

Common Area Infrastructure Assessment

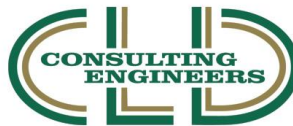
Hickory Woods, Londonderry

Prepared for:

Hickory Woods Unit Owners Association
C/O Evergreen Harvard Group
17 Commerce Drive
Bedford, NH 03110



Prepared by:



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August 15, 2017

CLD Ref. No. 17-0224

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Section 1: Project Summary

CLD Consulting Engineers, Inc. (CLD) was selected by the Hickory Woods Unit Owner's Association (the Association) to perform a common area Infrastructure Assessment based on a Request for Proposal issued by the Association. Below is a summary of the work performed.

Research

CLD started work by contacting the Association and Town of Londonderry to gather any available plans and review the inspection reports that were performed during construction. A full set of Civil Design and Architectural Design Plans were provided to CLD by the Association. On July 21, a visit to various Town departments was performed. No additional plans were found other than the approved set of plans. The Town had almost a hundred of pages of construction inspection reports for the sitework infrastructure; therefore, a copy was not obtained. However, a detailed summary of the results is included in Section 2.

Inspection

CLD reviewed the information gathered and visited the site to perform multiple site inspections of the infrastructure items. Inspections by CLD were performed on June 5, 2017 (initial meeting and walkthrough), July 7, 2017 (post approval visit) and July 26, 2017 (independent review). The results of these inspections are provided in Section 3. The Civil inspection consisted of a site walk with visual inspection of all common infrastructure items including roadways, sidewalks, curbs, retaining walls, drainage structures, and visible utilities. No destructive testing (borings) were performed. Inspection Reports are included in Section 3. Included in the Civil Inspection is a Narrative and an Overview Plan of the property with a key of areas of concern; only items that were found to be deficient are detailed. The pages following the overview plan contain a detailed report with photos and a narrative of the specific deficiencies and in some locations suggested repair options.

Conclusion

Overall, the project was built with good construction practices and is in good condition. The majority of deficiencies related to site infrastructure are related to erosion issues, and some curbing being damaged by plows and/or construction traffic. The roadway pavement is overall in good condition, with the exception of one low point at the entrance to the clubhouse, and some premature cracking potentially caused by construction traffic along Tavern Hill Road. With some minor corrections, the project should be ready to transition to the Association.



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TO: File

FROM: Brian Pratt

DATE: August 1, 2017

RE: Research at Town
Hickory Woods – Londonderry, NH
CLD Reference No. 17-0224

Amy Sanders visited the Town to perform research on the history of the Hickory Woods Development in Londonderry, New Hampshire. Amy reviewed construction inspection files with the Department of Public Works and project files with the Planning and Economic Development Department. In addition, Amy has discussed the project with the assistant director of public works and engineering, John Trottier and with Rich Philbrook of Pennichuck Water Works, Inc.

DPW Summary

- Stantec (Town's consultant Engineer) performed regular inspections throughout construction. Stantec has historically been known to be very particular about inspections. Prior to final paving, a punch list was issued to correct curbing and trench repair, shim pavement, trim and mill joints at the pavement limits, and cleanout catch basin sumps.
- Erosion control was monitored regularly throughout construction and no issues were noted in the inspection reports reviewed.
- Stantec noted that retaining walls need to be inspected by the Town. Stantec directed the contractor to contact the building department to coordinate inspections.
- Roadway material testing was performed by Miller Engineering and Testing.
- Discussions with John Trottier confirmed that there were no major issues that were out of the ordinary during construction. John also mentioned that some residents of Hickory Woods have reached out to him to let him know that a catch basin was not installed near the pickle court. John did know why it was not installed as it could have been a safety issue or as a construction change. He also noted that there were complaints about a puddle near the intersection of Tavern Road.
- DPW inspection reports note that the contractor installed natural gas main through the project although it was not shown on approved plans. In speaking with John Trottier, the gas main was installed as a design change during construction.
- A water main leak was noted in the inspection reports. Several excavations were done. UTS was then on site for water main leak detection. There was later reference to preliminary pressure testing to be performed, but no definitive notes were found as to how/when the leak was identified.

Planning Summary

- We reviewed the files and obtained copies of project related permits including NHDES Subdivision, NHDES Alteration of Terrain, Town of Londonderry Notice of Decision and Town of Londonderry Zoning Board of Adjustment.
- Stantec reviewed the subdivision design plans along with the Town's Design Review Committee including; assessor's office, building department, fire department, planning and economic development department, police department, department of public works, tax collector's office, zoning board of adjustment, conservation commission and heritage/ historic district commission. Comments from the review committee were address prior to the Planning Board signing the phased plans.
- Stormwater Inspection Reports that summarize the on-site drainage operations and maintenance, as identified within the plan set, shall be submitted to the Town for their files on an annual basis.

Pennichuck Summary

Based on previous conversations with Pennichuck Water works, the following is the ownership and maintenance structure.

- Pennichuck owns the water main;
- Each house is individually metered; and
- The hydrants are private, but the Association pays a fire service charge for Pennichuck to inspect the hydrants on a regular basis (I believe he said twice a year).

Section 3: Inspection Report

Infrastructure Summary

The common areas consist of a network of private roadways/driveways with associated water, septic systems, storm drainage, site lighting, and fencing. A clubhouse with an associated parking lot is located on Tavern Hill Road/Church Lane. Our inspection was limited to the exterior site features and did not include any building inspections. Specifics about the level of inspections and general notes are listed below.

Roadways/Sidewalks

The roadways consist of 5 privately owned bituminous concrete roadways (approximately 6150 lf of roadway) most of which are 28 feet in width. Sidewalks consist of bituminous concrete behind vertical granite curbing and are limited to the front of the clubhouse in the parking lot. The remainder of the roads do not have sidewalk. All of the roadways have been completed as of the date of our final inspection and the final top coat of pavement has been placed. Good quality pavement in residential developments (with quality sub-base) is expected to last 15+ years without major problems, provided cracks are sealed in a timely manner and potholes are prevented or repaired. Once the top coat of pavement reaches the end of its useful life, milling and repaving the top coat should extend the life another 10-15+ years. After 30-35 years typically the pavement and sub-base will need to be replaced. Based on inspections, the pavement on-site appears to be in good condition and the sub-base appears to be solid with no obvious observed pothole or sinkholes, and we expect the routine maintenance required to consist of yearly crack sealing, and milling and repaving around the 15+ year mark. There was some premature cracking noticed along the centerline of Tavern Hill Road and around the structures at the corner of Black Forest Circle. These should be crack sealed yearly and monitored regularly to avoid damage to the subbase. There were also nails observed in the top coat of the pavement. It's unclear how these nails got into the pavement, whether they were in the asphalt mix or dropped immediately after the pavement was placed. No nails were observed protruding up from the pavement, however if nails are observed protruding they should be removed. The only deficient area is the clubhouse entrance off of Tavern Hill Road. There was ponding observed. It's unclear if this is from settlement or from improper original placement, however this causes a puddle at an intersection which in the winter could freeze and cause a safety hazard. We recommend that this puddle be corrected.

Curbing

The curbing on-site consists of Cape Cod berm (approximately 11,500 lf). Cape Cod berm is the cheapest type of curbing to construct, and the least durable. A fair amount of the curbing on-site was observed to have received some damage from plowing and/or construction traffic. Most of the damage was minor and is expected due to plowing. No specific areas of curbing were damaged to such a great extent that repairs are recommended.

Septic Systems

There is no public sewer available on-site therefore all the effluent is treated by individual and shared septic systems. Since the septic systems are buried beneath the ground they are difficult to access their condition. Refer to Section 4 for Septic system maintenance required. The scope of this inspection is limited to a visual review of the two shared septic systems of concern. One of

which is behind 21 Quarry Road and the other is behind 33 Black Forest Circle. These are both shared septic systems that the association has observed erosion/water seepage. Refer to the inspection report for a detailed review.

Drainage System

Stormwater is collected by a closed drainage system consisting of catch basins, drain manholes, and plastic HDPE culverts which outlet to concrete headwalls and flared end sections generally located at detention and/or treatment ponds. Culverts made of plastic are expected to require little to no maintenance or replacement cost, provided they are not damaged. Refer to the Section 5 for stormwater maintenance requirements. Refer to the inspection reports for additional information. Inspection and maintenance reports for the drainage system including stormwater treatment as described below, must be submitted to the Town of Londonderry annually.

Stormwater Treatment (Detention Ponds, Level Spreaders, Headwalls, Outlet Structures)

The stormwater management consists of multiple vegetated detention ponds, water quality unit, and rain gardens, along with flared end sections and concrete outlet structures. These vegetated areas should receive yearly removal of vegetation around the outlets/inlets, and removal of sediment and vegetation when they become silted in and overgrown.

Water/Hydrants

The water distribution system is owned and maintained by Pennichuck Water Works (Pennichuck); however, it appears that the hydrants are owned by the Association. Life expectancy of a hydrant, provided it is properly maintained, could be 50+ years. Based on conversations with Pennichuck, the maintenance of the hydrants is performed by Pennichuck and funded by a fire service charge paid by the Association.

Steep Riprap Slope

A steep riprap slope was installed behind units 16-19. No details of the riprap wall were found. We have reviewed the proximity of the homes to the slope. Refer to the inspection report for more info.

Buried Electricity/Cable/Telephone

Electrical utilities are located underground with pull boxes and transformers. These utilities within the street are typically maintained by the respective utility and are not expected to add any maintenance expenses to the Association budget.

Landscaping/Erosion

There are a few areas on the site that have some minor erosion. There are a few areas where landscaping is missing. Refer to the inspection report for detailed locations of the missing shrubs and erosion. Note that any erosion controls should be removed once the areas become stable.

Irrigation

Irrigation systems were not reviewed as part of this inspection. The irrigation systems connect to each individual home. Irrigation design plans were not found; therefore, it is unclear as to the extent or layout of the system. Irrigation systems should be blown out prior to freezing

temperatures to avoid damage. Presumably, this is already incorporated into the landscaping contract.

Chain Link Fencing

Black vinyl-coated chain link fencing was observed at the top of the riprap slopes and retaining walls. The vinyl coating protects the fence and should extend its life expectancy. Except for accidental damage by falling trees and vandalism, this fence is expected to last at least 20 years. The fence appears to be in good condition, however with it being at the top of the slope it may be damaged if erosion occurs. This would also be a good indicator that the slope is failing.

Street and Area Lighting

There appears to be six large light poles for the parking lot along with building mounted lighting at the clubhouse. The rest of the lighting appears to be residential fixtures controlled by each individual unit. No deficiencies were observed with the lighting.

Catch Basin Maintenance

Some of the catch basins on Quarry Road were observed to be partially full of sediment and should be cleaned out. All catch basins should be checked and if necessary, cleaned of sediment upon completion of construction. Moving forward, catch basins should be cleaned when sediment is at a depth of 6-inches or greater.

Driveways/Pavement Scuffing

Some of the driveways have been constructed without removing or lowering the curb. Scrapes on some of the driveways indicate that this was causing vehicles to bottom out. It was observed that some of the driveways have been corrected, and some more driveways were in the process of being repaired during the site visit. The repairs were made by saw cutting the driveways approximately 5' from the curb line and repaving the last section driveway. These repairs should correct the concern; however an additional joint is created. These additional joints should be crack sealed to prevent failure at these joints.

It was also observed that these repairs were done approximately 5 weeks after the top coat of pavement was laid. Due to the heat of the summer the pavement is still somewhat soft and some scuffing and minor damage has occurred in the street adjacent to these driveways. Most of this is cosmetic, but it appears as if in some areas, small gouges were filled with asphalt. These gouges are likely to be the first to fail and create potholes in the future if not maintained.

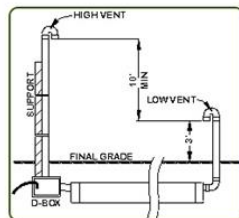


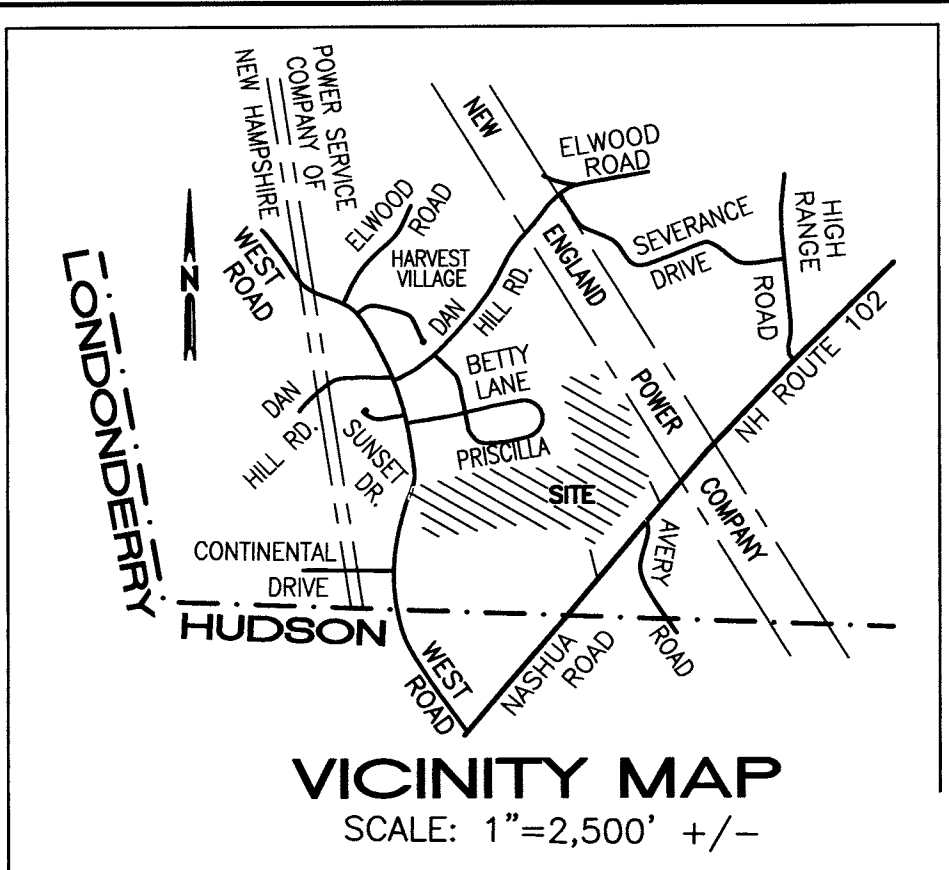


Pumped Septic Systems

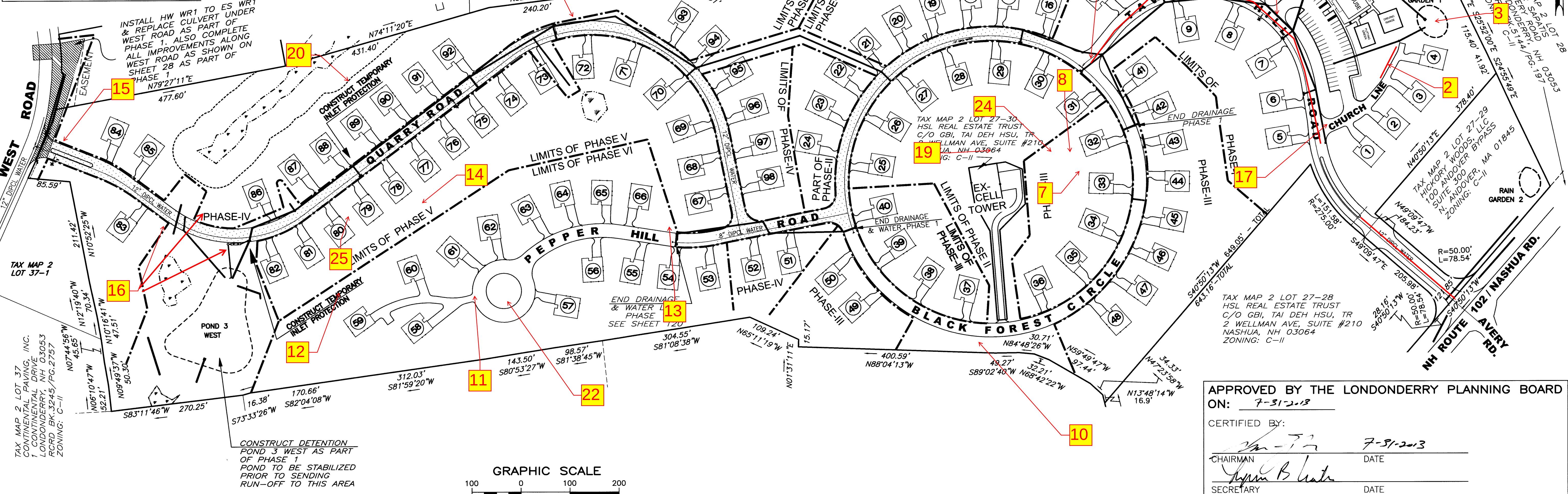
We reviewed two pump septic systems. Neither of the septic systems had the “high vent” that was called out in the septic design. The high vent is required to maintain proper air circulation. The vent coming from the D-box should be raised to maintain a 10’ separation between the high and low vents. While this was only observed for two leach fields, all pumped septic systems in the development should be confirmed that they have a high and low vent. These high vents are recommended to be run up a nearby tree for support and to screen visually. Painting it the color of the bark also helps to blend the vents.

- High and low vent openings must be separated by a minimum of 10 vertical feet.
- The high and low vents should be of the same capacity.
- A low vent is installed through an offset adapter at the end of each row, Section or Basic Serial Bed.
- Low vents should be a minimum of 3 ft. high or above snow line.
- Alternatively, the low vent may be attached to the d-box and the high vent may be attached to the end of the last AES or Enviro-Septic® row. If this configuration is used in cold climates, the d-box must be insulated to prevent it from freezing.
- A high vent is installed through an unused d-box outlet (see diagram below).
- Sch. 40 PVC or equivalent should be used for all high vents.
- All high vents should be at least 4 in. in diameter.
- All vents higher than 3’ should be anchored.





Site Inspection Index Plan
by CLD Consulting Engineers
8-15-2017
Refer to Report for
details of each number



PHASING NOTES:

1. HICKORY WOODS SHALL CONSIST OF THE FOLLOWING PHASES:

PHASE-I: SEE SHEET 120 FOR DETAILS OF PHASE I CONSTRUCTION

PHASE-II: CONDOMINIUM UNITS 16-31
FINISH CONSTRUCTION OF BLACK FOREST CIRCLE, INCLUDING WATER SERVICES, ELECTRIC AND PAVEMENT TO BINDER FOR ENTIRE LENGTH OF ROAD

PHASE-III: CONSTRUCT NEW CELL TOWER ACCESS DRIVE

PHASE-IV: CONDOMINIUM UNITS 32-50
CONDOMINIUM UNITS 51-52 & 84-98
FINISH PEPPER HILL ROAD STA. 0+00 TO STA. 3+50, INCLUDING WATER SERVICES, ELECTRIC AND PAVEMENT

PHASE-V: FINISH QUARRY ROAD STA. 0+00 TO STA. 18+98, INCLUDING WATER SERVICES, ELECTRIC AND PAVEMENT FOR THE ENTIRE LENGTH OF THE ROAD

PHASE-VI: CONDOMINIUM UNITS 67-83
CONDOMINIUM UNITS 53-66
PEPPER HILL ROAD STA. 3+50 TO 10+31 INCLUDING THE CROSS COUNTRY DRAINAGE RUN TO DETENTION POND 3 WEST

2. THE DEVELOPER RESERVES THE RIGHT TO INTERCHANGE PHASES III, V AND VI

3. THIS PLAN SET SHOWS THE OVERALL PROPOSED SIX (6) PHASE PROJECT. HOWEVER, APPROVAL FOR CONSTRUCTION SHALL NOT BE VALID UNTIL PLANS FOR EACH PHASE, TO BE SUBMITTED PRIOR TO CONSTRUCTION OF EACH NEW PHASE, ARE APPROVED BY THE PLANNING BOARD.

OWNER OF RECORD

Toddle New 7-22-13

HSL REAL ESTATE TRUST
C/O GBI - TAI-DEH HSU, TRUSTEE

DATE

#	DATE	REVISION	BY	APP.
1	1/2013	DRC & STANTEC COMMENTS	JS	
2	3/2013	STANTEC COMMENTS	JS	
3	5/2013	NOTICE OF DECISIONS	JS	
4	6/2013	JUNE 4 MEMO	JS	
5	7/2013	WATER REVISION	JS	
6	7/2013	JULY 15 MEMO	JS	

APPROVED BY THE LONDONDERRY PLANNING BOARD
ON: 7-31-2013

CERTIFIED BY:

[Signature] 7-31-2013

CHAIRMAN DATE

[Signature]

SECRETARY DATE

OVERALL DEVELOPMENT PLAN
HICKORY WOODS
TAX MAP 2 LOT 27
WEST ROAD/NH ROUTE 102
LONDONDERRY, NEW HAMPSHIRE 03053

OWNER OF RECORD: HSL REAL ESTATE TRUST
C/O GBI, TAI-DEH HSU, TR
2 WELLMAN AVE, SUITE #210
NASHUA, NH 03064

PREPARED FOR: HICKORY WOODS, LLC
100 ANDOVER BY-PASS, SUITE 300
NORTH ANDOVER, MASSACHUSETTS 01845

SCALE: 1"=100' SHEET 5 OF 120 SEPTEMBER 18, 2012

BENCHMARK ENGINEERING, INC.
Consulting Engineers Land Planners
11 Commons Drive, Suite 39
Londonderry, New Hampshire 03053
Phone: (603) 437-5000

Site Infrastructure Inspection Details

Refer to Site Inspection Index Plan for specific location.

1. Puddle at Community Center Entrance:

We observed a puddle at the entrance of the Clubhouse parking lot off of Tavern Hill Road. It's unclear if this is from settlement or from improper construction. This puddle will freeze and cause ice and potentially cause an accident.



2. Church Lane Erosion:

The north side of Church lane is eroding due to stormwater runoff & a lack of curbing or swale in this location. The edge of the pavement is starting to receive damage and sediment is being washed to the catch basin and rain garden. This swale should be stabilized as soon as possible to prevent damage to the pavement. Many methods are possible, but cutting in a small swale is recommended, with either loam, seed, and jute matting, or small riprap underlaid with filter fabric would also likely work.



3. Rain Garden #1: (End of Church Lane)

There are multiple deficiencies observed with Rain Garden 1 including the following:

- The outlet structure is missing its grate. This should be installed immediately.
- The PVC inlet pipe extends too far into the pond. This pipe should be cut back with a flared end section or at minimum riprap stabilization.
- There is sediment accumulated in the pond
- Where the edge of the sod from the neighbor's house meets the top of the pond is an abrupt drop-off which will likely erode in the future and be difficult to mow. We recommend blending the transition better.
- The back of the pond (opposite the outlet structure) is steeper than planned. It's unclear if this is due to ledge or a large boulder. This may be a cause for concern as the grass is slightly thinner than the rest of the area.
- The design plans call for a rain garden planted with shrubs and a mulch bottom. This appears to have been constructed as a typical detention pond.



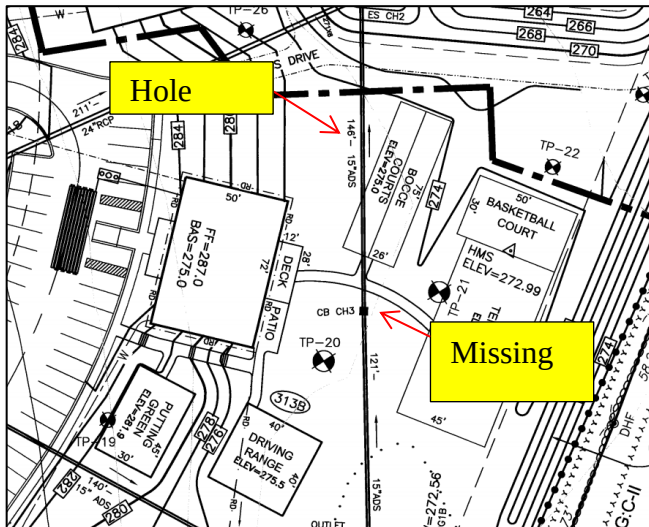
4. Detention Pond 1NE

The detention pond appears overall in good shape and functioning well. Some of the grass around the outlet side is fairly thin. Additional grass seed may be planted to provide a denser vegetated cover to protect this from eroding.



5. Missing Catch Basin

The design plans call for a catch basin to be located behind the clubhouse. This catch basin appears to not have been installed and the area behind the clubhouse is soggy and does not drain during rain events. It's unclear why this catch basin was not installed. There is also a hole in the lawn that accumulates water



6. Clubhouse Exterior:

There are three noted deficiencies on the exterior of the clubhouse.

1. The retaining wall on the north side is separating slightly from the foundation and may cause sediment transport.
2. The air conditioning unit is sinking
3. There is a vent pipe that is disconnected and is tattered.



7. Ledge Erosion behind unit 32

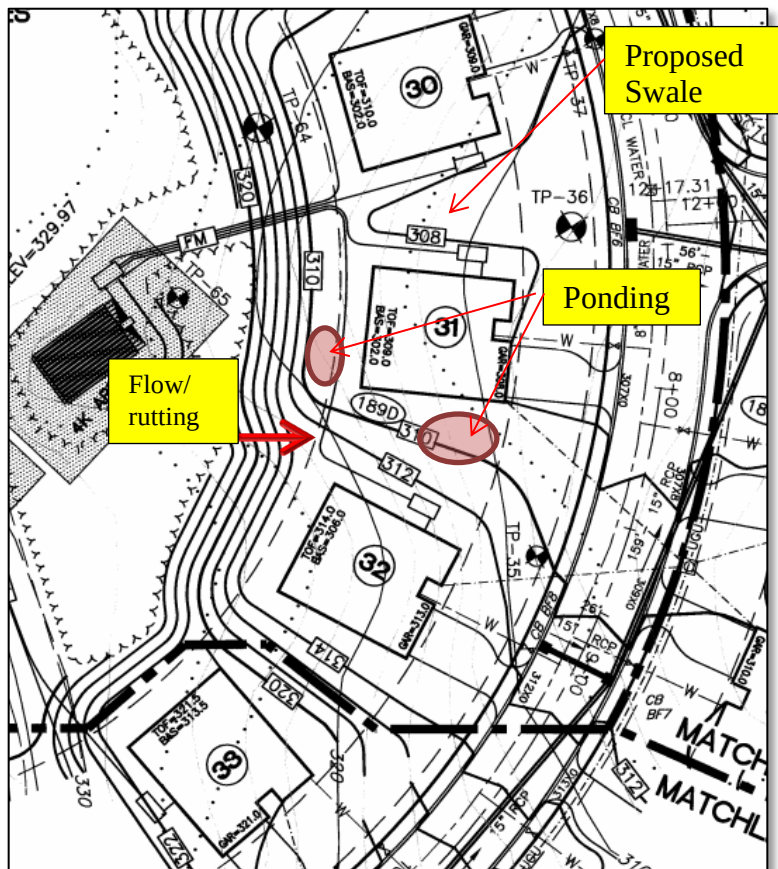
There is an area behind unit 32 (31 Black Forest Circle) that was blasted/hammered and is exposed ledge. While the ledge itself appears stable, there is exposed sand above the ledge and to the side of it that does not appear stable. This could potentially cause the trees above the ledge to fall down onto the house. The exposed sand should be stabilized somehow to prevent additional erosion and trees from falling onto the house. It is recommended that a geotechnical engineer inspect and provide recommendations.



8. Drainage behind unit 31/32 (#33 Black Forest Circle)

The stormwater from the cell phone tower area all flows directly to the backyard behind #33 Black Forest Circle (Unit 31). This stormwater is causing some rilling in the slope and is causing some ponding in the backyard and then it flows between units 31 and 32. The slope between unit 31 and 32 is very flat which is also causing some ponding between the two homes. The design intent was for this stormwater to flow between units 30 and 31 where a swale could collect it and route it to the catch basin in the street.

Diversion methods should be explored or perhaps infiltrating the stormwater before it makes it down the banking would be an alternative. We suggest that the design engineer be involved in proposing solutions. It was also observed that the swale between 30 and 31 was not constructed per the design plans and is also ponding between the homes. The concern with ponding between and around the homes is that the basements could flood. A potential alternative is to provide yard drains to connect to the catch basin in the street



9. Tree Buffer along Quarry Road:

The plans indicate that at least 10 trees to supplement the buffer should be added. There are only 3 trees provided and noticeable gaps where the additional trees would help supplement the buffer to the abutting property.

The area is also unstable, both along the treeline and around the transformer. Loam and hydroseed should be added to stabilize the area.



10. Tree Buffer along Black Forest Road:

The plans indicate that 25 evergreen trees should be planted along the berm. Only 9 trees were observed in the field, with holes where some of the dead trees have been removed. The trees should be replanted with temporary or permanent irrigation to ensure they survive.



11. Catch Basin at Pepper Mill Cul-De-Sac

The catch basin at the end of the cul-de-sac appears to have been designed to take the roadway flow. The road and cul-de-sac appears to have been constructed differently than planned which causes the runoff to head down the shared driveway to the catch basin in the pavement. The drainage seems to be working fine, but the concern is in the winter that this long flow

path may cause icy conditions. The steepness of the driveway may allow it to drain properly however. The runoff also flows alongside the driveway for part of the driveway, which in the future may cause erosion. The area should be reviewed in the winter for icing concerns and reviewed periodically to ensure erosion isn't occurring at the edge.



12. Slope behind Unit 59

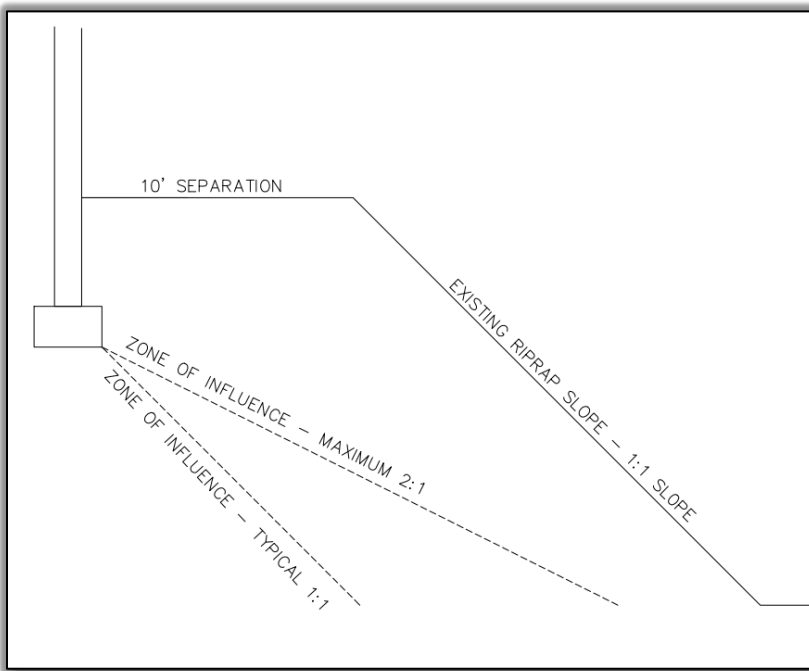
The slope behind unit 59 is fairly steep and fairly long. During our second visit we observed some minor rilling in the slope. On a follow up visit on July 26 the rills have partially stabilized, however the rills should have a bit more seed added and perhaps a short section of straw wattle to ensure the rills become fully stabile.



13. Riprap Slope behind units 16-19

We were asked to review the riprap slope behind units 16-19 (4 – 10 Black Forest Circle) to review the proximity of the homes to the steep slope and the condition of the slope. A detail was not found for the slope so we don't know if this was engineered or constructed by the contractor without design. Typically slopes as steep as this should be designed by a geotechnical engineer, and at a minimum under laid with a filter fabric, laid with thick layer of riprap (typically 8-12" +), with benching constructed mid slope. The slope appears to be constructed from mostly variable diameter riprap but it wasn't obvious if it was underlaid with fabric. Overall the slope appears to be mostly stable except for a portion where a foundation/roof drain outlets at the top of the slope behind 6 Black Forest Circle. There is minor erosion around the outlet which should be stabilized to prevent undermining and additional erosion and an area that needs a bit more stabilization. It was also noted that a planter at the top of the slope appears to have shifted/sunk after its installation. Since the slope doesn't appear to be engineered, the slope should be visually monitored for stability on a somewhat regular basis. It is recommended that the developer have a geotechnical engineer review the stability of the slope and offer assurance that the slope was properly constructed and will be stabile in the long term.

The closest house sits approximately 10 feet from the top of the slope. The riprap is a 1:1 slope. The zone of influence of the house is typically a 1:1 slope but can max out at 2:1. Based on the proximity of the slope to the house we do not anticipate the house footings having an influence on the slope, so provided this slope remains stable it should not cause danger to the homes.



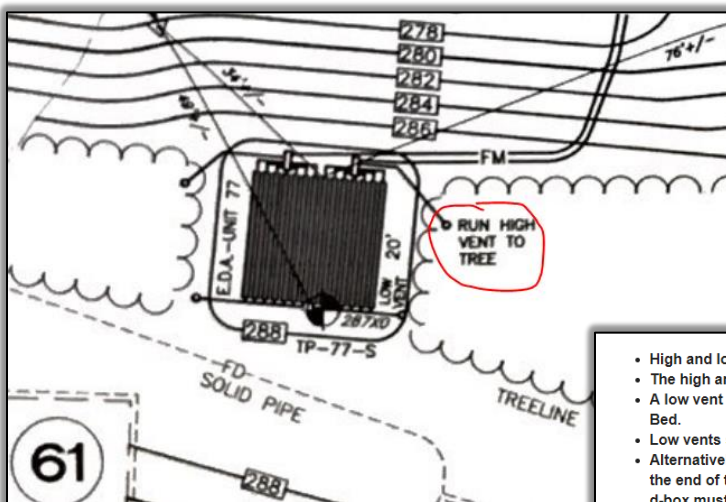
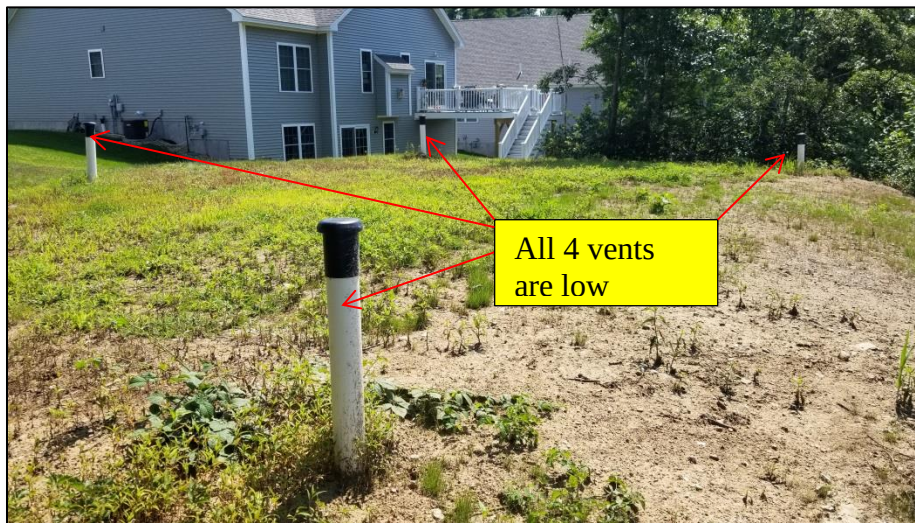
14. Septic/Slope behind units 77 & 78

We inspected the slope behind units 77 and 78. This area was recently regraded. At the time of the initial inspection on July 9 it appeared to have been seeded. We visited a second time on July 26 and the seed has only partially started to vegetate. Due to the placement during the peak of summer it is anticipated that this seed will not take well until cooler weather occurs in September/October. Additional seeding will likely be required as birds, heat, and erosion have limited the amount of seed available to germinate. The plans also call for jute matting which has not been placed. Jute matting would help protect the seed and is recommended to be placed with an additional seeding in the late summer/early fall.

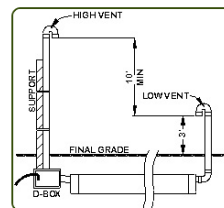
We also performed two auger holes to review any issue with the septic system. The first was in the sand at the edge of the leach field. The sand appeared dry and to meet the system sand specifications. The second auger was mid slope to look for seepage from the leach field. No seepage or signs of failure were observed. There was some dead grass noted at the bottom of the slope. This appears to be caused by sediment washing down the slope.



One noted deficiency is that the pumped leach fields were supposed to have a high vent off of the D-Box and a low vent off of the end of the leach field. In the field it was observed that there were 4 low vents. The high vents (off of the D-box) should be 10' higher than the low vent to allow for proper air circulation. This will cause the system to fail if not corrected. While most of the remaining septic systems were not inspected, the high vent/low vent differential should be completed at all pumped systems. Gravity systems only need the low vent as the high vent is run through the house.



- High and low vent openings must be separated by a minimum of 10 vertical feet.
- The high and low vents should be of the same capacity.
- A low vent is installed through an offset adapter at the end of each row, Section or Basic Serial Bed.
- Low vents should be a minimum of 3 ft. high or above snow line.
- Alternatively, the low vent may be attached to the d-box and the high vent may be attached to the end of the last AES or Enviro-Septic® row. If this configuration is used in cold climates, the d-box must be insulated to prevent it from freezing.
- A high vent is installed through an unused d-box outlet (see diagram below).
- Sch. 40 PVC or equivalent should be used for all high vents.
- All high vents should be at least 4 in. in diameter.
- All vents higher than 3' should be anchored.



15. Curbing at exit

The curbing at the exit to West Road needs loam and seed behind it to complete the stabilization. The shoulder on West Road and the grass beyond the shoulder need to be cleaned up and stabilized.



16. Debris at staging area

There is some construction debris remaining and two staging areas near lot 83 (37 Quarry Road) that should be removed and vegetated. The shoulder next to the detention pond also needs to be stabilized.



17. Cracking Tavern Hill Road

A fairly large crack was observed the entire length of Tavern Hill Road. This may have been caused by construction traffic or just normal wear. The crack is small enough to fill with crack sealant, but should be done as soon as possible and monitored and filled in as necessary to avoid premature roadway failure.



There are also cracks at the intersection of Tavern Hill/Church Lane, and the Community Center driveway that should be filled



18. Cracking around catch basin

One catch basins at the intersection of Tavern Hill and Black Forest have received more cracking than would be considered normal. At a minimum these cracks should be crack sealed to prevent further damage and potholes.



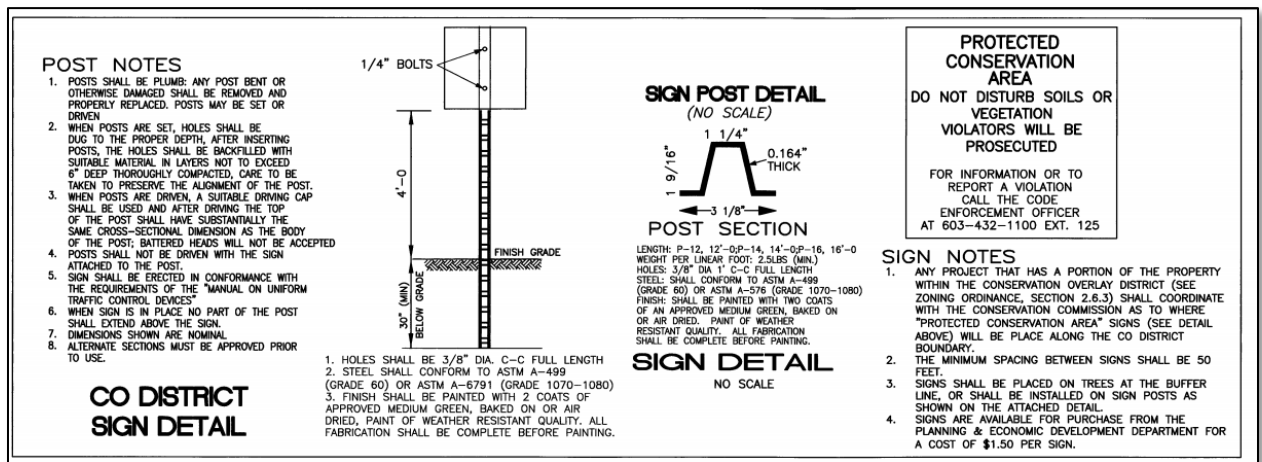
19. Building Materials

There are piles of building materials near the cell phone tower. These should be removed.



20. Missing Wetland Signs at Quarry Road

The developer was supposed to install Conservation overlay district signage at the 50' wetland buffer behind units 86-92 on Quarry Road. No signs were observed during the sitewalk. These signs are required by the Town Zoning Ordinance.

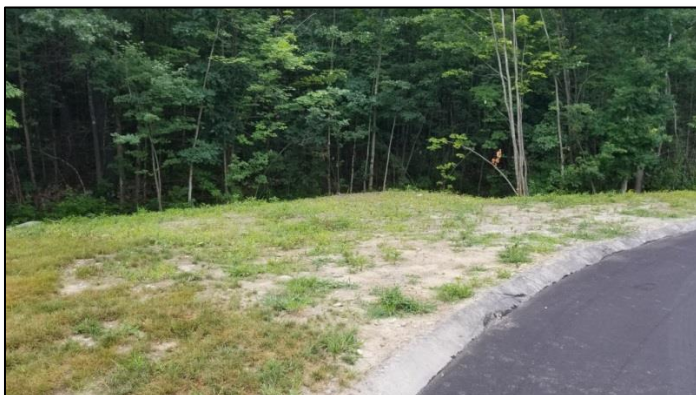


21. Missing Wetland Signs at Tavern Hill Road

The developer was supposed to install Conservation overlay district signage at the 50' wetland buffer behind units 10-14 on Tavern Hill Road. No signs were observed during the site walk. These signs are required by the Town Zoning Ordinance.

22. Erosion at Pepper Hill Cul De Sac

The center of the cul de sac on Pepper Hill Road and the south side of the cul-de-sac have not been stabilized and are in need of loam and seed.



23. Minor Pitting at Clubhouse Sidewalk

Some minor pitting was observed in the sidewalk in front of the clubhouse.

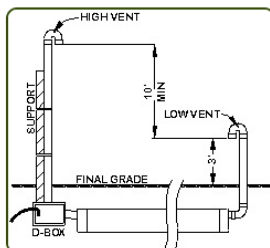


24. Septic behind unit 32

The septic vents for the septic system behind unit 32 were installed improperly. The plans (and proper practice) require that a high vent and a low vent be installed. The high vent should be 13' tall and the low vent should be 3' tall. The vents installed in the field are approximately 5' tall and 8' tall. This separation doesn't allow for proper airflow through the system and may cause the system to become anaerobic and fail. The proper venting should be installed.



- High and low vent openings must be separated by a minimum of 10 vertical feet.
- The high and low vents should be of the same capacity.
- A low vent is installed through an offset adapter at the end of each row, Section or Basic Serial Bed.
- Low vents should be a minimum of 3 ft. high or above snow line.
- Alternatively, the low vent may be attached to the d-box and the high vent may be attached to the end of the last AES or Enviro-Septic® row. If this configuration is used in cold climates, the d-box must be insulated to prevent it from freezing.
- A high vent is installed through an unused d-box outlet (see diagram below).
- Sch. 40 PVC or equivalent should be used for all high vents.
- All high vents should be at least 4 in. in diameter.
- All vents higher than 3' should be anchored.



25. Flooding at 25 Quarry Road

25 Quarry Road has had flooding issues with water ponding adjacent to their home and then seeping into their windows, which required a pump to remove the water. There is a fairly large area behind multiple homes which flows to this area. There is almost no pitch away from the house, and then a high point near the front of the house which retains water. There should be a swale or drain pipe in this area to divert water away from the house. This will continue to be an issue and continue to cause flooding in the basement if not corrected



Section 4: Septic System Maintenance

The Hickory Woods development has approximately 76 leach fields, some of which are shared between multiple homes, and approximately 99 septic tanks (one for each home, plus one for the clubhouse). Septic systems require maintenance to remain functional and we recommend that care instructions be distributed to the individual homeowners to ensure that the septic systems last.

What is a septic System?

A septic system is a system that collects, treats, and disperses sewage when a sewer system isn't available. The septic system consists of piping, a septic tank, a leach field, and sometime an effluent pump. The piping exits the house and enters the septic tank. The septic tank collects the sediment and settles out the solids. Bacteria grow within the tank and feed on the sewage which breaks it down and provides some treatment. The septic tank allows the effluent time to settle out a large percentage of the solids. Once the effluent leaves the septic tank it flows to the leach field. The leach fields in Hickory Woods are manufactured by Presby Environmental and called Enviro-Septic. They consist of a 12" HDPE (Plastic) pipe, wrapped in filter fabric and plastic media. This filter fabric and media provides a place for additional bacteria to grow that consume much of the remaining pollutants within the effluent. After flowing through the fabric the effluent then flows through a 6" sand layer and into the natural aquifer. The 6" sand and natural soil beneath provides the remaining treatment so the effluent is fully treated by the time it reaches the natural aquifer.

Pumping

It is recommended that septic tanks be pumped every 2-3 years. The cost of this can vary from \$200-\$300 for each tank, but may be less if multiple tanks are pumped simultaneously. It is our understanding that the tanks and pumping are the responsibility of each homeowner, but the leach fields are the responsibility of the association. We recommend that the association consider providing the tank pumping services as it is not guaranteed that each homeowner will pump their tank. With this being a 55+ community, the solids generated may be less than a family would generate, so the pumping time may be extended, however it is recommended to stick with the 2-3 year window and ask the pumper to provide recommendations if the pumping schedule can be extended.

Other considerations

A septic system is a biological ecosystem for the bacteria. As such, the introduction of harsh chemicals or an extreme amount of sewage can kill the bacteria and clog the leach field, resulting in expensive repair and replacement. Below are some recommendations on how to protect the leach fields

- Pump the tank every 2-3 years
- If an effluent pump is included, it should be inspected yearly by a septic pump service
- Do not use garbage disposals. The grinder chops solids too fine and they can clog the leach field as they pass through the septic system.
- Correct plumbing leaks as soon as possible. A leaky toilet or sink can flush large amounts of water through the tank, potentially causing failure.

- Use chemicals sparingly. Bleach, cleaning products, and excess beauty products can kill the helpful bacteria in the leach field.
- Do not dump chemicals, including but not limited to paint, gasoline, bleach, etc. down the drain.
- Do not dump fats, oils, and grease down the drain. Instead collect them and place in the trash. The bacteria cannot consume the high fat content and it could clog the leach field.
- If an outlet filter is installed, be sure to inspect and maintain it regularly. A outlet filter will clog over time if not maintained.
- If a large usage is anticipated such as a party, it is recommended to pump the tank in advance or rent a port-o-potty. A large amount of sewage being flushed can flush the solids directly to the leach field.
- Water softeners should not outlet to the leach field. If provided, the softener system should outlet to a drywell instead. The salts will kill the bacteria.

Additional Resources

A fact sheet is provided attached to this report from the New Hampshire Department of Environmental Services (NHDES), and also available here

<https://www.des.nh.gov/organization/commissioner/pip/factsheets/ssb/index.htm>.

ENVIRONMENTAL Fact Sheet



29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-SSB-13

2011

You and Your Septic System *A Homeowner's Guide to Septic System Maintenance*

Your septic system is a highly efficient biological system that can effectively digest and disperse your household sewage and other organic wastes. Properly designed, installed and maintained, it should give you many years of trouble-free service, **but only if it is properly maintained**. The key to the life and service of any septic system is proper maintenance.

How Does Your Septic System Work?

A septic system is designed to condition untreated liquid household waste (sewage) so that it can be readily dispersed and percolated into the subsoil. Percolation through the soil accomplishes much of the final purification of the effluent, including the destruction of disease-producing bacteria.

Your septic tank is the first step in the process of sewage conditioning. Without it, the untreated sewage would quickly clog the receiving soil and prevent the purification process of leaching and soil percolation. Septic tanks serve three functions:

- Removal of solids.
- Bacterial action.
- Sludge and scum storage.

In the first step, as sewage enters the septic tank, its rate of flow is reduced so that the larger solids sink to the bottom or rise to the surface. These solids are retained in the tank, and the clarified effluent with suspended and dissolved solids is discharged.

Bacterial action is the second function. The solids and the liquids in the tank are partially decomposed by bacteria and other natural processes. These bacteria are called anaerobic because they thrive in the absence of free oxygen. This decomposition of sewage under anaerobic conditions is termed "septic," hence the name of the system (and the cause of the odor).

Storage is the third function of your system. Sludge is the accumulation of solids at the bottom of the tank, while scum is a partially submerged mat of floating solids that may form at or near the surface. Space must be provided in the tank to store the residues during the intervals between cleaning. Otherwise, the sludge and scum will eventually be scoured from the tank and will clog the leach field and receiving soil. **PERIODIC CLEANING OF YOUR TANK IS ESSENTIAL TO ITS PROPER FUNCTION.**

Finally, the treated effluent from the septic tank is discharged to the leach field where it percolates through suitable gravel and finally into the subsoil for further purification.

Remember: A properly maintained septic system will adequately treat your sewage. A septic system failure is unhealthy, illegal if not corrected and a nuisance. Also, replacing an existing system can be costly! The life of the system can be prolonged by proper maintenance and frequent tank pumping.

What You Can Do to Properly Maintain Your Septic System

First and foremost, inspect your septic tank every year. If the sludge and surface scum combined are as thick as 1/3 the liquid depth of your tank, have the tank pumped out by a licensed pumper. Your tank should be pumped out **at least every two to three years**.

Do not flush bulky waste or grease into the system. It can plug the sewer and/or distribution lines.

Do not flush toxic materials into the system. Paint thinner, gasoline, pesticides, chlorine, drain cleaners and other caustic or toxic substances can kill the naturally-occurring bacteria in the tank and impair its function. If in doubt, don't flush it.

Conserve water. Too much water can overload your system and adversely affect its function.

Don't allow vehicles or livestock on your leach field. The weight can compact the soil and/or break pipes.

Any soggy areas around the system, or disagreeable odors, could indicate system failure. Have it checked.

Additional Suggestions

Minimize or eliminate use of kitchen "disposal" units, which grind up food wastes and place a burden on the septic tank, especially if the original septic design did not accommodate one.

If water treatment system backwash has been directed into the home septic system, check to make sure that the additional volume from the discharge can be accommodated by your septic system. Unfortunately the majority of treatment systems are installed after the home and septic system are built. The additional water to the septic tank and leaching field may cause problems with septic system operation or may overload the existing leaching area and result in premature failure. Additionally, some experts believe that the brine from backwashing may have detrimental effects on bacteria growth and may influence the soil's ability to infiltrate water.

Maintaining a Record

On the next page, is a template for creating a permanent maintenance record of your septic system for your files.

For More Information

For more information, please contact the DES Subsurface Systems Bureau at (603) 271-3501 or go on-line at <http://des.nh.gov/organization/divisions/water/ssb/index.htm> for detailed information.

Septic System Maintenance Record for: _____

First, in the space below, make a sketch of the location of your septic tank in relation to your house. Measure and record on your sketch the distances from the house foundation to the septic tank or cesspool cover, to the distribution box, leaching system and to other permanent features such as nearby trees or rocks.



Date System Installed: _____ Installer: _____

Record of Pumping Service / Maintenance	
Date	Septic Service Provider

For More Information

For more information, please contact the DES Subsurface Systems Bureau at (603) 271-3501 or go on-line at <http://des.nh.gov/organization/divisions/water/ssb/index.htm> for detailed information. Subsurface Systems Bureau; 29 Hazen Drive, PO Box 95; Concord, NH 03302-0095.

Section 5: Ongoing Stormwater Requirements

The Hickory Woods development was constructed on wooded/vegetated land. When stormwater falls on raw land, much of it absorbs into the ground. When that vegetation is replaced with homes, parking lots and pavement, the stormwater can no longer absorb into the ground and it runs off. NHDES and the Town of Londonderry have regulations in place to prevent damage from occurring downstream of the site due to this increase in stormwater. To prevent damage the stormwater is collected in detention basins which slow down the stormwater. Hickory Woods has a fairly extensive stormwater system in order to meet these rules and protect the environment and downstream property. This stormwater system starts with catch basins in the street which collect the stormwater. Pipes then extend to other structures such as drain manholes or other catch basins, then they outlet to detention ponds, rain gardens, swales, etc.

Treatment

Another consideration to the stormwater quantity is the stormwater quality. Stormwater quality is significantly decreased due to oils dripping from vehicles, salt and sand used in the winter, sediment from erosion, and organic matter accumulating. These contaminants are picked up by the stormwater and flushed through the stormwater systems. The purpose of the catch basins, sediment forebays, detention ponds and rain gardens are to remove this sediment and treat the stormwater.

Maintenance

As with the septic systems, the stormwater systems require maintenance to continue to function properly. The project also required an Alteration of Terrain (AOT) Permit from NHDES. As part of this, an inspection and maintenance manual was created by the engineer and developer. As the new owner of the project the Association will be responsible for the ongoing stormwater maintenance for the project. The maintenance is typically provided by your landscaping contractor and includes, but not limited to the following:

- Street sweeping sand off the streets in the spring.
- Inspect & cleanout catch basin sumps when the sediment depth is 6-inches or greater.
- Inspect Water Quality Units biannually remove sediment when it reaches $\frac{1}{2}$ the depth of the first orifice. Clean by pumping and pressure washing at least once per calendar year.
- Inspect forebays annually and remove sediment at least annually. Inspect rain gardens biannually and remove trash and debris. Inspect vegetation and maintain in a healthy condition including pruning and removal of invasive species and replacement of dead or diseased vegetation.
- Inspect detention ponds biannually, mow vegetation and remove sediment when it affects basin capacity. Remove trash and debris from any inlet or outlet structure when observed during inspection.
- Repairing erosion if/when it occurs anywhere on site.
- Inspecting swales, remove sediment, and make repairs as needed.

A copy of the inspection and maintenance reports must be submitted to the Town of Londonderry annually. Additionally, NHDES Alteration of Terrain may request a copy of these inspection reports. The Association could face fines for non-compliance.



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

April 25, 2013

Hickory Woods, LLC
Attn: Rick Welch
100 North Andover By-Pass, Suite 300
North Andover, Massachusetts 01845

Re: Hickory Woods
West Road/Route 102
Tax Map 2, Lots 27 & 28, Londonderry, NH

Permit: AoT-0548

Dear Applicant:

Based upon the revised plans and application, approved on April 25, 2013, we are hereby issuing RSA 485-A:17 Alteration of Terrain Permit AoT-0548. The permit is subject to the following conditions:

1. Activities shall not cause or contribute to any violations of the surface water quality standards established in Administrative Rule Env-Wq 1700.
2. You must submit revised plans for permit amendment prior to any changes in construction details or sequences. You must notify the Department in writing within ten days of a change in ownership.
3. You must notify the Department in writing prior to the start of construction and upon completion of construction. Forms are available at:
<http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm>
4. The plans and supporting documentation in the permit file are a part of this approval.
5. **This permit expires on April 25, 2018.** No earth moving activities shall occur on the project after this expiration date unless the permit has been extended by the Department. If requesting an extension, the request must be received by the department before the permit expires. The Amendment Request form is available at: <http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm>.
6. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits that may be required (e.g., from US EPA, US Army Corps of Engineers, etc.). Projects disturbing over 1 acre may require a federal stormwater permit from EPA. Information regarding this permitting process can be obtained at: <http://des.nh.gov/organization/divisions/water/stormwater/construction.htm>.
7. No construction activity shall occur until a Wetlands Permit is obtained from the Department, if applicable.

Sincerely,

Ridgely Mauck, P.E.
Alteration of Terrain Bureau

cc: **Londonderry Planning Board**
Londonderry Conservation Commission

cc: Benchmark Engineering, Inc.

DES Web site: www.des.nh.gov

P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095

Telephone: (603) 271-3503 • Fax: (603) 271-2982 • TDD Access: Relay NH 1-800-735-2964

Inspection & Maintenance (I&M) Manual for Stormwater Best Management Practices

Hickory Woods Unit Owners Association
Londonderry, NH

The purpose of this Inspection and Maintenance manual is to assist the responsible parties for maintaining and understanding the functions of the stormwater best management practices.

Party Responsible for Reporting, Inspection, & Maintenance after construction completion:

Hickory Woods Unit Owners Association
c/o Evergreen Harvard Group
17 Commerce Drive
Bedford, NH 03110
603-622-7000

Stormwater BMP's on Site:

- Catch Basins and Drain Pipes
- Sediment Forebay
- Pretreatment Swale
- Wet Detention Pond
- Infiltration Pond
- Rain Garden
- Water Quality Unit
- Outlet Protection

Recommended Maintenance for specific BMP's:

Catch Basins and Drain Pipes:

- Catch basins may require frequent maintenance. Depending on location, this may require several cleanings of the sumps each year. At a minimum, it is recommended that catch basins be inspected at least twice annually, once following snow-melt and once following leaf-drop, and cleaned as indicated by inspection.
- Remove grates and covers.
- Skim off oils and floatables
- Use stadia rod, measure the depth of sediment, if sediment is greater than 6-inches, vacuum or manually remove sediment.
- Replace grates or covers
- Record observation, depth, date and schedule next inspection.

Sediment Forebay:

- Inspect at least twice annually;
- Remove debris from outlet structures
- Remove and dispose of accumulated sediment based on inspection;
- Conduct periodic mowing of embankments (generally two times per year) to control growth of woody vegetation on embankments;
- Install and maintain a staff gage or other measuring device, to indicate depth of sediment accumulation and level at which clean-out is required.

Pretreatment Swale:

- Inspect at least twice annually for erosion, sediment accumulation, vegetation loss and presence of invasive species;
- Perform periodic mowing: frequency depends on location and type of grass. Do not cut shorter than 4-inches.

Wet Detention Pond:

- Inspect at least twice annually;
- Remove trash and debris from inlet and outlet structures
- Remove and dispose of accumulated sediment based on inspection;
- Conduct periodic mowing of embankments (generally two times per year) to control growth of woody vegetation on embankments;
- Remove any woody vegetation from fill embankments
- Inspect and repair embankments.

Infiltration Pond:

- Inspect at least twice annually;
- Removal of debris from inlet structures
- Remove and dispose of accumulated sediment based on inspection;
- Inspect and repair outlet structure and appurtenances;
- Conduct periodic mowing of embankments (generally two times per year) to control growth of woody vegetation on embankments;
- Remove woody vegetation from embankments
- Inspect and repair embankments;
- If an infiltration system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore infiltration function, including but not limited to removal of accumulated sediment or reconstruction of the infiltration trench.

Rain Garden:

- Inspect at least twice annually.
- Inspect pretreatment at least twice annually (sediment forebay or deep sump catch basins)
- Remove trash and debris at inspection.

- At least once annually, inspect for drawdown time. If system does not drain within 72 hours following rainfall event, then a qualified professional should assess the condition to determine measures required to restore filtration function.
- Inspect vegetation annually and maintain in healthy condition including pruning, removal and replacement of dead or diseased vegetation and removal of invasive species.

Water Quality Unit

- Inspect at least twice annually.
- Remove and legally dispose of floating debris at each inspection.
- Remove sediment when inspection indicates depth is approaching half the depth to the lowest orifice or other outlet in the first chamber baffle.
- Clean unit by pumping and pressure washing at least once per calendar year.
- Remove floating hydrocarbons immediately whenever detected by inspection.
- Dispose of sediments and other waste in conformance with applicable local, state and federal regulations.

Outlet Protection

- Inspect the outlet protection annually for damage and deterioration. Repair damage immediately.

Required Submittals:

- Annual submission of Operation and Maintenance Reports must be submitted to:
 - Town of Londonderry Department of Public Works.
268B Mammoth Road, Londonderry, NH 03053

Inspection Log & Checklist

Date_____

(make additional copies of this sheet for each inspection)

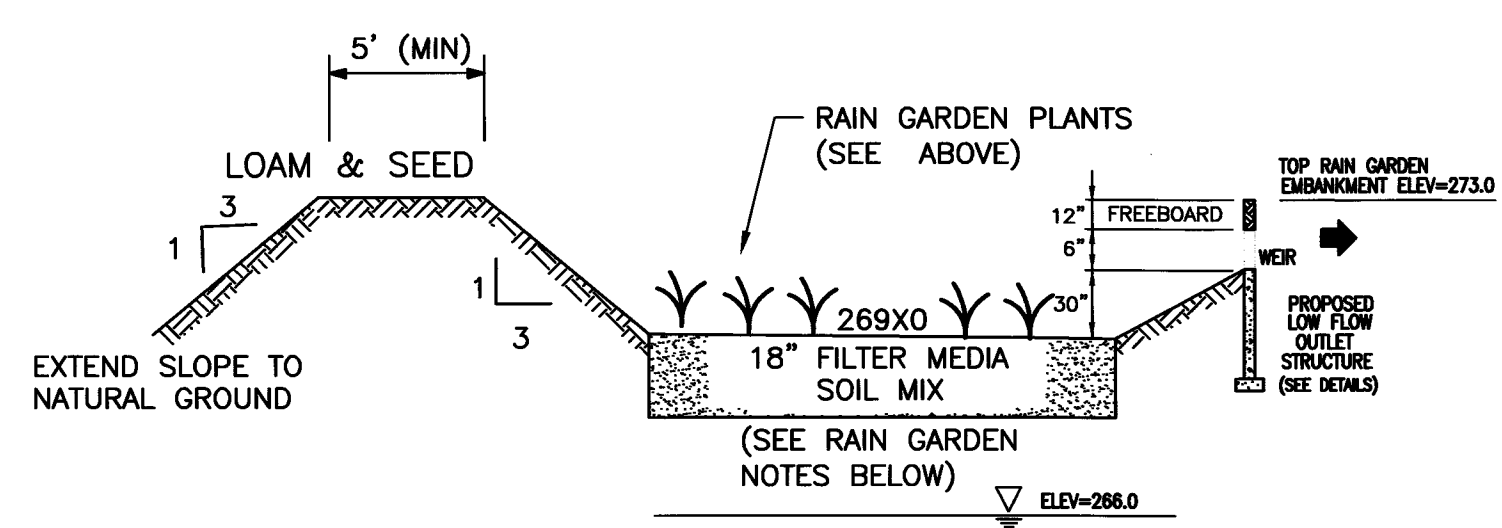
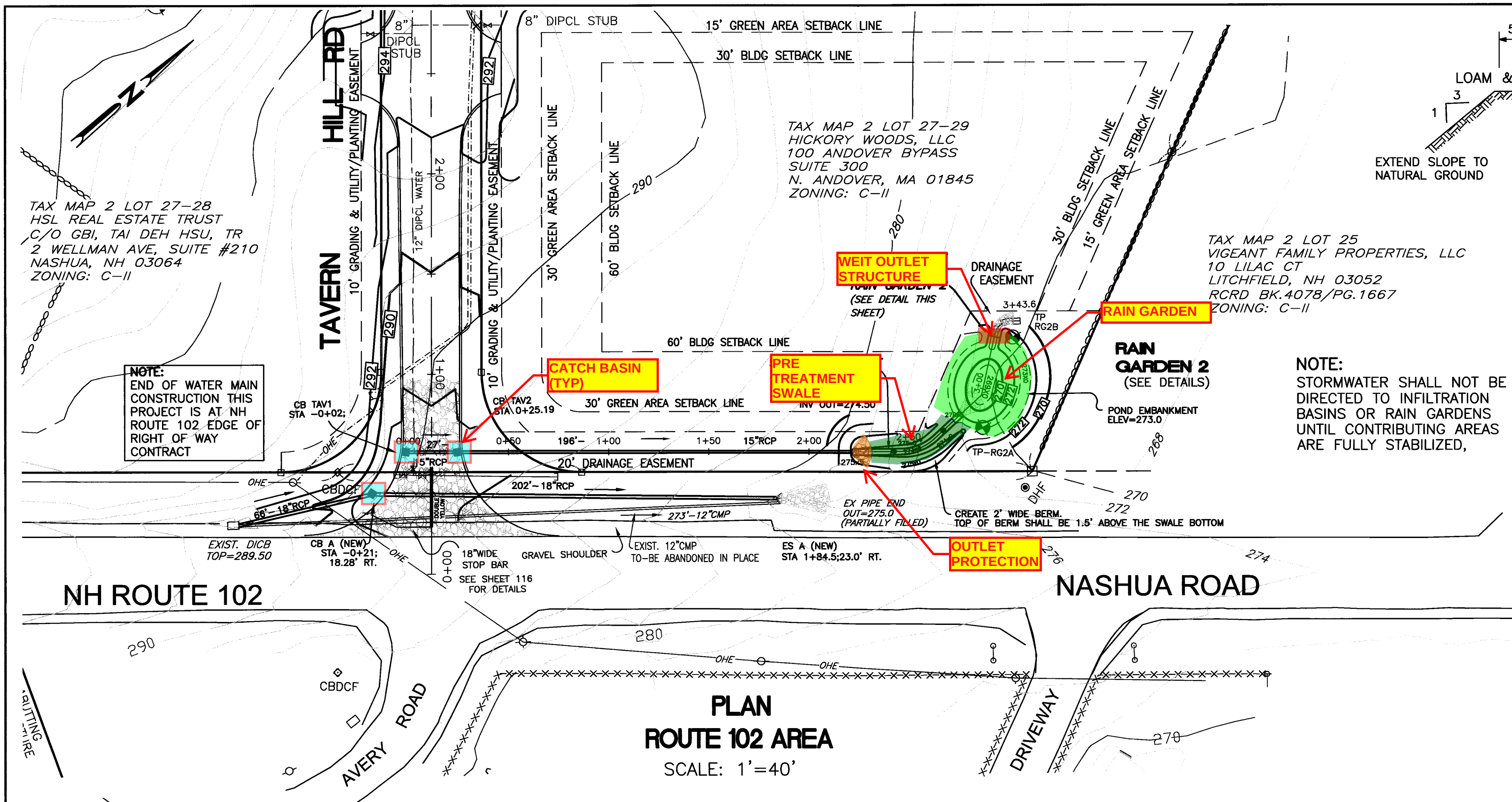
Best Management Practice (BMP)	Inspected? (Y/N)	Maintenance Required? (Y/N)	Repair Required? (Y/N)	List Specific Details of Maintenance or Repairs performed
Catch Basins and Drain Pipe				
Sediment Forebay				
Pretreatment Swale				
Wet Detention Pond				
Infiltration Pond				

Inspection & Checklist

Date_____

(make additional copies of this sheet for each inspection)

Best Management Practice (BMP)	Inspected? (Y/N)	Maintenance Required? (Y/N)	Repair Required? (Y/N)	List Specific Details of Maintenance or Repairs performed
Rain Garden				
Water Quality Unit				
Outlet Protection				

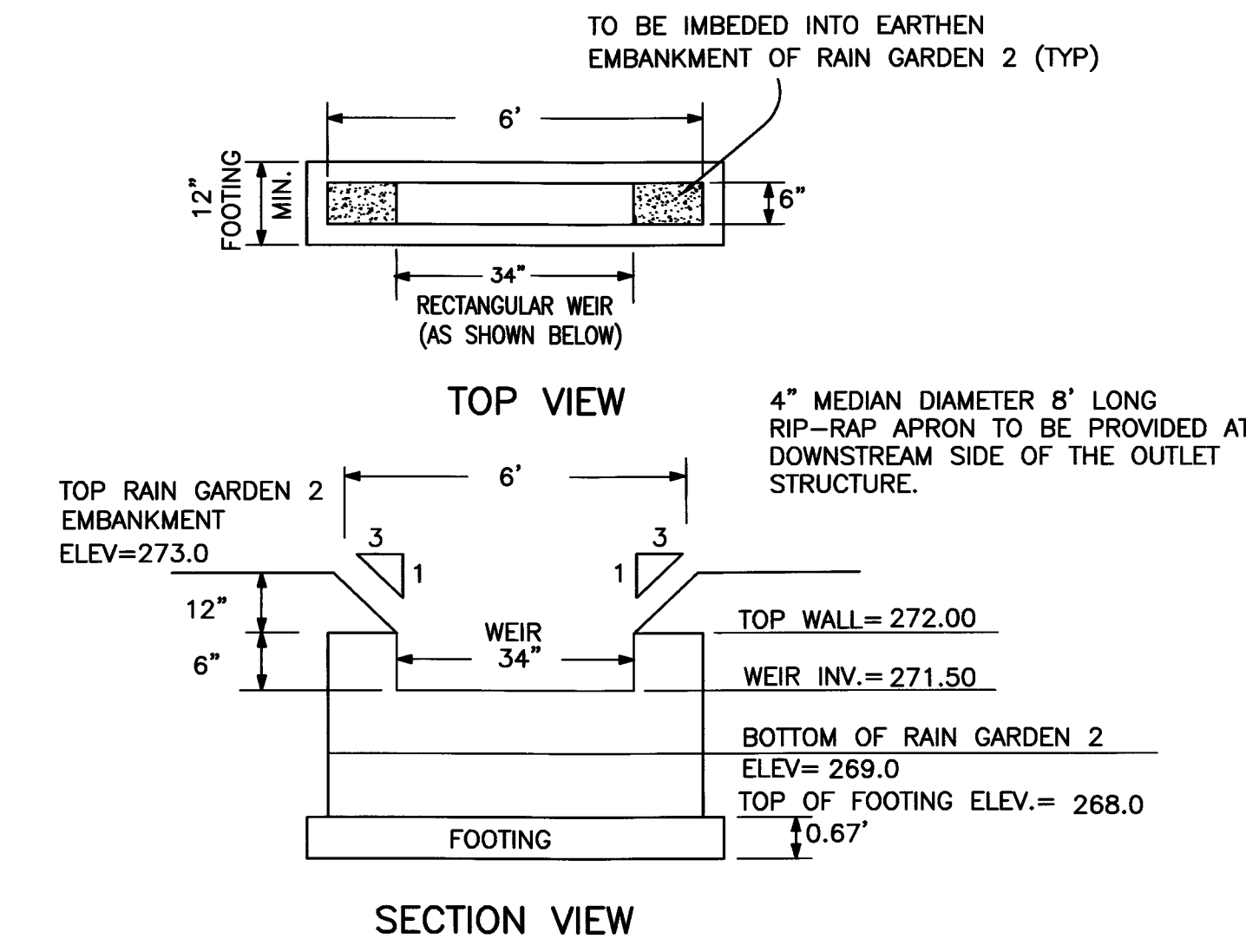


RAIN GARDEN 2 DETAIL
(NO SCALE)

PLANTING SCHEDULE FOR RAIN GARDEN 2				
ABR.	QTY	BOTANICAL NAME	COMMON NAME	INSTALL SIZE
AA	3	ACORUS AMERICANUS	SWEET FLAG	1 GALLON
AC	3	ANEMONE CANADENSIS	WINDFLOWER	1 GALLON
ACA	6	AQUILEGIA CANADENSIS	COLUMBINE	1 GALLON
AF	5	ATHYRIUM FILIX-FEMINA	LADY FERN	1 GALLON
CT	6	CAULOPHYLLUM THALICTROIDES	BLUE COHOSH	1 GALLON
CA	2	CORNUS SERICEA 'ARCTIC FIRE'	RED OSIER DOGWOOD	2-3 GALLON
LC	3	LOBELIA CARDINALIS	CARDINAL FLOWER	1 GALLON

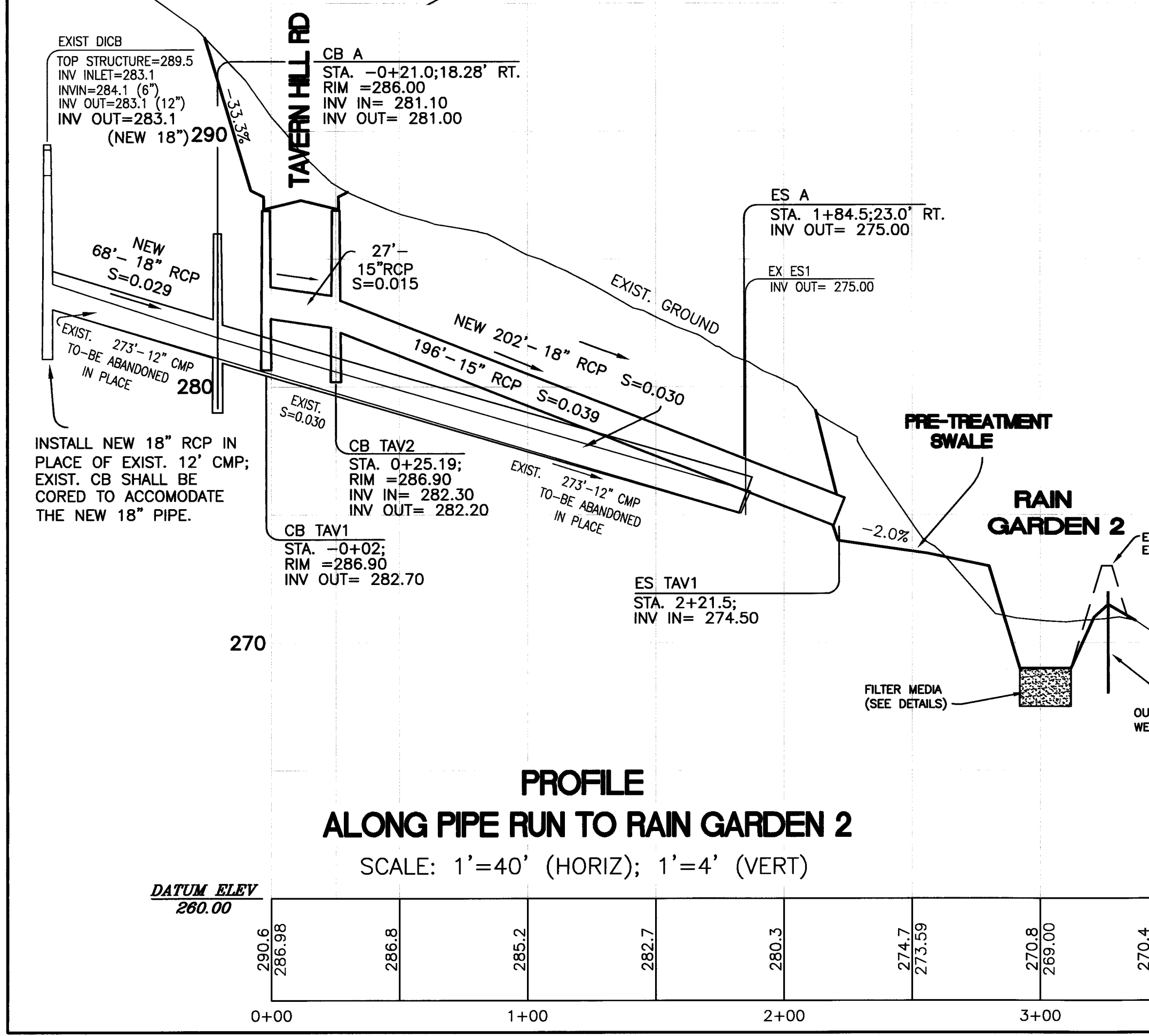
PLANTS TO BE SPACED THROUGHOUT THE RAIN GARDEN AREA IN NATURAL ARRAYS/ INFORMAL DRIFTS.

- RAIN GARDEN NOTES:**
1. THE FILTER MEDIA SHALL CONSIST OF ONE OF THE FOLLOWING MIXTURES BY VOLUME:
A. 55% BY VOLUME SAND ALSO IDENTIFIED AS ASTM C-33 CONCRETE SAND, 20% BY VOLUME OF LOAMY SAND TOPSOIL WITH 15% TO 25% FINES PASSING THE NUMBER 200 SIEVE, AND 25% BY VOLUME MODERATELY FINE SHREDED BARK OR WOOD FIBER MULCH WITH LESS THAN 5% PASSING THE 200 SIEVE.
B. 20% BY VOLUME OF MODERATELY FINE SHREDED BARK OR WOOD FIBER MULCH THAT HAS NO MORE THAN 5% FINES PASSING THE 200 NUMBER 200 SIEVE WITH 80% BY VOLUME LOAMY COURSE SAND USED IN THE MIXTURE MEETING THE FOLLOWING SIEVE ANALYSIS SPECIFICATION:
1. FROM 85 TO 100% BY WEIGHT SHALL PASS THE NUMBER 10 SIEVE;
2. FROM 70 TO 100% BY WEIGHT SHALL PASS THE NUMBER 20 SIEVE;
3. FROM 15 TO 40% BY WEIGHT SHALL PASS THE NUMBER 60 SIEVE; AND
4. FROM 8 TO 15% BY WEIGHT SHALL PASS THE NUMBER 200 SIEVE.



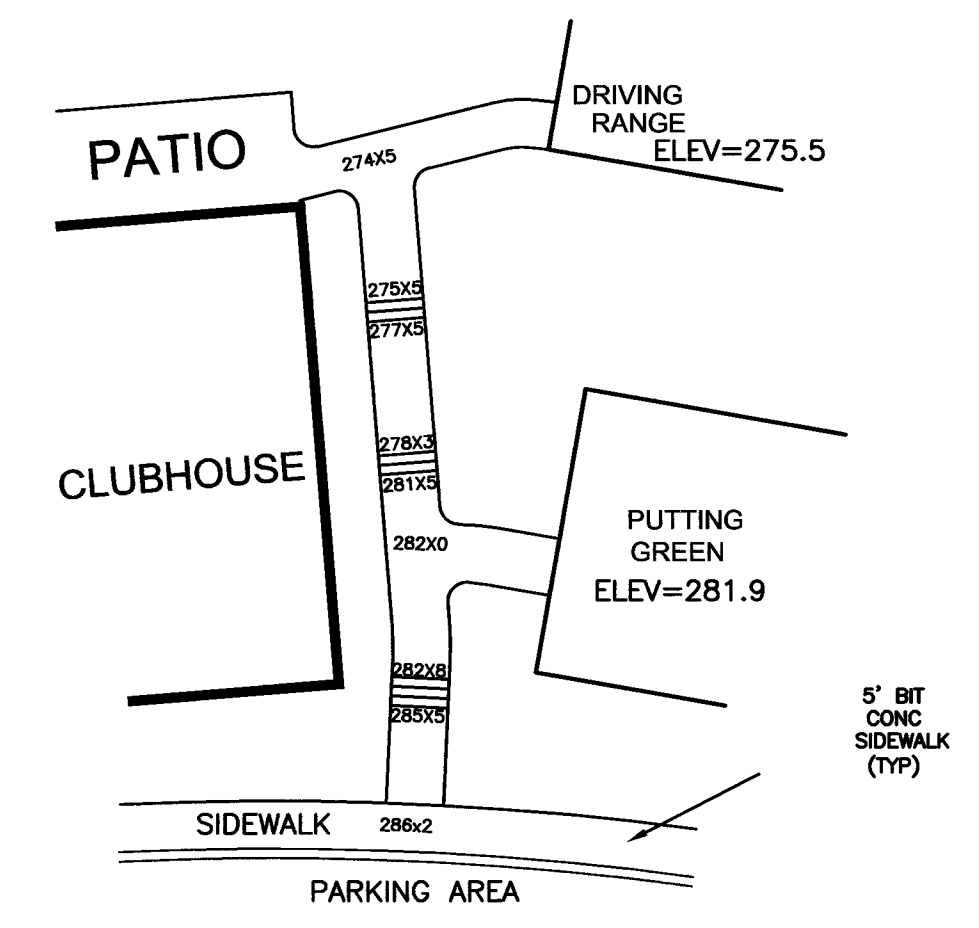
OUTLET STRUCTURE
LOW FLOW OUTLET WEIR DETAIL
(OUTLET RAIN GARDEN 2)
(NO SCALE)

- RAIN GARDEN 2 OUTLET STRUCTURE NOTES:**
1. THIS LOW FLOW OUTLET STRUCTURE CAN BE MADE OF PRECAST OR CAST-IN-PLACE CONCRETE SLAB.
 2. ALL CEMENT CONCRETE TO BE 4,000 PSI
 3. ALL OPENINGS CAST IN AS REQUIRED.
 4. CONTROL WEIR SHALL BE AS SHOWN BELOW.
 5. MINIMUM EMBANKMENT ELEVATION SHALL BE 273.0 WHICH IS 12"+ ABOVE THE MAXIMUM WATER SURFACE ELEVATION AT 50-YEAR STORM ELEVATION.
 6. MINIMUM EMBANKMENT WIDTH SHALL BE 4.0 FEET WITH 3(H):1(V) SIDE SLOPES.

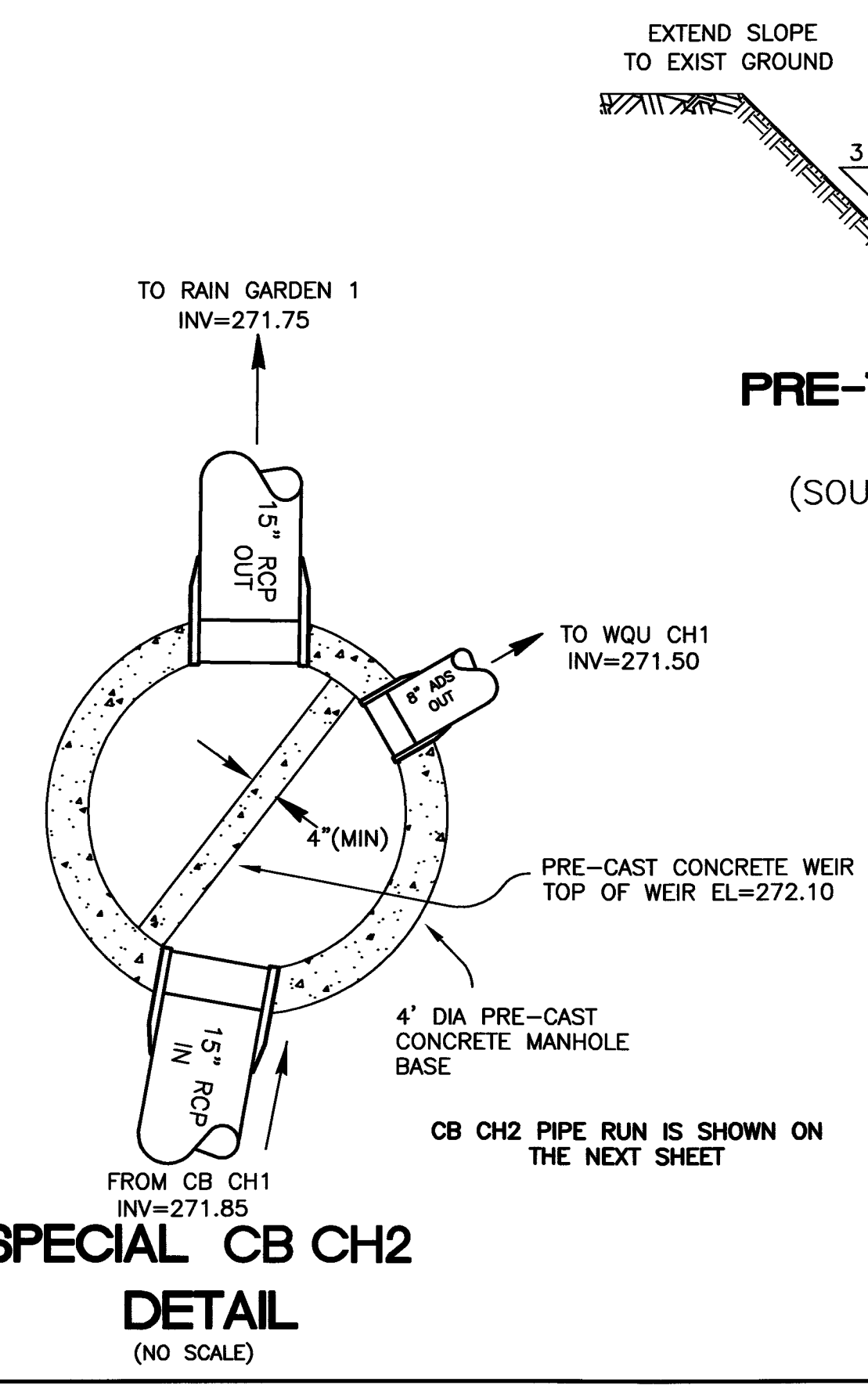


PROFILE
ALONG PIPE RUN TO RAIN GARDEN 2
SCALE: 1'=40' (HORIZ); 1'=4' (VERT)

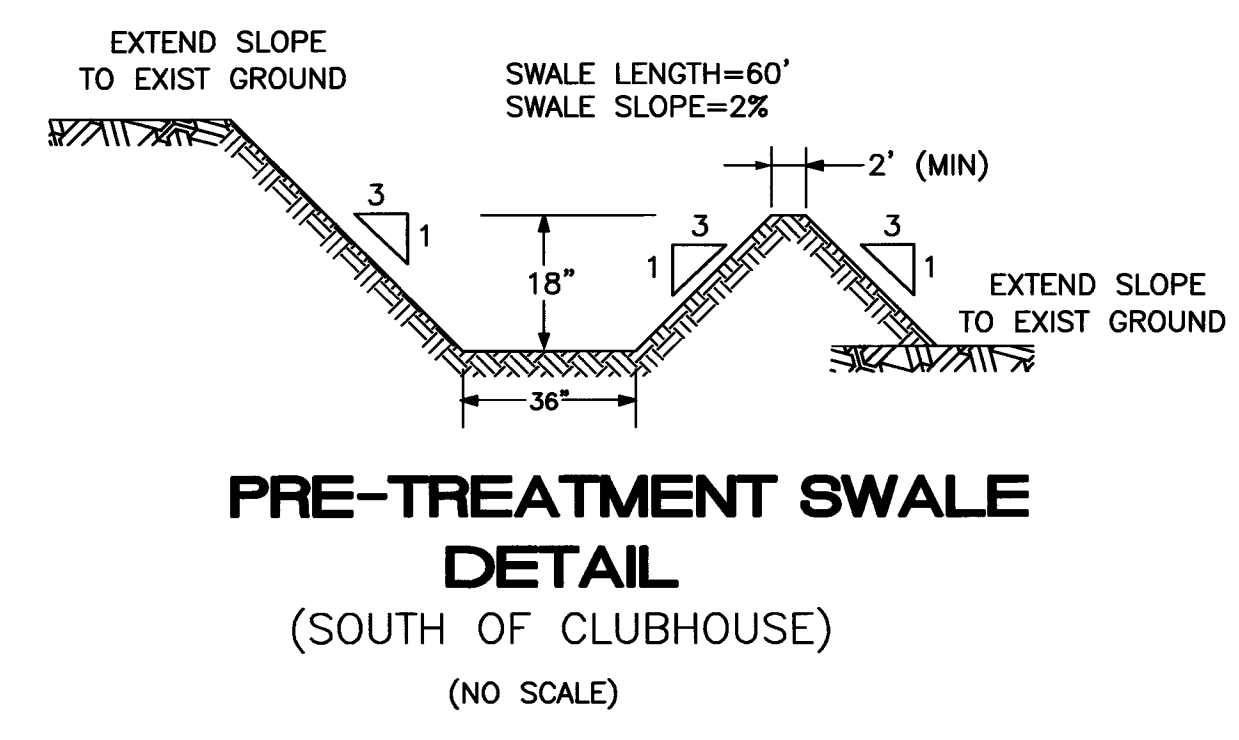
THE PURPOSE OF THESE PLANS IS TO IDENTIFY THE DRAINAGE FEATURES THAT REQUIRE INSPECTION AND MAINTENANCE AND DOES NOT INCLUDE THE FULL SET OF PLANS. REFER TO THE COMPLETE SET OF PLANS FOR ALL CATCH BASINS, OUTLET PROTECTION AND ANY OTHER DRAINAGE FEATURE THAT MAY NOT BE REPRESENTED ON THESE PLANS.



WALKWAY DETAIL
(SOUTH OF CLUBHOUSE)
(NO SCALE)



SPECIAL CB CH2
DETAIL
(NO SCALE)

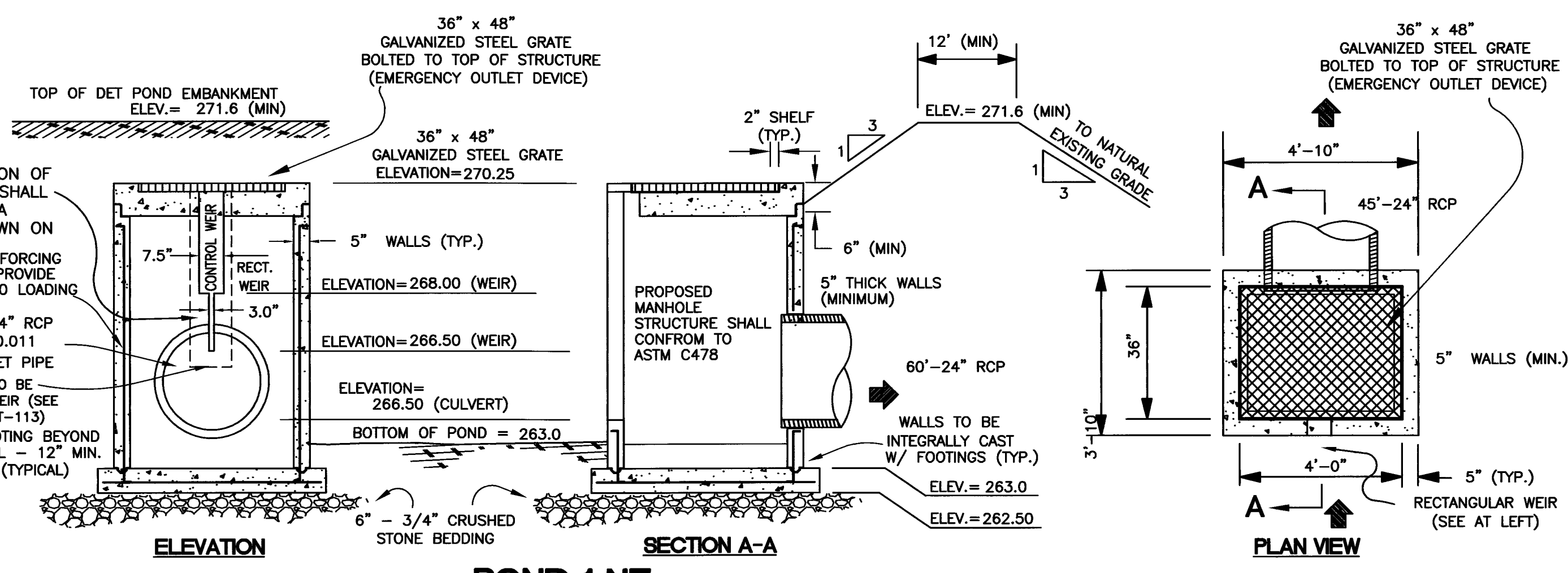
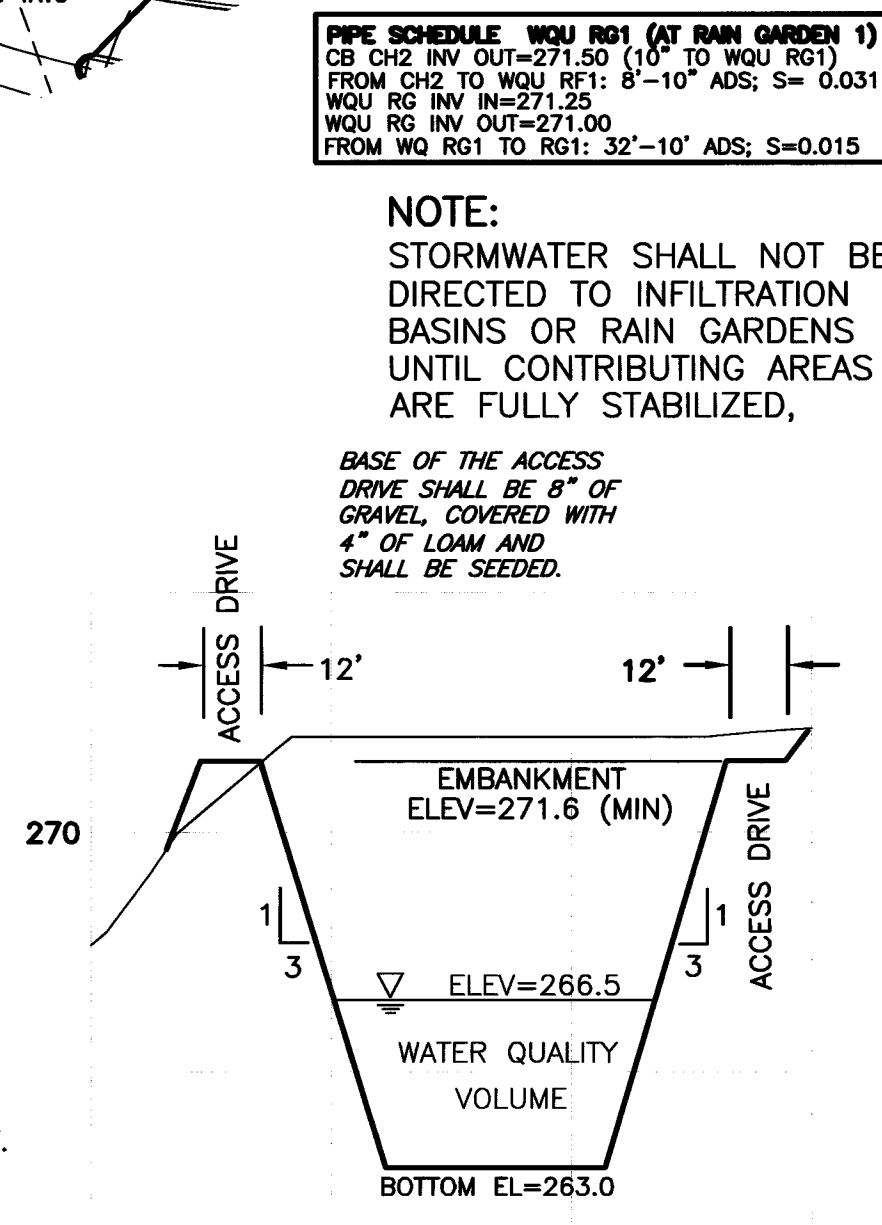
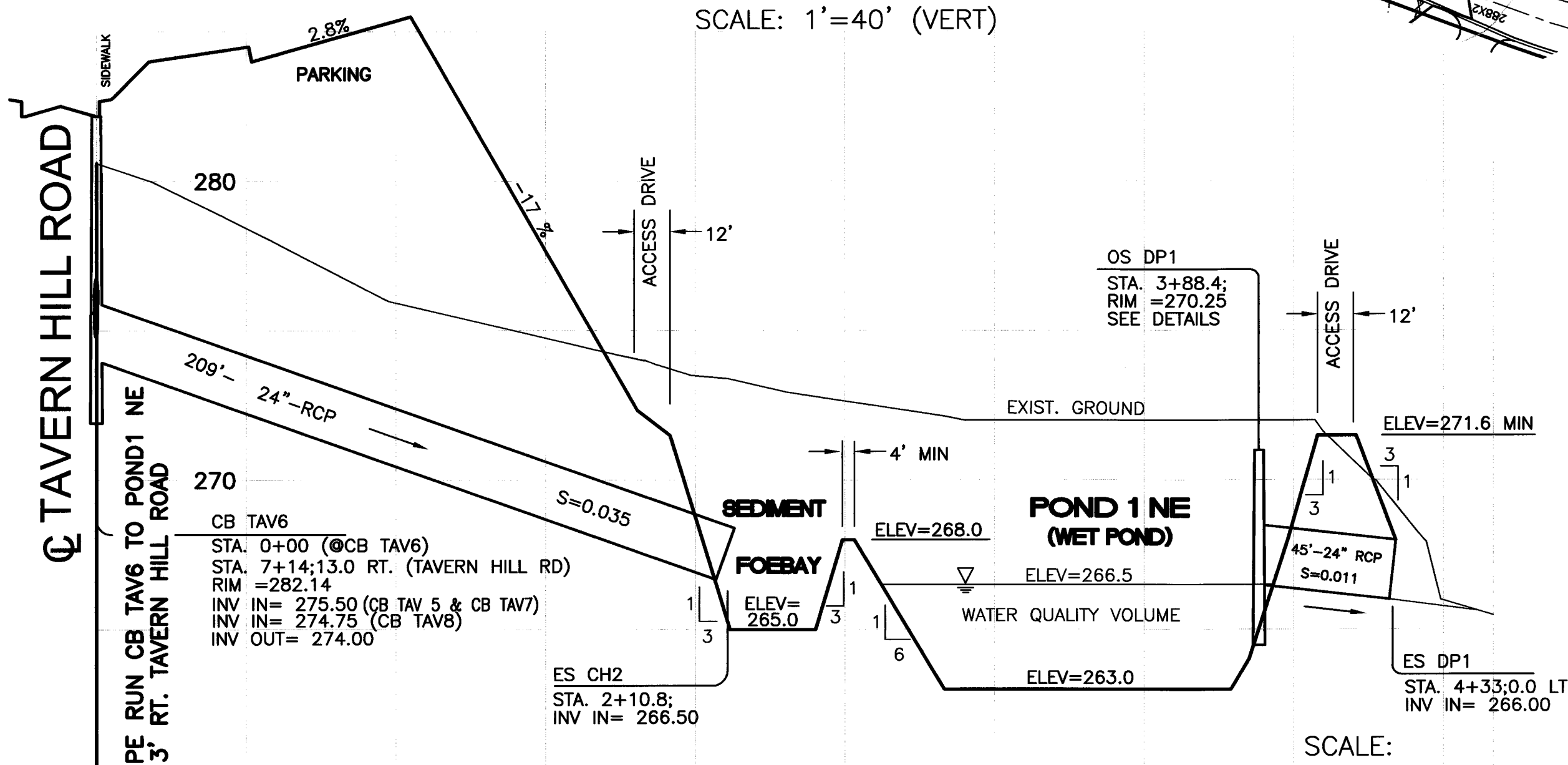
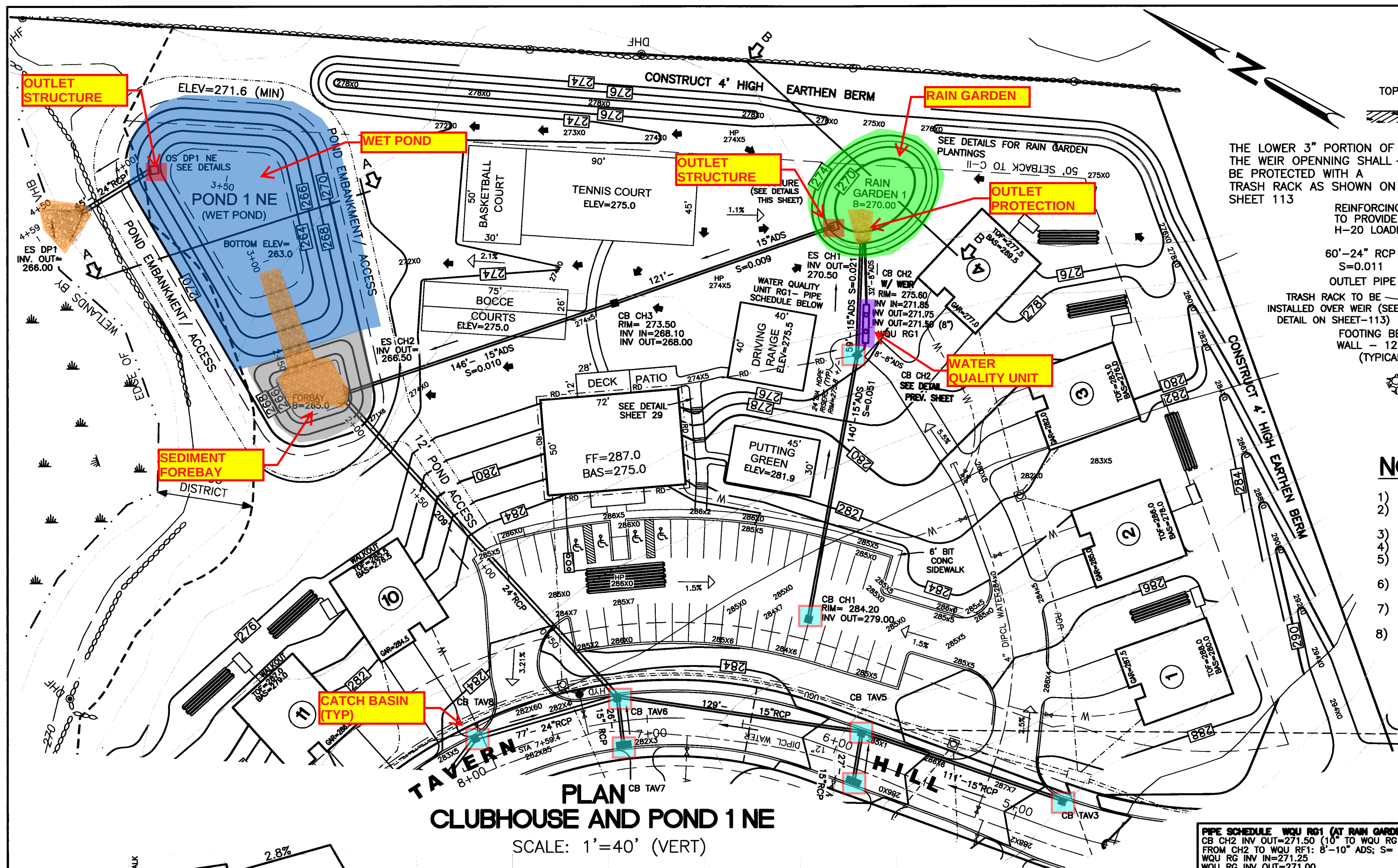


PRE-TREATMENT SWALE
DETAIL
(SOUTH OF CLUBHOUSE)
(NO SCALE)

DRAINAGE DETAILS AT RTE 102
HICKORY WOODS
TAX MAP 2 LOT 27
WEST ROAD/NH ROUTE 102
LONDONDERRY, NEW HAMPSHIRE 03053
OWNER OF RECORD: HSL REAL ESTATE TRUST
C/O GBI, TAI-DEH HSU, TR
2 WELLMAN AVE, SUITE #210
NASHUA, NH 03064
PREPARED FOR: HICKORY WOODS, LLC
100 ANDOVER BY-PASS, SUITE 300
NORTH ANDOVER, MASSACHUSETTS 08145
SCALE: AS NOTED SHEET 29 OF 120 SEPTEMBER 18, 2012

#	DATE	REVISION	BY	APP.
1	1/2013	STANTEC COMMENTS	NL	JAS
2	3/2013	STANTEC COMMENTS	JAS	JAS
3	5/2013	NOTICE OF DECISION	JAS	JAS
4	6/2013	JUNE 4 MEMO	JAS	JAS
5	7/2013	WATER REVISIONS	JAS	JAS
6	7/2013	JULY 15 MEMO	JAS	JAS

BENCHMARK ENGINEERING, INC.
Consulting Engineers Land Planners
1F Commons Drive, Suite 309
Londonderry, New Hampshire 03053
Phone: (603) 437-5000

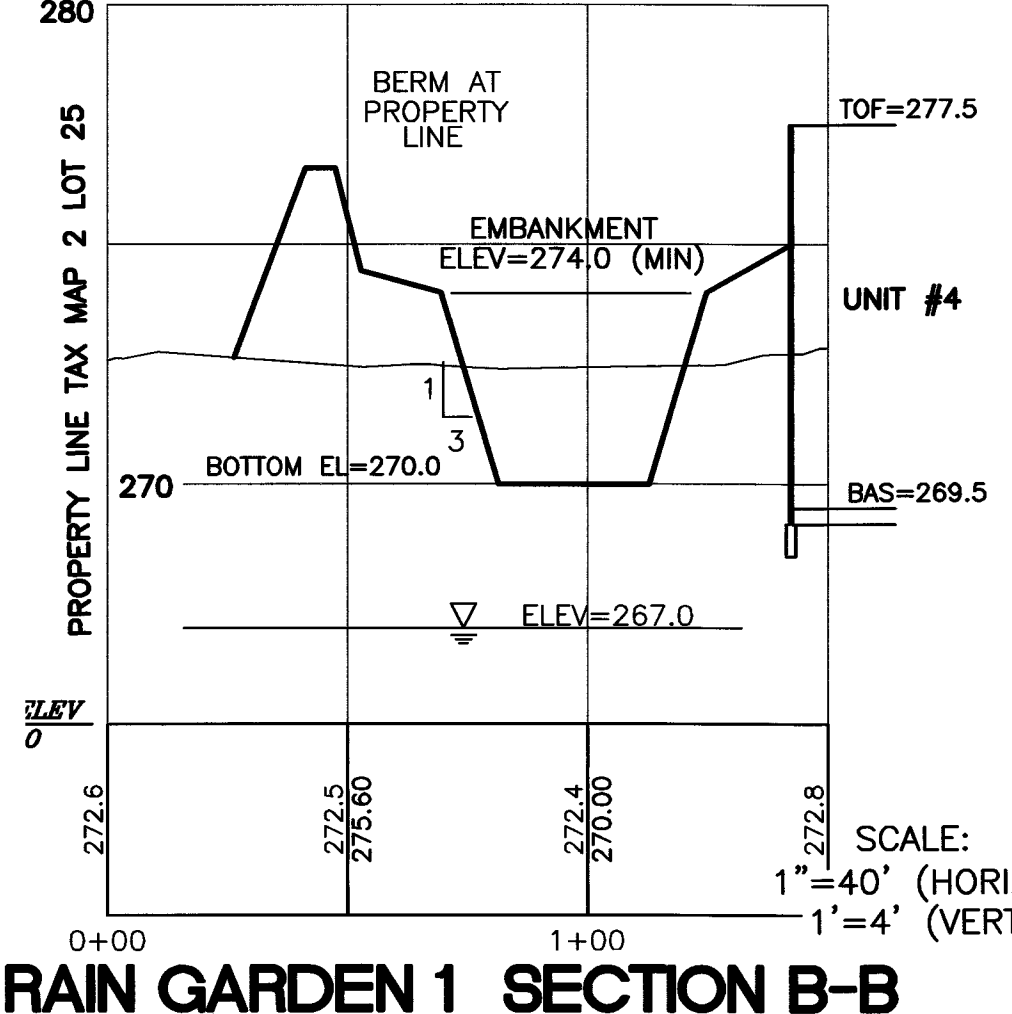
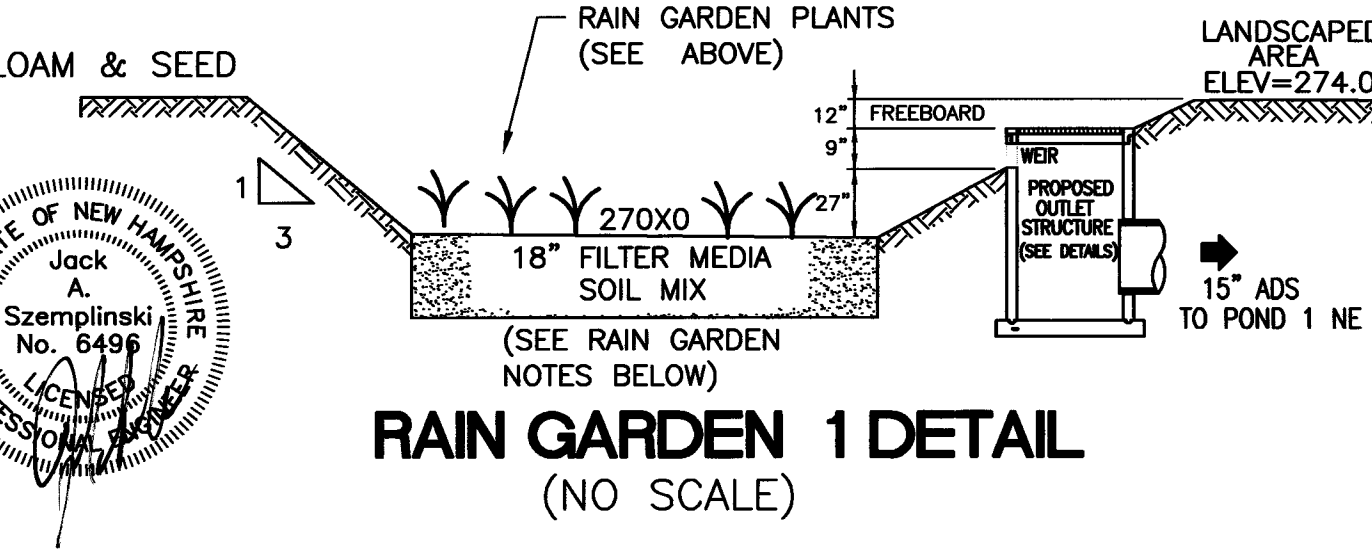
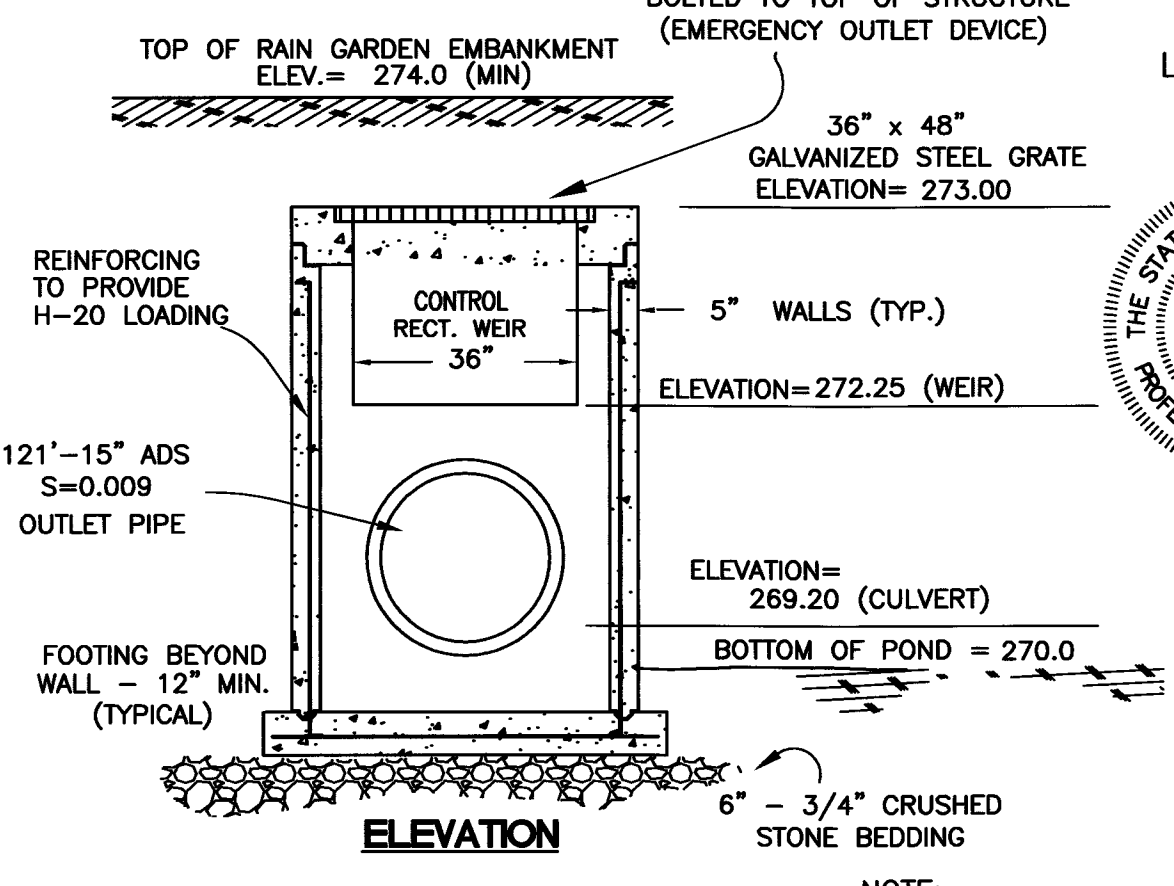


- NOTES:**
- 1) ALL CEMENT CONCRETE TO BE 4,000 PSI (MIN.)
 - 2) GALVANIZED STEEL GRATE SHALL BE BOLTED TO THE TOP OF THE STRUCTURE (EMERGENCY OUTLET DEVICE)
 - 3) OUTLET PIPE SHALL NOT BE LESS THAN 15" (MINIMUM)
 - 4) ALL OPENINGS SHALL BE CAST IN AS REQUIRED
 - 5) PRECAST CONCRETE REINFORCED STRUCTURE TO MEET ASTM C-478 DESIGNATION AND H-20 LOADING
 - 6) CONTROL WEIR SHALL BE SIZED TO MITIGATE DESIGN STORM AS REQUIRED BY THE REGULATIONS
 - 7) MINIMUM EMBANKMENT ELEVATION TO BE 12" ABOVE THE 50-YEAR STORM ELEVATION.
 - 8) ALL PIPE CONNECTIONS, INCLUDING PIPE-TO-RISER JOINT AND ALL PIPE COUPLINGS SHALL BE WATERTIGHT.

PLANTING SCHEDULE FOR RAIN GARDEN 1 & 2

ABR.	QTY	BOTANICAL NAME	COMMON NAME	INSTALL SIZE
AA	3	ACORUS AMERICANUS	SWEET FLAG	1 GALLON
AC	3	ANEMONE CANADENSIS	WINDFLOWER	1 GALLON
ACA	6	AQUILEGIA CANADENSIS	COLUMBINE	1 GALLON
AF	5	ATHYRIUM FILIX-FEMINA	LADY FERN	1 GALLON
CT	6	CAULOPHYLLUM THALICTROIDES	BLUE COHOSH	1 GALLON
CA	2	CORNUS SERICEA 'ARCTIC FIRE'	RED OSIER DOGWOOD	2-3 GALLON
LC	3	LOBELIA CARDINALIS	CARDINAL FLOWER	1 GALLON

PLANTS TO BE SPACED THROUGHOUT THE RAIN GARDEN AREA IN NATURAL ARRAYS/ INFORMAL DRIFTS.



POND 1 NE DETAILS
HICKORY WOODS
TAX MAP 2 LOT 27
WEST ROAD/NH ROUTE 102
LONDONDERRY, NEW HAMPSHIRE 03053

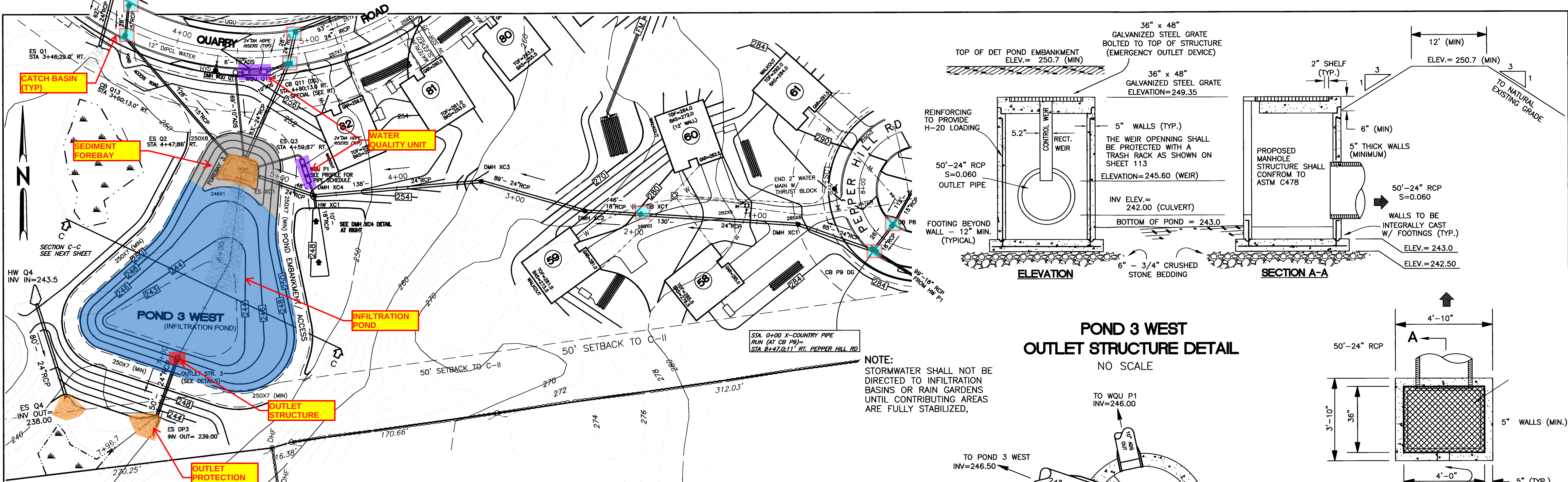
OWNER OF RECORD:
HSL REAL ESTATE TRUST
C/O GBI, TAI-DEH HSU, TR
2 WELLMAN AVE, SUITE #210
NASHUA, NH 03064

PREPARED FOR:
HICKORY WOODS, LLC
100 ANDOVER BY-PASS, SUITE 300
NORTH ANDOVER, MASSACHUSETTS 08145

SCALE: AS NOTED SHEET 30 OF 120 SEPTEMBER 18, 2012

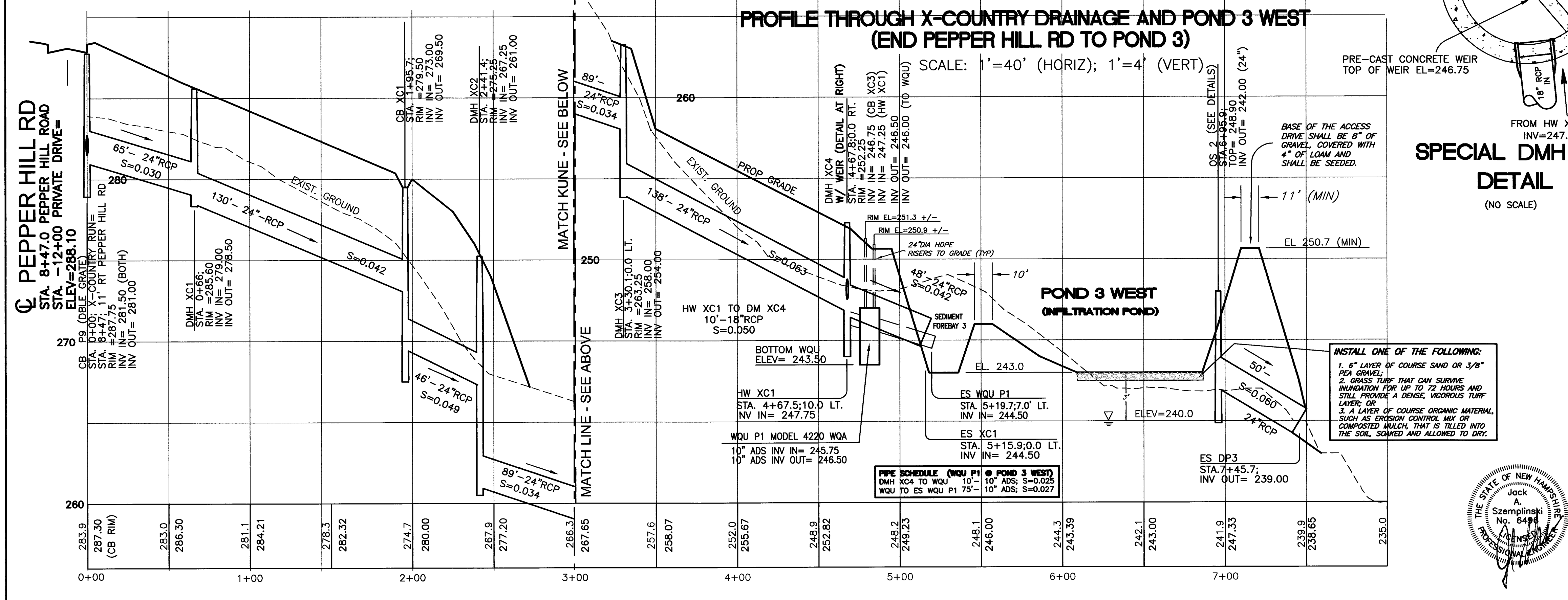
#	DATE	REVISION	BY	APP.
1	1/2013	STANTEC COMMENTS	NL	JAS
2	3/2013	STANTEC COMMENTS	JAS	JAS
3	5/2013	NOTICE OF DECISION	JAS	JAS
4	6/2013	JUNE 4 MEMO	JAS	JAS
5	7/2013	WATER REVISIONS	JAS	JAS
6	7/2013	JULY 15 MEMO	JAS	JAS

BENCHMARK ENGINEERING, INC.
Consulting Engineers Land Planners
1F Commons Drive, Suite 39
Londonderry, New Hampshire 03053
Phone: (603) 437-5000

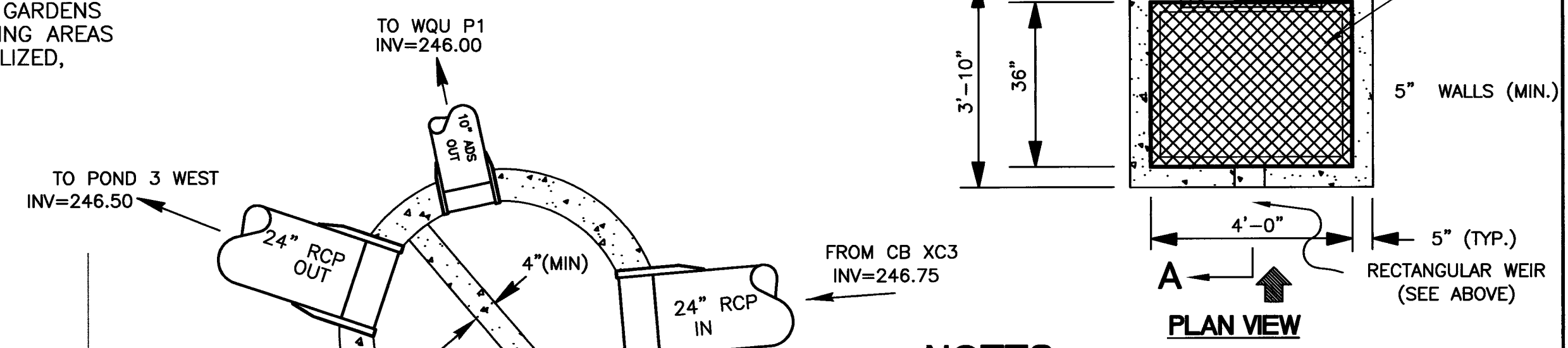


PLAN X-COUNTRY DRAINAGE AND POND3 WEST (END PEPPER HILL RD TO POND 3)
SCALE: 1' = 40'

PROFILE THROUGH X-COUNTRY DRAINAGE AND POND 3 WEST
(END PEPPER HILL RD TO POND 3)
SCALE: 1' = 40' (HORIZ); 1' = 4' (VERT)

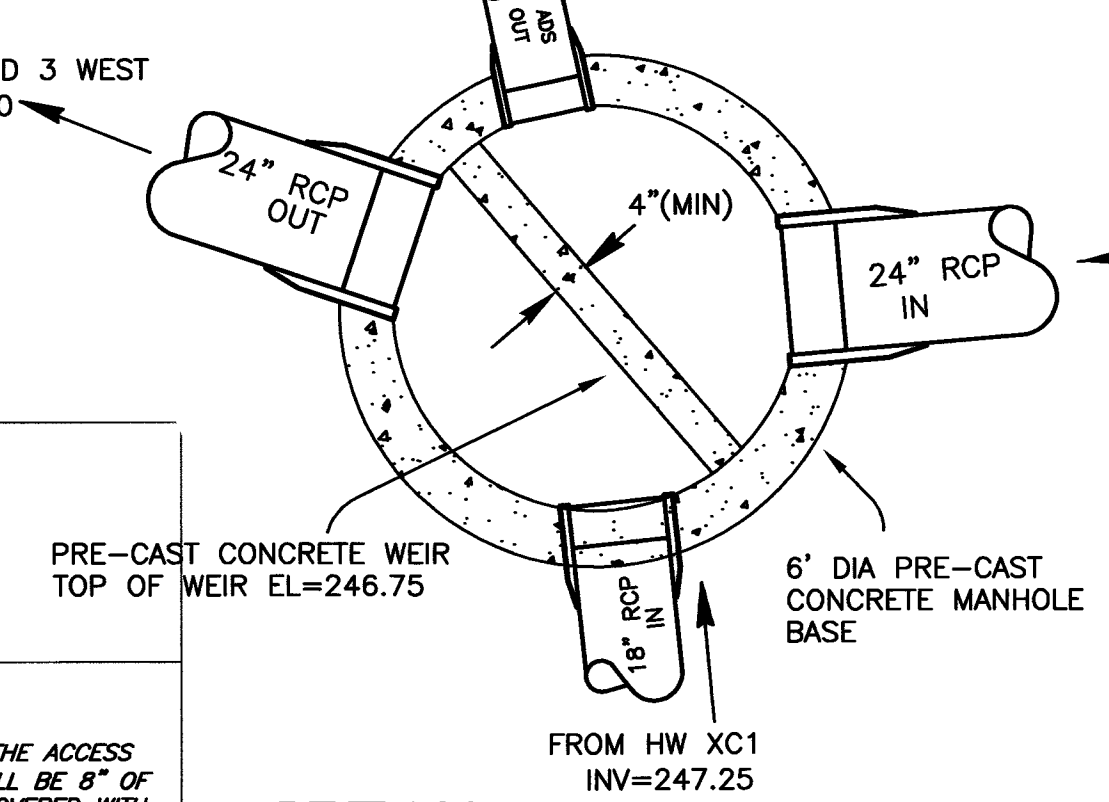


POND 3 WEST
OUTLET STRUCTURE DETAIL
NO SCALE



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SPECIAL DMH XC4
DETAIL
(NO SCALE)



X-COUNTRY DRAINAGE TO POND 3 WEST & POND 3 WEST DETAILS

HICKORY WOODS

TAX MAP 2 LOT 27
WEST ROAD/NH ROUTE 102
LONDONDERRY, NEW HAMPSHIRE 03053

SCALE: AS NOTED SHEET 31 OF 120 SEPTEMBER 18, 2012

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