Public Health Assessment for

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YAWORSKI LAGOON NPL SITE

TOWN OF CANTERBURY, WINDHAM COUNTY, CONNECTICUT

CERCLIS NO. CTD009774969

APRIL 5, 1988

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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SUMMARY

The Yaworski NPL site is situated in a meander loop and floodplain of the Quinebaug River in Windham county in the Town of Canterbury, Connecticut. The site groundwater is heavily contaminated with volatile organic compounds and heavy metals and is unfit for human consumption. The nearest residence that uses groundwater is 1,600 feet upgradient from the site and across the Quinebaug River. No downgradient public well fields or water intakes ere identified within three miles of the site. At the present, there does not appear to be any potential human exposure to the contaminated groundwater due to groundwater flow conditions, and the site is not likely to be developed. EPA target clean-up levels were proposed for consumptive use of the groundwater by the public if the site were developed. The primary potential exposure pathway is ingestion of contaminated groundwater if the aquifer around the site is developed.

BACKGROUND

The Yaworski NPL site is located in Eastern Connecticut in Canterbury Township of Windham County. The Connecticut Turnpike skirts Plainfield, the nearest Town, about three miles to the east. The Yaworski site is situated within a meander loop on the floodplain of the Quinebaug River. The site is not fenced and consists of a dewatered and backfilled lagoon (approx. 300' by 700') that had been used for industrial liquid and sludge waste disposal. The northeast end of the lagoon dike lies within 30 to 40 feet of the Quinebaug River. To the east and south, most of the adjacent floodplain is cultivated open fields; the remainder consists of wetland and riparian areas. The former is generally open meadow north of the lagoon, becoming more heavily vegetated with trees to the south and west. On the southern end of the site is an agricultural area that was used for corn silage production. Beyond the corn field is another active mixed-use landfill that is not considered a part of this site.

Approximately 50,000 barrels of waste material were dumped into the lagoon during its operating life. The lagoon contains approximately 76,000 cubic yards of both waste and backfilling materials, including a variety of liquid wastes, rags, organic solvents, paint, and textile dye pigments. Flammable liquid waste was burned in several pits in the lagoon area, but this practice was discontinued due to public complaints. In 1973, waste dumping in the lagoon was terminated. In 1982, the lagoon was closed in accordance with an engineering plan. Liquid from the lagoon was pumped out and discharged onto the ground into waste and native soils were mounded on top to promote drainage away from the lagoon area. A draft remedial investigation (RI/FS) study was issued in July 1987; this Health Assessment (HA) is being performed in connection with a forthcoming record of Decision (ROD) on the site.

The site lies within the 100 year floodplain of the Quinebaug River. The groundwater is classed for industrial use only. The Federal Emergency Management Agency (FEMA) designated the area as a "special flood hazard area." Construction activities must be approved by the Canterbury Inland Wetland Commission. Presently, residential development within the 100 year floodway appears remote.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

1. Waste/liquid lagoon monitoring results (see Appendix, Table 1.)

2. Groundwater contamination (See Table below).

GROUNDWATER CONTAMINANT CONCENTRATIONS

CHEMICAL	MIN-MAX CONCENTRATION (ug/l)		
Benzene	ND	-	4,400
Hexachlorobenzene	ND	-	54
1,1,1-trichloroethane	ND	-	1,400
Tetrachloroethene	ND	-	4,700
Trichloroethene	ND	-	78
1,1-dichloroethene	ND	-	100
Chloroform	ND	-	130
Methylene Chloride	ND	-	675
Polynuclear Aromatic Hydrocarbons	ND	-	84
Cadmium	ND	-	21
Nickel	ND	-	56
Hexachlorobutadiene	ND	-	8
Acetone	ND	-	29,000
2-butanone	ND	-	660,000
4-methyl-2-pentanone	ND	-	130,000
Ethylbenzene	ND	-	12,000
Toluene	ND	-	9,600
Total Xylenes	ND	-	68,000
Chlorobenzene	ND	-	19,000
1,2-dichloroethane	ND	-	1,900
Lead	ND	-	200

ND-Not Detected

B. OFF-SITE CONTAMINATION

The Yaworski Lagoon caused some contamination to the wetlands, the Quinebaug River, sediments, and surface waters. Analysis of groundwater, soils, and surface water from the agricultural area were not included in the July 1987 RI.

C. PHYSICAL HAZARDS

None known at this time.

DEMOGRAPHICS

The Yaworski site is located in the Town of Canterbury in east-central Connecticut. Canterbury is situated approximately 13 miles Northeast of Norwich, Connecticut, and approximately 30 miles west of Providence, Rhode Island. The population of Canterbury was 3,300 in 1980 according to US Census Bureau figures.

Although the site is in the Town of Canterbury, the nearest community is Plainfield, about three miles to the east. Most of the Town of Canterbury and adjacent parts of the Town of

Plainfield are rural land, cultivated fields, and forested areas. The light industry is textile manufacturing and textile-related industries. The majority of land use near the site is agricultural. The field adjoining the lagoon was used for corn production. The nearest residence is approximately 1,600 feet west of the site on the opposite side of the Quinebaug River.

EVALUATION

A. SITE CHARACTERIZATION

The overall site appears to be adequately characterized except for the agricultural field in close proximity to the Lagoon. Since the field was used in the past for corn production in feeding chickens, soil and groundwater information in this area is needed. Further characterization of the wetland area is also necessary to adequately assess the effects of cadmium and lead on consumable aquatic organisms. Cadmium and lead were chosen because cadmium has a high tendency to bioaccumulate in aquatic organisms and the lead values exceed the EPA proposed MCL. Lead can also bioaccumulate in aquatic organisms. The focus should be on potential foodchain contamination.

Target groundwater clean-up levels were developed in the July 1987 feasibility study. The target clean-up levels consisted of MCLs, proposed MCLs, proposed MCLGs, and risk calculations for carcinogenic and non-carcinogenic compounds. The proposed target clean-up levels appear appropriate to protect the public health except for cadmium and lead. Remedial measures involved five source control alternatives and four mitigation of migration alternatives. All final alternatives except the minimal/no action alternatives appear viable for long term protection of public health.

1. Environmental Media

The RI conducted air, hydrologic, geologic, and benthic investigations. Sampling efforts were concentrated on groundwater, surface water, sediments of the Quinebaug River, soil sampling in the former dewatering area and the former lagoon. A wetland assessment (see Appendix, Table 2) was also done for the surface waters. Although qualitative information was available for the wetland Quinebaug River sediments, quantitative data were not available for review.

2. Land Use and Demographics

Data were not available for the number of residences and businesses within one mile of the site. This Health Assessment is based on the site being remediated or remaining undeveloped.

3. Quality Assurance/Quality Control (QA/QC)

This Health Assessment was based on compiled data in the 1986 RI, and the 187 RI/F. This assumes that the samples ere handled properly and the analytical data provided by the laboratories is correct. Insufficient information was available on QA/QC to further comment on the validity of the previous groundwater sampling in the earlier RI and CLP results for the agricultural area were not available. Samples for dioxin analysis were taken but the data were not available for this Health Assessment.

B. **ENVIRONMENTAL PATHWAYS**

1. Air

Results of air sampling taken in 1983 when a part of the lagoon was uncovered showed some contamination with volatile organics in trace amounts. These levels were below the recommended American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV) and time-weighted average values (TWA). Since 1983, the lagoon has been covered. Additional air samples were taken in 1986. ATSDR was notified verbally that these sample results were also below the guideline values.

2. Quinebaug River surface water

Upstream and downstream sample analytical data indicate that the lagoon site may be contributing some copper, mercury, and zinc to the river (see Appendix, Table 3).

3. Wetland surface water

Cadmium, chromium(VI), copper and lead (see Appendix, Table 2) were present in the wetland surface water with values at or below the MCL/PMCL. Zinc with maximum concentration of 30690 ug/l, is above the secondary MCL (SMCL) of 5000 ug/l and the AWQC (for humans) of 5000 ug/l. There appears to be a combination of potential pathways for this contamination:

a. Desorption of inorganics from wetland sediments: The level of inorganics in wetland sediments are greater than river sediments. However, the rate of desorption/dissolution from sediment to surface water is not known and, therefore, the contribution from sediment is difficult to assess.

b. Discharge of contaminated groundwater to wetland: This pathway was probably not significant. Lower levels of inorganic contaminants were found in shallow groundwater than in the wetland surface waters.

c. Leachate flow, erosion of leachate seep sediments, and desorption from seep sediments to surface waters: This pathway is thought to be the likely source because physical drainage pathways from the site to the wetlands were documented when the lagoon was pumped before closing. Leachate seeps are also known to occur.

d. Another potential source is the filled meadow northwest of the wetland: The area is unknown in terms of nature and extent of fill and cannot be addressed.

e. Flooding: The site is located within the 100 year floodplain. The possibility of surface water and soil contamination from Lagoon leakages during a flood event does exist. However, the extent and magnitude of contamination would be difficult to predict or characterize.

4. Groundwater

The groundwater at the site is unfit for human consumption. Sampling and analysis of 25 on-site groundwater monitoring wells revealed heavy contamination by volatile organics and some inorganic compounds. The levels of these volatile organics are sufficiently high to pose a threat to human health should this groundwater be used for potable purposes. The groundwater in the site area generally flows to the Quinebaug River. The groundwater has a low horizontal flow rate because of aquifer conductivity, and area of discharge. No public well fields are downgradient of the site for at least three miles and no water intakes were identified within three miles of the site. Residential wells are located on topographic highs on either side of the river. Contaminants are not likely to migrate to these areas because of groundwater flow conditions. Monitoring wells indicate that contaminants will not be transported beneath the river to residential wells via a bedrock migration path. Under present site conditions, exposure from groundwater use does not appear to occur. Residential wells within one-half mile of the site should be sampled to confirm this.

5. Soil/sediment

There appears to be some contamination by PCBs and PAHs of some soil/sediment samples. These contaminants were not widely distributed on the site and were in maximum concentrations of 4.37 ppm (soils) for PCBs and 3.8 ppm (sediments) for PAHs. The mobility of PAHs and PCBs in soil is very limited.

6. Leachate seeps

After heavy rainfalls, numerous leachate seeps from the diked lagoon were documented. An environmental exposure route may occur from seep water and affected sediment samples. Data was not available to determine the effects of leachate seeps on the cornfield next to the Lagoon.

C. HUMAN EXPOSURE PATHWAYS

1. Inhalation

Air samples taken in 1983 at the site revealed contamination by volatile organics to be below the ACGI TLV/TWA guidelines. An evaluation of the data for the inhalation of fugitive dust from the contaminated site suggests that this does not pose a human health risk.

2. Ingestion of Quinebaug River surface water

The ingestion of river water does not appear to be a significant contributor of contaminant exposure to human receptors. All indicator sample values (see Appendix, Table 3) were below the PMCL/SMCL/MCL levels for drinking water and ambient water quality criteria (AWQC[Human]). The mercury value which exceeded the AWOC [Human] was an estimate and was based on one sample. Further sampling is required to adequately characterize the Quinebaug River.

3. Ingestion of wetland surface water

All sample values were at or below the MCL/PMCL and AWQC (human)except zinc which exceeded a secondary MCL. This method of exposure is very unlikely due to the amount of algae in the water. This water is not normally used for human consumption without treatment.

4. Ingestion of groundwater

Presently, the site aquifer is not used for human consumption. The designated use of the aquifer was classified by the State as GB or "industrial, process water and cooling waters." It is not suitable for direct human consumption without treatment.

5. Ingestion of soil/sediment

The possibility appears very remote. The site is not in a populated area and is bounded by the Quinebaug River, an agricultural area, and wetlands. It is located in a 100 year floodplain, and very little possibility exists for development of the area.

6. Ingestion of fish that accumulate chemicals in the wetland area

The ingestion of fish is a possible mechanism of human exposure to chemicals in the wetland area since the area is used for fishing. No data on fish bioassays were available. The extent and degree of fishing are not known.

7. Dermal contact with surface soil/sediment/or surface water

A review of the indicator chemicals in the surface soil/sediments/and surface water suggests that these routes of exposure pose a minimal risk to human health.

8. Ingestion of agricultural products, and poultry from the adjacent cornfield

It is not known at this time if corn grown and used for poultry feed is contaminated by the groundwater or the soil.

9. Leachate seeps

Teenagers who trespass on the site are expected to be potential receptors. Exposed arms and legs represent the surface area exposed for direct contact with seep water and sediments. This type of exposure appears to present minimal risk to human health.

PUBLIC HEALTH IMPLICATIONS

A. Site access under present conditions:

Currently, access to the site is not restricted and recreational activities such as hunting and fishing are possible.

B. Exposures to on-site surface soil:

Exposures to the concentrations of contaminants, including Polychlorinated Biphenyls (PCB's) and Polyaromatic Hydrocarbons (PAH's), present in o-site surface soil pose minimal threat to public health.

C. Exposure to leachate seeps and sediments, and wetland surface water and sediments:

1. Leachate

Contaminants in the leachate seeps and sediments are present at levels which will not pose a threat to human health.

2. Wetlands

Cadmium, chromium VI and copper are present in the wetland surface water at levels which will not cause adverse health effects. Although this is also the case for lead, the maximum concentration of lead detected in the wetland surface water was 47 ug/l, which is approaching the current Maximum Contaminant Level (MCL=50 ug/l) and exceeds the Proposed Maximum Contaminant level (PMCL= 20 ug/l). The ambient water quality criterion for lead is 50 ug/l. Since recent research has documented toxicity resulting from levels of lead lower than the MCL, ingestion of untreated wetland surface water over a long period of time may pose a potential health threat. The concentration of zinc in the wetland surface water was 30,690 ug/l (30.69 mg/l). Water containing zinc at 40 mg/l produced irritability, muscular stiffness and pain, loss of appetite and nausea in two adults in a study by the National academy of Sciences (Ref. 5). The high algae content of the wetland surface water and its disagreeable taste (the Secondary Maximum Contaminant level (SMCL) for Zinc is 5 mg/l) will probably prevent consumption in quantities sufficient to cause adverse health effects.

Two species of consumable fish (Rainbow Trout and Bluegill), are capable of bioaccumulation of several of the above mentioned metals (Ref. 1). Bioconcentration factors for cadmium, lead and chromium VI in these fish species ranged from 2.8 to 540, which implies that biomagnification is a possibility. Adequate data on the levels of these contaminants in fish, the degree of fishing and the human population targeted for consumption, are unavailable. A judgment on the potential adverse health effects through consumption of contaminated fish from the wetland surface waters therefore cannot be made.

D. Cornfield:

The production of corn for silage has been discontinued this year. However, since the permission to extend the existing active landfill, located southeast of the site into the former cornfield, is still pending, the area may still be used for its original purpose. Although sampling of the soil on this field has not been performed, it may be expected that several contaminants, including cadmium, can potentially migrate to the cornfield through surface runoff and leachate seeps from the former lagoon according to a surface water drainage map by the NUS Corporation (Ref.1) and bioaccumulate in the corn. Bioaccumulation in the roots and tops of corn has been documented, but data on bioconcentration in the ear only (the part that is fed to the chickens) has not been reported (Ref. 6). An assessment of the adverse health effects from the consumption

of potentially contaminated poultry can not be performed, because of the lack of information, such as the extent of bioaccumulation in the chicken, the dose received by the chicken, the number of chickens and the human population "exposed."

E. Exposure to the Quinebaug River:

The concentration of mercury in the Quinebaug River was estimated at 0.46 ug/l. For the protection of human health from the toxic properties of mercury ingested through water and contaminated aquatic organisms, the Ambient Water Quality criterium (AWQC) is 144 ug/l (0.144 ug/l). Although the reported value exceeds the AWQC, the fact that it is an estimate and that this was the only result documented, does not justify a judgement of the effects on public health. Information on recreational activities associated with this body of surface water (i.e., fishing, swimming) is needed to determine if foodchain contamination and direct dermal contact are potential routes of exposure.

F. Potential adverse health effects from ingestion of on-site groundwater in its current state of contamination:

The on-site groundwater is heavily contaminated with organics as well as several inorganic compounds. The groundwater in its present state is unfit for human consumption. Exposure to these concentrations may lead to acute and chronic adverse health effects, including an increased lifetime cancer risk.

G. The proposed groundwater clean-up target levels:

The proposed groundwater cleanup levels for cadmium and lead are at their respective MCLs (10 ug/l and 50 ug/l respectively). However, cleanup to the respective lifetime health advisory levels (LTHA Cd: 5 ug/l; Pb: 20 ug/l) of these contaminants should be considered since toxicity caused by levels lower than the MCLs for both cadmium and lead are currently being cited with increasing frequency in the literature.

CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. The Yaworski site does not pose a public health threat at this time. The July 1987 remedial investigation presented an assessment of current risk to the public health associated with hazardous substances at the Yaworski site. The ingestion of groundwater in its current state appears to be a potential route of exposure that could pose a threat to public health. The contaminated aquifer is not currently being used for public consumption, therefore, no human receptor exists.

2. The cornfield adjacent to the lagoon could be affected by surface runoff from the lagoon cap. The effects of groundwater in its current state appears to be a potential route of exposure that could pose a threat to public health. The contaminated aquifer is not currently being used for pubic consumption, therefore, no human receptor exists.

3. The cornfield adjacent to the lagoon could be affected by surface runoff from the lagoon cap. The effects of groundwater on the corn is not known. CLP data were not available for soils contamination review.

4. The extent and effect of bioaccumulation of chemical compounds in consumable aquatic organisms is also not known.

5. The potential for aquifer development exists should institutional controls fail.

6. Should aquifer development occur, the proposed target clean-up levels appear appropriate to protect the public health except for cadmium and lead. All final alternatives sin the July, 187 Feasibility Study except the minimal/no action alternatives appear viable for protection of public health.

B. RECOMMENDATIONS

1. Assess the extent of lagoon groundwater contamination (contamination plume) for better definition of vertical gradients and migration pathways.

2. Sample the nearest residential wells within a one-mile radius of the site to insure groundwater contamination of the well has not occurred.

3. Determine the extent of contamination of the Quinebaug river water and sediments to assess potential adverse public health effects.

4. Continue to monitor wetland surface water, since the lead concentration present in this water body exceeds the proposed MCL. Quantitative data on wetland sediments are needed.

5. Sample consumable game fish from the Quinebaug River and the wetlands for analysis of tissue contaminant concentrations, since bioaccumulation may lead to food chain contamination. Although empirical regression equations were presented and used in calculating contaminant levels, field data required to confirm the results. To adequately determine the potential foodchain contamination, information on fishing in the area is also needed.

6. If the cornfield will again be used for its original purpose, characterization of the soil as well as the groundwater of this area is needed. In addition, assessment of the extent of bioaccumulation in the ear of the corn and the chickens is necessary.

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APPENDIX

1. Table 1, Waste/Liquid Lagoon Monitoring Results

2. Table 2, Wetland Area Contaminants and MCL/PMCL/SMCL/AWQC (Human) Values

3. Table 3, Chemical Concentrations-Quinebaug River Surface Waters

TABLE 1

WASTE/LIQUID LAGOON MONITORING RESULTS

Contamination	(ug/l) Highest Concentration
Acetone	450,000
Butanol	310,000
4-methyl-2-pentanome	540,000
2-butanone	10,000,000
Toluene	1,000,000
Ethyl benzene and xylene isomers	3,800,000
Tetrahydrofuran	490,000
Benzene	1,200
Butyl acetate	260
Methyl acetate	1,200
Tetrachloroethylene	260
1,1,1-trichloroethane	1,000
Trichloroethylene	320

TABLE 2

WETLAND AREA CONTAMINANTS AND MCL/PMCL/SMCL/AWQC(HUMAN) VALUES

Contaminant	Max. Concentration in Wetland Surface Waters (ug/l)		MCL/PMCL/SMCL (ug/l)	AWQC (ug/l)
Cadmium	6.6		10 MCL	10
Chromium (VI)	51	(a)	50 MCL	170
Copper	42		No Value	No Value
Lead	47		20 PMCL	50
Zinc	30690	(b)	5000 SMCL	5000

a. Results reported as total chromium
b. Estimated value

TABLE 3

QUINEBAUG RIVER SURFACE WATER-CHEMICAL CONCENTRATIONS
(ug/l)

Chemical	Upstream	Downstream	MCL/PMCL/SMCL	AWQC (Human)
Beryllium	13	-	No Value	No Value
Chromium (VI)	10	17	50 MCL	170
Copper	57	132	No Value	No Value
Lead	2.8	16	20 PMCL	50
Mercury	-	0.46 (a)	2 MCL	0.144
Zinc	135	262	5000 SMCL	5000

a. Estimated value