



September 26, 2017

VIA EMAIL

Ms. Julia Godtfredsen
Conservation Administrator
60 Pleasant Street
Newburyport, MA 01950

Re: Peer Review for Notice of Intent – Evergreen Commons, 18 Boyd Drive, Newburyport, MA
MassDEP File No. 051-0973

Dear Ms. Godtfredsen:

The Horsley Witten Group, Inc. (HW) is pleased to provide the Newburyport Conservation Commission with this letter report summarizing our initial peer review of the Notice of Intent application for the proposed subdivision located at 18 Boyd Drive, also known as Port Place, submitted by Design Consultants Inc. (DCI), Hughes Environmental Consulting (HEC), and Mead, Talerman and Costa, LLC (MTC) on behalf of Evergreen Commons, LLC (Applicant).

We understand that the proposed project is an Open Space Residential Development project on a 36+ acre parcel that is currently occupied by a 9-hole golf course. The entire site is located within the Zone II of a Newburyport public water supply well (Well #2) which supplies untreated water directly to the public water supply distribution system. The site contains an Isolated Land Subject to Flooding (ILSF) and an Isolated Vegetated Wetland (IVW), both confirmed through an Order of Resource Area Delineation (ORAD) issued in 2016. Both resource areas are regulated under the MA Wetlands Protection Act and implementing regulations; however, the IVW is regulated only at the local level. The proposed stormwater management design includes a combination of deep-sump catch basins, drain manholes, hydrodynamic separators, five bioretention areas, a constructed wetland, and grass conveyance channels. The stormwater management system discharges to the regulated wetland resource areas and is therefore required to meet the Massachusetts Stormwater Standards (MASWS) as described in the Massachusetts Stormwater Handbook (MSH) (February 2008).

HW prepared the following comments based on a review of the materials provided by the City and the Applicant, as well as a site visit with the City and the Applicant's Team on September 8, 2017. The package of materials reviewed by HW was extensive, and a list of these materials is attached for reference. The peer review comments are organized as follows:

1. General Overview Comments
2. Wetland Resource Comments
3. Stormwater Management Comments
4. Groundwater Comments

We have numbered our comments according to each section to provide an easy reference for the Commission and the Applicant's Team in discussing and addressing these comments.

1. General Overview Comments

- 1.1 Wetland resource areas were defined in the ORAD, and therefore, HW limited our focus to the potential impacts to the regulated resource areas and the interests they protect. We did not revisit the ORAD decision, except in reference to the observed boundary of the ILSF during the 2006 Mother's Day storm, because this was discussed and evaluated by the Applicant's team in their submittals.
- 1.2 We reviewed the stormwater management system for compliance with the MASWS as the measure for potential impacts to the regulated wetland resources. In our review, we found that the general stormwater management approach was suitable for the site and has the potential to meet the MASWS. However, as reflected in our comments, the current information includes inconsistencies in the data provided, and in some cases a lack of information provided, such that we cannot confirm that the design meets the MASWS. Most of our comments relate to clarification of design elements and bringing all design data up to date with the latest design revisions, but do not suggest any major revisions to the overall stormwater management approach at the site.
- 1.3 We evaluated the potential impacts to groundwater and drinking water sources as a result of the proposed alteration of the wetland resources onsite. This required us to examine:
 - a. the seasonal high groundwater elevation for the site and understanding of groundwater flow across the site,
 - b. the proposed alteration of the wetland resources and how that alteration may affect the ability of the resources to protect groundwater quality and drinking water supply, and
 - c. the quality and quantity of the water discharging to the wetland resources which could ultimately infiltrate into the groundwater.

In this groundwater impact evaluation, we assumed that the water discharging to the wetland resources can and would be designed to meet the MASWS, which is the regulatory benchmark for discharges to wetland resources. Most of our comments on this matter are to request clarification of inconsistencies in data provided as a result of numerous updates and responses to comments. We note that there is some confusion as to whether all parties are discussing elevations in reference to the same datum. On our part, all elevations discussed in this letter are presented in feet in reference to NAVD88.

- 1.4 We recommend that the Applicant should first clarify the estimated SHGW elevation across the site and in relation to the various proposed stormwater practices and wetland resources around the site. They should also clarify the current and proposed ILSF boundary elevation and storage volumes. Once those items can be vetted with the City,

the proposed design plans can be comprehensively updated to reflect those key site reference elements and address the remainder of the comments provided herein.

2. Wetland Resource Area Comments

Understanding and Background

The proposed Open Space Residential Design (OSRD) involves work within ILSF as defined under the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.57(2)(b) and within an IVW as regulated under the Newburyport Wetlands Protection Ordinance (Chapter 6.5-27).

These resource areas have been confirmed through an ORAD issued by the Newburyport Conservation Commission on June 14, 2016 (DEP File No. NE-051-0950). The ORAD findings acknowledge that of the four areas of delineated IVW, only Wetland A would be regulated under the local Ordinance. Wetlands C and D were found to be non-jurisdictional IVWs because they were created for the purpose of stormwater management in approximately 1986, and Wetland B was determined to be non-jurisdictional because it did not meet the 1,000 SF size criteria.

According to the NOI, the Applicant proposes to expand and improve the existing IVW (Wetland A) by over excavating the underlying sediments, adding soil enhancements, replanting with native species, and providing an enhanced buffer zone around the newly renovated wetland to improve its functions and values.

Within the 2016 ORAD, the Commission issued Findings regarding the extent of ILSF (an area of 222,431 SF or approximately 5.1 acres). ILSF is confined within the 55.6 foot contour boundary within the existing golf course, and extends beyond the boundaries of the delineated IVWs, such that each is contained within the extent of the ILSF (see approved ANRAD plans prepared by DCI). According to the May 16, 2016, report, "Peer Review for ANRAD," ESS indicates that the volume of the existing ILSF is 330,489 cubic feet – or approximately 7.59 acre-feet), representing the calculated runoff volume of water within the ILSF. ESS stated that the "*illustrative boundary adequately defines the extent of the ILSF,*" and the Commission has approved this through the issuance of the ORAD.

The project will result in impacts to two resource area types: 1) ILSF, as regulated under the Massachusetts Wetlands Protection Act and the local Ordinance, and 2) IVW, as regulated under the local Ordinance. The NOI states that the project will alter apparently all of the ILSF (222,431 SF) and the entirety of the 36,233 SF IVW with proposed mitigation involving the reconfiguration and expansion of each of these resource areas. In order for the project to be approved, the Applicant must demonstrate that the proposed work within resource areas meets the applicable performance standards. Under the local Ordinance, the proposed project requires a variance from the performance standards for work in resource areas and the buffer zone, and the Applicant has requested a waiver.

Isolated Land Subject to Flooding (ILSF)

2.1 The boundary of an ILSF is defined in 310 CMR 10.57(2)(b)(3) as the largest observed or recorded volume of water confined within an area that is not a bordering land subject to flooding (i.e. a flooded area with surface water inlets and outlets). In the event of dispute, calculations regarding the extent of the 100-year flood event are used to determine the probable extent of such water. The lateral boundary of the ILSF is the area that will be inundated during that event. ILSF determination must take groundwater inundation into account in that the available flood storage volume in the ILSF should be calculated only for the volume above SHGW. However, because the definition for an ILSF is based on observed flood conditions, those observed flood conditions are generally higher than SHGW. In the subject matter, DCI originally provided calculations to estimate the 100-year flood elevation for the site ILSF, and then later correlated photographs of the Mother's Day flood to known survey elevations to estimate the flood condition surface water elevation for the ILSF. It is unclear if the boundaries of the ILSF on the most current plans have been updated to match the observed Mother's Day flood elevation. We note that the currently shown ILSF appears to cross proposed topographic contours, which we assume to be a drafting mistake.

2.2 The performance standards for ILSF state the following.

(b) Isolated Land Subject to Flooding. A proposed project in Isolated Land Subject to Flooding shall not result in the following:

1. Flood damage due to filling which causes lateral displacement of water that would otherwise be confined within said area.

It appears that the proposed design will meet this performance standard. While the ILSF will be altered and reconfigured, the reconfigured ILSF is designed to support a greater flood storage capacity than under existing conditions. However, the flood storage calculations for existing compared to the proposed ILSF should be updated to reflect the final agreed upon estimated seasonal high groundwater (SHGW) elevation, the storage volume represented by the Mother's Day flood observations, and the final grading plans.

2. An adverse effect on public and private water supply or ground water supply, where said area is underlain by pervious material.

The Applicant states that under existing conditions, untreated stormwater runoff drains into the isolated wetland (presumably also intended to indicate that this condition also occurs within the ILSF), and that water quality will benefit from conversion of the golf course to open space; improvements to the IVW (see additional comments below); and providing stormwater treatment for Boyd Drive and the proposed development to meet MASWS within a critical area. Under existing conditions, these areas likely provide only minimal treatment of pollutants through and uptake of pollutants (nutrients) prior to infiltration to groundwater given the lack of organic materials in the soil profile.

The Applicant proposes to create a more extensive area of IVW, and improve the ability of the IVW to protect water quality by adding a 12-inch layer of organic rich soil material and replanting the area with native plant species.

3. An adverse effect on the capacity of said area to prevent pollution of the ground water, where the area is underlain by pervious material which in turn is covered by a mat of organic peat and muck.

This performance standard is not applicable. The Applicant indicates that the soils within the ILSF are lacking in organic material.

4. An impairment of its capacity to provide wildlife habitat where said area is vernal pool habitat, as determined by procedures contained in 310 CMR 10.60.

According to the NOI, the site does not support vernal pools or rare species habitat. The Applicant indicates that the proposed revegetation and preservation of this area as Open Space will improve the capacity of the area to provide wildlife habitat, which is likely, as long as the area is properly maintained over time. HW provides some design recommendations below intended to improve the ability of this restored resource area to provide improved wildlife habitat values.

2.3 HW has the following comments regarding the ILSF calculations:

- a. Our interpretation of the August 29, 2017 letter prepared by DCI is that the Applicant believes that the elevations documented in the golf course during the 2006 Mother's Day storm event, which peaked at approximately elevation 56.2 (NAVD 88) per the DCI letter, represent a reasonable delineation of the existing ILSF. If the Applicant agrees with this interpretation, we recommend that they state so explicitly and that the elevation of 56.2 feet should be recorded to define the limits of the ILSF. HW also recommends that the ILSF elevation of 56.2 be documented and clearly noted on the drawings for clarity.
- b. Furthermore, in that August 29, 2017 DCI letter, the Applicant has stated that the estimated SHGW for a majority of the site is elevation 52.0. We note that Figure 2 from that DCI letter indicates variable SHGW indicator elevations at different locations across the site, which is reasonable. We recommend that the Applicant confirm whether a single SHGW elevation of 52.0 will be used, or whether a different SHGW elevation or elevations are to be used and for what purposes. For example, will the same or different SHGW elevation be used for the design of the IVW and for the different bioretention practices depending upon their geographic locations? Once the Applicant confirms their selected SHGW for each applicable design purpose and that is approved by the Commission, any storage volume below SHGW should be excluded from the available ILSF storage volume in the calculations.
- c. The latest HydroCAD calculations, (ilsf prop) printed May 21, 2017, do not appear to be consistent with the Proposed ILSF Drainage Areas figure, revised August 4, 2017, provided in the revised Stormwater Analysis, dated August 8, 2017. HW recommends that the Applicant review the HydroCAD calculations and verify that the information is consistent between the calculations and the plans.

- d. The Applicant has provided a bold line on the Grading Plans revised September 12, 2017, labeled as Proposed ILSF. The ILSF boundary logically should be associated with a specific elevation. The line as noted on the most recent plan set appears erratic and does not correlate with an elevation.
- e. In the response letter prepared by DCI dated August 8, 2017, comment 8 includes a sentence which states that the ILSF volume calculation has been updated based on the revised grading. HW recommends that the Applicant verify that they have provided the most up to date calculation regarding the ILSF as referenced in their August 8, 2017 letter.
- f. HW recommends that the Applicant provide a HydroCAD model for the existing ILSF which includes a stage-storage analysis of the existing contours within the golf course. The Applicant should use an extreme storm event that will raise the pond elevation within the existing contours to the 56.2 elevation noted for the Mother's Day storm. Once the extreme storm event rainfall depth is determined the HydroCAD model should be performed for the proposed development and the proposed contours. The stage storage analysis under proposed conditions should indicate that the area will not rise over the 56.2 elevation for a similar storm event. The available storage in the existing and proposed ILSF modeled should be set above the estimated SHGW elevation for the ILSF (refer to additional comments concerning confusion about Applicant's estimated SHGW elevation for different areas of the site).

Isolated Vegetated Wetland and Surrounding Buffer Zone and Variance Request

- 2.4 The proposed project will result in disturbance within the entire IVW as well as the surrounding 25-foot No-Disturbance Zone, which under existing conditions consists largely of maintained turf for the golf course. The IVW as well as its surrounding "buffer" will be completely reconfigured and expanded as part of this proposed project. Under existing conditions, the IVW is vegetated with primarily herbaceous species, some of which are non-native invasive species (e.g., purple loosestrife). According to the NOI, and as observed by HW during the site visit, the area lacks an organic layer and A-layer soil horizon. It also does not appear to be hydrologically supported by groundwater from below, but rather from surficial stormwater runoff. All of these conditions diminish the ability of the IVW to serve the interests that this resource is presumed to protect, which include all interests under the Massachusetts Wetlands Protection Act and those identified under the local Ordinance.
- 2.5 The Applicant discusses the proposed work within the buffer zone to the IVW, but does not directly address the performance standards for IVW in the NOI narrative. HW recommends that the Applicant also address these performance standards under section 8(C) of the Ordinance Regulations, which states the following:

Performance Standards

Isolated Vegetated Wetlands are protected to the same extent as Bordering Vegetated Wetlands, as set forth in 310 CMR 10.55 (2). When the presumption set forth in Section 8(C)(3) of these Regulations is not overcome, any proposed work in the Isolated Vegetated

Wetlands shall not destroy or otherwise impair any portion of said area. The following standards apply to Isolated Vegetated Wetlands:

Any alteration of any Isolated Vegetated Wetland shall be treated under the standards for Bordering Vegetated Wetlands under the WPA (G.L. Ch. 131 §40) and its regulations (310 CMR 10.00).

Variance Request

- 2.6 According to Section 6.5-34(B) of the Ordinance, disturbance of any kind is prohibited within the 25-foot No-Disturbance Zone, with the exception of proposed planting of native vegetation and construction and maintenance of unpaved pedestrian paths, both of which are proposed as part of this project. Section 6.5-34(B) states the following:

The Conservation Commission may, in its discretion, grant variances from the specific submission requirements and performance standards of this Ordinance and Regulations adopted pursuant to Section 6.5-35. The Conservation Commission may grant such variances when an overriding public interest is demonstrated

Section 6.5-30 of the Newburyport Wetlands Protection Ordinance, states the following:

The Commission may waive the application of any performance standard herein when it finds, after opportunity for a hearing that:

- 1. There are no reasonable conditions or alternatives that would allow the project to proceed in compliance with these regulations;*
- 2. Mitigating measures are proposed that will allow the project to be conditioned so as to contribute to the protection of the wetland values protected by this ordinance; and*
- 3. That the project is necessary to accommodate an overriding public interest or that it is necessary to avoid a decision that so restricts the use of property as to constitute an unconstitutional taking without compensation.*

Under this provision, the Applicant has submitted a waiver request (presumably this was intended to be a request for a *variance*) in order to allow for work within the 25-foot No-Disturbance Zone. Although not specifically addressed, we presume this is also intended to apply to work within the IVW. The Applicant has also briefly discussed alternatives to the proposed work within these resources, indicating that the project could be constructed without altering the IVW or its adjacent buffer zone, but points out that this alternative would not result in the benefits to the renovated and expanded wetland in its ability to protect the local interests under the Ordinance.

As the entire site is located within a Zone II of a Newburyport public water supply well (Well #2), which supplies water to the public water supply distribution system, the protection of water quality and groundwater is particularly important with this application. In our opinion, provided that the MASWS are met, this project would meet the presumption for protection of water quality within the ILSF.

However, in light of HW's recommendation above for addressing the performance standards for work in IVW, HW believes that the request for a variance may need to be revisited and strengthened to include work within IVW and ILSF, rather than just within the buffer zone, before the Commission could exercise its discretion in granting a variance under the Ordinance. This discussion should also take into account other comments regarding the proposed stormwater management and protection of the Zone II as discussed elsewhere in this letter.

Proposed Mitigation

The Applicant proposes several measures as mitigation for impacts to the wetland resource areas and buffer zones.

- 2.7 The Applicant proposes to expand and improve the IVW. The Commission included as a finding in the ORAD, the following:

“The Conservation Commission further finds that the functions and values of Basin A as IVW could be significantly improved. The Commission would therefore consider granting a variance to improve and expand the wetland functions and values of Basin A under a future Order of Conditions, provided that the project would meet all of the variance criteria as outlined in the Newburyport Wetland Protection Ordinance and Regulations.”

Accordingly, the Applicant proposes to improve the functions of the IVW by renovating and expanding it. As reported in the NOI, the existing source of hydrology supporting the IVW is largely stormwater runoff from the surrounding golf course and from the neighborhood along Boyd Drive. As we understand it, this interpretation by the Applicant was based upon their original estimate that SHGW in the vicinity of the IVW is at approximately elevation 50 feet (p. 3 of NOI narrative). However, based upon the HEC July 11, 2017 letter, the Applicant adjusted their SHGW estimate to elevation 52. The bottom of the IVW is currently located at approximately elevation 52 feet, indicating that groundwater may not be within 12 inches of the soil surface. This has led to some confusion.

To improve the overall functions the wetland, the Applicant proposes to over-excavate the sediments within the IVW and expand its surface area, and introduce 12 inches of organic rich soils to improve the ability of the renovated wetland to support a more natural hydrologic regime. The proposed bottom elevation within the IVW has been lowered to a consistent elevation of 50 feet with a proposed island (former golf course green) retained, along with the existing golf cart paths to allow for recreational use of the area. The July 11 letter, indicates that “Low spots will be created closer to 49 [feet], with finish elevations ranging from about 49.5 to 50” (p. 3). Based on this, the IVW appears to be designed to support standing water at depths between 1.5 to 2.5 feet during seasonal high groundwater conditions.

HW recommends that the Applicant confirm that the wetland mitigation area is designed in reference to the latest estimate of SHGW (elevation 52') and confirm their design intent for the wetland mitigation area. The elevation of SHGW is important for the above discussion of the appropriate bottom elevation for the proposed IVW. We note that Figure 2 from the August 29, 2017, DCI letter indicates variable SHGW indicator elevations at different locations across the site, which is reasonable. The four closest test pits to the ILSF indicate SHGW varying between elevation 50 and 55 feet. We recommend that the Applicant confirm which SHGW elevation they intend to use for the IVW design. In addition, will the same or different SHGW elevations be used for the design of the different bioretention practices depending upon their geographic locations?

2.8 Proposed plantings include just two shade trees within the wetland area, and a wetland seed mix. We believe that the wetland mitigation area could be enhanced with the incorporation of additional woody species (clusters of shrubs and additional trees).

2.9 HW also recommends that rather than maintaining a consistent elevation within the renovated IVW (as shown on the plans), that the design incorporate pit and mound microtopography to create a diversity of hydrologic regimes within the wetland area that will in turn create a diversity of microhabitats over time, as indicated in HEC's July 11, 2017 letter. Such topographic variation would also provide protection against year-to-year variation in groundwater conditions. Inclusion of coarse woody debris and rocks, as well as a diversity of plantings would improve the ability of this mitigation area to protect the interests under the WPA and the Ordinance.

2.10 In their letter regarding the ANRAD review, ESS had recommended that

"If the basins at the site are to be altered in the future, ESS recommends that ... any alteration of the basins be conducted during the winter to help minimize impacts to wildlife using the basins."
(ESS letter, May 16, 2016)

HW concurs with this recommendation that to the extent practicable, work within the wetland areas be conducted during the non-active season for wildlife.

2.11 Monitoring and maintenance of the renovated and expanded wetland and its associated buffer zone will be critical to its success in improving the ability of this resource to support the interests of wildlife habitat, conservation, outdoor education, and passive and active recreation as noted in the NOI narrative (p. 3). This will be particularly true for ensuring that a native plant community develops within the wetland area. Provisions within the eventual Conservation Restriction (CR) require long-term maintenance and monitoring within the Open Space area in perpetuity.

HW recommends that the wetland area be monitored for a minimum of two growing seasons to ensure that the wetland functions as designed. Of particular concern is the potential for the spread of invasive species that are currently within the seedbed of the wetland areas and surrounding buffers. We understand that a long-term Operations and

Management schedule has been or will be developed for the entire Open Space area in accordance with the requirements of the CR per the OSRD requirements (see below for additional comments).

Buffer Zone Plantings

- 2.12 The Applicant also proposes to introduce native plantings within the buffer zone to further protect the renovated wetland. The proposed diversity of plantings within the buffer zone is an improvement over existing conditions of golf course turf grass. As noted above, we understand that the entire Open Space area will be required to be maintained by the Homeowner Association.

HW recommends that the Applicant provide proposed signage to identify the new no disturbance buffer areas and present this to the Commission for consideration.

Open Space Preservation

- 2.13 The Applicant also proposes to preserve approximately 60 percent of the site as Open Space (as per the OSRD provisions), and have the open space area held under a CR in perpetuity. The NOI notes that the open space is specifically designed to be maintained for wildlife habitat, conservation, outdoor education, and passive and active recreation. A draft CR was submitted with the NOI application materials. While this process is largely handled by the State (Executive Office of Energy and Environmental Affairs), it would be important for the Commission, as well as the entity that would eventually hold the CR, which may be the Conservation Commission, to understand the management activities and requirements within the CR area, as well as the designated allowable and prohibited activities within the CR.

HW recommends that the Commission include within any conditions, should an Order of Conditions (OOC) be issued, that the maintenance and management of the CR be a part of the conditions in perpetuity.

- 2.14 HW recommends that the Open Space area incorporate educational signage. Potential topics could include (but not limited to), the function and values of wetlands, the importance of native habitats to native wildlife, and the importance of stormwater management.

Stormwater Management Discharge Channel

- 2.15 During the site visit, the Applicant's wetland scientist indicated that the outfall /overflow channel from the constructed stormwater wetland would be graded in a meandering configuration and planted to mimic the characteristics of an intermittent stream. This is not reflected on the planting plan submitted with the NOI. HW recommends that this stormwater overflow feature include elements such as small rocks or boulders and downed woody debris to increase the habitat value of this feature and that this be incorporated within an updated planting plan.

Other Permitting

2.16 Massachusetts Environmental Policy Act (MEPA)

MassDEP raised the issue of whether or not review under MEPA would be required. The Applicant proposes “alteration of ½ or more acres of any other wetlands” [ILSF], which is a threshold for filing an Environmental Notification Form (ENF), provided another state-issued permit were needed. The Applicant has stated in the July 11, 2017 letter that a MEPA review would not be required:

“The man made, isolated wetland, is located approximately 2200 feet from the nearest tributary to navigable waters (located on the Maudslay State Park property to the west, and approximately 2,400 feet to the Merrimac River near the I-95 Bridge. Based on the separation between the isolated wetland and these nearest water bodies, our position is that it is not jurisdictional under section 404 of the Clean Water Act, as this separation is too great to be considered “bordering, contiguous, or neighboring” within the context of the jurisdictional guidance currently in effect. Since the project requires no state permits, a MEPA ENF is not required.” (p. 3)

However, there is no evidence that the Applicant has consulted with the U.S. Army Corps of Engineers (Corps) or MassDEP on this position. We recommend that the Applicant follow up with these agencies.

2.17 Federal Clean Water Act

The Applicant proposes filling of greater than 5,000 square feet of isolated wetlands as part of this project. This activity would normally trigger the filing of a Water Quality Certification (WQC) under the Section 401 of the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*) in accordance with the regulations at 314 CMR 9.04(1). The need for a WQC, a state-issued permit, would, in turn, trigger the need for a MEPA filing, pursuant to the regulations at 301 CMR 11.03(3)(b)1.d.

Jurisdiction under the WQC regulations at 314 CMR 9.01(2) is as follows:

(2) Jurisdiction. 314 CMR 9.00 applies to the discharge of dredged or fill material, dredging, and dredged material disposal activities in waters of the United States within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification under 33 U.S.C. 1251. The federal agency issuing a permit initially determines the scope of geographic and activity jurisdiction. (e.g. the Corps of Engineers for Section 404 permits for the discharge of dredged or fill material).

Waters of the United States within the Commonwealth are defined as follows:

Waters of the United States within the Commonwealth. Navigable or interstate waters and their tributaries, adjacent wetlands, and other waters or wetlands within the borders of the Commonwealth where the use, degradation, or destruction could affect interstate or foreign

commerce as determined by the Corps of Engineers. Bordering and isolated vegetated wetlands and land under water are waters of the United States within the Commonwealth when they meet the federal jurisdictional requirements defined at 33 CFR 328 through 329 [314 CMR 9.02].

HW recommends that the Applicant seek a regulatory opinion from MassDEP and or the Corps to determine if the IVW would be jurisdictional under the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*). Should these other agencies concur with the Applicant's position, and the Commission agree that a variance from the local Ordinance is appropriate, HW believes that this could be properly conditioned to allow the project to move forward.

3. Stormwater Management Comments

HW has reviewed the proposed stormwater management designs as per the standards of the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131, Section 40), the Wetlands Protection Regulations (310 CMR 10.00), the MASWS, the City of Newburyport Stormwater Management Ordinance (September 2010), and the City of Newburyport Stormwater Management Rules and Regulations (April 28, 2014) (as well as Section 6.14, Appendix VIII, and Appendix IX of the Rules and Regulations Governing the Subdivision of Land in Newburyport, Massachusetts, re-codified on February 6, 2002). The proposed development is considered a new development which is required to fully comply with the MASWS.

Comments 3.1 through 3.10 below relate to the standards as presented in the MSH. Comment 3.11 addresses the flood storage calculations for the ILSF.

- 3.1 *Standard 1: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*
- a. The majority of the stormwater runoff proposed from the development would be contained on the project parcel contributing to the ILSF and the IVW. Both resource areas will be disturbed during construction; however the proposed design includes discharge outfalls from the constructed stormwater wetland and the bioretention areas which have been sized to minimize any potential erosion to the "improved" resource areas. With the understanding that the final plans will illustrate that the proposed stormwater practices will be located upgradient of the ILSF as well as the IVW, the Applicant appears to be in compliance with Standard 1.
- 3.2 *Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*
- a. The Applicant has defined the watershed divide for the Existing and Proposed Drainage Areas figures using the property boundaries. Drainage areas should be delineated based on topography rather than property boundaries. The Proposed ILSF Drainage Area figure shows the ILSF drainage area extending outside of the property boundaries in a more realistic manner. HW recommends that the Applicant verify that the drainage divide is defined accurately, specifically for those areas that are contributing to a proposed drainage practice such as subcatchment Area 1H. Furthermore HW recommends that the Applicant verify that the proposed watershed

divide along the northeast property boundary is comparable to the drainage divide illustrated on Figure-2 Supplemental Groundwater Analysis Figure, prepared by Design Consultants Inc., dated August 23, 2017.

- b. Subcatchment Area 1H appears to be discharging into numerous drywells. It does not appear that the Applicant has provided calculations for the sizing of these drywells. HW recommends that the Applicant provide documentation verifying that the proposed drainage system for subcatchment 1H is sized appropriately.
- c. HW recommends that the Applicant verify that the runoff from the Village at Newburyport Condominiums is not contributing to the proposed ILSF watershed.
- d. In the HydroCAD model it does not appear that the Applicant has included the overland flow catchment areas directed towards bioretention basins C (Pond C BR) and F (Pond F BR). HW recommends that the Applicant revisit these stormwater practice calculations to verify that the entire watershed flowing into the basins has been accounted for and that the basins are adequately sized.
- e. There are a number of inconsistencies between the plans and the HydroCAD model, including elevations, lengths of pipes, and slopes of pipes. The most significant inconsistencies include the pipe and weir sizes as modeled in HydroCAD. For example, Pond B lists an 18-inch culvert while the plan shows a 12-inch culvert, the pipe to Pond E is not labeled, and the weirs listed under the bioretention basins include a 1.0 foot breadth but neither the plan views nor the detail provided indicate a weir location or size for any of the bioretention areas. HW recommends that the Applicant verify that all elevations and inlet and outlet information are carefully reviewed and accurately and consistently documented between the calculations and the design plans.
- f. It appears that the Applicant has mislabeled a number of the bioretention basins. HW recommends correcting this typographical error for clarity.
- g. HW recommends that additional documentation be provided regarding the bioretention areas and the constructed wetland design to ensure that designs meet the MASWS and are consistent with the MSH. Each system should have an individual detail including specific design parameters, including dimensions, overflows, depth to seasonal high ground water, and native plantings.

3.3 *Standard 3 requires that the annual recharge from post-development shall approximate annual recharge from pre-development conditions.*

- a. The Applicant has chosen to include narratives to document that they are providing adequate recharge volumes. It is difficult to verify that the values presented are accurate. HW recommends that the Applicant provide clear calculation work sheets which correlate accurately to the Proposed Drainage Area figure, and plan details, including the recharge attributed to the bioretention basins and the infiltration trenches around the buildings.
- b. HW recommends that the Applicant provide the drawdown calculations for the bioretention areas in accordance with Volume 3 of the MSH.

3.4 *Standard 4 requires that the stormwater system be designed to remove 80% Total Suspended Solids (TSS) and to treat 1.0 inch of volume from the impervious area for water quality. (Note: Because the site is located within a Zone II area, the water quality*

treatment volume is 1 inch instead of 0.5 inches. See Standard 6.)

- a. The Applicant has stated in the Stormwater Narrative that the details on the drawings include a detailed breakdown of the water quality volumes. HW was not able to locate this information and requests that the Applicant clarify where these details are located.
- b. The peer review conducted by CSI requested that the Applicant provide TSS removal calculations. In the revised Stormwater Narrative the Applicant has outlined the proposed TSS removal; however, they have not provided the TSS removal calculation sheets as required in the MSH.
- c. The Applicant has chosen to include narratives to document that they are providing adequate water quality volumes. As listed it is difficult to verify that the values presented are accurate. HW recommends that the Applicant provide clear calculation work sheets which correlate accurately to the Proposed Drainage Area figure. The information provided has numerous inconsistencies making it difficult to verify.
- d. HW further recommends that the Applicant model the water quality volume through the HydroCAD program. The model should clearly indicate that the constructed wetland and the bioretention basins will each contain and treat 1-inch of the proposed impervious area without discharging.

3.5 *Standard 5 is related to projects with a Land Use of Higher Potential Pollutant Loads (LUHPPL).*

The proposed project is not considered a LUHPPL; therefore Standard 5 is not applicable.

3.6 *Standard 6 is related to projects with stormwater discharging into a critical area, a Zone II or an Interim Wellhead Protection Area of a public water supply.*

The proposed development is located within a Zone II wellhead protection area. Projects within a Zone II must use a 1 inch water quality treatment volume instead of ½ inch, and must provide pretreatment removal of 44% total suspended solids (TSS) prior to discharge into an infiltration practice. As noted above, the design calculations are difficult to follow. However, if the stormwater calculations have been performed accurately and comments 3.1 through 3.10 are addressed, it appears that the system management system has been designed in accordance with the MSH for discharging into a critical area. The Applicant appears to be in compliance with Standard 6 and should clearly document this in their revisions.

3.7 *Standard 7 is related to projects considered Redevelopment.*

The proposed project is not considered a redevelopment; therefore Standard 7 is not applicable.

3.8 *Standard 8 requires a plan to control construction related impacts including erosion, sedimentation or other pollutant sources.*

- a. The Applicant has provided some details and notes on Sheet C16 regarding erosion and sedimentation control. Section B of the Newburyport Stormwater Management

Rules and Regulations (as well as Appendix IX of the Rules and Regulations Governing the Subdivision of Land in Newburyport, Massachusetts) includes specific requirements to be included on an erosion/sedimentation control plan. HW recommends that the Applicant provide an Erosion and Sediment Control Plan in accordance with the City of Newburyport requirements.

- b. The Applicant states that a Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to any land disturbance. HW recommends that the Applicant prepare and provide the SWPPP in accordance with the EPA NPDES permit to the City of Newburyport for review at least 14 days prior to any land disturbance.

3.9 *Standard 9 requires a Long Term Operation and Maintenance (O & M) Plan to be provided.*

- a. The Applicant has provided an Operation and Maintenance Plan in Appendix C of the Stormwater Analysis. The Applicant has included a brief paragraph referencing the cleaning of forebays, which is a critical component of the long term functionality of the stormwater system. HW recommends that the Applicant expand their narrative to describe the procedure for cleaning forebays and identify suitable access for such maintenance.

3.10 *Standard 10 requires an Illicit Discharge Compliance Statement to be provided.*

The intention of Standard 10 is for the property owner/developer to understand that illicit discharges are prohibited. HW recommends that the Applicant provide a signed Illicit Discharge Compliance Statement prior to any earth disturbance.

4. Groundwater Comments

To the best of our understanding, there are two primary groundwater-related issues that have been raised for our consideration about the proposed development that come under the purview of the Wetlands Protection Act (WPA) and the Conservation Commission (CC):

Seasonal High Groundwater (SHGW): What is the appropriate SHGW level to use for Project planning purposes, and what is the potential impact from SHGW on the ILSF and IVW resource areas and the proposed development infrastructure (e.g. basements and stormwater management facilities).

Groundwater/Drinking Water Supply Impacts: How will the proposed development impact water quality in the ILSF and IVW, and how will water quality from those wetlands resource areas impact groundwater quality contributed to the City's nearby drinking water wells? These resource areas are the receiving waters for the stormwater discharge from the site; both currently and under proposed conditions. The protection of drinking water quality, as impacted by infiltration to groundwater from the wetland resource areas, is one of the functions of those resource areas protected by WPA and the CC.

Based on our review of the information provided and discussion at the site visit, we offer the following comments with regard to SHGW:

- 4.1 There may be an issue with different parties discussing elevations in different vertical datums. Having all parties conversing in a common vertical datum is a pre-requisite for comparing and discussing different data sources. All plans and analyses presented on behalf of the Applicant by DCI and NGI clearly note their use of the NAVD88 vertical datum, the most common vertical datum in current use for land-based survey in the region. Elevations in the AECOM email correspondence and the related water level record from City observation well OB-6 are described as being presented relative to mean sea level (MSL). While tidal data for a specific tide gauge over a specific time period can be described in terms of MSL, MSL is not consistent either spatially or temporally and, therefore, the MSL term does not refer to a specific, land-based, survey datum.

We recommend that it be clarified whether City and Applicant discussions of elevations are both being definitively presented in a common datum. If not, we recommend that attempts be made to reconcile the data reported as MSL with the NAVD88 datum. If OB-6 (and other monitoring wells) were surveyed by both the Applicant and the City, comparison of those survey data would allow for the most direct and accurate datum conversion.

- 4.2 SHGW should not be confused with record or flood high water levels from any specific historic event. SHGW is the long-term average high groundwater elevation. Historic flood events like the Mothers Day storm of 2006, or the period of intense storm activity in March 2010, may potentially produce surface water elevations at specific locations higher than the underlying groundwater, or even groundwater elevations higher than the SHGW. Massachusetts regulations for septic systems (not applicable to this project) and stormwater infiltration systems require specific separations from the bottom of the facility and SHGW; not historic high groundwater. Developers and Planning Boards may wish to protect homes and other infrastructure from potential flood levels above SHGW, but those interests are not relevant to CC WPA regulatory resource concerns.
- 4.3 SHGW is best determined by either observation of soil mottling in test pits and or comparison to nearby, long-term groundwater data from "Index Wells" (a method referred to as the Frimpter Method in Massachusetts). We recommend that both methods be applied and compared whenever possible. Multiple lines of evidence pointing to a similar SHGW level lend confidence to the assessment. Conversely, widely differing results reinforces the need for a more thorough investigation of potential errors in observation or calculation.

The Soil Suitability Assessment Reports submitted for the project contain soil mottling observations indicative of SHGW at varying depths for different locations. According to comments (made during the September 8 site visit) from the soil evaluator who

witnessed the test pits¹, mottling indications were strong and clear in the test pits. In their August 29, 2017 letter, DCI converted those mottling depths to SHGW elevations based upon site survey elevations at each test pit location. Those SHGW elevations are shown on Figure 2 of the letter and range between elevations 50 and 57.5 +/- feet above NAVD88; lowest at the northwest part of the site and highest to the southeast.

DCI submitted a discussion of site groundwater levels relative to USGS Index Well NIW-27 in Newbury, though not an actual Frimpter evaluation. While relatively close to the site, the Newbury Index Well is located in a glacial till hydrogeologic setting and is therefore not an appropriate analog for the more permeable sand and gravel deposits that underlie the project site. We recommend that Frimpter evaluations (USGS Open File Report 80-1205) be completed comparing groundwater levels from site monitoring wells to data from the USGS Georgetown well (GCW-168) and Haverhill well (HLW-23), both located in sand and gravel deposits. Those Index Well-based SHGW estimates can then be compared to the soil mottling-based estimates.

- 4.4 Based on the above-mentioned data sources and analyses, we recommend that the Applicant provide confirmation of a consensus SHGW elevation (or elevations for different purposes in different areas of the site). It is possible for a large site such as this to have variable SHGW. We recommend that a single SHGW be determined for the purpose of the ILSF calculations. Potentially different SHGW elevations may be recommended for the design of stormwater features and wetland resource enhancements in different areas of the site. Following confirmation of best-estimated SHGW, stormwater system elevations, wetland design, and ILSF calculations should be confirmed or re-evaluated to ensure that site design is consistent with the best SHGW estimates across the site.
- 4.5 The photo documentation and site survey reconciliation of flood water elevations associated with the Mother's Day storm, and the correlation of those flood elevations with basement floor elevations presented in the August 29, 2017 DCI letter provide a reasonably quantitative estimate of that storm's flood elevations on the site. The current, revised site design maintains key infrastructure (e.g., road, basement, and stormwater management systems) above those flood water elevation estimates.
- 4.6 With regard to the higher range of groundwater fluctuation documented in City observation well OB-6 (as reported in the AECOM email correspondence), we visited OB-6 during our September 8, 2017 site visit. We noted that OB-6 is located at the edge of an off-site ILSF area displaying clear wetlands characteristics. We observed an intermittent runoff channel connecting a stormwater outfall to the ILSF. That outfall appears to discharge stormwater runoff generated off of Briggs Ave. The contributing

¹ We believe this was Planning Board consultant Phil Christiansen, but we note that the soil logs have no reference to a witness representing the City.

area to the Briggs Ave outfall is unknown but site observations indicate that the ILSF receives significant water. At our site visit we also observed a topographic ridge located at the northeastern edge of the site, between the site and OB-6 and the ILSF that receives stormwater runoff from Briggs Ave. According to the Applicant's engineer Stephen Sawyer, a monitoring well was attempted to be installed at the ridge but it refused on bedrock at a depth of four feet. We have not seen a boring log for this attempted monitoring well and request that the log be submitted to confirm the reported bedrock high at that location. Based on these factors, it appears probable that groundwater elevations at OB-6 are influenced by stormwater runoff from Briggs Ave to a greater extent than would be expected for the majority of the site. Therefore, the range of groundwater fluctuations in OB-6 would be greater than would be expected to occur over the majority of the site. The potential datum inconsistency between how OB-6 water levels are described compared to site water levels (described above) may also contribute to the discrepancy between OB-6 and site groundwater conditions.

Based on our review of the above-listed information sources, we offer the following comments with regard to groundwater issue #2 for potential water quality impacts to wetlands resource areas, and from wetlands resource areas to the City drinking water supply:

- 4.7 The Wetlands Protection Act (WPA) and the Conservation Commission (CC) interests related to water quality impacts from the proposed development concern the potential impacts to the wetlands resource areas themselves (ILSF and IVW), and the impacts to groundwater infiltrated beneath the wetlands resource areas that will ultimately be withdrawn by nearby City drinking water wells.

Wetlands resources areas at the site currently receive stormwater inputs both directly from overland runoff off the golf course, and in a conveyed manner from impermeable surfaces associated with the golf course and from Boyd Drive. As observed at our site visit, there is currently minimal vegetated buffer between managed turf areas of the golf course and the wetlands areas. Stormwater runoff from the golf course, therefore, currently receives minimal treatment before entering the wetlands. Similarly, runoff from Boyd Drive was observed to flow towards Wetland D and the ILSF with minimal treatment beyond some settling in the catch basins and some deposition and uptake as runoff travels overland between Boyd Drive and the wetlands.

- 4.8 Under proposed conditions, the buffer to the wetlands will be expanded, allowing additional treatment of any direct runoff beyond what currently exists. In addition, a stormwater management design compliant with current state regulations (refer to earlier comments for discussion of state stormwater standards) will provide significantly enhanced water quality treatment for runoff conveyed to the wetlands resources from both the site and Boyd Drive relative to existing conditions.

The conversion of the surrounding land use from managed golf course to open space residential development would also generally be considered an improvement from a

pollutant loading standpoint. Obviously, there is a wide range of pollutant loading that occurs between different golf courses and amongst different homeowners so that generality does not always hold true but. But, in our opinion, this is a valid generality. Special conditions regarding lawn maintenance included as Article IX of the August 8, 2017 Draft Homeowners Agreement (HOA) for the development will help to further ensure that pollutant loading under proposed conditions should be less than under existing conditions. The Draft HOA includes requirements for landscaping of all home lots and common areas to be conducted by a single contractor who must submit a landscape management plan to the City each year specifying what fertilizers and pesticides may be used. The City will have the right to limit the allowable products and quantities in recognition of the site's location within a Zone 2 contributory area to City drinking water wells.

- 4.9 Potential impacts to the City drinking water Well 2 from water infiltrated to groundwater from the wetland resource areas follows the same logic as the potential impacts to the resource areas themselves, as discussed above. Better water quality entering the resource areas themselves, relative to existing conditions, would translate to better groundwater quality following infiltration of water from the wetlands to groundwater. Currently, surface water moves generally south to north across the site through two lined water features/detention ponds and terminates at an unlined IVW. Any water in the two lined wetland areas within the ILSF (Wetlands C and D from the ANRAD) that is not withdrawn for golf course irrigation or evapotranspired flows to the IVW where it is either infiltrated or evapotranspired. Under proposed conditions, the southernmost wetland D will be eliminated, the wetland C will be significantly reduced in size, and the IVW (wetland A) will be greatly enlarged with an expanded naturalized buffer added. In addition, six stormwater wetlands or bioretention systems will be added to manage stormwater in accordance with the MA Stormwater Standards (refer to earlier comments regarding the stormwater standards) prior to discharge to the expanded IVW. The improved stormwater management and vegetated buffer under proposed conditions will result in improved water quality entering the IVW and, ultimately, infiltrating to groundwater. That groundwater is in turn expected to travel towards the City drinking water Well 2 under pumping conditions.
- 4.10 We have reviewed the correspondence from AECOM and NGI regarding potential soil and groundwater contamination on site and concur with both parties that no data supplied to HW for review indicate the potential for any significant, existing, groundwater contamination, and that the low concentrations of pesticides observed in soil samples are consistent with the site's use as a golf course. As stated in the July 30, 2017 letter from NGI, we also concur that numerical modeling of contaminant transport from the site is not warranted due to the lack of a significant source of contamination to model.
- 4.11 In summary, we make the following statements/ requests for information regarding groundwater issues related to the proposed development:

- a. Observed water level fluctuations at City monitoring well OB-6 are greater than those observed on site. This is likely due to the location of OB-6 adjacent to an ILSF that collects significant stormwater runoff, the potential for a partial groundwater restriction between OB-6 and the site, and the potential for miscommunication between parties using different vertical datums. We recommend the following to resolve this issue:
 - o that the datum issue be resolved;
 - o that the Applicant submit further detail regarding the drainage area to the Briggs Ave outfall and the resulting calculations of the volume of stormwater conveyed to the ILSF under specified flood events; and
 - o that the Applicant submit boring logs documenting the described bedrock high between OB-6 and the site
- b. SHGW seems fairly well defined based on soil mottling observed in test pits. We recommend that the Applicant conduct Frimpter SHGW estimates for various site monitoring wells in different locations using USGS Index wells GCW-168 and HLW-23 (located in sand and gravel aquifers) to compare to estimates based on soil mottling observed in test pits. A single SHGW should be determined for use in ILSF calculations. Potentially varying SHGW elevations may be estimated for stormwater management design features and wetland enhancement at different locations across the site.
- c. We recommend that the Applicant confirm or re-evaluate their estimated ILSF boundaries based upon the observed Mother's Day flood elevation and the revised SHGW estimates discussed above to ensure that the ILSF represents the observed flood elevation, that adequate flood storage volume is provided above SHGW, and that SHGW is constrained within the ILSF boundaries. The ILSF should not cross topographic contours, or explanation should be provided as to why this should occur.
- d. The proposed stormwater management systems, improvements to the vegetated buffers around resource areas, and improvement to the IVW are expected to improve the quality of water contributed to the site wetlands resource areas and, ultimately, to the groundwater resources that will receive infiltration from the IVW following significant storm events. Improved groundwater quality will be beneficial to the City's nearby public drinking water wells.

5. Conclusion

Thank you for the opportunity to assist the Conservation Commission in reviewing this significant project. Please feel free to reach out to Ellie Baker at ebaker@horsleywitten.com or 603-658-1660 with any questions regarding these comments. We would be happy to attend an upcoming Public Hearing to present these comments and respond to questions.

Ms. Julia Godtfredsen

September 26, 2017

Page 21 of 21

Sincerely,

Horsley Witten Group, Inc.



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cc: Mr. Thomas Hughes, Hughes Environmental Consulting
Mr. Stephen Sawyer, Design Consultants, Inc.
Atty. Lisa Mead, Mead, Talerman and Costa, LLC

Enclosures

Attachment A. List of Project Materials Reviewed

The following materials were reviewed for the 18 Boyd Drive Open Space Residential Development:

- Soil Suitability Reports from January 28, 2016 Deep Observation Holes TP-1 through TP-13 from January 28, 2016, performed by Alexander Parker (no City witness documented).
- City of Newburyport Conservation Commission Findings, DEP File Number 051-0950, issued on June 13, 2016;
- October 17, 2016 professional opinion letter from Geosphere Environmental Management, Inc. to the Planning Board and Board of Health.
- June 1, 2017 letter from EnviroRisk Solutions to NGI about residual herbicide and pesticide sample data from 3/21/17.
- June 2, 2017 Notice of Intent submitted to Conservation Commission by HEC.
- June 5, 2017 letter from Northeast Geoscience, Inc. (NGI) to Cottage Advisors, LLC discussing soil and groundwater contamination concerns.
- Chart of groundwater elevations from City observation well OB-6 (2001-2017) (submittal date and author not referenced).
- June 26, 2017 memorandum to the Planning Board from Mead, Talerman, and Costa (MTC), LLC, the attorneys representing the Applicant.
- June 26, 2017 Site Plan Review letter prepared by Christiansen & Sergi, Inc. (CSI) in review of June 22 plans;
- June 27, 2017 and July 6, 2017 letters from the Board of Health.
- July 11, 2017 letter from Hughes Environmental Consulting (HEC) to the Conservation Commission addressing June 20, 2017 Conservation hearing comments and MA DEP comments. Referenced two attachments:
 - July 5, 2017 letter from NGI to MTC.
 - July 11, 2017 letter from DCI to the CC regarding ILSF calculations and SHGW. Includes Jan 28, 2016 Deep Observation Hole Reports for TP16-5, 6, 7, 8, 9, 10, 11, and 13.
- July 17, 2017 letter from AECOM commenting on the June 5, 2017 soil contamination letter from NGI;
- August 9, 2017 letter to the Planning Board from MTC, including attachments:
 - Aug 8, 2017 Draft Homeowners Associations Declaration of Trust
 - Jul 6, 2017 Board of Health comment letter
 - Jul 30, 2017 letter to the Planning Board from NGI opining the lack of appropriateness for modeling of the contaminant transport
- August 8, 2017 DCI response to June 26, 2017 CSI review letter.

- August 8, 2017 Project Narrative and Stormwater Analysis, prepared by DCI. Updated from May 22, 2017.
- August 10&11, 2017 emails from AECOM to the City Planning Board on behalf of the Water Department.
- August 17, 2017 email comments from abutter Peter Hatcher.
- August 29, 2017 letter from DCI to the Planning Board.
- August 29, 2017 OW-6 Groundwater Evaluation letter (with 4 figures), prepared by DCI.
- Open Space Residential Definitive Subdivision of Land & W.R.P.D. Special Permit, Newburyport, Massachusetts, prepared by Design Consultants Inc., prepared for Evergreen Commons, LLC, original date June 2, 2017, includes:
 - Cover Sheet T1 rev. 8/8/17
 - Existing Conditions Plan of Land EX1 rev. 8/8/17
 - Existing Conditions Plan of Land EX2 rev. 8/8/17
 - Existing Conditions Plan of Land EX3 rev. 8/8/17
 - Existing Conditions Plan of Land EX4 rev. 8/8/17
 - Existing Conditions Plan of Land EX5 rev. 8/8/17
 - Existing Conditions Plan of Land EX6 rev. 8/8/17
 - Lot Layout Key Sheet S1 rev. 8/8/17
 - Lot Layout Sheet 1 S2 rev. 8/8/17
 - Lot Layout Sheet 2 S3 rev. 8/8/17
 - Lot Layout Sheet 3 S4 rev. 8/8/17
 - Lot Layout Sheet 4 S5 rev. 8/8/17
 - Lot Layout Sheet 5 S6 rev. 8/8/17
 - Civil Key Sheet C1 rev. 8/8/17
 - Grading Plan 1 C2 rev. 9/12/17
 - Grading Plan 2 C3 rev. 9/12/17
 - Grading Plan 3 C4 rev. 9/12/17
 - Grading Plan 4 C5 rev. 9/12/17
 - Drainage & Utility Plan 1 C6 rev. 8/8/17
 - Drainage & Utility Plan 2 C7 rev. 8/8/17
 - Drainage & Utility Plan 3 C8 rev. 8/8/17
 - Drainage & Utility Plan 4 C9 rev. 8/8/17
 - Street Plan & profile Road A & D C10 rev. 8/8/17
 - Street Plan & Profile Road B C11 rev. 8/8/17
 - Street Plan & profile Road C C12 rev. 8/8/17
 - Typical Sections, Details & Notes 1 C13 rev. 8/8/17
 - Typical Sections, Details & Notes 2 C14 rev. 8/8/17
 - Typical Sections, Details & Notes 3 C15 rev. 8/8/17
 - Typical Sections, Details & Notes 4 C16 rev. 8/8/17