DARREL A. TALCOTT
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130 S. Leonard St.
West Salem, Wis. 54669
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July 11, 1979

Mr. James Boetcher
Department of Natural Resources
3550 Mormon Coulee Road
La Crosse, Wisconsin 54601

Mr. Gene Mitchel
Department of Natural Resources
Bureau of Waste Management
4610 University Ave.
Madison, Wisconsin 53701

Mr. Alex Cameron
Attorney for Cecil Miller
1206 Caledonia Street
La Crosse, Wisconsin 54601

Re: Groundwater Monitoring-Town of Onalaska Sanitary Landfill

Gentlemen:

Pursuant to instructions from Mr. Roger Cooley of Warzyn Engineering, Inc. to forward as quarterly reports copies to the aforesaid D.N.R. offices and at the specific request of Attorney Cameron, I herewith enclose that portion of a copy of a letter of May 1, 1979 from Warzyn relative to its analytical results of samples obtained in the vicinity of the Town landfill and its conclusions reached therefrom resulting from tests conducted on March 24, 1979 and April 19, 1979. Should you need any further information please feel free to contact me so that I may obtain from Warzyn.

Very truly yours,

Darrel A. Talcott

Darrel A. Talcott
Town Attorney
Town of Onalaska

cc: Angelia Trussoni, Town Clerk
Roger Cooley, Warzyn Engineering, Inc.

WARZYN
ENGINEERING INC

Consulting Engineers • Civil • Structural • Geotechnical • Materials Testing • Soil Borings • Surveying

1409 EMIL STREET, P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

May 1, 1979
C 7606

Mr. Carl Pedretti, Chairman
Town of Onalaska
Town Hall
Route 2
Onalaska, WI 54650

Re: Groundwater Monitoring
Onalaska Sanitary Landfill

Dear Mr. Pedretti:

Please find attached the analytical results of samples obtained in the vicinity of the Town of Onalaska Sanitary Landfill on the dates of March 24, 1979 and April 19, 1979. In addition to the groundwater observation wells at the landfill, samples were also obtained from the following sources: Cecil R. Miller residence (2 wells), an abandoned rendering plant well, Sportsman Club, Fritz residence, Marshall residence, and the Black River. All sampling locations are shown on Drawing C 7606-18.

Per our previous report dated March 23, 1979, we indicated that insufficient data has been available to evaluate possible contamination of the Miller residence water supply well. Our assessment has been hampered by the lack of information of groundwater quality significant distances from the landfill to determine natural (background) concentrations of some parameters. The present monitoring results incorporate our recommendations to sample a larger number of wells in the area and perform additional laboratory testing for comparative purposes to obtain a better indication of the possibility of contamination of the Miller home well without incurring significant additional costs.

Groundwater Flow Directions

Groundwater elevations measured in the observation wells indicate a change in horizontal flow directions between March and April, 1979. In March, because of the relatively lower water level,

the Black River was receiving groundwater discharge from the aquifer resulting in a southwesterly direction of groundwater flow. Associated with the surface water level decline is a somewhat more steep horizontal gradient towards the river. April increases in the water level of the Black River have modified the flow direction to a more southerly orientation with groundwater being recharged through river infiltration. Based on past groundwater measurements, it appears this latter flow pattern is present for most of the year.

Vertical groundwater gradients measured in Wells 2 and 2A indicated slight upward movement with a gradient of 0.003 in March 1979. There was no measurable vertical gradient in April. Previous vertical gradients have been very slightly downward (10^{-3} to 10^{-4}).

With respect to the Miller private wells, both the Miller residence well and the garden well were located directly downgradient of the landfill at the time of the April measurements, however the garden well may be approaching the fringe of possible contaminant flow paths. Data obtained in March, 1979 also indicates both Miller wells were downgradient of the landfill with the home well possibly on the margin of possible contaminant flow path.

Groundwater Quality

Chemical analyses of water samples obtained from the various locations are shown on the attached Data Summaries. To aid in illustrating the trends in the chemical data, the order of presentation has been modified.

Briefly, the main purpose of sampling the Fritz, Marshall and Sportsman's Club wells was to provide better information of natural groundwater quality at depths similar to the Miller residence well. Detailed information in the form of driller's logs is presently not available to document the depths of these private wells. Because of their greater distance from the disposal site, we feel they are more likely to be representative of background concentrations at depth than the upgradient observation wells 1 and 5, located adjacent to the landfill.

If the Town of Onalaska Sanitary Landfill is impacting groundwater quality, the concentrations of the analyzed parameters are likely to be greatest in Wells 2 and 2A located within the waste disposal area. Since contaminants in the groundwater travel in the same direction the groundwater is flowing, we would also anticipate seeing elevated concentrations in downgradient wells 3A and 4 if contamination has occurred.

With respect to the rendering plant well, the data must be reviewed with caution. Because the rendering plant well has been abandoned for some time, we feel the information derived from this well is less reliable than the other wells sampled. As will be discussed later, the Miller wells must also be evaluated in a slightly different light.

In reviewing the water quality data, we find several trends. With respect to dissolved iron concentrations, the data is somewhat erratic between the March and April, 1979 sampling periods. Samples obtained in March show slightly higher iron concentrations in wells located near the disposal site. The Miller wells show no dissolved iron increases compared to the other private wells. In April, all wells sampled, except the Miller garden well, exceed the State of Wisconsin recommended drinking water standard (Chapter NR109, Wisconsin Administrative Code) of 0.3 mg/l. dissolved iron, with no apparent trends in the data. From this information, we conclude that high dissolved iron concentrations appear to be a natural occurrence in this area and are not related to the operation of the disposal site. As indicated in our previous report, high iron concentrations in groundwater are a relatively common occurence in Wisconsin.

Chemical oxygen demand (COD) analyses show no significant trends in the March sampling period. There is some indication of higher COD concentrations in the April data in Wells 2, 2A and 4 located within and immediately down gradient of the landfill. However, concentrations of this parameter in the Miller wells are similar to the other private wells sampled. There is no State of Wisconsin recommended drinking standard for this parameter.

Sulfate and nitrate-nitrogen analyses were performed on the April samples only. For these parameters, we find no trends between the wells sampled. The concentrations of sulfate and nitrate-nitrogen at all sampling locations are well within recommended drinking water standards of 250 mg/l. and 10 mg/l., respectively. Similarly, analysis of the pH for both months show no trends among the wells.

It appears that the water quality in the Miller home well may be affected with respect to the following parameters; conductivity, chloride and total hardness. Conductivity is a general indicator of the amount of dissolved matter in a water sample. Comparison of conductivity and chloride levels measured on each date between the upgradient wells (Fritz, Marshall, Sportsman Club,#1, and#5) and observation wells within and downgradient of the disposal area (#2, #2A, #3A, #4, rendering plant, and Miller wells) show concentration increases in those wells downgradient except for the garden well. A similar, but less significant trend, is also observed with respect to total hardness.

Although conductivity, chloride and total hardness appear to be relatively higher in the Miller home well, the concentrations observed are within acceptable limits. The State of Wisconsin recommended drinking water standard for chloride is 250 mg/l. There are no drinking water standards with respect to conductivity and total hardness.

We find it significant that the water quality data on the Miller home and garden wells are conflicting for those parameters where groundwater contamination near the landfill is apparent. The data indicates elevated conductivity, chloride and total hardness levels in the Miller home well while the Miller garden well shows concentrations similar to the other private wells sampled (Fritz, Marshall and Sportsman's Club). This trend is the opposite of what would be expected.

Mr. Miller has indicated in conversations with us the depths of the home and garden wells to be approximately 63 feet (Elevation 592) and 24 feet (Elevation 626), respectively. We estimate that the water table occurs at a depth of approximately 12 feet below the ground surface at the Miller house (Elevation 644). Generally, the deeper the well is cased, the less likely it is that contamination will occur from a source at the surface, such as a sanitary landfill. Our measurements of vertical groundwater flow directions at the landfill indicate that potential contaminates will not tend to significantly migrate downward in the saturated zone (water table).

Conclusions

From the above information, we conclude that the Town of Onalaska Sanitary Landfill appears to be having an impact on underlying groundwater quality with respect to conductivity, chloride and to a lesser extent, total hardness. The observed concentrations of all parameters analyzed are within current State of Wisconsin drinking water standards, with the exception of dissolved iron, which we attribute to natural groundwater quality.

The Miller residence is located such that during at least portions of the year contaminants derived from the disposal site would tend to migrate in the direction of the Miller wells. It is our opinion that the difference in water quality between the Miller home well and the garden well is probably due to improper construction, deterioration of the well located within the residence or local variation of the water quality.

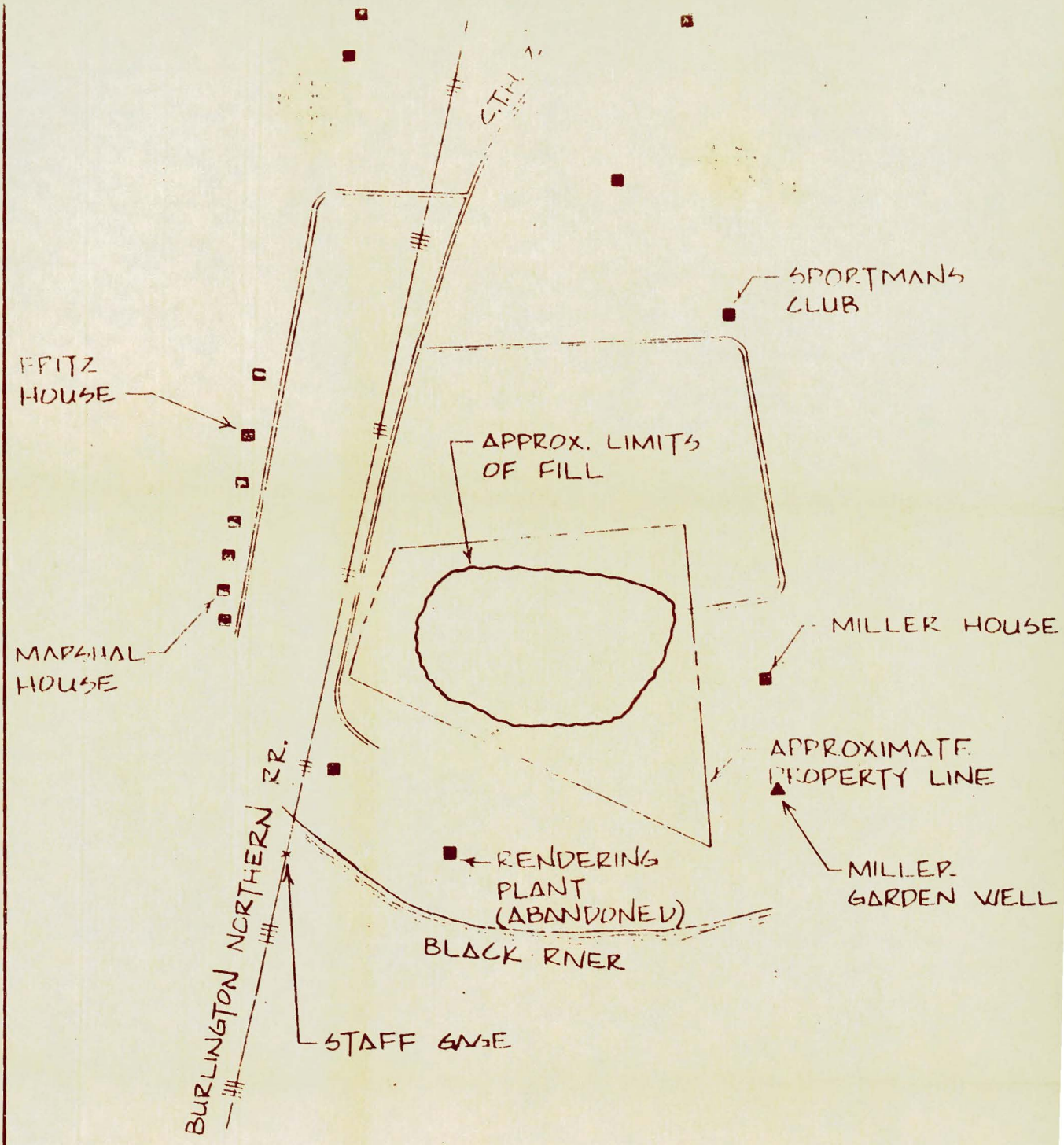
Since the nitrate level in the Miller wells is low, it would appear to indicate that the septic tank system is not contributing to the groundwater quality degradation in the Miller home well.

However, from the information gathered to date, the off-site groundwater flow patterns and groundwater quality data cannot be conclusively assessed. As indicated, some of the data is conflicting.

There appears to be contamination in the deeper on-site well, (2A) which is installed to an approximate elevation of 612 feet. However, based on the very slight vertical gradients in the area and the high permeability of the sandy soils in the area, the contaminants would be expected to remain near the surface. The contamination in this well could be due to an insufficient seal in the monitoring well or several other reasons.

In looking at the elevations of the Miller wells, it would be expected to find contamination in the garden well due to possible landfill related contaminants rather than the home well since the home well is much deeper. However, as noted in the discussion on groundwater flow directions, the garden well may be on the fringe of the flow path of possible contaminants from the landfill for much of the year. Since the groundwater flow system is not defined beyond the site boundaries, it may be that the river has additional affects in that area, therefore, diverting the flow path of any possible contaminants from the landfill around the garden well. It appears that the Miller home well is directly downgradient from any possible landfill contaminants for much of the year.

The Town on Onalaska has indicated to us that the landfill began operation in 1969 and that Mr. Miller did not locate at his present location until some time in 1971. As noted in an earlier report, the construction of the Miller home well is questionable. If the contamination of the Miller home well is due to the landfill, it would most likely be due to an opening in the well casing or some other construction defect.



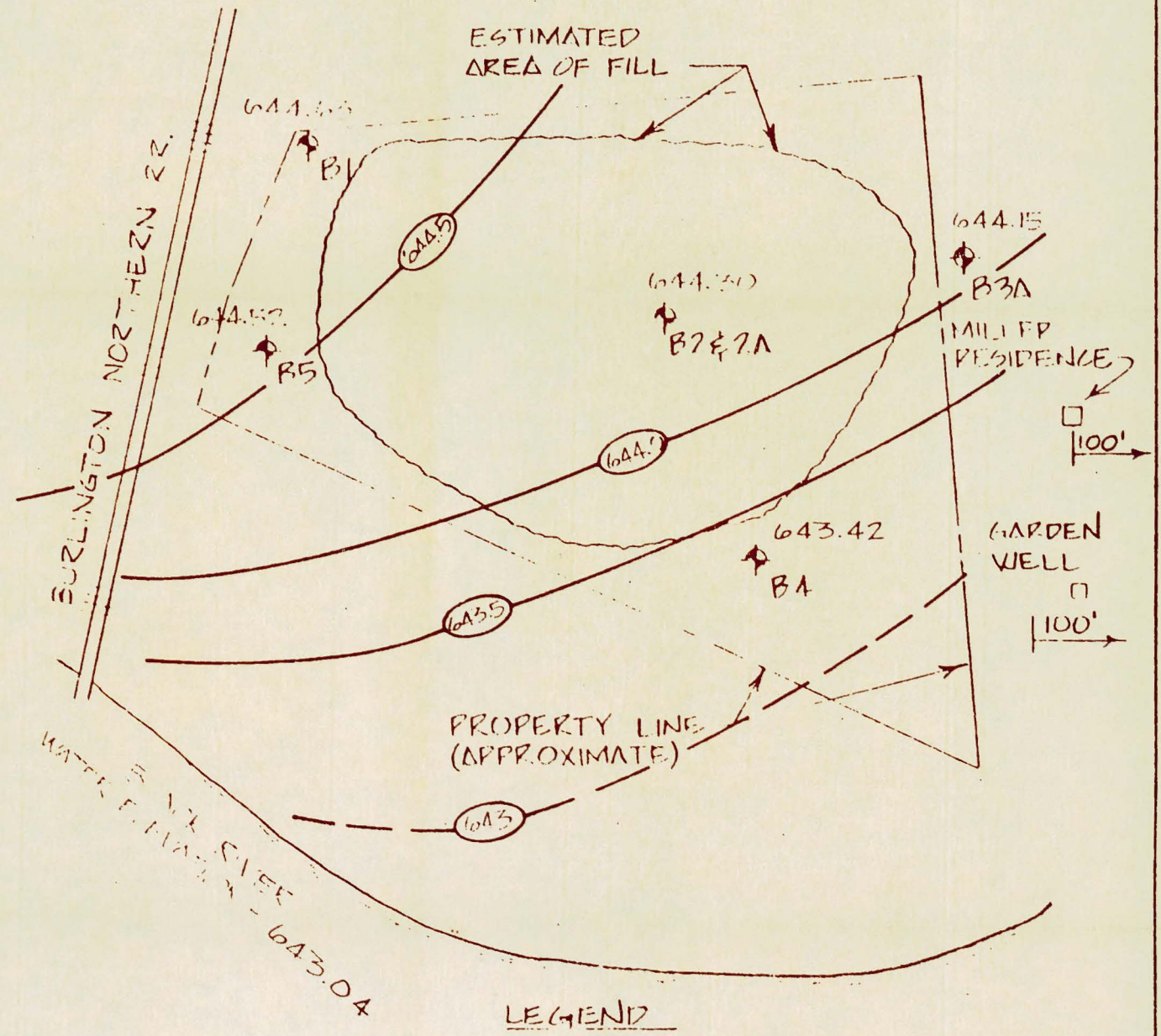
SCALE: 1" = 400'

WARZYN ENGINEERING INC

SAMPLE LOCATION MAP

TOWN OF ONALASKA SANITARY LANDFILL
ONALASKA, WISCONSIN

DWN TDH	CHK'D CGK	APP'D Robert J. Kammerer	DATE 5-1-79	C76056-A1



LEGEND

(640) — GROUNDWATER CONTOUR

DIRECTION OF HORIZONTAL GROUNDWATER FLOW

B4 — GROUNDWATER MONITORING WELL NUMBER & ELEVATION

NORTH

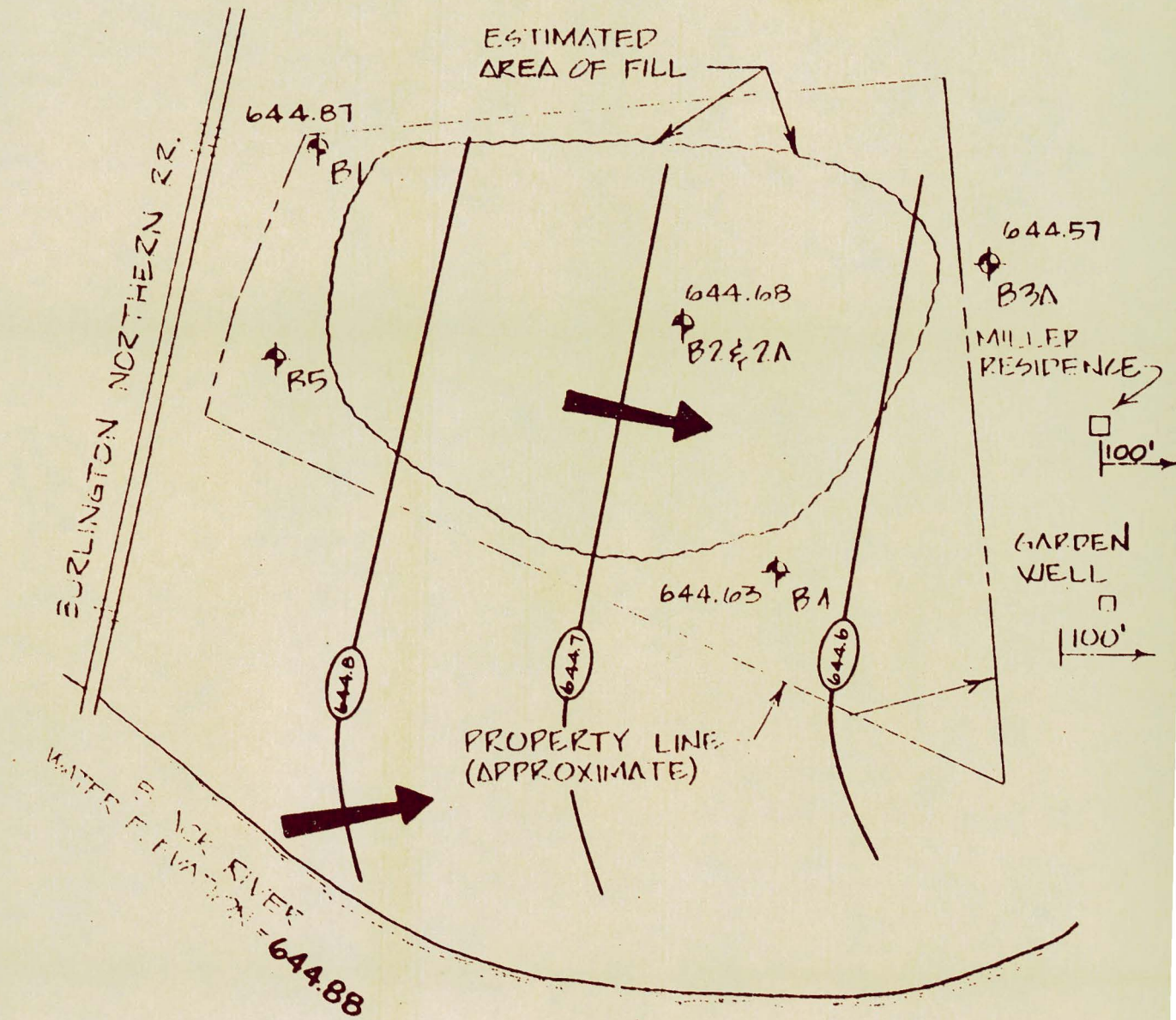
SCALE: 1" = 200'

WARZYN ENGINEERING INC

GROUNDWATER CONTOUR MAP
3/21/79 DATA

TOWN OF ONALASKA SANITARY LANDFILL
ONALASKA, WISCONSIN

DWN TDH	CHK'D CAK	APP'D Robert J. Kammerhuber	DATE 5-1-79	C-1606-A16



WARZYN
ENGINEERING INC

GROUNDWATER CONTOUR MAP
4/19/79 DATA

TOWN OF ONALASKA SANITARY LANDFILL
ONALASKA, WISCONSIN

DWN IDH	CHK'D CGK	APP'D Robert J. Kammer	DATE 5-1-79	C-1606-A17

WATER QUALITY MONITORING RESULTS

DATE OF SAMPLING: 4-19-79

SAMPLE LOCATION	WATER ELEVATION	PARAMETER TESTED: pH	TEMPERATURE °C	CONDUCTIVITY μmhos/cm²	CHLORIDE ppm	COD ppm	DISS. IRON ppm	SULFATE ppm	TOTAL HARDNESS	NITRATE ppm		
Fritz		7.20		260	2.0	56	0.45	1.4	90	0.45		
Marshall		6.90		230	2.0	43	4.17	2.0	104	<0.05		
Sportsman's Club		7.40		230	4.0	35	0.27	12.3	86	0.45		
B-1	644.87	6.40		230	3.0	51	3.97	3.4	124	0.20		
B-5	645.83	6.85		260	6.0	46	0.30	1.4	114	2.55		
B-4	644.63	6.35		490	15.0	313	2.25	< 0.05	174	0.25		
B-2	644.68	6.65		1120	57.0	350	4.49	4.1	292	< 0.05		
B-2A	644.68	6.80		810	54.0	127	0.93	3.0	138	0.45		
B-3A	644.57	6.90		575	24.0	94	0.37	1.4	200	0.30		
Miller Home		6.95		600	41.0	54	0.37	2.5	236	0.35		
Miller Garden		7.80		250	5.0	38	0.17	6.6	94	0.25		

WATER QUALITY DATA
ONALASKA SANITARY LANDFILL
ONALASKA, WI

DWN ktg | CHK'D JAH | APP'D [signature] | DATE 5-1-79 | C-7606M

WARZYN ENGINEERING AND SERVICE COMPANY, INC
Consulting Engineers
WISCONSIN

WATER QUALITY MONITORING RESULTS

DATE OF SAMPLING: 4-19-79

SAMPLE LOCATION	WATER ELEVATION	PARAMETER TESTED: pH	TEMPERATURE °C	CONDUCTIVITY μmhos/cm²	CHLORIDE ppm	COD ppm	DISS. IRON ppm	SULFATE ppm	TOTAL HARDNESS	NITRATE ppm	
Rendering Plant	~645.	7.80		380	47.0	54	1.00	3.4	30	1.10	
Black River	644.88	7.30		85	3.5	39	0.37	5.3	28	0.35	

WATER QUALITY DATA
ONALASKA SANITARY LANDFILL
ONALASKA, WI.

WARZYN ENGINEERING AND SERVICE COMPANY, INC
Consulting Engineers

DWN kto | CHK'D JAH | APP'D | DATE 5/1/79 | C-7606W

WATER QUALITY MONITORING RESULTS

DATE OF SAMPLING: 3-21-79

SAMPLE LOCATION	WATER ELEVATION	PARAMETER TESTED: PH	TEMPERATURE °C	CONDUCTIVITY μmhos/cm²	CHLORIDE PPM	COD PPM	DISS. IRON PPM					
Fritz		7.65		390	2.5	9	0.05					
Marshall		6.9		360	1.5	36	0.05					
Sportsman's Club		7.2		310	4.0	52	0.05					
B-1	644.63	6.8		320	3.5	54	0.17					
B-5	644.52	7.7		505	5.5	38	0.07					
B-4	643.37	7.1		600	6.5	81	0.15					
B-2	644.30	6.9		1750	53.0	83	0.15					
B-2A	644.39	7.1		1240	44.0	23	0.13					
B-3	644.15	7.2		1010	30.5	14	0.13					
Miller House		7.5		760	31.5	94	0.05					
Miller Garden		8.3		340	5.5	63	0.05					

WATER QUALITY DATA
ONALASKA SANITARY LANDFILL
ONALASKA, WISCONSIN

WARZYN ENGINEERING AND SERVICE COMPANY INC
Consulting Engineers

M9096

WATER QUALITY MONITORING RESULTS

DATE OF SAMPLING: 3-21-79

SAMPLE LOCATION	WATER ELEVATION	PARAMETER TESTED: pH	TEMPERATURE °C	CONDUCTIVITY μ mhos/cm²	CHLORIDE PPM	COD PPM	DISS. IRON PPM					
Rendering Plant	~645	8.4		560	41.0	88	0.05					
Black River	643.04	6.8		150	8.5	99	0.57					

WARZYN ENGINEERING AND SERVICE COMPANY INC
Consulting Engineers

WATER QUALITY DATA
ONALASKA SANITARY LANDFILL
ONALASKA, WISCONSIN