CALCULATIONS

- BASIS OF DESIGN - 600 GPD
- MOUND DESIGN FLOW - 600 GPD
- TREATMENT SYSTEM CHOSEN - 2-1000 GAL SEPTIC TANKS W/ DOSE TANK
- SOILS REPORT SUMMARY:
  - SOILS SERIES - MAHONING
  - SOIL TEXTURE - SILT
  - LIMITING CONDITION - PERCHED SEASONAL WATER TABLE
  - DEPTH TO LIMITING CONDITION - 9"
  - DEPTH TO BED ROCK > 72"
  - PERMEABILITY - 8"-60"
  - SLOPE OF MOUND - 7.3%
  - VERTICAL SEPARATION OF MOUND SITE - 24"
- (LINEAR LOADING RATE USED - 2.7 GPD/LF ± INFILTRATION LOADING RATE CHOSEN) - 0.6 GPD/SF.
- SAND FILL LOADING RATE - 1.0 GPD/SF.
- ABSORPTION AREA LENGTH - FT. (B)
  - DESIGN FLOW - 600 GPD
  - LINEAR LOADING RATE - 2.7 GPD/LF
  - (B = 222 FT)
- ABSORPTION AREA WIDTH - FT. (A)
  - LINEAR LOADING RATE - 2.7 GPD/LF
  - SAND FILL LOADING RATE - 1.0 GPD/SF
  - (A = 2.7 FT)
- MOUND FILL DEPTH - IN - D
  - MOUND DEPTH REQ'D - 24"
  - DEPTH TO LIMITING CONDITION - 9"
  - UPSLOPE (D = 15")
- UP SLOPE WIDTH - FT - J J = 3(D+F+G) x SLOPE CORR FACTOR
  - D = 15 IN.
  - F = 9 IN.
  - G = 12 IN.
  - UPSLOPE CORRECTION FACTOR - 0.92
  - (J = 9 FEET)
- DOWNSLOPE WIDTH - FT - I I = 3(D+F+G) x SLOPE CORR. FACTOR
  - D = 15 IN.
  - F = 9 IN.
  - G = 12 IN
  - DOWNSLOPE CORRECTION FACTOR - 1.10
  - (I = 10 FEET)
- END SLOPE WIDTH - FT. K K = 3((D+E)/2 + F+H)
  - D = 15 IN.
  - E = 9 IN.
  - F = 9 IN.
  - H = 18 IN.
  - (K = 9.75 FT)

MIN. MOUND BASAL LENGTH - FT. - L L = B + 2K
- ABSORPTION AREA LENGTH B - 222 FT.
- END SLOPE WIDTH K - 9.75 FT
- (L = 231.5)

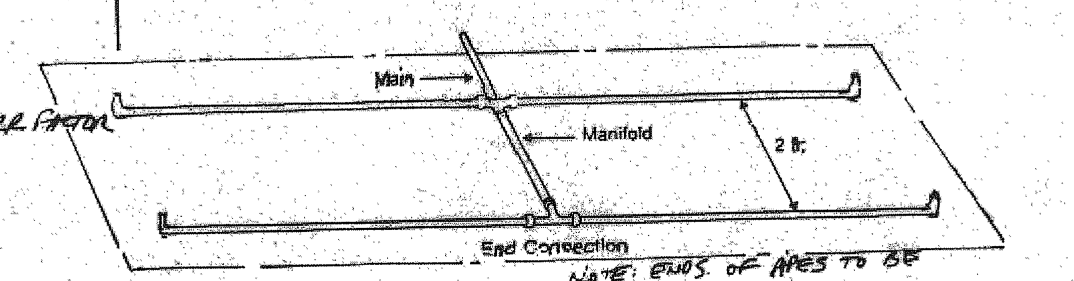
MIN. MOUND BASAL WIDTH - FT. - W W = A+I+J
- ABSORPTION AREA WIDTH A - 2.7 FT.
- DOWN SLOPE WIDTH FT - I - 10 FT.
- UPSLOPE WIDTH FT - J - 9 FT.
- (W = 23.7 FT)

APPROX. OVERALL MIN. HEIGHT - FT - T = (D+E)/2 + F+H
- E = 9 IN.
- D = 15 IN.
- F = 9 IN.
- H = 18 IN.
- (T = 51 IN.)

PRESSURE DISTRIBUTION PIPING & PUMP DESIGN

- MOUND CONFIGURATION CHOSEN - SINGLE MOUND W/CENTER FEED/CENTER MANIFOLD
- NUMBER OF LATERALS CHOSEN - 4
- LENGTH OF LATERALS LL - LL = B / # LATERALS
  - B = 222' (LL = 55.5 FEET (EA))
- PERFORATION SIZE & SPACING
  - DOSAGE AREA CHOSEN - 6 SF.
  - ABSORPTION AREA WIDTH - 2.7 FT.
  - REQ'D SPACING - 2.2 FT CENTER-CENTER
  - PERFORATION SIZE CHOSEN - (1/4" DIAMETER)
- LATERAL DIAMETER - USING FIG. A-2A (1 1/2" DIAMETER)
- PERFORATIONS PER LATERAL - # - LL / REQ'D SPACING
  - LL = 55.5 FEET (EA.)
  - REQ'D SPACING - 2.2 FEET CENTER-CENTER
  - # OF PERFORATIONS PER LATERAL - 25
- LATERAL DISCHARGE RATE (LDR) - # OF LATERALS x GPM/PER. SIZE
  - GPM/PERFORATION - 0.780 GPM/PERFORATION
  - # OF PERFORATIONS - 25
  - (LDR = 19.5 GPM)
- FORCE MAIN MANIFOLD CHOSEN - (2" DIAMETER)
- NETWORK DISCHARGE RATE (NDR) - # LATERALS x LDR
  - # OF LATERALS - 4
  - LDR = 19.5 GPM
  - NDR = 68.8 GPM (PSI CONVERSION = 29.77 PSI)

NOTE: LATERAL SIZE = 1 1/2"
HOLE SPACING = 2.2'
HOLE DIAMETER = 3/16"



NOTE: ENDS OF PIPES TO BE TURNED UP

PIPE LAYOUT

PUMP DESIGN

- DISTAL HEAD - 3.5 FT
- SYSTEM HEAD - 4.6 FT (1.3 x DISTAL HEAD)
- STATIC HEAD - 2 FT ± ELEV. FROM DOSE PUMP TO INVERT OF MOUND LATERAL
- FORCE MAIN - 2"
- FITTINGS EQUIV. PIPE LENGTH - 49 FT
  - FORCE MAIN LENGTH - 100 FT
  - EQUIV. PIPE LENGTH FITTINGS - 49 FT.
  - HEAD LOSS IN FORCE MAIN - 4 FT.
  - NDR - 4.6 + 2.0 + 4 = 8.6 FT.
  - TDH = 49 FEET
- PUMP CHOSEN - FLOW - 9.6 GPM (MIN.) TDH - 50 TDH (MIN.)

DOSE TIMING DESIGN

- NET DOSE VOL - 78 GAL
  - FLOW BACK IN FORCE MAIN - 8 GAL (6% OF VOL)
  - TOTAL - 86 GAL.
- TOTAL DOSE - 86 GAL
  - NDR - 9.6 GPM
- TIMER DOSE DURATION - 5.1 MIN.
  - PDF - 600 GPD
  - NET DOSE - 78 GAL
  - TOTAL # OF DOSES - 7.7 (MIDNIGHT TO MIDNIGHT)
- DOSE FREQUENCY - 24 HRS (DAY) / # OF DOSES
  - 24/7.7 = (3.1 HOURS / TIMER DOSE FREQUENCY)

DOSING CHAMBER DESIGN

- DOSE VOLUME - 25% MAX.
  - PDF - 600 GPD
- TOTAL DOSE VOL. ALLOWABLE - 150 GAL.
- NET DOSE VOLUME - VOID MULT. x LAT. LEN. x # LATERALS x VOID VOL.
  - LAT. VOID MULTIPLIER USED - 5
  - LATERAL LENGTH - 55 FT.
  - LATERAL DIA. - 1 1/2"
  - # LATERALS - 4
  - LAT. VOID VOLUME 0.092 GAL/FT
- (NET DOSE VOL. CHOSEN - 80 GAL)
- SIZE OF DOSING CHAMBER
  - WORKING STOR. MIN. - NET DOSE VOL. + 0.5 + 1.5(PDF) + FM. FLOW BACK (6" BLOCK)
  - FORCE MAIN CHOSEN - 2"
  - FORCE MAIN LENGTH - 100 FT.
  - FORCE MAIN VOID VOL. - 0.163 GAL/FT.
  - WATER VOL. IN FORCE MAIN - 24 GAL.
- TOTAL WORKING VOL. REQ.
  - 90 + 246 + 540 + 49 = 925 GAL
  - DOSING TANK CHOSEN - 2000 GAL
  - W/ WORKING STORAGE OF 1335 GAL.

CONSTRUCTION NOTES

LOCATION OF MOUND TO BE STAKED BY CONTRACTOR PRIOR TO BEGINNING CONSTRUCTION.

MEASURE THE AVERAGE GROUND ELEVATION ALONG THE UPSLOPE EDGE OF THE UPPER TRENCH. BOTTOM ELEVATION OF THE TRENCHES TO BE A MINIMUM OF 18" ABOVE THIS ELEVATION AS SHOWN ON THE DETAIL.

DETERMINE WHERE THE PIPE FROM THE PUMPING CHAMBER CONNECTS TO THE DISTRIBUTION SYSTEM IN THE MOUND.

TRENCH AND LAY THE EFFLUENT PIPE FROM THE PUMPING CHAMBER TO THE MOUND. CUT AND CAP THE PIPE ONE FT. BENEATH THE GROUND SURFACE. LAY PIPE BELOW FROST LINE, SLOPING UNIFORMLY BACK TO THE PUMPING CHAMBER SO THAT THE LINE DRAINS AFTER DOSING. BACKFILL AND COMPACT SOIL AROUND PIPE TO PREVENT BACK SEEPAGE OF EFFLUENT ALONG THE PIPE.

CHECK THE MOISTURE CONTENT OF THE SOIL AT 7-8 IN. DEEP. IF IT IS TOO WET, SMEARING AND COMPACTION WILL RESULT. SOIL MOISTURE CAN BE DETERMINED BY ROLLING A SOIL SAMPLE BETWEEN THE HANDS. IF IT ROLLS INTO A RIBBON, THE SITE IS TOO WET TO PREPARE. IF IT CRUMBLES, SOIL PREPARATION CAN PROCEED.

CUT TREES TO GROUND LEVEL. REMOVE EXCESS VEGETATION BY MOWING. PREPARE THE SITE USING A MOLDBOARD OR CHISEL PLOW BY PLOWING PERPENDICULAR TO THE SLOPE. ROTOTILLING THE SITE IS NOT PERMITTED. CONSTRUCTION OF THE MOUND SHALL BEGIN AS SOON AS THE BASE AREA HAS BEEN PLOWED. THE CONTRACTOR SHALL AVOID RUTTING OF PLOWED AREA WITH VEHICULAR TRAFFIC.

EXTEND THE EFFLUENT PIPE TO SEVERAL FEET ABOVE THE GROUND SURFACE.

PLACE THE FILL MATERIAL WHICH HAS BEEN PROPERLY SELECTED AROUND THE EDGE OF THE PLOWED AREA. KEEP WHEELS OF TRUCK OFF PLOWED AREAS. MINIMIZE TRAFFIC ON THE DOWNSLOPE SIDE OF THE MOUND. WORK FROM THE END AND UPSLOPE SIDE.

MOVE THE FILL MATERIAL INTO PLACE USING A SMALL TRACK TYPE TRACTOR WITH A BLADE. ALWAYS KEEP A MINIMUM OF 6" OF SAND BENEATH TRACKS TO PREVENT COMPACTION OF THE NATURAL SOIL.

PLACE THE FILL MATERIAL TO THE REQUIRED DEPTH WHICH IS THE TOP OF THE TRENCHES. SHAPE SIDES TO THE DESIRED SLOPE.

WITH THE BLADE OF THE TRACTOR, FORM THE TRENCHES. HAND LEVEL THE BOTTOM OF THE TRENCHES. THE BOTTOMS SHALL BE AT THE SAME ELEVATION AND LEVEL.

PLACE THE COARSE AGGREGATE IN THE TRENCHES. AGGREGATE SHALL BE 1/2-2 IN. NON-DETERIORATING AGGREGATE.

PLACE THE DISTRIBUTION SYSTEM ON THE AGGREGATE. CONNECT THE MANIFOLD TO THE PIPE FROM THE PUMPING CHAMBER. SLOPE MANIFOLD TO EFFLUENT PIPE. LAY LATERALS LEVEL, REMOVING RISES AND DIPS.

PLACE 2 IN. OF AGGREGATE OVER THE DISTRIBUTION PIPES.

PLACE 4-5 IN. OF UNCOMPACTED STRAW OR MARSH HAY, UNTREATED BUILDING PAPER OR A SYNTHETIC FABRIC, SUCH AS TYPAR, MIRAFI OR THE EQUIVALENT OVER AGGREGATE.

PLACE SOIL ON TOP OF THE TRENCHES TO A DEPTH OF 1 FT. IN THE CENTER AND 6 IN. AT THE OUTER EDGE OF THE TRENCHES. THIS MAY BE A SUBSOIL OR TOPSOIL.

PLACE 6 IN. OF GOOD QUALITY TOPSOIL OVER THE ENTIRE MOUND SURFACE. THIS WILL RAISE THE ELEVATION AT THE CENTER OF THE MOUND TO A MINIMUM OF 1.5 FT. AND THE OUTSIDE EDGES OF THE TRENCHES TO 1 FT.

LANDSCAPE THE MOUND BY SEEDING AND MULCHING. A MIXTURE OF 90% BIRDSFOOT TREEFOIL AND 10% TIMOTHY MAY BE USED IF THE MOUND WILL NOT BE MANICURED. IF MANICURING IS DESIRED, A COMBINATION OF 60% BLUEGRASS, 30% CREEPING RED FESCUE AND 10% ANNUAL RYE GRASS MAY BE USED. SHRUBS CAN BE PLANTED AROUND THE BASE AND UP THE SIDESLOPES. THEY SHOULD BE SOMEWHAT MOISTURE TOLERANT SINCE THE TOE OF THE MOUND MAY BE SOMEWHAT MOIST DURING VARIOUS TIMES OF THE YEAR.

ALL LAWS AND RULES OF THE LAKE COUNTY GENERAL HEALTH DISTRICT AND THE OHIO DEPARTMENT OF HEALTH PERTAINING TO INDIVIDUAL SEWAGE DISPOSAL AND WATER SUPPLY SYSTEMS SHALL BE FOLLOWED.

BUILDING CONSTRUCTION SHALL COMPLY TO ALL APPLICABLE REGULATIONS OF THE LAKE COUNTY BUILDING DEPARTMENT.

RESIDENCE MUST UTILIZE WATER SAVING TOILETS, SHOWERHEADS, AND FAUCETS.

DRAINAGE IMPROVEMENTS OR CHANGES FROM EXISTING GRADE NOTED ON THE APPROVED PLAN SHALL BE INSTALLED PRIOR TO SEWAGE DISPOSAL SYSTEM CONSTRUCTION.

NO OPEN BURNING WILL OCCUR DURING CONSTRUCTION.

DOWNSPOUTS AND FOOTER DRAINS SHALL BE CONNECTED TO THE MOUND SYSTEM CURTAIN DRAIN AS SHOWN ON THE PLANS.

SURFACE WATER SHALL BE DIVERTED AWAY FROM THE MOUND AREA BY THE USE OF SWALES.

SEWAGE LIFT PUMP SHALL BE CAPABLE OF LIFTING RESIDENTIAL SEWAGE EFFLUENT AT A RATE OF 41 GPM AT 49 FT. OF HEAD. THE PUMPING CHAMBER SHALL HAVE A MINIMUM CAPACITY OF 2000 GALLONS. THE FLOAT LEVELS SHALL BE ADJUSTED TO PROVIDE FOR A 80 GALLON DOSING VOLUME TO THE MOUND.

ELECTRICAL WORK & EQUIPMENT SHALL CONFORM WITH THE CURRENT EDITION OF THE NATIONAL ELECTRICAL CODE.

MECHANICAL COMPONENTS SHALL BE INSTALLED IN A PROPERLY VENTED LOCATION AND ALL VENTS, AIR INTAKES AND AIR HOSES SHALL BE PROTECTED FROM SNOW, ICE OR WATER VAPOR ACCUMULATIONS. INSTALLATION SHALL BE MADE TO MINIMIZE RELEASE OF ODORS AND AEROSOLS.

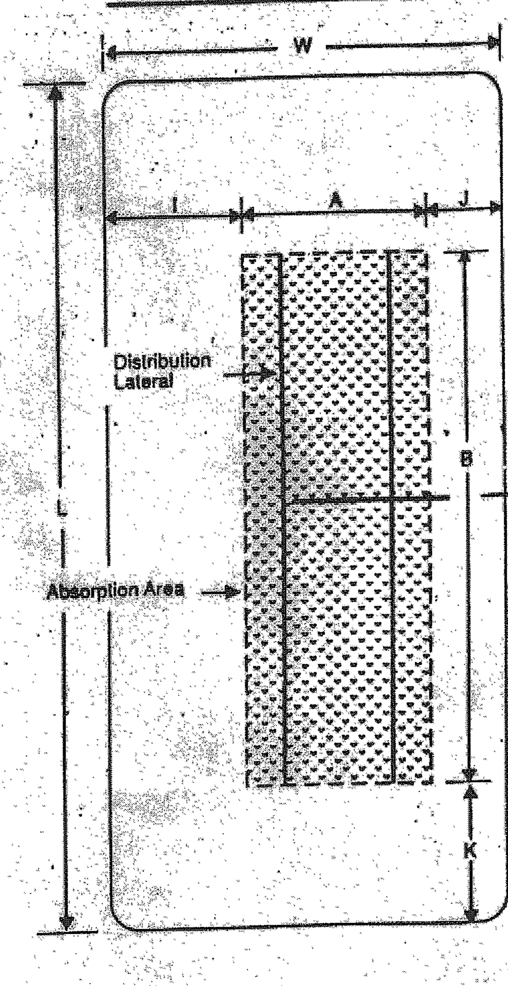
MECHANICAL COMPONENTS INSTALLED IN OR AT THE SEWAGE TANK SHALL BE PROTECTED AGAINST DAMAGE OR IMPAIREMENT OF EFFICIENCY BY FLOODING, FOAMING OR SURCHARGING. PUMPS MUST BE READILY REMOVABLE FROM THE MANHOLE IN CASE OF PUMP FAILURE.

Sand Fill - The mound sand fill depth shall be determined based on the depth to the limiting conditions. The sand fill depth shall not exceed two feet and shall not be less than four inches. The loading rate for the sand fill material shall not exceed 1.0 gpd/ft². For the purpose of this document, natural sand is defined as naturally deposited silica based sand not manufactured by mechanical processing such as the crushing of rock or coarse aggregates. The mound sand fill shall be a natural sand meeting one the following:

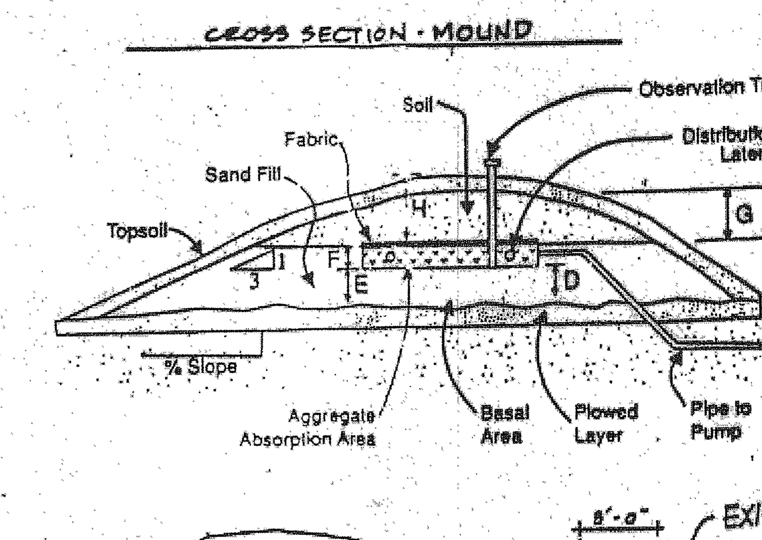
i. Referenced specifications in Wisconsin Mound Soil Absorption System: siting, design and construction manual (Converse & Tyler, 2000) recognizing it is best to stay on the coarse side with effective size (D_{10}) close to 0.30 mm and uniformity coefficient (D_{60}/D_{10}) of 4.0 as stated in the referenced resource on page 13).
ii. Concrete sand meeting the gradation requirements of ASTM C33 provided not more than 5% passes the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing". In order to allow for greater void space and water movement, and to help deter premature clogging, it is best to err on the coarse side of the ASTM C33 standard with a recommended effective size close to 0.30 mm and a uniformity coefficient close to 4.0.
iii. Having an effective size between 0.20 to 0.35 mm, a uniformity coefficient of 5.0 or less with not more than 5% passing the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing" and not less than 80% passing the No. 8 (2.36mm) sieve.

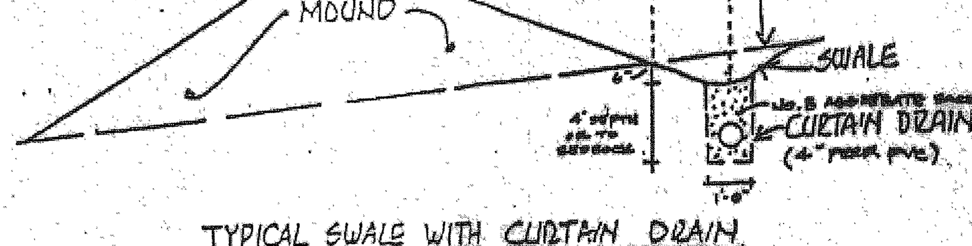
Distribution Area over Sand Fill - The design plan shall specify the depth of the distribution area. If using coarse aggregate, it shall be washed with not more than 5% passing the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing" and shall be durable with a hardness of 3 or greater on the Moh's Scale of Hardness. Plans may specify the use of other distribution area products or material such as gravelless and chamber products.

PLAN VIEW - MOUND



CROSS SECTION - MOUND





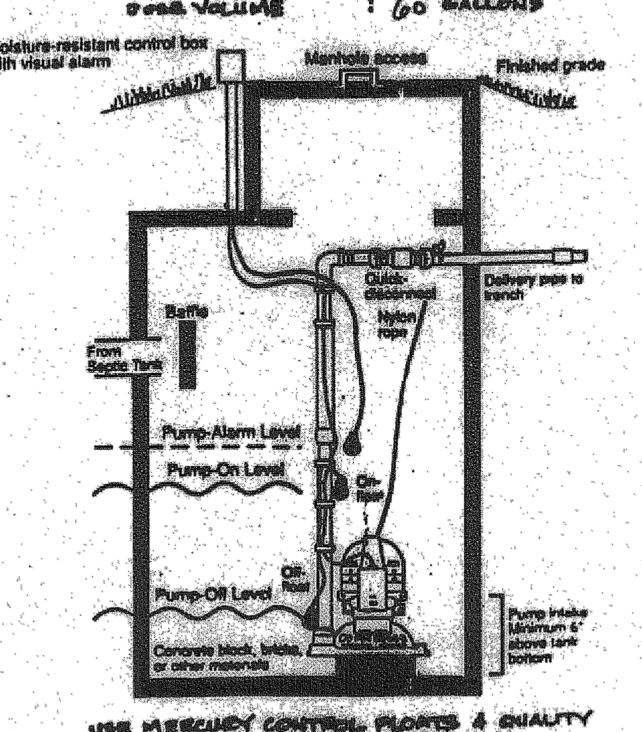
TYPICAL SWALE WITH CURTAIN DRAIN

NO SCALE

TYPICAL CROSS SECTION

DOSE CHAMBER W/ PUMP & CONTROL UNIT

DOSE CHAMBER SIZE: 2000 GALLONS
DOSE VOLUME: 60 GALLONS



USE MERCURY CONTROL FLOATS & QUALITY ALARM W/ A MERCURY CONTROL FLOAT.

MOUND DIMENSIONS (FT.)					
A	2.7	F	0.75	J	9
B	222	G	1.0	K	9.75
D	1.25	H	1.5	L	231.5
E	0.75	I	10	W	23.7

TOTAL HEIGHT = 57"

STATE OF OHIO
HARRY E. JONES, JR.
S-6346
REGISTERED
PROFESSIONAL SURVEYOR

NO.	DESCRIPTION	DATE	BY	CHK'D
1	REVISED CALCULATIONS	1/8/14	HJ	HJ

Jones Surveying, LLC
ENGINEERS - SURVEYORS - PLANNERS
1924 MENTOR AVE., PAINESVILLE, OHIO 440-357-1811
440-357-9173 (FAX) hjonessurveying@yahoo.com

DATE	8/29/13
DESIGN BY	H.J.
DRAWN BY	—
APPROVED BY	H.J.
CREW CHIEF	—

SITE PLAN
FOR
CREIGHTON MURCH

CITY OF KIRTLAND LAKE COUNTY STATE OF OHIO

SCALE —
JOB NO 02-047
SHEET 4/4