TOWN OF WESTFORD
PERMANENT TOWN BUILDING COMMITTEE
TOWN HALL
WESTFORD, MASSACHUSETTS 01886
(978) 692-5501

REQUEST FOR QUALIFICATIONS

WESTFORD ACADEMY ATHLETIC COMPLEX MASTER PLAN

ADDENDUM NO.1

A Briefing Session was held on Wednesday, September 9th, 2015 at 10:00 a.m. at the Westford Academy Athletic Complex. A tour of the facilities was provided to all attendees. The following documents are being provided to all registered firms:

1. Briefing Session Attendance Sheet (see attached)
2. Zone II Delineation Report – prepared by Dufresne-Henry, Inc., May 2006.
3. Wastewater Treatment Facility Plans

The Zone II Report and Treatment Facility Plans are available to be downloaded directly off the Town of Westford website.

http://www.westfordma.gov/Pages/Government/WestfordMA_Procurement/list

All documents are being provided for information purposes only.

All proposals must be received at the Westford Public Schools Office, 23 Depot Street, Westford, MA 01886 by no later than 2:00 p.m. on Friday, September 18, 2015.

All proposals must be submitted in a sealed envelope, clearly marked as follows:

REQUEST FOR QUALIFICATIONS
WESTFORD ACADEMY ATHLETIC COMPLEX
MASTER PLAN

Everett V. Olsen, Jr.
Superintendent of Schools
Westford Public Schools
23 Depot Street
Westford, MA 01886

End of Addendum No.1

ATTENDANCE SHEET

Westford Academy Athletic Complex Master Plan – Request for Proposals

Briefing Session
Location: **Westford Academy, 60 Patten Road, Westford, MA**
Date: **Wednesday, September 9th, 2015 - 9:00 a.m.**

	Name	Representing	Email
1.	Thomas J. Mahanna	Permanent Town Building Committee	tmahanna@westfordma.gov
2.	Dan Twomey	Westford Academy Athletic Dept.	dtwomey@westfordk12.us
3.	James Antonelli	Westford Academy	jantonelli@westfordk12.us
4.	Kathy Auth	Westford School Department	kauth@westfordk12.us
5.	Stephen Cronin	Westford Water Department	scronin@westfordma.gov
6.	Danielle Spicer	Green International Affiliates	dspicer@greenintl.com
7.	Rachel Amato	JJA Sports	JAmato@JJasports.com
8.	Bob Sykes	Pare Corporation	bsykes@parecorp.com
9.	Bill Seymour	Gale	wjs@gainc.com
10.	J. Michael Sullivan	Beacon Arch. Assoc.	jms@beaconarch.com.
11.			

SECTION THREE
ZONE II DELINEATION

3.1 INTRODUCTION

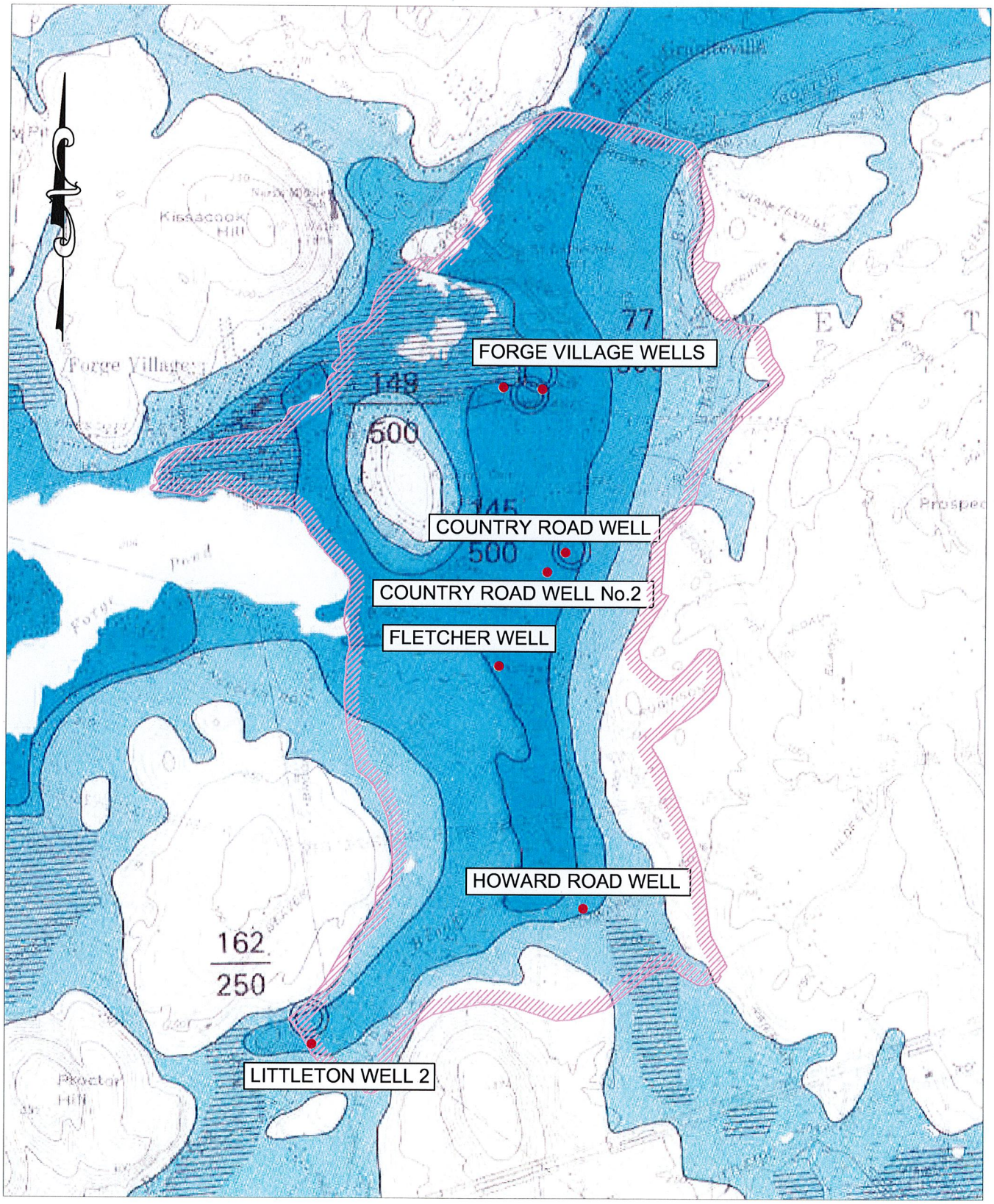
To delineate the Zone II for the proposed Country Road Well No.2, a computer model was developed using the U.S. Geological Survey Modular Finite-Difference Groundwater Flow Model (MODFLOW). This model was used to determine the area of the regional aquifer that contributes water to the proposed well under severe pumping and recharge conditions.

3.2 CONCEPTUAL MODEL

The Beaver Brook Aquifer is a valley-fill aquifer created by the deposition of sand and gravel from glacial meltwater flowing in a pre-existing valley in the bedrock. These permeable stratified-drift deposits extend from Littleton through Westford and Chelmsford to the Merrimack River. These deposits are bounded by upland areas mantled by glacial till. Till has much lower hydraulic conductivity than the outwash deposits and is not considered an aquifer deposit. The USGS mapped limit of the aquifer is shown in Figure 3-1.

The glacial outwash aquifer is fed by local recharge and by recharge and runoff from the neighboring hillsides. Stony Brook and other surface water courses are generally gaining streams into which groundwater discharges. Thus near the wells, in the absence of pumping, groundwater flows from the surrounding hills into Stony Brook and its tributaries. The aquifer is bounded by local surface water divides for the surface water basin draining to Stony Brook and its tributaries. In the absence of pumping withdrawals, the groundwater divide would tend to mirror the overlying surface water divide.

Well logs for pumping and observation wells installed in the vicinity of the Country Road Well No.2 site indicate the presence of stratified sand and gravel, and fine sand and silt. Outwash deposits extend to at least 90 feet deep in the aquifer, but are generally in the range of 30 to 60 feet thick.



FROM USGS HA-662

FIGURE 3-1

Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

WESTFORD WATER DEPARTMENT

BEAVER BROOK AQUIFER
PROPOSED COUNTRY ROAD No.2

WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=2000'
Date	MAY 2006
A	

An areal or two-dimensional model of the glacial drift aquifer is appropriate for determining the groundwater flow in the project area because the aquifer is a single layer of outwash deposits and vertical flows are not relevant for identifying the zone of contribution.

3.3 GROUNDWATER MODEL DESCRIPTION

The groundwater flow model of the Beaver Brook Aquifer was developed using the U.S. Geological Survey (USGS) MODFLOW computer program. The model determines the distribution of hydraulic head and the ground-water flow field over time and space. The model considers:

- the varying capacities of the geologic materials to transmit groundwater flow, represented by the aquifer transmissivity;
- the changes in the quantity of water stored in the geologic materials, represented by the aquifer storage coefficient; and
- the influence of boundary conditions where water enters or leaves the groundwater system.

Typical boundary conditions are wells, streams, springs, and impermeable barriers to flow. The water table is also a boundary through which rainfall or other recharge enters the groundwater system.

MODFLOW is described by its authors as a modular computer program for three-dimensional groundwater flow modeling (McDonald and Harbaugh, 1988). "Modular" refers to the structuring of the computer programming code into independent sub-programs or modules, each performing a distinct, well-defined task. One or more modules together form the major code capabilities, or "packages." Individual packages address specific aspects of the groundwater system. The MODFLOW packages used for this model are as follows:
Basic package - establishes basic model structure and computer code bookkeeping and output instructions. The basic package is required for use in all MODFLOW applications.
Block-centered flow package - establishes the geometry and hydraulic properties of the model grid. The block-centered flow package is required for use in all MODFLOW applications.

River Package - represents a river underlain by a variable permeability bottom. A riverbed conductance parameter must be specified in using a river package.
Recharge package - specifies the rate of rainfall recharge into the surface of the modeled area.
Well package - represents withdrawal wells (negative flow in model input), recharge wells (positive flow), and specified-flow boundary conditions.
Strongly implicit procedure (SIP) package - one of several available packages with which to solve the groundwater flow equations. The SIP is an accelerated solution technique that solves most problems more quickly than the other packages.

The MODFLOW code provides several computation options. In representing processes over time, the model can be operated as a steady-state (not varying in time) or transient (varying in time) model. In this study, the model was run in steady-state mode to evaluate long-term average behavior of the groundwater system. MODFLOW permits the vertical geometry to be represented as fully three-dimensional, quasi-three-dimensional, or two-dimensional. In the quasi-three-dimensional option, aquifers are represented as model layers, but separating confining units are modeled through interlayer leakage coefficients rather than as explicit model layers. In the fully three-dimensional option both aquifer units and confining units are explicitly represented in the model layer structure. In the two-dimensional model a single model layer is specified. A two-dimensional formulation is used in this study.

3.4 MODEL DEVELOPMENT

The development of a groundwater flow model entails preparing the geological information from the conceptual model in a form usable by the MODFLOW computer program. This preparation included the following:

- subdividing the model horizontal area into a grid of computation elements;
- specifying boundary conditions in the model domain; and
- assigning values of physical properties such as transmissivity to the resulting two-dimensional array of model cells.

The input data required by the model include

- geographical definition of the model area and model computation grid;
- model boundary conditions (no-flow, specified-flow, river, and constant head boundaries);
- distribution of the hydraulic parameters, the aquifer transmissivity, and storage coefficient;
- location and pumping rate of wells; and
- amount of precipitation recharge.

Model Area and Boundaries - The model area is shown in Figure 3-2. Most of the model boundaries are placed at the natural boundaries of the aquifer where the sand and gravel deposits meet the glacial till as mapped by the USGS in HA-662 (Brackley and Hansen, 1985). Other no-flow boundaries are located at the drainage basin boundary, surface water bodies, or far enough from the pumping wells to ensure no effect on the zone of influence.

Internal boundaries are typically surface-water features that interact with the ground-water system. Beaver Brook is represented in the model using the MODFLOW river package. Stream elevations were determined using the U.S. Geological Survey topographic maps. Stream elevations were specified at points where contours on the topographic map cross the stream. Elevations in the model were linearly interpolated between the map points.

The MODFLOW river package considers the stream to be underlain by a stream bed of variable conductance. The stream conductance, C, for each river cell was calculated using the following equation:

$C = K L W / M$

Where:

K = hydraulic conductivity of the stream bed material

L = length of stream within the cell

W = width of stream, and

M = thickness of the stream bed material.

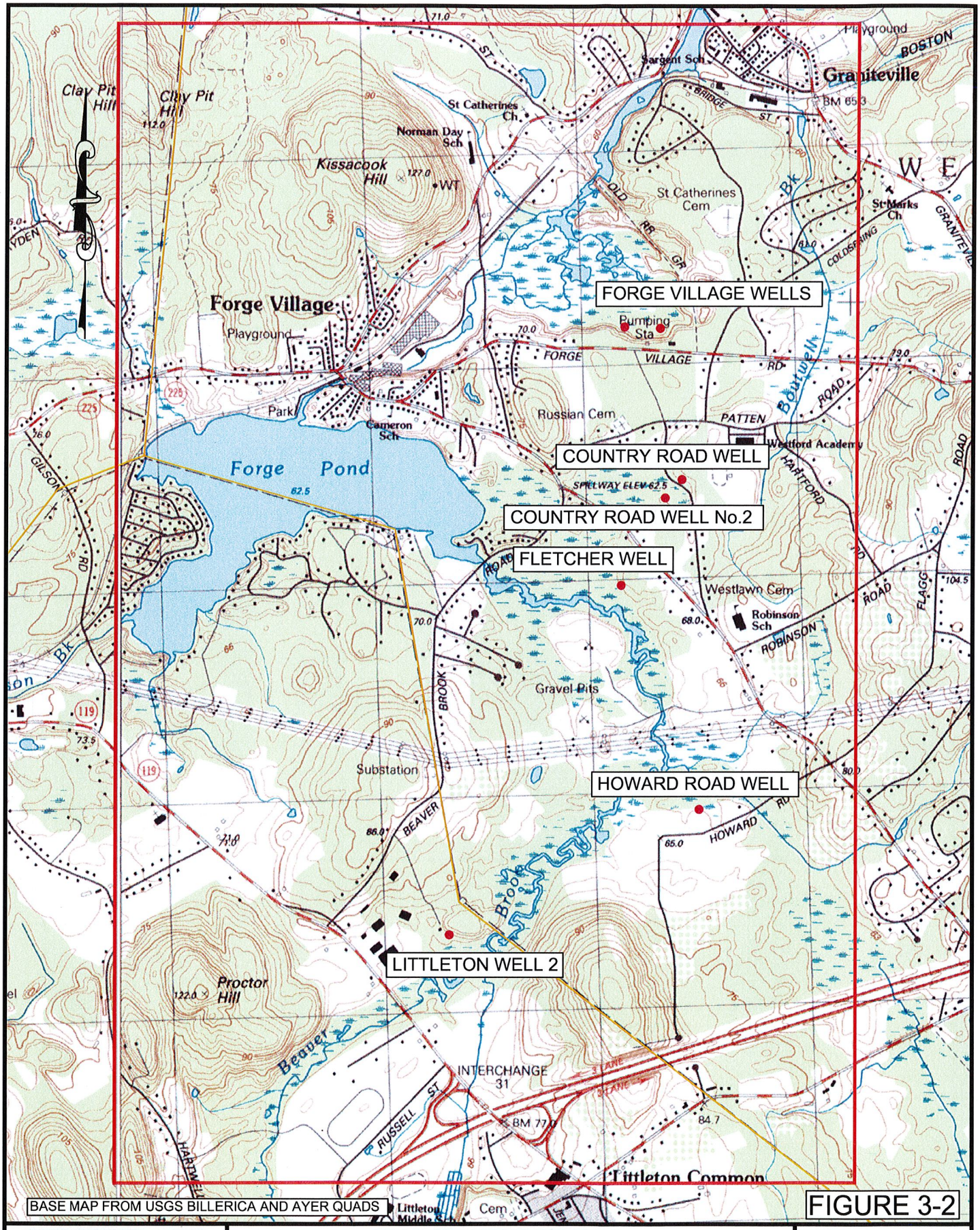


FIGURE 3-2

Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

WESTFORD WATER DEPARTMENT

MODEL AREA
PROPOSED COUNTRY ROAD No.2

WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=2000'
Date	MAY 2006
A	

For the ponds and the streams, the stream bed hydraulic conductivity was assumed to be 2.0 feet/day, a value consistent with those reported by de Lima (1991) for small sandy bottom streams in New England.

The existing Westford Water Department wells in the model area are also represented as a boundary in the model with the well package. The Town of Littleton Well 2 is located in the model area and was included in the simulations. The wells in the model were set to the 2005 average rates in order to simulate the overall average baseline groundwater flow in the aquifer. The results from the average conditions simulation were used as the starting conditions for the transient Zone II simulation with the wells pumping their maximum approved yield. Pumping rates used in the model are given in Table 3-1.

Table 3-1
Pumping Rates Used in Model
(Million Gallons per Day)

Well Name	Starting Conditions (Average Rate*)	Zone II Simulation (Max Rate)
Forge Village 1	0.135	0.34
Forge Village 2	0.280	0.59
Country Road	0	0**
Country Road 2	0	0.61
Fletcher	0.316	0.69
Howard Road	0.191	0.43
Littleton Well 2	0.200	0.41

* Based on 2005 DEP report. Estimated for Littleton Well 2.
** The approved Zone II rate for the Country Road Well is 0.54 MGD.

No private wells are believed to exist near the project site. Private wells are almost exclusively deep bedrock wells with relatively small yields. Furthermore, any groundwater extracted from them would be almost entirely discharged on site through private septic systems resulting in essentially no impact to the groundwater system. For these reasons, no private wells were modeled.

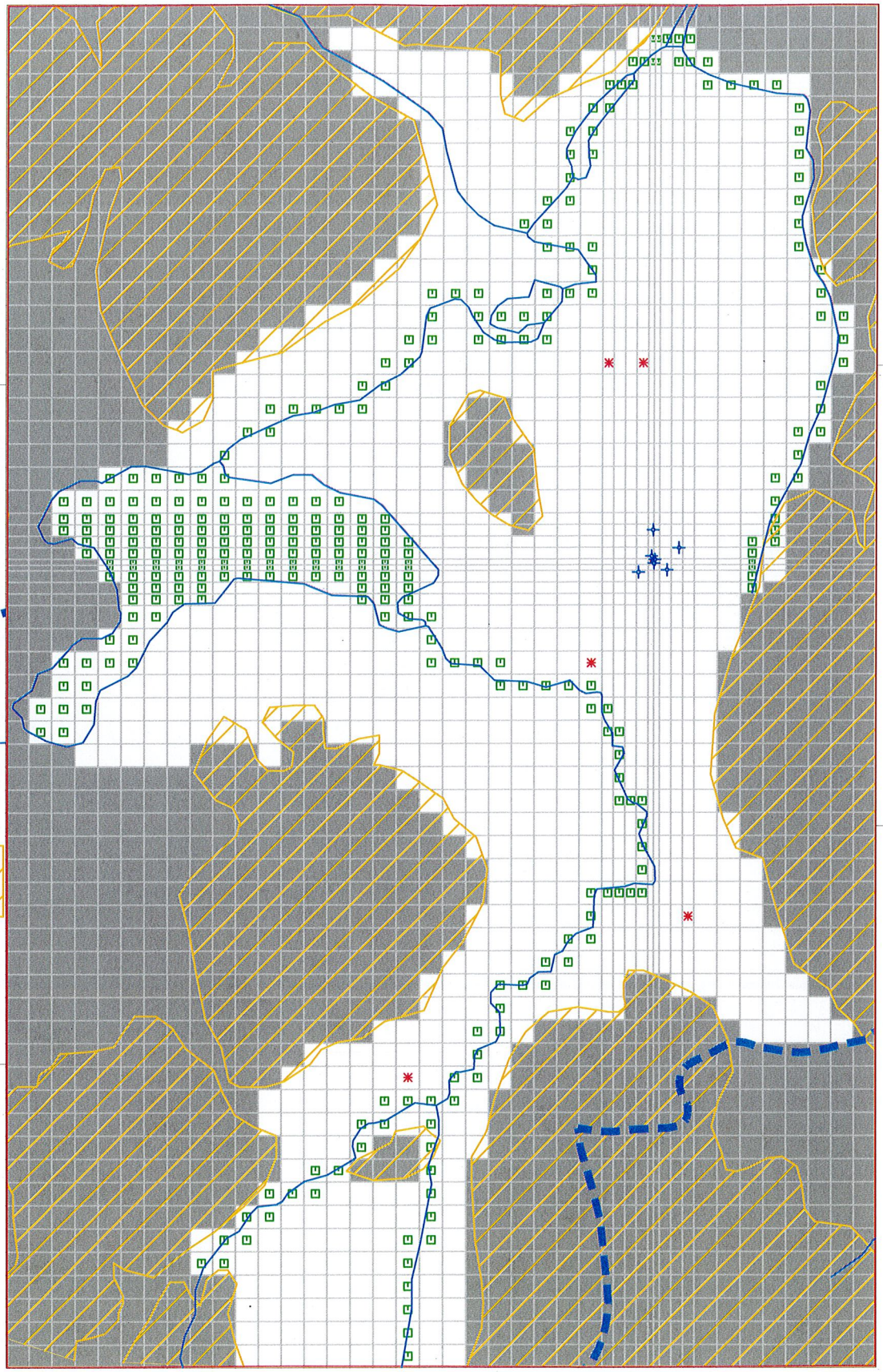
The numerical model grid used by the computer program must be a rectangular area, therefore there are inactive grid cells between these boundaries and the limits of the numerical grid. The limit of the active grid cells and boundary conditions are shown in Figure 3-3. A detail of the well area with the calibration targets is given in Figure 3-3A.

Hydraulic Parameters - The distribution of aquifer transmissivity in the model is shown in Figure 3-4. This distribution is directly from the U.S. Geological Survey Hydrologic Atlas HA-662. The transmissivity values used in the model are based on the results of the pumping test and model calibration and are in the ranges indicated by HA-662. A storage coefficient of 0.09 was assigned to the entire model area based on model calibration and aquifer test data. This value is consistent with unconfined conditions.

Recharge - The recharge rate used for precipitation in the model was 21-inches per year which is one half the average annual precipitation for this area. One half the precipitation is accepted as the amount to recharge sandy aquifers in New England after losses of runoff and evapo-transpiration.

3.5 MODEL CALIBRATION

The model was calibrated to results from the pumping test. The observed drawdown in six observation wells during the test at 425 GPM was compared to results from a simulation of the test. Minor adjustments to transmissivity and storativity values in the model were made until the residual mean of observed and calculated drawdowns could not be further improved. Observed and simulated drawdown for each observation well in the pumping test is shown on Chart 3-1. Most calculated drawdown curves match observations favorably. Observed vs simulated drawdown is shown on Chart 3-2. The overall residual mean of observed and calculated drawdowns is 0.20 feet indicating good model calibration.



MAPPING FROM USGS HA-662 AND MASS GIS

FIGURE 3-3

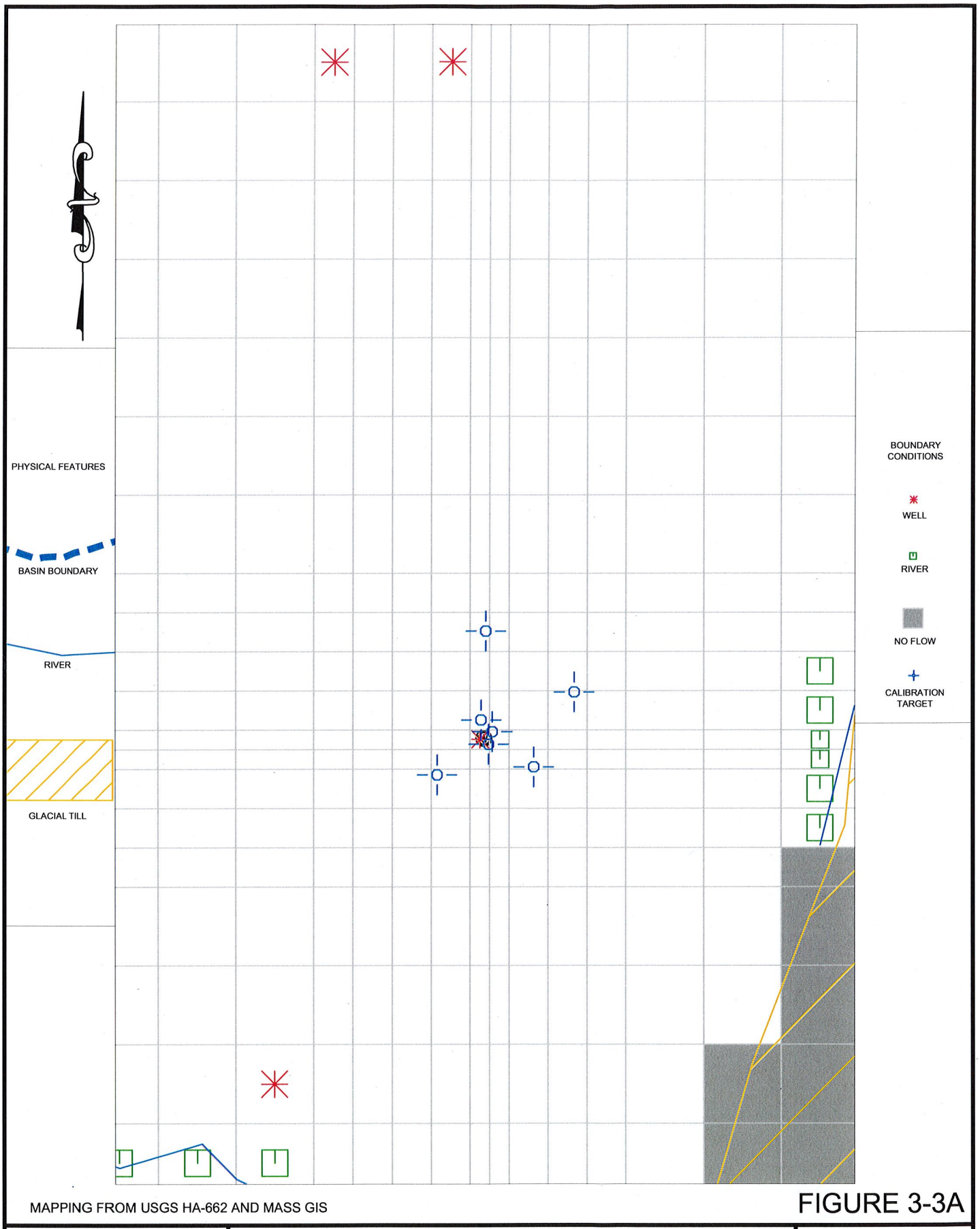
Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

WESTFORD WATER DEPARTMENT

MODEL GRID AND BOUNDARY CONDITIONS
PROPOSED COUNTRY ROAD No.2

WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=2000'
Date	MAY 2006
A	



MAPPING FROM USGS HA-662 AND MASS GIS

FIGURE 3-3A

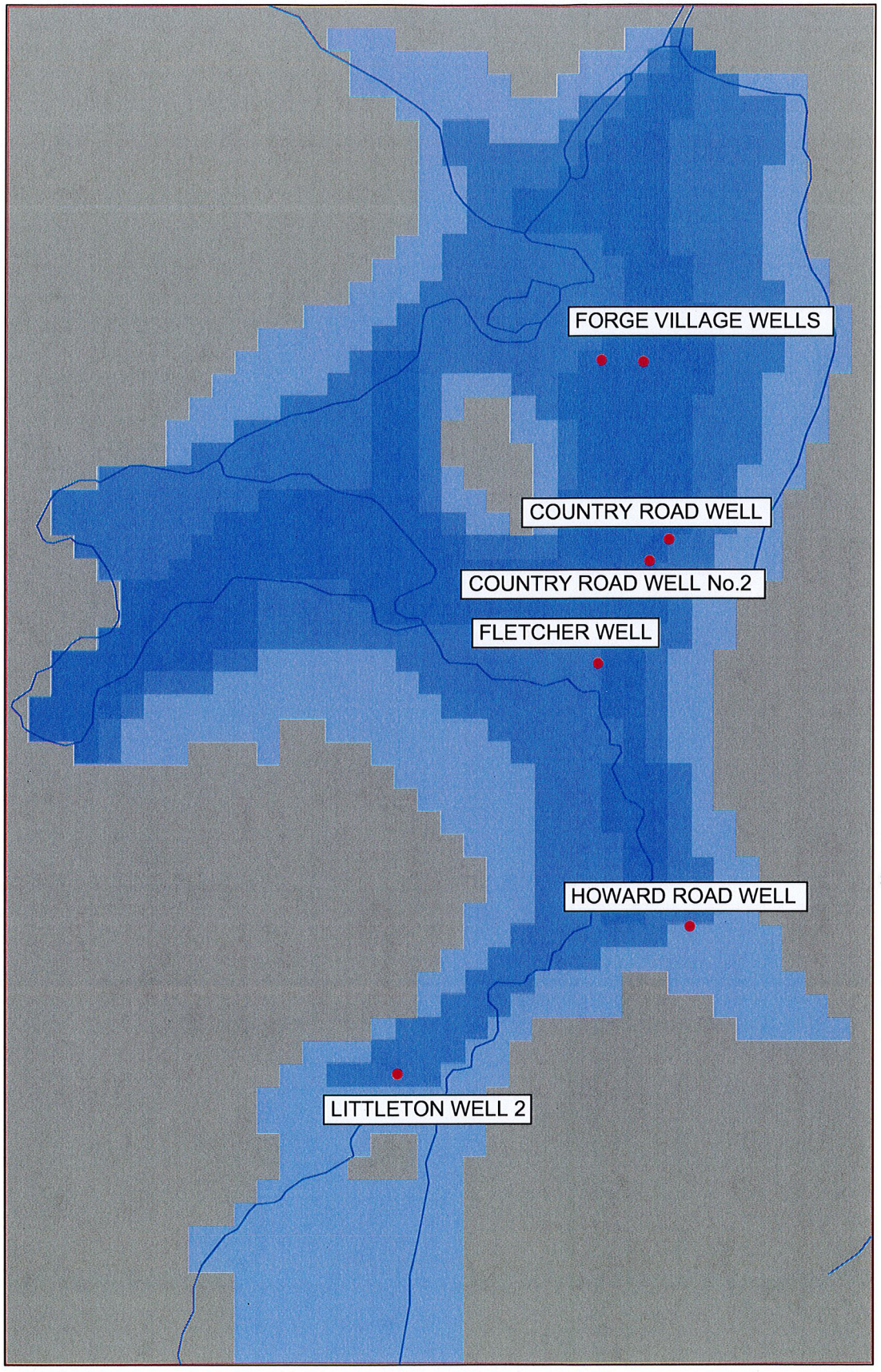
Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

WESTFORD WATER DEPARTMENT

MODEL GRID AND BOUNDARY CONDITIONS PROPOSED COUNTRY ROAD No.2

WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=500'
Date	MAY 2006
A	



BASED ON USGS HA-662

FIGURE 3-4

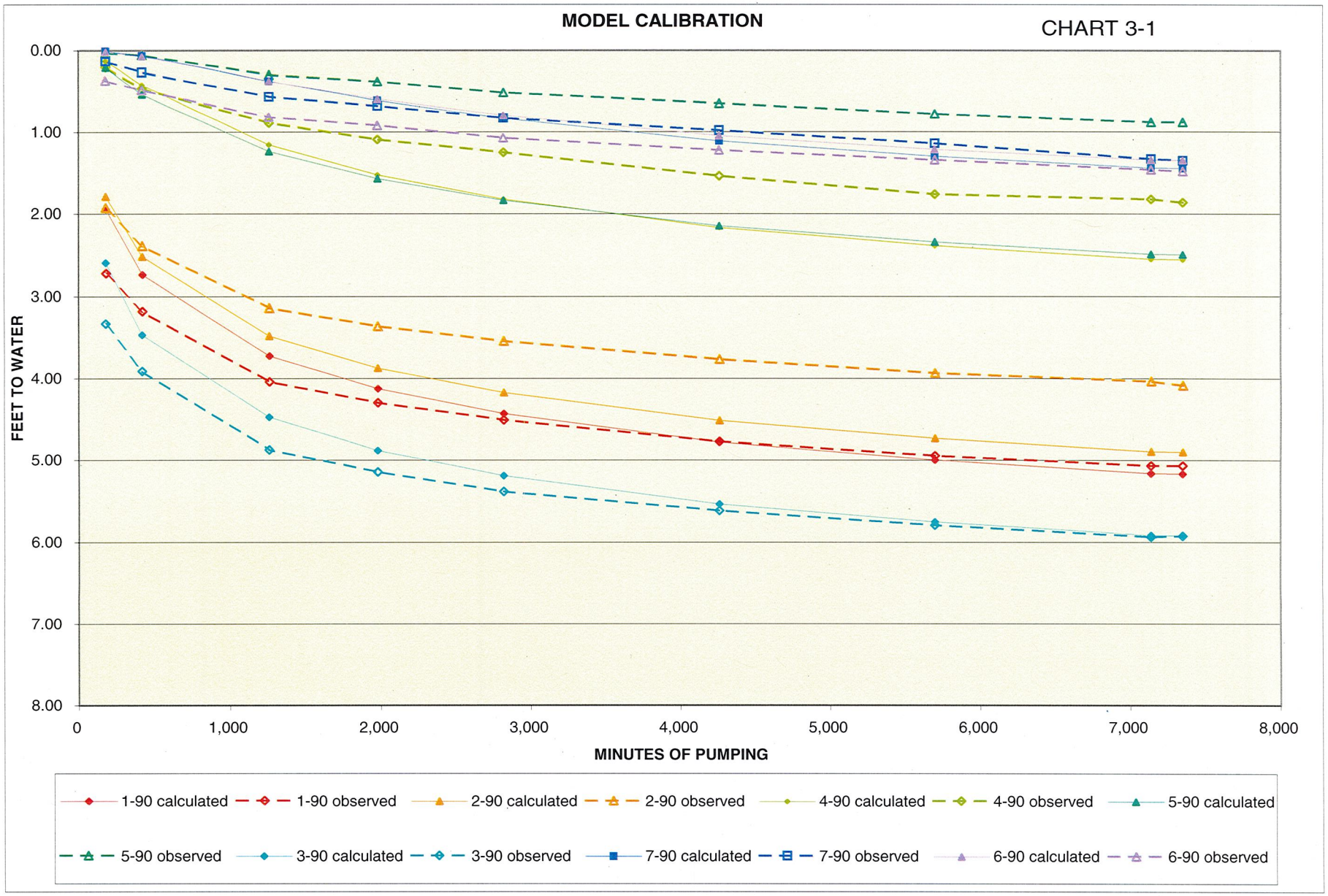
Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

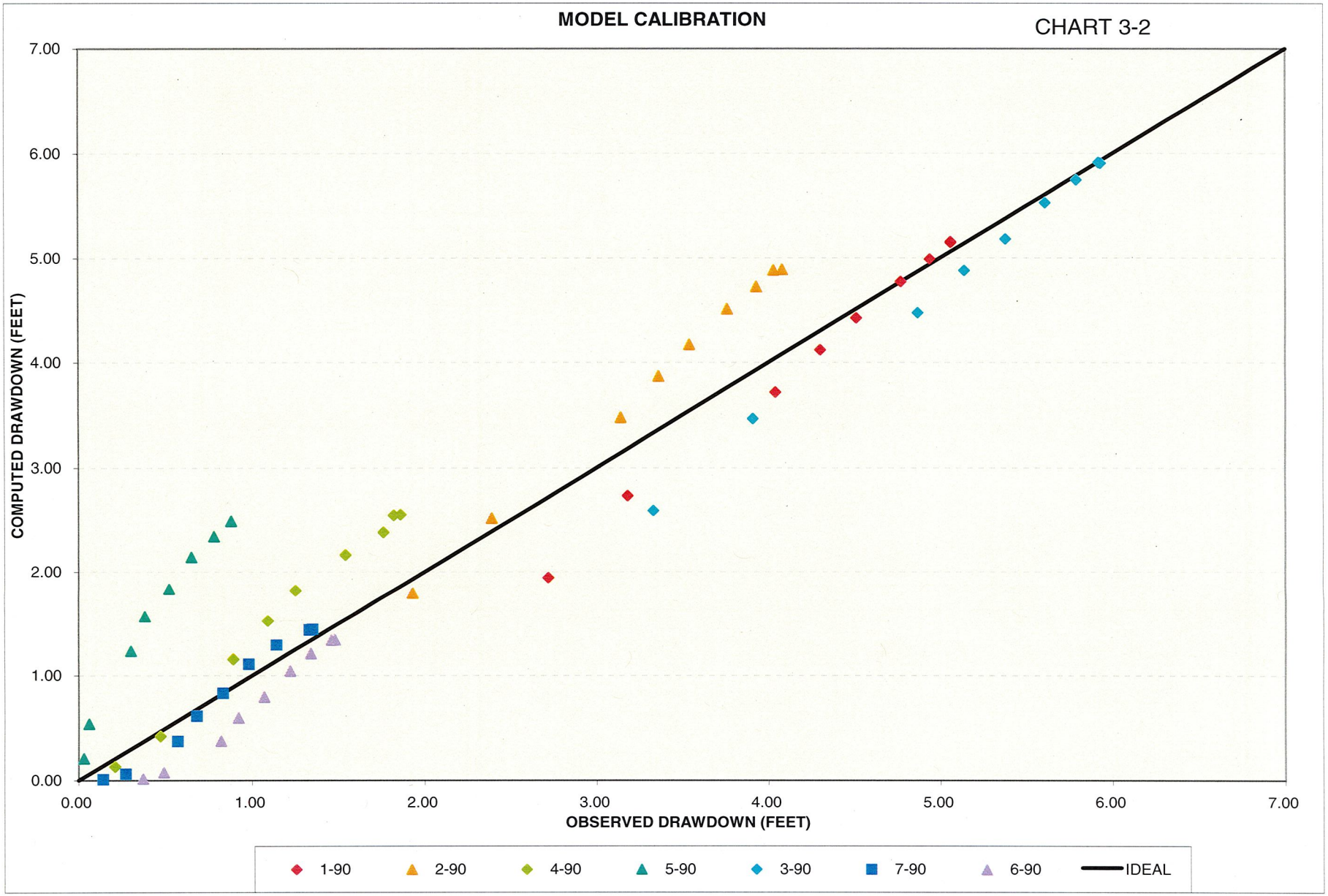
WESTFORD WATER DEPARTMENT

TRANSMISSIVITY DISTRIBUTION
PROPOSED COUNTRY ROAD No.2

WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=2000'
Date	MAY 2006
A	


MODEL CALIBRATION
CHART 3-1
FEET TO WATER
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
MINUTES OF PUMPING
1-90 calculated
1-90 observed
2-90 calculated
2-90 observed
4-90 calculated
4-90 observed
5-90 calculated
5-90 observed
3-90 calculated
3-90 observed
7-90 calculated
7-90 observed
6-90 calculated
6-90 observed

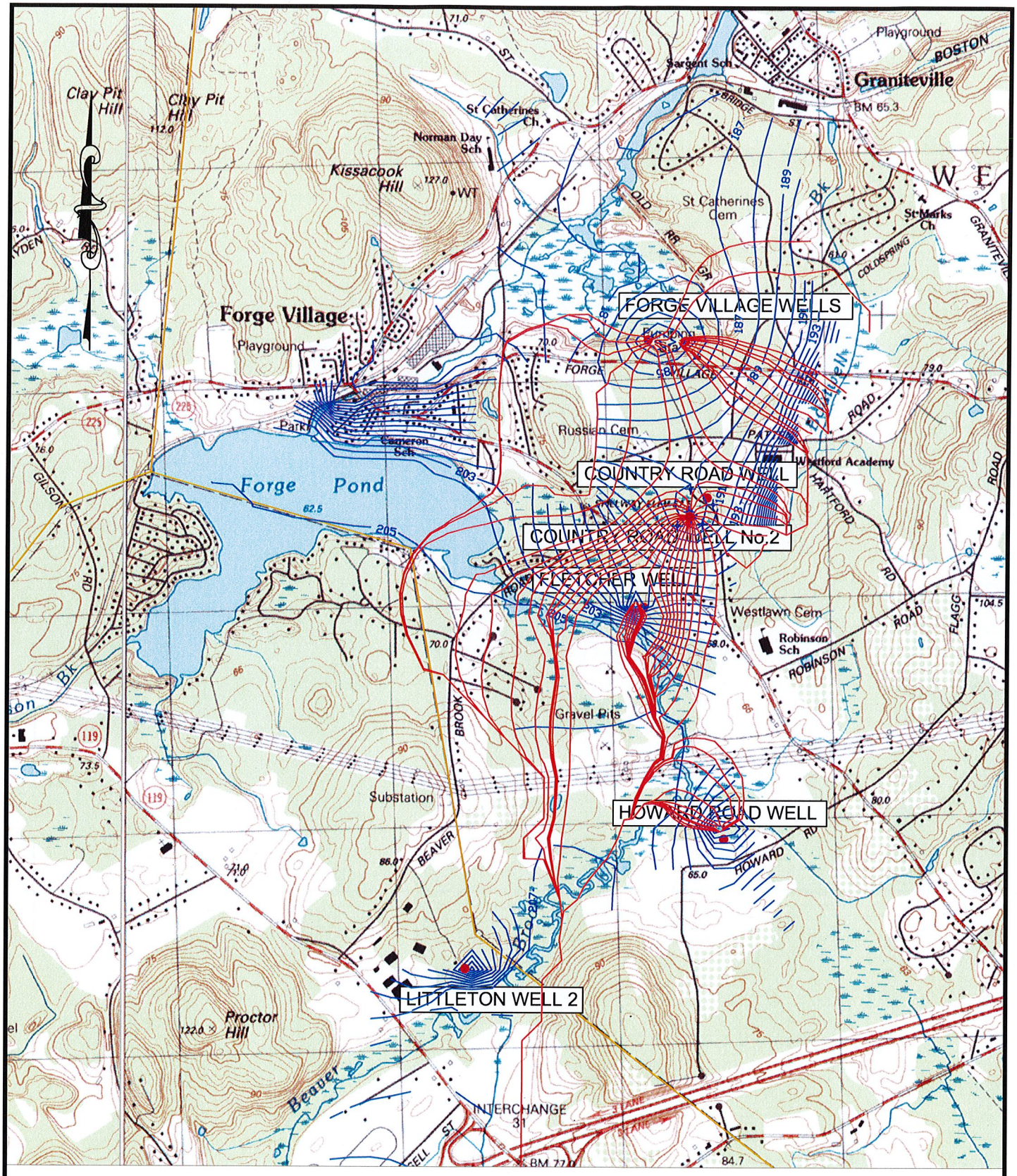

MODEL CALIBRATION
CHART 3-2
COMPUTED DRAWDOWN (FEET)
OBSERVED DRAWDOWN (FEET)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
1-90
2-90
4-90
5-90
3-90
7-90
6-90
IDEAL

3.6 MODEL RESULTS

To delineate the Zone II, the model was used in transient mode to simulate groundwater flow for 180 days of pumping with no recharge. Starting conditions for the Zone II simulation were constructed in a steady-state model simulation with 21-inches per year of recharge and the existing wells pumping at average rates. The Zone II simulation used maximum approved pumping rates and no recharge. The U.S. Geological Survey MODPATH particle-tracking model was applied to the potentiometric surface predicted by MODFLOW to backtrack groundwater flow to the source of the water reaching the well. A total of 10 particles were tracked distributed around the pumping well at a radius of 50 feet.

Contours of hydraulic head and particle tracks predicted by the model are provided in Figure 3-5. The Zone II is delineated in Figure 3-6 as a composite of the results shown in Figure 3-5 and the existing Zone II (Figure 3-1). The portions of the model results Zone II that did not encompass the existing Zone II were included to prevent the Zone II boundary from becoming smaller.

All original MODFLOW input and output files are included on disk in Appendix E.



BASE MAP FROM USGS BILLERICA AND AYER QUADS

FIGURE 3-5

Dufresne-Henry
Westford, Massachusetts
Tel. (978) 692-1913
www.dufresne-henry.com

WESTFORD WATER DEPARTMENT

MODEL RESULTS
PROPOSED COUNTRY ROAD No.2

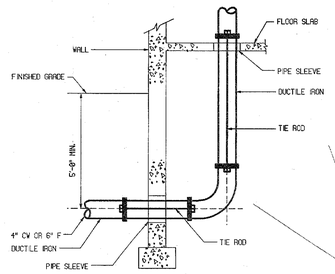
WESTFORD MASSACHUSETTS

Project No.	9105031
Proj. Mgr.	DGH
Scale	1"=2000'
Date	MAY 2006
A	

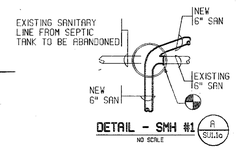
DEMOLITION KEYED NOTES

EXISTING SEWAGE DISPOSAL SYSTEM SHALL BE DEMOLISHED AFTER NEW WASTE WATER TREATMENT PLANT IS IN SERVICE.

1. EXISTING SEPTIC TANKS, PUMP CHAMBERS AND DISTRIBUTION BOXES SHALL BE PUMPED OUT AND CLEANED. BOTTOM OF EACH STRUCTURE SHALL BE PUNCHED OUT PARTIALLY. TOP OF EACH TANK SHALL BE REMOVED AND SIDEWALL SHALL BE BROKEN DOWN TO A MINIMUM OF 4'-0" BELOW GRADE. ALL STRUCTURES SHALL BE FILLED WITH GRANULAR MATERIAL AND COMPACTED AS SPECIFIED.
2. EXISTING AMERATION CHAMBERS SHALL BE REMOVED. TOP OF EXISTING VELOCITY REDUCING PITS SHALL BE REMOVED AND PITS FILLED WITH A GRANULAR MATERIAL AND COMPACTED AS SPECIFIED. AREA WHERE AMERATION CHAMBERS WHERE REMOVED SHALL BE BACKFILLED AND PREPARED FOR PARKING AS SPECIFIED IN SECTION 02743 BITUMINOUS PAVING.
3. REMOVE ALL VENTS AND MANHOLES ASSOCIATED WITH THE EXISTING SEWAGE DISPOSAL SYSTEM.
4. BOTTOM OF AMERATION CHAMBERS ARE AT ELEVATION 224.25' ±
5. BOTTOM OF VELOCITY REDUCING PIT IS AT ELEVATION 221.0' ±
6. REMOVE EXISTING FIRE HYDRANTS AND RELOCATE AS SHOWN ON THIS DRAWING.
7. RELOCATE EXISTING WATER LINE, RELOCATE AND REPLACE WITH NEW AS SHOWN ON THIS DRAWING.
8. MODIFY EXISTING MANHOLE CHANNEL & INVERTS FOR NEW CONFIGURATION. REFER TO (A / SU1.1c)



DETAIL (AA / SU1.1c)
WATER / FIRE SERVICE THROUGH FLOOR
NO SCALE



DETAIL - SMH #1 (A / SU1.1c)
NO SCALE

SITE UTILITY LEGEND

SYMBOL	ABV.	DESCRIPTION
		LIGHT LINE INDICATES EXISTING WORK
		HEAVY LINE INDICATES NEW WORK
97		EXISTING CONTOUR
		PIPING INTERRUPTED OR TO BE CONTINUED
D	DMH	STORM-DRAINAGE MANHOLE
S	SMH	SANITARY SEWER MANHOLE
W	W	WATER PIPING
G	G	GAS PIPING
S	S	SEWER LINE
D	D	DRAIN LINE
HYD	HYD	HYDRANT
V&VB	V&VB	GATE VALVE & VALVE BOX
CTE	CTE	CONNECT TO EXISTING
	INV.	INVERT ELEVATION
	RIM	RIM ELEVATION
	(E)	EXISTING

REMOVE EXISTING ACID WASTE MANHOLE & PIPING BETWEEN BUILDING & MANHOLE. BACKFILL AND COMPACT. REMOVAL WORK TO BE DONE BY LICENSED DISPOSAL FIRM.

EXISTING SEPTIC TANK 1
EXISTING PUMP CHAMBER 1
EXISTING SEPTIC TANK 1
SMH #1 (E) RIM 223.0' INV IN 217.5 INV OUT 217.5 MODIFY MH TABLE, REFER TO DETAIL (A / SU1.1c)
SMH #2 RIM 223.8' INV IN 216.7' INV OUT 216.6 (B / SU1.1b)
SMH #3 RIM 223.6' INV IN 215.7' INV OUT 215.6 (B / SU1.1b)
SMH #4 RIM 222.8'± INV IN 214.2' INV OUT 214.1 (BB / SU1.1c)
NEW GAS SERVICE TO WWTP BY GAS COMPANY 2,013,000 Btu/hr
GREASE TRAP RIM 224.0 INV IN 219.9 INV OUT 219.75
KITCHEN WASTE
SCIENCE CLASSROOM ACID NEUTRALIZERS
F.F.E. 224.0'
2-6" SANITARY (E)
2-6" BLDG SEWER INV. 219.8'
CONTRACTOR TO CONFIRM INVERTS PRIOR TO STARTING INSTALLATION OF WWTP & ASSOCIATED SYSTEMS.
2-INV @ 220.8'
INV. 220.8'
INV. 219.25'
FLOW TEST HYDRANT #2
FLOW TEST HYDRANT #1
EXISTING V&VB
TAPPING SLEEVE & GATE W/ CURB BOX (D / FP8.1)
8" FIRE SERVICE INTO BUILDING BY SPRINKLER CONTRACTOR SECTION 15300 (AA / SU1.1c)
RUN CLEAR OF EXIST OIL TANK
NEW OIL TANKS (2)
AW INV. 120.9 SAN INV. 121.1
DROP CONNECTION
CONCESSION STAND
400 FEET FROM TOWN WELL
WESTFORD ACADEMY
ROAD
NOTIFIED PL TO FIT WALLS

GENERAL NOTE

ALL NEW SANITARY SEWER LINES FROM HIGH SCHOOL AND ROBINSON ELEMETRAY SCHOOL SHALL BE INSTALLED WATER TIGHT.

CONFIRM ALL EXISTING INVERTS WHERE CONNECTIONS SHALL BE MADE PRIOR TO START OF WWTP AND ASSOCIATED SYSTEMS.

N

SITE UTILITY PLAN
SHEET 1

SCALE:1"=40'-0"

D·R·A
DRUMMEY ROSANE ANDERSON INC.
Colby Hall
141 Herrick Road
P.O. Box 299
Newton Centre, MA. 02159-0299
Architecture Interior Design
617-964-1700

TCI THOMPSON CONSULTANTS, INC.
ENGINEERS
525 MILL ST.
MARION, MA. 02738
(508) 748-2828 (617) 426-4883

WESTFORD ACADEMY

WESTFORD MASSACHUSETTS

D.E.P. REVISION 10-17-97
D.E.P. REVISION 8-28-97

COMMONWEALTH OF MASSACHUSETTS MICHAEL J. HICKEY No. 27564 REGISTERED PROFESSIONAL ENGINEER

SITE PLAN - SHEET 1

Scale:	AS NOTED	SU-1
Dr. By:	CST	
Job No.:	92-183b	SU1.1a
Date:	01/14/98	

h:\dwg\wsaplo
92-183B

SEWAGE PUMP No. 1
CONTROL PANEL

6" FIRE
4" WATER

2 - 4" VENT TERMINATE TO TOP OF FENCE.
PROVIDE CHARCOAL FILTER ON TOP OF VENT.

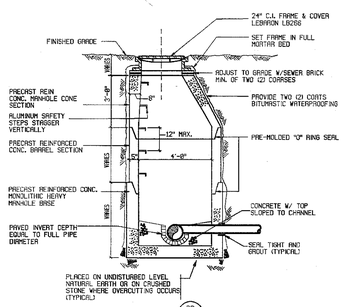
PROPOSED SEWAGE TREATMENT PLANT

INV. 216.18±
INV. 213.35' (3)
STAT 20+75
INV. 213.18±
INV. 214.68±
PRE-TREATMENT TANK
REFER TO DETAIL ON
DRAWING SU3.1
MH RIM 222.0
D SU1.1c MH (AIR VENT
STAT 20+45)
6" SANITARY FROM W.W.T.P.
INV. 217.8±
MH RIM 223.0
CTB(2)
CTB SU4.1
STAT 20+0
1 1/2" LOW PRESSURE SEWER FROM
ROBINSON ELEMENTARY SCHOOL
EQUALIZATION TANK
REFER TO DETAIL ON
DRAWING SU3.1
STAT 19+0
STAT 18+0
STAT 17+0
STAT 16+0
STAT 15+0
STAT 14+0
STAT 13+0
STAT 12+0
STAT 11+0
STAT 10+0
SU4.1 CTB (2)
V&VB (2)
CTB (3)
FH
LG-9R
225.86
LG-1P
227.52
D SU1.1c MH (AIR VENT
STAT 17+35)
LG-7P
226.37
LG-3P
226.78
LG-4P
223.94
LG-5P
221.64
C SU1.1b MH (CLEANOUT
STAT 9+90)
100 FOOT
BASE BID/ BID ALTERNATE LINE
UPOLE #125
UPOLE #124
UPOLE #123
UPOLE #122
UPOLE #121
OBSERVATION & PERCOLATION PIT LOCATIONS.
THE NUMBERS ARE TIED TO LEACHING GALLEY NO'S.

NOTE:
WORK SHOWN ON THIS SIDE OF THE BASE BID/BID ALTERNATE LINE IN ORDER TO CONSTRUCT PLAYFIELDS AND GRAVEL ROAD ARE UNDER BID ALTERNATE #1. WORK TO CONSTRUCT ENTIRE SANITARY SEWER SYSTEM IS IN BASE BID.

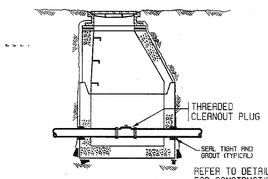
NOTE:
WORK SHOWN ON THIS SIDE OF THE BASE BID/BID ALTERNATE LINE IS UNDER THE BASE BID.

N

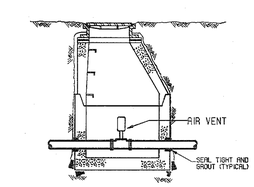


DETAIL B SU1.1b
TYPICAL SANITARY MANHOLE
NO SCALE

DETAIL BB SU1.1b
TYPICAL SANITARY MANHOLE
NO SCALE



DETAIL C SU1.1b
TYPICAL PRESSURE SEWAGE MANHOLE
WITH THREADED CLEAN OUT
NO SCALE



DETAIL D SU1.1b
TYPICAL PRESSURE SEWAGE MANHOLE
WITH AIR VENT CHAMBER
NO SCALE

REFER TO DETAIL B SU1.1b
FOR CONSTRUCTION
OF MANHOLE

BASE BID NOTES

1. ALL SANITARY WORK ASSOCIATED WITH THE ROBINSON SCHOOL AND CONNECTION WITH WWTP IS PART OF BASE BID.
2. THE 1 1/2" PRESSURE SEWER SHALL FOLLOW ALIGNMENT OF EXISTING GRAVEL ROAD. THE EXACT LOCATION DETERMINED IN THE FIELD BY ARCHITECT AND APPROVED BY THE CONSERVATION COMMISION.
3. LIMIT OF WORK ALONG THE GRAVEL ROAD AND SEWER IS 20'-0" WIDE.
4. INSTALL EROSION CONTROL ALONG GRAVEL ROAD SIMILAR TO THAT SHOWN ON DRAWING L-5 & L-6, PRIOR TO DOING ANY OTHER WORK.

SITE UTILITY PLAN
SHEET 2

SCALE:1"=40'-0"

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MASSACHUSETTS

D.E.P. REVISION 10-17-97
D.E.P. REVISION 8-28-97

COMMONWEALTH OF MASSACHUSETTS
MICHAEL J. HICKEY
No. 27584
REGISTERED PROFESSIONAL ENGINEER

SITE PLAN - SHEET 2

Scale:	AS NOTED
Dr. By:	CST
Job No.:	92-183b
Date:	01/14/98

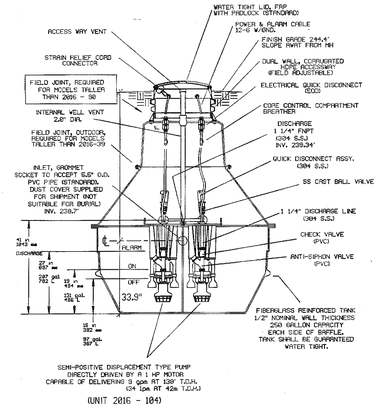
SU-2

SU1.1b

DEMOLITION NOTES

ROBINSON SCHOOL SEWAGE DISPOSAL

1. EXISTING LEACHING AREA TO BE ABANDONED IN PLACE.
2. ALL MANHOLES & DISTRIBUTION BOXES SHALL BE ABANDONED IN PLACE. REMOVE COVERS AND TOPS OF STRUCTURES. FILL STRUCTURES WITH GRAVEL AND COMPACT.
3. PHASE NEW CONSTRUCTION WITH EXISTING. PROVIDE TEMPORARY SEWAGE HOLDING TANK AND PUMP OUT AS REQUIRED.



(UNIT 2016 - 104)

BASE BID NOTES

1. ALL SANITARY WORK ASSOCIATED WITH THE ROBINSON SCHOOL AND CONNECTION WITH WWTP IS PART OF BASE BID.
2. THE 1 1/2" PRESSURE SEWER SHALL FOLLOW ALIGNMENT OF EXISTING FOOT PATH. THE EXACT LOCATION DETERMINED IN THE FIELD BY ARCHITECT AND APPROVED BY THE CONSERVATION COMMISION.
3. LIMIT OF WORK ALONG THE FOOT PATH AND SEWER IS 20'-0" WIDE.
4. INSTALL EROSION CONTROL ALONG FOOT PATH SIMILAR TO THAT SHOWN ON DRAWING L-5 & L-6, PRIOR TO DOING ANY OTHER WORK.

NOTE:
WORK SHOWN IN THIS PLAN VIEW IS UNDER BID ALTERNATE #1.
WORK IN THIS PLAN VIEW TO CONSTRUCT ENTIRE SANITARY SEWER SYSTEM IS IN BASE BID.

SITE UTILITY PLAN SHEET 3

SCALE: 1"=40'-0"

CONSTRUCTION OF NEW ATHLETIC FIELDS SHALL BE PART OF THE ADD ALTERNATE NO. 1. GRADES TO BE ADJUSTED ACCORDINGLY.

SEWAGE PUMP #3

NO SCALE

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WESTFORD MASSACHUSETTS

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D.E.P. REVISION 8-28-97

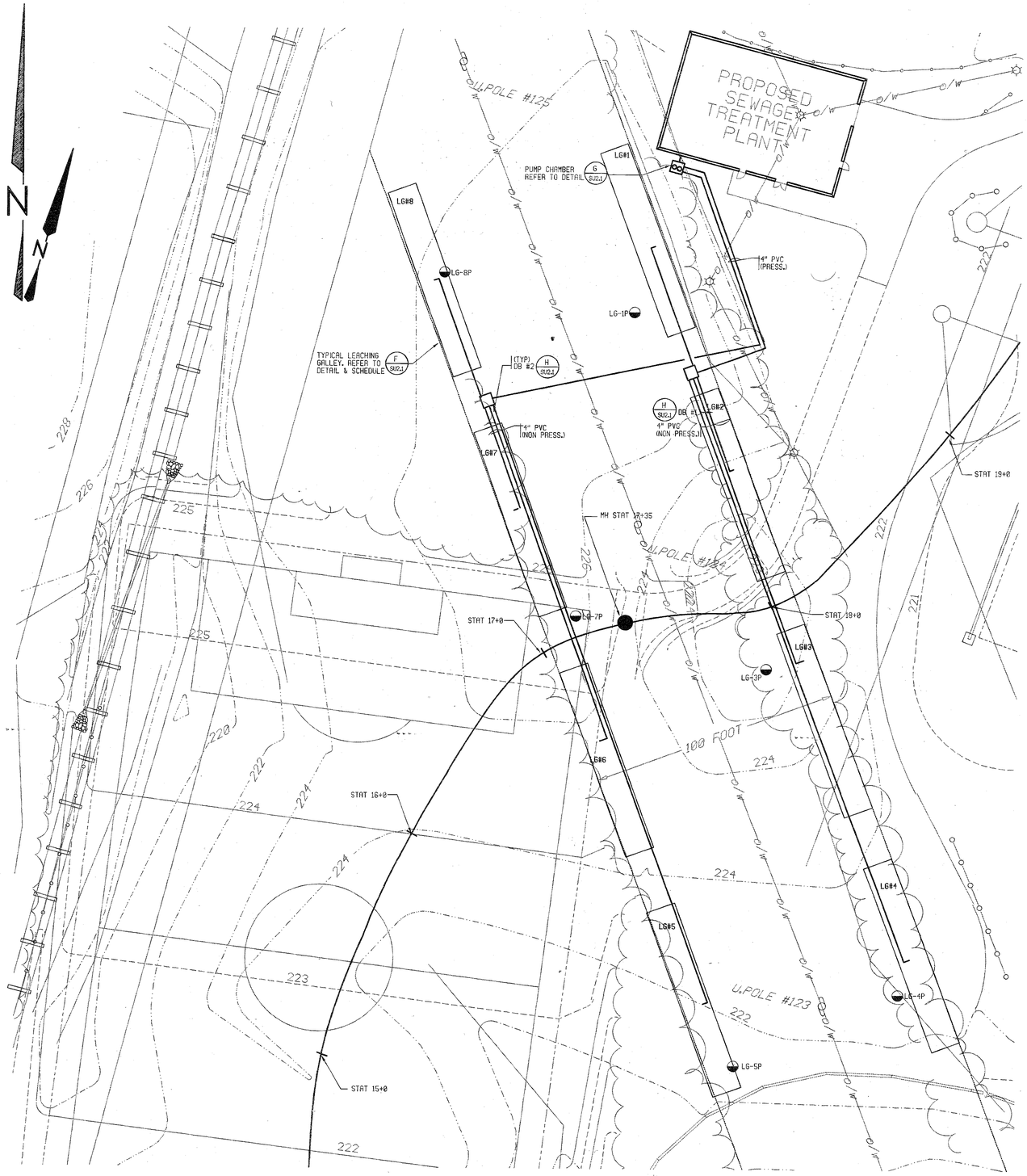
MICHAEL J. HICKEY No. 27554 REGISTERED PROFESSIONAL ENGINEER

SITE PLAN - SHEET 3

Scale: AS NOTED
Dr. By: CST
Job No.: 92-193b
Date: 01/14/98

SU-3
SU1.1c

H:\dra\wssp1c
92-193B



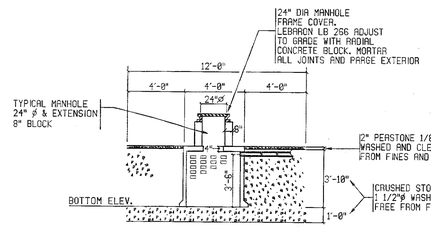
LEACHING AREA PLAN

SCALE: 1" = 20'-0"

SITE EQUIPMENT SCHEDULE

DISTRIBUTION BOX #1		DISTRIBUTION BOX #2	
FINISHED GRADE	226.0' ±	FINISHED GRADE	226.0' ±
INVERT IN	223.0'	INVERT IN	223.0'
INVERT OUT	222.8'	INVERT OUT	222.8'

LEACHING GALLEYS			LEACHING GALLEYS	
#1 FINISHED GRADE	226.0' ±	#5 FINISHED GRADE	222.0' ±
INVERT IN	222.1'	INVERT IN	218.1'
BOTTOM	218.8'	BOTTOM	214.8'
#2 FINISHED GRADE	224.0' ±	#6 FINISHED GRADE	224.0' ±
INVERT IN	219.6'	INVERT IN	219.6'
BOTTOM	216.07'	BOTTOM	216.07'
#3 FINISHED GRADE	224.0' ±	#7 FINISHED GRADE	226.0' ±
INVERT IN	219.6'	INVERT IN	222.1'
BOTTOM	216.07'	BOTTOM	218.8'
#4 FINISHED GRADE	224.0' ±	#8 FINISHED GRADE	226.0' ±
INVERT IN	219.8'	INVERT IN	222.1'
BOTTOM	216.07'	BOTTOM	218.8'



ELEVATION

SCALE: 1/2" = 1'-0"

DESIGN DATA

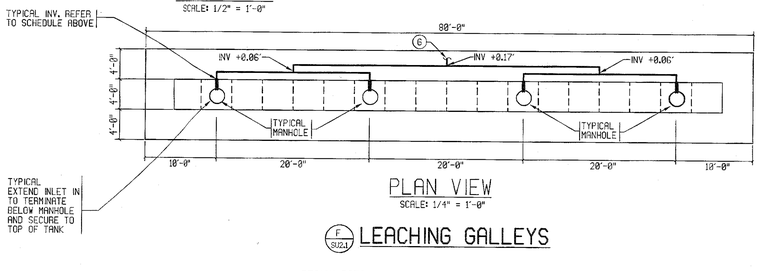
1) TOTAL DAILY FLOW = 32000 GAL
PERCOLATION RATE LESS THAN 5 MIN/INCH DROP = 3 GAL/SQ FT
PERCOLATION RATE IS 3 MIN/INCH BASED ON PERCOLATION TEST DATED 4-30-97

2) 32000 GAL / 3 GAL/SQ FT = 10667 SQ FT

3) GALLEY SIZE: 80' LG x 12' WIDE x 2' DEEP (2'-0" USABLE DEPTH)
AREA - BOTTOM: 80' x 12' = 960 SQ FT
AREA - SIDE WALL: 184' x 2' = 368 SQ FT
1328 SQ FT

4) 10667 SQ FT / 1328 SQ FT = 8 UNITS REQUIRED

5) NOTE LONGEST AT GALLEY 34 FT FROM POINT (6)



PLAN VIEW

SCALE: 1/4" = 1'-0"

F SU2.1 LEACHING GALLEYS

DESIGN DATA

1) DUPLEX PUMP SET SIZED TO DOSING HALF THE CHAMBERS AT A TIME WITH 1" OF COVERAGE.

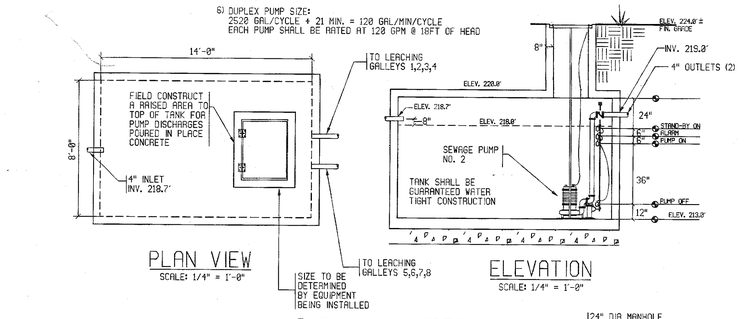
2) LEACHING CHAMBERS : 12' x 80' x 4 x .0833 FT x 7.5 GAL/CU FT = 2400 GALS.

3) DOSING TANK SIZE: 14 FT LONG x 8 FT x 3 FT DEEP DOWN x 7.5 GAL/CU FT = 2520 GAL/CYCLE. NET DEPTH OF DOSE FOR (4) FOUR LEACHING CHAMBERS IS .0875 FT OR 1 1/16" INCH.

4) DESIGN FLOW = 32000 GAL/DAY
DOSES PER DAY 32000 GAL / 2520 GAL = 12.7 DOSES/DAY

5) ACTUAL DOSES PER DAY SHALL BE 6 DOSES/DAY OR 3 DOSES/SIDE. THIS IS PREDICATED ON ACTUAL WATER METER USAGE IN THE EXISTING SCHOOL.

6) DUPLEX PUMP SIZE:
2520 GAL/CYCLE ÷ 21 MIN. = 120 GAL/MIN/CYCLE
EACH PUMP SHALL BE RATED AT 120 GPM @ 18FT OF HEAD



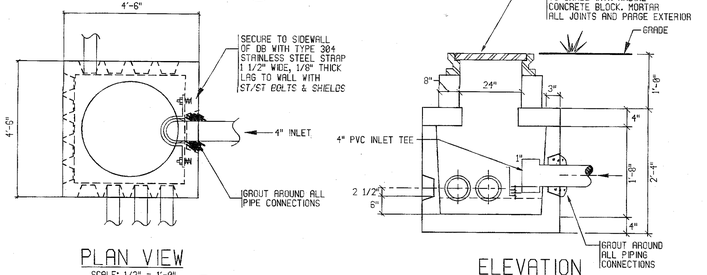
PLAN VIEW

SCALE: 1/4" = 1'-0"

ELEVATION

SCALE: 1/4" = 1'-0"

G SU2.1 PUMP CHAMBER



PLAN VIEW

SCALE: 1/2" = 1'-0"

H SU2.1 DISTRIBUTION BOX

AS NOTED

ELEVATION

SCALE: 1/2" = 1'-0"

h:\dra\wsu\sit2
92-183b

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D.E.P. REVISIONS 8-28-97

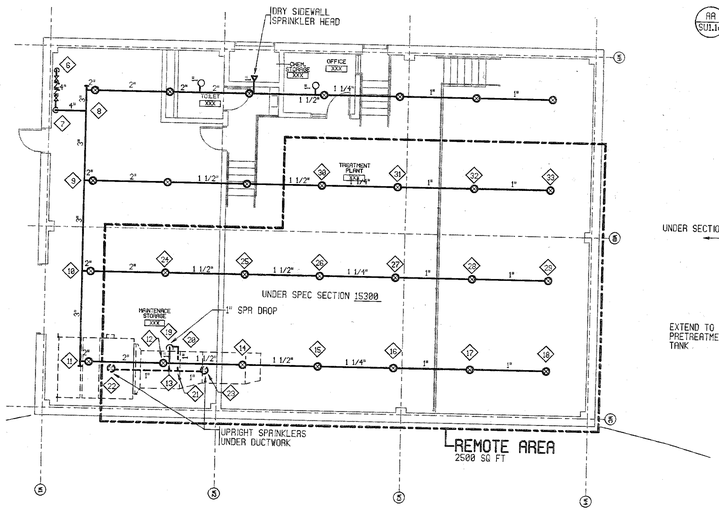
MICHAEL J. HICKEY No. 27694 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS

SITE PLAN
LEACHING AREA PLAN
SITE UTILITIES

SU-4

Scale: AS NOTED
Dr. By: CST
Job No.: 92-183b
Date: 01/14/98

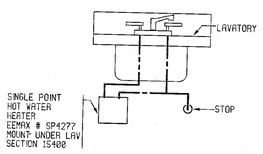
SU2.1



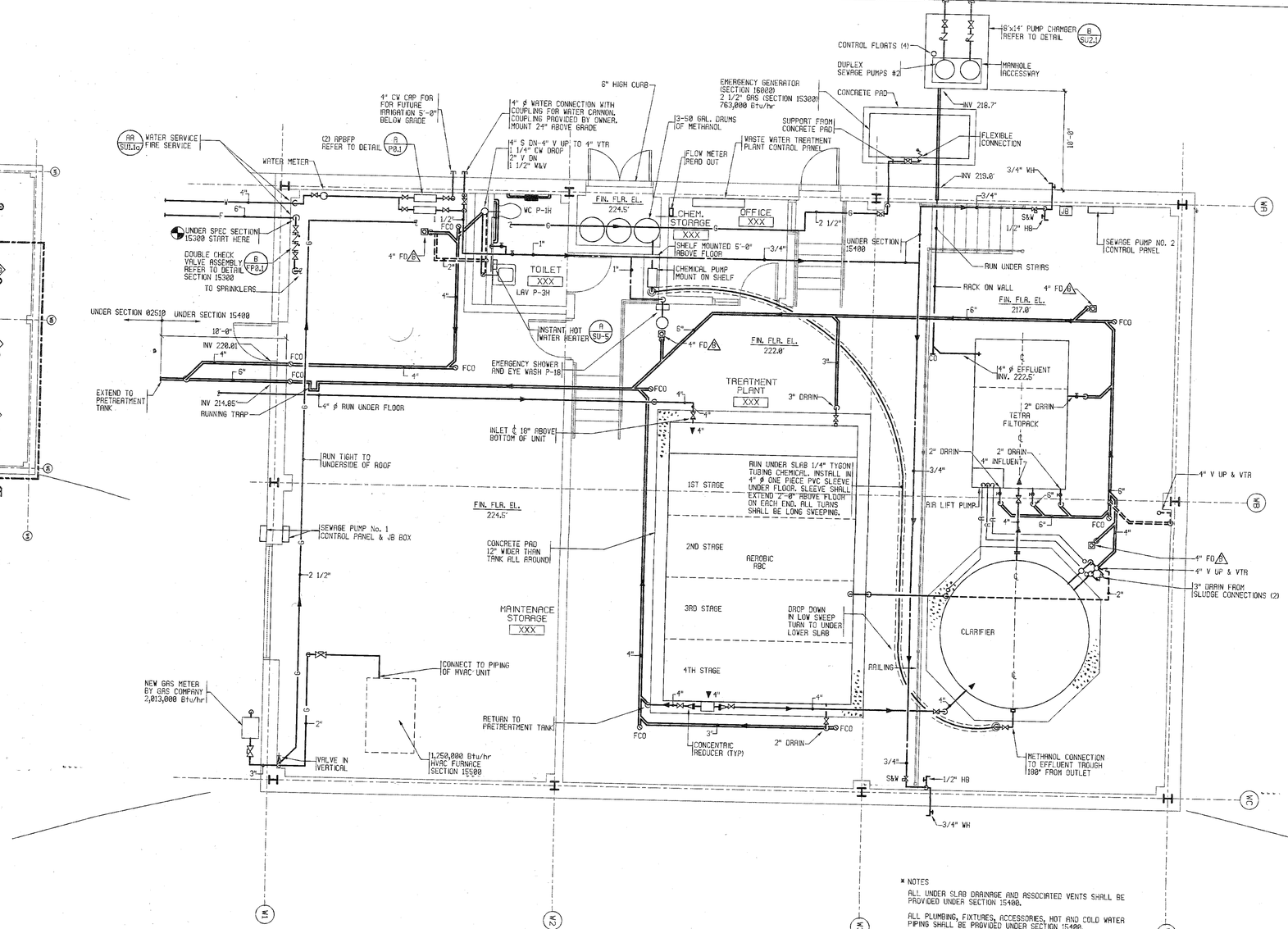
FLOOR PLAN - SPRINKLERS

SCALE:1/8"=1'-0" SECTION 15300

* FLOW TEST DATA ON DWG FP0.1



(A / SU-5) DETAIL
NO SCALE



WASTEWATER TREATMENT PLANT

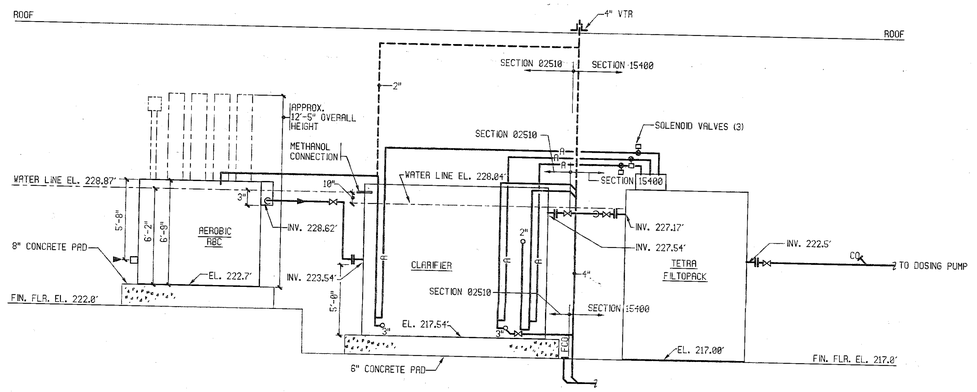
SCALE:1/4"=1'-0"

* NOTES

ALL UNDER SLAB DRAINAGE AND ASSOCIATED VENTS SHALL BE PROVIDED UNDER SECTION 15400.

ALL PLUMBING, FIXTURES, ACCESSORIES, HOT AND COLD WATER PIPING SHALL BE PROVIDED UNDER SECTION 15400.

ALL PROCESS WASTE WATER TREATMENT PLANT EQUIPMENT AND PIPING SHALL BE PROVIDED UNDER SECTION 02510.



WASTEWATER TREATMENT SCHEMATIC

NO SCALE

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COMMONWEALTH OF MASSACHUSETTS
MICHAEL J. MICKEY No. 27664
REGISTERED PROFESSIONAL ENGINEER

WASTEWATER TREATMENT PLANT FLOOR PLAN

Scale: AS NOTED
Dr. By: WJA
Job No.: 92-193b
Date: 01/14/98

SU-5
SU2.2

N:\Projs\ww\92-193B

PRE-TREATMENT TANK 24,000 GAL

DESIGN DATA

1) WWTP TOTAL DESIGN FLOW = 32000 GPD

2) PRETREATMENT TANK 50% OF 32000 + 50% SLUDGE STORAGE

3) (50% X 32,000)+ 50% = 24,000 GALS.

4) USE 1 - 24,000 GAL TANK EQUAL TO ROTONDO & SONS MODEL ST 8 X 18 - 24, STEEL REINFORCED PRE-CAST CONCRETE TANK DESIGN FOR H-20 LOADING.

5) NO GARBAGE DISPOSAL TO BE USED

6) WEIGHT OF TANK = 168,500 LBS.

BUOYANCY CALCULATION

24,000 GALLON TANK	46' x 11' x 9' DEEP
24,000 GALLON TANK	168,500 LBS.
7'-0" EARTH COVER	630 P.S.F.

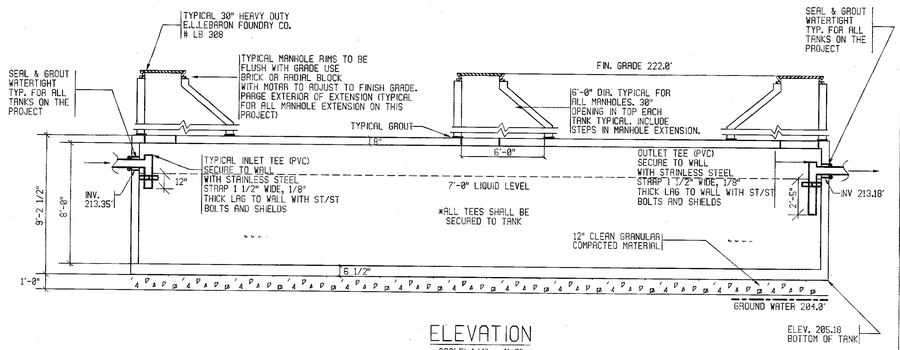
GROUND WATER LEVEL	204.0' ELEVATION
BOTTOM OF TANK	205.0' ELEVATION
ALLOW AN ADDITION 3' G.W.	207.0' ELEVATION
HYDROSTATIC UP LIFT 2 (62.5)	125 P.S.F.

TANK (EMPTY) = $\frac{168,500 \text{ LBS}}{46 \times 11}$ = 317 P.S.F.

EARTH COVER = + 630 P.S.F.

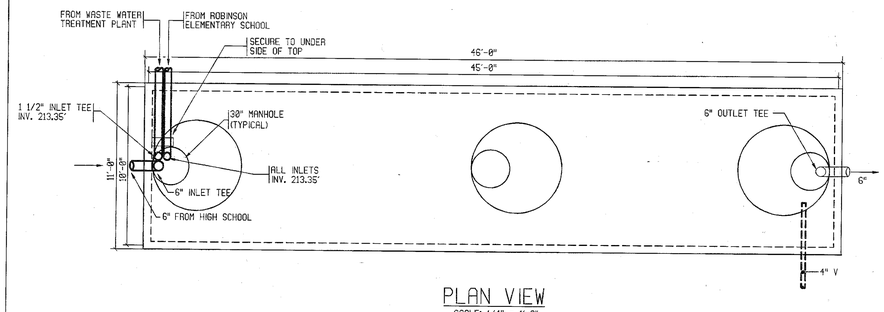
TOTAL = 947 P.S.F.

FACTOR OF SAFETY = $\frac{947}{125}$ = 7.58



ELEVATION

SCALE: 1/4" = 1'-0"



PLAN VIEW

SCALE: 1/4" = 1'-0"

EQUALIZATION TANK 18,000GAL

DESIGN DATA

1) WWTP TOTAL DESIGN FLOW = 32000 GPD

2) EQUALIZATION TANK 50% OF 32000 GPD

3) 50% X 32000 GAL/DAY = 16000 GALS.

4) BOTTOM OF TANK TO BE SLOPE 2% MIN. WE HAVE SHOWN 3.3% SLOPE.

5) USE 1- 18000 GALLON TANK EQUAL TO ROTONDA & SONS MODEL # 57 8 X 18 STEEL REINFORCED PRECAST CONCRETE TANK DESIGNED FOR H-20 LOADING.

6) NO GARBAGE DISPOSAL TO BE USED

7) SLOPE AREA = $\frac{18' \text{ X } 30' \text{ X } 1'}{2}$ X 7.5 GAL = 1125

NET VOLUME 18,000 - 1125 = 16,875 GAL

8) PUMPS SHALL BE WEIL PUMP CO. GRINDER TYPE RATED AT 100 GPM @ 26 FT HEAD W/ 1 HP MOTORS. MODEL 2516 (REFER TO SPECS FOR DETAILS)

9) WEIGHT OF TANK = 128,200 LBS.

BUOYANCY CALCULATION

18,000 GALLON TANK	35' x 11' x 9' DEEP
18,000 GALLON TANK	128,200 LBS.
7'-0" EARTH COVER	630 P.S.F.

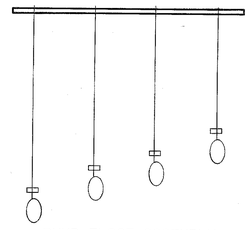
GROUND WATER LEVEL	204.0' ELEVATION
BOTTOM OF TANK	205.0' ELEVATION
ALLOW AN ADDITION 3' G.W.	207.0' ELEVATION
HYDROSTATIC UP LIFT 2 (62.5)	125 P.S.F.

TANK (EMPTY) = $\frac{128,200 \text{ LBS}}{35 \times 11}$ = 333 P.S.F.

EARTH COVER = + 630 P.S.F.

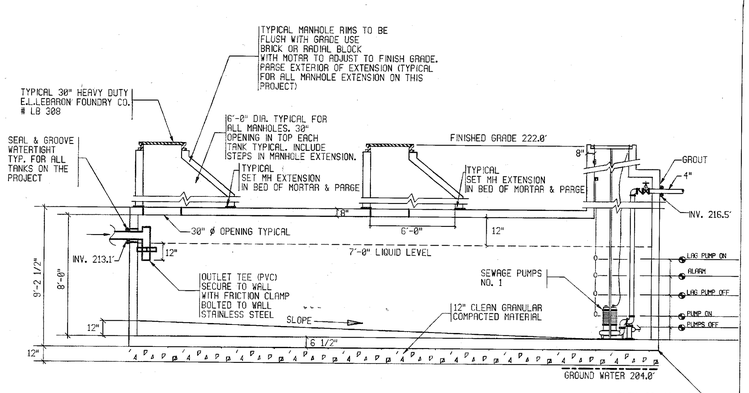
TOTAL = 963 P.S.F.

FACTOR OF SAFETY = $\frac{963}{125}$ = 7.70



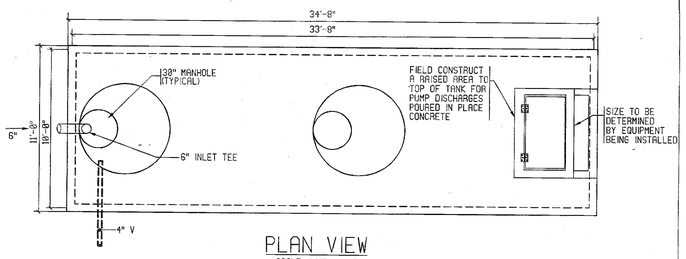
PUMP FLOAT ASSEMBLY

NO SCALE



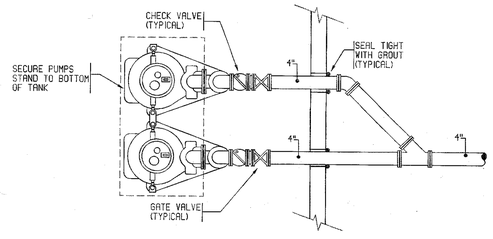
ELEVATION

SCALE: 1/4" = 1'-0"



PLAN VIEW

SCALE: 1/4" = 1'-0"



PUMP PLAN VIEW

NOT TO SCALE

GREASE TRAP

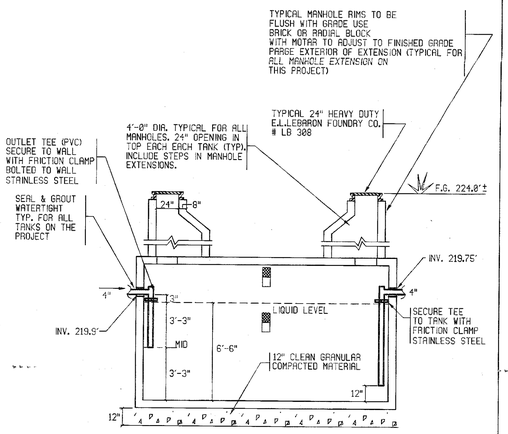
DESIGN DATA

1) KITCHEN GREASE TRAP - 1738 STUDENT, 4 GPD PER STUDENT.

2) 1738 X 4 = 6952 GALLONS USE 7000 GALLON

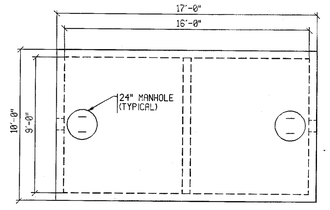
3) USE - 1 - 7000 GALLON TANK EQUAL TO ROTONDO & SONS MODEL # ST 9 X 16 - 7 STEEL REINFORCED PRECAST CONCRETE TANK DESIGNED FOR H-20 LOADING.

4) NO GARBAGE DISPOSAL TO BE USED



ELEVATION

SCALE: 1/4" = 1'-0"



PLAN VIEW

SCALE: 1/4" = 1'-0"

NOTES:

STRUCTURES (TANKS) SHOWN ON THIS DRAWING SHALL BE GUARANTEED WATER TIGHT. INSTALLATION METHODS SHALL FOLLOW MANUFACTURES RECOMMENDATIONS. ADDITIONAL REQUIREMENTS ARE AS FOLLOWS:

1) THE BASE MUST BE A TRANSIT LEVELED CLEAN GRANULAR COMPACTED MATERIAL TO SUPPORT THE CHAMBER WITHOUT THE CHANCE OF DIFFERENTIAL SETTLEMENT.
2) THE EXCAVATION MUST BE PUMPED AND KEPT DRY DURING INSTALLATION.
3) THE CHAMBER MUST BE BACKFILLED WITHIN 24 HOURS OF THE INSTALLATION STARTING WITH THE TWO ENDS IN ORDER TO PROPERLY COMPRESS THE JOINING GASKETS, THEN WORKING TO THE MIDDLE OF THE TANK.
4) THE CRANE (OBTAINED BY CONTRACTOR) MUST BE LARGE ENOUGH TO PLACE THE SECTIONS WITHOUT DAMAGING THEM IN ANY WAY.
5) SUITABLE BACKFILL MATERIAL AND PLACEMENT METHODS MUST BE USED TO AVOID ANY DAMAGE OR SHIFTING OF THE SECTIONS.
6) THE JOINTS MUST BE KEPT CLEAN OF ANY FOREIGN MATERIALS WHILE THE SECTIONS ARE BEING DRAWN TOGETHER.
7) IN CASE OF HOLDING TANKS, PLEASE IDENTIFY ANY UNUSUAL COMPONENTS OF LIQUID RETAINED AT TIME OF ORDER (CERTAIN CHEMICALS REACT ADVERSELY WITH THE GASKET MATERIAL)
8) TANK MUST BE BACKFILLED PRIOR TO FILLING (WATER TESTING) TO PREVENT POTENTIAL JOINT SEPERATION.

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D.E.P. REVISIONS 8-28-97

COMMONWEALTH OF MASSACHUSETTS
MICHAEL J. MICKEY No. 27664
REGISTERED PROFESSIONAL ENGINEER

SITE PLAN DETAILS SITE UTILITIES

Scale:	AS NOTED
Dr. By:	CST
Job No.:	92-183b
Date:	01/14/98

SU-6

SU3.1

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AEROBIC RBC

DESIGN DATA

WASTEWATER INFLUENT CHARACTERISTICS

AVERAGE FLOW (QA)	.032 MGD
PEAK DAILY FLOW (QP)	.04 MGD
MINIMUM FLOW (QM)	.003 MGD
TOTAL BOD (B1)	250 MG/L
SOLUBLE BOD (F1)	150 MG/L
SUSP. SOLIDS (S1)	250 MG/L
NH3-N (N1)	45 MG/L
WATER TEMP (T1)	55 DEG F

WASTEWATER EFFLUENT REQUIREMENTS

EFF TOTAL BOD (B9)	30 MG/L
EFF SOL BOD (F9)	15 MG/L
EFF SUSP.SOLIDS (S9)	30 MG/L
EFF NH3-N (N9)	2 MG/L

*EFF SOL BOD SPECIFIED AS 15. HOWEVER BOD PHASE IS DESIGNED TO REDUCE BOD CONCENTRATION TO 15 OR TO NH3N INFLUENT CONCENTRATION WHICHEVER IS LEAST. ADDITIONAL BOD REDUCTION IN NH3N REMOVAL PHASE.

CLARIFIER

DESIGN DATA

1) 300 GPD / SQ FT

2) 32000 GPD TOTAL FLOW
32000 DIVIDED BY 300 = 107 SQ FT REQUIRED.

3) 12 FT DIA CLARIFY
$\pi r \times R = \phi$
3.14 x 6x6 = 113 SQ FT

TETRA FILTOPACK FILTER

DESIGN DATA

GENERAL DESIGN PARAMETERS:

MEDIA DEPTH	= 4.0 FEET
MEDIA VOLUME VOID FACTOR	= 0.4
REACTOR SURFACE AREA	= 12.5 SQ FT, FILTOPACK CELL
INITIAL BW WATER RATE	= 5 GPM/SQ FT
INITIAL BW WATER DURATION	= 15 MINUTES
FINAL BW WATER RATE	= 5 GPM/SQ FT
FINAL BW WATER DURATION	= 5 MINUTES
BW AIR RATE	= 3 LCFM/SQ FT
METHANOL STORAGE TANKS	= 55 GAL. (TOTAL) (2)

FLOW:

		SUMMER	WINTER
ADF,	MGD =	0.032	0.032
	GPM =	22	22
PEAK-DAY,	MGD =	0.032	0.032
	GPM =	22	22
PEAK-HOUR,	MGD =	0.032	0.032
	GPM =	22	22

HYDRAULIC LIMITS:

FILTR. RATE @ ADF W/ALL IS	= 5.0 GPM/SQ FT
FILTR. RATE @ ADF W/1 OOS	= GPM/SQ FT
FILTR. RATE @ PK W/ALL IS	= 5.0 GPM/SQ FT
FILTR. RATE @ PK W/1 OOS	= GPM/SQ FT

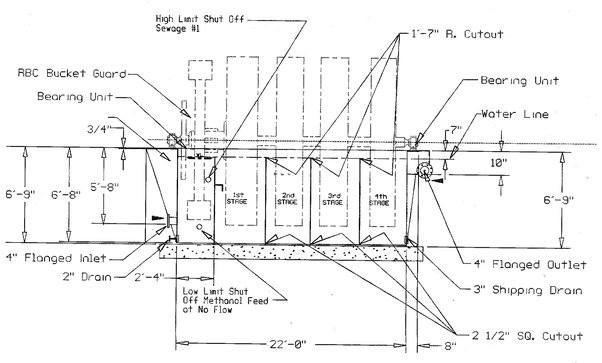
INFLUENT CHARACTERISTICS:

PARAMETER		SUMMER	WINTER
NITRATE AS N, MG/L @ ADF	=	30.0	30.0
NITRATE AS N, MG/L @ PK-DAY	=	30.0	30.0
TSS, MG/L @ ADF	=	30.0	30.0
PHOSPHATE AS P, MG/L @ ADI	=	2.0	2.0
pH, SU	=	7.0	7.0
DO, MG/L	=	2.0	2.0
MIN. TEMPERATURE, DEG. C	=	20.0	12.8

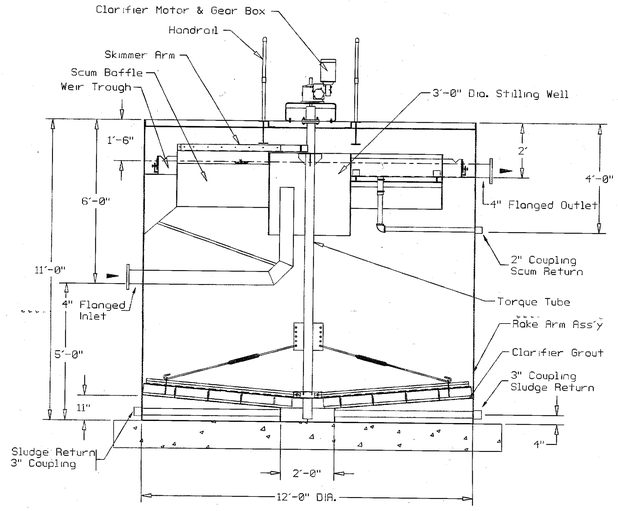
DESIRED EFFLUENT CHARACTERISTICS (DISCHARGE LIMITS):*

PARAMETER		SUMMER	WINTER	
NITRATE AS N, MG/L @ ADF	=	2.0	2.0	93% REMOVAL
NITRATE AS N, MG/L @ PK-DAY	=	2.0	2.0	
TSS, MG/L	=	5.0	5.0	83% REMOVAL
pH, SU	=	6-9	6-9	

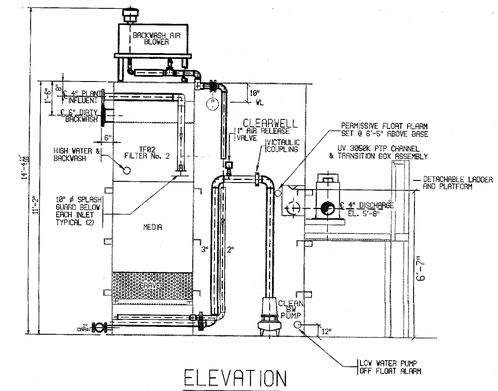
CLEARWELL GROSS VOLUME = 1740 GAL
NET USEABLE VOLUME = 1490 GAL
BACK WASH USE = 1250 GAL



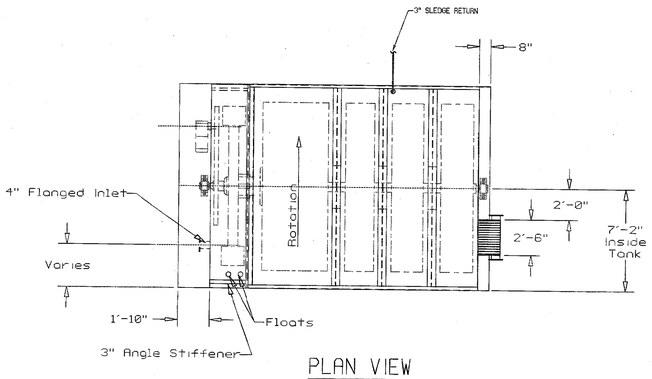
ELEVATION
NOT TO SCALE



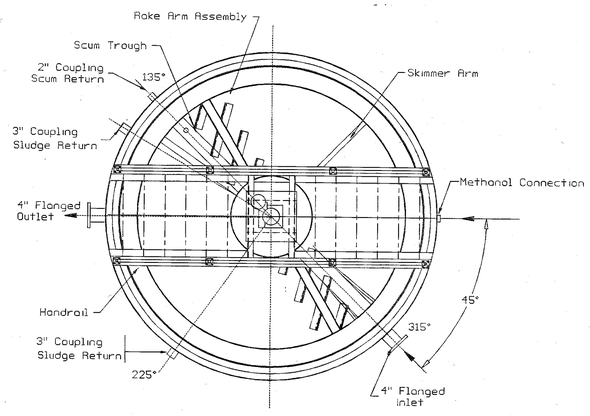
ELEVATION
NOT TO SCALE



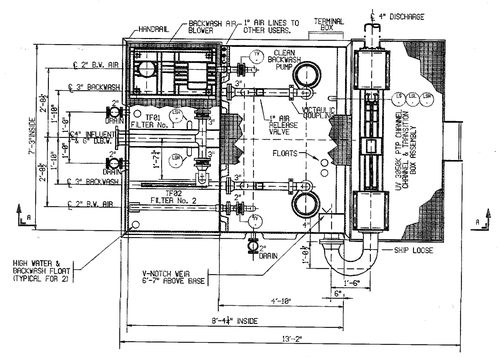
ELEVATION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

D·R·A

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TCI THOMPSON CONSULTANTS, INC.
ENGINEERS
525 MILL ST.
MARION, MA. 02738
(508)-748-2020 (617)-426-4803

WESTFORD ACADEMY

WESTFORD MASSACHUSETTS

D.E.P. REVISION 10-17-97
D.E.P. REVISION 8-28-97

MICHAEL J. MICKEY No. 27564 REGISTERED PROFESSIONAL ENGINEER

WASTEWATER TREATMENT PLANT DETAILS

Scale: AS NOTED
Dr. By: WJA
Job No.: 92-183b
Date: 01/14/98

SU-7

SU3.2

K:\dra\wwwr1det
92-183B

COMMONWEALTH OF MASSACHUSETTS
WESTFORD, MASSACHUSETTS

SITE SUITABILITY ASSESSMENT FOR ON SITE SEWAGE DISPOSAL

PERFORMED BY: MICHAEL J. HICKEY P.E. CERTIFICATION NUMBER: MA PE NO. 27564
WITNESSED BY: MARGO WEBER - DEP
KEVIN JOHNSTON - WESTFORD BOARD OF HEALTH

LOCATION ADDRESS OR LOT NUMBER:	OWNER'S NAME, ADDRESS AND TEL. #
30 PATTEN ROAD WESTFORD, MA 01886	TOWN OF WESTFORD WESTFORD SCHOOL COMMITTEE 35 TOWN FARM ROAD WESTFORD, MA 01886 (508) 692-5563

NEW CONSTRUCTION ☒ REPAIR ☐

OFFICE REVIEW

PUBLISHED SOIL SURVEY AVAILABLE: NO ☐ YES ☒
YEAR PUBLISHED: 1995 PUBLICATION SCALE: 1:25,000 SOIL MAP UNIT: #20
DRAINAGE CLASS: EXCESSIVE SOIL LIMITATIONS: DROUGHT

SURFICAL GEOLOGIC REPORTS AVAILABLE: NO ☐ YES ☐
YEAR PUBLISHED: --- PUBLICATION SCALE: ---
GEOLOGIC MATERIAL (MAP UNIT): ---
LANDFORM: ---

FLOOD INSURANCE MAP:
ABOVE 500 YEAR FLOOD BOUNDARY NO ☐ YES ☒
WITHIN 500 YEAR FLOOD BOUNDARY NO ☒ YES ☐
WITHIN 100 YEAR FLOOD BOUNDARY NO ☒ YES ☐

WETLAND AREA:
NATIONAL WETLAND INVENTORY MAP (MAP UNIT):
WETLANDS CONSERVANCY PROGRAM MAP (MAP UNIT):

CURRENT WATER RESOURCE CONDITIONS (USGS): MONTH
RANGE: ABOVE NORMAL ☐ NORMAL ☐ BELOW NORMAL ☐

OTHER REFERENCES REVIEWED:

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-3P DATE: 4/30/97 TIME: 12:40 PM WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 500 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 280 feet PROPERTY LINE: 300 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-9	A	---	---	---	---
9-25	B	SANDY LOAM	---	---	---
25-59	C_1	SAND	2.5Y 6/3	NONE	---
59-144	C_2	SAND	2.5Y 6/3	NONE	---
---	---	---	---	---	---
---	---	---	---	---	---
---	---	---	---	---	---

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ----
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 12'-0"

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-5P DATE: 4/30/97 TIME: 9:26 AMM WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 480 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 125 feet PROPERTY LINE: 320 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-9	A	---	---	---	---
9-21	B	SANDY LOAM	10YR 5/8	NONE	---
21-96	C_1	LOAMY SAND	2.5Y 7/3	NONE	---
96-150	C_2	SAND	2.5Y 6/3	NONE	---
---	---	---	---	---	---
---	---	---	---	---	---
---	---	---	---	---	---

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ---
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 12'-6"

DETERMINATION OF SEASONAL HIGH WATER TABLE

METHOD USED:
☒ DEPTH OBSERVED STANDING IN OBSERVATION HOLE: >144 inches NONE OBSERVED
☐ DEPTH WEEPING FROM SIDE OF OBSERVATION HOLE:
☒ DEPTH OF SOIL MOTTLES: NONE OBSERVED
☐ GROUND WATER ADJUSTMENT:

INDEX WELL NUMBER: --- READING DATE: --- INDEX WELL LEVEL: ---
ADJUSTMENT FACTOR: --- ADJUSTED GROUND WATER LEVEL: ---

PERCOLATION TEST

DATE: 4/30/97	TIME: ---	
OBSERVATION HOLE#	LG1P	LG3P
DEPTH OF PERC	72"	64"
START PRE-SOAK	12:39 PM	11:25 AM
END PRE SOAK	12:54 PM	UNABLE TO SOAK HOLE
TIME AT 12"	24 GALLONS	UNABLE TO SOAK HOLE
TIME AT 9"	ADDED, UNABLE TO SOAK	24 GALLONS
TIME AT 6"	UNABLE TO SOAK	ADDED
TIME (9"-6")	---	---
RATE MIN./INCH	<2 MIN/ INCH	<2 MIN/ INCH

SITE SUITABILITY ASSESSMENT: ☒ SITE PASSED ☐ SITE FAILED
ADDITIONAL TESTING NEEDED:
PERFORMED BY: MICHAEL J. HICKEY PE CERTIFICATION NUMBER: 27564
WITNESSED BY: MARGO WEBER - DEP
KEVIN JOHNSTON - WESTFORD BOARD OF HEALTH
COMMENTS:

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-1P DATE: 4/30/97 TIME: --- WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 600 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 460 feet PROPERTY LINE: 190 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-14	A	---	---	---	---
14-28	B	SANDY LOAM	---	---	---
28-62	C_1	SAND	2.5Y 5/4	NONE	---
62-76	C_2	FINE SAND	2.5Y 5/3	NONE	---
76-88	C_3	SANDY LOAM	2.5Y 6/4	NONE	---
88-144	C_4	FINE SAND	2.5Y 5/3	NONE	---
---	---	---	---	---	---

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ---
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 12'-0"

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-7P DATE: 4/30/97 TIME: --- WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 620 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 320 feet PROPERTY LINE: 200 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-12	A	---	---	---	---
12-36	B	---	---	---	---
36-72	C_1	SAND	2.5Y 5/4	NONE	---
72-112	C_2	LOAMY SAND	2.5Y 6/3	NONE	---
112-144	C_3	SAND	2.5Y 7/3	NONE	---
---	---	---	---	---	---
---	---	---	---	---	---

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ---
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 12'-0"

DETERMINATION OF SEASONAL HIGH WATER TABLE

METHOD USED:
☒ DEPTH OBSERVED STANDING IN OBSERVATION HOLE: >144 inches NONE OBSERVED
☐ DEPTH WEEPING FROM SIDE OF OBSERVATION HOLE:
☒ DEPTH OF SOIL MOTTLES: NONE OBSERVED
☐ GROUND WATER ADJUSTMENT:

INDEX WELL NUMBER: --- READING DATE: --- INDEX WELL LEVEL: ---
ADJUSTMENT FACTOR: --- ADJUSTED GROUND WATER LEVEL: ---

PERCOLATION TEST

DATE: 4/30/97	TIME: ---	
OBSERVATION HOLE#	LG4P	LG5P
DEPTH OF PERC	72"	53"
START PRE-SOAK	10:45 AM	9:44 AM
END PRE SOAK	11:00 AM	9:59 AM
TIME AT 12"	11:00 AM	9:59 AM
TIME AT 9"	11:06 AM	10:06 AM
TIME AT 6"	11:14 AM	10:16 AM
TIME (9"-6")	8 MIN	10 MIN
RATE MIN./INCH	2.67 MIN/ INCH	3.3 MIN/ INCH

SITE SUITABILITY ASSESSMENT: ☒ SITE PASSED ☐ SITE FAILED
ADDITIONAL TESTING NEEDED:
PERFORMED BY: MICHAEL J. HICKEY PE CERTIFICATION NUMBER: 27564
WITNESSED BY: MARGO WEBER - DEP
KEVIN JOHNSTON - WESTFORD BOARD OF HEALTH
COMMENTS:

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-4P DATE: 4/30/97 TIME: 10:24 AM WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 440 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 145 feet PROPERTY LINE: 380 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-15	A	---	---	---	---
15-31	B	SANDY LOAM	---	---	---
31-43	C_1	SAND	2.5Y 5/3	NONE	---
43-54	C_2	LOAMY SAND	2.5Y 6/3	NONE	---
54-96	C_3	LOAMY SAND	2.5Y 6/3	NONE	---
96-111	C_4	LOAMY SAND	---	---	EXCAVATION UNSTABLE
111-141	C_5	LOAMY SAND	---	---	BELOW THIS POINT

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ---
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 12'-0"

ON-SITE REVIEW

DEEP HOLE NUMBER: LG-8P DATE: 4/30/97 TIME: 12:20 PM WEATHER: CLEAR
LOCATION (identify on site plan): EASEMENT SOUTH OF TRACK, BETWEEN POLES 123 & 125
LAND USE: UTILITY EASEMENT SLOPE (%): 2 SURFACE STONE: <10%
VEGETATION: GRASS & SCRUB BRUSH
LANDFORM: OUTWASH PLAIN
DISTANCES FROM:
OPEN WATER BODY: 720 feet DRAINAGEWAY: >500 feet
POSSIBLE WET AREA: 440 feet PROPERTY LINE: 130 feet
DRINKING WATER WELL: ---- OTHER: ----

DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-7	A	---	---	---	---
7-20	B	---	---	---	---
20-62	C_1	COURSE SAND	2.5Y 5/3	NONE	---
62-132	C_2	FINE SAND	2.5Y 6/4	NONE	---
---	---	---	---	---	---
---	---	---	---	---	---
---	---	---	---	---	---

PARENT MATERIAL (geologic): GLACIAL OUTWASH DEPTH OF BEDROCK: ---
DEPTH OF GROUND WATER: STANDING WATER IN HOLE: NONE WEEPING FROM PIT FACE: NONE
ESTIMATED SEASONAL HIGH GROUND WATER: BELOW 11'-0"

DETERMINATION OF SEASONAL HIGH WATER TABLE

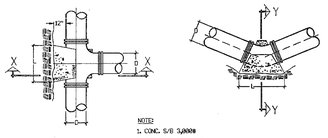
METHOD USED:
☒ DEPTH OBSERVED STANDING IN OBSERVATION HOLE: >144 inches NONE OBSERVED
☐ DEPTH WEEPING FROM SIDE OF OBSERVATION HOLE:
☒ DEPTH OF SOIL MOTTLES: NONE OBSERVED
☐ GROUND WATER ADJUSTMENT:

INDEX WELL NUMBER: --- READING DATE: --- INDEX WELL LEVEL: ---
ADJUSTMENT FACTOR: --- ADJUSTED GROUND WATER LEVEL: ---

PERCOLATION TEST

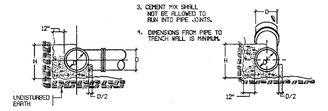
DATE: 4/30/97	TIME: ---	
OBSERVATION HOLE#	LG7P	LG8P
DEPTH OF PERC	72"	54"
START PRE-SOAK	UNABLE TO SOAK HOLE	UNABLE TO SOAK HOLE
END PRE SOAK	UNABLE TO SOAK HOLE	UNABLE TO SOAK HOLE
TIME AT 12"	---	---
TIME AT 9"	---	---
TIME AT 6"	---	---
TIME (9"-6")	---	---
RATE MIN./INCH	2 MIN/ INCH	2 MIN/ INCH

SITE SUITABILITY ASSESSMENT: ☒ SITE PASSED ☐ SITE FAILED
ADDITIONAL TESTING NEEDED:
PERFORMED BY: MICHAEL J. HICKEY PE CERTIFICATION NUMBER: 27564
WITNESSED BY: MARGO WEBER - DEP
KEVIN JOHNSTON - WESTFORD BOARD OF HEALTH
COMMENTS:



PLAN AT TEE PLAN AT BEND

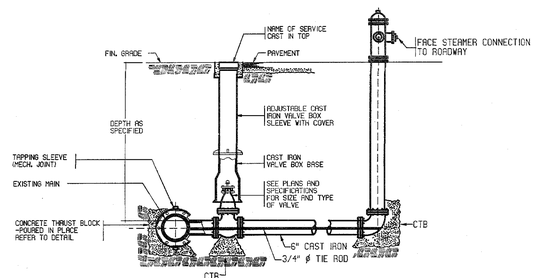
NOTES:
1. CONC. S/B 3,000#
2. THRUST BLOCKS SHALL BEAR ON UNDISTURBED EARTH.
3. CEMENT MIX SHALL NOT BE ALLOWED TO RUN INTO PIPE JOINTS.
4. DIMENSIONS FROM PIPE TO TRENCH WALL IS MINIMUM.



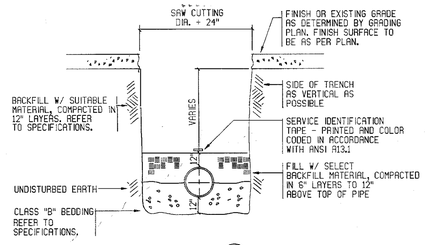
SECTION "X-X" SECTION "Y-Y"

THRUST BLOCK DIMENSIONS							
DIAMETER	TEE		1/4 BEND		1/8 BEND	1/16 BEND	
D	H	L	H	L	H	L	H	L
6"	8"	8"	10"	6"	8"	3"	8"
8"	9"	11"	12"	8"	10"	5"	9"

DETAIL (K, SU4.1)
CONCRETE THRUST BLOCKS
NO SCALE



DETAIL (J, SU4.1)
FIRE HYDRANT INSTALLATION
NO SCALE



DETAIL (K, SU4.1)
TYPICAL TRENCH SECTION
NO SCALE

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WESTFORD ACADEMY

WESTFORD MASSACHUSETTS

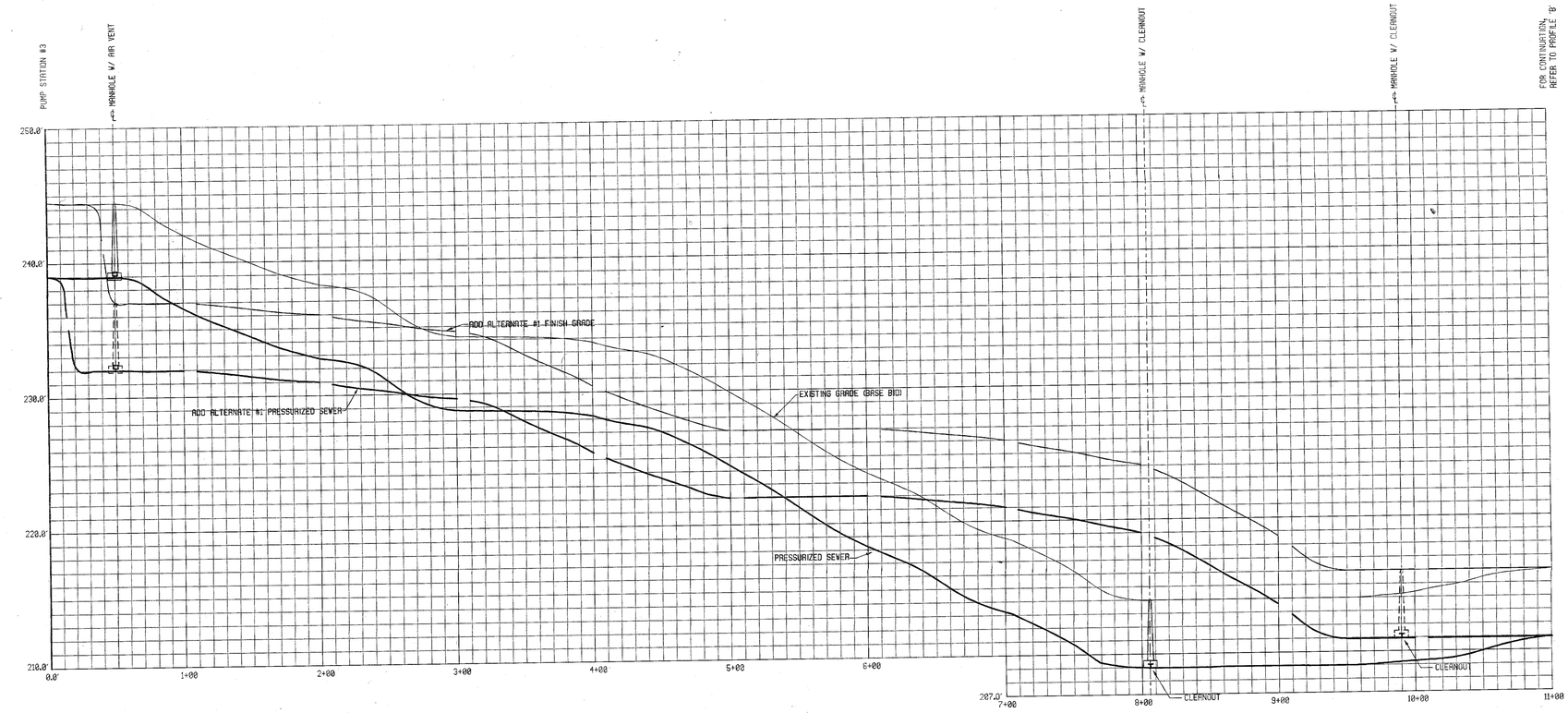
MICHAEL J. HICKEY No. 27564 REGISTERED PROFESSIONAL ENGINEER

SITE PLAN
SITE SUITABILITY ASSESSMENT

SU-8

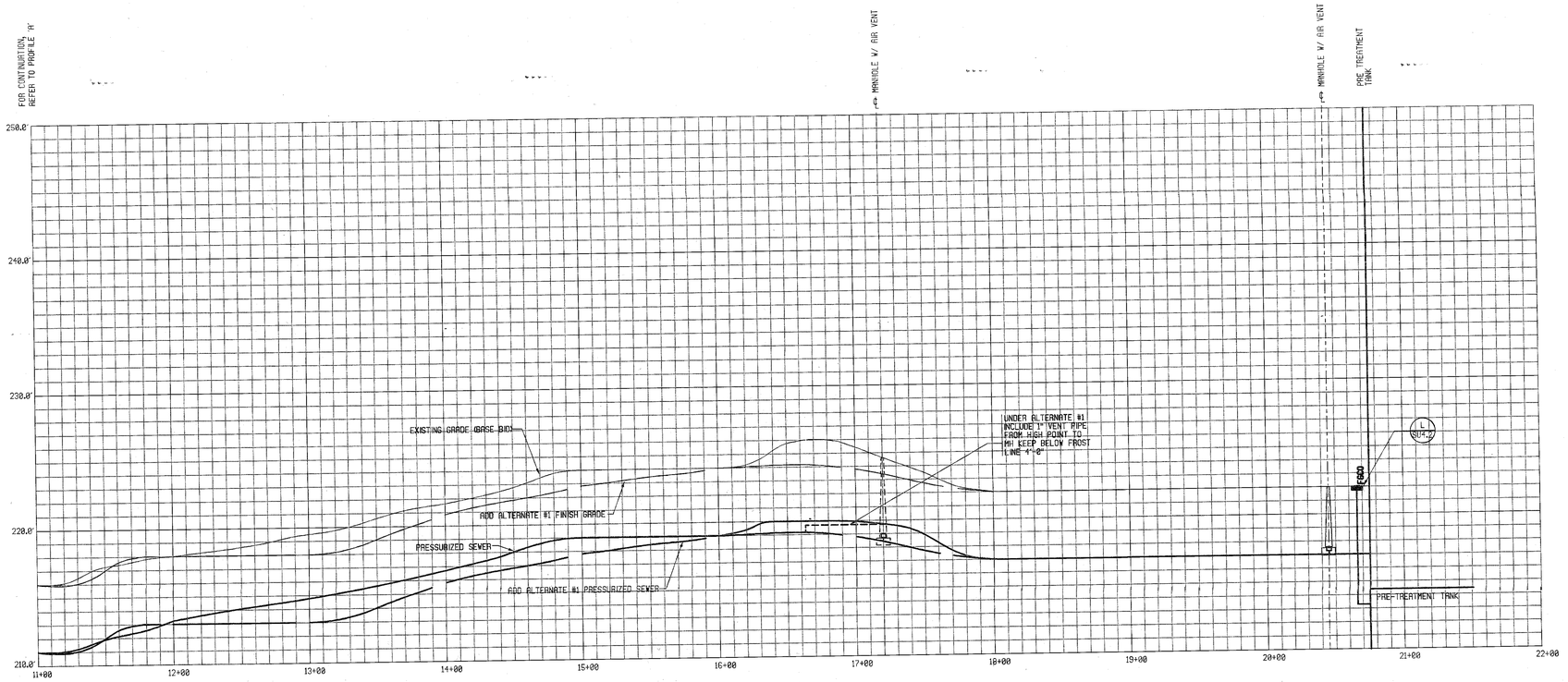
Scale: NONE
Dr. By: CST
Job No.: 92-183b
Date: 01/14/98

SU4.1



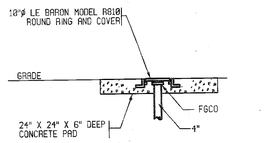
PROFILE 'A'

HORIZONTAL SCALE: 1"=40'-0"
VERTICAL SCALE: 1"=4'-0"



PROFILE 'B'

HORIZONTAL SCALE: 1"=40'-0"
VERTICAL SCALE: 1"=4'-0"



DETAIL (L SU4.2)

TYPICAL FLUSH GRADE CLEANOUT

SCALE: 1" = 1'-0"

H:\DRA\WSU\PROF 92-183B

D·R·A

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Colby Hall
141 Herrick Road
P.O. Box 299
Newton Centre, MA. 02159-0299

Architecture
Interior Design
617-964-1700

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D.E.P. REVISION 10-17-97
D.E.P. REVISION 8-28-97

MICHAEL J. HICKEY No. 27984 REGISTERED PROFESSIONAL ENGINEER

SITE UTILITY PROFILES

Scale: AS NOTED
Dr. By: CST
Job No.: 92-183b
Date: 01/14/98

SU-9

SU4.2