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Effective, Affordable, and Sustainable Solutions for Land & Water Environment

August 15, 2018

To: Town of Wayland- Conservation Commission
Ms. Linda Hansen
41 Cochituate Road
Wayland, MA 01778

Re: Response to comments at hearing and updated WPA Performance Analysis, **NOI, 24 School Street**

Dear Ms. Hansen and Commissioners:

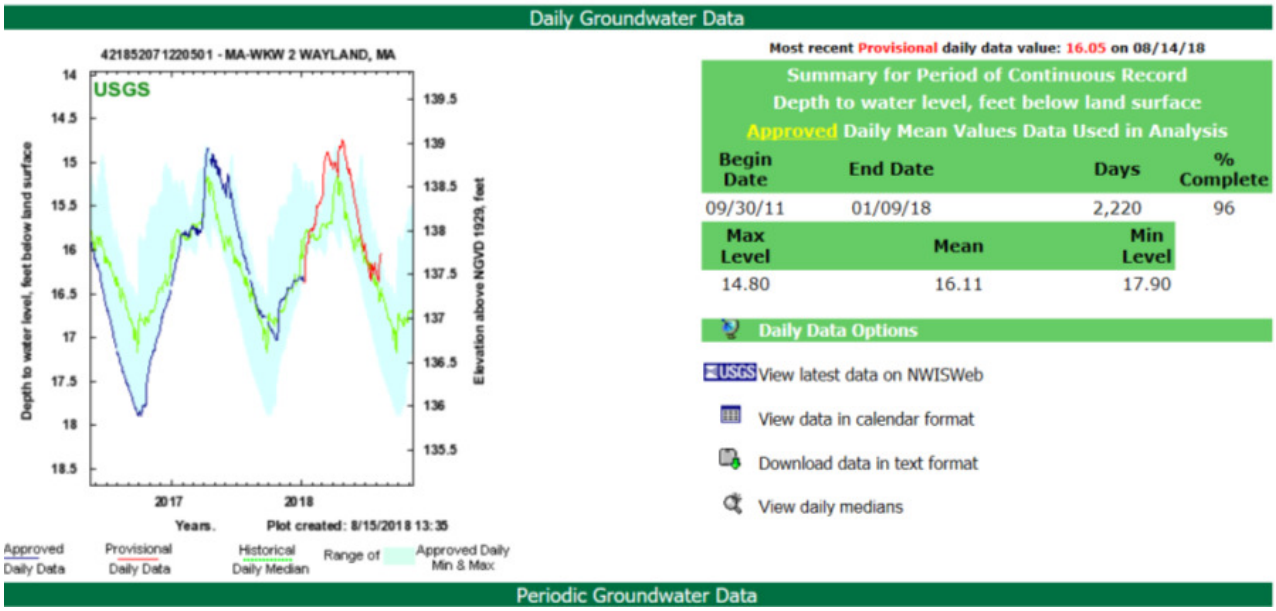
At the August 9, 2018 public hearing, the Commission requested that 1)some additional information about USGS monitored groundwater table in the high water season (March – May), 2) provide an update of the WPA Performance Analysis. The neighor, Mr. George Bernard's Attorney, Mr. Wiggens spoke on behalf of Scott Horsely, concerning the long term accumulative groundwater elevation impact. This letter provides the requested information and presents our responses.

1. Addition Highwater Table Supplement Data

At this point, the town consultant, Mr. Henry Nover and the project team agreed on the adequacy of high groundwater determination using soil morphology and supplemented and supported by onsite groundwater monitoring data in high water table range months in accordance with 310 CMR 15.103 (3)[1].

We checked USGS monitoring well WKW 2 in Wayland, which would be located in the same weather zone. The monitoring data showed that the water table recorded on 3/12/2018 is 14.94 ft from grade, while the highest water table recorded in April 2018 is 14.75 ft (4/28/2018), and in May 2018 is 14.79 ft (5/2/2018). As a standard practice, USGS normally only take one reading in a month, which would carry a margin of error 6-7". The high water table we caught in March is only 0.19' or 2.28" from the highest point, which would be considered well acceptable in groundwater monitoring. See the following chart from USGS Website. The 2018 water table recorded exceeded the history high 14.80' at the USGS monitoring well. If the project has been done in 2016, the highest water table monitored would be more than 6" lower than what we had for this year. The detailed data is presented in Appendix A.

[1] (3) High ground-water elevation shall be determined by:
(a) soil color using the Munsell system, the abundance, size and contrast of redoximorphic features, if present;
(b) one or more of the following methods may be used to supplement the method in 310 CMR 15.103(3)(a) and shall be used when no redoximorphic features are present:
一. observation of actual water table during times of annual high water table;
一. the use of USGS wells for correlating comparisons in water tables during times when the water table is not at the annual high range;



USGS monitoring well WKW 2 Wayland water table chart.

2. Wetland Interests Impact Performance Analysis Update

Our November 16, 2017 letter presented our updated analysis and response to the comments by the Conservation Agent, Ms. Linda Hansen. We reviewed the analysis against the revised plan. Our conclusions stand the same with some minor editing here. For the convenience of reading, we will keep the analysis table and provide a separate response in Table 2 to Ms. Hansen's comments.

Table 1. Wetland interests impact analysis summary

Interest	Existing	Proposed	Remarks
Public and private water supply	No public water supply within limit of disturbance	No public water supply within limit of disturbance, residential houses will be serviced by onsite septic and **public water supply through pipe**.	There will be more groundwater recharge (up to 100-year storm). See stormwater report for details.
Groundwater Supply	Public water supply. Not applied	Increased groundwater recharge by stormwater infiltration system	No negative impact
Food control	No flood control in upland area for existing condition.	Stormwater management system meet all nine DEP stormwater management standards	Less flooding to wetlands and down stream
storm damage prevention	No know stormwater damage	Better stormwater management	No significant impact
prevention of pollution	Some solid construction debris in buffer zone. Old septic system out of date. No treatment for driveway runoff.	Wastewater treatment exceed Title 5 requirements. Almost all stormwater runoff treated through infiltration	Improved pollution prevent for stormwater and wastewater.

protection of fisheries	No direct fisheries on site	Increased ground water recharge will increase base flow for downstream water body for fisheries	No significant impact some improvement
wildlife habitat	No MESA protected habitat on site. Entire lot are mostly disturbed	Some trees will be removed.	Buffer zone mitigation and enhancement planting are provided. No significant impact to wetland habitat.

Table 2. Response to Wetland interests impact analysis Comments

Interest	Hansen's comments	Response by CLAWE
Public and private water supply	The site plans do not indicate that the residential units will be serviced by private wells. The protection of public and private water supplies is intended to protect downgradient water supplies, not just the immediate area. Natick has public wells adjacent to Lake Cochituate and the Stream adjacent to 24 School Street is a tributary. Groundwater recharge only addresses volume, not protection of water quality.	**It is a typo**. The house will be serviced by public water. Lake Cochituate itself is not considered public water supply surface water. Natick public water supply well does not have an impact zone (Zone II or IWPA, see MGIS map) to the project site per applied standards and regulations. The project design will comply with DEP applied regulations and standards, which is devised to protect both groundwater and surface water in water quality and water quantity.
Groundwater Supply	The volume of leachate generated by the onsite leach field could produce approximately 2800 gallons of water/day. This amount of water within a small footprint could negatively impact groundwater quality.	The wastewater treatment design exceeded applied environmental code therefore shall not have significant impact on groundwater quality per applicable state regulations 310 CMR10.00 and standards 310CMR15.000.
Food control	Flood control on this property is related to the increase in impervious surfaces, stormwater management controls, climate, etc. Half the roof runoff is not captured by the onsite stormwater management. A stormwater peer review will determine if the SW management system is properly designed and sized.	As we know, stormwater management system design meets all nine DEP stormwater management standards and is reviewed by Town hired third party reviewer.
storm damage prevention	Again, until the proposed SW system is reviewed, a statement of no significant impact cannot be verified.	Agreed. The Town Consultant Nover-Armstrong Associates, Inc. had reviewed the stormwater management design and all supporting calculations and concluded the project can be issued an order of conditions.
prevention of pollution	The statement that wastewater treatment exceeds Title 5 requirements is not supported. (I	Wastewater treatment (conventional system plus A/I treatment FAST system) exceed Title 5 requirements for the site conditions. Almost

	assume the author meant to say the onsite septic system). The septic system design has not been submitted to the BOH for their review. Again, not All runoff is being treated. Any substances from parking lot runoff needs to be treated.	all except for a very small driveway ramp stormwater runoff (roof is considered clean runoff) will be treated through Stormceptor and infiltration while the existing site has no stormwater management system. Great improvement for the proposed condition.
protection of fisheries	The statement that there is not significant impact without understanding the impact of untreated runoff, or the impact of the leach field on the unnamed tributary in unsupported. Lake Cochituate supports a robust fish habitat and this resource needs to be protected.	Our statement is based on the assumption that all stormwater and wastewater treatment design are confirmed in compliance with all applicable state regulations and standards. Lake Cochituate as now has many less robust treatment septic systems in the watershed at this point. The proposed stormwater and wastewater systems are above DEP acceptable treatment systems as used in the watershed.
wildlife habitat	The protection of wildlife habitat includes all wildlife, not just threatened or endangered species. Buffer zone mitigation that includes seeding a wetland buffer area that was previously filled with unknown material is not considered enhancement. Installing a 7 foot retaining wall to limit wildlife movement or removal of mature trees are also not considered enhancements.	No proposed activities will occur in regulated resource areas per 310 CMR 10.600. All buffer zone and outside buffer zone work are designed to meet all applicable state standards including wildlife habitat per 310 CMR 10.60. Wildlife has left adequate area to live and move around the project site. Landscaping will be incorporated to improve the site condition for post construction.

3. Long-term Accumulative Groundwater Table Impact

As stated at the hearing by Mr. Henry Nover, the long-term groundwater impact concern claimed by the neighbor's consultant was no more than a theory and there is no evidence or data that even supports such a claim. We agree with Mr. Nover for the following reasons as we stated at the meeting:

1) DEP Stormwater Management does not require such analysis. Our direct consultation with DEP stormwater management staff, Mr. Tom Mcguire, revealed that the groundwater mounding analysis is to make sure that the flood storage could be dewatered in 72 hours before next storm. We have demonstrated that for a 100-year storm, the system will be dewatered in less than 72 hours.
2) The groundwater mounding model – Hantush's Method, as used in the common practice assumed that water table is flat and the mounding would be normally conservatively calculated higher than it would be for a sloped water table, which is truce here. The water table at high pitching toward the stream and wetland is about 3.8%, which can move much more water downstream than a flat water pool.
3) The impact to water table is more concerned by depletion than recharging. That is why DEP requires minimum recharge rather than a maximum recharge limitation in the stormwater regulations. Another concern of groundwater mounding for a residential development would be basement flooding, which we do not see here for our case as we do not have basement for the project. All neighbors are located far away to be impacted. The ground water mounding

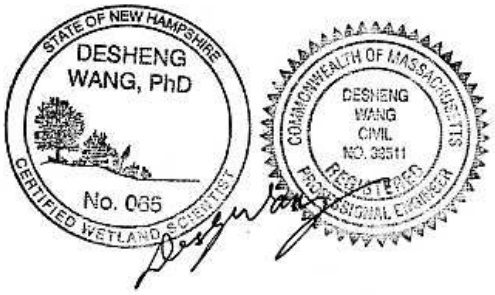
impact to septic system under a 100 year storm event barely reach the septic field as they are located in almost parallel gradient towards the stream.

4) The wetland and stream would control the maximum groundwater table as it breaks out when the water table reaches the wetland area. The water recharged is from the same amount of rain over the same general area as the existing condition. The long term impact will be from an average storm event in this area, which is about 0.68" rain in about 5.5 days span. As we receives about 66 rain events in a year for a total of about 45" rain. Based on this fact and the conservative flat water table assumption, the mounding height at the end of 5.5 days would be about 0.18 ft or 2.16". This would not be identifiable in real world, as the natural groundwater table at the site can fluctuate more than 6" in a month and over 4 ft in a year. The mounding height was based on the high groundwater condition that does not last more than a couple of weeks. This would not cause a concern for long term site condition. See the updated Groundwater mounding summary for reference. Detail analysis was attached in Appendix B.

We believe that the applicant team has provided all requested information beyond the requirements by 310 CMR 10.00 in order to address all concerns and to answer questions from the Commission and neighbors to the best applicable engineering practice.

Please feel free to contact us if you have any questions.

Sincerely,
Creative Land & Water Engineering, LLC
by



Desheng Wang, Ph.D., P.E.
Civil/Environmental Engineer and
Certified Wetland Scientist

cc: DEP NERO, Wetland Division, 205B Lowell Street, Wilmington, MA 01801
Chris D'Antonio, Chadwick Homes, LLC.
Mark Kablack, esq., M.A. Kablack & Associates, P.C.
Brian Nelson, Metrowest Engineering

Table 3. Summary of Updated Mounding Analysis, revsied 6-11-2018, 7-2-2018 8/15/2018

Parameters	Long-Term	100-year Storm	Wastewater				
Recharge area	Infiltration- LT	Infiltration-cons	SAS, K1	SAS, K1,2,3, WT DTH1,2	SAS - K1,3, WT DTH 1,2	SAS, K1,2,3, WT MW1,2	SAS - K1,3, WT MW 1,2
Scenarios	Inf-sys	Inf - sys	SCN 1	SCN 2	SCN 3	SCN4	SCN 5
Dimension, ft	32x52	32x52	86 x 72	86 x 72	86 x 72	86 x 72	86 x 72
Area, sq. ft	1664	1664	6192	6192	6192	6192	6192
Recharge Vol. Cu ft (per day or event)	804	4344	358.24	358.24	358.24	358.24	358.24
Duration, day	1	1	90	90	90	90	90
Recharge rate, cu ft/day/sq. ft	0.48	2.61	0.0579	0.0579	0.0579	0.0579	0.0579
Dewater time, day	3	3	90	90	90	90	90
GW Separation, ft	2.11	2.11	4	4	4	4	4
Maximum mounding height, ft	1.13	6.17	0.27	0.38	0.49	0.4	0.52
Estimated effective Max MH, ft	**1.14**	**2.962**	**0.31**	**0.42**	**0.53**	**0.44**	**0.56**
Impact mounding height by other systems, ft	**0.01**	**0.2**	0.04	0.04	0.04	0.04	0.04
Combined Mound height, ft	**1.14**	**6.37**	**0.31**	**0.42**	**0.53**	**0.44**	**0.56**
3-day residual height, ft	0.3	1.75					
5-day residual height, ft	**0.18**	**0.93**					
Estimated effective 3d MH, ft	**0.3**	**1.75**					
Estimated effective 5d MH, ft	**0.18**	**0.93**					
Bottom of stones, ft	**162.25**	**162.25**	**163.25 to 166**	**163.25 to 166**	**163.25 to 166**	**163.25 to 166**	**163.25 to 166**
Top of stones, ft							
EHGW, ft	**160.14 MW#3**	**160.14 MW#3**	**156.12 to 158.16 160**	**(DTH 1+DTH2)/2 159.55**	**(DTH 1+DTH2)/2 159.55**	**(MW1+MW2)/2 158.62**	**(MW1+MW2)/2 158.62**
Bottom aquifer, ft	**148.1**	**148.1**	**142.7**	**144.45**	**144.45**	**144.45**	**144.45**
3 day elevation, ft	**160.22**	**160.22**					
Flood routing elev, ft	**161.28**	**163.10**					
Top of grade, ft	167	167					
Aquafer depth, ft	12.04	12.04	17.3	15.1	15.1	14.17	14.17
Hydraulic Conductivity, ft/day	6.51, MW#3	6.51, MW#3	25.97 Min(MW#1, MW#2)	21.19 (MW#1+2+3)/3	16.24 (MW#1+3)/2	21.19 (MW#1+2+3)/3	16.24 (MW#1+3)/2

* mounded water tables for stormwater management area are at 3-day.

Appendix A: USGS Monitoring well WKW 2 Wayland monitoring data March – May 2016-2018

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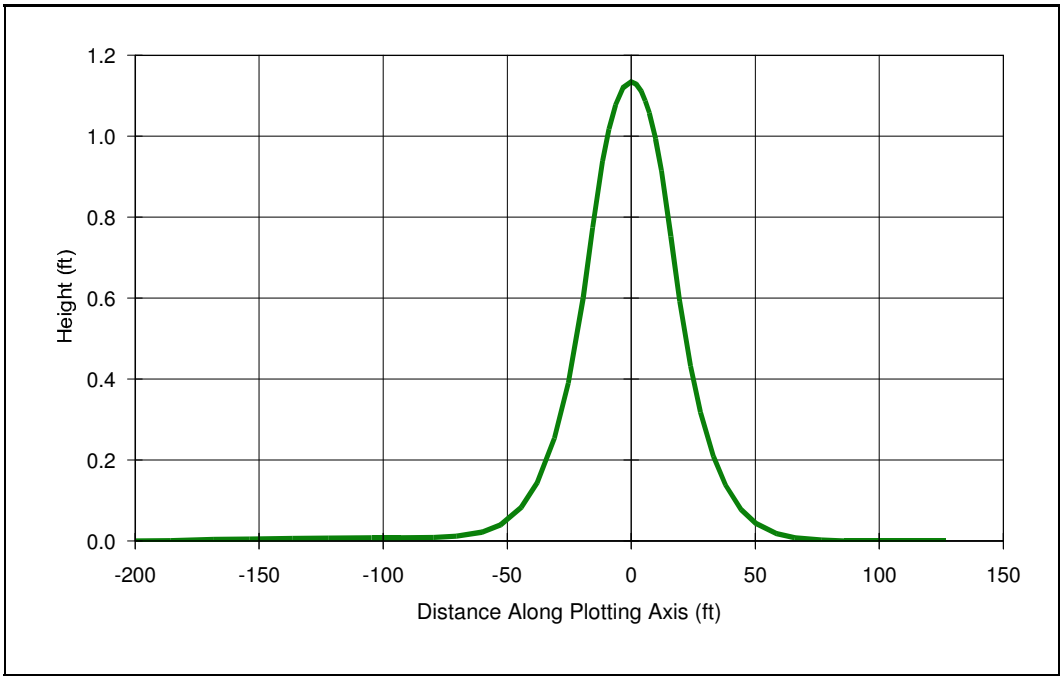
Appendix B: Groundwater Mounding Analysis for long-term impact under Infiltration System

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM Long-Term

ANALYST: Desheng Wang

DATE: 8/15/2018 TIME: 9:50:43 PM

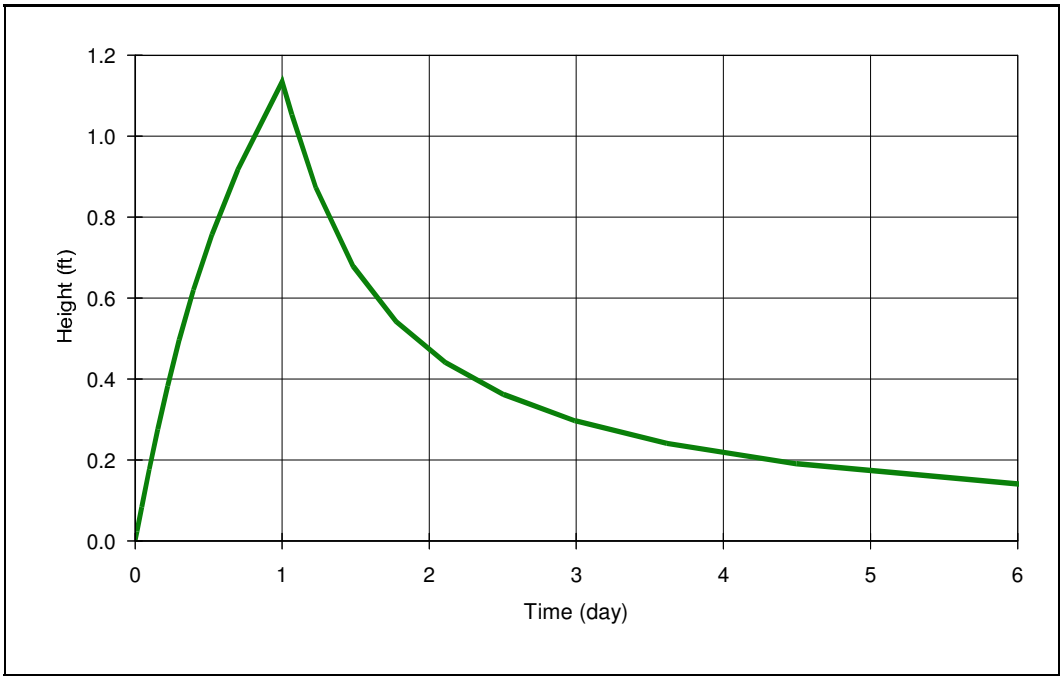
INPUT PARAMETERS

Application rate: 0.48 c.ft/day/sq. ft
Duration of application: 1 days
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Plotting axis from Y-Axis: 90 degrees
Edge of recharge area:
positive X: 16 ft
positive Y: 0 ft
Total volume applied: 798.72 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-200	0	-200	0
-168.2	0	-168	0
-136.4	0	-136	0.01
-104.6	0	-105	0.01
-79.6	0	-80	0.01
-60.2	0	-60	0.02
-44.4	0	-44	0.08
-31	0	-31	0.25
-19.4	0	-19	0.6
-11.6	0	-12	0.94
-6.3	0	-6	1.08
0	0	0	1.13
4	0	4	1.11
7.3	0	7	1.06
12.2	0	12	0.92
19.5	0	20	0.59
27.9	0	28	0.32
37.9	0	38	0.14
50.1	0	50	0.04
65.9	0	66	0.01
85.9	0	86	0
106	0	106	0
126	0	126	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM Long-Term

ANALYST: Desheng Wang

DATE: 8/15/2018 TIME: 9:51:25 PM

INPUT PARAMETERS

Application rate: 0.48 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 6 day
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 798.72 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.02
0	0.08
0.1	0.18
0.2	0.28
0.2	0.38
0.3	0.5
0.4	0.62
0.5	0.76
0.7	0.92
1	1.13
1.1	1.05
1.2	0.87
1.5	0.68
1.8	0.54
2.1	0.44
2.5	0.36
3	0.3
3.6	0.24
4.5	0.19
6	0.14