

THE HYDE PARK LANDFILL

AN ASSESSMENT

OF THE

STIPULATION ON REQUISITE REMEDIAL TECHNOLOGY (1985)

THE POLLUTION PROBE FOUNDATION

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1.0 INTRODUCTION AND SUMMARY

Nov. 13
1985
This brief is submitted by the Pollution Probe Foundation for the review of the Court. Its purpose is to assist the Court in reaching a decision on whether to approve the Stipulation on Requisite Remedial Technology Programme (hereafter RRT) for the Hyde Park landfill. From our review, we have found the RRT fundamentally defective and unable to accomplish its intended purpose of providing protection for human health and the environment.

In summary, The Pollution Probe Foundation has concluded the RRT is substantially inadequate in the following respects:

1.1. RRT has been developed without an adequate determination of all potential pathways by which the Hyde Park chemicals may eventually reach the the Niagara River. The data on which the RRT is based are severely flawed and insufficient, and all subsequent modelling based on this data, however sophisticated, is likewise suspect. In particular the data base fails to establish preferential pathways by which chemicals are or will eventually travel to the River. Furthermore, the RRT makes no provisions for investigative programmes to determine these pathways.

1.2. Without fully defining all potential pathways to the Niagara River, the Parties cannot demonstrate with any degree of assurance that the measures proposed in the remedial action plan will prevent the chemicals from reaching the River or will protect the environment from endangerment by Hyde Park chemicals;

1.3. Without fully defining all potential pathways by which the chemicals may reach the Niagara River, the monitoring programmes are inadequate and insufficient to assess the effectiveness of the RRT programmes in preventing the chemicals from reaching the River;

1.4. The RRT stipulates chemical and hydrogeological monitoring and analysis techniques which will provide poor data with which to develop and refine groundwater modelling at the site;

1.5. The reassessment provisions of the RRT (10.3 (b),(c)) contemplate that the action levels may be relaxed where it is demonstrated that the Hyde Park chemicals do not exceed or significantly contribute to the total flux from all sources to the river. It is appropriate to take background levels into consideration in any reassessment provisions, but where background levels exceed regulatory standards there is no justification for relaxing action levels. If a change in action levels is justified, high background levels demand that more stringent controls be enforced on the Hyde Park site given the extremely toxic nature of the chemicals put in the site;

1.6. The Source Control provisions of the RRT rely on secondary source control technologies such as bedrock grouting, possibly to the exclusion of excavation. Bedrock grouting is an untested remedy in a NAPL setting (Faust: #71) and may ultimately interfere with excavation;

1.7. The RRT programmes are subject to unjustifiable delays because beginning the investigation, operation and monitoring provisions is contingent upon there being available destruction technologies (incineration). Given the urgency with which the source chemicals and the APL/NAPL plume must be removed from the site, it is incumbent upon the parties to assess interim options for on-site, above ground, safe, inspectable storage.

1.8 In conclusion, it is the recommendation of The Pollution Probe Foundation, that the substantial inadequacies manifest in the Stipulation on Requisite Remedial Technology Programme should result in disapproval and rejection by the Court; or in the alternative, a fact finding hearing should be held to ascertain the validity of the material representations made by the parties.

2.0 OVERVIEW

The Pollution Probe Foundation has been directly involved in this legal case concerning the cleanup of the Hyde Park landfill since 1981, at which time we were afforded amicus curiae status in the case. The legal arguments and affidavits presented in the Amicus Brief of June 30, 1981 continue to have relevance for this Court in determining the adequacy of the RRT as filed, and the Court is referred to that brief.

2.1. In our submission, the substantial inadequacies of the RRT Stipulation have rendered it fundamentally defective and unable to accomplish its intended purpose of providing protection to human health and the environment given the following considerations:

2.1.1 The hazardous wastes contained in Hyde Park are extremely toxic, with tremendous potential for lethal consequences in extremely small doses. The fact that Hyde Park contains an estimated 2000 pounds of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) establishes the necessity for urgent and comprehensive action;

2.1.2 Hyde Park chemicals are regularly leaking into the Niagara River at the gorge-face. Results of the gorge face seep sampling programme conducted by New York State have detected Hyde Park chemicals in significant concentrations. 2,3,7,8-TCDD has been detected during this sampling programme at the gorge face seeps. The evidence is unequivocal that Hyde Park chemicals are entering the Niagara River from the seeps at the gorge face. Furthermore there are good reasons to believe that undetected and unquantified portions of the chemicals reaching the river may be travelling through preferential pathways along vertical stress relief fractures between the gorge face and the Hyde Park landfill;

2.1.3 TCDD and other toxic chemicals are accumulating in the food chain. For example, in 1981, the Ontario Ministry of the Environment placed restrictions on consumption of Lake Ontario trout based on 2,3,7,8-TCDD content. Niagara River sources are known to be the major contributors to dioxin levels in Lake Ontario;

2.1.4 These chemicals are being released to a public water supply and an International body of water. The 1909 Boundary Waters Treaty expressly prohibits pollution of boundary waters causing injury to property or health of persons on either side of the border. Lake Ontario is the source of drinking water for almost four million Canadians.

2.2 It is our submission that the RRT Programme will fail to avert an environmental catastrophe of unprecedented proportions in the Niagara River and Lake Ontario ecosystem. Not only is the Lake Ontario fishery at risk, Lake Ontario is the source of drinking water for almost four million Canadians. It has been estimated that the costs of additional advanced water treatment and lost revenues of the sports and commercial fisheries represents an annual loss to Canadians in the order of \$170 million dollars if the RRT programme allows Hyde Park chemicals to reach the Niagara River. (Ann Sudar: Environment Canada, 1985.)

The extreme urgency of the situation demands that the parties draft a remedial action plan which is supported by a sound and complete data base and which will, without arbitrary and undue delay, guarantee that in perpetuity, Hyde Park chemicals will be prevented from reaching the Niagara River. Therefore, notwithstanding the scope of Court authority, it is our submission that the parties be directed to draft a RRT programme which extends beyond the proposals of the current RRT to include the following additional provisions:

2.2.1 Without delay, the parties shall conduct studies to define all potential pathways by which chemicals may reach the Niagara River. At the gorge face, investigations should begin immediately to determine the extent and character of the rock-tension release area with seismic techniques. Other preferential pathways to the River would be evident from geophysical investigations of the lateral heterogeneity within the bedrock;

2.2.2 Without delay, the parties shall conduct studies to define the extent of the APL plume with geo-electrical and/or other geophysical investigation techniques;

2.2.3 Without delay, the parties shall conduct investigations to define the full extent of the NAPL plume into and below the Deep formations;

2.2.4 The parties shall define specific sampling and analytical protocols based on sound scientific principles to apply to all components of the RRT programme;

2.2.5 Without delay the parties shall conduct the necessary investigations to determine the present position of the NAPL/APL within the landfill (for instance from well points installed within the landfill as was done in a dioxin site in Hamburg, West Germany site), their properties (including density, viscosity and chemical analysis), and the development of these parameters under the influence of rain, flow, mixing and settlement etc, and finally determination of the vertical and horizontal permeabilities in the landfill. Based on this information the parties shall be required to conduct further studies with respect to the excavation option.

3.0 DATA BASE AND MODELLING

RRT has been developed without an adequate determination of all potential pathways by which the Hyde Park chemicals may eventually reach the the Niagara River. The data on which the RRT is based is severely flawed and insufficient and all subsequent modelling, however sophisticated, is likewise suspect. In particular the data base fails to establish preferential pathways by which chemicals would eventually travel to the River. Furthermore, the RRT makes no provisions for investigative programmes to determine these pathways.

Without fully defining all potential pathways to the Niagara River, the Parties cannot demonstrate with any degree of assurance that the measures proposed in the remedial action plan will prevent the chemicals from reaching the River or will protect the environment from endangerment by Hyde Park chemicals;

Without fully defining all potential pathways by which the chemicals may reach the Niagara River, the monitoring programmes are inadequate and insufficient to assess the effectiveness of the RRT programmes in preventing the chemicals from reaching the River.

The RRT stipulates chemical and hydrogeological monitoring and analysis techniques which will provide poor data with which to develop and refine groundwater modelling at the site.

3.1 There is limited data for the immediate Hyde Park area with which to assess the groundwater flow system. Without reliable data, it is not possible to determine the effectiveness of the remedial technologies which have been proposed. Nor is it possible to use computer modelling of the Hyde Park System to determine whether or not RRT programmes developed in the future will be able to be evaluated with confidence. Furthermore, an improvement in model calibration cannot be obtained unless the

hydrogeologic data base of the site is substantially increased to encompass the entire domain being considered.

At present, all computer modelling, regardless of its sophistication is based on only twelve control points, encompassing less than 10% on the region modelled.

In our submission, the groundwater data base is substantially inadequate in the following respects:

3.1.1 There is insufficient data from the aquifer survey studies and previous studies to permit a proper analysis or modelling of the groundwater flow system beneath the Lockport Dolomite. To date, there have been no investigations below the Lockport Dolomite on which to base any modelling for the Intermediate and Deep Formations. Any predictions as the the hydraulic character of these formations is hypothetical.

3.1.2 The 1983 Aquifer Testing Programme did not enhance the earlier predictions of the ground water flow analysis.

3.1.3 The pump tests performed by CRA in October and November 1983 were conducted for the purpose of determining the location and hydraulic characteristics in the Lockport Dolomite. However the methodology utilized in these tests rendered it impossible to fulfill these objectives. Because pumping tests were performed in holes open over the entire depth of the Lockport Dolomite only very crude estimates can be made of the overall hydraulic properties of the entire Lockport Dolomite thickness. Therefore despite the fact that RRT has been developed based on a seven layer simulation model for the Lockport Dolomite, the data base is not sufficiently detailed to achieve a realistic model.

The determination of hydraulic conductivity, transmissivity and storativity can be misleading if averaged over the entire

thickness in this type of bedrock. In order to gain a better understanding of the hydraulic connections, the individual water-bearing zones must be isolated and pumped separately.

There are also problems with the data because the pumping tests were performed too soon after each other to allow the groundwater system to return to equilibrium. The water level data are the critical data required for a proper analysis of the hydraulic parameters. In these cases, the water level changes due to pumping cannot be separated from other factors affecting the water level variations and therefore the data cannot be properly interpreted.

Finally, water levels in the pumping wells may not be representative of the water levels in the formation as a whole. This could have serious detrimental consequences in a purge well system in that the APL and NAPL plume flow pathways could easily bypass a purge well system. (Gartner-Lee Associates 1983, 1984)

3.2 In order to overcome the substantial inadequacies of the Hyde Park data, the RRT should stipulate a series of tests be conducted based on sound scientific principles including the following:

3.2.1 Multi-level installations must be installed to characterize ground water movement in each water bearing zone from the surface to below the Niagara River;

3.2.2 The RRT should require that there be hydraulic parameter testing to determine transmissivity, permeability, storativity, and porosity;

3.2.3 In regards to 2 above, tracer test must be carried out to determine field scale porosity.

3.3 It is accepted that the bedrock underlying Hyde Park is a

very heterogenous region with macrofeatures which may provide preferential pathways by which chemicals may reach the river. The possibility of preferential pathways for chemical migration in the bedrock renders the modelling efforts substantially inadequate in that there are absolutely no data on preferential pathways with which to predict the behaviour of the system before and after implementation of the RRT programmes.

It is also accepted that at the gorge face and moving back from the gorge towards Hyde Park, the bedrock will have vertical fractures through the Rochester Shale. These vertical fractures occur when the subsurface tension of the bedrock is released because of the closeness to the gorge face. The region in which these cracks exist is called the rock-tension release zone. Wherever these vertical fractures exist, there is the possibility that the chemicals will move vertically through the Rochester Shale, and it would be possible for fluids to be discharged through the interlayered sandstone sequence underlying the Rochester Shale. If this were the case, the discharge to the River would not be noticed on the cliff face.

3.4 The RRT, as proposed, makes no allowance for determining whether or not these potential pathways contribute to the flux of Hyde Park chemicals to the River. Furthermore, there is no agreement as to exactly how far back from the gorge face the rock-tension release zone extends. Available data suggests that it may extend inland about 2000 feet from the Niagara Gorge to the Hyde Park Landfill (Johnston - Bulletin G.W.- 53, 1964. cited in Gartner-Lee Associates: Hyde Park Landfill - Hydrogeological Review - Final Report (May 1983))

In order to investigate this possibility, the RRT should provide for the following investigations:

3.4.1 Full literature review and assessment of the reports by engineering geologists during the construction of the buried

conduits (about 3000 feet east of the gorge) for evidence of jointing and changes in density of jointing.

3.4.2 A number of boreholes should be drilled into the Rochester Shale and logged with a number of geophysical tools, in particular the sonic or acoustic device. These measurements would be completed by fluid flow tests. Since the tension relief jointing may decrease in a direction away from the gorge, the boreholes should be on a line perpendicular to the edge of the gorge. The described logging will provide proper information on the possibility of fluid transmission through the Rochester Shale and on the influence of distance to the cliff.

3.4.3 Angled boreholes should be used in the Intermediate Deep Formations Study to collect information on the fracturing.

3.5 These substantial inadequacies in the data base undermine the reliability of the predictions on which the following aspects of the RRT are based:

3.5.1 The location, operation and monitoring of the APL plume containment system. Without more adequate data it is impossible to determine whether or not the pumping figure of 15 gpm maximum will effectively pump the APL plume. Furthermore, the monitoring wells in the APL plume programme will provide inconclusive evidence that the purge wells have achieved convergence, bearing in mind that the monitoring wells have been placed adjacent to the APL purge wells and not between the purge wells and the gorge face.

3.5.2 The location, operation and monitoring of the recirculation wells. The recirculation system is based on the practice of waterflooding which is accepted practice in the oil industry. Dr. Faust admitted at the Bedrock Remedies public meeting that this technique has only been applied with NAPL of lower density and viscosity than water. The NAPL at the site is

more dense and more viscous than water. Because of this, waterflooding may be less effective than expected, and modelling predictions must be adjusted to reflect this difference.

3.5.3 The location of the Flux Monitoring Wells. It must be remembered that the Flux Monitoring programme is the critical defence against Hyde Park chemicals reaching the Niagara River. It is absolutely essential that the Flux Monitoring wells be located to address every potential pathway to the River, otherwise the flux levels which are calculated based on the ground water flow and the chemical concentration will underestimate the chemical flux to the River.

Given that the data are inadequate to assess the groundwater flow and that there have been no investigations to identify the possible preferential pathways, the proposed location and number of Flux Monitoring wells is without scientific basis and therefore insufficient. The arbitrariness of the Flux Monitoring programme affects the Reassessment provisions of the RRT and undermines the assertion of the parties that the RRT is flexible enough to be adapted based on the monitored performance of the individual remedial programmes.

3.5.4 Regarding the location, operation and monitoring of the NAPL plume containment system, there are no provisions in the current RRT to add new wells if the NAPL plume moves. The visual and olfactory identification of NAPL is purely subjective and should be replaced by chemical analysis conducted in an onsite laboratory capable of quick turn-around time for water and soil analysis. Furthermore, this method of NAPL determination will subject individual workers to unconscionable risks given the extremely toxic nature of the Hyde Park chemicals.

3.5.5 The location, operation and monitoring of the Intermediate and Deep Formation study wells. In our submission the proposed investigations will be insufficient to characterize

the hydrogeological character of the Intermediate and Deep formations. The parties should conduct Tritium tests to give an indication of the hydraulic connections to the surface. The Deep Formation Study should be mandatory and not contingent upon the flux monitoring results or the detection of chemicals in the Intermediate formation. The RRT should have as one of its highest priorities the determination of the full extent of the APL/NAPL plume.

3.6 Given the potentially devastating consequences of inadequate RRT at the Hyde Park site, any modelling which is performed to evaluate the monitoring and remedial activities must combine scientifically sound field data with computer simulations which take into account a **worst case study** and a sensitivity analysis for:

3.6.1 The migration of the APL and NAPL from the landfill site which would occur without the application of RRT;

3.6.2 The migration of the APL and NAPL with the intended RRT;

3.6.2 The migration of APL and NAPL plumes with more extensive RRT activity than was contemplated in 3.6.2.

With such a modelling analysis, it would be clear whether or not the RRT as proposed could be expected to make a significant or insignificant impact on the site. As well, the analysis would provide some standards against which to evaluate the efficacy of the proposed RRT programme.

4.0 REASSESSMENT PROVISIONS

The reassessment provisions of the RRT (10.3 (b),(c)) contemplate that the action levels may be relaxed where it is demonstrated that the Hyde Park chemicals do not exceed or significantly contribute to the total flux from all sources to the river. It is appropriate to take background levels into consideration in any reassessment provisions, but where background levels exceed regulatory standards there is no justification for relaxing action levels. If a change in action levels is justified, high background levels demand that more stringent controls be enforced on the Hyde Park site given the extremely toxic nature of the chemicals put in the site;

4.1 This means that as long as the loading from Hyde Park is less than that from all other sources into the River, no further action is required by the parties. This is a license to continue to pollute the River if it is polluted already.

It is appropriate to take background levels into consideration in any reassessment provisions, but where background levels exceed standards there is no justification for relaxing action levels. If a change in action levels is justified, high background levels demand that more stringent controls be enforced on the Hyde Park site given the extremely toxic nature of the chemicals in the site.

4.2 Reassessment at the gorge face is dependant on measurements taken primarily at the three flux monitoring wells and two APL plume purge wells. It is questionable whether five monitoring wells could adequately characterise the non-point source loading to the river along the 6000 foot stretch of gorge face.

4.3 If pumping from the bedrock formations is contemplated as RRT, then a commitment to perpetual operation, maintenance and monitoring will be required. This is especially the case given that those wastes which were stored in drums may not begin

migrating from the site until after the thirty-five year operation period contemplated in the RRT has expired. It must be recognized now that as long as the source of contaminants is left in place, the chemicals will continue to leach into the underlying bedrock. Therefore, the application of any of the reassessment provisions to terminate or relax any of the conditions of an RRT programme will be contrary to the purpose of the programme, which is to protect human health and the environment for as long as wastes remain on the site.

4.4 The five year reporting period contemplated in the reassessment provisions is too long in order to assess the performance of an RRT programme. The reporting frequency should be annual for the first five years of the programme and adjusted appropriately when each programme has stabilized.

5.0 EXCAVATION AS A SOURCE REMOVAL OPTION

The Source Control provisions of the RRT rely on secondary source control technologies such as bedrock grouting, possibly to the exclusion of excavation. Bedrock grouting is an untested remedy in a NAPL setting (Faust: #71) and may ultimately interfere with excavation.

The Pollution Probe Foundation has argued consistently for the removal of the source chemicals at Hyde Park. If the source is not removed, the remedial programme will have to operate in perpetuity. This is especially the case given that those wastes which were stored in drums may not begin migrating from the site until after the thirty-five year operation period contemplated in the RRT has expired.

5.1 The OCC assessment of excavation is inadequate. The cost estimates provided in the report express enormous uncertainties with regard to the techniques being considered for treatment, disposal and workplace safety. The choice of techniques will refinement of associated costs is essential to provide an adequate assessment of the excavation option.

Furthermore, the excavation report is inadequate in that it fails to consider the following techniques and options as part of the excavation programme for source control:

5.1.1 a detailed investigation of the historical development of the landfill to determine the locations of potential hotspots within the landfill (particularly the locations of NAPL, APL and drummed and bulked solid chemical wastes), stages of dumping, locations of drummed and/or bulked hazardous chemical wastes as opposed to non-hazardous wastes, the location of historical roadways in the landfill etc.;

5.1.2 the option of partial excavation of, for example,

hotspots within the landfill, particularly of full and partially full drums;

5.1.3 the possible use of a moveable cover over small areas of the landfill in a progressive excavation of the site;

5.1.4 the use of over-pressurized cabins for workers which would ensure that workers are not directly exposed to hazardous contaminants while operating under a moveable cover;

5.1.5 the use of excavation apparatus which can be controlled from a distance such as would be possible with the use of robotics;

5.1.6 the possibility of dredging a part of the wastes as a slurry through the addition of water or chemicals in order to reduce the hazards of dust emissions during excavation;

5.1.7 the possibility of heating NAPL found within the site and the impact of heating NAPL on the process dynamics of the extraction technology.

5.2 Although excavation of the source is the only sure method of eliminating the migration of the Hyde Park chemicals from the site to the bedrock, the Stipulation at section 2.3.B.2. contemplates that OCC may be excused from undertaking excavation. If OCC has been required to undertake a grouting programme, then OCC would not be required to undertake even an assessment of excavation unless there was substantial failure to meet the monitoring criteria. The time to begin an assessment of excavation is not when there has been a substantial failure to meet the monitoring criteria. At that time it is too late and excavation should be mandatory, not discretionary because it would be unconscionable to continue to permit migration of chemicals from the site.

6.0 ONSITE STORAGE

The RRT programmes are subject to unjustifiable delays because beginning the investigation, operation and monitoring provisions is contingent upon there being available destruction technologies (incineration). Given the urgency with which the source chemicals and the APL/NAPL plume must be removed from the site, it is incumbent upon the parties to assess interim options for on-site, above ground, safe, inspectable storage.

The RRT contemplates that the programme for bedrock investigation, source removal and APL/NAPL plume remediation would be delayed until a destruction facility is available. Interim storage of the wastes should be considered at this site.

For example, the wastes might be stored in large containers in a tank farm or smaller containers in a warehouse. These storage facilities should be above ground with the outer walls and floor able to be visually inspected. Assuming that the wastes have a density 20% greater than water, Faust estimates that the volume of wastes would fill a tank over three feet high covering 15 acres (Faust: #45). It is not at all uncommon in the petrochemical industry for tank farms to cover larger areas.

6.0 CONCLUSIONS

In conclusion, it is the recommendation of The Pollution Probe Foundation, that the substantial inadequacies manifest in the Stipulation on Requisite Remedial Technology Programme should result in disapproval and rejection by the Court; or in the alternative, a fact finding hearing should be held to ascertain the validity of the material representations made by the parties.