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Andrew Galarnyk
Environmental Affairs
Centra Gas
444 St. Mary Ave.
Winnipeg, Manitoba R3C 3T7

Dear Mr. Galarnyk:

Re: Centra Gas - Phase IIB Biological Impact Assessment

Attached please find comments from our Department of Fisheries and Oceans for your review. Please have your consultant address these comments at our September meeting.

Sincerely

Adolf Andres

Adolf Andres, P. Eng.
Senior Project Engineer

cc: Ed Yee
Arnold Permut

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DANGEROUS GOODS

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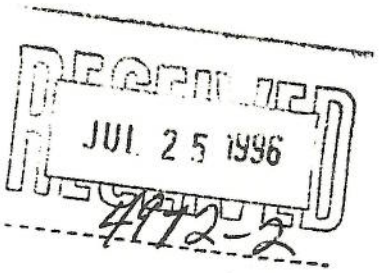

July 23, 1996

Your file Votre référence

Our file Notre référence

Mr. Adolf Andres
Senior Project Engineer
Environment Canada
513 - 269 Main St.
Winnipeg, MB
R3C 1B2

Dear Mr. Andres:

Re: Centra Gas - Phase IIB Biological Impact Assessment

The Department of Fisheries and Oceans (DFO) has completed its review of the above document. Included are comments by Dr. David Rosenberg (benthos) and Mr. Brian Billeck (PAH's) both who reviewed the biological impact assessment study design. The conclusions of the report, that the environmental impacts of the contaminated zone are minor and that immediate remediation is not required are probably reasonable, however, some of the logic used to come to this conclusion are flawed.

1. **No PAH bioaccumulation in excess of background levels was found in fish, indicating that the level of PAH exposure was low.**

It is well known that PAH's do not bioaccumulate very well in fish, however, PAH exposure is the only parameter measured in fish. Not surprisingly, PAH bioaccumulation was found not to be in excess of background levels. This does not necessarily mean that PAH exposure was low, however. Black and Baumann examined hepatic and lip tumors, induction of mixed function oxidase (MFO's) and bile metabolites, and concluded that in less contaminated sediment, PAH's can produce adverse effects. Mr. Billeck had recommended these measurements be included in his comments on the study design.

2. **The impact on the zoobenthos is minor.**

It is possible that the impacts of the contaminated area are minor, but the reasoning for explaining away much of the data is flawed. There are significant differences between the control and contaminated sites, but the conclusion was that it doesn't matter, because the standing stocks are still in the range of the variability observed for the Red River. However, no details (year, month, mesh size, sample gear, level of taxonomy, etc.) of the other studies on the Red River are provided, thus comparisons may be meaningless.

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The consultant concludes that crayfish have higher levels of PAH's at the contaminated site, but it doesn't matter because its only stuck on the outside of the cuticle. There are ways to verify this contention, for example dissecting the muscle from the exoskeleton, however no attempt was made to examine this.

There were rather large differences between the treatment and control sample stations with respect to depth and distance from shore (see table 2). This could greatly affect the distribution and sorting of riverine sediments, and ultimately affect the distribution and abundance of benthos.

Other minor comments appear within the report. Should periodic monitoring be considered, as recommended by the consultant, the study design should take into account the comments from this review.

If you have any question on the above review comments, please call me at (204) 983-5135.

Sincerely,

Donald G. Cobb
Impact Assessment Biologist
Manitoba/Saskatchewan Area

cc: J.N. Stein
D. Majewski
D. Rosenberg
B. Billeck

Table 2. Sampling station characteristics and sediment contamination assessment.

Sample ID	Distance from Shore (m)	Water Depth (m)	Evidence of Contamination (VC) *
C-S1	8	1.5	No contamination
C-S2	5	1.2	No contamination
C-S3	9	1.8	No contamination
C-S4	12	2.4	No contamination
C-S5	10	2.4	No contamination
C-S6	11	2.4	No contamination
C-D7	22	3.7	No contamination
C-D8	22	4.6	No contamination
C-D9	21	4.0	No contamination
C-D10	38	6.1	No contamination
C-D11	30	5.8	No contamination
C-D12	37	4.0	No contamination
T-S13	12	1.8	No contamination
T-S14	13	1.8	No contamination
T-S15	13	1.5	No contamination
T-S16	18	2.7	VC; evident at about 4 cm
T-S17	18	3.1	VC; evident at about 5 cm
T-S18	17	2.7	VC; evident near surface; tarry deposit on nosepiece
T-D19	43	4.9	VC; heavy contamination below about 5 cm
T-D20	38	4.9	VC
T-D21	26	5.2	VC
T-D22	49	4.0	VC
T-D23	46	5.2	VC; evident at about 5 cm
T-D24	37	5.2	VC

*VC Visual contamination

2.3 Zoobenthos Sample Collection

Sediment samples for zoobenthos community analysis were collected using a 15 cm x 15 cm x 26 cm tall, stainless steel, Burton-Ekman dredge. A single dredge sample was taken at each station and the contents transferred to a polyethylene bag for transport to the Agassiz North Associates Limited laboratory in Winnipeg. The sample volume was reduced in the laboratory on the day of collection by sieving through a 400 µm mesh size wash bag. The reduced sample was returned to the polyethylene sample bag and preserved with 70% ethanol (ETOH).

The samples were examined under a dissecting microscope. Any invertebrates observed were removed from the sample, identified to family in all cases and to genus for some taxa, and placed in a glass vial with 70% ETOH. Sample sorting and invertebrate identification was performed by Lisette Ross of Winnipeg.

The Tubificidae was the most abundant taxon in both the shallow and the deep zones, with significantly (Table 13) higher numbers occurring in the deep zone. The Chironomidae and Enchytraeidae were, respectively, the second and third most abundant taxa, with no difference in mean numbers between the shallow and deep zones. Single specimens of *Sphaerium* were recovered from each zone. The higher numbers of Tubificidae in the deep zone entirely account for the significantly higher total zoobenthos numbers than in the shallow zone.

3.4.2 Contaminated Area

Five taxa occurred in the sediment samples from the contaminated area, all of which also occurred in the control area (Tables 12 and 14). Representatives of the Mermithidae and the Ceratopogonidae were absent from the contaminated zone, but this cannot be considered a significant difference as these taxa occurred as single specimens in the control area.

There was no significant difference in total zoobenthos numbers between the shallow and deep zones of the contaminated area (Table 13). This reflected the absence of significant differences in abundance between these zones for any individual taxon.

Total zoobenthos numbers in the shallow zone of the contaminated area were not significantly different (Table 13) from the shallow zone of the control area. However, the counts of Tubificidae at the shallow contaminated stations were significantly lower, by about 50%, than at the shallow control stations. Conversely, there were significantly higher *Hexagenia* numbers at the shallow contaminated stations than at the shallow control stations. *Hexagenia* was present in 5 of the 6 shallow/contaminated samples but not in any of the shallow/control samples. There were no significant differences in the abundance of any other taxa between the shallow/contaminated and shallow/control stations.

Total zoobenthos numbers in the deep zone of the contaminated area were significantly lower (Table 13), by about 80%, than in the deep zone of the control area. This was the product of significantly lower numbers of Tubificidae at the deep/contaminated stations. The abundance of Enchytraeidae at the deep/contaminated stations also was marginally lower than at the deep/control stations.

No assessment of any differences in community diversity was undertaken. Consideration of diversity requires identification to genus, at least in the more abundant taxa such as the Diptera and the oligochaetes.

A total of 12 crayfish were captured from the control zone in 1,650 trap-hours of effort compared to a total catch of 3 crayfish from the contaminated zone in 700 trap-hours of effort.

Don: Numbers/m² are pretty low in control + treatment zones. Is the "control" realistic?

D

There are few published reports of PAH concentrations in fish from uncontaminated areas, but Baumann et al. (1987) report some values for brown bullheads from Buckeye Lake, a recreational lake in Ohio (Table 20). Again, the concentrations in minnows and catfish from the Red River are comparable to these reference values.

Although fish do not efficiently bioaccumulate PAHs, as discussed in Section 1.2, the evidently low PAH concentrations in fish from the Red River indicate that fish are not exposed to particularly high concentrations. If this were the case, then some PAH elevation in tissues would be expected. For example, Baumann et al. (1987) found concentrations of individual PAHs in brown bullheads from the Black River, Ohio, that were more than 100 times higher than in fish from Buckeye Lake (Table 20). Total PAH concentrations in Black River sediments, on the order of 1,112,000 ng/g dry weight, were comparable to that measured at T-S18 in the Red River. Therefore, the finding of no elevation of tissue PAH concentrations in Red River fish indicates their overall exposure is low despite the occurrence of high sediment concentrations at some locations.

4.4 Evidence of Adverse Impact

4.4.1 Zoobenthos Community

It is generally believed that discharges of organic wastes (e.g., from sewage treatment plants and from combined storm and sanitary sewers during heavy rainstorms) are adversely affecting the zoobenthos community in the Red River, although there has not been an extensive study of the issue. The net effect of these discharges appears to be a benthic community dominated by large numbers of Chironomidae and/or tubificid Oligochaeta, as found in the control zone of this study, as well as in the vicinity of the Norwood Bridge (5 km upstream of the present study site), near St. Vital Park (18 km upstream of the present study site), and near Valhalla Drive (8 km downstream of the present study site) (Table 21). The St. Vital Park site is downstream of the South End Pollution Control Centre and the University of Manitoba, which discharges raw sewage to the river during heavy rainfall events. In addition to these sources, the Norwood Bridge site receives discharges from a number of combined storm/sanitary sewers. Additional potential impact sources at the present study site include the discharge from Gateway Paper, the combined storm/sanitary sewer immediately upstream of the control zone, as well as the Assiniboine River, which receives discharges from a number of combined sewers. Finally, the Valhalla Drive site is downstream of all the above impact sources, including some 50 combined storm/sanitary sewer discharges, along with the discharge from the North End Pollution Control Centre. The numbers of oligochaetes at these sites, and of chironomids at all but the St. Vital Park site, are much higher than at the South Perimeter Bridge, which is upstream of the impact sources and may be considered indicative of the zoobenthos community which could be expected in the absence of these discharges.

The finding of significantly lower mean numbers of Tubificidae, Enchytraeidae, and total zoobenthos at the deep/contaminated stations than at the deep/control stations and of significantly lower mean numbers of tubificidae at the shallow/contaminated stations than at the shallow control stations suggests the PAH contamination may be having an impact on zoobenthos in the contaminated zone. However, the net effect of this impact is to reduce

abundance of the oligochaeta, comprised primarily of the tubificids, to a level comparable to that at the South Perimeter bridge, upstream of the city (Table 21). While this change is statistically significant, it is questionable whether the decrease can be considered adverse as the resulting abundance is comparable to what might be expected at this site in the absence of the urban impact sources.

The benthic community analysis indicated there were no gross effects on community diversity but could not address the question completely with the level of identification completed to date. All organisms removed from the samples were preserved, allowing future investigation of this issue without additional sample collection.

4.4.2 PAH Bioaccumulation

No evidence of increased PAH bioaccumulation in fish was found, indicating low exposure despite the occurrence of levels in excess of the PEL at 42% of the stations in the contaminated zone.

In contrast to the analyses on fish, a number of higher mw PAH compounds occurred at elevated concentrations in the whole body analyses of crayfish taken from the contaminated area. Although this suggests the crayfish may be bioaccumulating PAHs from the contaminated sediments, the analytical results are not conclusive in this regard. The elevated PAH concentrations in the crayfish are more likely a result of the compounds sticking to the outer surface of the crayfish exoskeleton.

4.5 Risk Assessment

4.5.1 Benthic Invertebrates

The portion of the benthic invertebrate community living within the contaminated zone is at the greatest risk. Although a lower abundance of some taxa was documented in the present study, the magnitude of the reductions was within the known range of variation along the Red River. The ecological risk associated with the PAH contamination is restricted to the level of the individual. No population or community is threatened by the contamination.

4.5.2 Fish

The contaminated sediments are unlikely to affect most fish species in any way. Mid and surface water feeders should not be exposed to the contaminants at all due to the absence of PAH contamination in the water column. Bottom feeders may be exposed, but any such exposure should be of short duration due to the small area of contamination in relation to the range of fish movement, the reduced zoobenthos standing crop which may discourage use of the area, and the apparent absence of spawning or rearing habitat. Furthermore, fish may be able to avoid areas with extremely high concentrations of aromatic hydrocarbons (Rice 1973).

5.0 Conclusions

The only receptors for which there is any evidence of impact at this time is the portion of the benthic invertebrate community residing in the area of contamination. Statistically significant local reductions in the abundance of tubificid oligochaetes were documented, but the resulting standing crops, both of total zoobenthos and of tubificids, remained within the range of variation observed in the Red River within and near Winnipeg. This impact is minor in degree.

Effects on fish are highly unlikely, given the restriction of contamination to the sediments, the limited area of contamination, and the types and quality of fish habitat within and adjacent to the contaminated sediments. No PAH bioaccumulation in excess of background levels was found in fish, indicating the level of PAH exposure is low.

Based on these findings, and provided the zone of contamination remains stable, there appears to be no immediate need for remedial measures related to either the contaminated sediments or the source of contamination. Although the area of contamination is not presently believed to be expanding, it is recommended that Centra Gas undertake periodic monitoring to confirm this assumption, using methods consistent with those employed in the present study. In the unlikely event that the area of PAH contamination is found to be increasing, another assessment of ecological effects should be conducted to re-evaluate the need for remediation.