ZONING BOARD OF APPEALS

Agenda

DATE OF MEETING: Thursday, September 24, 2020
TIME OF MEETING: 5:30 pm
LOCATION OF MEETING: Remote Meeting
www.truro-ma.gov

Open Meeting
This will be a remote meeting. Citizens can view the meeting on Channel 18 in Truro and on the web on the "Truro TV Channel 18" button under "Helpful Links" on the homepage of the Town of Truro website (www.truro-ma.gov). Click on the green “Watch” button in the upper right corner of the page. Please note that there may be a slight delay (approx. 15-30 seconds) between the meeting and the television broadcast/live stream.

Citizens can join the meeting to listen and provide public comment via the link below, which can also be found on the calendar of the Board’s webpage along with the meeting Agenda and Packet, or by calling in toll free at 1-866-899-4679 and entering the following access code when prompted: 983-197-413. Citizens will be muted upon entering the meeting until the public comment portion of the hearing. If you are joining the meeting while watching the television broadcast/live stream, please lower the volume on your computer or television during public comment so that you may be heard clearly. Citizens may also provide written comment via postal mail or by emailing the Town Planner at planner1@truro-ma.gov.

Meeting link: global.gotomeeting.com/join/983197413

Hearing materials can be found at the following web address:
Review of Comments

- Letter from the Truro Town Manager, Rae Ann Palmer

Public Hearing – Continued

2019-008 ZBA – Community Housing Resource, Inc. seeks approval for a Comprehensive Permit pursuant to G.L. c. 40B, §§20-23 to create 40 residential rental units, of which not less than 25% or 10 units shall be restricted as affordable for low or moderate income persons or families, to be constructed on property located at 22 Highland Road, as shown on Assessor’s Map 36 and Parcel 238-0 containing 3.91 acres of land area.

- Responses to Third Peer Review

- Review Updated Building Plans

- Waivers:
  ♦ Prioritize

Public Comment

Adjourn
September 16, 2020

MEMORANDUM

FROM: J.M. O’REILLY & ASSOCIATES, INC.

John O’Reilly, P.E., P.L.S.

RE: Third Peer Review, September 3, 2020
Cloverleaf Project

Responses to the third Peer review by Horsley-Witten are as follows:

**Contingency Plan:**
Our office is in agreement with the suggestion put forth by Horsley-Witten:
- At the time the Board of Health received Disposal Works Permit, the application will include a detailed Sampling & Contingency Plan as outline in the August 14, 2020 Memo, prepared by J.M. O’REILLY & ASSOCIATES, INC.
- Sampling & Contingency Plan will also include any and all requirements set forth in the Massachusetts DEP Pilot Approval Permit for the proposed sewage treatment process.

**Groundwater Monitoring:**
Our office is in agreement with the suggestion put forth by Horsley-Witten
- The Sampling and Contingency Plan will include the testing and reporting frequency of the groundwater and shall be part of the Board of Health’s approval process.

**Pipe sizes:**
- Final Construction Plans will include the necessary detailed information as required for complete construction plans.

**Setbacks:**
- The location of the drywell for building 22-24 has not changed, the reserve area to the rear of the building eliminates the possibility of shifting the drywell to the north. The contractor will need to install the drywell and piping at the time of the foundation work for the buildings. Slope shall be established during the backfilling of the foundations.

**Specific Comments on Stormwater Management Facilities:**
- A stamped MA Stormwater Report will be provided with the final permit plans to the ZBA.
- A typical cross section of the drainage swales has been developed on Sheet 5 of 6.
The still water within the swale will be about 1 foot deep, prior to the discharge into the subsurface leaching facility. Refer to the TSS calculation sheet for TSS reductions for the site.

- The Pre and Post stormwater runoff calculations have been updated to reflect a reduction of the post-development stormwater runoff than currently exists from the property.
- Drainage Facility #4: The swale and associated grading has been adjusted to allow for a forebay, prior to the actual swale, so as to receive stormwater from the adjacent gravel emergency road.

Page 5: Item #2 & #3 – Contributory Area:

- The Plan Sheet 2 of 6 has been updated to reflect the flow patterns of the project site once the proposed grading is complete.
- Contributory areas are updated so as to capture the offsite drainage patterns towards the project site. Refer to the Drainage calculations and Contributory Area Plan

Page 6: Item 4 – Roof Runoff:

- The construction drawings will include an overflow opening so as to allow for stormwater to discharge at times of exceedance of drywell capacity.

Page 7: Item 10 & 12 – Additional Comments:

- #10 – The elevations have been corrected.
- #12 – Sheet 2 of 6 now reflects boulders along the entrance off Highland and along Drainage Swale #4, so as to protect the drainage swales.

Page 7: Item #2 – Comments on Other Utilities:

- The cover over the leaching facilities for the wastewater will range from a maximum of 3 feet to about 1.5 feet. The electrical conduit for the small post lights will run about 12 inches below grade. The installation of the electrical or post lights will not impact the leaching facility.
- Contractor should take the necessary care during the installation of the posts and associated conduit.

Page 7 to 9: Other Site Design Comments:

- #1
  - The phasing of the project will still need to be worked out given the water main work by the Town. See the Stormwater Management During Construction section below.

- #2
  - Sheet 6 of 6 has been prepared to address the erosion controls through-out the site. The protocols identified on Sheet 6 and within the Safe Harbor Documents shall be incorporated into the phasing of the project, in conjunction with the Town’s work.

- #11
  - Snow removal: The D.P.W. for the Town of Truro, is going to be responsible for the plowing and removal of the snow. Areas will be designated, by the DPW, for snow storage.
  - Snow shall not be stockpiled within the drainage swales or over leaching facility.
• #14
  o Landscape Plan will be finalized to address specific species and quantities. Planting protocols and details shall be included within the final Landscape Plan.
  o The vegetation within the drainage swales, up to the outlet invert to the catch basin grates for the drainage structures, is outlined below and on the Typical Swale Detail on Sheet 5 of 6.

Page 9, Item 15 - Landscape Plan:
  o The final landscape plans shall include planting details and specifications.
  o The area within the drainage swales are to be loamed and seeded with a wet-meadow seed mix. Refer to Sheet 5 of 6 for Swale detail and notes.

Parking Spaces:
  • The Sheet 1 of 6 and 2 of 6 include the spot grades necessary to show the slope and grade of the parking stalls. Flow directions have also been added to Sheet 1 of 6 for additional detail.

**Stormwater Management During Construction:**

The coordination of the water main installation and the housing development needs to be finalized and determine prior to start of any construction activities on the site. The following points are meant to offer an outline/recommendation in preparing the Coordination Plans for the site.

_The ideal Coordination Plan would include that the water main installation and the site work for housing development being completed in one phase. The Plan would include some, if not all, of the suggested construction steps outlined below. It is imperative that the ground surfaces be stabilized and secured as quickly as possible so as to minimize negative impacts to the site or Highland Road, during an intense storm event._

Prior to any disturbance to the site, all protocols and requirements for the protection of the turtles shall be implemented and followed. Refer to the Turtle Protection Plan as filed with the Natural Heritage Program (MESA).

• Suggested Construction Stages for the water main and/or housing development:
  o Contractor and project engineer shall identify areas of stockpiling of the existing vegetation materials to be used for slope stabilization.
  o Contractor and project engineer shall identify the areas to be used to store stormwater during the construction activities. The proposed drainage swales shall not be used for the temporary drainage areas.
    - The temporary drainage controls could include the natural low area to the north of buildings 22-24 and 23-25 and creating collection area(s) within the building locations around the center court area.
  • Note: The location and number of the collection areas to be created would be determined prior to start of any component of the water and/or housing development improvements.
Area to be cleared of all trees and stumps.
Vegetation shall be removed and stockpiled within identified areas.
  - The stockpile shall be protected along the base with erosion controls. (silt fence, or Biolog to be used)
Area shall be rough graded as shown on the project documents.
  - The stockpile of materials shall be protected along the base with erosion controls. (silt fence and/or biology).
  - As the areas are graded, the contractor shall create the needed collection areas which are to be used for the temporary drainage controls.
The slopes, once established shall be stabilized per the Erosion Control Practices of Sa'ë Harbor and SWPPT.
Irrigation shall be supplied for the slopes so as to enhance the establishment of the applied existing ground cover material.

- **Temporary Drainage Controls During Construction Activities:**
  - The temporary low points, as established, shall be shallow in nature so as to prevent ponding over 18 inches.
  - The ground surface within the low point shall be scraped clean of silt and debris after any rain event were ponding occurred within the low point. The area shall be scrapped once construction activities resume on the site, after a rain event.

- **Disturbance of the Southern Portion of the Site – Highland Road Access:**
  - Our Office strongly recommends the final plans to construct the water main and housing development includes a requirement that the project area up to and including buildings 5-7 and 10-12 be graded and stabilized prior to clearing and grading the remaining southern area of the site.

Thank You
Riprap Splash Pad Design:

Splash Pad is designed using the Federal Highway Administration Specifications 2006

Determine the Riprap Size:

\[ D(50) = 0.2D \left( \frac{Q}{\sqrt{gD^{2.5}}} \right)^{4/3} \left( \frac{D}{TW} \right) \]

- \( D(50) \): riprap size (ft)
- \( Q \): Design Discharge at Outlet (cfs); 4.27 cfs (100 year outfall for Drainage Facility #4)
- \( D \): Culvert Diameter (Circular), (ft); 1 foot
- \( TW \): Tailwater Depth (ft); Per Guidelines, \( TW = 0.4D \)
- \( g \): Acceleration Due to Gravity, \( g = 32.2 \text{ ft/sec} \)

\[ D(50) = 0.2\{4.27 / \sqrt{32.2}(1)^{2.5}\}^{4/3}(1 / 0.4(1)) \]
\[ D(50) = 0.2\{4.27 / 5.67\}^{4/3}(2.5) \]
\[ D(50) = 0.34 \text{ feet } = 4 \text{ inches} \]

Riprap stone, within splash pad, shall be 4 to 6 inch chink stone

Size of Splash Pad:

Using the attached Figure 10.4 and Table 10.1 from the Federal Highway Administration Publication July 2006 Hydraulic Engineering Circular No. 14, Third Edition Hydraulic Design of Energy Dissipators for Culverts and Channels

- Length of Apron: \( 4 \times D = 4 \text{ feet minimum} \)
- Depth of Apron: \( 3.5(D) = 3.5(4) = 14 \text{ inches } = 1.2 \text{ feet} \)
- Width of Apron at Culvert: \( 3 \times D = 3 \times 1 = 3 \text{ feet} \)
- Width of Apron at End: \( 3:1 \text{ angle) x Length } = 3 \times 4 = 12 \text{ feet} \)

**Note:** The apron sizing is based on Drainage Facility #4 with a outflow of 4.27 cfs, 100 year storm event. All stone riprap splash pads shall be the same size.
Hydraulic Design of Energy Dissipators for Culverts and Channels
L_B \text{ min} = 4W_o = 4(6) = 24 \text{ ft}, \text{ use } L_B = 24 \text{ ft}

W_B = W_o + 2(L_B/3) = 6 + 2(24/3) = 22 \text{ ft}

However, since the trial D_{50} is not available, the next larger riprap size (D_{50} = 0.83 \text{ ft}) would be used to line a basin with the given dimensions.

Step 4 (3rd iteration). Determine the basin exit depth, y_B = y_c and exit velocity, V_B = V_c.

Q^2/g = (A_c)^3/T_c = [y_c(W_B + zy_c)]^3/ (W_B + 2zy_c)

135^2/32.2 = 566 = [y_c(22 + 2y_c)]^3/ (22 + 4y_c)

By trial and success, y_c = 1.02 \text{ ft}, T_c = 26.1 \text{ ft}, A_c = 24.5 \text{ ft}^2

V_c = Q/A_c = 135/24.5 = 5.5 \text{ ft/s} \text{ (acceptable)}

Two feasible options have been identified. First, a 2.3-ft-deep, 23-ft-long pool, with an 11.5-ft-apron using D_{50} = 0.5 \text{ ft}. Second, a 1.4-ft-deep, 18-ft-long pool, with a 6-ft-apron using D_{50} = 0.83 \text{ ft}. The choice between these two options will likely depend on the available space and the cost of riprap.

Step 5. For the design discharge, determine if TW/y_o \leq 0.75

TW/y_o = 2.0/2.7 = 0.74, which satisfies TW/y_o \leq 0.75. No additional riprap needed.

10.2 RIRPRAP APRON

The most commonly used device for outlet protection, primarily for culverts 1500 mm (60 in) or smaller, is a riprap apron. An example schematic of an apron taken from the Federal Lands Division of the Federal Highway Administration is shown in Figure 10.4.

Figure 10.4. Placed Riprap at Culverts (Central Federal Lands Highway Division)

They are constructed of riprap or grouted riprap at a zero grade for a distance that is often related to the outlet pipe diameter. These aprons do not dissipate significant energy except
Table 10.1. Example Riprap Classes and Apron Dimensions

<table>
<thead>
<tr>
<th>Class</th>
<th>$D_{50}$(mm)</th>
<th>$D_{50}$(in)</th>
<th>Apron Length</th>
<th>Apron Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>125</td>
<td>5</td>
<td>4D</td>
<td>3.5$D_{50}$</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>6</td>
<td>4D</td>
<td>3.3$D_{50}$</td>
</tr>
<tr>
<td>3</td>
<td>250</td>
<td>10</td>
<td>5D</td>
<td>2.4$D_{50}$</td>
</tr>
<tr>
<td>4</td>
<td>350</td>
<td>14</td>
<td>6D</td>
<td>2.2$D_{50}$</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
<td>20</td>
<td>7D</td>
<td>2.0$D_{50}$</td>
</tr>
<tr>
<td>6</td>
<td>550</td>
<td>22</td>
<td>8D</td>
<td>2.0$D_{50}$</td>
</tr>
</tbody>
</table>

*1D is the culvert rise.

The apron dimensions must also be specified. Table 10.1 provides guidance on the apron length and depth. Apron length is given as a function of the culvert rise and the riprap size. Apron depth ranges from $3.5D_{50}$ for the smallest riprap to a limit of $2.0D_{50}$ for the larger riprap sizes. The final dimension, width, may be determined using the 1:3 flare shown in Figure 10.4 and should conform to the dimensions of the downstream channel. A filter blanket should also be provided as described in HEC 11 (Brown and Clyde, 1989).

For tailwater conditions above the acceptable range for Equation 10.4 ($TW > 1.0D$), Figure 10.3 should be used to determine the velocity downstream of the culvert. The guidance in Section 10.3 may be used for sizing the riprap. The apron length is determined based on the allowable velocity and the location at which it occurs based on Figure 10.3.

Over their service life, riprap aprons experience a wide variety of flow and tailwater conditions. In addition, the relations summarized in Table 10.1 do not fully account for the many variables in culvert design. To ensure continued satisfactory operation, maintenance personnel should inspect them after major flood events. If repeated severe damage occurs, the location may be a candidate for extending the apron or another type of energy dissipator.

**Design Example: Riprap Apron (SI)**

Design a riprap apron for the following CMP installation. Available riprap classes are provided in Table 10.1. Given:

- $Q = 2.33\text{ m}^3/\text{s}$
- $D = 1.5\text{ m}$
- $TW = 0.5\text{ m}$

**Solution**

Step 1. Calculate $D_{50}$ from Equation 10.4. First verify that tailwater is within range.

$TW/D = 0.5/1.5 = 0.33$. This is less than 0.4D, therefore,

use $TW = 0.4D = 0.4(1.5) = 0.6\text{ m}$

$$D_{50} = 0.2D \left( \frac{Q}{\sqrt{gD^{2.5}}} \right)^{0.15} \left( \frac{D}{TW} \right) = 0.2(1.5) \left( \frac{2.33}{\sqrt{9.81(1.5)^{2.5}}} \right) \left( \frac{1.5}{0.6} \right) = 0.13\text{ m} \checkmark$$

Step 2. Determine riprap class. From Table 10.1, riprap class 2 ($D_{50} = 0.15\text{ m}$) is required.
CLOVERLEAF TRURO RENTAL HOUSING
BUILDINGS 1-3, 2-4, AND 6-8 (Buildings may be mirrored)
Truro, Massachusetts

Friday, September 4, 2020

Spring Hill Design
INTERIORS    ARCHITECTURE    SPACE PLANNING

158 Central Street, Somerville, MA, 02145 - 617.6702.4622
First/Garden Level Plan Unit 1, Unit 4, and Unit 8

Scale: 1/8" = 1'-0"

Second/Main Entry Level Plan Unit 1, Unit 4, and Unit 8

Scale: 1/8" = 1'-0"
1. THIRD LEVEL PLAN UNIT 2, UNIT 3, AND UNIT 5
   SCALE: 1/8" = 1'-0"

2. BUILDINGS 1-3, 2-4, AND 6-8 ROOF PLAN
   SCALE: 1/8" = 1'-0"
CLOVERLEAF TRURO RENTAL HOUSING
BUILDING 5-7
Truro, Massachusetts
Friday, September 4, 2020

Spring Hill Design
INTERIORS  ARCHITECTURE  SPACE PLANNING
158 Central Street, Somerville, MA, 02145 – 617.6702.4622
1. FOUNDATION PLAN
   SCALE: 1/8" = 1'-0"

2. BUILDING 5-7 ROOF PLAN
   SCALE: 1/8" = 1'-0"
CLOVERLEAF TRURO RENTAL HOUSING
BUILDINGS 9-11, 10-12, 17-19, AND 18-20
Truro, Massachusetts

Friday, September 4, 2020

Spring Hill Design
INTERIORS ARCHITECTURE SPACE PLANNING
158 Central Street, Somerville, MA, 02145 - 617.570.4622
CLOVERLEAF TRURO RENTAL HOUSING
BUILDINGS 13-15 AND 14-16
Truro, Massachusetts

Friday, September 4, 2020

Spring Hill Design
INTERIORS  ARCHITECTURE  SPACE PLANNING
158 Central Street, Somerville, MA, 02145 - 617.670.24622
CLOVERLEAF TRURO RENTAL HOUSING
BUILDING 21
Truro, Massachusetts

Thursday, September 17, 2020

Spring Hill Design
INTERIORS ARCHITECTURE SPACE PLANNING
21 Dartmouth Street, Somerville, MA, 02145 - 617.623.1833
CLOVERLEAF TRURO RENTAL HOUSING
BUILDING 22-24 AND 23-25 (MIRRORED)
Truro, Massachusetts

Friday, September 4, 2020

Spring Hill Design
INTERIORS ARCHITECTURE SPACE PLANNING
158 Central Street, Somerville, MA, 02145 – 617.6702.4622