Report on Revised SEIC River Crossings Strategy Document of 6 December 2005

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1. Introduction

1. This short report focuses solely on the 'track changes' version of the revised River Crossings Strategy emailed to us at 12noon on Tuesday 6 December 2005, referred to as RXS. Shortly after, AEAT has also supplied an email of its own concerns.

2. This report is confidential to AEA Technology, and may not be disclosed without their prior written consent in accordance with the Confidentiality Agreement, attached to the Contract for Services.

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4. This delayed delivery of the RXS to us has inevitably shifted the timetable, and this report contains brief, preliminary comments prepared for a teleconference on a revised date of Friday 9 December.

5. Furthermore, there has been some slippage to what was agreed at the 2.12.05 meeting (see below), *without these being flagged up in a separate mark-up of the minutes or in a covering statement*, and this has meant that additional time-consuming review has been necessary.

6. It is recommended that AEAT and the lenders request from SEIC a mark-up of the Minutes of 2.12.05 detailing exactly the departures in the RXS from agreements made on 2.12.05, so that issues are not overlooked.

7. AEAT and the potential lenders will need also to satisfy themselves, for example through additional specialist surveys or advice, that hydrological, ecological, environmental and social issues related to river crossing activities are satisfactorily dealt with, and that they comply with their own environmental policies (e.g. through detailed review of Execution Plans, Monitoring Plans and Method Statements, Oil Spill Response Plan; groundwater protection; hydrotesting; impact mitigation for lagoon, brackish, estuarine and coastal systems fed by crossed rivers (these have not been addressed); ROW soil erosion issues; bank, bed and channel margin reinstatement; induced access; field monitoring; contractor inspection; operation of pipeline and infrastructure, including pump stations). This report, as with our previous three reports, is solely a desktop review, based on information provided by AEA Technology, Sakhalin Energy and its Affiliates.

8. Comments are necessarily preliminary because of the very limited time available to study the RXS and scrutinise the data contained within it. We are assuming that all data contained in the RXS is accurate and representative. We also assume that all changes from the previous version of the RXR/RXS considered have been highlighted as Track Changes.

9. We reiterate our strongly-held view that sufficient time must be allowed for a full consideration of an ever-expanding RXS.

10. Given these timescales, we reserve our right to modify views once clarification of the outstanding issues and datasets in the River Crossing Reports and RXS has been achieved.

11. We have now seen six versions of the River Crossings Report, and this is our fourth report.

12. It was considered inappropriate for us to add text to the RXS, as this would infer a co-authorship incompatible with our role as independent advisors as part of the ‘due diligence’ contract with AEAT. However, we can make, as ever, constructive suggestions on how the RXS can be improved.

13. To help with this process, we have largely used the same headings and order of discussion as our last report of 28 November 2005 (Lawler and Milner, 2005c) to maintain consistency, ease access by users and assist the process of addressing the issues raised. Furthermore, most issues are mainly discussed in the order they are raised by SEIC in the revised RXS.

14. Also, in the absence of line numbers on the RXS, and to ease addressing of the points by users, we have largely used a clear ‘x.y’ page reference system (x = page number; y = fraction down page; e.g. 68.4 is 40% down page 68), when discussing a specific point.

15. In a number of cases, an error or inconsistency is made at a number of different points in the RXS, and we flag one occurrence normally: a global search on the relevant key word will reveal these. All should be altered to make consistent and credible.

16. Specific minutes from the 2 December 2005 meeting are referred to by Minute number.

2. Improvements

A number of improvements are evident, and these can be discussed at the teleconference.

3. Issues with the development of the River Crossings Strategy

1. However, we still have the following concerns, and these are explained below. The meeting in London on 2 December 2005 represented useful progress, but it is disappointing that some of the points agreed in the minutes have not been integrated, or only partially integrated, or draw back from commitments made at the meeting. There remain also the two key issues on which we reserved our position. Moreover, several points from our earlier reports which still stand, as clearly stated in a letter from EBRD to SEIC of 1 December 2005, have not been addressed.

2. We strongly feel that one reason why this RXS does not realise the full scope for improvement is that SEIC left itself with too little time to revise the document effectively. We reiterate our view, often expressed (including at the meeting at Shell in October 2005), that hasty turnarounds actually lead to further delays because partial revisions simply lead to the need for further necessary iterations, each one taking considerable time to carry out.

3. We restate our view that it is very important not to proceed with further construction of river crossings on any Group II or III river, or any Group I river which flows into a Group II or III river, until these points have been addressed satisfactorily and consistently in the RXS and all derivative or associated documentation. All of these rivers are in the highest fish category defined by Sakhrybvod.

4. Precautionary principle

1. Given the lack of presented key baseline data, the absence of monitoring data, the limitations of the modelling, and the sensitivity of the freshwater systems (some describe them as ‘world-class salmon rivers’), the precautionary principle should be invoked, as agreed at the Shell meeting in October 2005.

2. At all points, it is recommended, therefore, that worst-case scenarios are assumed until solid evidence to the contrary is available. It may then be possible to relax constraints without compromising environmental protection when the data come on-stream. This recommendation will assist SEIC, AEAT and the lenders to comply with their own environmental policies.

3. The rest of the report deals with the following key issues.

5. Species life cycles (p.60)

1. This section is improved, but is *still* inaccurate, and internally inconsistent with the text. It is crucial to get it right to be defensible and appropriate for use here, e.g. it is also apparently used to help schedule crossing activity.

2. For example on p 54.4 it states that taimen migrate in mid-October through to November to the wintering areas. This statement appears to contradict the Figure that shows migration beginning in late November through December. If the Figure is accurate and the migration of taimen to their overwintering grounds occurs right through December, this migration could be interfered with by the river crossings.

3. In the same Figure there is a need to move embryo and larvae in river gravel for silver salmon to mid October as some fish will spawn earlier.

4. Also in the text it states that chum fry remain in the rivers for 1 to 2 months compared to pink salmon, and therefore the period of chum fry migration to sea should not be the same as the pink fry. Also there is a need to add a block on the Figure for pink fry emergence. Also, the text on p 100 under timing (para 4) states “the spawning season for pink and chum salmon is July-September” but we know from other text and the Figure on p 60 that autumn chum salmon spawn through December. This also contradicts Table 3-14 which shows the autumn run occurring through November.

6. Suspended sediment loads analysis (Chapter 4)

1. Some issues have been addressed, and the simplicity of the methods acknowledged.

2. However, the previous point re the shift in *timing* of high suspended sediment concentrations has not been addressed: high suspended sediment concentrations will naturally occur with summer meltwater peaks, but the key point here is that high suspended sediment concentrations could occur in winter during crossing activity, when some organisms could be at more sensitive stages (e.g. when young).

7. Sediment transport modelling (Chapter 5)

1. We continue to have difficulty in accepting this ECMOS sediment transport and deposition modelling work as presented.

2. Given that there no hard *data* apparently available on sediment deposition or plume generation by pipeline crossings in Sakhalin rivers, despite over 500 crossings having been completed to date (but see monitoring section below), it is essential that any *modelling* work is clearly set out, with visible methods and assumptions. This is still not the case here.

3. The RXS should clearly state what the aim(s) and approaches of the modelling exercise are, and where the results are used in the crossing strategy. The calculated sediment transport distances appear to be used by ECMOS to determine 'the overall area of spawning habitat likely to be affected by sediment deposition' (p. 92.6). This, and other parts of the impact assessment material in the RXS, needs to be addressed (as in letter from EBRD to SEIC of 1 December 2005).

4. We reiterate, therefore, that we cannot advise AEAT and the lenders that the modelling work is acceptable as given, because of several apparent *key* limitations that persist. Three of these are generic; several are specific:

(i) Information on generic modelling approaches adopted, or specific techniques or governing equations used to derive the sedimentation results, is absent. Models mean very little without (a) calibration and (b) field testing, especially when the supportive material is absent.

It was agreed on 2.12.05 that methods would be declared (Minute 7). This has not been done, although the additional data on model inputs and results are welcome. As we commented very clearly in our 28.11.05 report (Lawler and Milner, 2005c), o*n this basis alone, it is impossible to accept the findings (e.g. the model outputs and deposition curves and any conclusions derived from these), as the absolutely crucial foundations to the arguments are missing*.

(ii) Relation to SHI work. The ECMOS work suddenly appeared in the November version of the RXR and appeared to supplant the SHI modelling. Are these two different pieces of work? We had requested further details of the SHI *modelling* – not the fish damage calculations that flowed from the modelling – as only one, very simple, equation had been presented. The SHI work appeared to have been carried out on several Sakhalin rivers, and represented a very useful source of information to inform the process. There is still no comment on this, or how the two pieces of work, and their results, relate to each other (see Lawler and Milner (2005c) 28.11.05 report).

(iii) Underestimation of the impact zone*.* With no methods declared, it is impossible to appraise the findings properly. However, it appears that the downstream sedimentation rates/distances may have been underestimated, and are still confusingly presented (transliteration issues?). The limitations set out below are also relevant here.

5. Minute 7 also agreed that our specific comments (a) – (g) would be addressed. Many of these have not been addressed.

We use our (a) – (g) checklist below (see *italicised* points) to assess whether this has been done satisfactorily in the RXS in our view.

(a) ***Only fine silt (<0.1 mm) has been included*** *apparently (Table 5-2). The graph we gave in our 21 October report (*Lawler and Milner, 2005a) *clearly showed the importance of coarser sediment* ***too*** *(e.g. <0.88mm: sand) in controlling the strong relationship between sedimentation and redd permeability and survival etc. Effects have thus been significantly underestimated therefore.*

The key point is that sediment of *both* silt- and sand-sized range is important for spawning and behaviour. We illustrate this below with a few quotations from recent, fully refereed papers in the international published journal literature on this key topic:

'Our results show that variations of only a few percent of silt content can strongly degrade survival to emergence'.

'For sand contents over 10%, an increment of 1% silt has over three times the effect on survival as a 1% increment in sand'

(Lapointe et al., 2004, p.2271)

'Incubation success is inhibited by: (i) the impact of fine sediment accumulation on gravel permeability and, subsequently, the rate of passage of oxygenated water through the incubation environment; (ii) reduced intragravel O_2 concentrations that occur when O_2 consuming material infiltrates spawning and incubation gravels; and (iii) the impact of fine particles (clay) on the exchange of O_2 across the egg membrane.' (Greig, Sear and Carling, 2005, p. 241)

'redd interstitial velocities were reduced whenever a runoff event deposited more than 7 kg/m(2) of sands in infiltration traps' (Zimmermann and Lapointe, 2005, p.865)

See the graphs in our October report also *(*Lawler and Milner, 2005a).

(b) ***If the modelling is focusing on this very fine sediment, then the plume distances (impact zones) are likely to be much greater than the 100m apparently envisaged*** **(**see earlier plume evidence we present, and the literature).

There is confusion here to be clarified. The RXS (p. 91.2) refers to 'coarser grained sediment' settling out: surely this should be *fine* sediment, if they are referring to the ECMOS modelling which appears to be restricted to this *fine* sediment? Reference to sediment by its specific grain size range is preferred, or establish definitions at the outset of what is 'coarse' and 'fine' sediment etc.

We therefore cannot accept the modelling as presented: if employed at all, it should be consigned to an Appendix and not used in any way, for example, to justify impact assessment, the limits of a spawning ground survey, and especially, in combination with Averina surveys, to compute (apparently) percentage spawning grounds affected to yield the figures of 0.34% etc.

The figure of 0.51% (p. 90.2) cannot be accepted as presented, as it appears to depend on a small impact zone being defined.

There must be a very clear statement in the RXS that impact zones will be greater than 100m, and may consist of several km of infiltration into gravels downstream. Recalculate using different downstream impact zone estimates.

We reiterate that this fine *silt* material is likely to travel downstream in a plume of much greater distance, even under the low-flow conditions described in the RXS, and potentially infiltrate gravels downstream to reduce their permeability and lower dissolved oxygen – two significant ecological effects. These downstream effects need to be categorically stated and assessed.

Water depths are not insignificant (p. 91.1) from the data given in the RXS. Low-flow water depths and *mean* velocities for Sakhalin depths can be up to the following levels (see data in RXS, pp.36-47, for which we have summarised the maxima below for different areas of Sakhalin, as defined in the RXS):

AREA	***Depth (m)***	***Mean velocity (m s^{-1})***
Area 1:	1.1	0.34
Area 2:	0.9	0.5
Area 3:	0.5	0.4
Area 4:	1.0	0.56
Area 5:	1.1	0.28

These are significant values (e.g. waist-deep waters flowing at average velocities of 50 cm per second). These values are characteristic of many medium-sized rivers or large streams (e.g. in UK), which carry fine sediment long distances (to downstream gravels etc.). Any modelling retained must address the resultant plumes generated, and explain how such depths and mean velocities reported in the RXS itself could not transport fine sediment significant distances downstream**.**

Note that these are *mean* low-flow velocities; *maxima* will be significantly higher.

Some plume evidence

This links to the wider and recurrent sediment plume issue, and some brief evidence is offered here:

- R. Amur (Russian mainland) sediments have been found in the seas around Sakhalin.

- There are many examples of fine sediments travelling long distances, even in small streams (e.g. as presented on 29 September: the Spain example of c.500m; the Icelandic example of 8km; the urban river Tame in UK). These are not examples of very high flows (as the RXS implies incorrectly) and they compare favourably with low flow Sakhalin discharges presented.

- The Reid & Anderson (1998, 1999) studies cited by RXS point to 180-290m sediment impact zones, and *30 cm (1 foot) sediment depths* within this type of zone. An explanation how these reconcile with *5mm depths* estimated in the RXS is absent.

- Figures 1-2 in our 28.11.05 report *(*Lawler and Milner, 2005c) show high suspended sediment concentrations even in *stagnant* water in the ROW.

- A recent photograph has been released by Sakhalin Environment Watch of a river where high suspended sediment concentrations apparently persist 13 km downstream of 'a river crossing'. If SEIC have hard data which show that this plume has not been caused by crossing activity, then, in our view, it should be released in their interests and those of the lenders, but also to shed more light on fluvial processes and impact zones in Sakhalin.

We have repeatedly called for existing monitoring data to be supplied to us. It now appears that some monitoring of suspended sediment concentrations has indeed been carried out in 2004 and 2005: this is stated on p.117.7. We repeat our call, and for photographic or video evidence of plumes. This will assist the assessment process and mitigation definition etc.

We restate our request for satellite imagery of plumes that the RXS refers to. This is essential, yet the SEIC response was that they are not available*.*

(c) ***Input data have also been excluded****, e.g. the crucial channel boundary particle size distributions, from which they appear to derive the silt percentages*.

ADDRESSED IN PART. Particle size distributions not given in full.

Also, tabulated data for rivers in Table 5-1 are not given for the rivers where sedimentation curves are presented, so it is impossible to assess the results even at a cursory level.

Some units are missing from Table 5-1.

The implied figure of only 2% loss of sediment when removing buckets of sediment from the bed of a flowing river seems very low (Table 5-1). Some comment is needed here.

(d) ***The target variable is not justified (sedimentation depth**). The crucial variable is the percentage of sand/silt that ingresses the redds, including the proportion <0.88mm (coarse sand) as shown in the graphics supplied with our earlier report (Lawler and Milner, 2005a). However, the modelling focuses only on sedimentation depth, with no comment on its significance*.

NOT ADDRESSED

(e) ***In any event, no justification is offered for the 5mm sediment figure used**. What is the ecosystem significance of 5mm*?

NOT ADDRESSED

(f) ***Note that the curves are asymptotic too, on the downstream diagrams** confirming that significant sedimentation will occur downstream of the 100m 'limit' they propose*.

NOT ADDRESSED

(g) ***Eroded vs deposited sediment volume differences**. It appears that no allowance has been made for the fact that deposited sediment generally occupies larger volume than the host sediment body delivering the sediment, because of unconsolidation processes. This again may understate the effects, and will especially apply to sediment derived from river banks and the ROW/floodplain surface.*

NOT ADDRESSED

6. The precautionary principle would suggest that caution is exercised before accepting modelling results which appear not to have been validated against field data or verified.

7. Clearly, many Sakhalin crossing sites have the *potential* to generate and deliver considerable quantities of fine sediment (e.g. Figs 1-2 on earlier report, and Sakhalin Environment Watch photographs).

8. Under types of disturbance on p. 67 it states that "any increase in suspended load can be assumed to be restricted to the duration of in-stream construction activity ….and effects like to be short term" but this ignores the disturbance to the stream banks and the need for rapid reinstatement in the acknowledged difficult conditions.

9. We recommend that a photographic library of existing and new crossings and plumes for the Sakhalin II project – keyed into a clear location map - be established on LiveLink or similar site to allow access by interested parties.

8. Strategy development and implementation, including River Classification system (Chapter 5)

1. This has improved. However (p. 85 onwards) it would be better to go back to Group I, II and III in line with earlier RXR rather than 1, 2 and 3 as this as links back to the 'Type' classification that is now defunct.

2. The definition of "good quality" spawning grounds has now finally been included as defined by Sakhalinrybvod (1987). However, it should be realised that these definitions of good, medium and poor are from the Russian authorities, not international literature. It should be clarified how 10-20% fine sediment in the spawning grounds can be categorised as 'medium quality' when on p.77 the McHenry reference states that with >13% fine sediment (<0.85 mm) no coho salmon eggs survived. Similar data were provided in our earlier report (Lawler and Milner, 2005a) from Murphy and Milner (1997). Even the "good" spawning grounds, which could have up to 10% fine sediment in the gravels, would potentially cause up to 50% mortality of alevins (Murphy and Milner 1997).

3. However, a major concern in the RXS is still the confusion evident in the text, Figures and Tables on river classification, operation and usage in Mitigations and crossing design. For example, as written with the use of the 'and/or' construction (p. 86.8), the number of streams known to support taimen or their potential spawning grounds in the crossing area is now stated as 70 (also in Figure 5.1 - not Table 5.1) compared to the 48 rivers in Table 3-11. This inconsistency needs to be clarified, or the wording changed to make it clear that only 48 streams fall within this category.

4. Also Figure 5-1 indicates that Group II stream criteria includes the "known or possible presence of taimen in the river", but in earlier versions of the report all rivers that had possible taimen were Group III rivers. This appears to be step backwards: is this an error or is it now part of the proposed policy we are being asked to review, perhaps including data from the recent taimen survey? Please clarify, and if all these streams are in Group III then this criteria should be removed for Group II streams to avoid confusion. For Group II and III it should also state in the criteria "TOTAL spawning habitat in river < 10,000 m^2".

5. Pages 87.1 and p. 107.5 appear to differ from what was agreed at the 2 December meeting, i.e. "during construction Group I tributaries that flow into Group II and Group III rivers, and which have been assessed high susceptibility for disturbance will be treated as Group II rivers". This is incorrect – it was agreed as outlined in the Minutes that Group I streams with medium or high susceptibility to disturbance that flowed into Group III rivers **were to be treated as Group III rivers** (Minute 6). We suggest the following * system be considered:

1*/2 river is a Group I river which flows into a Group II river

1*/3 river is a Group I river which flows into a Group III river

6. The report addresses on p 90.2 the 80/20 split of spawning habitat. However the figure should be *23*% affected from the areas given in the RXS – not *20*%. Change throughout the document. Can a figure on rearing habitat ratios be given too? Also, these figures need to be presented for each species, as discussed earlier.

7. On p.95.3, the area affected now relates to bedload deposition and not sediment in transport and it states that this might be as far as 250 m.

8. The "mortality of eggs and alevins" discussion on p 101 may be incorrect – it is unlikely that alevins would be able to avoid areas of fine sediment deposition

9. The statement on p 102 "providing broad timing framework for the winter river crossings" is contrary to what was agreed at the meeting of 2 December : "Group III rivers of *high and medium susceptibility* to disturbance will be constructed in mid-winter". Ideally this should be all Group III rivers. "All other Group II or III rivers will be constructed during the December-April period or possibly during low flow periods of low flow in October-November." It was agreed that all Group III rivers would be cut during low flow in *winter* unless it was shown to be of lower ecological sensitivity (Minutes p 2 under pt 6 River Classification). "Group I rivers will be constructed in accordance with the Russian regulations" but this is not all Group I rivers as some may be of high susceptibility to disturbance and flow into Group III rivers (see point 5 above), e.g. some will be 1*/3 rivers, which are Group I river which flow into a Group III river.

10. We note a useful discussion (p 105) with respect to particular attention to ensuring that the integrity of river features are restored so that habitat function is retained. We note also the recent 'Rules of the River' undertaking by SEIC and its contractors presented at the 2 December meeting.

11. The summary crossing strategy on p 107/8 is fundamentally flawed – and follows on from points on p 102. In Group III low susceptibility to disturbance states crossing will be "low flow, outside spawning": we agreed low winter flow ***not*** just outside spawning (p 2 of Minutes under pt 6 River Classification). Priority permanent reinstatement should be for ALL Group III rivers.

12. Group II should not include Group I tributaries of high susceptibility to disturbance if they flow into Group III (p 107) - these should be 1*/3 rivers and treated as Group III rivers (see point 5 above).

13. Define basic bed reinstatement: all rivers should have permanent reinstatement, not just Group III and Group II high susceptibility (p 107).

14. Bank reinstatement should be fully addressed in the Table on p.107 as this is also an important component of reducing disturbance effects.

9. Minimising impacts (p. 99 -): Mitigation measures

1. The key mitigation measure (dry cuts) now appears to be back on the table, from useful discussions at the 2.12.05 meeting. This is encouraging: indeed, the possibility of using flume pipes was raised in our first report of October 2005 (Lawler and Milner, 2005a), and subsequently.

2. We are assuming that whenever 'water management control' is used in the RXS this will mean the use of flume pipes in the standard way. Also, we assume that these will be deployed using international best practice to minimise sediment generation to environmentally acceptable levels (e.g. the seals between flume pipe(s) and channel boundary will be robust, adequate for purpose and non-polluting, that trenching activity will take place only when the flowing water has been ducted successfully through the pipes above, and ensuring adequate pipe removal etc.). This should reduce sediment generation downstream. This will need a full Methods Statement, of course.

3. This technique is sometimes referred to as 'isolated crossings' (e.g. by Reid and Anderson, who in their recent work suggest typical suspended sediment concentration increases which are associated with this method). We can supply bibliographic references here.

4. However, the issue remains to be resolved with Sakhrybvod. AEAT and the lenders will need to come to a satisfactory agreement on this with SEIC.

5. The use of flume pipes is a key issue, and we are assuming that this technique will be deployed correctly. We have not seen a Method Statement, which should cover, for example, all aspects of crossing technique, timetable, duration and necessary engineering, including temporary bridge building and decommissioning. Environmental impacts of all these stages and components still remain to be assessed.

6. As in our last report (Lawler and Milner, 2005c), further reassurance needs to be provided re river crossing timings. Winter is too broad a term. We need to define winter as mid-December to end of March, and exclude April (as too close to the meltwater season and sensitive life-stages). Mid-winter is already defined as January and February**.** Sakhyrbvod may prefer a specific month, apparently: this issue should be discussed with them**.**

7. Clarify the proposed use of turbidity curtains and/or other in-stream sediment traps or control devices.

8. Bank reinstatement systems should follow international best practice, and be rigorously monitored, to prevent sediment leakage into stream systems during and following construction.

10. Residual impacts (p. 112)

1. RXS states “Rivers of high and medium ecological sensitivity will be crossed in winter when aquatic life is largely dormant”. This may be the case but the biota may still be affected. The effects need to be assessed, therefore. Also this section discusses rivers of “high and medium ecological sensitivity” – is this all Group II and III streams or just those streams with this criteria within Group II and III as outlined on p 107?

2. The strategy on p 113 when stating “Group II and III rivers will be crossed during the winter” does not correspond to previous statements outlined above.

3. Re the silver salmon point on p 113: it may be good practice if it is known that a river contains significant spawning of this species upstream not to cut until January and the migration of this species is over.

4. The mitigation for “survival of fish eggs” section needs some input on bank protection and possible reinstatement as this is an important component of the sediment issue, in addition to minimizing the instream generation of sediment. This information may be available elsewhere but some summary text and cross-reference is needed here to ensure that this important aspect of river crossing strategy is being addressed, and so that banks during and after river crossings will not generate sediment and become press disturbances to the stream.

5. There has been no discussion of wetlands (except for a few lines on p 105) as agreed, and of different spawning requirements of different salmon species.

6. Impact identification, quantification and mitigation for lagoon, brackish, estuarine and coastal systems that are fed by rivers crossed by pipelines still do not appear to have been addressed, despite earlier calls.

11. Monitoring

1. This looks to be far stronger and we welcome an immediate start to monitoring (although we do not know full details of the monitoring programme). However, a full discussion of the proposed analysis and reporting of monitoring results (e.g. a secure or public website), and detailed responsive action in the light of monitoring results, still needs to be included.

2. A key issue is the reporting of results. The annual reporting implied (p. 122.5) is insufficient. It needs, for example, regular weekly/monthly circulation of results especially in the first winter (2005/06), then possibly a relaxed frequency depending on results from the first winter.

3. Also, how will the results feed back directly to management practices? Fig 6-1 is a fair start, but it looks rushed, and needs to be more carefully constructed to show all linkages in the management chain: feedback to whom, for

example? Crossing activity should be suspended and the situation investigated and rectified if monitoring results or inspector's reports show unfavourable impacts.

4. We are assuming (though we have not reviewed the relevant written plans) that, in the event of sediment pollution incidents, investigations will be held. How will these be reported (e.g. to lenders), and how will contractors and SEIC be tasked to action any lessons learnt? Given the Sakhalin Environment Watch photos, it is recommended that each crossing which NGOs or inspectors identify as problematic be investigated fully. The results of this enquiry should be circulated, and lessons adopted and publicised. A folder of photographs of 'good' crossings elsewhere is not a rebuttal statement in itself. As a PR, a trust-building and environmental protection measure, this would be useful to SEIC and the potential lenders to address criticism with hard data and photographic evidence.

5. Monitoring has apparently begun, including suspended sediment concentration data (p. 117.7). We urgently request that method statements and data be supplied so that AEAT, the lenders and their advisors can assess, for example, the suspended sediment concentrations involved in crossing activity. Monitoring should be sufficient to assess the *dynamics* (e.g. Lawler, 2005; Lawler et al., 2006; Mitchell et al., 2003)

6. Video monitoring should also be included to detect sediment plumes qualitatively (and to approximate surface velocity distributions in the absence of any other data). Video files/tapes should be passed to monitors and inspectors.

7. The post-construction monitoring start date is vague on p. 122.4: 'following 2005/2006 winter construction season'. We recommend a specific date be proposed here.

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