WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew J. Frank, Secretary
Gloria L. McCutcheon, Regional Director

Plymouth Service Center
1155 Pilgrim Rd.
Plymouth, Wisconsin 53073-4294
Telephone 920-892-8756
FAX 920-892-6638
TTY Access via relay - 711

November 5, 2007

Mr. Rick Michalski
Lakeside Village Square LLC
4525 S. Lawler Avenue
Cudahy, WI 53110

Subject: Conditional (Expedited) Grant of Exemption for the Development of Building Additions Where Solid Waste has been Disposed
BRRTS# 07-41-55028

Dear Mr. Michalski:

We have received your request for a grant of exemption from regulation under ch. NR 506.085, Wis. Adm. Code. Your application includes a statement that the site has received closure under ch. NR 726. Your application also indicates that analytical data for the presence of methane was not collected or examined, however it does include a certification from a Professional Engineer that site development will not cause a significant increase in risk due to the migration or concentration of explosive or toxic gasses or cause any other significant risk to public health, safety or welfare or the environment. The Department is issuing this conditional grant of exemption from the prohibitions contained in ch. NR 506.085, Wis. Adm. Code provided you comply with the conditions of this grant of exemption. This grant of exemption is limited to the proposed development described in your application, a 10,000 square foot commercial building. If you are considering additional changes beyond those described in the application, a new application must be submitted to the Department for approval.

Please review the information contained in the publication *Development at Historic Fill Sites and Licensed Landfills: Considerations and Potential Problems* PUB-RR-685 to assist you in preventing environmental or safety problems during and after development.

You are reminded that this approval does not relieve you of obligations to meet all other applicable federal, state and local permits, as well as zoning and regulatory requirements including site closure under ch. NR 726. If you have any questions concerning this letter, please contact Thomas A. Wentland at 920-892-8756 Ex. 3028.

Sincerely,

James A. Schmidt, Supervisor
Remediation and Redevelopment Section
Southeast Region

Cc: City of St. Francis
United Engineering

BEFORE THE

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

CONDITIONAL GRANT OF EXEMPTION
FOR
DEVELOPMENT ON A PROPERTY
WHERE SOLID WASTE HAS BEEN DISPOSED

FINDINGS OF FACT

The Department finds that:

1. Lakeside Village Square LLC owns the property at 3825 Kinnickinnic Ave., St. Francis, Wisconsin.
2. Based on information provided by the applicant solid waste material consisting primarily of foundry sand has been disposed of at this property but will be removed and properly disposed of as noted in the report of United Engineering Inc., dated September 12, 2007.
3. Mr. Rick Michalski has submitted a request received October 1, 2007 for an exemption from the prohibition in NR 506.085, Wis. Adm. Code. The request includes a statement signed by Mr. Timothy Anderson, a professional engineer, relating to the proposed development and the environmental conditions at the property.
4. This property has received closure under ch. NR 726.
5. Based upon the evaluation provided to the Department, the proposed development at the property is not expected to cause future exceedances of applicable soil and groundwater standards.
6. The Department finds that if the conditions set forth below are complied with, the development of the property will not result in environmental pollution as defined in ss. 289.01(8) and 299.01(4), Wis. Stats.

CONCLUSIONS OF LAW

1. The Department has the authority under s. NR 500.08(4), Wis. Adm. Code to issue an exemption from the prohibition in s. NR 506.085, Wis. Adm. Code, if the proposed development will not cause environmental pollution as defined in ss. 289.01(8) and 299.01(4), Wis. Stats.
2. The Department has authority to approve a grant of exemption with conditions if the conditions are necessary to ensure compliance with the applicable provisions of chapters NR 500 to 538, Wis. Adm. Code, or to assure that environmental pollution will not occur.
3. The conditions set forth below are necessary to ensure compliance with the applicable provisions of chapters NR 500 to 538, Wis. Adm. Code, and to assure that environmental pollution will not occur.
4. In accordance with the foregoing, the Department has the authority under s. NR 500.08(4), Wis. Adm. Code, to issue the following conditional grant of exemption.

CONDITIONAL GRANT OF EXEMPTION

The Department hereby issues an exemption to Lakeside Village Square LLC, from the prohibition in s. NR 506.085, Wis. Adm. Code for development on a property which contains solid waste as proposed in the submittal received October 1, 2007 subject to the following conditions:

1. No action related to the development of the property may be taken which will cause a significant adverse impact on wetlands as provided in ch. NR 103, Wis. Adm. Code.

2. No action related to the development of the property may be taken which will cause a significant adverse impact on critical habitat areas, as defined in s. NR 500.03(55), Wis. Adm. Code.

3. No action related to the development of the property may be taken which will cause a detrimental effect on any surface water, as defined in s. NR 500.03(62), Wis. Adm. Code.

4. No action related to the development of the property may be taken which will cause a detrimental effect on groundwater, as defined in s. NR 500.03(62), Wis. Adm. Code, or will cause or exacerbate an attainment or exceedance of any preventive action limit or enforcement standard in ch. NR 140, Wis. Adm. Code.

5. No action related to the development of the property may be taken which will cause an emission of any hazardous air contaminant exceeding the limitations for those substances contained in s. NR 445.03, Wis Adm. Code.

6. No action related to the development of the property may be taken which will cause an exceedance of a soil clean up standard in ch. NR 720, Wis. Adm. Code.

This grant of exemption is limited to the proposed changes described in your application. If you are considering additional changes beyond those described in the application, a new application must be submitted to the Department for approval. The Department reserves the right to require the submittal of additional information and to modify this grant of exemption at any time, if in the Department's opinion, modifications are necessary. Unless specifically noted, the conditions of this grant of exemption do not supersede or replace any previous conditions of approval for this property.

NOTICE OF APPEAL RIGHTS

If you believe that you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

For judicial review of a decision pursuant to section 227.52 and 227.53, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for judicial review shall name the Department of Natural Resources as the respondent.

Dated: 11-6-07

DEPARTMENT OF NATURAL RESOURCES
For the Secretary

James A. Schmidt, Supervisor
Remediation and Redevelopment Section
Southeast Region

Thomas A. Wentland
Waste Management Engineer
Remediation and Redevelopment Section
Southeast Region

GP# 07-41-550228

State of Wisconsin
Department of Natural Resources

Development at Historic Fill Site or Licensed Landfill Exemption Application

Form 4400-226 (R 12/05)

Notice: Use of this form is required by the DNR for any application to develop at a historic fill site or licensed landfill pursuant to secs. NR 506.085 and NR 500.08(4), Wis. Adm. Code. The Department will not consider your application unless you provide complete information requested. Personally identifiable information collected will be used to process your application and will also be accessible by request under Wisconsin's Open Records law [ss.19.31 - 19.39, Wis. Stats.]

Instructions: See *Development at Historic Fill Sites and Licensed Landfills: What you need to know* (PUB-RR-683, April 2002) for detailed instructions.

- All Exemption Application materials should be sent to the region where the site is located, as listed on page 6.
- Include $500 fee payment with this application unless a fee was already paid for the review of the remedial design report under the NR 700 process.
- Determine the appropriate exemption type for the site and check appropriate box below.
- Provide complete information requested for each type of exemption. Include the following attachments:
  Required: Summary of Existing and Potential Impacts described in Section V as an attachment, under the seal of a professional engineer or geologist registered to practice in Wisconsin.
  Optional: Site Visit Summary Comments (Section IX) including any photos, sketches or site visit notes.

Exemption Type

☐ **Remediation and Redevelopment Program NR 700 Rule Series Process Exemption:** Site with remedial actions conducted in accordance with NR 700 series
Required: Sections I - VI ***Optional:*** Sections VII - X

☐ **Case-by-Case Evaluation:** Sites with anticipated environmental impacts or wastes of special concerns
Required: Sections I - VI ***Optional:*** Sections VII - X

☑ **Expedited Exemption:** Site with no expected environmental impact
Required: Sections I - VI **and** Form 4400-256A Expedited Exemption Application ***Optional:*** Sections VII - X

I. Applicant Information

Owner - Last Name	First	MI	Telephone Number
LAKESIDE VILLAGE SQUARE LLC			

Contact Name (if different): RICK MICHALSKI

Street Address	City	State	ZIP Code
4525 S. LAWLER AVENUE	CUDAHY	WI	53110

Developer - Last Name	First	MI	Telephone Number
LAKESIDE VILLAGE SQUARE LLC			

Street Address	City	State	ZIP Code
4525 S. LAWLER AVENUE	CUDAHY	WI	53110

II. Site Name and Location

Site Name	Location / Address
LAKESIDE VILLAGE SQUARE DEVELOPMENT	3825 S. KINNICKINNIC AVENUE

Is the site known by another name(s)? ☑ Yes ☐ No ☐ Unknown

☑ City ☐ Town ☐ Village of ST FRANCIS

If yes, provide name.	ZIP Code	State
FORMER WOLF CLEANERS & LAUNDERERS	53235	WI

Does the site have a license number? ☐ Yes ☑ No ☐ Unknown — If yes, License Number:

County: MILWAUKEE

A. Attach a map with site location and limits of fill/waste disposal area.

B. Global Positioning System Coordinates

Latitude: DEG	MIN	SEC	Longitude: DEG	MIN	SEC
42	58	27.4 N	87	52	33.4 W

Describe method for collecting GPS Coordinates: GIS REGISTRY OF CLOSED REMEDIATION SITES

Program Lead, Fee Status and Regulatory ID Numbers *(This area for DNR use only)*

☐ **Waste Management Bureau**

☐ **Remediation and Redevelopment Bureau - Exemption is part of remedy under NR 700 program**
- ☐ Fee already paid for review of remedial design report.
- ☐ Review of remedial design report not requested and payment is attached.

☐ Payment Attached
Amount: $

Hazardous Waste Facility License ID No. (5 digits)	DNR FID No. (9 digits)	USEPA ID No. (used for both RCRA and CERCLIS #s) (WI+Alpha+9 digits)

Region	Project Manager	Telephone Number

III. Site Ownership History

Previous Owner - Last Name	First	MI	Telephone Number
WOLF CLEANERS & LAUNDERERS			

Street Address	City	State	ZIP Code
3825 S. KINNICKINNIC AVENUE	ST FRANCIS	WI	53235

Responsible Municipal / Private Operator - Last Name (if applicable)	First	MI	Telephone Number

Street Address	City	State	ZIP Code

IV. Evaluation of Existing and Potential Impacts. **See Development at Historic Fill Sites and Licensed Landfill: Guidance for Investigation and Development at Historic Fill Sites and Licensed Landfill: Potential Problems and Considerations.**

A. Analytical data for the following media have been collected and/or examined before completing this application:

1. Groundwater:	☑ Yes	☐ No
2. Soil:	☑ Yes	☐ No
3. Surface water / sediment:	☐ Yes	☑ No
4. Air:	☐ Yes	☑ No
5. Methane or other explosive gases:	☐ Yes	☑ No

B. Based on known or suspected sources and wastes, their physical characteristics, containment and geologic environment, do you suspect a release of pollutants to the environment?

☐ Yes: ☐ Groundwater ☐ Soil ☐ Surface Water / Sediment ☐ Methane or Other Explosive Gases
☑ No

If yes, an expedited exemption is not appropriate unless further investigation shows that a release of pollutants is not likely.

C. If there is NOT a likelihood of a release of pollutants or evidence of a release, would the impact of the proposed development be likely to cause a release to the environment?

☐ Yes **If yes, be sure to summarize actions to be taken to prevent adverse environmental impacts in V. Part C below.**
☑ No

V. Summary of Existing and Potential Impacts. **See Development at Historic Fill Sites and Licensed Landfill: Guidance for Investigation and Development at Historic Fill Sites and Licensed Landfill: Potential Problems and Considerations.**

Describe the following in an attached narrative under the signature of a qualified professional. Organize, label and package as listed below.

A. Existing Site Conditions
   1. existing site conditions including waste types,
   2. potential for impacts, and
   3. evaluation of existing impacts.

B. Proposed Development Summary. Include explanation for overall site decision.

C. Summary of actions to be taken and engineering controls that will prevent or minimize adverse environmental impacts and potential threats to human health and welfare, including worker safety.

VI. Certification of Application Information

I certify that information in this application and all its attachments is true and correct and in conformity with applicable Wis. statutes.

Print / Type Name of Applicant
TIMOTHY J. ANDERSON

Applicant Signature	Date Signed
Timothy J. Anderson	9/12/07

NARRATIVE

The site is located at the northwest corner of the intersection of East Howard Avenue and South Kinnickinnic Avenue in St. Francis, Wisconsin. The site is currently vacant and is covered with grass, weeds and deciduous trees.

During the advancement of seven (7) boreholes for a geotechnical engineering exploration and analysis, "possible" foundry sand was located at two (2) locations at approximate depths ranging from one (1) to nine (9) feet. (See Attached Geotechnical Engineering Exploration and Analysis dated October 20, 2006).

Groundwater was not encountered during the advancement of the augers or upon completion throughout the sixteen (16) foot depth of the boreholes. Therefore, the potential impact to the groundwater is minimal. In addition, groundwater analysis performed in the northwest corner of the site did not indicate the presence of any Volatile Organic Compounds (VOC) at or above their respective detection limits with the exception of Methylene Chloride which is a common airborne laboratory contaminant. (See Attached Laboratory Analysis and Boring Location Map). In addition, laboratory analysis of soil and groundwater samples from the immediately adjacent property to the north (3815 S. Kinnickinnic Avenue) are attached.

The proposed development, Lakeside Village Square, will consist of the construction of a two (2) story brew pub, without a basement, about ten thousand (10,000) square feet in plan dimension with a two thousand (2000) square foot mezzanine. An exterior patio and beer garden is planned in addition to paved parking areas and exit/entrance ways. (See Attached Geotechnical Engineering Exploration and Analysis-Figure 1 Test Boring Location Plan).

It is proposed to stockpile any foundry sand encountered during foundation excavation activities on-site. The foundry sand will be placed on and covered with plastic. Laboratory analysis of the foundry sand will be performed to confirm acceptance of the material at a licensed off-site disposal facility. Subsequent to acceptance, the material will be transported by a licensed hauler to the facility.

Upon completion of Phase I of Lakeside Village Square, the surface in the area of the documented "possible" foundry sand will be covered with a building constituting an engineering control.

State of Wisconsin
Department of Natural Resources

Development at Historic Fill Site or Licensed Landfill Expedited Exemption Application

Form 4400-226A (R 5/02)

Notice: This form and Form 4400-226 are required to apply for an expedited exemption to develop at a historic fill site or licensed landfill pursuant to secs. NR 506.085 and NR 500.08(4), Wis. Adm. Code. This form may only be used for landfill sites with no environmental impact. The Department will not consider your application unless you provide complete information requested. Personally identifiable information collected will be used to process your application and will also be accessible by request under Wisconsin's Open Records law [ss.19.31 - 19.69, Wis. Stats.]

Environmental Professional Evaluation

Professional Engineer or Geologist - Last Name	First	MI	Telephone Number (incl. area code)
ANDERSON	TIMOTHY	J	414-327-8790

Address	City	State	ZIP Code
10617 W. OKLAHOMA AVENUE SUITE L2	WEST ALLIS	WI	53227

I am a professional engineer or professional geologist registered to practice in Wisconsin and am qualified by training and experience to evaluate the potential for soil and groundwater contamination and the migration and concentration of explosive or toxic gases to occur from the disposal of solid waste.

I have evaluated the proposal described in this document for development on a property where solid waste has been disposed and it is my professional opinion that it is unlikely that "environmental pollution" exists or that there has been a significant "discharge" of a "hazardous substance" at the property (as these terms are defined in s. 292.01, Wis. Stats.). It is also my professional opinion that the development of the property as described in this document will not cause or exacerbate an exceedance of any applicable soil or groundwater standard and will not cause a significant increase in risk due to the migration or concentration of explosive or toxic gasses or cause any other significant risk to public health, safety or welfare or the environment.

My professional opinion is given to a reasonable degree of professional certainty, and is based upon my evaluation of reasonable and sufficient information and generally accepted engineering and scientific practices.

Signature	Date Signed	Wisconsin Registration Number
Timothy J. Anderson	9/12/07	28935

Site Owner and Developer Certification

Property Owner - Last Name	First	MI	Telephone Number (incl. area code)
LAKESIDE VILLAGE SQUARE LLC			

Address	City	State	ZIP Code
4525 S. LAWLER AVENUE	CUDAHY	WI	53110

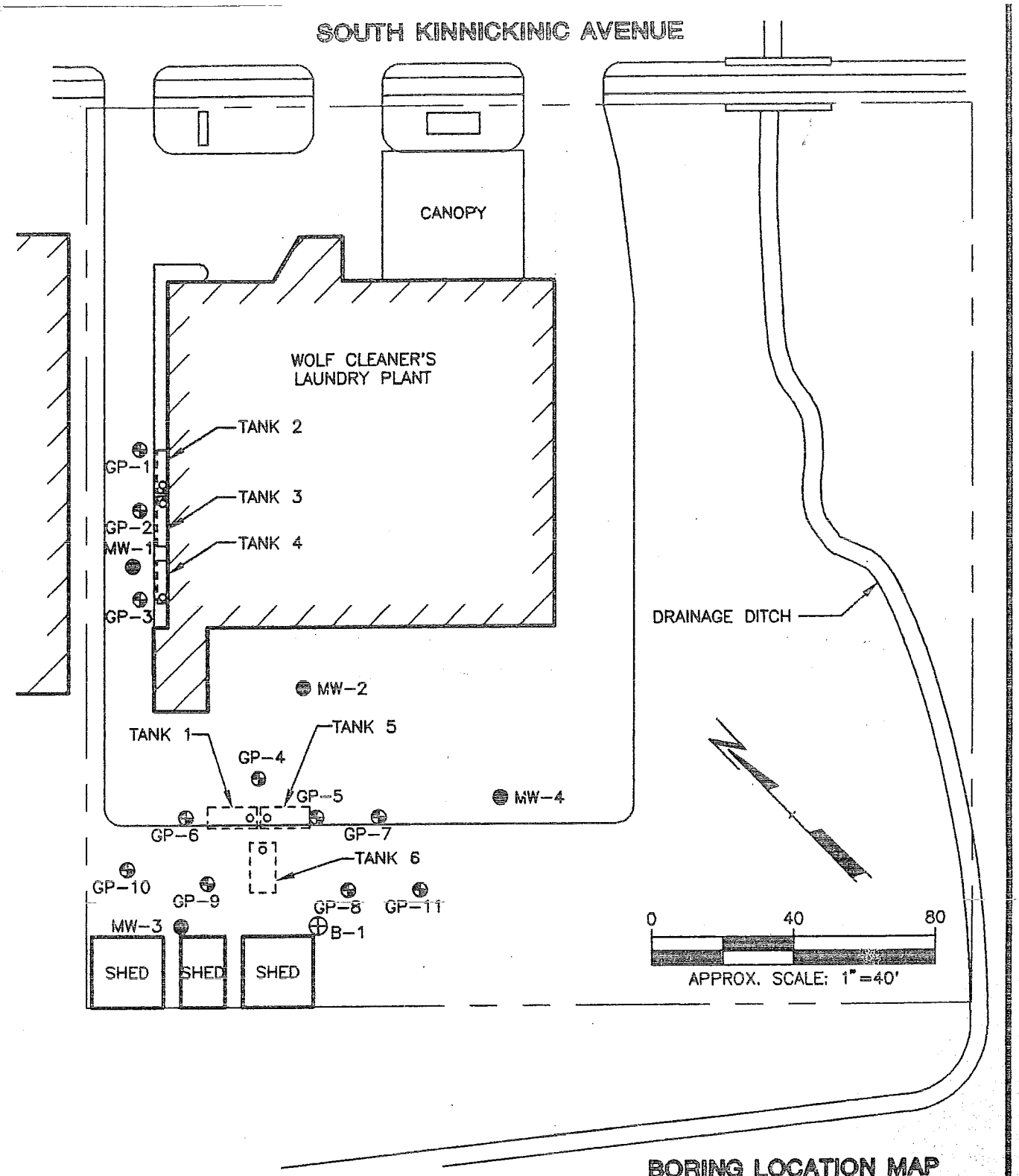
Developer - Last Name	First	MI	Telephone Number (incl. area code)

Address	City	State	ZIP Code

I certify that I have read the DNR publication, *Development at Historic Fill Sites and Licensed Landfills: Considerations and Potential Problems* (PUB-RR-685, April 2002), and understand the potential environmental, health and safety risks if the development of the property is not compatible with the waste disposed at the site.

I also understand that future decisions regarding the use of the property must consider whether those changes will create an adverse environmental impact and that activities causing a significant threat to public health, safety, or welfare are prohibited under s. 289.46(2), Stats. This exemption application and any exemption related to this document that is issued by the Department transfers to any future purchaser of this property.

Owner Signature	Date Signed
	9/12/07
Developer Signature	**Date Signed**



BORING LOCATION MAP

LEGEND

- ESTIMATED UST LOCATIONS
- GEOPROBE BORING LOCATIONS
- MONITORING WELLS
- BORING LOCATIONS

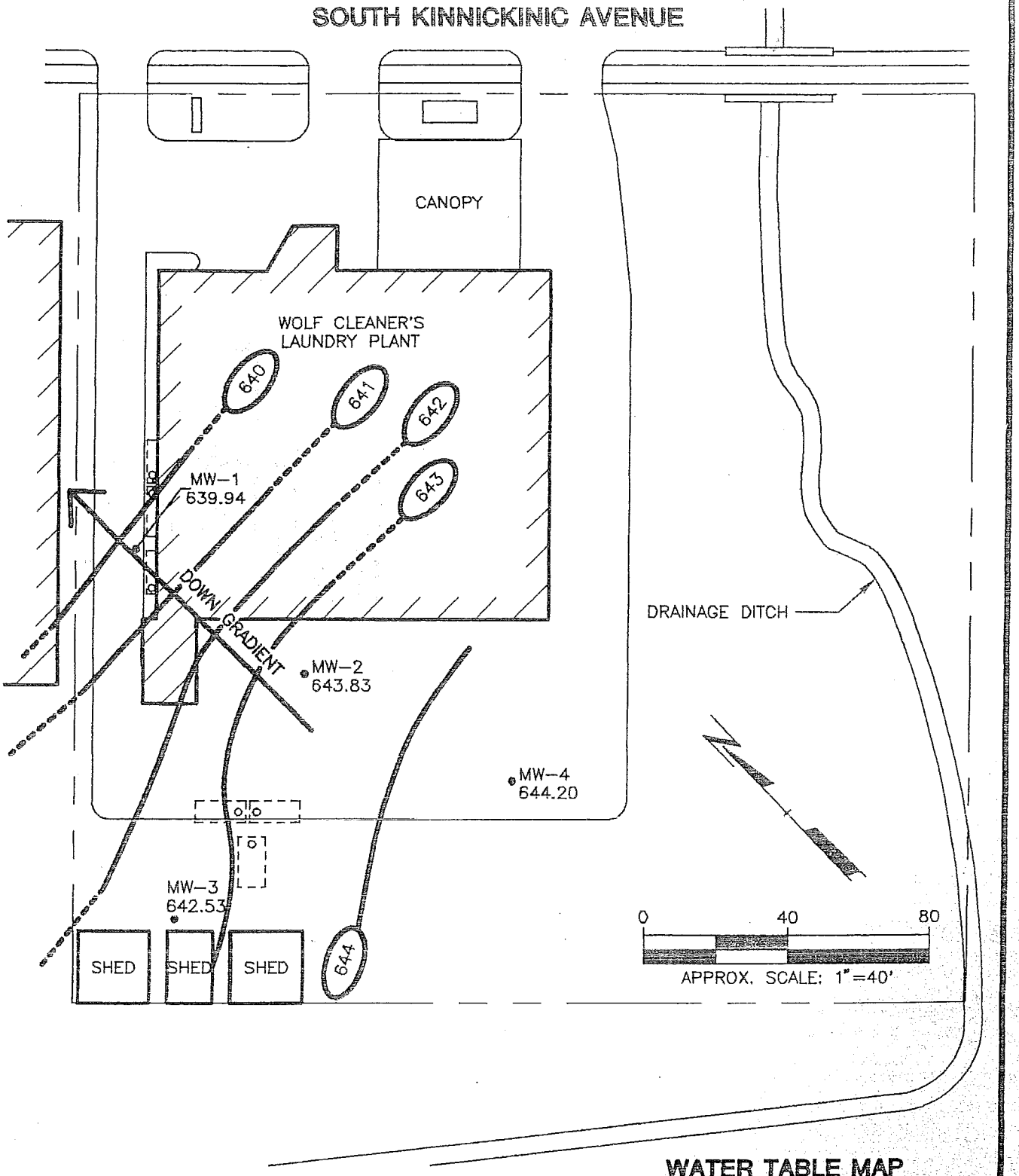
WOLF CLEANERS & LAUNDERERS
ST. FRANCIS, WI.

RMT INC.

DWN. BY:	TCP
APPROVED BY:	
DATE:	AUGUST 1994
PROJ. #	2777.02
FILE #	27770202

FIGURE 3

3825 S. KINNICKINNIC AVENUE



WATER TABLE MAP

WOLF CLEANERS & LAUNDERERS
ST. FRANCIS, WI.

LEGEND

- ESTIMATED UST LOCATIONS
- (xxx) WATER TABLE CONTOUR LINE (IN M.S.L.)
- MW–1 644.20 MONITORING WELL AND WATER ELEVATION

NOTE: WATER TABLE BASED ON WELL MEASUREMENT ON 8–10–94.

RMT INC.

DWN. BY:	TCP
APPROVED BY:	
DATE:	AUGUST 1994
PROJ. #	2777.02
FILE #	27770207

FIGURE 4

TABLE 5

SUMMARY OF GROUNDWATER LABORATORY ANALYSES[1,4]

Boring ID	GP-5	GP-10	Trip Blank	MW-1	MW-2	MW-3	MW-4	DUP1	TRIP BLANK	EQUIP BLANK	ES[2]	PAL[2]
Date Collected	2-8-94	2-9-94	2-7-94	6-21-94	6-21-94	6-21-94	6-21-94	6-21-94	6-21-94	6-21-94	---	---
VOC Parameters												
1,2,4-Trimethylbenzene	81	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	NE	NE
Ethylbenzene	4.8	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	1,360	272
Methylene Chloride[3]	**65**	8.1	6.1	5.9	5.9	6.7	5.5	15	16	15	150	15
n-Butylbenzene	12	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	NE	NE
n-Propylbenzene	8.2	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	NE	NE
Naphthalene	**21**	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	40	8
sec-Butylbenzene	12	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	NE	NE

NOTES:

1 Laboratory results reported in μg/l.

2 Enforcement Standard (ES) and Preventive Action Limit (PAL) from NR 140 Public Health Groundwater Quality Standards, Wisconsin Administrative Code.

3 The Methylene Chloride values in the samples can be attributed to laboratory background.

4 Only those compounds which were detected in at least one sample are listed. A full list of Method 8021 compounds is presented in Appendix C.

BQL means below quantification limit.

NE means values not established to date.

Values in **BOLD** exceed NR 140 Preventative Action Limit

1.2.3 UST Information

The general UST information including estimated size and contents are listed in Table 1.

TABLE 1
SUMMARY OF USTs

UST ID	Tank Volume[1] (gallons)	Diameter[2] (inches)	Length[3] (feet)	Contents[1]	Fluid Level[2] (inches)	Water Product
1	8,000	114	14	Stoddard Solvent	0	34.5
2	6,000	87	21	Stoddard Solvent	0	7.5
3	6,000	87	21	Stoddard Solvent	10	3
4	6,000	65	<24	Stoddard Solvent	7	3
5	8,000	124	14	diesel fuel/fuel oil	5	7
6	500	48	6	waste Stoddard Solvent	unknown	58

NOTE: [1] Information was supplied by Milwaukee County or Wolf Cleaners representatives.
[2] Values were measured in the field through the fill pipes.
[3] The lengths of tanks were estimated based on standard tank dimensions.

1.3 Purpose and Scope

The purpose of this Closure Plan is to describe the closure activities that Milwaukee County will perform to remove and close the hazardous waste UST, the five non-hazardous waste USTs, and any soil impacted by releases from the USTs. The plan is intended to fulfill the closure plan requirements in Wisconsin Administrative Code Chapters NR 600 through 685. The plan describes the key activities, tests, and performance standards for closing the hazardous waste UST. It is the intention of Milwaukee County to obtain a no further action letter and clean closure of the UST.

The scope of this document is limited to providing a Closure Plan for the hazardous waste UST at the Wolf Cleaners facility. The Closure Plan includes the following:

- A general description of the Wolf Cleaners facility and the hazardous waste UST.

SOIL ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
JUNE 1, 18, 2004 and April 20, 2006

Parameter	B-1	B-2	B-3	B-4	B-5	B-1	B-1	B-4	B-4	B-5	B-5	B-8	B-8	B-9	B-9	B-9	B-10	B-10	B-10	RCL
Depth (Ft)	3-1/2'	3'	2'	2'	2'	5-1/2'	11-1/2'	6'	12'	5'	11'	4'-8'	12'-16'	0'-4'	8'-12'	12'-15'	0'-4'	8'-12'	12'-16'	
Gasoline Range Organics (mg/kg)	ND	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*100
Diesel Range Organics (mg/kg)	ND	ND	ND	9.68	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*100
Volatile Organic Compounds (VOC) (ug/kg)																				
Bromodichloromethane	ND	ND	ND	65	ND	ND	ND	ND	ND	-	-	<42	<42	<44	<42	<41	<42	<46	<41	-
n-Butylbenzene	ND	ND	ND	57.1	ND	ND	ND	ND	ND	-	-	<39	<39	<41	<39	<38	<39	<43	<39	-
Ethylbenzene	ND	ND	ND	42.4	ND	ND	ND	ND	ND	-	-	<28	<28	<29	<28	<27	<28	<30	<27	2,900
Naphthalene	51.9	ND	ND	80.8	ND	ND	ND	ND	ND	-	-	<83	<83	<86	<83	<80	<83	<90	<82	-
n-Propylbenzene	ND	ND	ND	92.7	ND	ND	ND	ND	ND	-	-	<31	<31	<32	<31	<30	<31	<34	<30	-
Tetrachloroethene	74.8	ND	ND	ND	ND	31.8	ND	ND	ND	-	-	<34	<34	<35	<34	<32	56*	1520	3180	-
Toluene	ND	ND	ND	164	ND	ND	ND	ND	25.4	-	-	<32	<32	<33	<32	<31	<32	<35	<37	1,500
Trichloroethene	ND	ND	ND	7200	ND	ND	ND	81.3	337	-	-	<38	<38	92	1090	1320	<38	103*	<37	-
1, 2, 4 – Trimethylbenzene	ND	ND	ND	136	ND	ND	ND	ND	ND	-	-	<33	<33	<34	<33	<32	<33	<36	<33	-
1, 3, 5 – Trimethylbenzene	ND	ND	ND	43	ND	ND	ND	ND	ND	-	-	<38	<38	<39	<38	<36	<38	<41	<37	-
Xylenes	ND	ND	ND	265	ND	ND	ND	ND	ND	-	-	<59<27	<59<28	<61<29	<59<27	<57<27	<59<28	<64<30	<58<27	4,100
RCRA Metals (mg/kg)																				
Mercury	0.0496	0.135	ND	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	**5.6**	**4.15**	ND	**3.92**	**9.62**	**3.78**	ND	ND	**5.86**	**2.75**	ND	-	-	-	-	-	-	-	-	0.039
Barium	ND	31.6	50.4	ND	62.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	ND	ND	ND	ND	5.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
Chromium - Trivalent	13.5	7	7.72	10.5	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16,000
Chromium – Hexavalent	ND	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
Lead	11.3	16.7	10.5	14.9	**193**	-	-	-	-	ND	ND	-	-	-	-	-	-	-	-	50
Selenium	ND	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	ND	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND/< = analyte not detected at or above the respective detection limit

RCL = Residual Contaminant Level - Dependent on soil hydraulic conductivity

- analysis not performed

* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-1

Compounds	12/15/2004	5/12/2005	8/30/2005	3/30/2006	11/10/2005	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	ND	<0.310	<2.150	<0.50	<0.50	<0.310	<0.310	0.5	5.0
Trichloroethene	**206**	**117**	**130**	**91**	**110**	**99**	**139**	0.5	5.0
1,2,3 - Trichlorobenzene	ND	<0.500	<1.850	<0.25	<0.25	24	<0.500	-	-
1,2,4 - Trichlorobenzene	ND	<0.470	<1.600	<0.25	<0.25	11	<0.470	14	70
1, 2 - Dichloroethane	ND	**119**	<1.700	<0.50	<0.50	<0.350	<0.350	0.5	5.0
1,2,4-Trimethylbenzene	ND	<0.300	3.800*	<0.20	<0.20	0.550*	<0.300	96	480
1,3,5-Trimethylbenzene	ND	<0.340	3.900*	<0.20	<0.20	0.380*	<0.340		
Chloroform	ND	<0.240	*4.800**	*<0.20*	<0.20	<0.240	<0.240	0.6	6
Naphthalene	ND	<0.750	6.1	<0.25	<0.25	*15*	1.740*	10	100
n-Propylbenzene	ND	<0.280	3.700*	<0.50	<0.50	<0.280	<0.280	-	-
p-Isopropyltoluene	ND	<0.310	4.7	<0.20	<0.20	0.690*	<0.310	-	-
1,2-Dichlorobenzene	ND	<0.340	<1.500	<0.20	<0.20	0.370*	<0.340	60	600
1,3-Dichlorobenzene	ND	<0.260	<1.400	<0.20	<0.20	0.550*	<0.260	125	1250
1,4-Dichlorobenzene	ND	<0.360	<1.500	<0.20	<0.20	0.480*	<0.360	15	75
2-Chlorotoluene	ND	<0.300	<1.600	<0.50	<0.50	0.430*	<0.300	-	-
cis-1,2-Dichloroethene	ND	<0.270	<2.200	<0.50	<0.50	0.320*	<0.270	-	-
cis-1,3-Dichloropropane	NA	<0.370	NA	<0.20	<0.20	0.380*	<0.370	-	-
Dibromomethane	NA	<0.460	<3.950	<0.20	<0.20	0.480*	<0.460	-	-
Hexachlorobutadiene	ND	<0.420	<2.900	<0.50	<0.50	9.810	<0.420	-	-
n-Butylbenzene	ND	<0.360	<1.200	<0.20	<0.20	0.940*	<0.360	-	-
sec-Butylbenzene	ND	<0.340	<1.400	<0.25	<0.25	0.580*	<0.340	-	-
tert-Butylbenzene	ND	<0.300	<1.500	<0.20	<0.20	0.380*	<0.300	-	-
trans-1,3-Dichloropropene	NA	<0.260	NA	<0.20	<0.20	0.270*	<0.260	-	-

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
- PAL/ES Not Established
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-2

Compounds	12/15/2004	5/12/2005	8/30/2005	11/10/2005	3/30/2006	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	**12,800**	**2050**	**2600**	**7400**	**11000**	**3,100E**	**4000**	0.5	5.0
Trichloroethene	**145**	**89**	**34**	**76**	**140**	**58**	**56**	0.5	5.0
1,1,1,2 - Tetrachloroethane	NA	<0.220	NA	<0.25	<0.25	**<0.220**	**3850**	7	70
1,1,2 - Trichloroethane	ND	<0.440	<20	<0.25	<0.25	**49**	**91**	0.5	5.0
1, 2 - Dichloroethane	ND	**83**	<17	<0.50	<0.50	<0.350	<0.350	0.5	5.0
Ethylbenzene	ND	0.440*	<13	<0.50	<0.50	<0.250	<0.250	140	700
1,2,4-Trimethylbenzene	ND	<0.300	37*	<0.20	<0.20	<0.300	<0.300	96	480
1,3,5-Trimethylbenzene	ND	<0.340	40*	<0.20	<0.20	<0.340	<0.340		
Chloroform	ND	<0.240	**46***	<0.20	<0.20	<0.240	<0.240	0.6	6
Naphthalene	ND	<0.750	**60**	<0.25	<0.25	1.903*	<0.750	10	100
n-Propylbenzene	ND	<0.280	36*	<0.50	<0.50	<0.280	<0.280	-	-
1,2-Dichloropropane	ND	<0.320	<27	*0.64**	*<0.50*	<0.320	<0.320	0.5	5.0
Xylenes (Total)	ND	<0.53/<0.25	<37	<0.50	0.75*	5	5	200	1000
1,2,3-Trichlorobenzene	ND	<0.500	<19	<0.25	<0.25	2.970	<0.500	-	-
1,2,4-Trichlorobenzene	ND	<0.470	<16	<0.25	<0.25	1.620	<0.470	14	70

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
- PAL/ES Not Established
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-3

Compounds	12/15/2004	5/12/2005	8/30/2005	11/10/2005	3/30/2006	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	*2.31*	*4.860*	<0.430	<0.50	<0.50	*1.460*	NS	0.5	5.0
Trichloroethene	ND	*0.560**	<0.260	<0.20	<0.20	<0.340	NS	0.5	5.0
Carbon Tetrachloride	ND	<0.270	<0.360	<0.50	<0.50	0.310*	NS	0.5	5.0
1,2-Dichloropropane	ND	<0.320	*0.620**	<0.50	<0.50	<0.320	NS	0.5	5.0
1,3-Dichloropropane	ND	<0.390	0.400*	<0.25	<0.25	<0.390	NS	-	-
Methylene Chloride	ND	<0.300	*0.930**	<1.0	<1.0	<0.300	NS	0.5	5.0

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
- PAL/ES Not Established
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-4

Parameters	12/15/2004	5/12/2005	8/31/2005	11/10/2005	3/31/2006	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	*2.74*	*4.020*	*1.5*	*4.3*	*1.2**	*2.810*	*1.700*	0.5	5.0
Trichloroethene	ND	<0.340	<0.260	<0.20	<0.20	<0.340	<0.340	0.5	5.0
1,1,1,2 - Tetrachloroethane	NA	<0.220	NA	<0.25	<0.25	<0.220	1.330	7	70
Methylene Chloride	ND	<0.300	*0.670**	<1.0	<1.0	<0.300	<0.300	0.5	5.0
Naphthalene	ND	<0.750	2.7	<0.25	<0.25	<0.750	3.070	10	100
Total Xylenes	ND	<0.53/<0.25	0.850*	<0.50	<0.50	<0.53/<0.25	<0.53/<0.25	200	1000

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-5

Parameters	2/27/2005	5/12/2005	8/30/2005	11/10/2005	3/31/2006	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	ND	*1.270*	<0.430	<0.50	<0.50	<0.310	NS	0.5	5.0
Trichloroethene	ND	<0.340	<0.260	<0.20	<0.20	<0.340	NS	0.5	5.0
Methylene Chloride	ND	<0.300	*0.410**	<1.0	<1.0	<0.300	NS	0.5	5.0
Benzene	ND	<0.270	*0.320**	<0.20	<0.20	<0.270	NS	0.5	5.0
Toluene	ND	<0.290	<0.320	<0.20	0.20*	<0.290	NS	200	1000

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
MW-6

Parameters	2/27/2005	5/12/2005	8/30/2005	11/10/2005	3/30/2006	6/28/2006	12/8/2006	PAL	ES
Tetrachloroethene	*1.09*	*2.72*	*1.200**	*1.9*	*3.0*	*1.120*	*2.470*	*0.5*	*5.0*
Trichloroethene	ND	<0.340	<0.260	<0.20	<0.20	<0.340	<0.340	0.5	5.0
1,1,1,2 - Tetrachloroethane	NA	<0.220	NA	<0.25	<0.25	<0.220	2.210	7	70
Methylene Chloride	ND	<0.300	0.420*	<1.0	<1.0	<0.300	<0.300	0.5	5.0
1,4-Dichlorobenzene	ND	<0.360	<0.300	0.24*	<0.20	<0.360	<0.360	15	75
cis-1,2-Dichloroethene	ND	<0.270	<0.440	<0.50	<0.50	0.320*	<0.270	7	70

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
ES = Enforcement Standard
ES exceedances in **Bold**
PAL exceedances in *italics*

GROUNDWATER ANALYTICAL RESULTS
PROPOSED LAKESIDE VILLAGE SQUARE
3815 S. KINNICKINNIC AVENUE
ST. FRANCIS, WISCONSIN 53235
PZ-2, PZ-4 and TW-1

	PZ-2		PZ-4		TW-1		
Compounds	6/28/2006	12/8/2006	6/28/2006	12/8/2006	4/20/2006	PAL	ES
Tetrachloroethene	**11**	*2.480*	<0.310	*1.290*	<0.310	0.5	5.0
Trichloroethene	0.440*	<0.340	<0.340	<0.340	**66**	0.5	5.0
1,1,1,2 - Tetrachloroethane	<0.220	2.020	<0.220	0.240*	<0.220	7	70
1,2,4 - Trimethylbenzene	<0.300	0.930*	<0.300	<0.300	<0.300	96	480
2 - Chlorotoluene	<0.300	0.340*	<0.300	<0.300	<0.300	-	-
Ethylbenzene	<0.250	0.450*	<0.250	<0.250	<0.250	140	700
Naphthalene	<0.750	<0.750	<0.750	1.070*	<0.750	10	100
Total Xylenes	<0.53/<0.25	0.870*	<0.53/<0.25	<0.53/<0.25	<0.53/<0.25	200	1000
1,3 - Dichlorobenzene	<0.260	<0.260	0.360*	<0.260	<0.260	125	1250
Methyl-tert-butyl-ether	<0.390	<0.390	0.830*	0.440*	<0.390	12	60
sec-Butylbenzene	<0.340	0.740*	<0.340	<0.340	<0.340	-	-

All results expressed as micrograms per liter (ug/l)
ND/< = Analyte not detected at or above the respective detection limit
NA - Not Analyzed
* Result between the Limit of Detection (LOD) and Limit of Quantitation (LOQ)
PAL = Preventive Action Limit
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ES exceedances in **Bold**
PAL exceedances in *italics*

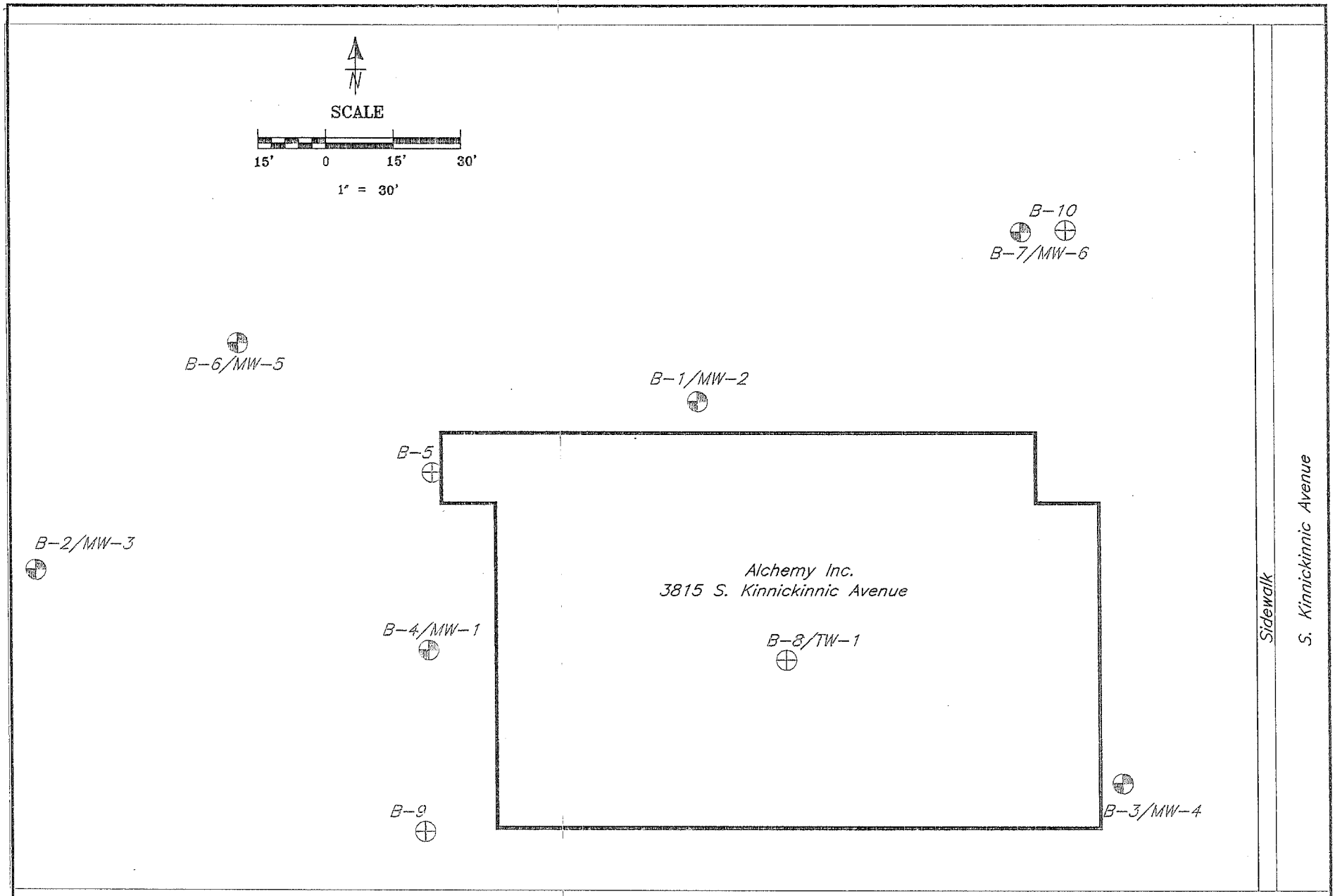


Figure 3A: Soil Boring and Groundwater Monitoring Well Location Map

United Engineering Consultants, Inc.

Alchemy, Inc.
3815 S. Kinnickinnic Avenue
Saint Francis, Wisconsin

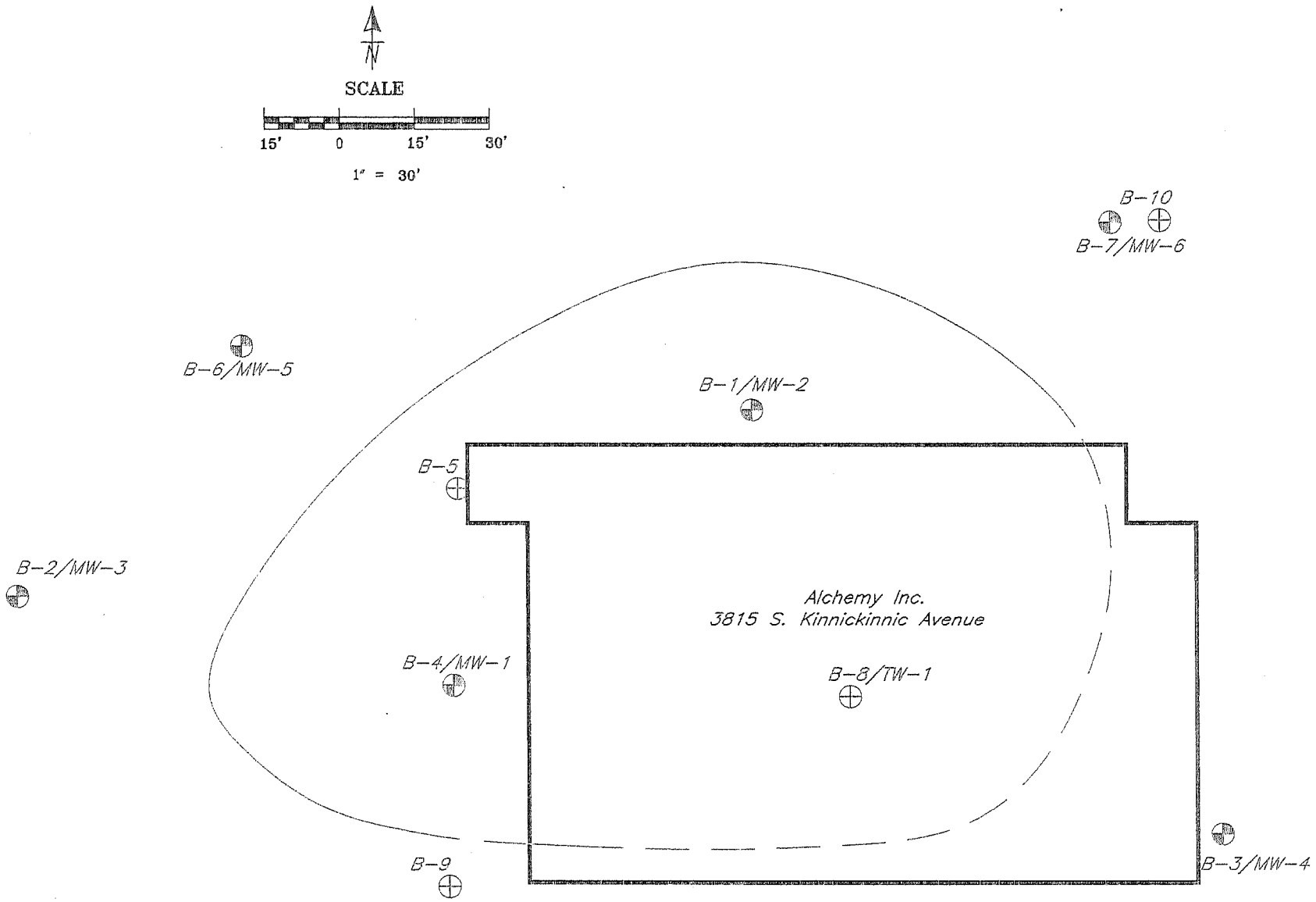


Figure 8A: Approximate Limits of Impacted Groundwater Above WDNR NR140 ES's

United Engineering Consultants, Inc.

Alchemy, Inc.
3815 S. Kinnickinnic Avenue
Saint Francis, Wisconsin

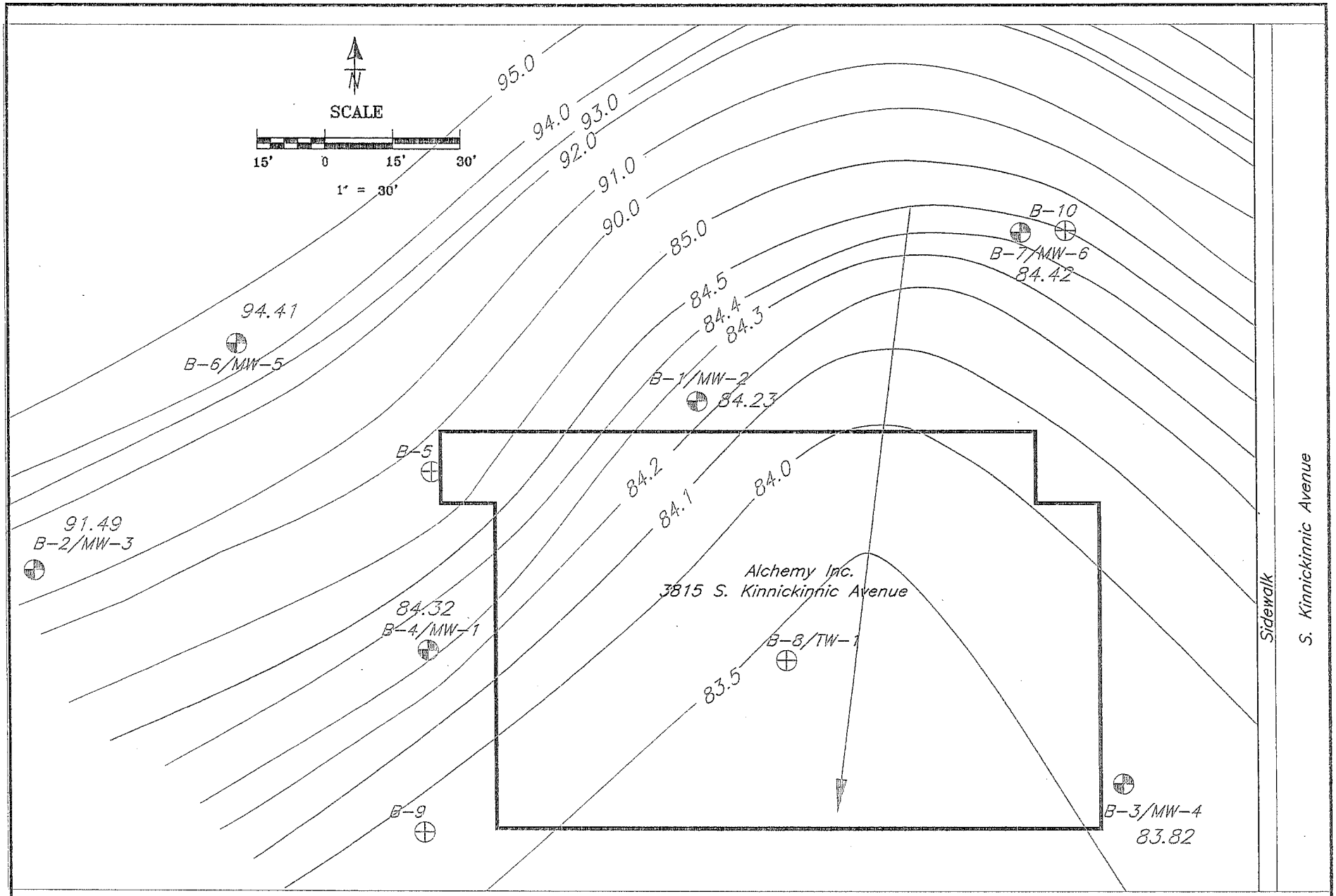


Figure 10: Groundwater Contour Map – June 28, 2006

United Engineering Consultants, Inc.

Alchemy, Inc.
3815 S. Kinnickinnic Avenue
Saint Francis, Wisconsin

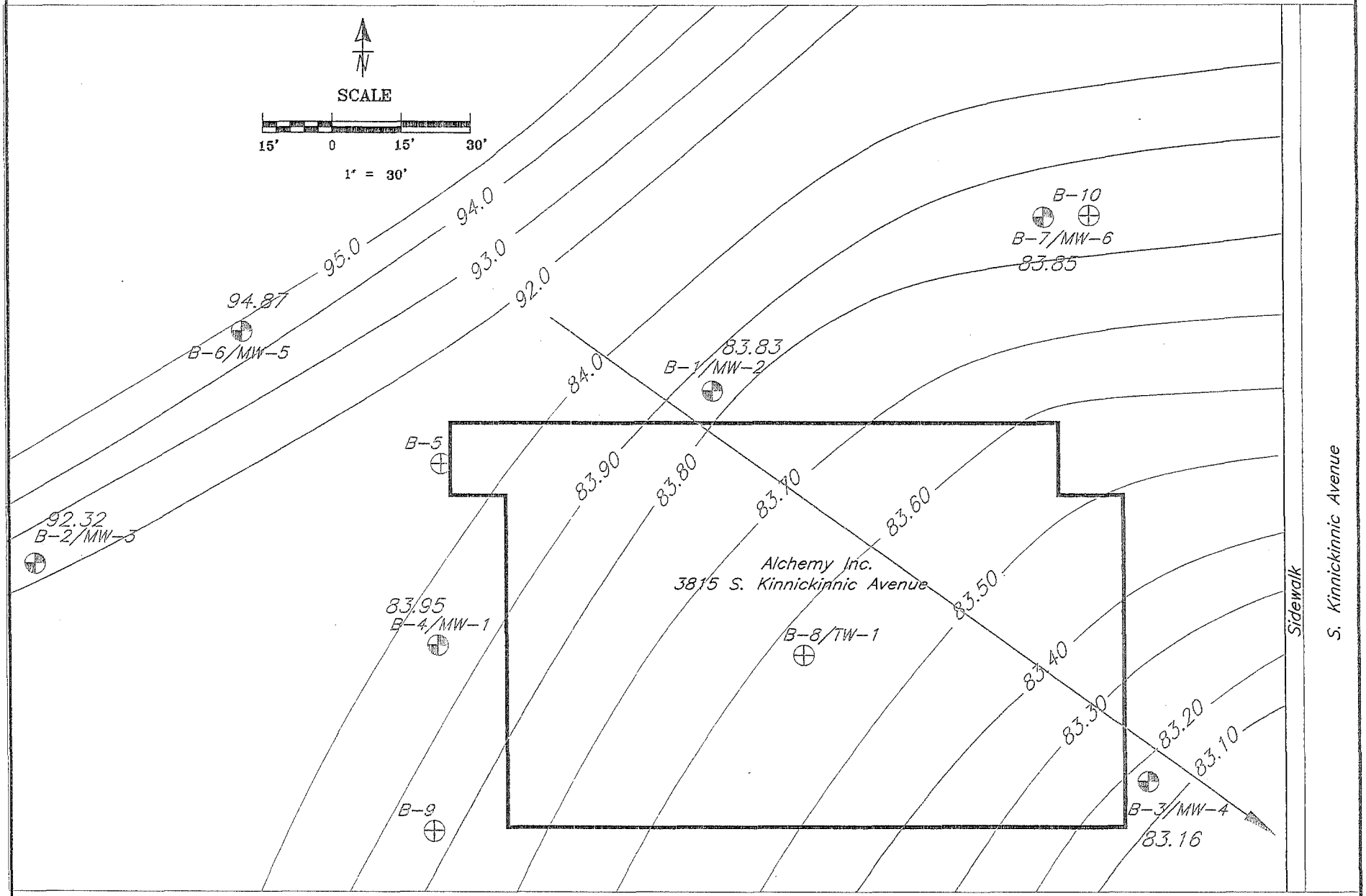


Figure 11: Groundwater Contour Map – March 30, 2006

United Engineering Consultants, Inc.

Alchemy, Inc.
3815 S. Kinnickinnic Avenue
Saint Francis, Wisconsin

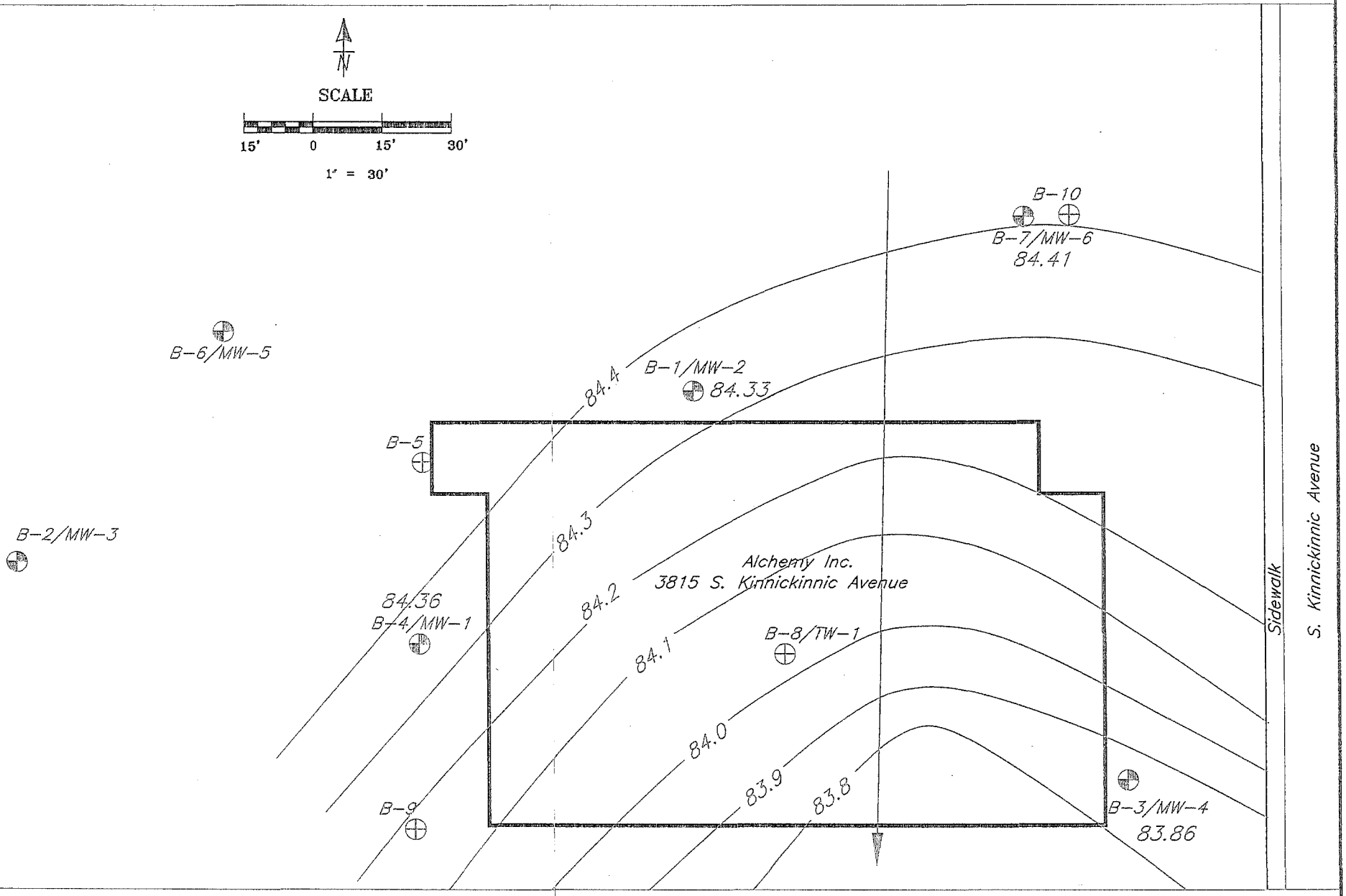
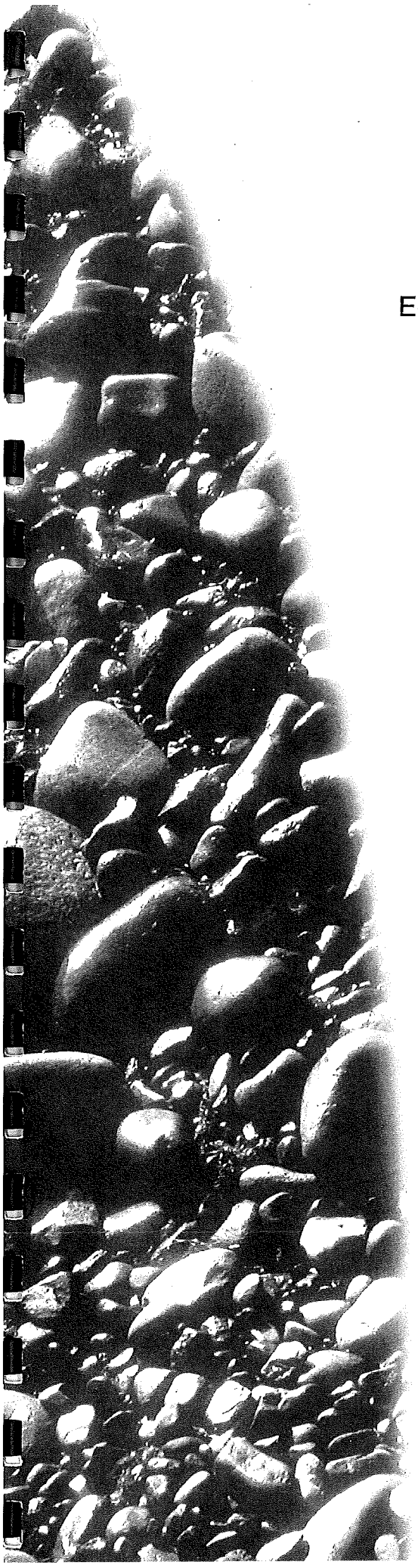


Figure 12: Groundwater Contour Map – December 8, 2006

United Engineering Consultants, Inc.

Alchemy, Inc.
3815 S. Kinnickinnic avenue
Saint Francis, Wisconsin



Geotechnical Engineering Exploration and Analysis

Proposed Lakeside Village Square Phase I
East Howard Avenue and South Kinnickinnic Avenue
Milwaukee, Wisconsin

Prepared for:

Rick Michalski
Cudahy, Wisconsin

October 20, 2006
Project Number 1G-0609023

GILES
ENGINEERING ASSOCIATES, INC.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Atlanta, GA
• Baltimore, MD
• Dallas, TX
• Los Angeles, CA
• Milwaukee, WI
• Orlando, FL
• Tampa, FL

October 20, 2006

Mr. Rick Michalski
4525 South Lawler Avenue
Cudahy, WI 53110

Subject: Geotechnical Engineering Exploration and Analysis
Proposed Lakeside Village Square Phase 1
East Howard Avenue and South Kinnickinnic Avenue
Milwaukee, Wisconsin
Project Number 1G-0609023

Dear Mr. Michalski:

As requested, Giles Engineering Associates, Inc. conducted a *Geotechnical Engineering Exploration and Analysis* for the proposed project. The accompanying report describes the services that were conducted for the project and it provides geotechnical-related findings, conclusions and recommendations that were derived from those services.

We sincerely appreciate the opportunity to provide geotechnical consulting services for the proposed project. Please contact the undersigned if there are questions concerning the report or if we may be of further service.

Very truly yours,

GILES ENGINEERING ASSOCIATES, INC.

Angela A. Jacobi
Geotechnical Engineer

Paul J. Giese, P.E.
Geotechnical Division Manager

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GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED LAKESIDE VILLAGE SQUARE PHASE I
EAST HOWARD AVENUE AND SOUTH KINNICKINNIC AVENUE
MILWAUKEE, WISCONSIN
PROJECT NUMBER 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED LAKESIDE VILLAGE SQUARE PHASE I
EAST HOWARD AVENUE AND SOUTH KINNICKINNIC AVENUE
MILWAUKEE, WISCONSIN
PROJECT NUMBER 1G-0609023

EXECUTIVE SUMMARY

Seven geotechnical test borings were performed at the subject site to evaluate subsurface conditions. About 2 inches of rootmat was at the ground surface at Test Boring Nos. 1 and 4. About 1 to 5 inches of topsoil fill was at the ground surface of Test Boring Nos. 2, 3, 5, 6, and 7. The topsoil fill consisted of clayey silt and silty clay with little organic matter. Fill composed of sandy silt, silty sand, clayey silt, and silty clay was below the rootmat and the topsoil at the test boring locations and was present to 6½ to 9 feet below-ground at Test Boring Nos. 1, 2, 3, and 4 and at least the 6-foot test boring termination depth at Test Boring Nos. 5, 6, and 7. Silty fine sand classified as possible foundry sand was encountered between the depths of about 1 and 4 feet below-ground at Test Boring No. 1 and between about 4 and 6½ feet below-ground at Test Boring No. 4. Native silty clay and fine sandy clay was below the fill and was present to at least the 16-foot test boring termination depth at Test Boring Nos. 1, 2, 3, and 4. It is estimated that the water table was about 7½ to 9 feet below-ground at Test Boring Nos. 1, 2, 3, and 4 and deeper than the 6-foot test boring termination depth at Test Boring Nos. 5, 6, and 7 when the Geotechnical Subsurface Exploration Program was conducted.

Possible foundry material was encountered in two of the test borings. It is recommended an environmental assessment be performed to determine what concerns exist. Alteration to the geotechnical recommendations of this report may be needed depending on the results of the recommended environmental assessment and WDNR requirements.

Based on the subsurface conditions encountered at the test boring locations, the existing fill could be used for floor slab and foundation support, provided a risk of increased settlement in excess of that estimated herein is acceptable to the owner and the rigidity of the foundations and floor slab are increased to help resist potential differential settlement.

The proposed building will be a two-story, masonry structure that will not have a basement or other below-ground spaces. Two foundation alternates are recommended, and those alternates are based on settlement risk. Alternate A is for a spread-footing foundation directly (and fully) supported by native soil and/or newly placed engineered fill used to replace existing fill soils, and Alternate B is for a moderately-rigid spread-footing foundation supported by suitable-bearing existing fill and native soil. If Alternate B is chosen, the client (and building owner)

EXECUTIVE SUMMARY CONT.

must accept there is risk that the total and differential settlements of the building could be more than the estimated settlements given in this report, which could result in structural distress. The settlement risk with Alternate B might be acceptable since Alternate B will likely be less costly than Alternate A because less excavation and off-site disposal will likely be needed for Alternate B.

A new parking lot will surround the proposed building and it will include automobile parking stalls and automobile drive lanes. Hot-mix asphalt (HMA) pavement with an aggregate base course is considered suitable for the parking lot, with proper sub-grade preparation as described in the report. Portland cement concrete pavement is recommended within high-stress areas, such as near the trash enclosure and at exit/entrance aprons.

This Executive Summary provides limited geotechnical information regarding the proposed project. Since this Executive Summary is exceedingly abbreviated, it must be read in complete context with the following report.

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED LAKESIDE VILLAGE SQUARE PHASE I
EAST HOWARD AVENUE AND SOUTH KINNICKINNIC AVENUE
MILWAUKEE, WISCONSIN
PROJECT NUMBER 1G-0609023

1.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. ("Giles") conducted regarding the proposed development. The *Geotechnical Engineering Exploration and Analysis* included several separate, but related, service areas referenced hereafter as the Geotechnical Subsurface Exploration Program, Geotechnical Laboratory Services, and Geotechnical Engineering Services. The scope of each service area was narrow and limited, as directed by our client and in consideration of the proposed project. The scope of each service area is briefly explained later.

Geotechnical-related recommendations for design and construction of the foundation and ground-bearing floor slab for the proposed building are provided in this report. Geotechnical-related recommendations are also provided for the future parking lot pavement. Site preparation recommendations are also given; however, those recommendations are only preliminary since the means and methods of site preparation will largely depend on factors that were unknown when this report was prepared. Those factors include the weather before and during construction, subsurface conditions that are exposed during construction, and finalized details of the proposed development. Environmental services were beyond the scope of services for this report.

2.0 SITE DESCRIPTION

The site is on the northwest corner of intersection of East Howard Avenue and South Kinnickinnic Avenue. The geotechnical test borings (described later) were performed on September 25, 2006 and on that date the site was vacant and covered with grass and weeds, and it included some trees. Also, the site was relatively flat and level; a maximum of about 1½ feet of topographic relief was measured between the test boring locations. East Howard Avenue was to the south of the site, a factory building was north of the site, South Kinnickinnic Avenue was east of the site and a railroad track was west of the site.

3.0 PROJECT DESCRIPTION

It is understood that the development of the Lakeside Village Square will be constructed in three phases. This project is understood to be considered Phase I of the development. Phase I is understood to consist of a two-story structure and associated parking lot.

The two-story structure will not have a basement or other below-ground spaces. The perimeter above-ground walls of the proposed building will be built of concrete masonry units (CMU) and the roof will be a wood-truss or bar-joist system. Perimeter CMU walls and interior, steel columns will support the roof structure. It is estimated that foundation loads will be a maximum of 2,000 pounds per lineal foot (plf) from CMU bearing walls and 80,000 pounds per column. It is understood that the floor is to be a ground-bearing concrete slab. It is assumed that the maximum floor load will be 100 pounds per square foot (psf).

A new parking lot will surround the proposed building. The parking lot will include automobile parking stalls and automobile drive lanes. It is assumed that the parking lot pavement is planned to be hot-mix asphalt (HMA).

The proposed floor and parking lot elevations were not given to Giles; therefore, in order to conduct geotechnical analysis and complete this report, it was necessary for Giles to assume those elevations. The floor elevation was assumed to be El. 95 and the pavement surface elevations were assumed to be between El. 94 and El. 95; those elevations are referenced to the benchmark on the *Test Boring Location Plan* (Figure 1) in Appendix A. Based on the assumed elevations, and considering the site topography when the test borings were performed, it is assumed that only minor grade changes will be needed for site development.

4.0 GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM

The scope of the Geotechnical Subsurface Exploration Program was to evaluate subsurface conditions by drilling seven geotechnical test borings at the site on September 25, 2006. Test Boring Nos. 1 through 4 were 16 feet deep, as planned, and they were in the proposed building location. Test Boring Nos. 5 through 7 were 6 feet deep, as planned, and they were in the proposed parking lot area. The test boring locations were positioned from median on East Howard Avenue near the intersection of East Howard Avenue and South Kinnickinnic Avenue. The approximate test boring locations are shown on the *Test Boring Location Plan*.

The ground elevations at the test borings were determined as part of the Geotechnical Subsurface Exploration Program using survey methods related to the adopted benchmark shown on the *Test Boring Location Plan*. The test boring elevations are noted on the *Records of Subsurface Exploration* (enclosed in Appendix A), which are logs of the test borings. The test boring elevations are considered accurate within about one foot.

Samples were collected from the test borings, at certain depths, using a split-barrel sampler during Standard Penetration Testing (SPT), which is described in Appendix B, along with descriptions of other field procedures. Immediately after sampling, select portions of the SPT samples were transferred from the sampler to clean jars that were labeled at the site for identification. The jarred samples were transported to Giles' geotechnical laboratory as part of the Geotechnical Subsurface Exploration Program.

5.0 GEOTECHNICAL LABORATORY SERVICES

Samples that were jarred at the site were classified by a geotechnical engineer using the descriptive terms and particle-size criteria shown on the *General Notes* in Appendix D, and by using the Unified Soil Classification System (ASTM D 2488-75) as a general guide. The classifications are shown on the *Records of Subsurface Exploration*, along with horizontal lines that show supposed depths of material change. Field-related information pertaining to the test borings is also shown on the *Records of Subsurface Exploration*. For simplicity and abbreviation, terms and symbols are used on the *Records of Subsurface Exploration;* the terms and symbols are defined on the *General Notes*.

Unconfined compression, calibrated penetrometer resistance, and water content tests were performed on select cohesive soil samples to establish the geotechnical recommendations in this report. The test results are on the *Records of Subsurface Exploration*.

6.0 MATERIAL CONDITIONS

Since material sampling at the test borings was discontinuous, it was necessary for Giles to suppose conditions between sample intervals. The supposed conditions at the test borings are briefly discussed in this section and are described in detail on the *Records of Subsurface Exploration*. Also, the conclusions and recommendations in this report are based on the supposed conditions.

6.1. Ground Surface Material

About 2 inches of rootmat was at the ground surface at Test Boring Nos. 1 and 4. About 1 to 5 inches of topsoil fill was at the ground surface of Test Boring Nos. 2, 3, 5, 6, and 7. The topsoil fill consisted of clayey silt and silty clay with little organic matter.

6.2. Fill Material

Fill composed of sandy silt, silty sand, clayey silt, and silty clay was below the rootmat and the topsoil at the test boring locations and was present to 6½ to 9 feet below-ground at Test Boring Nos. 1, 2, 3, and 4 and at least the 6-foot test boring termination depth at Test Boring Nos. 5, 6, and 7. Silty fine sand classified as possible foundry sand was encountered between the depths of about 1 and 4 feet and 6½ and 9 feet below-ground at Test Boring No. 1 and between about 4 and 6½ feet below-ground at Test Boring No. 4.

6.3. Native Soil

Native medium stiff to stiff comparative consistency silty clay and fine sandy clay was below the fill and was present to at least the 16-foot test boring termination depth at Test Boring Nos. 1, 2, 3, and 4.

7.0 GROUNDWATER CONDITIONS

It is estimated that the water table was about 7½ to 9 feet below-ground at Test Boring Nos. 1, 2, 3, and 4 and deeper than the 6-foot test boring termination depth at Test Boring Nos. 5, 6, and 7 when the Geotechnical Subsurface Exploration Program was conducted. Therefore, the water table was likely between about El. 85 and El. 87 referenced to the benchmark on Figure 1. Groundwater conditions will fluctuate and groundwater may become perched above the water table.

The estimated water table depth is only an approximation based on the colors and water content of the jarred soil samples, and water levels that were encountered at the test borings. The actual water table depth may be higher or lower than estimated. If a more precise depth estimate is needed, groundwater observation wells are recommended to be installed and observed at the site. It is recommended that Giles install and observe the observation wells, if it is decided that observation wells are necessary.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1. Seismic Design Considerations

A soil Site Class D is recommended for seismic design. By definition, Site Class is based on the average properties of subsurface materials to a depth of 100 feet below the ground surface.

Since 100-foot test borings were not requested or authorized for the project, it was necessary to estimate the Site Class based on the test borings, presumed area geology, and Table 1615.1.1 of the 2003 International Building Code.

8.2. Building Foundation Recommendations

Two foundation alternates are given below, and those alternates are based on settlement risk. Alternate A is for a spread-footing foundation directly (and fully) supported by native soil and/or newly placed engineered fill used to replace existing fill soils, and Alternate B is for a moderately-rigid spread-footing foundation supported by existing fill and native soil. If Alternate B is chosen, the client (and building owner) must accept that there is a risk that the total and differential settlements of the building could be more than the estimated settlements given in this report, which could result in structural distress. The settlement risk with Alternate B might be acceptable since Alternate B will likely be less costly than Alternate A because less excavation is expected for Alternate B. The cost savings with Alternate B could be significant depending on the characteristics of the excavated materials, and the need to dispose the excavated materials off-site.

8.2.1. Alternate A: Spread Footing Foundation

Alternate A is for a spread-footing foundation. With this alternate, the footings must be directly supported within suitable-bearing native soils that are considered to be available at depths ranging from 6½ to 9± feet below the existing grade. However, some variation should be expected. The foundations are recommended to be extended in depth to suitable bearing soils or be supported on newly placed engineered fill or lean concrete mix extending to suitable native soils. For Alternate A, the foundation is recommended to be designed using a 2,000 psf maximum, net, allowable soil bearing capacity. Also, strip footing pads are recommended to be at least 16 inches wide and isolated column pads are recommended to be at least 24 inches wide for geotechnical considerations, regardless of the calculated foundation bearing stress. Foundation walls could be built of cast-in-place concrete or concrete masonry units. It is recommended that a structural engineer or architect provide specific foundation details including footing dimensions, reinforcing, etc.

Assuming that the finished floor will be at El. 95, it is assumed that the planned bearing grade for footings will be El. 90.5 for exterior and El. 93 for interior; those elevations are referenced to the temporary benchmark on the *Test Boring Location Plan*. Native soil was not encountered at those assumed foundation bearing elevations at Test Boring Nos. 1, 2, 3 and 4; therefore it is expected that over-excavation depths of about 2 to 5 feet for exterior footings and about 5 to 8 feet for interior footings should be expected due to the existing fill.

Estimated Alternate A Foundation Settlement

The post-construction total and differential settlements of a spread-footing foundation directly supported by suitable-bearing native soil, and designed and constructed per this report, are estimated to be a maximum of about 1.0 and 0.5 inch, respectively. The post-construction angular distortion is estimated to be a maximum of about 0.0021 across a distance of 20 feet or more.

8.2.2. Alternate B: Moderately-Rigid Spread Footing Foundation

Alternate B is for a moderately-rigid spread footing foundation within suitable bearing existing fill soils that have been evaluated and approved by a representative of Giles at the time of construction. As indicated, if this alternate is chosen, risk of increased total and differential settlement most be accepted. In addition, extension of footings and/or over-excavation of unsuitable materials and replacement with engineered fill in some areas of the structure should be anticipated due to the potential variability of the existing fill soils.

The foundation analysis was conducted assuming that the floor of the proposed building will be at El. 95 referenced to the benchmark on the *Test Boring Location Plan*. Based on that floor elevation and the building-area test borings, a moderately-rigid spread footing foundation designed using a 2,000 psf maximum, net, allowable soil bearing capacity is recommended for the proposed building. Footing pads are recommended to be founded on suitable bearing existing soil (fill or native) or upon engineered fill placed on a suitable bearing existing soil subgrade. Strip footing pads are recommended to be at least 16 inches wide and isolated column pads recommended to be at least 24 inches wide for geotechnical concerns, regardless of the calculated soil pressure. The longitudinal reinforcement in continuous strip footing pads is recommended to consist of at least four No. 5 rebars (two top and two bottom) to increase resistance against differential movement from non-uniform soil support. The longitudinal reinforcement is based on a minimum 12-inch-thick and a maximum 24-inch-wide footing pad. Additional reinforcement may be needed if the footing pads are thinner and/or wider. A combination of footing pad and stemwall reinforcement could alternatively be used to provide the intended rigidity. The reinforcement is also recommended to be carried through the column pads located within the wall lines to increase the overall structural rigidity. Foundation walls are recommended to be constructed of cast-in-place concrete, rather than concrete masonry units due to the existing fill. It may be feasible to construct footings without forms (i.e. earth-formed trench footing construction methods). Forming of footings will be needed where excavations are not stable. A structural engineer or architect should design the foundation, including footing widths and reinforcing details.

Using the assumed floor elevation (El. 95) and foundation bearing depths, it is assumed that the perimeter and interior footings will bear at about El. 90.5 and El. 93, respectively, referenced to the benchmark on the *Test Boring Location Plan*. The soil that was encountered at those assumed foundation bearing elevations at the building-area test borings is anticipated to be suitable to support spread footings that exert a maximum 2,000 psf foundation bearing stress. However due to the potential variability of the existing fill soils, unsuitable bearing soil may be encountered.

Estimated Alternate B Foundation Settlement

It is estimated that the post-construction total and differential settlements of a moderately-rigid spread-footing foundation designed and constructed based on the recommendations of this report will be a maximum of about 1.2 inches and 3/5 inch, respectively. It is also estimated that the post-construction angular distortion of a moderately-rigid spread-footing foundation will be a maximum of about 0.0025 across a distance of 20 feet or more. As noted above, if Alternate B is chosen, the client (and building owner) must accept that there is a risk that the total and differential settlements of the building could be more than the estimated settlements, which could result in structural distress.

8.2.3. General Foundation Recommendations

It is understood that a minimum 48-inch foundation depth is required by the local building code. Therefore, footings for perimeter walls and other exterior elements of the proposed structure are recommended to bear at least 48 inches below the finished ground grade. Interior footings could be directly below the floor slab if the building will be heated and support soil will not freeze. The foundation analysis was conducted assuming that the perimeter and interior foundations will bear at about 4½ feet and 2 feet below the floor surface, respectively.

Foundation excavations are recommended to be dug with a smooth-edge backhoe bucket to develop a relatively undisturbed bearing grade. A toothed bucket will likely disturb foundation-bearing soil more than a smooth-edge bucket, thereby making soil at the excavation base more susceptible to saturation and instability, especially during adverse weather. It is critical that contractors protect foundation support-soil and foundation construction materials (concrete, reinforcing, etc.). In addition, engineered fill is recommended to be placed and compacted in benched excavations along foundation walls immediately after the foundation walls are capable of supporting lateral pressures from backfill, compaction, and compaction equipment. Earth-formed footing construction techniques will likely not be feasible considering that sand was at and above the estimated foundation bearing elevations at the test borings.

Foundation Support Soil Requirements

For Alternate A, footings are recommended to be directly and entirely supported by suitable-bearing native soil, or new engineered fill placed and compacted on suitable-bearing, native soil. Based on the recommended 2,000 psf bearing capacity for Alternate A, the unconfined compressive strength of cohesive (clayey) foundation support soil, such as silty clay, is recommended to be at least 1.0 ton per square foot (tsf). For non-cohesive (granular) foundation support soil, such as sand, the average corrected N-value (determined from SPTs and correlated from other in-situ tests) is recommended to be at least 8 based upon a 2,000 psf maximum bearing capacity.

For Alternate B, footings are recommended to be directly and entirely supported by suitable-bearing existing fill or native soil, or new engineered fill placed and compacted on a suitable bearing existing fill or native soil. Based on the recommended 2,000 psf bearing capacity for Alternate A, the unconfined compressive strength of cohesive (clayey) foundation support soil, such as silty clay, is recommended to be at least 1.0 ton per square foot (tsf). For non-cohesive (granular) foundation support soil, such as sand, the average corrected N-value (determined from SPTs and correlated from other in-situ tests) is recommended to be at least 8 based upon a 2,000 psf maximum bearing capacity.

Because of the existing fill, it is critical that Giles evaluate foundation support soil immediately before foundation construction. The purpose of the recommended evaluation is to confirm that the foundation will be properly supported and to confirm that the support soil is accurately represented by the conditions described on the *Records of Subsurface Exploration*. In the event that another firm performs the recommended foundation elevation, Giles must be notified if the composition or strength characteristics of foundation support soil differ from those shown on the *Records of Subsurface Exploration*. If foundation support soil is not tested during construction, there is a significant risk that the foundation could be improperly supported, which could result in excessive building settlement and structural distress.

It is recommended that the strength characteristics of soil within the entire foundation influence zone (determined by Giles during construction) meet or exceed the recommended values given above, unless Giles approves lesser values based on the conditions encountered at the time of construction. Soil that is within a foundation influence zone but does not meet the recommended strength criteria (described above), or is otherwise unsuitable, is recommended to be replaced. Unsuitable bearing material could be replaced with engineered fill, such as well-graded aggregate or lean-mix Portland cement concrete (with a minimum 28-day compressive strength

of 500 psi). It is recommended that Giles provide specific recommendations pertaining to soil over-excavation and replacement at the time of construction. As an option to soil replacement, strip footing pads could be stepped or thickened to extend through unsuitable bearing materials and isolated column pads could be uniformly thickened for Alternative A. It is recommended that a structural engineer or architect should provide specific details of stepped or thickened footings.

8.3. Floor Slab Recommendations

It is understood that the floor of the building is to be a ground-bearing concrete slab. Considering the assumed floor elevation (El. 95), it is assumed that the base course sub-grade will be at El. 94.2±. Based on that elevation, and with proper sub-grade preparation, it is expected that existing fill and native soil will be suitable for support of a ground-bearing concrete floor. However, considering the existing fill, there is a risk that the total and differential settlements of the floor slab could be more than the estimated settlements given below, which could result in floor slab distress. At least some over-excavation of unsuitable bearing materials (including rubble) will likely be needed to develop a suitable floor slab sub-grade. Engineered fill that is selected, placed, and compacted according to this report could also support a concrete slab.

Assuming a maximum 100 psf floor load, the floor slab is recommended to be at least 4 inches thick. The floor slab is recommended to be reinforced with fiber mesh or welded wire fabric (6x6-W2.9xW2.9 WWF) to help control shrinkage cracking. In lieu of WWF or steel bars, the floor slab concrete could alternatively contain an appropriate concrete admixture, such as NOVOMESH 850®, to help to control shrinkage cracking. It is recommended that a structural engineer or architect specify the floor slab thickness, reinforcing, joint details and other parameters.

A minimum 6-inch-thick base course is recommended to be directly below the floor slab to serve as a capillary break and help develop uniform support. It is recommended that the base course consist of free-draining aggregate. Also, it is recommended that Giles test and approve base course aggregate before it is placed. Depending on aggregate gradation, a geotextile might need to be below the base course.

A minimum 10-mil vapor retarder is recommended to be directly below the base course throughout the entire floor area. The vapor retarder is recommended to be in accordance with ASTM E 1745-97, which is entitled: *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.* If the base course has sharp, angular aggregate, protecting the retarder with a geotextile (or by other means) is recommended.

Also, it is recommended that a structural engineer or architect specify the vapor retarder location with careful consideration of concrete curing and the effects of moisture on future flooring materials.

Estimated Floor Slab Settlement

The post-construction total and differential settlements of an isolated floor slab constructed in accordance with this report are estimated to be a maximum of about 0.6 and 0.4-inch, respectively, over a distance of about 20 feet.

8.4. Pavement Recommendations

Giles was not given information regarding future parking lot traffic. Therefore, in order to provide pavement recommendations, it was necessary for Giles to use arbitrarily-selected design traffic volumes. The recommended parking-stall section is for a maximum daily traffic volume of 200 automobiles, but no heavy trucks. The recommended drive-lane section is for a maximum daily traffic volume of five 18,000-pound equivalent single axle loads (ESALs).

It is recommended that the project owner, developer, civil engineer and other design professionals involved with the project confirm that the arbitrarily-selected traffic volumes are appropriate. If requested, Giles will provide supplemental pavement recommendations based upon other traffic conditions if the arbitrarily-selected traffic volumes are not appropriate.

A California Bearing Ratio (CBR) test is commonly used to determine soil support parameters for pavement design. Since a CBR test was not authorized for this project, it was necessary for Giles to assume a CBR design value in order to give pavement recommendations. The pavement subgrade soils are anticipated to consist of sandy silt, silty sand and clayey silt existing fill soils. These soils exhibited somewhat variable characteristics, however complete removal of these materials is not likely economically feasible. As such, provided they are prepared as outlined in the site preparation recommendations section of this report, and provided the client is willing to accept the risk of settlement and the associated distress on the overlying pavement, the existing soils can be used for standard flexible or rigid pavement construction. The following pavement sections are based on an assumed CBR design value of 4, considering the somewhat variable fill soils on this site. Engineered fill that is placed in proposed pavement areas is recommended to have a CBR design value equal to or greater than 4 and the fill is recommended to be placed and compacted per this report.

RECOMMENDED PAVEMENT SECTION			
Material	**Pavement Section Thicknesses (inches)**		**Wisconsin DOT Standard Specifications**
	Drive Lanes	**Parking Stalls**	
Hot Mix Asphalt Surface Course	1½	1½	Section 460, E-0.3 (9.5 or 12.5 mm)
Hot Mix Asphalt Binder Course	2	2	Section 460, E-0.3 (12.5 or 19 mm)
Aggregate Base Course	8	6	Section 305, 19 mm Crushed Stone

A minimum 6-inch-thick Portland cement concrete pavement with a minimum 4-inch-thick compacted aggregate base course is recommended to be in high-stress areas such as at entrance/exit aprons, at the trash enclosure, and in areas where trucks will turn or will be parked. The pavement is recommended to be reinforced with heavy welded wire fabric (6x6-W2.9xW2.9 WWF), which should be at about mid-height of the slab. The materials and construction procedures for the pavement should be in accordance with the Wisconsin Department of Transportation Standard Specifications Section 415 for concrete and Section 305 for base course.

The pavement recommendations assume that the pavement sub-grade will be prepared per this report, the base course will be properly drained, and Giles will observe pavement construction. The asphalt pavement was designed based on AASHTO design parameters for a twenty-year design period. Due to the presence of somewhat variable fill soils, more extensive pavement repair and maintenance along with a major rehabilitation after about 8 to 10 years should be expected. Local codes may require specific testing to determine soil support characteristics and/or minimum pavement section thickness might be required.

8.5. Generalized Site Preparation Recommendations

This section deals with site preparation including preparation of floor slab, pavement, and engineered fill areas. The means and methods of site preparation will greatly depend on the weather conditions before and during construction, the subsurface conditions that are exposed during earthwork operations, and the finalized details of the proposed development. Therefore, only generalized site preparation recommendations are given.

In addition to being generalized, the following site preparation recommendations are abbreviated; the *Guide Specifications* in Appendix D gives recommendations that are more detailed. The *Guide Specifications* should be read along with this section. Also, the project specifications are recommended to be based upon the *Guide Specifications*.

Clearing, Grubbing and Stripping

Surface vegetation, trees and bushes (including root-balls), topsoil with adverse organic content, and otherwise unsuitable bearing materials are recommended to be removed from the proposed building footprint, pavement area, and other structural areas. Clearing, grubbing and stripping should extend at least several feet beyond proposed development areas, where feasible.

When the test borings were drilled, the topsoil fill and rootmat at the test boring locations was between about 2 to 5 inches thick. Those topsoil fill and rootmat thicknesses could be used on a preliminary basis to estimate topsoil stripping quantities. However, since topsoil fill and rootmat may be thinner or thicker away from the test borings, the actual stripping quantity may be more or less than estimated. It might be beneficial to stockpile stripped topsoil fill on the site for later use in landscape areas.

Proof-Rolling and Fill Placement

After the recommended clearing, grubbing, and stripping, and once the site is cut (lowered) as needed, the sub-grade is recommended to be proof-rolled with a fully-loaded, tandem-axle dump truck or other suitable construction equipment to help locate unstable soil based on sub-grade deflection caused by the wheel loads of the proof-roll equipment. The entire site is recommended to be proof-rolled and, where feasible, proof-rolling should extend at least several feet beyond development areas. It is recommended that Giles observe proof-roll operations and evaluate the sub-grade stability based on those observations. To improve the existing sandy fill soils, the sub-grade is also recommended to be surface-compacted with a minimum 10-ton smooth-drum roller, or other suitable construction equipment to help locate unstable soil. The entire site should be surface-compacted and if feasible, surface compaction should extend at least several beyond development areas. We recommend at least 8 passes of the compactor across the site. The 8 passes should consist of two sets of four passes perpendicular to each other. It is recommended that Giles observe surface-compaction operations and evaluate the sub-grade stability based on those observations.

Soil that yields excessively or ruts during proof-rolling or surface-compaction, or shows other signs of instability, is recommended to be replaced with engineered fill. As an option to replacement, unsuitable soil could be scarified to a sufficient depth (likely 6 to 12 inches, or more), moisture-conditioned (uniformly moistened or dried), and compacted to the required in-place density. Unsuitable soil could also be modified with hydrated lime or Portland cement, or mechanically stabilized with coarse aggregate and/or geosynthetics (geogrids, geotextiles, etc.). It is recommended that Giles provide specific soil improvement recommendations based on the conditions during construction.

The site is recommended to be raised, where necessary, to the planned finished grade with engineered fill immediately after the sub-grade is confirmed to be stable and suitable to support the proposed site improvements. Engineered fill is recommended to be placed in uniform, relatively thin layers (lifts). And, each layer of engineered fill is recommended to be compacted to at least 95 percent of the fill material's maximum dry density determined from the geotechnical test titled: *Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort* (ASTM D698). That test is hereafter referenced as: *The Standard Proctor Compaction test.* As an exception, the in-place dry density of engineered fill within one foot of the pavement sub-grade is recommended to be compacted to at least 100 percent of the fill's maximum dry density. Item Nos. 4 and 5 of the *Guide Specifications* give more specific information pertaining to selection and compaction of engineered fill.

The water content of fill material is recommended to be uniform and within a narrow range of the optimum moisture content, as described in Item No. 5 of the *Guide Specifications*. The optimum moisture content is to be determined by the Standard Proctor Compaction test.

Engineered fill that does not meet the density and water content requirements is recommended to be replaced or scarified to a sufficient depth (likely 6 to 12 inches, or more), moisture-conditioned, and compacted to the required density. A subsequent lift of fill should only be placed after Giles confirms that the previous lift was properly placed and compacted. Sub-grade soil may need to be recompacted immediately before construction since equipment traffic and adverse weather may reduce soil stability.

Use of Site Soil as Engineered Fill

Site soil that does not contain adverse organic content, or other deleterious materials, could be used as engineered fill. Considering the measured water contents of the jarred soil samples, site soil may need to be moisture-conditioned prior to use as engineered fill. If construction is during adverse weather (discussed in the following section), drying site soil will likely not be feasible. In that case, aggregate fill (or other fill material with a low water-sensitivity) will likely need to be imported to the site. Specific recommendations regarding fill selection, placement and compaction are given in the *Guide Specifications*.

8.6. Generalized Construction Considerations

Adverse Weather

Site soil is moisture sensitive and will become unstable when exposed to adverse weather such as rain, snow, and freezing temperatures. Therefore, it might be necessary to remove or stabilize the

upper 6 to 12 inches (or more) of soil due to adverse weather, which commonly occurs during late fall, winter, and early spring. At least some over-excavation and/or stabilization of unstable soil should be expected if construction is during or after adverse weather. Based on the test borings, extensive over-excavation is not expected to be needed if construction is during and after favorable, dry weather. Because site preparation is weather dependant, bids for site preparation, and other earthwork activities, are recommended to be based on the time of year that construction will be conducted.

In an effort to protect soil from adverse weather, the site surface is recommended to be smoothly graded and contoured during construction to divert surface water away from construction areas. Also, contoured subgrades are recommended to be rolled with a smooth-drum compactor, before precipitation, to "seal" the surface. Furthermore, construction traffic should be restricted to certain aggregate-covered areas in an effort to minimize traffic-related soil disturbance. Foundation, floor slab and pavement construction should begin immediately after suitable support is confirmed.

Dewatering

It is estimated that the water table was about 7½ to 9 feet below-ground at Test Boring Nos. 1, 2, 3, and 4 and deeper than the 6-foot test boring termination depth at Test Boring Nos. 5, 6, and 7 when the test borings were performed. Accordingly, the water table was likely between El. 85 and El. 87 referenced to the benchmark on Figure 1. Based on the assumed floor elevation (El. 95) and parking lot grades (El. 94 to El. 95), it is expected that excavations for foundations and utilities, and other earthwork operations, will be above the water table.

Some dewatering might be needed during construction due to precipitation or if perched water is encountered. Water that accumulates in construction areas is recommended to be removed from excavations and other construction areas, along with unstable soil as soon as possible. Filtered sump pumps, drawing water from sump pits excavated in the bottom of construction trenches, will likely be adequate to remove water that collects in shallow excavations. Excavated sump pits should be fully-lined with a geotextile and filled with open-graded, free-draining aggregate.

Excavation Stability

Excavations may cave during construction, especially due to the potential variability of the fill soils and if granular soil is encountered. Excavations are recommended to be made in accordance with current OSHA excavation and trench safety standards, and other applicable

requirements. Sides of excavations might need to be sloped or braced to maintain or develop a safe work environment. Temporary shoring must be designed according to applicable regulatory requirements. Contractors are responsible for excavation safety.

Existing Fill Considerations

Questionable materials, if encountered, are recommended to be evaluated by a geotechnical engineer to determine if removal and replacement with compacted structural fill is necessary. Disposal of unsuitable material should be in accordance with local, state and federal regulations for the material type.

Possible Foundry Material Considerations

Possible foundry material was encountered in two of the test borings. It is recommended an environmental assessment be performed to determine what concerns, if any, exist. Based on past conversations with the Wisconsin Department of Natural Resources (WDNR), it is understood that the WDNR considers foundry material deposits to be solid waste and that special permits would likely be required for construction within or adjacent to foundry material. If possible, the excavated possible foundry material should be left on-Site. The WDNR typically requires that any removed foundry material be placed in areas where foundry material is already present so that the lateral extent of the foundry material is not increased. If the material is actually foundry material and off-site disposal is needed, it will likely require disposal in a licensed landfill. If it is necessary to remove foundry sand materials from the site, construction delays may result and additional costs associated with excavation, trucking, disposal and backfill replacement may be incurred. Alteration to the geotechnical recommendations of this Report may be needed depending on the results of the recommended environmental assessment and WDNR requirements.

8.7. Recommended Construction Materials Testing Services

This report was prepared assuming that Giles will perform Construction Materials Testing ("CMT") services during construction of the proposed development. In general, CMT services are recommended (and expected) to at least include observation and testing of: foundation, floor slab and pavement support soil; concrete; asphalt, and other construction materials. It might be necessary for Giles to provide supplemental geotechnical recommendations based on the results of CMT services and provided specific details of the project.

8.8. Basis of Report

This report is based on Giles' proposal, which is dated September 20, 2006 and is referenced by Giles' proposal number 1GP-060931. The actual services for the project varied somewhat from those described in the proposal because of the conditions that were encountered while performing the services and in consideration of the proposed project.

This report is strictly based on the project description given earlier in this report. Giles must be notified if any part of the project description is not accurate so that this report can be amended, if needed. This report is based on the assumption that the facility will be designed and constructed according to the codes that govern construction at the site.

The conclusions and recommendations in this report are based on supposed subsurface conditions as shown on the *Records of Subsurface Exploration.* Giles must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Records of Subsurface Exploration* because this report will likely need to be revised. General comments and limitations of this report are given in the appendix.

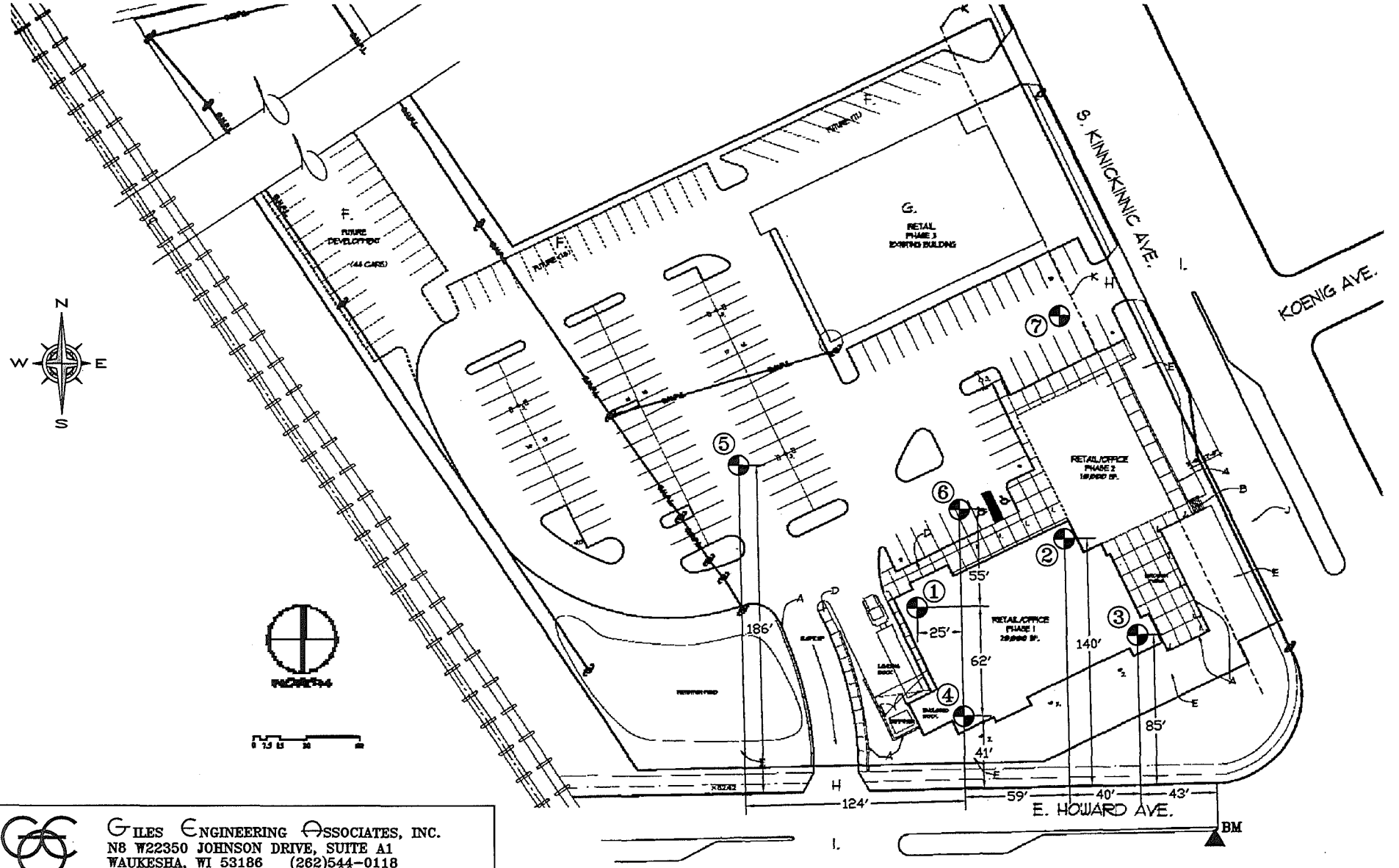
1G0609023-Report/06Geo03/aaj/sat

APPENDIX A

FIGURES AND TEST BORING LOGS

The Boring Location Plan contained herein was prepared based upon information supplied by Giles' client, or others, along with Giles' field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.



GILES ENGINEERING ASSOCIATES, INC.
N8 W22350 JOHNSON DRIVE, SUITE A1
WAUKESHA, WI 53186 (262)544-0118

FIGURE 1
TEST BORING LOCATION PLAN
PROPOSED LAKESIDE VILLAGE SQUARE PHASE I
E. HOWARD AVENUE AND S. KINNICKINNIC AVENUE
MILWAUKEE, WISCONSIN

DESIGNED	DRAWN	SCALE	DATE	REVISED
AAJ	JSZ	1"=80'	10-02-06	--
PROJECT NO.: 1G-0609023			CAD No. 1g0609023-blp	

LEGEND:

① GEOTECHNICAL TEST BORING

BM BENCHMARK: TOP OF ISLAND ON E. HOWARD AVE.
ASSUMED ELEVATION = 100.0'

NOTES:

1.) DIMENSIONS INDICATE THE APPROXIMATE METHOD OF LOCATING THE TEST BORINGS IN THE FIELD RELATIVE TO THE EXISTING CURB LINES STARTING AT ISLAND.

2.) BASE MAP DEVELOPED FROM THE "SITE PLAN", DATED 6/24/06, PREPARED BY WELMAN ARCHITECTS INC.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
1-NWC of Building	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
95.2	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.

Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
2" Rootmat		1-SS	6		4.1		11		
Black-Brown Sandy Silt, little Gravel, trace Clay (Fill)-Moist		2-SS	6						
Black Silty fine Sand, trace Gravel (Fill) (Possible Foundry Sand)-Moist									
Light Brown Silty Clay, trace Sand (Fill)-Moist	5	3-SS	6	1.7	2.0		17		
Black Silty Clay, trace Sand (with layers of Black fine Sand (Possible Foundry Sand) (Fill)-Moist		4-SS	8		2.1		32		
Gray Silty Clay-Moist	10	5-SS	9		1.8		22		
	15	6-SS	7		0.8		22		

Boring terminated at 16 feet

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▼	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 8 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

NORMAL BORING LOGS 1G0609023.GPJ GIL_CORP.GDT 10/20/06

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
2-NEC of Building	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
94.3	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.
Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
5" Dark Brown Clayey Silt, little Organic Matter, trace Gravel (Topsoil Fill)-Damp		1-SS	14		2.5		8		
Dark Brown and Brown Clayey Silt, little fine Sand, trace Gravel (Fill)-Moist		2-SS	17		4.5+		15		
Light Brown Clayey Silt, little fine Sand, trace fine Roots and Gravel (Fill)-Moist	5	3-SS	14	3.7	4.5+		19		
Dark Brown Silty Clay, little Organic Matter (Fill)-Moist		4-SS	15	5.9	4.5+		20		
Gray Silty Clay, trace fine Sand-Moist	10	5-SS	8	1.8	2.1		23		
	15	6-SS	6	1.2	0.8		23		
Boring terminated at 16 feet									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▽	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 5.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

NORMAL BORING LOGS 1G0609023.GPJ GIL_CORP.GDT 10/20/06

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
3-SEC of Building	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
94.2	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.

Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
5" Dark Brown Clayey Silt, little Organic Matter, trace fine Sand (Topsoil Fill)-Damp		1-SS	6	0.8	1.5		23		
Dark Brown and Brown Silty Clay, little fine Sand (Fill)-Moist		2-SS	--						
Dark Brown Silty Clay, little fine Sand, trace fine Roots (Fill)-Moist	5	3-SS	28	2.6	4.5+		15		
		4-SS	8						
Gray Brown Silty Clay (with layers and/or lenses of fine Sand)-Moist to Wet	▽ 10	5-SS	7	0.9	1.0		21		
Gray Silty Clay-Wet	15	6-SS	8	0.8			22		

Boring terminated at 16 feet

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▼	WATER LEVEL AFTER REMOVAL: 9.9 ft.	
	CAVE DEPTH AFTER REMOVAL: 10 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

NORMAL BORING LOGS 1G0609023.GPJ GIL_CORP.GDT 10/20/06

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
4-SWC of Building	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
94.6	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.

Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
2" Rootmat		1-SS	8		3.0		15		
Light Brown Silty Clay, little fine Sand, trace fine Roots (Fill)-Moist		2-SS	14		4.5+		13		
Light Brown fine Sandy Silt, little Clay, trace Gravel (Fill)-Moist									
Light Brown Silty Clay, little fine Roots, trace Gravel (Fill)-Moist	5	3-SS	22				12		
Dark Brown Silty fine Sand (Possible Foundry Sand) (Fill)-Moist		4-SS	7		1.5		28		
Brown fine Sandy Clay, little Silt-Very Moist									
Gray Silty Clay-Very Moist	10	5-SS	7	1.2	1.8		22		
	15	6-SS	6		1.1		21		

Boring terminated at 16 feet

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▼	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 7.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
5-Parking Area	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
94.8	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.
Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
5" Dark Brown Silty Clay, little Organic Matter, trace fine Sand (Topsoil Fill)-Moist		1-SS	8	1.4	2.1		20		
Light Brown fine to coarse Sandy Silt, little Gravel (Fill)-Moist		2-SS	30				6		
	5	3-SS	21				6		
Boring terminated at 6 feet									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▼	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 3.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
6-Parking Area	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
95.9	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.
Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
2" Dark Brown Silty Clay, little fine Sand and Organice Matter (Topsoil Fill)-Damp		1-SS	7		1.0		25		
Dark Brown Silty fine Sand, trace Gravel (Fill)-Moist		2-SS	15				11		
	5	3-SS	7				25		
Boring terminated at 6 feet									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: None	
▼	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 3.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

NORMAL BORING LOGS 1G0609023.GPJ GIL_CORP.GDT 10/20/06

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
7-Parking Area	Proposed Lakeside Village Square Phase 1
SURFACE ELEVATION:	PROJECT LOCATION:
95.8	East Howard Avenue & South Kinnickinnic Avenue
COMPLETION DATE:	
9/25/06	Milwaukee, Wisconsin
FIELD REPRESENTATIVE:	
Keith Flowers	GILES PROJECT NUMBER: 1G-0609023

GILES ENGINEERING ASSOCIATES, INC.

Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
1" Dark Brown Silty Clay, little Organic Matter, trace fine Sand (Topsoil Fill)-Damp		1-SS	4		3.8		12		
Dark Brown and Light Brown Clayey Silt, little Gravel (Fill)-Moist		2-SS	6	3.2	2.8		15		
Dark Brown Silty Clay, trace fine Sand and fine Roots (with layers of fine Sand) (Fill)-Moist	5	3-SS	5	0.8	0.8		21		
Boring terminated at 6 feet									

WATER OBSERVATION DATA	REMARKS
WATER ENCOUNTERED DURING DRILLING: None	
WATER LEVEL AFTER REMOVAL: None	
CAVE DEPTH AFTER REMOVAL: 3.5 ft.	
WATER LEVEL AFTER HOURS:	
CAVE DEPTH AFTER HOURS:	

NORMAL BORING LOGS 1G0609023.GPJ GIL_CORP.GDT 10/20/06

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

APPENDIX B

FIELD PROCEDURES

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D 420 entitled "Standard Guide for Sampling Soil and Rock" and/or other relevant specifications. Soil samples were preserved and transported to *Giles*' laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled "Standard Practice for Preserving and Transporting Soil Samples." Brief descriptions of the sampling, testing and field procedures commonly performed by *Giles* are provided herein.

GENERAL FIELD PROCEDURES

Test Boring Elevations

The ground surface elevations reported on the Test Boring Logs are referenced to the assumed benchmark shown on the Boring Location Plan (Figure 1). Unless otherwise noted, the elevations were determined with a conventional hand-level and are accurate to within about 1 foot.

Test Boring Locations

The test borings were located on-site based on the existing site features and/or apparent property lines. Dimensions illustrating the approximate boring locations are reported on the Boring Location Plan (Figure 1).

Water Level Measurement

The water levels reported on the Test Boring Logs represent the depth of "free" water encountered during drilling and/or after the drilling tools were removed from the borehole. Water levels measured within a granular (sand and gravel) soil profile are typically indicative of the water table elevation. It is usually not possible to accurately identify the water table elevation within cohesive (clayey) soils, since the rate of seepage is slow. The water table elevation within cohesive soils must therefore be determined over a period of time with groundwater observation wells.

It must be recognized that the water table may fluctuate seasonally and during periods of heavy precipitation. Depending on the subsurface conditions, water may also become perched above the water table, especially during wet periods.

Borehole Backfilling Procedures

Each borehole was backfilled upon completion of the field operations. If potential contamination was encountered, and/or if required by state or local regulations, boreholes were backfilled with an "impervious" material (such as bentonite slurry). Borings that penetrated pavements, sidewalks, etc. were "capped" with Portland Cement concrete, asphaltic concrete, or a similar surface material. It must, however, be recognized that the backfill material may settle, and the surface cap may subside, over a period of time. Further backfilling and/or re-surfacing by *Giles*' client or the property owner may be required.

FIELD SAMPLING AND TESTING PROCEDURES

Auger Sampling (AU)

Soil samples are removed from the auger flights as an auger is withdrawn above the ground surface. Such samples are used to determine general soil types and identify approximate soil stratifications. Auger samples are highly disturbed and are therefore not typically used for geotechnical strength testing.

Split-Barrel Sampling (SS) - (ASTM D-1586)

A split-barrel sampler with a 2-inch outside diameter is driven into the subsoil with a 140-pound hammer, free-falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12 inches of an 18-inch sample interval is defined as the "Standard Penetration Resistance" or "N-value." The N-value is representative of the soils' resistance to penetration. The N-value is therefore an index of the relative density of granular soils and the comparative consistency of cohesive soils. A soil sample is collected from each SPT interval.

Shelby Tube Sampling (ST) - (ASTM D-1587)

A relatively undisturbed soil sample is collected by hydraulically advancing a thin-walled Shelby Tube sampler into a soil mass. Shelby Tubes have a sharp cutting edge and are commonly 2 to 5 inches in diameter. Unless otherwise noted, *Giles* uses 3-inch-diameter tubes.

Bulk Sample (BS)

A relatively large volume of soil is collected with a shovel or other manually-operated tool. The sample is typically transported to *Giles*' materials laboratory in a sealed bag or bucket.

Dynamic Cone Penetration Test (DC) - (ASTM STP 399)

This test is conducted by driving a 1.5-inch-diameter cone into the subsoil using a 15-pound steel ring (hammer), free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density, and is defined as "N." The Dynamic Cone Penetration test is commonly conducted in hand auger borings, test pits and within excavated trenches.

- Continued -

Ring-Lined Barrel Sampling - (ASTM D 3550)

In this procedure, a ring-lined barrel sampler is used to collect soil samples for classification and laboratory testing. This method provides samples that fit directly into laboratory test instruments without additional handling/disturbance.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e. N-values) are reported on the Test Boring Logs. Explanations of the terms and symbols shown on the logs are provided on the appendix enclosure entitled "General Notes."

APPENDIX C

LABORATORY TESTING AND CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory tests commonly performed by *Giles* are provided herein.

LABORATORY TESTING AND CLASSIFICATION

Photoionization Detector (PID)

In this procedure, soil samples are "scanned" in *Giles'* analytical laboratory using a Photoionization Detector (PID). The instrument is equipped with an 11.7 eV lamp calibrated to a Benzene Standard and is capable of detecting a minute concentration of **certain** Volatile Organic Compound (VOC) vapors, such as those commonly associated with petroleum products and some solvents. Results of the PID analysis are expressed in HNu (manufacturer's) units rather than actual concentration.

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Unconfined Compressive Strength (qu) (ASTM D 2166)

An axial load is applied at a uniform rate to a cylindrical soil sample. The unconfined compressive strength is the maximum stress obtained or the stress when 15% axial strain is reached, whichever occurs first.

Calibrated Penetrometer Resistance (qp)

The small, cylindrical tip of a hand-held penetrometer is pressed into a soil sample to a prescribed depth to measure the soils capacity to resist penetration. This test is used to evaluate unconfined compressive strength.

Vane-Shear Strength (qs)

The blades of a vane are inserted into the flat surface of a soil sample and the vane is rotated until failure occurs. The maximum shear resistance measured immediately prior to failure is taken as the vane-shear strength.

Loss-On-Ignition (ASTM D 2974: Method C)

The Loss-On-Ignition (L.O.I.) test is used to determine the organic content of a soil sample. This procedure is conducted by heating a dry soil sample to 440°C in order to burn-off or "ash" organic matter present within the sample. The L.O.I. value is the ratio of the weight lost due to ignition compared to the initial weight of the dry sample. L.O.I. is expressed as a percentage.

Particle Size Distribution (ASTM D 421, D 422, and D 1140)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a "sieve analysis," which is conducted by passing the sample through a series of nested sieves. The distribution of fine-grained soil particles (silt and clay) is determined from a "hydrometer analysis," which is based on the sedimentation of particles suspended in water.

Consolidation Test (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, lateral ly confined soil sample. During each load increment, vertical compression (consolidation) of the sample is measured over a period of time. Results of this test are used to estimate settlement and time rate of settlement.

Classification of Samples

Each soil sample was visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D-2488-75). The classifications are reported on the Test Boring Logs.

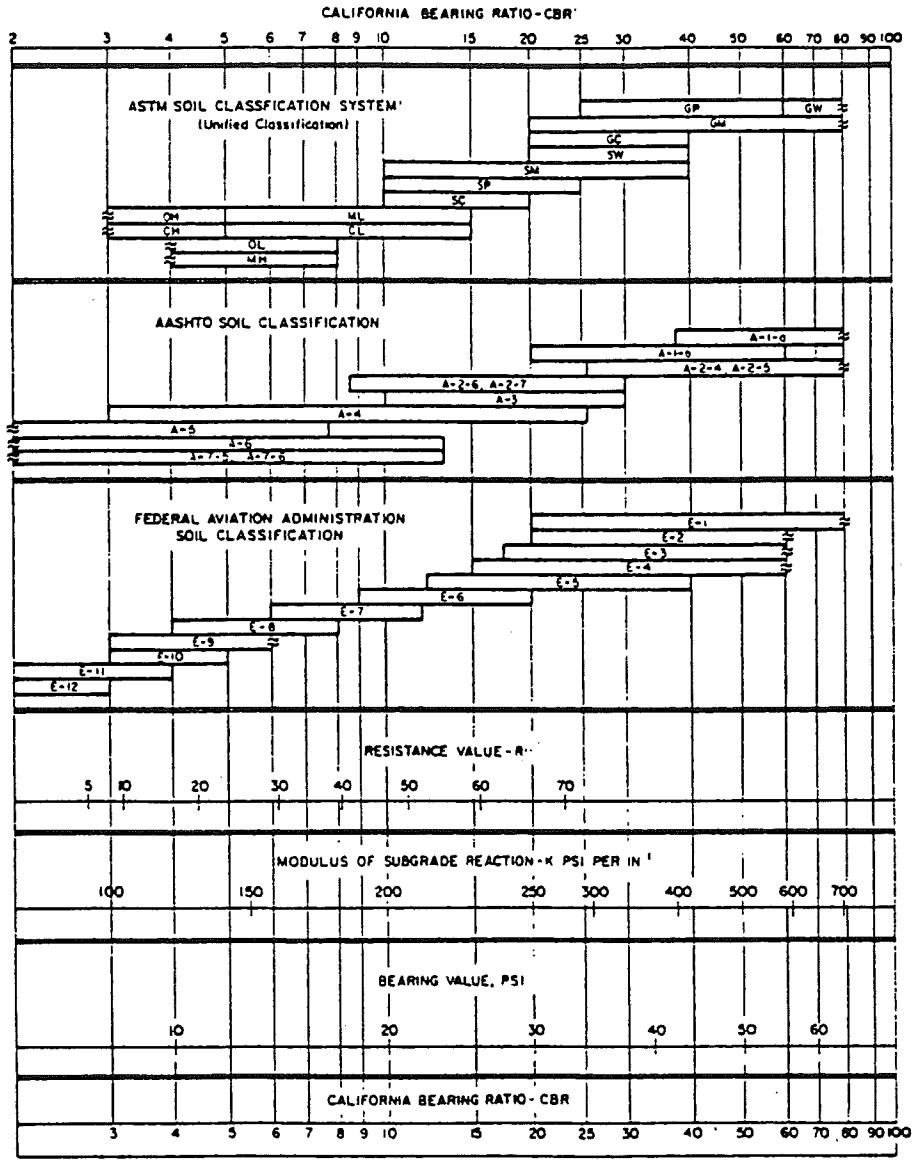
Laboratory Testing

The laboratory testing operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the laboratory tests are provided on the Test Boring Logs or other appendix enclosures. Explanation of the terms and symbols used on the logs is provided on the appendix enclosure entitled "General Notes."

California Bearing Ratio (CBR) Test ASTM D-1833

The CBR test is used for evaluation of a soil subgrade for pavement design. The test consists of measuring the force required for a 3-square-inch cylindrical piston to penetrate 0.1 or 0.2 inches into a compacted soil sample. The result is expressed as a percent of force required to penetrate a standard compacted crushed stone.

Unless a CBR test has been specifically requested by the client or heavy traffic loads are expected, the CBR is estimated from published charts, based on soil classification and strength characteristics. A typical correlation chart is indicated below.



GUIDE SPECIFICATIONS FOR SUBGRADE AND GRADE PREPARATION FOR FILL, FOUNDATION, FLOOR SLAB AND PAVEMENT SUPPORT; AND SELECTION, PLACEMENT AND COMPACTION OF FILL SOILS USING STANDARD PROCTOR PROCEDURES

1. Construction monitoring and testing of subgrades and grades for fill, foundation, floor slab and pavement; and fill selection, placement and compaction shall be performed by an experienced soils engineer and/or his representatives.

2. All compaction fill, subgrades, and grades shall be (a) underlain by suitable bearing material, (b) free of all organic, frozen, or other deleterious material, and (c) observed, tested and approved by qualified engineering personnel representing an experienced soils engineer. Preparation of subgrades after stripping vegetation, organic or other unsuitable materials shall consist of (a) proofrolling to detect soil, wet, yielding soils or other unstable materials that must be undercut, (b) scarifying top 6 to 8 inches, (c) moisture conditioning the soils as required, and (d) recompaction to same minimum in-situ density required for similar materials indicated under Item 5. Note: Compaction requirements for pavement subgrade are higher than other areas. Weather and construction equipment may damage compacted fill surface and reworking and retesting may be necessary to assure proper performance.

3. In overexcavation and fill areas, the compacted fill must extend (a) a minimum 1 foot lateral distance beyond the exterior edge of the foundation at bearing grade or pavement at subgrade and down to compacted fill subgrade on a maximum 0.5 (H): 1(V) slope, (b) 1 foot above footing grade outside the building, and (c) to floor subgrade inside the building. Fill shall be placed and compacted on a 5 (H):1 (V) slope or must be stepped or benched as required to flatten if not specifically approved by qualified personnel under the direction of an experienced soil engineer.

4. The compacted fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated," and shall be low-expansive with a maximum Liquid Limit (ASTM D-423) and Plasticity Index (ASTM D-424) of 30 and 15, respectively, unless specifically tested and found to have low expansive properties and approved by an experienced soils engineer. The top 12 inches of compacted fill should have a maximum 3-inch-particle diameter and all underlying compacted fill a maximum 6-inch-diameter unless specifically approved by an experienced soils engineer. All fill material must be tested and approved under the direction of an experienced soils engineer prior to placement. If the fill is to provide non-frost susceptible characteristics, it must be classified as a clean GW, GP, SW or SP per Unified Soil Classification System (ASTM D-2487).

5. For structural fill depths less than 20 feet, the density of the structural compacted fill and scarified subgrade and grades shall not be less than 95 percent of the maximum dry density as determined by Standard Proctor (ASTM D-698) with the exception of the top 12 inches of pavement subgrade which shall have a minimum in-situ density of 100 percent of maximum dry density, or 5 percent higher than underlying fill materials. Where the structural fill depth is greater than 20 feet, the portions below 20 feet should have a minimum in-place density of 100 percent of its maximum dry density of 5 percent greater than the top 20 feet. The moisture content of cohesive soil shall not vary by more than -1 to +3 percent and granular soil ±3 percent of the optimum when placed and compacted or recompacted, unless specifically recommended/approved by the soils engineer monitoring the placement and compaction. Cohesive soils with moderate to high expansive potentials (PI>15) should, however, be placed, compacted and maintained prior to construction at a moisture content of 3±1 percent above optimum moisture content to limit future heave. The fill shall be placed in layers with a maximum loose thickness of 8 inches for foundations and 10 inches for floor slabs and pavements, unless specifically approved by the soils engineer taking into consideration the type of materials and compaction equipment being used. The compaction equipment should consist of suitable mechanical equipment specifically designed for soil compaction. Bulldozers or similar tracked vehicles are typically not suitable for compaction.

6. Excavation, filling, subgrade and grade preparation shall be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working platform. Springs or water seepage encountered during grading/foundation construction must be called to the soil engineer's attention immediately for possible construction procedure revision or inclusion of an underdrain system.

7. Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls (i.e. basement walls and retaining walls) must be properly tested and approved by an experienced soils engineer with consideration for the lateral pressure used in the wall design.

8. Wherever, in the opinion of the soils engineer or the Owner's Representatives, an unstable condition is being created either buy cutting or filling, the work shall not proceed into that area until an appropriate geotechnical exploration and analysis has been performed and the grading plan revised, if found necessary.

GENERAL COMMENTS

The soil samples obtained during the subsurface exploration will be retained for a period of thirty days. If no instructions are received, they will be disposed of at that time.

This report has been prepared exclusively for the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. Copies of this report may be provided to contractor(s), with contract documents, to disclose information relative to this project. The report, however, has not been prepared to serve as the plans and specifications for actual construction without the appropriate interpretation by the project architect, structural engineer, and/or civil engineer. Reproduction and distribution of this report must be authorized by the client and Giles.

This report has been based on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the architect, civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. The project plans and specifications may also be submitted to Giles for review to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted.

The analysis of this site was based on a subsoil profile interpolated from a limited subsurface exploration. If the actual conditions encountered during construction vary from those indicated by the borings, Giles must be contacted immediately to determine if the conditions alter the recommendations contained herein.

The conclusions and recommendations presented in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *									
Class	Compaction Characteristics	Max. Dry Density Standard Proctor (pcf)	Compressibility and Expansion	Drainage and Permeability	Value as an Embankment Material	Value as Subgrade When Not Subject to Frost	Value as Base Course	Value as Temporary Pavement	
								With Dust Palliative	With Bituminous Treatment
GW	Good: tractor, rubber-tired, steel wheel or vibratory roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to Poor	Excellent
GP	Good: tractor, rubber-tired, steel wheel or vibratory roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
GM	Good: rubber-tired or light sheepsfoot roller	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
GC	Good to fair: rubber-tired or sheepsfoot roller	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
SW	Good: tractor, rubber-tired or vibratory roller	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
SP	Good: tractor, rubber-tired or vibratory roller	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SM	Good: rubber-tired or sheepsfoot roller	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SC	Good to fair: rubber-tired or sheepsfoot roller	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
ML	Good to poor: rubber-tired or sheepsfoot roller	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
CL	Good to fair: sheepsfoot or rubber-tired roller	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
OL	Fair to poor: sheepsfoot or rubber-tired roller	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
MH	Fair to poor: sheepsfoot or rubber-tired roller	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Not suitable
CH	Fair to poor: sheepsfoot roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
OH	Fair to poor: sheepsfoot roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
Pt	Not suitable		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

* "The Unified Classification: Appendix A - Characteristics of Soil, Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments and Foundations," Technical Memorandum 357, U.S. Waterways Ixperiment Station, Vicksburg, 1953.

** Not suitable if subject to frost.

Important Information About Your
Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

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The Best People on Earth

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