



ENGINEERING SUCCESS TOGETHER

February 5, 2016

Town of Sherborn  
19 Washington Street  
Sherborn, Massachusetts 01770

Attn: Mr. Alan Rubenstein, Chairman      Ms. Daryl Beardsley, Chairman  
Board of Appeals                              Board of Health

Re: The Fields at Sherborn - Comprehensive Permit Application  
Sewer and Water Systems Review Update

Dear Mr. Rubenstein and Ms. Beardsley:

BETA reviewed supplemental and revised documents for the Comprehensive Permit Application for The Fields at Sherborn relative to the onsite sewer and water systems. This letter is provided to update BETA's findings, comments and recommendations.

#### BASIS OF REVIEW

The applicant has provided the following supplemental and revised documents that will form the basis of the review.

- Sewer and water systems review update letter to Town of Sherborn dated January 30, 2016 from Creative Land & Water Engineering, LLC including supporting groundwater data tables.
- Septic SAS Area of Impact (AOI) to Drinking Water Wells plan dated January 25, 2016 revised January 30, 2016 prepared by Creative Land & Water Engineering, LLC
- Sewer and water systems review update letter to Town of Sherborn dated February 2, 2016 from Bruce Saluk & Associates, Inc.
- HydroCAD model Summary for Pond R1: ROOF DW dated February 1, 2016
- Plans (C-3, C-4, & C-6) entitled *The Fields at Sherborn Washington Street Sherborn* dated, December 8, 2014, revised through January 28, 2016 by Bruce Saluk & Assoc. Inc., Marlborough, MA
- Septic System Plan (SDS-1) entitled *The Fields at Sherborn Washington Street Sherborn* dated, July 13, 2015 and revised through February 1, 2016 by Bruce Saluk & Assoc. Inc., Marlborough, MA

#### COMPILED REVIEW LETTER KEY

BETA reviewed this project previously and provided review comments in a letter to the Board dated December 28, 2015 (*original comments in italic text*). Trask, Inc., Creative Land & Water Engineering, LLC. and Bruce Saluk & Associates, Inc., collectively Design Team (DT) provided responses (responses in standard text) and BETA has provided comments on the status of each (*in bold italics*).

#### PROJECT OVERVIEW

The existing 17.55± acre wooded lot containing wetland resource areas is located on the south side of Washington Street opposite Knollcrest Farm Lane in Sherborn, Massachusetts. The project documents indicate the proposed development modifications includes 32 new residential units in 9 buildings with associated access drives, parking, private water wells, on-site septic, stormwater management systems and private utilities.

Supplemental documents indicate that the proposed units are two stories with an average of 2500 sq. ft. of floor area. The site plan and architectural elevations depict some units with walk out basements.

#### WATER SERVICE

The project is proposing to install a well for each of the 9 buildings. The Applicant is indicating that this configuration qualifies as a private water system. In reviewing 310 CMR 22.02 a public water system is defined as:

*Public Water System means a system for the provision to the public of water for human consumption, through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days of the year. Such term includes any collection, treatment, storage, and distribution facilities under control of the operator of such a system and used primarily in connection with such system, and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. The Department may presume that a system is a public water system as defined herein based on the average number of persons using a facility served by the system or on the number of bedrooms in a residential home or facility. The Department reserves the right to evaluate and determine whether two or more wells located on commonly owned property, that individually may serve less than 25 people, but collectively serve more than 25 people for more than 60 days of the year should not be regulated as a public water system, taking into account the risk to public health.*

BETA was provided with an email and guidance from MassDEP relative to this issue. It is unclear from the correspondence when the project was discussed and how much detail of the project, beyond the original email, was provided.

- W1. *BETA recommends the Applicant provide an official letter from MassDEP that they have reviewed the entire project as it relates to both water supply and sewer treatment issues and the question of whether this should be considered a Public Water System. DT: The DT has reached out and has made this request, see attached response. BETA2: ZBA Chairman has requested that DEP not make a determination at this time, to allow Town to gather all the facts. Once Town has all the necessary data, they will make a formal request of DEP to review this matter. DT2: We will let the ZBA Chairman to follow through with DEP at proper time. It is our professional opinion that the water wells for the project site is private water supply wells according to our communication with DEP and review of 310 CMR 22.02. BETA3: BETA defers to the recommendation of the Town.*
- W2. *Provide well quality and quantity testing data including short and extended time well pump testing to confirm that there is sufficient supply and whether treatment is required. DT: The DT will agree that following the issuance of the well permits, and the installation of each well, quality and quantity testing shall be provided when the proposed wells (including irrigation) are being tested. The DT states that these well locations and design parameters are to be confirmed on the plan as drawn and accompanying submittals, and that the DT will file permits as needed during the construction process and not prior to issuance of the Comprehensive Permit. This condition can be added to the Comprehensive Permit. BETA2: Testing and sampling of the wells should be done simultaneously with all wells pumping. DT should provide testing and sampling protocol. DT3: See the documentation submitted by Desheng Wang, PHD, P.E. BETA3: Recommend sampling all the wells for Coliform Bacteria, Radionuclides, Inorganics Constituents, Volatile Organics and Secondary Contaminants as outlined in Appendix A of the 2014 State Water Supply Guidelines. For well testing, recommend a two-day test with all wells pumping simultaneously. DT4: See DT Response dated*

1/18/2016 for detailed water quantity and quality testing protocols. *BETA4: Well testing is appropriate – see also W4.*

W3. *Provide information on proposed irrigation well.* DT: The actual minimum design and construction standards of each well can be found in CLAWE report attached hereto. *BETA2: Provide proposed irrigated acreage along with proposed use of the irrigation well.* DT3: The irrigation acreage is 50,725 SF as shown on Sheet L3 (Irrigation Plan). *BETA3: Please provide complete calculations showing how the irrigation well pumping rate was determined.* DT4: The irrigation water well withdrawal volume and time as based on the MA DEP water management policy BRP/BWM/PeP-P00-5 and the condition of the proposed lawn area. The DEP recommended irrigation water under 45% of precipitation condition is 0.74"/week for newly established lawn and 1.12"/week for mature lawn for the three high demand months June to August. See Table W3-1 for a summary of the DEP water management irrigation water demand. The applicant will sod to establish the lawn, which will require water as mature lawn. The new 32-unit plan will have 25,000 sq. ft of irrigated lawn and 20,000 sq. ft of no irrigated mulch bed shrub planting area. The water demand for June-August was calculated for both 45% of normal rainfall and no rain at all condition. See Tables W3-2 and W3-3. The daily water demand for irrigation will vary from 1647 gpd to 2493 gpd for the two rainfall amount. Assuming we will irrigate at 10 gpm rate, the watering hours will vary from 2.75 hours to 4.16 hours. The actual watering time may vary a little depending on the zoning and heads per zone. It is recommended that the irrigation will be zoned 10 heads per area with 1 gpm head. The irrigation well testing can be tested using the same protocol as the drinking water wells and the worst water demanding is slightly less than the maximum drinking water volume of 2700 gpd for irrigation and will be safe to use.

Table W3-1. Irrigation water budget analysis per MA DEP Water Management Policy BRP/BWM/PeP-P005

Weather condition	Irrigation amount, inches	
	New lawn	Mature Lawn
45% of normal rain in June-Aug (	1.12"	0.74"
No rain at all in June - Aug	1.5"	1.12"

Table W3-2. Irrigation water budget analysis: mature lawn with 45% normal rainfall

Land use	Area, sq. ft	Irrigation, in/wk	gpd	Irrigation time, hr/day
Lawn	25000	0.74	1647.4	2.75
Bedded Landscaping	20000	0	0.0	0.00
Total	45000		1647.4	2.75

Table W3-3. Irrigation water budget analysis: mature lawn without rainfall

Land use	Area, sq. ft	Irrigation, in/wk	gpd	Irrigation time, hr/day
Lawn	25000	1.12	2493.3	4.16
Bedded Landscaping	20000	0	0.0	0.00
Total	45000		2493.3	4.16

*BETA4: Information provided – issue resolved.*

- W4. *BETA3: With regard to the new drinking water well locations, the two wells closest to the leach fields are 478 and 402 feet. DT calculations show an Interim Wellhead Protection Area (IWPA) radius for one of those wells at 429 feet. Provide an explanation of why this well is not impacted. DT4: The IWPA does not apply to these wells. As private water supply wells, they are located far away than all applied regulations required. In addition, the more complete groundwater contours map shows that the plume of the leaching fields will not flow to any of these drinking water wells. This is why his well is not impacted. BETA4: Although the well locations appear to be outside the influence of the septic discharge, it is recommended that all the potable wells be sampled regularly, as suggested in the Massachusetts Private Well Guidelines for bedrock wells:*
- a. Initial Sampling - the constituents in Table 8 (attached) including radon*
  - b. Annually - Coliform*
  - c. Every 3 Years - Table 10 (attached)*
- W5. *BETA3: It is not standard practice to assume the effects of pumping from one aquifer can be accurately simulated by using the hydrogeologic characteristics of another adjacent aquifer. Provide drawdown calculations for the wells in the bedrock aquifer using bedrock aquifer characteristics. DT4: DT agrees to conduct well pumping test according to agreed pumping protocol. The drawn downs that we calculated using overburden aquifer wells characteristics provide some conservative referenced of the drawdown influence zone. As we will conduct simultaneous pumping test for all drinking water wells, which will monitored to get more accurate drawdown impact zone than any simulation using hypothetic parameters. BETA4: Recommend a condition to provide calculation if results of monitoring during well test pumping show significant alteration of groundwater elevations.*
- W6. *BETA3: Groundwater drawdowns for all the pumping wells should be superimposed on groundwater contours so that the overall pumping effect of all the wells can be evaluated, including the irrigation well. Provide these calculations. DT4: See W5 response. It was agreed not needed as we will conduct simultaneous pumping test for all wells. BETA4: See status update for W5.*
- W7. *BETA3: It was not clear what infiltration rate was used by the DT in calculating nitrogen impact. The guidelines for calculating nitrogen impacts use an infiltration rate of 18 inches per year, as well as the 40,000 square feet per acre value which the DT did use. Recommend the DT use the guideline value of 18 inches per year. DT4: As we stated in the general project condition, nitrogen impact analysis does not apply this project. BETA4: Due to the current area of impact (AOI) showing the effluent plume will bypass the wells; a nitrogen loading analysis to the wells does not apply. Recommend the Board reserve the right (by condition) to require a mass balance analysis should the results of well testing reveal a change to groundwater flow characteristic and AOI such that the wells may be impacted.*
- W8. *BETA3: In the Nitrogen Impact Analysis, Scenario #1, for the nitrogen amount of 1,051.67 lbs/yr, the table indicates a concentration of 8.82 mg/L. Provide a complete listing of the values used for this calculation. DT4: As we stated in the general project condition, nitrogen impact analysis does not apply this project. BETA4: See status update of W7.*
- W9. *BETA3: The Area of Interest (AOI) submitted depicts a plume that originates at septic Primary's 1 & 2, and terminates / discharges into the nearby wetlands, missing all proposed wells area of influence. Note that the nitrogen budget analysis (Table 4, on page 5 of CLAWE report) only addresses the wetland impact. Extend AOI to the nearest down-gradient sensitive receptor(s) (i.e.*

*drinking water supply wells in this case*). DT4: As requested by the peer reviewer, we added more groundwater data in and near wetland area and generated a more completed contours map for both high and low water conditions. The groundwater mounding in septic leaching field and the large stormwater recharge area were superimposed to the groundwater to generate the contours. The septic plume area of impact (AOI) was mapped for both high and low groundwater conditions. The AOI was extended further downgradient to show no impact on drinking water wells. The updated groundwater data is attached to the letter for reference. *BETA4: See status update of GW6 below.*

- W10. *BETA3: The plume / AOI analysis as currently submitted is depicted in relation to maximum seasonal groundwater levels only. Provide analysis to account for seasonal variation in fluctuating water table, and/or the operating pumping conditions of the proposed system of water supply wells (see W6). BETA is concerned that the operating wells and seasonally fluctuating water levels may contribute to groundwater flow direction toward the wells, resulting in water quality impact. DT4: See response for W9. BETA4: See status update of GW6 below and W7 above.*
- W11. *BETA3: According to the topographical information on the site plans submitted, the approximate surface elevation of the wetlands edge is around el. 170.00, and the depicted ESHGW elevations range from el. 168.00 to el. 166.00 (with low GW conditions that range from el. 166.00 to el. 164.00) across the wetland (where the plume "discharges"). The wetlands edge further to the south and southeast (in the direction of proposed wells D, E, F, G, H, I, and J) are depicted to be at surface el. 160.00. The ESH/LGW data is limited in the wetlands portion of the site. Without additional subsurface investigation of the wetlands, and associated soils, the plume as depicted is questionable during the course of the year, as water levels vary. BETA recommends the the DT resolve the issue of lower ESHGW elevations at the wetlands where groundwater is assumed to discharge. DT4: See response for W9. BETA4: See status update of GW6 below.*

## SEWER SYSTEM

The project on-site wastewater treatment system has been updated and now includes a shared gravity sewer servicing the 32 units. Major components have been revised to include the following: septic tank, pumping chamber (Denoted "Primary Tank"), a "Secondary Tank" and two effluent disposal facilities. It also includes a utility building, which houses the electrical control panels.

### December 2015 Modifications to the septic design, as follows:

1. The DT decreased number of residential buildings proposed:
  - a. from 10 (previous submission) to 9 (current submission),
    - i. which results in reduced number of units from 84(previous submission), to 76(current submission),
    - ii. which translates in slight reduction of flow from 9,240gpd(previous submission), to 8,360gpd(current submission).
2. The DT repositioned the onsite water supply wells (both drinking and irrigation). The DT's revised submission depicts the septic effluent plume will only impact hydraulically down-gradient wetlands, which are adjacent to the property line for abutting property at #257 Washington Street, and to the south of the septic field. The DT has prepared a figure included with the plan set which depicts an Area of Interest (AOI) that illustrates a down gradient plume from the septic field, as the plume relates to seasonal high water table.
3. The DT re-designed the septic system and effluent disposal fields, where:
  - a. Two effluent disposal fields are now proposed, whereas three were previously proposed.

- b. The former "Primary 3" has been removed, and Primary #1 and #2 have been resized/reconfigured
- 4. The DT's re-designed septic system consists of "traditional" Title-5 septic system, with no I/A treatment technology, as previously submitted. The major components consist of:
  - a. One (1), two compartment septic tank (Compartment #1 - 16,720-48hr.detention time, Compartment #2 – 8360gal-24hr.detention time), 25,080 gallons total, with commercial rated effluent tee filter
  - b. Effluent pump chamber, consisting of
    - i. A "Primary Tank" and "Secondary Tank", which together, provide 24-hours of supplemental storage for power outage, or pump failure conditions.
    - ii. Duplex pumping system with float controls (located in the "Primary Tank") which dose the effluent disposal fields, sequentially, and on an alternating basis.
  - c. Two, pressure-dosed effluent disposal fields consisting of,
    - i. Stone trench construction, 2'wide by 2' effective depth (6SF/LF) effective leaching area,
    - ii. Trenches total, providing 11,352 SF effective infiltrative surface area.

#### Title 5 Compliance

Design flows: BETA updated the bedroom count analysis based on the latest preliminary floor plans in the attached document and not that unless the units are deed restricted there is potential of 131 bedrooms. The following review is based on the Applicant's assertion that the project will provide 76 bedrooms or 8,360 gal/ day.

- T5-1. *Include a condition that units will be deed restricted based on the final floor plans with the total number of bedrooms not to exceed 84 (15.002 Bedroom).* DT: The language as correctly stated in the Sherborn Board of Health regulations for this condition is: "All SINGLE-FAMILY dwellings shall be designed for a minimum of three (3) bedrooms" The DT asserts that this is not a single family, it is a multi-family and this condition doesn't apply.

The DT has submitted plans that show plans that have 2-3 bedrooms each; most of the plans show a family room, study, kitchen and dining room on the first floor; and 2 or 3 bedrooms on the second floor. Under the Sherborn definition of bedrooms as it relates to design standards, these units comply as only having rooms not named above, and/or located on second floor are considered bedrooms. The "Adams 2 bedroom" which did have a study on the second floor has been removed as an option. The only other plan that has a bedroom on the second floor is the first floor master plan (The Kirkland, first floor master) which has one bedroom on the first floor and one bedroom and a study on the second floor. The DT has also provided copies of potential finished basement areas. Any basement, if finished, can be limited (either in condo docs or deed restriction) to an open floor plan finished area as per attached plans. These rooms will be labeled playroom, and do not represent bedrooms under the Sherborn BOH regulations.

The DT agrees that the SBOH requirement that all second floor rooms be considered bedrooms and that the "Kirkland 2 Bedroom, First floor master plan" requires a waiver from that condition.

The DT will also be phasing in the master deed with each unit being fully detailed and all rooms (bedroom or otherwise) labeled and accounted for, The DT will also agree that a conditions can be added to the condo docs restricting future unit modifications that would include a new bedroom.

*BETA2: The Board should discuss how to interoperate the bedroom count first per the Title 5 definition and then through the local bylaw. Also seek DEP's guidance on this issue.* DT3: According

to Claire Golden of DEP, 3 bedroom design loading for the condominium units is not required according to Title 5, because they are multifamily units, and the bedroom count falls under 310 CMR 12.203...."The number of bedroom in a condominium shall be specified in the Master Deed." She said that she would call Ellen Hartnett at the Board to explain. The attached sample deed language was submitted, together with the redundant deed restriction, to the Board of Health at the November 4th meeting. *BETA3: BETA defers to the Board on this issue.*

System components meet the minimum setbacks (15.211) for property lines, BVW, private water supply well, leaching catch basins and drywells.

- T5-2. *Provide retaining wall designed by a Massachusetts Registered Professional Engineer (310CMR 15.211(1)[4]). Confirm that the property line setback(s) of the proposed retaining walls complies with applicable zoning, building, planning board requirements. It is depicted as being installed 6-inches away from the property line.* DT: The DT has attached herewith wall specification from the structural engineer meeting the requirements of 310CMR 15.211(1)(4), in so much as the Sherborn Zoning Board determines that these walls represent a setback requirement, a waiver for such will be requested. *BETA2: The wall is within 6 to 14 inches from property line and foundation is 4 or more feet below grade in a course to medium sand with 15% gravel. Provide notes and details protecting abutters' properties. Walls may require easements from abutters, a building permit and be subject to setback requirements. Applicant is seeking a waiver from setback requirements. Also, provide details for the other walls proposed on site.* DT3: Easements are not required, because retaining wall construction will include drive & pull cold formed steel sheet piling, Pan Type SKL sheeting or approved equal. Proposed method driving & extraction is Vibratory. The proposed concrete modular block gravity walls will only extend approximately 12" below finished grade. The details of the other gravity walls are currently being finalized and will be submitted when completed. *BETA3: BETA recommends that the Town of Sherborn Building, Planning, and Zoning departments review the proposed property setback waivers requested by the DT. DT has submitted a portion of the requested Title-5 related design information requested related to the retaining walls, prepared and stamped by a Massachusetts registered structural engineer. For final plans provide modular block retaining wall design and details.*

#### Facility Aggregation Plan

Based on 15.214, with proposed on-site wells, the project must comply with nitrogen loading limitations. With the use of an approved system with enhanced nitrogen removal the loading can be increased up to 9,652 gals/day – the design flow is 9,240 gal/ day which is below the maximum amount allowed.

- T5-3. *Provide the aggregation plan report, and mass balance analysis required per the guidelines for 310 CMR 15.216, to assure that groundwater quality standards (10 mg/l total nitrogen and 10 mg/l nitrate nitrogen) are met at down gradient sensitive receptors, and at both the private wells to be located on the proposed development, as well as at the private well(s) on adjacent lots. Down gradient groundwater monitoring will also be required according to the nutrient loading guidelines.* DT: The DT responds that this project does not, nor is it required to, represent a Facility Aggregation Plan, instead an enhanced nitrogen removal system has been designed to meet nitrogen loading limitations:

*Under 310CMR15.214 (2) the applicant may choose to provide either a Facility Aggregation Plan or enhanced nitrogen removal treatment system: "No system serving new construction in areas where the use of both on-site systems and drinking water supply wells are proposed to serve the facility shall be designed to receive or shall receive more than 440 gallons of design flow per day per acre from residential uses except as set forth at*

*30CMR15.216 (aggregate flows) or 15.217 (enhanced nitrogen) Under the applicable reference; 310 CMR 15.217: Systems with Enhanced Nitrogen Removal: (1) " The nitrogen loading limitations established in 310 CMR 15.214 shall not apply to discharge of an effluent meeting the federal Safe Drinking Water Act nitrate standard of 10 ppm through either an approved alternative system or a treatment..." And:*

*"(2) An increase in calculated allowable nutrient loading per acre may be allowed with the use of a technology approved for enhanced nutrient removal pursuant to either the piloting, provisional or general use certification provisions in 310 CMR 15.281 through 15.288..."*

The application as submitted conforms to 30CMR15.217 and the applicable sections of 15.281-15.288 for an enhanced nitrogen system, and does not represent a Facility Aggregation Flow Plan. *BETA2: DEP has not approved an I/A technology to provide 10 mg/l of total nitrogen effluent under Title 5. See attached email from Olusegun Onatunde. If this technology is not approved, provide an aggregation plan using approved 25 mg/l nitrogen effluent to meet 10 mg/l threshold at the property line or downgradient sensitive receptors. DT3: This peer review comment no longer applies to the updated plan. BETA3: The project has been revised to meet the 440 gal./acre threshold meeting Title 5 requirements, however concerns of water quality to area private wells are valid and therefore comments regarding this issue are noted in Water Service section above and section BOH10 (below).*

#### Plans and Specifications

- T5-4. *Provide legal boundaries of the facility (property) to be served (15.220(4)(a)). DT: Please find the attached property plan. BETA2: Plan provided – issue resolved.*
- T5-5. *Confirm that septic tank is 25 feet or more from wetlands. DT: The proposed septic tank (52' from the wetlands) has been confirmed to be more than 25 feet from the wetlands. BETA2: Clarification provided – issue resolved.*
- T5-6. *Provide buoyancy calculations for all tanks installed below seasonal high groundwater elevations. DT: Please find the attached buoyancy calculations. BETA2: BETA could not locate the buoyancy calculations with the submitted materials. This could be included as a condition of approval. DT3: Please find the attached buoyancy calculations. BETA3: Calculations provided – issue resolved.*

Pump Chamber: The project includes a pump chamber and a secondary pump chamber tank to provide supplemental 24 hour emergency storage.

#### Innovative/Alternative (I/A) Treatment Technology Comments:

- T5-7. *The MassDEP provisional use approval letter for the Biomicrobics FAST system for flows between 2,000 gpd to 10,000 gpd requires effluent monitoring requirements. Flow metering provisions were missing on the plans, and are required in the provisional approval letter. Wastewater flow meter is to be provided to measure the flow to each of the leaching fields. Water metering of the domestic, non-irrigation or fire suppression system well flows is also not specified. DT: Flow metering has been included on the previous Septic system plans submitted to the Board of Health. Refer to note #6 on Sheet SDS-3 where the elapsed time meters and pump cycle counters are proposed. BETA2: Treatment system revised. See response to DT's comment BOH8. DT3: The comment under BOH8 is a separate comment and response and doesn't concern the pump chamber metering. Since flow metering was already included on the plan, this item should be noted as resolved. BETA3: Design modified – issue dismissed.*

- T5-8. *The proposed I/A septic system design must also be reviewed and approval obtained by MassDEP, per 310 CMR 15.003 (2) (a) and (e). This is stipulated in the provisional approval for the proposed system, Item III, C. 1. DT: The MADEP Provisional Use Permit for the proposed I/A systems has been submitted to the Board of Health. The above reference §15.003(2)(a)and(e) has been revised in the most recent version of 310 CMR 15.003. BETA2: Due to the sensitivity and complexity of this project BETA recommends receiving guidance from DEP prior to approving – see DEP section at end of this letter. DT3: This peer review comment no longer applies to the updated plan. BETA3: Design modified – issue dismissed.*
- T5-9. *BETA2: Provide location and elevation of one benchmark within 50-75 feet of the system components. DT3: Bench Marks have been added to the Septic Plan. BETA3: Benchmarks provided – issue resolved.*
- T5-10. *BETA2: Sheet SDS-3 - Septic Tank Detail- The detail depicts a 1-1/2" pvc recycle line feeding into the septic tank. The Nitrifast 9.0 Tank Detail states this line goes to the Flow Equalization Tank. Confirm intended location. DT3: This comment no longer applies to the updated plan. BETA3: Plan revised – issue dismissed.*
- T5-11. *BETA2: Provide a complete hydraulic/system profile for entire wastewater system. The profile on sheet SDS-2 does not depict new revised treatment process components. DT3: This comment no longer applies to the updated plan. BETA3: Profile provided – issue resolved.*
- T5-12. *BETA2: Model Board of Health Regulations for Private Wells, Mass DEP, states " Water supply lines shall be installed ten (10) feet from and eighteen (18) inches above any sewer line. Provide a profile of the utilities along the roadway, as the three final effluent force mains will cross several water services. Sufficient water tight sleeves shall be provided in accordance with MassDEP water and sewer regulations, and depicted on the plans including detail. The typical road cross section on sheet C5 also does not adequately depict the three effluent sewer forcemains relative to adjacent utilities. DT3: The 3 force mains do not cross any potable water services. There are some water service and sewer building connections that do cross and a sewer/water crossing detail with separation requirements has been already been included on the plans. Detail Sheet C5 already includes a sewer and water crossing detail with specifications for water & sewer separation at these crossings. The detail on Sheet C5 now depicts the three force mains. BETA3: Detail provided – issue resolved.*
- T5-13. *BETA2: The finished grade slope for Primary 2 and Primary 3 is less than 0.02 ft/ft.. According to Title 5; 15.240 (10), the finished grade for the leaching area shall have a minimum slope of 0.02 ft/ft . DT3: Sheet SDS-1 now includes additional spot grades and 0.2 FT micro Contours. BETA3: Information provided – issue resolved.*
- T5-14. *BETA2: Sheet SDS-2 – General Notes- "Sudbury Board of Health" should be "Sherborn". DT3: The typo has been fixed. BETA3: Note revised – issue resolved.*
- T5-15. *BETA2: Sheet SDS-1 – Treatment System Layout – Septic tank states "I.D. = 16L x 9'W x 11.83'H". Sheet SDS-3 gives the height of the tank as 12'-2" on the septic tank detail. Confirm intended dimensions. DT3: This comment no longer applies to the updated plan. BETA3: Design revised – issue resolved.*

Soil Absorption System (SAS):

The project now proposes two SAS fields of trenches that will alternate dosing three times a day for each field.

SA1. *BETA3: Note that on plan SDS-3, there is a typo in the pressure dosing calculations, under "Required Pump output to each Primary", which still references "Primary 3", which has been eliminated. DT shall confirm and clarify the calculations.*

#### GROUNDWATER MODELING

The aquifer testing was done in the unsaturated zone of the aquifer above the water table, and the results of the testing were used to simulate saturated groundwater mounding for both septic and storm water.

- GW1. *Provide results of saturated aquifer testing. DT: Refer to the Alternative noted under GW3 below. BETA2: Information provided – issue resolved.*
- GW2. *As an alternative to the aquifer testing, conduct additional groundwater mounding calculations using the lowest hydraulic conductivity (29 feet per day) for both the storm water BMPs and the septic leach fields. DT: The alternative lowest hydraulic conductivity (29 feet per day) for both the storm water and the septic leach fields has been used. BETA2: Information provided – issue resolved.*
- GW3. *Determine a saturated thickness for the aquifer based on knowledge of local bedrock elevations obtained from well logs. DT: Records of depth to bedrock have been obtained by DeSheng Wang, and a 20 ft. saturated thickness has been used in the calculations. BETA2: Information provided – issue resolved.*
- GW4. *In converting HydroCAD storm water volumes to groundwater mounding model inputs, use the method developed by William Domey. DT: The HANTUSH and USGS software programs were used. BETA2: Explanation provided – issue resolved.*
- GW5. *In determining if the storm water BMP meets requirements, compare the 3-day residual groundwater mound elevation, as determined by groundwater modeling, with the design elevation of the bottom of the BMP. DT: Please find the attached calculations by Desheng Wang. BETA2: Information provided – issue resolved.*
- GW6. *Provide the groundwater flow direction and slope of the water table beneath the property. DT: Please find the attached groundwater profile drawing. BETA2: Provide a revised groundwater contour map, excluding the data from wells DHT-23 and STP-1. See 10/1/15 BETA Memorandum. DT3: Please find the revised groundwater contour Plan. BETA3: The DT has provided a groundwater contour map showing an Estimated Seasonal High Groundwater (ESHGW) and groundwater contours representing a time of year when groundwater is lower. However, the DT AOI/Plume delineations show ESHGW at lower elevations than the wetlands (see W11 and W12 recommendations). BETA4: A review of the groundwater data provided by the Design Team was completed and two independent figures showing groundwater contours were developed using the DT data. Figure 1 shows contours of Low Groundwater, and Figure 2 shows contours of High Groundwater.*

*The current AOI figure based on contours of high and low groundwater provided by DT was compared to the contours in Figures 1 and 2 and no significant differences were found. Based on this comparison, the resulting AOI for high and low groundwater reasonably represent groundwater flow under those conditions.*

## SHERBORN BOARD OF HEALTH REGULATIONS

Understanding that Comprehensive Applications are not bound to local regulations however 310 CMR 15.003 Coordination with Local Approving Authorities states:

*(1) In general, full compliance with the provisions of 310 CMR 15.000 is presumed by the Department to be protective of the public health, safety, welfare and the environment. Specific site or design conditions, however, may require that additional criteria be met in order to achieve the purpose or intent of 310 CMR 15.000.*

Based on the fact that Sherborn provides no public water supply or sewerage treatment and relies on on-site systems, it is recommended that the additional criteria (as outlined in the Sherborn Board of Health Regulations) be considered for this project due to the fact that maximum build out is proposed on a parcel that:

- Will provide private wells on the same lot
- 40 % of the project parcel is mapped as wetland resource areas
- Varies in elevation by 45± feet
- A portion of the parcel is located within an approved wellhead protection area (Zone II)
- A portion of which is located within a FEMA mapped 100 year flood plain.
- The entire site is located within a NHESP mapped estimated habitat area for rare wildlife.

Also the attached correspondence from MassDEP emphasizes the fact that they do not have jurisdiction over private wells and they are under the jurisdiction of the local board of health regulations.

*Commonwealth of Massachusetts "Private Well Guidelines" states:*

*"Where possible, a well should be located up-gradient of all potential sources of contamination and should be as far removed from potential sources of contamination as the general layout of the premises and surroundings permit (page 14) and*

*"Local hydrogeologic conditions may require more stringent regulations. Boards of Health have the authority to strengthen Title 5 by implementing appropriate and reasonable local regulations (page 15).*

The following are additional requirements indicated in the Sherborn Board of Health Regulations.

### I Sewerage Disposal

- BOH1. *All single family dwellings shall be designed for a minimum of three (3) bedrooms (7.1). Documentation indicates that the project is proposing 24 two bedroom units and 12 three bedroom units. Flows should be revised to reflect this requirement. DT: Refer to answer as provide in response to SBOH above. BETA2: Board should discuss the interpretation of this requirement. BETA notes the design includes overlapping easements. Also see W1 above. DT3: According to Claire Golden of DEP, 3 bedroom design loading for the condominium units is not required according to Title 5, because they are multifamily units. Overlapping easements within common area of the proposed condominium are neither unusual nor prohibited. A waiver request will be discussed with the waiver granting authority. BETA3: Board should discuss this waiver request again as it pertains to revised plan. BETA4: The Board voted to recommend to ZBA denial of this waiver.*
- BOH2. *Each (septic) tank in series shall be 200% of the design flow (7.2.2). Increase the second compartment to meet this requirement. Deed restriction on garbage grinders will be required, if system not designed for garbage grinder. DT: The proposed two compartment septic tank exceeds 300% of the design flow. We are not proposing septic tanks in series. BETA2: Design was modified*

*and the septic tank does not meet the minimum size requirement. A waiver from this is required.*

DT3: Since the system is part of a provisional use treatment system, the septic tank size is governed by the size requirements of the treatment system company. This has been confirmed with Shan Trans of DEP. A waiver request will be discussed with the waiver granting authority. *BETA3: Board should discuss this waiver request again as it pertains to revised plan. BETA4: BETA recommends the Board clarify if "tank in series" also includes "compartments".*

- BOH3. *Due to rapid infiltration rate of 2 minutes per inch, the minimum distance from private wells is 150 if it is upgradient of the SAS or 175 feet if down gradient (10.1). This will require the relocation of the SAS.* DT: The proposed SAS meets the 100' private well separation required by Title 5 for all existing and proposed wells, a waiver from local requirement will be requested. *BETA2: Provide a calculation for groundwater time-of-travel for viruses between the leach fields and water supply wells. Disinfection will be required. DT3: Refer to the report by DeSheng Wang. BETA3: BETA could not find information in response to this comment, provide. BETA4: Plan revised to meet 150 foot well to SAS separation – issue resolved.*
- BOH4. *All subsurface disposal areas shall be 20 feet from any property line. This will require the relocation of the SAS.* DT: The proposed SAS location exceeds the 10 ft. Title 5 separation requirement (310 CMR15.211), a waiver for local requirement will be requested. *BETA2: Board should discuss this waiver request. DT3: This request will be discussed with the waiver granting authority. BETA3: Board should discuss this waiver request again as it pertains to revised plan. BETA4: Plan revised to meet 20 foot setback – issue resolved.*
- BOH5. *Maximum cover allowed over leaching facilities is 2-ft (Section 8.3). 3-ft of cover is called out on the plans. This will require grades to be revised. Field Primary 2 is depicted with finish grade of 194.0, with top of lateral at elevation 191.2, depicting 2.8-ft of cover.* DT: The proposed SAS cover meets the 3 ft. maximum cover allowed under Title 5 regulation 310 CMR 15.221(7), a waiver from local requirement will be requested. *BETA2: Board should discuss this waiver request. DT3: This will be discussed with the waiver granting authority. BETA3: Board should discuss this waiver request again as it pertains to revised plan. BETA4: The Board voted to recommend to ZBA denial of this waiver.*

## II Domestic Water Supply

The project does not meet the regulations in respect to the following:

- BOH6. *Semi-Public Water Supply (§2.4): the project would be defined "Any water system serving or intended to serve water for human consumption for domestic uses or purposes including, but not limited to, multiple dwellings, ..." DT: A Semi-Public Water Supply is not proposed, instead water supply will be private wells. The mechanism for achieving this will be as outlined by James Persky, MassDEP Drinking Water Program, DEP., Northeast Regional Office: The Fields at Sherborn, LLC, will enter into Administrative Consent Orders that require the wells to be moved from the common deed to the sub-unit ownerships before the units are sold. See attached note from DEP. . BETA2: Board should discuss the interpretation of this requirement. BETA notes the design includes overlapping easements which may cause protection and maintenance issues. See also W1 above. DT3: Please refer to the email from the ZBA chairman to James Pesky at DEP. Again, regarding the overlapping easements, please specify why 2 parties cannot have separate easement rights within the same land area. BETA3: BETA defers to the Board and Town Counsel on this issue.*
- BOH7. *Number of wells (§7.0): No well shall be used to supply more than one dwelling.* DT: The procedure outlined by James Persky, MassDEP Drinking Water Program that assures that the wells remain as

private wells will be followed. *BETA2: Board should discuss the interpretation of this requirement. Also see W1 above.* DT3: See response to BOH6 above. *BETA3: BETA defers to the Board and Town Counsel on this issue.*

### III Public and Environmental Health Review Regulations and Standards for Other than Single Family Dwelling on a Single Lot

BOH8. *Environmental Health Impact Report (§3.1): The project proposes more than 10 dwelling units and sewage design flow of more than 4,400 gallons per day, provide report.* DT: This condition applies to 3.1 and 3.2 which requires an environmental Health Impact Report and Permit, through the review process for this Comprehensive Permit there has been soil testing, extensive storm water analysis, wetland impact reports, septic design analysis, hydrogeological evaluation for ground water and well impact; cuts and fill details, etc. The DT feels that they have completed this Impact report if not in name but in standards. The DT will request a waiver from this requirement and permit. *BETA2: DEP has not approved an I/A technology to provide 10 mg/l of total nitrogen effluent under Title 5, See attached email from Olusegun Onatunde. Provide a mass balance analysis based on the approved level of total nitrogen (25 mg/l) evaluates if this goal can be met at the sensitive down gradient receptors per the nitrogen loading guidelines.*

*The ABC-N9.0 reactor (denitrification) and chemical feed components are not part of the technology provisional approval or performance evaluation plan. These components are "add-on" unit processes that are commonly included in a more sophisticated design which require much more frequent and intensive operator attention, monitoring, testing, maintenance, and safety considerations, in order for the facility to routinely and safely meet an effluent Total Nitrogen permit limitation of 10 mg/L. The duties and level of required operator intervention and action required for this proposed system are typical of a facility that is regulated under 314 CMR 5.00, with a groundwater discharge permit, regulated by MassDEP, with monthly reports provided by the operator and daily inspection, routine sampling and monitoring on-site.*

*BETA recommends that any approval granted by the Board of Health regarding onsite wastewater collection, treatment, and disposal for this project, the BOH approval be conditional upon MassDEP approval.* DT3: This peer review comment no longer applies to the updated plan. *BETA3: Refer to updated comments in section T5-3 regarding potential drinking water well impacts.*

BOH9. *Water Supply (§7.0): "in the case of sites to be served by on-site wells, hydrogeological evaluation showing groundwater flow directions and the proposed placement of wells and septic systems. Zones of contribution to wells shall be delineated.* DT: The Hydrogeological Evaluation showing groundwater flow directions and the proposed placement of wells and septic systems has been prepared and submitted by Desheng Wang, PHD, P.E. *BETA2: Provide a groundwater contour map showing groundwater flow under septic mounding and water supply pumping conditions. This figure can be used to determine the groundwater time-of-travel calculation. See BOH3.* DT3: See the documentation submitted by Desheng Wang, PHD, P.E. *BETA3: Refer to updated comments in section T5-3 regarding potential drinking water well impacts. BETA4: See GW6 and W7.*

BOH10. *Sewage Disposal (§8.0.2): "or any subdivision having ten (10) or more dwelling lots or any project having a minimum design wastewater flow of 4400 gallons per day, a hydrogeological evaluation shall be performed by a qualified engineer or geologist, at the expense of the applicant, to be reviewed by the Board of Health for this determination. Hydrogeological evaluations shall include determination of geologic stratigraphy, determination of ground water flow directions, determination of minimum groundwater elevation when relevant, evaluation of water table*

*mounding, and prediction of down-gradient water quality impacts...”, provide evaluation. DT: The Hydrogeological Evaluation addressing the above provisions has been prepared and submitted by Desheng Wang, PHD, P.E. BETA2: Provide a groundwater contour map showing groundwater flow under septic mounding and water supply pumping conditions. This figure can be used to determine the water quality at the downgradient water supply wells. See BOH9. DT3: See the documentation submitted by Desheng Wang, PHD, P.E. BETA3: Refer to updated comments in section T5-3 regarding potential drinking water well impacts. BETA4: See GW6 and W7.*

BOH11. *Provide provisions/agreement to monitor wells on abutting properties. DT3: See the documentation submitted by Desheng Wang, PHD, P.E. - We will sample the water at the first accessible port from each monitored well quarterly and tested in a DEP certified laboratory. A report will be sent to SBOH and the well owner. BETA3: Provide a list of proposed analytics for testing. BETA4: Information provided - issue resolved.*

BOH12. *Provide sampling to determine current background ambient nutrient levels for water quality. DT3: See the documentation submitted by Desheng Wang, PHD, P.E. - “A baseline background water quality should be sampled for testing: one during low groundwater season and one during high groundwater season for future monitoring comparison. The testing should be limited to wastewater related parameters including nitrogen, VOCs, and E.coli bacteria.” BETA3: Refer to updated comments in section W-2 regarding recommended testing. BETA4: Information provided issue resolved.*

BOH13. *Provide groundwater monitoring well plan for effluent discharge from soil absorption systems. DT3: See the documentation submitted by Desheng Wang, PHD, P.E. BETA3: BETA could not information in response to this comment, provide. BETA4: Information provided issue resolved.*

#### Massachusetts Department of Environmental Protection (DEP) Guidance Request

*Upon receipt of all requested data and information BETA recommends that the Town formally request guidance from DEP on the following:*

DEP1. *Whether system of wells proposed on a single lot serving 32 units constitutes a public water supply. DT3: This comment is not affected by the updated plan, and a response is not required. BETA3: Board should discuss.*

DEP2. *Definition of bedroom, appropriateness and enforceability of deed restriction to prevent addition flow to system. DT3: See response under T5-1 regarding conversation with Claire Golden, DEP. BETA3: Board should discuss.*

DEP3. *Whether the project is required to be permitted under the groundwater discharge permit program, 314 CMR 5.00 and 6.00, even though the flow is less than the stipulated 10,000 gallons per day, in order to provide adequate protection of the public health, safety, and welfare of the environment, and determining consistency with 310 CMR 15.000 [Reference 310 CMR 15.003(2) and 15.003(2)(A), and (C)]. DT3: This peer review comment no longer applies to the updated plan. BETA3: Board should discuss.*

DEP4. *Approval of an I/A technology with an effluent of 10 mg/l total nitrogen. DT3: This peer review comment no longer applies to the updated plan. BETA3: Design modified – issue dismissed.*

If we can be of any further assistance regarding this matter, please contact the undersigned.

Very truly yours,  
BETA Group, Inc.



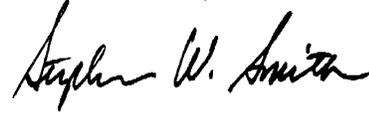
Philip F Paradis, Jr., PE  
Senior Project Manager

BETA Group, Inc.



Robert Baglini, PE  
Sr. Project Engineer

GeoHydroCycle, Inc.



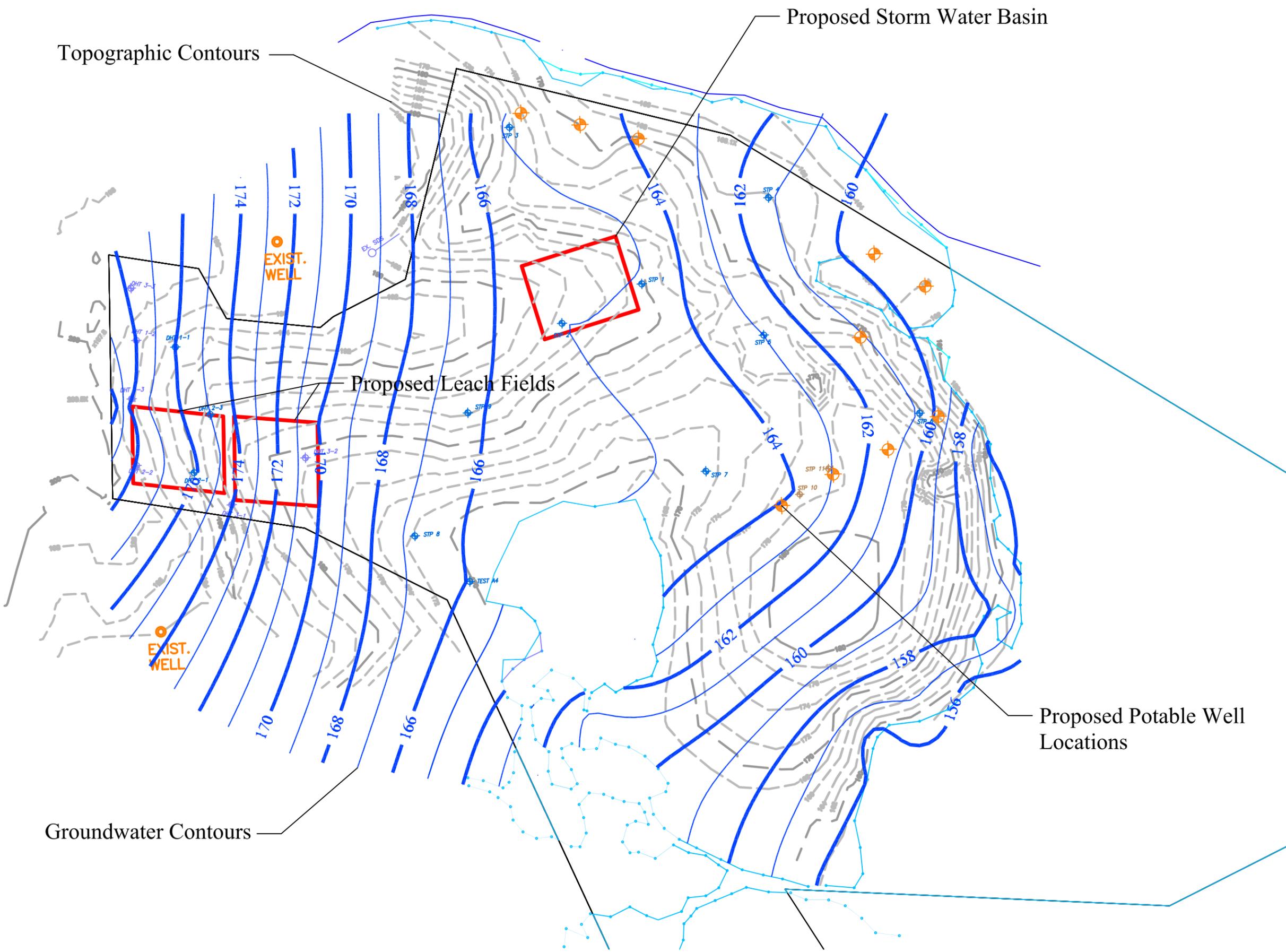
Stephen Smith, PE, P.HGW  
Hydrogeologist

Attachments:

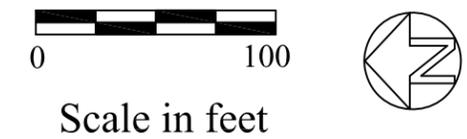
CC:     Jeanne Guthrie           Ben Stevens           Bruce Saluk  
          Jean Greco               Desheng Wang

# The Fields Washington Street Sherborn, MA

Figure 1. Groundwater Contours Derived from Bruce Saluk Data for Low Groundwater.



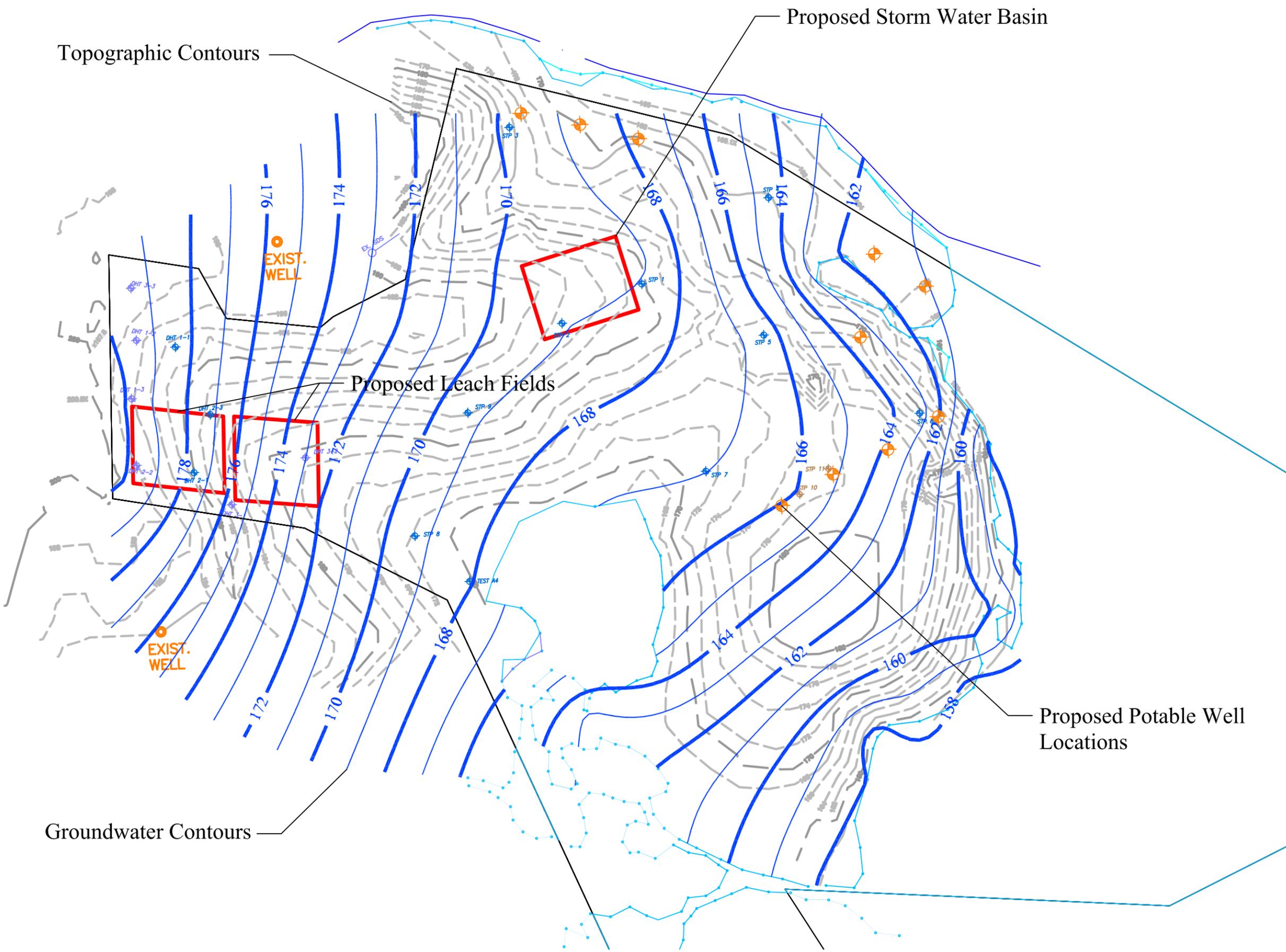
- NOTES:
1. Groundwater contour are based on groundwater measurements obtained from Bruce Saluk.
  2. Groundwater contours are based on widely spaced well locations and may not reflect actual groundwater elevations.
  3. Contour interval is 1 foot.



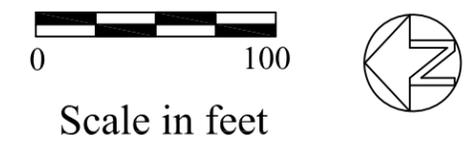
Project No. GHC#15018  
 Drafted SWS Checked  
 Date 2/4/16 Rev  
 Base Map: CAD File Obtained  
 from Bruce Saluk, data point  
 coordinates based on CAD file  
 from Saluk.

# The Fields Washington Street Sherborn, MA

Figure 2. Groundwater Contours Derived from Bruce Saluk Data for High Groundwater.



- NOTES:
1. Groundwater contour are based on groundwater measurements obtained from Bruce Saluk.
  2. Groundwater contours are based on widely spaced well locations and may not reflect actual groundwater elevations.
  3. Contour interval is 1 foot.



Project No. GHC#15018  
 Drafted SWS Checked  
 Date 2/4/16 Rev  
 Base Map: CAD File Obtained from Bruce Saluk, data point coordinates based on CAD file from Saluk.

**Table 8**  
**Recommended Analytes, Concentration Limits, and Monitoring Frequency**  
**for Private Wells**

*Concentrations are in milligrams per liter (mg/l); to convert to micrograms per liter (ug/l) multiply concentration in mg/l by 1000.*

PARAMETER	Recommended Concentration Limit	Recommended Sampling Frequency
Inorganic Compounds		Monitor initially for all compounds and then once every ten years if no detects, or as otherwise determined by the local Board of Health.  Note: Nitrate and Nitrite should be monitored once every year.
Antimony	0.006 mg/l	
Arsenic	0.010 mg/l	
Asbestos	7 million fibers/l	
Barium	2 mg/l	
Beryllium	0.004 mg/l	
Cadmium	0.005 mg/l	
Chromium (total)	0.1 mg/l	
Cyanide (as free cyanide)	0.2 mg/l	
Fluoride	4 mg/l	
Lead (action level)	0.015 mg/l	
Copper (action level)	1.3 mg/l	
Mercury	0.002 mg/l	
Nitrate (N)	10 mg/l	
Nitrite (N)	1 mg/l	
Total Nitrate & Nitrite (N)	10 mg/l	
Perchlorate	0.0020 mg/l	
Selenium	0.05 mg/l	
Sodium <sup>1</sup>	20 mg/l <sup>2</sup>	
Thallium	0.002 mg/l	
Turbidity		As determined by the local Board of Health.
Turbidity <sup>3</sup>	1 NTU <sup>4</sup>	

**Table 8 Continued on next two pages**

<sup>1</sup> Sodium guideline is based on an eight (8) ounce serving. This guideline was established to protect persons on sodium restricted diets. If the sodium concentration is above the guideline and a person using the water is on a sodium-restricted diet, that person's physician should be consulted as to whether the water should be consumed.

<sup>2</sup> **ORSG**: Office of Research and Standards Guideline.

<sup>3</sup> See the table and associated footnotes provided by EPA at <http://www.epa.gov/ogwdw/mcl.html> for a discussion of the concern for turbidity in drinking water and the recommended concentration limit.

<sup>4</sup> NTU = Nephelometric turbidity unit.

Table 8 Continued:

Parameter	Recommended Concentration Limit	Recommended Sampling Frequency
Synthetic Organic Compounds (SOC) <sup>5</sup>		<p>To reduce cost it is best to perform a monitoring screen initially using analytical method 505 or 508 and then once every ten years if no detects or as specified by the local Board of Health. The recommended monitoring screen won't provide analytical results for all of the SOC listed in Table 8. Monitoring for the remaining SOC should be considered if contaminants are detected in the monitoring screen. This approach is consistent with what MassDEP requires for SOC monitoring at public water supplies. Owners of wells in agricultural areas are encouraged to conduct more frequent testing.</p> <p>If private well owners decide to request laboratory analysis of all of the SOC listed in Table 8, MassDEP encourages them to request that the laboratory include analytical results for other synthetic organic compounds that the laboratory may normally include with the analysis of the synthetic organic compounds listed in this table at no additional cost.</p>
Alachlor	0.002 mg/l	
Atrazine	0.003 mg/l	
Benzo(a)pyrene	0.0002 mg/l	
Carbofuran	0.04 mg/l	
Chlordane	0.002 mg/l	
Dalapon	0.2 mg/l	
Di(2-ethylhexyl)adipate	0.4 mg/l	
Di(2-ethylhexyl) phthalate	0.006 mg/l	
Dinoseb	0.007 mg/l	
Diquat <sup>6</sup>	0.02 mg/l	
1,2-Dibromo-3-chloropropane (DBCP)	0.0002 mg/l	
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.07 mg/l	
Endothall <sup>6</sup>	0.1 mg/l	
Endrin	0.002 mg/l	
Ethylene Dibromide (EDB)	0.00002 mg/l	
Glyphosate <sup>6</sup>	0.7 mg/l	
Heptachlor	0.0004 mg/l	
Heptachlor epoxide	0.0002 mg/l	
Hexachlorocyclopentadiene	0.001 mg/l	
Lindane	0.002 mg/l	
Methoxychlor	0.003 mg/l	
Oxamyl(Vydate)	0.0002 mg/l	
Polychlorinated biphenyls (PCBs)	0.04 mg/l	
Pentachlorophenol	0.002 mg/l	
Picloram	0.2 mg/l	
Simazine	0.4 mg/l	
2,3,7,8-TCDD (Dioxin) <sup>6</sup>	0.006 mg/l	
Toxaphene	0.007 mg/l	
2,4,5-TP (Silvex)	0.02 mg/l	

<sup>5</sup> The SOC monitoring requirements for public water supply wells typically only involve screening by analytical method 505 or 508. The screening analysis does not test for all SOC listed in this table.

<sup>6</sup> EPA granted MassDEP a statewide groundwater monitoring waiver for diquat, endothal, glyphosate, and 2,3,7,8-TCDD (dioxin). MassDEP recommends against requiring private well owners to analyze for these four compounds unless MassDEP indicates a need for testing at a specific location or area.

Table 8 Continued:

Parameter	Recommended Concentration Limit	Recommended Sampling Frequency
<b>Bacteria</b>		
Total Coliform Bacteria	Positive sample	Monitor once every year, or as otherwise specified by the local Board of Health.  Initial monitoring for <i>Cryptosporidium</i> and <i>Giardia lamblia</i> is only recommended if the source is surface water (e.g. spring) or a well located within 100 feet of a surface water body or is prone to flooding. It is recommended that additional monitoring occur after any flooding event in which the flood waters reach the well location, or as otherwise specified by the local Board of Health.
Enterococci	Positive sample	
<i>Cryptosporidium</i>	Positive sample	
<i>Giardia lamblia</i>	Positive sample	
<b>Radionuclides</b>		
Gross Alpha Activity	15 pCi/l	Monitor for radionuclides initially and determine future sampling frequency based upon the results. If the gross alpha result is greater than 15 pCi/l then uranium testing should be performed. If the gross alpha result is greater than 5 pCi/l then Radium-226 and Radium-228 testing should be performed.
Radium –226 & 228	5 pCi/l	
Uranium	0.03 mg/l	
<b>Volatile Organic Compounds (VOC)</b>		
Benzene	0.005 mg/l	Monitor initially for VOC and then once every 10 years if no detects, or as otherwise determined by the local Board of Health. Owners of wells in industrial or densely developed residential areas are encouraged to conduct more frequent testing.  MassDEP encourages private well owners to request that the laboratory include analytical results for other volatile organic compounds that the laboratory may normally include with the analysis of the volatile organic compounds listed in this table at no additional cost.
Carbon Tetrachloride	0.005 mg/l	
Dichloromethane (methylene chloride)	0.005 mg/l	
1,2-Dichlorobenzene (o-DCB)	0.6 mg/l	
1,4-Dichlorobenzene (p-DCB)	0.005 mg/l	
1,2-Dichloroethane	0.005 mg/l	
1,2-Dichloroethylene (cis)	0.07 mg/l	
1,2-Dichloroethylene (trans)	0.1 mg/l	
1,1-Dichloroethylene	0.007 mg/l	
1,2-Dichloropropane	0.005 mg/l	
Ethylbenzene	0.7 mg/l	
Methyl Tertiary Butyl Ether (MTBE)	0.07 mg/l <sup>7</sup>	
Monochlorobenzene (chlorobenzene)	0.1 mg/l	
Styrene	0.1 mg/l	
Tetrachloroethylene (PCE)	0.005 mg/l	
Toluene	1 mg/l	
Trichloroethylene (TCE)	0.005 mg/l	
1,1,1-Trichloroethane (1,1,1-TCA)	0.2 mg/l	
1,2,4-Trichlorobenzene	0.07 mg/l	
1,1,2-Trichloroethane	0.005 mg/l	
Vinyl Chloride (VC)	0.002 mg/l	
Xylenes (total)	10 mg/l	

<sup>7</sup> ORSG: Office of Research and Standards Guideline.

**Table 10**  
**Recommended Analytes, Concentration Limits, and Monitoring Frequency**  
**for Private Wells – Secondary Standards**

Parameter	Recommended Concentration Limit	Recommended Sampling Frequency
Aluminum	0.05 to 0.2mg/l	These parameters are generally recommended for initial monitoring and then once every 10 years or as otherwise determined by the Local Board of Health.  TON: Threshold Odor Number
Chloride	250 mg/l	
Color	15 color units	
Copper	1 mg/l	
Fluoride	2 mg/l	
Foaming Agents	0.5 mg/l	
Iron	0.3 mg/l	
Manganese	0.05 mg/l	
Odor	3 TON	
pH	6.5-8.5	
Silver	0.10 mg/l	
Sulfate	250 mg/l	
Total Dissolved Solids	500 mg/l	
Zinc	5 mg/l	

**Table 11**  
**Indicator Parameters**

Parameter	Recommended Upper Limit	Recommended Lower Limit
Alkalinity	100 mg/l	30 mg/l
Calcium	150 mg/l	50 mg/l
Chloride	250 mg/l	N/A
Color	15 color units	N/A
Copper	1 mg/l	N/A
Hardness	200 mg/l	50 mg/l
Iron	0.3 mg/l	N/A
Magnesium	Relative scale	N/A
Manganese	0.05 mg/l	N/A
Nitrogen (as ammonia)	0.1 mg/l	0.015 mg/l
Nitrate	1 mg/l	N/A
Odor	3 TON	TON: Threshold Odor Number
pH	8.5	6.5
Potassium	Relative scale	N/A
Sediment	visual observation	N/A
Sulfate	250 mg/l	N/A
Total Dissolved Solids	500 mg/l	N/A