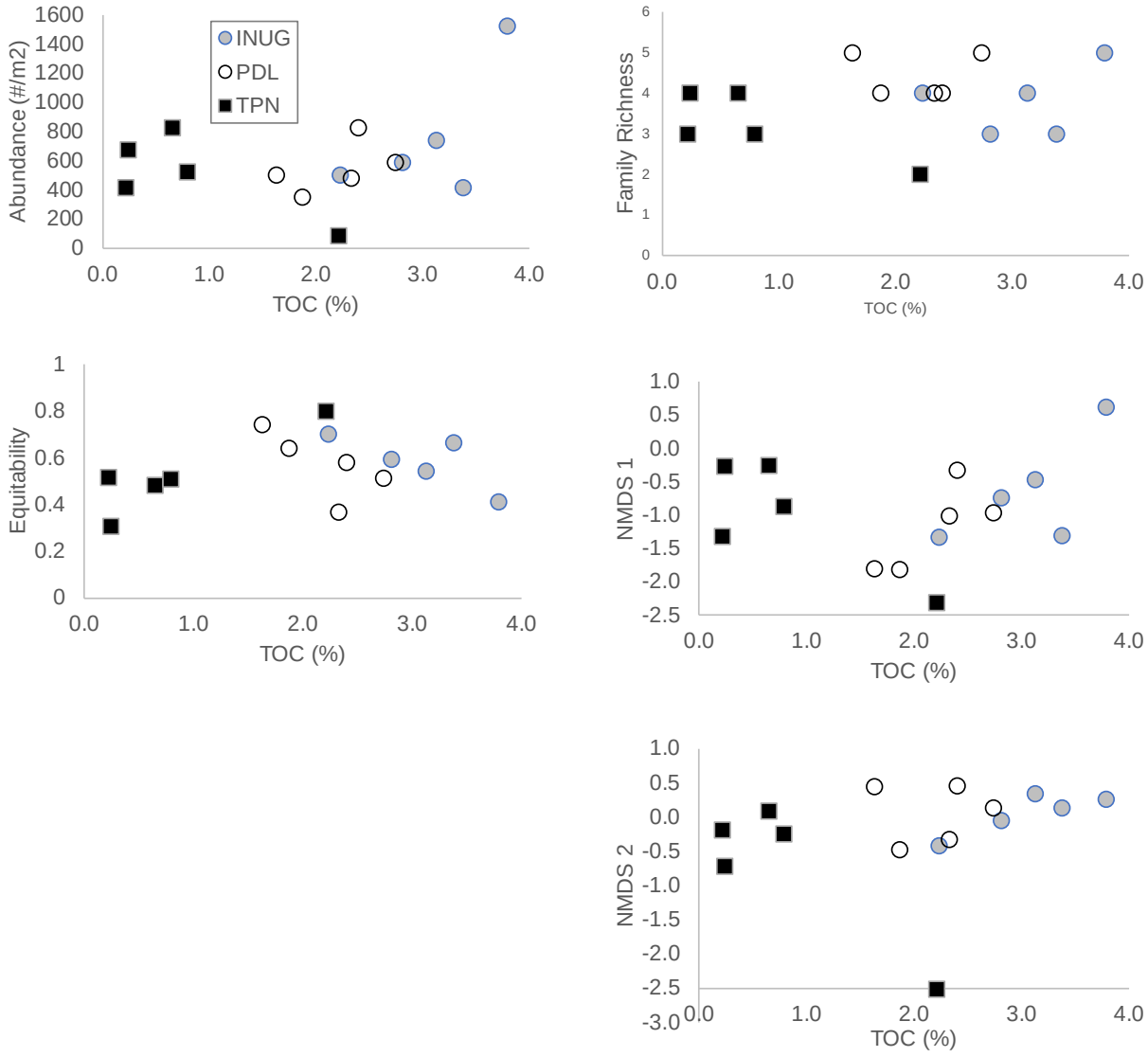

Figure 1. Variations in indices of benthic community composition in relation to TOC, Meadowbank 2014 EEM.

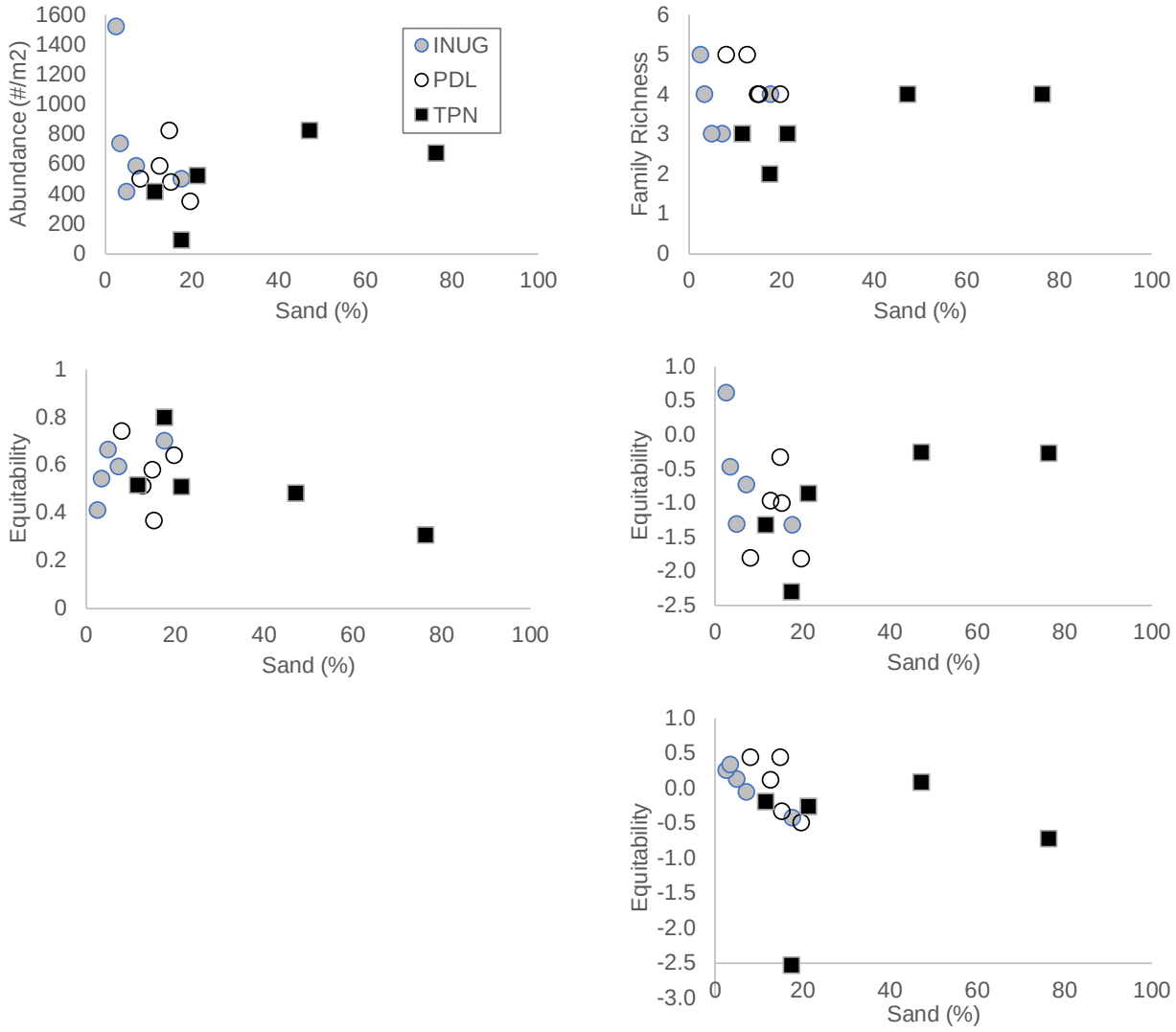

Figure 2. Variations in indices of benthic community composition in relation to sediment grain size (% sand), Meadowbank 2014 EEM.

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Appendix A

Table 1. Detailed statistics for benthic invertebrate indices of composition, Meadowbank Mine EEM, August 2014.

Statistic	Abundance Within Sample Area			Richness Within Sample Area			Diversity Within Sample Area			Equitability Within Sample Area			Bray-Curtis Within Sample Area		
	INUG	PDL	TPN	INUG	PDL	TPN	INUG	PDL	TPN	INUG	PDL	TPN	INUG	PDL	TPN
mean	752	548	504	4	4	3	0.53	0.57	0.35	0.58	0.57	0.52	0.38	0.36	0.46
median	587	500	522	4	4	4	0.51	0.61	0.35	0.59	0.58	0.51	0.37	0.34	0.32
min	413	348	87	3	4	2	0.44	0.32	0.18	0.41	0.37	0.31	0.15	0.00	0.21
max	1522	826	826	5	5	4	0.64	0.73	0.48	0.70	0.74	0.80	0.66	0.60	0.86
Std. dev.	447	178	281	0.8	0.5	0.8	0.08	0.15	0.11	0.11	0.14	0.18	0.16	0.17	0.25

Statistic	Between Sample Areas		
	INUG TPN	INUG PDL	TPN PDL
mean	0.44	0.38	0.46
median	0.37	0.36	0.40
min	0.10	0.17	0.09
max	0.92	0.70	0.86
Std. dev.	0.22	0.15	0.24

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Appendix B

The excerpt in italics below and Figure 4.3-11 are from the Cycle 1 EEM interpretive report (Azimuth, 2012). Figure 6 is from the Cycle 2 interpretive report (C. Portt and Associates and Kilgour & Associates, 2015).

The raw (i.e., untransformed[sic]*) relationship between PEC-based and OTO-based age estimates is shown in* ***Figure 4.3-11*** *relative to a 1:1 relationship (red dashed line). Overall, the PEC-based age estimates are biased about 5 years lower than the OTO-based ages. There was a pattern of increasing variance with increasing age, so variables were sqrt(x+0.5)-transformed to run the final linear regression model. The final model used to correct PEC-based age estimates to be consistent with OTO-based age estimates was:*

$Age_{OTOpred} = (0.966 + (0.915*(PEC+0.5)^{0.5}))^2 - 0.5$

p<0.001 *Adjusted R-squared: 0.77*

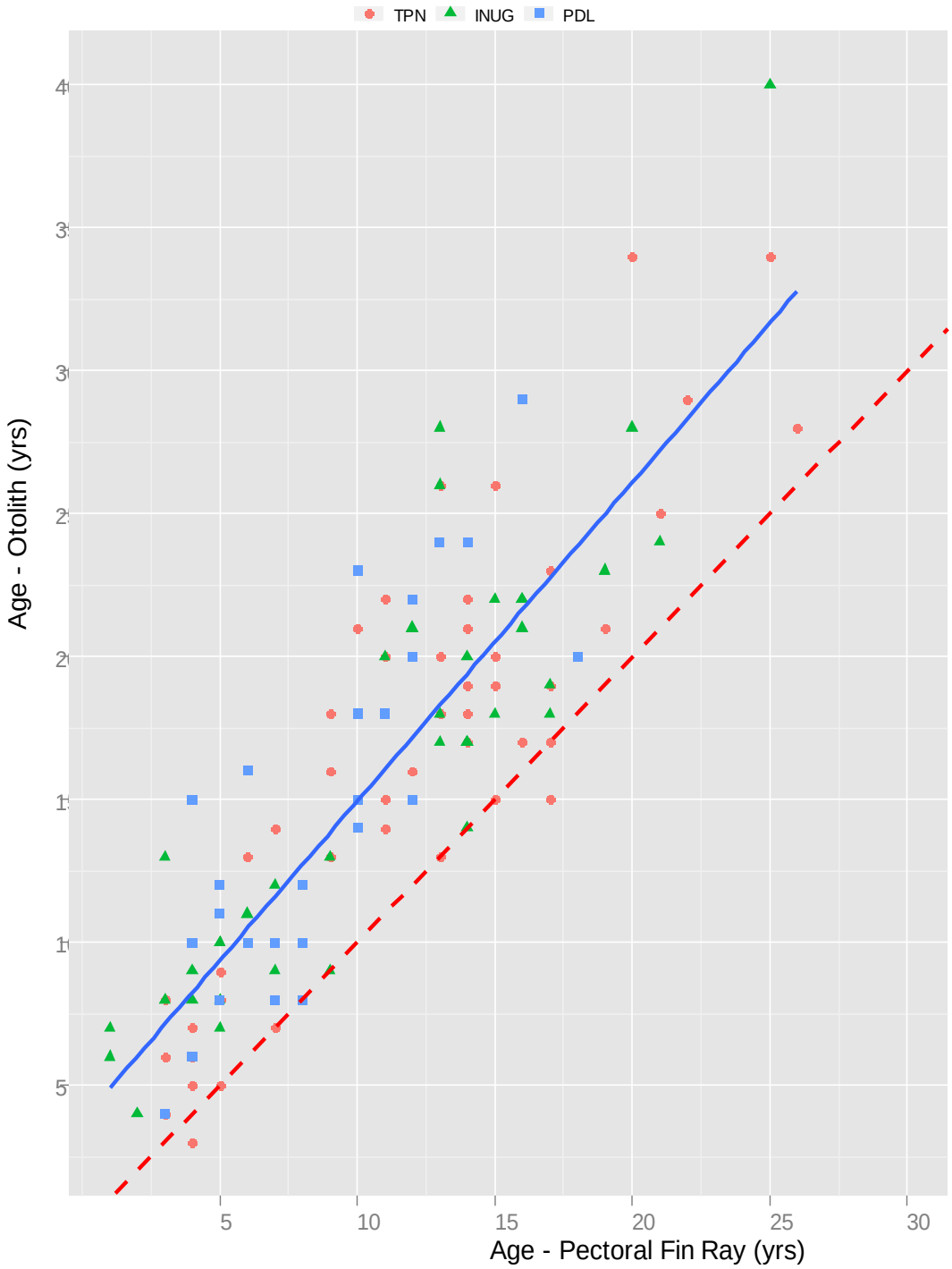
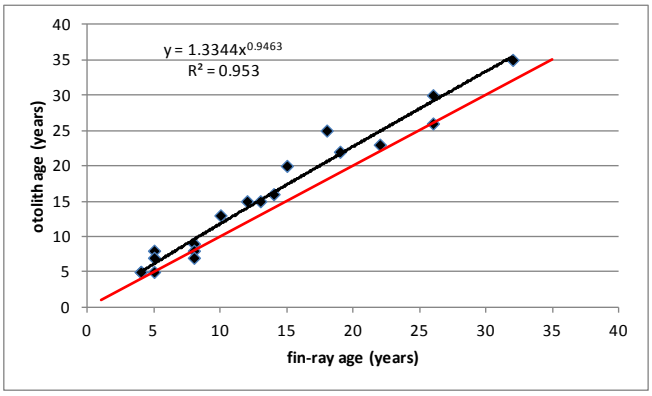
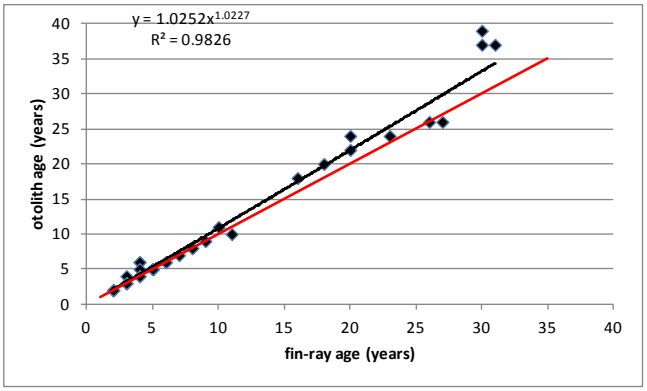


Figure 4.3-1. Relationship between PEC-based and OTO-based age estimates (un-transformed data) relative to a 1:1 relationship (red dashed line).

a) TPN



b) PDL



c) INUG

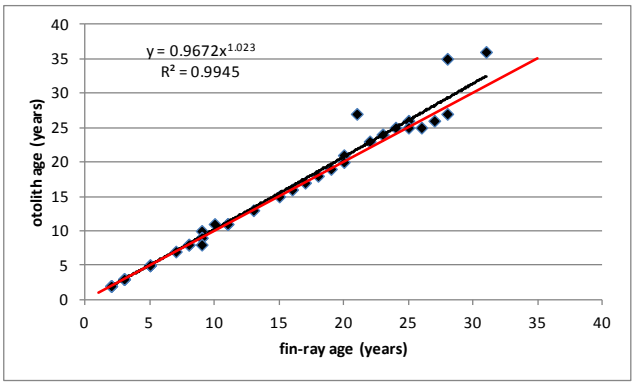


Figure 1. Plots of otolith age versus fin-ray age and the equations describing the relationships used to adjust fin-ray ages for each lake. The red lines represent equal fin-ray and otolith ages.