

October 16, 2020

Ms. Maria Matoska
Tennessee Department of Environment and Conservation (TDEC)
Division of Solid Waste Management
Nashville Environmental Field Office
711 R.S. Gass Blvd,
Nashville, TN 37216

**RE: Part II Application NOD Response
City of Lebanon Tier III Composting Facility
CMP950000010**

Dear Ms. Matoska:

Barge Design Solutions, Inc. (Barge) received a Notice of Deficiency electronically from TDEC on September 24, 2020, related to the proposed City of Lebanon Tier III Composting Facility. This response letter serves to address the deficiencies. We have provided a response that addresses each comment and have submitted a revised and complete permit package, including updated Permit Drawings.

Comment 1: The permit drawings do not contain the Northing and Easting coordinates and do not contain a benchmark. Please revise the drawings to include the coordinates and the benchmark.

Resolution: A benchmark has been added to the revised plans, see sheet 2 and 3 for benchmark location and information.

Comment 2: Attachment 6 of the submittal did not include the FEMA flood map. Please provide the map for review.

Resolution: Attachment 6 has been updated to include both the Firmette for the project, as well as the complete FEMA FIRM panel the project resides in.

Sincerely,

C. Jason Repsher

Jason Repsher, P.G.
Solid Waste Lead

Barge Design Solutions, Inc.

cc: Jeff Baines, City of Lebanon
Mike Horsely, NEFO

Enclosures : Revised City of Lebanon Tier III Compositing Facility Package

Barge project #36771-09

PERMIT APPLICATION

City of Lebanon

Part II Permit Application

Tier III Compost Facility

Prepared
For:



The City of Lebanon Tennessee

200 North Castle Heights Avenue

Lebanon, TN 37087

PREPARED BY

BARGE
DESIGN SOLUTIONS

615 3rd Avenue South, Suite 700

Nashville, TN 37210

BARGE # 36771-09



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NARRATIVE DESCRIPTION OF FACILITY AND OPERATIONS

The following narrative lists the composting regulations from the Tennessee Division of Solid Waste Management (Revised December 2019) in italic font and the responses to the regulations in regular font.

Rule 0400-11-01-.11 REQUIREMENTS FOR COMPOST AND COMPOSTING FACILITIES.

(1) *General*

(a) *Purpose - The purpose of this rule is to establish procedures, documentation, and other requirements which must be met in order for a person to operate a composting facility or offer for sale compost in Tennessee.*

(b) *Scope/Applicability*

1. *The requirements of this rule apply as specified to operators of composting facilities in Tennessee. Except as specifically provided elsewhere in these rules, no facility may compost solid waste without a permit as provided in paragraph (3) of Rule 0400-11-01-.02. Composting facilities, subject to a full permit on the effective date of this rule, must submit a part I and part II permit application to describe how it will comply with this rule. The application must be filed within 180 days of the effective date of this rule and implemented upon approval. The Division will not charge an application fee, nor require public notice of the application for facilities which already have permit-by-rule for composting.*
2. *Composting facilities that process biosolids or sewage sludge as a feedstock shall also comply with all other applicable federal or state laws regarding sludge management.*
3. *The following facilities or activities are not subject to the requirement to have a permit.*

(i) *Backyard composting and the resulting compost;*

(ii) *Animal and crop production operations that compost yard trimmings, agricultural residuals, mortalities, woody materials, and/or food scraps provided that the following conditions are met:*

(1) *The owner of the composting facility is the same as the owner of the animal or crop production operation where*

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- the yard trimmings, agricultural residuals, mortalities, food scraps, and woody materials are generated;*
- (II) *The composting facility is located on property owned or leased by the animal or crop production operation;*
- (III) *All compost produced is utilized exclusively at an animal or crop production operation;*
- (iii) *Any composting facility with a throughput of less than 400 cubic yards of Type 1 feedstock during any calendar year;*
- (iv) *Any composting facility with a throughput of less than 50 cubic yards of Type 2 feedstock during any calendar year; and*
- (v) *Any composting facility with a throughput of less than 100 cubic yards of Type 2 feedstock in any calendar year using an in-vessel composting method.*
4. *A Tier One composting facility may only process Type 1 feedstocks. Type 1 feedstocks include source separated yard trimmings, woody material, crop residues, and other materials determined to pose a low level of risk to human health and the environment, including from physical contaminants and human pathogens.*
5. *A Tier Two composting facility may only process Type 1 and/or Type 2 feedstocks. Type 2 feedstocks include agricultural residuals, source-separated organics, and food processing residuals and industrial by-products as approved by the Department. Type 2 feedstocks are materials that the Department determines to pose a low level of risk to human health and the environment despite having more physical contaminants and human pathogens than Type 1 feedstocks.*
6. *A Tier Three composting facility may process Type 1, Type 2 and/or Type 3 feedstocks. Type 3 feedstocks include mixed solid waste, diapers, sewage sludge, biosolids, and industrial by-products and food processing residuals not covered in Type 2. They also include other materials the Department determines to pose a low level of risk to human health and the environment despite having more physical contaminants and human pathogens than Types 1 and Type 2 feedstocks.*
7. *Owner or operators of Tier One composting facilities may apply for an authorization pursuant to part (2)(b)7. of Rule 0400-11-01-.02.*
8. *No waste defined as hazardous waste under subparagraph (1)(c) of Rule 0400- 12-01-.02 may be received for composting. Feedstocks containing*

industrial by- products, sewage sludge or biosolids are subject to a hazardous waste determination, in accordance with subparagraph (1)(b) of Rule 0400-12-01-.03, and must be approved in writing by the Division before being accepted at the facility.

The City of Lebanon (the city) is seeking a permit for a Tier Three composting facility (the facility).

- (2) *Facility Standards - Unless specifically noted otherwise, the standards of this paragraph shall apply to all compost facilities subject to a permit as provided at paragraph (3) of Rule 0400- 11-01-.02 and Tier One permit by rule facilities.*

(a) *General Facility Design and Operating Standards*

1. *All compost facilities shall meet the following design standards in order to operate in a manner that is protective of human health and the environment:*

- (i) *The feedstock receiving, processing and storage areas must be clearly defined and the maximum throughput and capacity specified.*

The feedstock receiving, processing and storage areas are clearly defined on the site plan for the facility. Please refer to Attachment 4 – Permit Drawings. The facility will be built out in multiple phases, the initial and final phases are shown in this application. The feedstock receiving area for the initial and final phase is 165 cubic yards. The feedstock receiving areas are clearly defined at the facility with signage. The maximum capacity of the windrow area for initial phase is 1,300 cubic yards of compost, which accommodates 325 cubic yards of feedstock mixed at a 3:1 ratio with wood products bulking material. The maximum capacity of the windrow area for the final phase is 9,800 cubic yards of compost, which accommodates 2,450 cubic yards of feedstock mixed at a 3:1 ratio with wood products bulking material. All windrow volumes assume 8' tall windrows with 3:1 side slopes. The wood products can be sourced either off-site or from the facilities existing Tier One composting facility (SWP950001387) adjacent to the proposed site of the Tier Three composting facility. A finished compost storage volume of approximately 650 cubic yards of will be available in both the initial and final phases to store finished compost before it is shipped offsite.

The facility volumes are based on the city's desire to process as compost the Class B biosolids generated at their wastewater treatment plant. On average the plant generates 1,500 tons (~2,450 CY) of biosolids each year in events that occur randomly throughout the year about 100 tons (~165 cubic yards) per event. Currently, this material is landfilled but composting it would allow the pathogens to be broken down and produce a product applicable for land

application. During Phases 1 and 2 the facility will be able to receive one event at a time in the feedstock receiving area. During the initial phase the facility will be sized to process two events in a windrow at a one time. The facility will be expanded in subsequent phases to reach the final volume capable of handling the entire 1,500-ton capacity at one time. Since it is unlikely for the city to need 1,500-tons of capacity at one time, the facility will have capacity available to receive other types of feedstocks if the city starts a composting program.

- (ii) *The composting facility shall have all-weather access roads. The facility shall be designed such that access to the composting facility shall be limited to authorized entrances, which shall be secured from public access when the facility is not in operation.*

Access roads and parking areas are paved with compacted stone.

The entire property is fenced and access to the facility is through the gated entry off of Franklin Road at the front of the facility. Access is controlled via the locked gates during non-business hours and visitors to the facility are accompanied by a facility representative during normal business hours.

- (iii) *Contact Water Collection*

- (I) *The facility shall have a contact water collection system that is properly managed.*

The facility is graded to direct contact water toward the contact water collection pond. The pond will be built to contain the 25-year storm volume for the full extents of the facility in the final phase. Therefore, for the initial and subsequent phases the pond will have significant amounts of additional storage. The system will be properly managed by city personnel. Please refer to Attachment 5 – Engineering Design Report.

- (II) *Contact water shall be reused in the process or otherwise properly managed as per all applicable laws and rules.*

Contact water from the concrete pad will be collected in the contact water detention pond and will be pumped and applied to the compost windrows or pumped to the city sanitary sewer manhole on-site. Prior to the completion of the city sanitary sewer installation any contact water that cannot be reapplied will be pumped and hauled by a tank truck. Since the concrete pad is built up there will be no run-

on water to be collected in the detention pond.

The contact water detention pond will be emptied prior to rain events to have maximum retention capacity. During the initial phase contact water can be left with 4 feet of water in the detention pond to have adequate water for applying to the windrows and still have substantial capacity with freeboard below the emergency spillway elevation. The calculations showing contact water runoff volumes and available water in the pond are shown in Attachment 5 – the Engineering Design Report. Water in the contact water detention pond is pumped and applied to the composting windrows when necessary for the composting process or applied to the land application area. Water which overtops the contact water detention pond flows to a sinkhole onsite.

The facility will collect water samples from the contact water detention ponds for analysis on an annual basis and submit the results with the annual report. The list of parameters analyzed which will be analyzed are included in Attachment 1 – Compost Facility Operation Plan (CFOP).

Please refer to Attachment 5 – Engineering Design Report for supporting runoff prevention calculations.

- (iv) *Litter Control - Fencing and/or other control shall be provided to confine loose waste to the area designated for storage or processing; Accidental dispersal from the designated areas shall be recovered daily.*

Fencing, vegetation and berms immediately adjacent to the compost windrows help contain loose waste to the compost pad. Accidental dispersal of loose waste from its designated area will be recovered daily.

- (v) *Personnel Facilities - There shall be provided:*

- (I) *A building or other shelter which is accessible to facility personnel which has adequate heating and light.*

During the initial phase the city requests a variance for the personnel facilities. A permanent staff member will not be maintained at the facility, but will be staffed by city personnel from other areas. During subsequent phases a portable office building will be located on-site with windows for lighting and electric heating. Proposed Facility locations are shown in Attachment 4 – the Permit Plans.

(II) *Potable water for washing and drinking.*

During the initial phase water for drinking and washing will be supplied from a water truck to refill a portable handwashing station. During subsequent phases municipally supplied potable water will be supplied to the portable office building.

(III) *Toilet facilities.*

During the initial phase a portable toilet facility will be utilized on site. During subsequent phases the toilet facility will be located in the portable office building.

(vi) *Operating Equipment - The facility shall have on-site operational and monitoring equipment capable of maintaining the waste processing as designed.*

The facility will be operated by the City's Public Works Department and will have access to a front-end wheel loader to move materials. They will also have access to dump trucks for delivery of feedstocks, removal of finished compost, and movement of large amounts of material around the site. In the initial phase they will use the wheel loader to turn compost. During subsequent phases, the facility may continue to use the wheel loader, but if volumes necessitate they may upgrade to a self-powered compost turner, which is pulled by tractor, to mix and aerate the windrows to maintain proper temperature, moisture and aerobic composting conditions. To monitor windrow temperatures the facility will utilize compost thermometers. Wood based materials will be ground in the adjacent Tier 1 compost facility. If any grinding / chipping of materials needs to be at this facility a wood-chipper will be used in on a portion of the concrete pad at the end of the windrows.

During subsequent phases the city may opt to process their compost in aerated static piles. If they use aerated static piles, they will use wastewater blowers with valves and piping to serve the aerated static piles.

(vii) *Endangered Species - Facilities shall be located, designed, constructed, operated, maintained, closed, and cared for during the post-closure care period in a manner that does not:*

(I) *Cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife; or*

(II) *Result in the destruction or adverse modification of the critical habitat of endangered or threatened species.*

The facility will be built upon a city owned material storage facility with gravel roads and bedrock within a few inches of the surface. Immediately adjacent to the facility is an existing Tier 1 composting facility. Due to the development and existing use of this site there is a lack of suitable habitat for threatened and endangered species, and no adverse impact is anticipated to any plants, fish, or wildlife. Attachment 9 contains a list of threatened and endangered species on the site generated by the US Fish and Wildlife Services iPaC online tool. Among the species are bats, mussels, flowering plants, and migratory birds. The impacted area does not contain any streams, creeks, or freshwater ponds therefore there is no suitable habitat for mussels. There is a more substantial growth of trees to the north and west of the impacted area on the property that will remain largely undisturbed that could remain a more suitable habitat for any bats, flowering plants, or migratory birds should they be present on the site than the proposed area.

- (viii) *Location in Floodplains- Facilities shall not be located in a 100-year floodplain, unless the demonstration is made to the Commissioner as required at subparagraph (2)(n) of Rule 0400- 11-01-.04.*

As shown on the Federal Emergency Management Agency Flood Insurance Rate Map, 47189C0190D, dated February, 20, 2008, the facility is not located in a 100-year floodplain. Please refer to the Firmette included in Attachment 6.

- (ix) *Wetlands - The facility shall not be located in a wetland unless the demonstration is made to the Commissioner as required at subparagraph (2)(p) of Rule 0400-11-01-.04.*

As shown on the National Wetland Inventory Map the facility is not located in a wetland and exceeds the 200-foot buffer from a small surface water pond on the property. Please refer to the Map included in Attachment 7.

- (x) *Buffer Zone Standards for Siting New Facilities - All waste management areas shall be located so as to conform to the distance standards at subparagraph (3)(a) of Rule 0400-11-01-.04.*

The waste management areas and buffer zones are shown in Attachment 4 – Permit Drawings, and detailed in the table on the next page.

Buffer Description	Distance Required	Distance Provided	Variance Requested?
All property lines.	100 feet	100 feet	No. All compost processing surfaces are 100' from property lines.
All residences, unless the owner of the residential property agrees in writing to a shorter distance.	500 feet	1,313 feet	No.
All downgradient wells used as a source of drinking water by humans or livestock.	500 feet	2,700 feet	No. – See Attachment 7 for Well Location Vicinity Map
Normal boundaries of springs, streams, lakes, (except that this standard shall not apply to any wet weather conveyance nor to bodies of water constructed and designed to be a part of the facility).	200 feet	700 feet	No.
A total site buffer with no constructed appurtenances within 50 feet of the property line.	50 feet	50 feet	No.

2. *All compost facilities shall meet the following operational standards:*

- (i) *Contingency operations shall identify proper management of all waste in the event of equipment failure, facility disaster, or receipt of unauthorized material such as oil, hazardous waste, etc.*

The city's public works department will be managing this facility. In the event of equipment failure, the public works has additional vehicles in their fleet that could serve as a temporary replacement to properly manage waste until the primary equipment is repaired. In the event of a facility disaster, no new waste will be accepted, and appropriate measures will be taken to manage waste currently on site. All loads of waste are monitored prior to unloading to prevent acceptance of unauthorized material; however, in the event of the receipt of unauthorized material, the waste will be placed in an on-site roll-off container for identification and removal.

(ii) *Fire Safety*

(I) *No open burning is allowed.*

Open burning is not permitted at the facility.

(II) *The facility shall have, on-site and continuously available, properly maintained fire suppression equipment capable of controlling accidental fires. If available, local firefighting service shall be acquired.*

Fire extinguishers are located in the vehicles, mounted on the bin-block final compost area, and in the office facility during future phases when it is on-site. Water pumps for the contact water detention area may also be utilized for fire suppression. The City of Lebanon Fire Department #1 is located 4.4 miles away at 209 E Gay Street, Lebanon, TN 37087.

(iii) *Communication - The facility shall have available during operating hours equipment capable of summoning emergency assistance as needed.*

Cellular telephones are available for emergency communications.

(iv) *Dust Control - The operator must take dust control measures as necessary to prevent dust from creating a nuisance or safety hazard to adjacent landowners or to persons engaged in supervising, operating, and using the site. The use of any dust suppressants (other than water) must be approved in writing beforehand by the Department.*

Access roads and parking areas are paved with compacted stone which on top of bedrock for dust control. The compost pad will be constructed from roller compacted concrete. Contact water from the detention pond may be used to suppress dust for areas that drain back to the detention pond.

(v) *The owner/operator of a compost facility permitted pursuant to paragraph (1) of Rule 0400-11-01-.02 shall file with the Commissioner a performance bond or equivalent cash or securities, payable to the State of Tennessee. Such financial assurance shall be in an amount determined by the Commissioner to be adequate to insure 30 days operation and proper closure of the facility. The types of financial assurance instruments that are acceptable are those which are specified in subparagraph (3)(d) of Rule 0400-11-01-.03. Such financial assurance shall meet the criteria set forth in T.C.A. § 68 211 116 and at subparagraph (3)(b) of Rule 0400-11-01-.03.*

Financial assurance will be provided to insure 120 days operation and proper closure of the facility appropriate for a composting facility. Please refer to Attachment 3 for the financial assurance spreadsheet.

- (vi) *Facility operations manager, person responsible for the day-to-day operation, must be able to document training in the basics of compost facility operations within the first year of supervising the facility. Training must consist of classroom and hands-on course work and conclude with a certificate of completion that must be kept on site at all times. Appropriate compost operations training must be approved by the Department.*

The facility operations managers, person responsible for the day-to-day operation, of the facility will complete a Department approved compost operations training within the first year of supervising the facility. The certificate of completion for the Department approved compost operations training will be kept on site at all times.

- (vii) *Facilities must follow a Composting Facility Operations Plan (CFOP) — reviewed and approved as part of the permit application — that describes operational procedures (methods and practices) to comply with the intent of regulations to protect human health and the environment and not create nuisances. This includes measures to control nuisance odors, vectors, fires, contact water and stormwater, provisions for the annual maintenance of the all-weather composting pads, as well as provisions for prompt equipment repair or replacement when needed. The CFOP must be internally reviewed annually to ensure it continues to reflect current procedures, equipment and feedstock(s). The CFOP must be updated when there is a change to procedures (including equipment) or the types of feedstocks processed, and reflect how the facility will continue to comply with the intent of the rules. The CFOP must be available to the permitting authority upon request. The Department shall be informed in writing of any proposed changes to the CFOP for approval prior to implementation.*

The facility will follow its approved Composting Facility Operations Plan (CFOP). The CFOP will be updated when there is a change to procedures, equipment, or types of feedstocks. The CFOP will be reviewed annually to ensure it reflects the current procedures, equipment, and feedstock(s). Please refer to the Compost Facility Operation Plan in Attachment 1. TDEC will be notified if there are changes made to the CFOP.

- (viii) *Facilities shall be maintained in a clean and sanitary condition, e.g., free of unsecured trash at end of each operating day.*

The facility will be maintained in a clean and sanitary condition. Please refer to the Compost Facility Operation Plan in Attachment 1.

- (ix) *Operators of composting facilities shall comply with all local rules, regulations, and ordinances pertaining to their facilities.*

The facility currently complies with applicable local rules, regulations, and ordinances.

- (x) *Contact water generated shall be directed to a containment, recycling, and/or treatment system sized to handle at a minimum a 24-hr 25-yr storm event.*

The facility is graded to directed contact water to a system of sedimentation and retention ponds which are sized to handle at minimum a 24-hr 25-yr storm event. Please refer to Attachment 4 – Engineering Design Report for supporting calculations.

- (xi) *Storage of finished compost on site is limited to 12 months of production, unless approved by the Department on a case-specific basis.*

The storage of finished compost on-site is limited ~650 cubic yards of finished compost for both initial and final phases. This can accommodate one Class B biosolids event (~100 tons / 165 cubic yards of feedstock) mixed at a 3:1 ratio with wood bulking material. The city will either open the facility for citizens to purchase finished compost on-site or be able to readily haul it to another city facility where it will be needed.

- (xii) *No material may be stored in excess of the designated capacity.*

No material will be stored in excess of the designated capacity.

- (xiii) *Non-compostable waste shall be removed or stored in a waste container and/or containment area, and disposed or recycled at a permitted solid waste facility in a timeframe approved in the CFOP.*

Non-compostable waste will be removed or stored in a waste container and/or containment area and disposed or recycled at a permitted solid waste facility as outlined in the CFOP. Please refer

to the Compost Facility Operation Plan in Attachment 1.

- (xiv) *The composting area shall be maintained and repaired, as needed.*

The composting area will be maintained and repaired, as needed. Please refer to the Compost Facility Operation Plan in Attachment 1.

- (xv) *Closure - The facility must meet closure requirements described herein. The facility is finally closed by removal of all solid wastes and solid waste residues for proper disposal. The operator must notify the Commissioner in writing of his completion of closure of the facility. Such notification must include a certification by the operator that the facility has been closed by removal of all the solid waste and residues. Within 21 days of the receipt of such notice the Commissioner shall inspect the facility to verify that closure has been completed. Within 10 days of such verification, the Commissioner shall approve the closure in writing to the operator. Closure shall not be considered final and complete until such approval has been made.*

As a composting facility, the following alternative schedule for closure is proposed:

Time Frame	Action Item
Day 0 - 120	The facility operator will notify the Commissioner of their intention to close the facility. The facility will cease to receive new feedstock on Day 0, and continue the processing of the feedstock on site. The composting of all feedstock on site is expected to be complete (i.e. the compost has finished the thermophilic stage) within 120 days. The removal of all solid waste and solid waste residues for proper disposal will be completed within 120 days. The finished compost will be hauled off-site by the city for their use.
Day 120	The facility operator will notify the Commissioner in writing of completion of closure of the facility. The notification will included a certification by the facility operator that the facility has been closed by removal of all the solid waste and residues.
Day 121- 141	The Commissioner will inspect the facility to verify that closure has been completed.
Day 121- 151	The Commissioner will approve the closure of the facility, in writing, to the facility operator.

- (xvi) *The facility shall have a sign at the entrance of the facility that lists the following: name of facility; operating permit number; hours of operation; and emergency contact information.*

The facility has a sign at the entrance of the facility that lists the following: name of the facility, operating permit number, hours of operation, and emergency contact information.

- (xvii) *The facility must manage and process feedstocks in a timeframe that minimizes odors, contact water, release of feedstock liquids, fire and scavenging by vectors.*

The facility will manage and process feedstocks in a timeframe that minimizes odors, contact water, release of feedstock liquids, fire and scavenging by vectors. Please refer to the Compost Facility Operation Plan in Attachment 1.

(b) *Tier One Facility Design and Operating Standards*

1. *Tier One composting facilities may process Type 1 feedstocks only.*
2. *Tier One facilities shall meet the following design standards in order to operate in a manner that is protective of human health and the environment:*
 - (i) *The composting area should have run on and run off control and slope of 1 to 6 percent as determined by site conditions to direct contact water to the appropriate collection, storage and treatment system.*

The composting area is graded to have run on and run off control and with slopes of ~1.5 percent to direct contact water toward sedimentation and retention ponds. The composting area is elevated and surrounded by berms to prevent run-on of storm water from surrounding areas. Please refer to Attachment 5 – Engineering Design Report for supporting hydrologic and hydraulic calculations.

- (ii) *All composting at Tier One composting facilities shall be conducted on an all-weather composting pad, except for those facilities operating on a seasonal basis only (e.g., fall leaves and spring yard cleanouts). The all-weather pad must meet the following criteria:*
 - (I) *Except as provided in item (III) of this subpart, the pad surface shall be 5 feet or more from the top of the seasonal high water table of the uppermost aquifer or the top of the formation of a confined aquifer;*

(II) *Soils within the first 5 feet of the surface shall exhibit hydraulic conductivity of 1.0×10^{-6} cm/s. If soil depth to seasonal high water table is 10 feet or greater, a geologic buffer consisting of 10 feet of clay with a maximum hydraulic permeability of 1.0×10^{-5} may be used;*

(III) *If less than 5-feet from the top of the seasonal high water table an improved low permeability surface is required for tipping, mixing and active composting areas. The improved low permeability surface shall consist of concrete, asphalt or other approved material capable of withstanding heavy equipment and preventing contamination of the uppermost aquifer; and*

The composting facility site contains bedrock at or within 6 inches of existing grade across the site. Therefore, the composting area will be constructed of roller compacted concrete (RCC).

(IV) *All weather pad shall be of sufficient slope to direct contact water to the appropriate collection, storage and treatment system. The pad shall also be constructed in such a manner as to prevent run-on of storm water to the extent practicable.*

The all-weather composting pad is of sufficient slope to direct contact water to the appropriate collection, storage, and treatment systems. The all-weather pad is elevated and surrounded by berms to prevent run-on of storm water from surrounding areas. Please refer to Attachment 5 – Engineering Design Report for supporting hydrologic and hydraulic calculations.

3. *Tier One facilities shall meet the following operational standards:*

(i) *Compost processing time and temperatures shall be sufficient to kill weed seeds, reduce pathogens and vector attraction, and produce compost that meets the stability necessary for the intended use. Pathogen and vector attraction reduction compliance achieved as follows:*

(I) *Windrow composting: the compost material must be maintained at a minimum average temperature of 55°C (131°F) or higher for 15 days or longer. During the period when the compost is maintained at 55°C (131°F) or higher, there shall be a minimum of five turnings of the windrow with a minimum of 3 days between turnings. The 15 or more days at or above 55°C (131°F) do not have to be continuous; and*

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- (II) *Aerated static pile or in-vessel composting process: Material maintained at a minimum average temperature of 55°C (131°F) or higher for three continuous days, followed by at least 14 days with a minimum of 45°C (113°F).*

Compost processing time and temperatures will meet process to further reduce pathogens (PFRP), vector attraction reduction requirements and produce compost that meets the stability necessary for the intended use.

(c) *Tier Two Facility Design and Operating Standards*

1. *Tier Two composting facilities shall process Types 1 and/or 2 feedstocks only.*
2. *Tier Two facilities shall meet the following design standards in order to operate in a manner that is protective of human health and the environment:*
 - (i) *Owner or operator must submit an engineering design report for approval with facility application.*

Refer to Attachment 5 – Engineering Design Report.

- (ii) *Tipping, mixing, active composting, curing, screening and finished compost storage areas must be on an all-weather pad as described at (b)2.(ii) of this paragraph.*

The tipping, mixing, active composting, curing, screening, and finished compost storage areas are all on an all-weather watertight RCC pad. The pad is graded and surrounded by berms to direct contact water to the geomembrane lined contact water detention pond. The contact water will be applied to the compost windrows.

The tipping / receiving and finished compost storage areas will be contained with bin blocks both initial and subsequent phases. By the final phase when the dedicated receiving and finished compost areas will be on a separate pad that is graded to drain away from the contact water detention pond the tipping / receiving and finished compost areas will be covered with a hoop roof system that will prevent any contact water from being generated from rainfall runoff. Any feedstock that has free liquid will be mixed with drier feedstock or bulking material upon receipt and not left to sit and leach out in the receiving area.

- (iii) *The maximum composting process windrow or pile size and minimum composting process windrow or pile spacing shall match the capability and requirements of the equipment used at the facility. As pile height increases, windrows or piles should be monitored to*

minimize compaction, a potential cause of odor.

Refer to the Composting Facility Operations Plan in Attachment 1.

- (iv) *A plan and procedure for monitoring the temperature and moisture during composting shall be provided, and should demonstrate that PFRP (Process to Further Reduce Pathogens, USEPA 40 CFR Part 503) is met. The temperature and moisture ranges for the composting cycle shall be specified. The plan shall include contingencies for not meeting the specified ranges for the composting process.*

Refer to the Composting Facility Operations Plan in Attachment 1.

3. *Tier Two facilities shall meet the following operational standards:*

- (i) *Feedstocks with free liquid shall be mixed with drier feedstocks, bulking material or compost so that the liquid is promptly adsorbed and not allowed to flow as free liquid from the compost piles or windrows. Free liquid that is not adsorbed shall be managed as contact water and directed to a containment or treatment system.*

Feedstocks with free liquid are mixed with drier feedstocks, bulking material, or compost so that the liquid is promptly adsorbed. Free liquid that is not adsorbed is captured in the geomembrane lined detention pond. The contact water from the detention pond will be pumped and applied back to the active compost.

- (ii) *By the end of each operating day, all incoming feedstocks must be processed into the active composting pile, transferred to leak-proof containment or mixed with bulking material and covered in a manner that minimizes nuisance odors and scavenging by vectors.*

At the end of each operating day all incoming feedstocks are processed into the active composting pile or mixed with bulking material and covered in a manner that minimizes nuisance odors and scavenging by vectors.

- (iii) *Compost processing time and temperatures shall meet PFRP and vector attraction reduction requirements, and produce compost that meets the stability necessary for the intended use. Pathogen and vector attraction reduction compliance is achieved as follows:*

- (I) *Windrow composting: the compost material must be maintained at a minimum average temperature of 55°C or higher for 15 days or longer. During the period when the compost is maintained at 55°C or higher, there shall be a*

minimum of five turnings of the windrow with a minimum of 3 days between turnings. The 15 or more days at or above 55°C (131°F) do not have to be continuous; and

- (II) Aerated static pile or in-vessel composting process: Material maintained at a minimum average temperature of 55°C (131°F) or higher for three continuous days, followed by at least 14 days with a minimum of 45°C (113°F).*

Compost processing time and temperatures will meet PFRP and vector attraction reduction requirements and produce compost that meets the stability necessary for the intended use.

(d) Tier Three Facility Design and Operating Standards

- 1. Tier Three composting facilities may process Types 1, 2 and/or 3 feedstocks.*
- 2. Tier Three composting facilities shall comply with design standards for Tier 2 composting facilities and the additional design standards listed below:*

- (i) The working surfaces for all receiving, mixing, active composting and storage areas must be designed, constructed, and maintained to prevent conditions of contamination, pollution, and nuisance. All working surfaces must have a hydraulic conductivity of 1x10⁻⁵ cm/s or less, and meet one the following construction and material specifications:*

- (I) Asphalt concrete or Portland cement concrete designed to minimize the potential for cracking and to allow equipment to operate without damage;*

The pad will be RCC which has a lower water cement ratio leading to less shrinkage than traditional concretes and therefore less shrinkage cracking. Any random cracking that does develop will be filled will be routed out to form a v-shaped groove and filled with non-shrinking grout as a part of regular pad maintenance.

- (II) Compacted soil, with a minimum thickness of one foot and protected from desiccation and installed in a manner such that the integrity will not be impaired by the operation of heavy equipment used at the composting and storage area;*
or
Not applicable.

- (III) An equivalent engineered alternative.*

Not applicable.

3. *Tier Three composting facilities shall meet the operational standards for Tier Two composting facilities and the additional operational standard listed below:*

Facilities that compost biosolids or sewage sludge shall comply with all applicable regulations regarding biosolids and sewage sludge in Rule Chapter 0400-40-15.

All handling of biosolids and sewer sludge at the proposed location will be in accordance with Rule 0400-40-15 and including but not limited to rules for contaminant limits, management practices, and operational practices. No land application is proposed at this site. Standards for pathogen and alternative vector attraction reduction requirement will be met as well.

- (3) *Testing – Tier 2 and 3 facilities shall meet the following test standards and requirements:*

- (a) *Samples and measurements taken for the purpose of product testing shall be representative of the composting activity and shall be conducted in a manner consistent with Test Methods for Evaluation of Compost and Composting (TMECC) or other applicable standards pre-approved by the relevant agency.*

Samples and measurements taken for the purpose of product testing will be representative of the composting activity and conducted in a manner consistent with TMECC or other applicable standards.

- (b) *The minimum number of samples that shall be collected and analyzed is shown below. Samples to be analyzed shall be composted prior to the analysis.*

<i>Compost Quantity¹</i>	<i>Frequency</i>
<i>1 – 2500 tons²</i>	<i>1 per quarter (or less for seasonal operation)</i>
<i>2501 – 6200 tons</i>	<i>1 per quarter</i>
<i>6201 – 17500 tons</i>	<i>1 per 2 months</i>
<i>17501 tons and above</i>	<i>1 per month</i>

¹ *Either the amount of finished compost applied to the land or prepared for sale or give away for application to the land (on as “as is” (wet weight) basis).*

² *For facilities without scales use 800 lb/yd³ conversion factor.*

If test results show the finished product is stable and in compliance with both metals and pathogens standards for a two year period the facility may request a reduction in the frequency of testing. Compost produced from non-biosolids feedstock may test for pathogens and trace metals at half the frequency, but overall testing for all other characteristics must be as defined in the table above.

Finished Compost shall be analyzed according to the requirements of Rule 0400-11-01.11(3) every three months since the city currently plans to not have more than 1,500 tons of feedstock per year equating to ~4,000 tons of finished compost if blended at a 3:1 ratio of feedstock to bulking material. If the test results are satisfactory to the DSWM for two years, the city may request a reduction in testing frequency to once per year. Since, the city plans to produce compost using biosolids feedstock they will meet the testing frequency in the table above. The city will also increase their testing if they increase their annual production according to the rates presented in the table above.

- (c) *All compost shall be tested for stability using one of the methods listed in TMECC 5.08, Respirometry. The stability results must be recorded.*

All compost will be tested for stability using one of the methods listed in TMECC 5.08, Respirometry.

- (d) *All compost shall be tested for the presence of pathogens using the methods in TMECC 7.00, Pathogens. Before the compost may be sold, given away or applied to the land, either:*

1. *The density of fecal coliform in the finished compost shall be less than 1,000 Most Probable Number (MPN) per gram of total solids (dry weight basis); or*
2. *The density of Salmonella sp. bacteria in the finished compost shall be less than three MPN per four grams of total solids (dry weight basis).*

All compost will be tested for the presence of pathogens using the methods in TMECC 7.00, Pathogens.

- (e) *All composts shall be analyzed for metals listed in 40 CFR, Section 503.13(b)(3), as amended using methods described in TMECC 4.00 Chemical Properties. The concentration of metals in compost to be sold, given away or applied to the land shall not exceed the pollutant concentration (milligrams per kilogram) limits for Exceptional Quality compost as defined in the following table contained in 40 CFR, Section 503.13, Table 3.*

METAL CONSTITUENT	TOTAL METAL CONCENTRATION(mg/kg)
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

- (f) *Prior to being sold, given away or applied to the land, compost produced from feedstocks containing industrial by-products, sewage sludge or biosolids shall be analyzed for the metals listed in Table 1 of subparagraph (3)(e) of Rule 0400-12-01-.02 to verify that the compost does not exhibit the hazardous waste toxicity characteristic for those metals. This analysis shall be conducted on the first batch of compost produced and, thereafter, at the same frequency required by subparagraph (b) of this paragraph. Compost that exhibits the characteristic of hazardous waste shall be managed under the requirements of Chapter 0400-12-01.*
 - (g) *Compost which fails to meet the criteria of subparagraphs (d) and (e) of this paragraph must be managed as solid waste.*

All composts shall be analyzed for metals listed in 40 CFR, Section 503.13(b)(3), as amended using methods described in TMECC 4.00 Chemical Properties.
- (4) *Records - Facility owner or operators shall record and maintain at the facility for three years the following information regarding their activities for each month of operation of the facility. Records shall be available for inspection by Department personnel during normal business hours and shall be sent to the Department upon request to include:*
 - (a) *Analytical results on composting testing;*
 - (b) *The type and quantity of feedstock and the source of feedstock received;*
 - (c) *The quantity of compost produced;*
 - (d) *The quantity of compost removed for use or for disposal, and the market or permitted disposal facility. The operator must identify the market for compost removed for use. The operator must identify the permitted disposal facility for compost removed for disposal; and*
 - (e) *Temperatures measurements throughout the composting process demonstrating that PFRP has been met is applicable.*

The city will record and maintain at the facility for three years the above information regarding their activities for each month of operation of the facility. In addition, the facility will collect water samples from the contact water detention pond for analysis on an annual basis and maintain the results with the above information. The list of parameters to be analyzed is included in Attachment 1 – Compost Facility Operations Plan.

- (5) *Design and Construction Plans*
 - (a) *Master Plan - A master plan shall be provided that is drawn at a scale of not less than 1" = 400' with not more than 20 foot contour interval and which clearly depicts:*
 - 1. *The boundary of the proposed facility;*

2. *The existing drainage pattern of all site runoff;*
3. *Runoff monitoring stations;*
4. *Primary access roads;*
5. *Wells within one quarter mile of the site boundary;*
6. *The location of all 100-year floodplain boundaries; and*
7. *All residences within one quarter mile of the site boundary (If in an urban area residential properties may be delineated).*

Attachment 4 – Permit Drawings contains a Master Plan showing the above information.

- (b) *Design Plans - Design plans shall be provided that are drawn at a suitable scale of not less than 1" = 50 feet and with contour intervals of not greater than five feet, which clearly depicts:*

1. *All structures;*
2. *Proposed waste processing areas;*
3. *Proposed waste storage areas;*
4. *All drainage appurtenances that control run-on/run-off and the direction of flow;*
5. *The location of all existing and proposed utilities and roads (defining surface material); and*
6. *The location of all contact water collection/treatment structures, piping, storage appurtenances, and any other associated unit.*

Attachment 4– Permit Drawings contains Design Plans showing the above information.

- (c) *Narrative Description of the Facility and Operation - A narrative description of the facility and operation shall be provided that defines all procedures and activities pertinent to the design and operation of the facility. This narrative shall include, but not necessarily be limited to:*

1. *A description of how the facility will achieve the compliance of all standards defined in paragraphs (2), (3), (4), and (5) of this rule;*
2. *A description of the waste handling and processing equipment to be used;*

Refer to the Composting Facility Operations Plan in Attachment 1.

3. *A description of the management of run-on/runoff with design calculations of all structures designed to meet the 24hr – 25 yr storm event;*

Please refer to Attachment 5 – Engineering Design Report for supporting hydrologic and hydraulic calculations.

4. *A description of the management of the contact water system and the disposition of the contact water;*

Please refer to Attachment 5 – Engineering Design Report for supporting runoff prevention calculations.

5. *A description of the odor control measures; and*

Refer to Attachment 1 – Composting Facility Operations Plan.

6. *A description of the procedures for the final closure of the facility.*

Refer to Attachment 3 for the procedures for the final closure of the facility.

(6) *Annual Report*

Owners and operators of facilities producing compost shall submit to the Department an annual report by March 1 of each year. The report and shall include at a minimum:

- (a) *The facility name, address and permit number;*
- (b) *The reporting year with all quantities expressed in tons (sludge expressed in dry weight);*
- (c) *The total quantity and type of feedstock received at the facility during the year covered by the report;*
- (d) *The total quantity of compost produced during the year covered by the report; and*
- (e) *The total quantity of compost removed for use or for disposal, and the market(s) or permitted disposal facility(s). The operator must identify the market for compost removed for use. The operator must identify the permitted disposal facility for compost removed for disposal.*

An annual report will be submitted to the Department by March 1 of each year which includes at a minimum the information listed above. In addition, the facility will collect water samples from the sedimentation and retention ponds for analysis on an annual basis and submit the results with the annual report.

Rule 0400-11-01-.02(3)(a)10

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. As specified in T.C.A. § 39-16-702(a)(4), this declaration is made under penalty of perjury."

OWNER

DATE

Rule 0400-11-0-1.02(3)(c)2 – Disclosure Statement and Engineer Preparation

2. *Contents of the Compost Facility Permit Application – A complete permit application shall consist of a Part I with the applicant's disclosure statement and a Part II as described in this subparagraph.*
 - (i) *The Part I compost facility permit application must be submitted on forms provided by the Department with appropriate attachments which includes a disclosure statement as required by T.C.A. § 68-211-106(h). All forms must be completed as per the accompanying instructions. The Part I application must include, but shall not necessarily be limited to, the following information:*
 - (I) *The activities conducted or to be conducted by the applicant which require him to obtain a permit under this rule and the general types of wastes handled or to be handled;*
 - (II) *The name, mailing address, and location of the facility for which the application is submitted;*
 - (III) *The name, mailing address, and telephone number of the applicant and, if the applicant is a government agency, corporation, company, or partnership, that of the process agent or other person who will serve as the primary contact with the Department;*
 - (IV) *If different from the applicant, the name, mailing address, and telephone number of the land owner, along with a signed letter from such owner to the Department allowing access to the property for such investigations as may be necessary to determine its suitability as a composting facility;*
 - (V) *The name, mailing address, and telephone number of the zoning authority of jurisdiction (if any), and the current zoning status of the property; and*

- (VI) *A United States Geological Survey (U.S.G.S.) 7.5 minute topographic map which clearly indicates the location of the facility.*
- (ii) *The Part II compost facility permit application shall consist of those reports, plans and specifications, or other documentation necessary to provide the information specified in paragraph (5) of Rule 0400-11-01-.11. The master plan, design plan, and narrative description of the facility and operation are components of the Part II application and each must be prepared by a registered engineer. Any registered engineer herein required shall be governed by the terms of T.C.A. Title 62, Chapter 2.*

**ATTACHMENT 1:
COMPOST FACILITY
OPERATIONS PLAN (CFOP)**

Composting Facility Operations Plan (CFOP)

The following operational procedures (methods and practices) comply with the intent of regulations to protect human health and the environment and not create nuisances.

I. Waste Handling and Processing Equipment

a. Equipment

- i. Front End Wheel Loader
 1. Bucket Attachment
 2. Pallet Fork Attachment
 3. Wood Grapple Attachment
- ii. Skid Steer
- iii. Dump Truck
- iv. Self-Powered Compost Turner
- v. Compost Thermometers
- vi. Wood Chipper

b. Operation

- i. Front end wheel loader
The front end loader is utilized to move materials on-site and to turn the compost during initial phases.
- ii. Skid Steer
Used as an alternative to the front end wheel loader to move smaller amounts of material and turn compost on the site.
- iii. Dump Truck
The dump Truck is utilized to deliver feedstock and bulking materials to the site.
- iv. Self-Powered Compost Turner
The compost turner is pulled behind the wheel loader and is utilized to mix and aerate the windrows to maintain the proper temperature, moisture, and aerobic composting conditions. This will not be used in initial phases, but may be implemented in future phases.
- v. Compost Thermometers
The compost thermometers are used to monitor the windrow temperatures.
- vi. Wood Chipper
The wood chipper is utilized to grind wood based feedstocks, such as wood chips, limbs, logs, and trees into ground wood. Most of the wood chipping will be done in the adjacent tier 1 facility, but this equipment may be used in the tier 3 facility as well. The wood chipper may also be utilized to grind food based feedstocks in preparation for adding to the compost windrows.

c. Maintenance

Refer to the “Daily Operations Checklist” for equipment maintenance.

d. Repair and Replacement

Waste handling and processing equipment will be repaired or replaced as needed. In the event of equipment failure, the city public works depart has backup equipment available.

II. Personnel

- a. The facility will maintain sufficient personnel to process the feedstocks and compost as described.

III. Feedstock

- a. Types of Feedstock accepted will primarily be Class B biosolids from the wastewater treatment plant. However, additional feedstocks may be accepted as well if the city implements a composting program. Feedstocks types approved by the Department would be accepted included: agricultural residuals, source-separated organics, and food processing residuals and industrial byproducts as approved by the Department. Examples of these types of feedstock include the following:

- i. Fruit and vegetable food waste
- ii. Cafeteria waste
- iii. Lawn and landscape waste
- iv. Tobacco processing waste
- v. Cardboard and paper
- vi. Wood waste
- vii. Horse manure

- b. Receiving

Waste acceptance guidelines are included in the “Daily Operations Checklist”.

This facility is being built with the intention of receiving Class B biosolids from the wastewater treatment plant. All biosolids will be screened prior to being shipped to the facility so there should be no non-compostable waste materials delivered to the site.

However, in the event that the city beings accepted other types of feedstocks. All loads of waste will be inspected prior to unloading to prevent acceptance of non-compostable and other unauthorized materials. Loads containing unauthorized materials will always be rejected.

- c. Non-compostable Waste Removal

Non-compostable waste materials are disposed of at an authorized facility.

Non compostable waste materials will be stored in a roll-off container on site and disposed of at an appropriate permitted solid waste facility.

- d. Materials Storage

Biosolids received with free liquid shall be mixed with drier feedstocks or bulking material immediately upon receipt. No biosolids with free liquid shall be stored without first being mixed until no free liquid remains.

Landscaping and wood feedstocks are stored separately from other feedstocks.

Wood feedstocks are separated between trees, logs, limbs, mixed wood and chips. The trees, logs, and limbs and mixed wood are stored outside of the waste

management area and separate from the wood chips. The wood chips are stored in the existing adjacent tier 1 waste compost facility

Putrescible feedstocks are processed upon arrival at the facility and at the end of each operating day are processed into the active composting pile or mixed with bulking material and covered in a manner that minimizes nuisance odors and scavenging by vectors. Once mixed with bulking material and covered it can be temporarily stored in the receiving area until ready to be composted

IV. Processing

a. Feedstock

Feedstocks with free liquid are mixed with drier feedstocks, bulking material, or compost so that the liquid is promptly adsorbed. Free liquid that is not adsorbed is captured in the geomembrane lined detention pond.

Most wood based feedstocks, such as wood chips, limbs, logs, and trees will be ground at the adjacent tier 1 facility or delivered to the site from an off-site processing location. However, a wood chipper may also be utilized to grind smaller amounts of wood based feedstock and other food based feedstocks in preparation for adding to the compost windrows.

At the end of each operating day all incoming feedstocks are processed into the active composting pile or mixed with bulking material and covered in a manner that minimizes nuisance odors and scavenging by vectors.

b. Windrows

Windrows are created by loading processed compost waste into the dump truck and dumping the material onto the composting pad in a long straight row. The loader is used to shape the material into a rough windrow shape. At this time, the loader, skid steer, or compost turner is used to further mix and aerate the material and form a windrow with maximum dimensions of 48 feet wide and 8 feet tall.

Windrow composting: the compost material must be maintained at a minimum average temperature of 55°C or higher for 15 days or longer. During the period when the compost is maintained at 55°C or higher, there shall be a minimum of five turnings of the windrow with a minimum of 3 days between turnings. The 15 or more days at or above 55°C do not have to be continuous.

c. Measures to Control Nuisance Odors

The available feedstocks are mixed in appropriate proportions to achieve a 25- 30:1 Carbon to Nitrogen ratio. The windrows are turned on a regular basis to facilitate expedient destruction of pathogens and additionally a breakdown of food wastes and minimize odors and deter vectors.

d. Measures to Control Vectors

The windrows are turned on a regular basis to facilitate expedient destruction of pathogens. Class B biosolids will be mixed with ample bulking material to remove odor and reduce vector attraction. Regular turning will facilitate the breakdown of any food wastes that are accepted and minimize odors and deter vectors. After the initial breakdown of the food wastes the compost becomes less attractive to vectors, specifically birds, rodents and other vectors. Frequent turning in the early stages of composting helps to reduce odors and destroy fly larvae in turn controlling flies.

e. Measures to Control Fires

Open burning is not permitted at the facility.

Fire extinguishers are located in the vehicles, mounted on the bin-block final compost area, and in the office facility during future phases when it is on-site. Water pumps for the contact water detention area may also be utilized for fire suppression. The City of Lebanon Fire Department #1 is located 4.4 miles away at 209 E Gay Street, Lebanon, TN 37087.

f. Measures to Control Contact Water and Stormwater

The facility is graded to direct contact water toward the contact water detention pond. Contact water collected in the detention pond is reused on the compost windrows and/or applied to the land application area.

The pond is maintained at an empty level to provide maximum retention capacity at all times except for the summer season to have adequate water for applying to the windrows, but will be pumped down prior to any storm events. Water in the contact water detention pond is pumped and applied to the composting windrows. Excess contact water not needed for compost application will be either pumped and hauled as needed to maintain storage or pumped to the municipal sewer manhole on-site once installed. Water which overtops the detention pond flows to the closed contour on site which currently accepts the site drainage in the proposed composting facility area. It has been determined to have adequate capacity due to a review of aerial photography immediately following the historic May 2010 flood and no ponded water was seen. Filter socks will be installed and regularly cleaned at the end of the compost pad to prevent sediment from washing into the contact water pond. Any sediment that does enter the pond will be removed as necessary to maintain its storage volume.

g. Composting Pad Maintenance

The compost pad is an RCC pad with 1.5% slope to maintain positive drainage. Roller compacted concrete is an extremely durable surface and should require little to no maintenance over its approximate 30-year lifespan. If cracks do develop that are determined to be substantial, they will be filled or patched.

The composting pad has been constructed with a berm surrounding it to prevent stormwater run on and contact water runoff from the pad. The one-foot-tall berm will need to be monitored and repaired as necessary to ensure it is structurally sound to continue to serve as an effective barrier. However, the pad is graded such that contact water will be managed in drainage aisles and not dependent on the 1' perimeter berm for containment of contact water.

V. Testing

a. Compost Temperature and Moisture Monitoring Plan

Compost thermometers are used to monitor the temperature of the compost windrows. The readings are recorded on a compost windrow monitoring form. These forms are used to monitor the breakdown on the compost. When a row has gone through the thermophilic composting phase and the temperature is consistently below 131° F and does not reheat to above 131° F after turning, it is considered to be in the curing phase.

The squeeze method is used to determine proper moisture level in the windrows. The compost should be moist enough to form a ball when squeezed in your hand, but should break apart easily when tossed into the air and caught again. Moisture should not freely run from the compost when squeezed.

b. Samples

- i. Samples and measurements taken for the purpose of product testing will be representative of the composting activity and conducted in a manner consistent with TMECC or other applicable standards.
- ii. Samples to be analyzed shall be composted prior to the analysis.
- iii. The minimum number of samples that shall be collected and analyzed is shown below.

Compost Quantity ¹	Frequency
1 – 2500 tons ²	1 per quarter (or less for seasonal operation)
2501 – 6200 tons	1 per quarter
6201 – 17500 tons	1 per 2 months
17501 tons and above	1 per month

¹ Either the amount of finished compost applied to the land or prepared for sale or give away for application to the land (on as “as is” (wet weight) basis).

² For facilities without scales use 800 lb/yd³ conversion factor.

Finished Compost shall be analyzed according to the requirements of Rule 0400- 11-01.11(3) every three months since the city currently plans to not have more than 1,500 tons of feedstock per year (~4,000 tons of finished compost if blended at a 3:1 ratio of feedstock to bulking material). If the test results are satisfactory to the DSWM for two years, the city may request a reduction in testing frequency to once per year. Since, the city plans to

produce compost using biosolids feedstock they will meet the testing frequency in the table above. They will increase testing if they increase annual production in accordance with the rates presented in the table above.

c. Stability

- i. Compost is tested for stability using one of the methods listed in TMECC 5.08, Respirometry.
- ii. The stability results must be recorded.

d. Pathogens

- i. Compost is tested for the presence of pathogens using the methods in TMECC 7.00, Pathogens.
- ii. Before the compost may be sold, given away or applied to the land, either:
 1. The density of fecal coliform in the finished compost shall be less than 1,000 Most Probable Number (MPN) per gram of total solids (dry weight basis); or
 2. The density of Salmonella sp. bacteria in the finished compost shall be less than three MPN per four grams of total solids (dry weight basis).

e. Metals

- i. Compost is tested for metals listed in 40 CFR, Section 503.13(b)(3), as amended using methods described in TMECC 4.00 Chemical Properties. The concentration of metals in compost to be sold, given away or applied to the land shall not exceed the pollutant concentration (milligrams per kilogram) limits for Exceptional Quality compost as defined in the following table contained in 40 CFR, Section 503.13, Table 3.

<i>METAL CONSTITUENT</i>	<i>TOTAL METAL CONCENTRATION (PPM)</i>
<i>Arsenic</i>	<i>41</i>
<i>Cadmium</i>	<i>39</i>
<i>Copper</i>	<i>1500</i>
<i>Lead</i>	<i>300</i>
<i>Mercury</i>	<i>17</i>
<i>Nickel</i>	<i>420</i>
<i>Selenium</i>	<i>100</i>
<i>Zinc</i>	<i>2800</i>

f. Detention Pond Water Analysis

- i. The contact water detention pond is designed and operated with the intent not to release any contact water. However, in the event of an unintended discharge during a large storm event a sample of the water will be collected.
- ii. The city currently is applying for a multisector discharge permit for the adjacent existing Tier 1 compost facility and the proposed Tier 3 compost facility. The existing Tier 1 compost facility will leave through the existing

injection well. For the proposed Tier 3 facility any unintended discharges should leave through the emergency spillway of the stormwater detention pond. The existing injection well and the proposed emergency spillway will be designated as collection points in the multisector discharge permit.

- iii. If there are no unintended discharges the facility will collect water samples from the contact water detention pond for analysis of the same constituents listed in the table below on an annual basis and submit the results with the annual report.
- iv. The contact water detention pond will be analyzed for the following.

CONSTITUENTS FOR GROUNDWATER MONITORING (TDEC Solid Waste Management Rule 0400-11-01, Appendix I)	
Inorganic Constituents	
1. Antimony	32. o-Dichlorobenzene; 1,2-Dichlorobenzene
2. Arsenic	33. p-Dichlorobenzene; 1,4-Dichlorobenzene
3. Barium	34. trans-1,4-Dichloro-2-butene
4. Beryllium	35. 1,1-Dichloroethane; Ethylidene chloride
5. Cadmium	36. 1,2-Dichloroethane; Ethylene dichloride
6. Chromium	37. 1,1-Dichloroethylene; 1,1-Dichloroethene; Vinylidene chloride
7. Cobalt	38. cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene
8. Copper	39. trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene
9. Fluoride	40. 1,2-Dichloropropane; Propylene dichloride
10. Lead	41. cis-1,3-Dichloropropene
11. Mercury	42. trans-1,3-Dichloropropene
12. Nickel	43. Ethylbenzene
13. Selenium	44. 2-Hexanone; Methyl butyl ketone
14. Silver	45. Methyl bromide; Bromomethane
15. Thallium	46. Methyl chloride; Chloromethane
16. Vanadium	47. Methylene bromide; Dibromomethane
17. Zinc	48. Methylene chloride; Dichloromethane
	49. Methyl ethyl ketone; MEK; 2-Butanone
Organic Constituents	
	50. Methyl iodide; Iodomethane
18. Acetone	51. 4-Methyl-2-pentanone; Methyl isobutyl ketone
19. Acrylonitrile	52. Styrene
20. Benzene	53. 1,1,1,2-Tetrachloroethane
21. Bromochloromethane	54. 1,1,2,2-Tetrachloroethane
22. Bromodichloromethane	55. Tetrachloroethylene; Tetrachloroethene; Perchloroethylene
23. Bromoform; Tribromomethane	56. Toluene
24. Carbon disulfide	57. 1,1,1-Trichloroethane; Methylchloroform
25. Carbon tetrachloride	58. 1,1,2-Trichloroethane
26. Chlorobenzene	59. Trichloroethylene; Trichloroethene

CONSTITUENTS FOR GROUNDWATER MONITORING (TDEC Solid Waste Management Rule 0400-11-01, Appendix I)	
Inorganic Constituents	
27. Chloroethane; Ethyl chloride	60. Trichlorofluoromethane; CFC-11
28. Chloroform; Trichloromethane	61. 1,2,3-Trichloropropane
29. Dibromochloromethane; Chlorodibromomethane	62. Vinyl acetate
30. 1,2-Dibromo-3-chloropropane; DBCP	63. Vinyl chloride
31. 1,2-Dibromoethane; Ethylene dibromide; EDB	64. Xylenes
<u>Other parameters</u>	
CBOD	
Total Nitrogen	
Nitrate-Nitrite	
Phosphorous, Total	
Kjeldahl Nitrogen, TKN	
Total Organic Carbon	
Dissolved Solids	

VI. Record Keeping

- a. The following information should be recorded:
 - i. Analytical results on composting testing;
 - ii. Analytical results of retention pond and sedimentation pond water analysis.
 - iii. The type and quantity of feedstock and the source of feedstock received;
 - iv. The quantity of compost produced; and
 - v. The quantity of compost removed for use or for disposal, and the market or permitted disposal facility. The operator must identify the market for compost removed for use. The operator must identify the permitted disposal facility for compost removed for disposal.
- b. Records regarding the activities for each month of operation of the facility are maintained at the facility for three years.

VII. Compost Facility Operations Plan Review

The CFOP will be updated when there is a change to procedures (including equipment) or the types of feedstocks processed, and reflect how the facility will continue to comply with the intent of the rules. In addition, the CFOP will be internally reviewed annually to ensure it continues to reflect current procedures, equipment and feedstock(s).

The city will monitor property transactions immediately adjacent to the facility and contact the new owners regarding the nature of the compost operation.

The CFOP will be made available to the permitting authority upon request.

ATTACHMENT 2: DAILY OPERATIONS CHECKLIST



Daily Operations Checklist

Wheel Loader / Skid Steer Maintenance

- ☐ Check Engine Oil
- ☐ Check Hydraulic Fluid
- ☐ Check For Fluid Leaks
- ☐ Check Tire Pressure
- ☐ Lubricate Grease Fittings (Every 10 hours)

Compost Turner Maintenance

- ☐ Check Engine Oil
- ☐ Check Hydraulic Fluid
- ☐ Clear Drum of Debris
- ☐ Lubricate Grease Fittings (Weekly)

Dump Truck Maintenance

- ☐ Check Engine Oil
- ☐ Check Engine Coolant
- ☐ Check Brake Fluid (Weekly)
- ☐ Check Hydraulic Fluid (Weekly)

Wood Chipper Maintenance

- ☐ Clear Debris
- ☐ Check Engine Oil
- ☐ Check Mill Bearings and add Grease as Necessary
- ☐ Check Air Filter
- ☐ Check Spark Plug
- ☐ Lubricate Grease Fittings (Weekly)

Accepting Load of Waste Produce

- ☐ Visually Inspect Load for Contamination as it is Being Unloaded onto Pad
- ☐ Note Contamination on tipping receipt
- ☐ Waste Tipping Receipts - Retain One Signed Copy & Provide One Signed Copy to Driver

Processing Load of Waste Produce

- ☐ Complete Checklist for *Wheel Loader / Skid Steer, Compost Turner, Dump Truck, and Wood Chipper Maintenance*
- ☐ Mix Tipped Material with Wood Chips/Mulch in Tipping Area
- ☐ Grind Tipped Material with wood chipper if Necessary
- ☐ Move mixed material with wheel loader to deposit in windrow on compost pad
- ☐ Add Tobacco to Row if Necessary
- ☐ Turn Wheel Loader, Skid Steer, or Compost Turner to Thoroughly Mix Feedstock
- ☐ Use *Compost Monitoring Form* to Create Record of location of new compost.

General Site Maintenance

- ☐ Visually Inspect Windrows for Leachate and Add Mulch if Necessary
- ☐ Visually Inspect Perimeter Berm for soundness to reduce debris from leaving site.
- ☐ Clear drainage aisles of debris.
- ☐ Remove debris from in front of filter socks.
- ☐ Take Temperature Readings of Windrows and Record on *Compost Monitoring Forms*
- ☐ Visually Inspect Site for Unsecured Trash and Remove as Necessary.
- ☐ Check for substantial cracks in the RCC pad and route and fill with non-shrinking grout.

Contact Water Detention Pond Monitoring

- ☐ Visually inspect the contact water pond to ensure it is empty before a storm event
- ☐ Dewater the contact water pond to the municipal sewer manhole or pump and haul
- ☐ Visually inspect the contact water pond for accumulated sediment and remove sediment as necessary.
- ☐ Visually inspect contact water pond for proper protective cover of geomembrane liner.
- ☐ Remove woody vegetation from pond berm.

**ATTACHMENT 3:
CLOSURE / POST-CLOSURE
CARE PLAN**

CLOSURE/POST-CLOSURE CARE PLAN

Closure of the facility should be as follows:

1. The facility will cease receiving new feedstock.
2. The facility will process feedstock located on-site for composting.
3. Excess feedstocks which cannot be composted will be removed from the site and disposed of at a permitted solid waste facility.
 - a. Excess wood based feedstock which has not been processed into chips (e.g. logs) will be stored in the existing adjacent tier 1 composting facility. Processed wood based feedstock which has been processed into chips will be spread onsite.
 - b. Excess feedstocks, other than wood based feedstocks, will be removed from the site and disposed of at a permitted solid waste facility
4. The facility will continue to operate and process the composting windrows through the thermophilic stage as specified in the Compost Facility Operations Plan.
5. The facility will remove all non-compostable waste as specified in the Compost Facility Operations Plan.
6. Finished compost may be distributed for beneficial use to local citizens or for use at municipal properties.
7. The contact water detention basin which receives runoff from the composting pad will be dewatered. But the pond will be left in place for the facility to be available to the city for other uses after all compost windrows have been processed through the thermophilic stage and spread or removed from the composting pad.
8. All bare areas that are vegetated along the berm will be stabilized to prevent erosion by being reseeded and spreading wood chips.

Post-closure care of the facility will not be required after all feedstocks, compost, and stabilization has been completed according to the closure plan. When closed according to the plan the facility will not pose a risk to public health or the environment.

Estimated Costs for Closure / Post-Closure¹**City of Lebanon Tier III Compost Facility**

Closure Tasks	Unit	2020 Unit Cost \$	Total Units	2020 Total Cost
Closure Operating Cost	Month	\$ 10,000	4	\$ 40,000
Disposal and Hauling of Non-Compostable Waste	CUYD	\$ 100	160	\$ 16,000
Disposal and Hauling Removal of Excess Feedstock	CUYD	\$ 10	160	\$ 1,600
Seed	Acre	\$ 200	1	\$ 200
Total Closure Costs				\$ 17,800

Post Closure Tasks	Unit	2020 Unit Cost \$	Total Units	2020 Total Cost
N/A	Year	\$ -	0	\$ -
Total Post Closure Costs				\$ -

Contingency (TDEC Requirement)	Closure Cost	Post Closure Cost	% Contingency	Total Contingency
5% of Total Closure Plus Post-Closure Costs	\$ 17,800	\$ -	5%	\$ 890
Total Contingency Costs				\$ 890

Estimated Costs for Closure / Post-Closure¹**City of Lebanon Tier III Compost Facility**

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Closure Operating Cost	Month	\$ 10,000	4	\$ 40,000
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Seed	Acre	\$ 200	1	\$ 200
Total Closure Costs				\$ 17,800

Post Closure Tasks	Unit	2020 Unit Cost \$	Total Units	2020 Total Cost
N/A	Year	\$ -	0	\$ -
Total Post Closure Costs				\$ -

Contingency (TDEC Requirement)	Closure Cost	Post Closure Cost	% Contingency	Total Contingency
5% of Total Closure Plus Post-Closure Costs	\$ 17,800	\$ -	5%	\$ 890
Total Contingency Costs				\$ 890

1. All Costs Given in Year 2020 dollars except post-closure total.
2. Operating cost includes processing of compost windrows through thermophilic stage, spreading of wood feedstock, spreading of finished compost, collection of non-compostable waste, dewatering of sediment basin, filling of sediment basin, and general site clean-up.
3. This quantity based on assumed 4 percent of accepted feedstock is non-compostable. 4-months of compost would yield an assumed 160 cubic yards of non-compostable waste at this rate.
4. Cost is for seed only. Finished compost will be used as mulch. The spreading of the finished compost as mulch is included in the operating cost.
5. Post-closure care of the facility will not be required after all feedstocks, compost, and stabilization has been completed according to the closure plan. When closed according to the plan, the facility will not pose a risk to public health or safety.

ATTACHMENT 4: PERMIT DRAWINGS

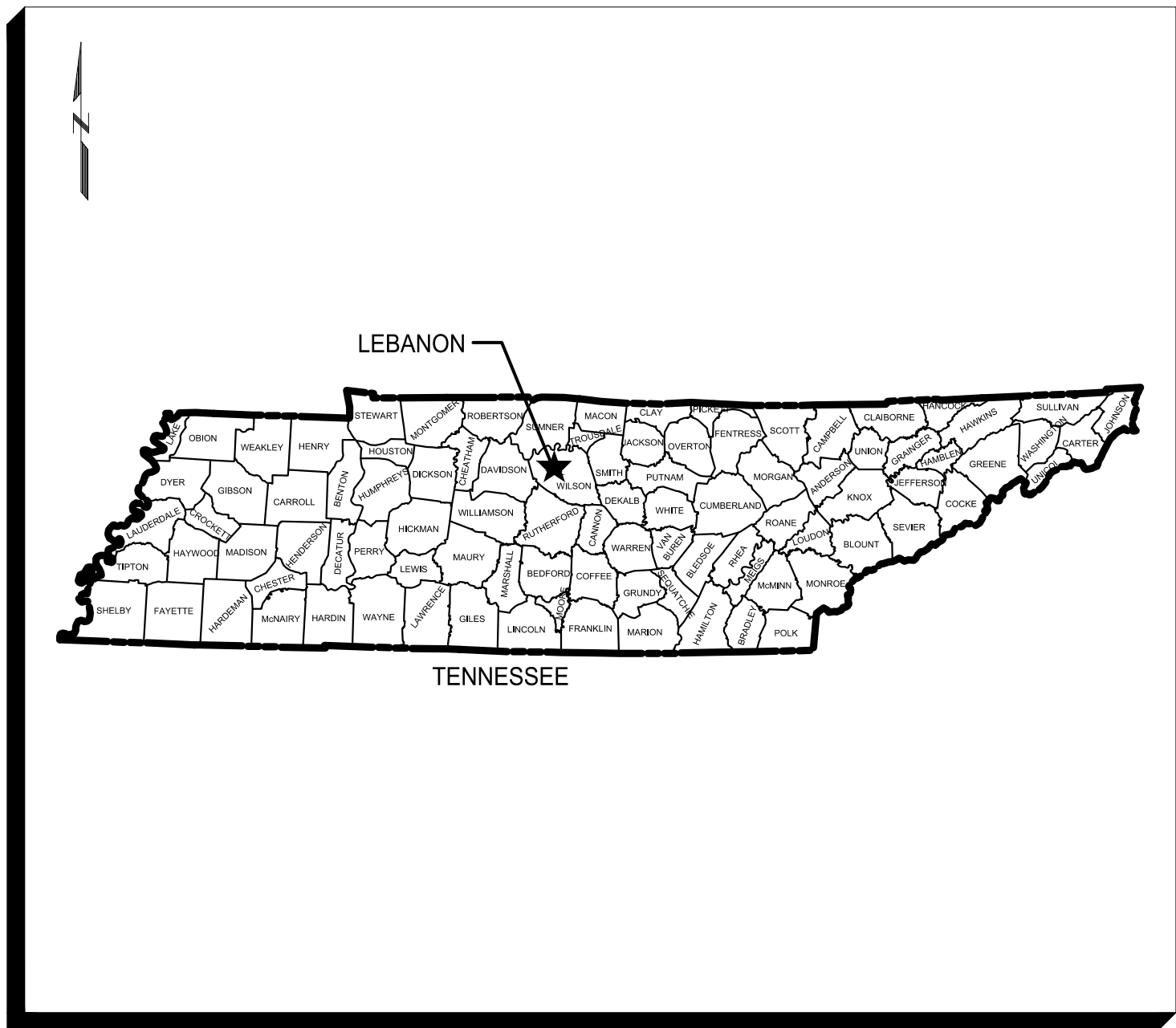
PART II PERMIT DRAWINGS FOR THE
CITY OF LEBANON
COMPOST FACILITY (CMP950000010)
LEBANON, TENNESSEE



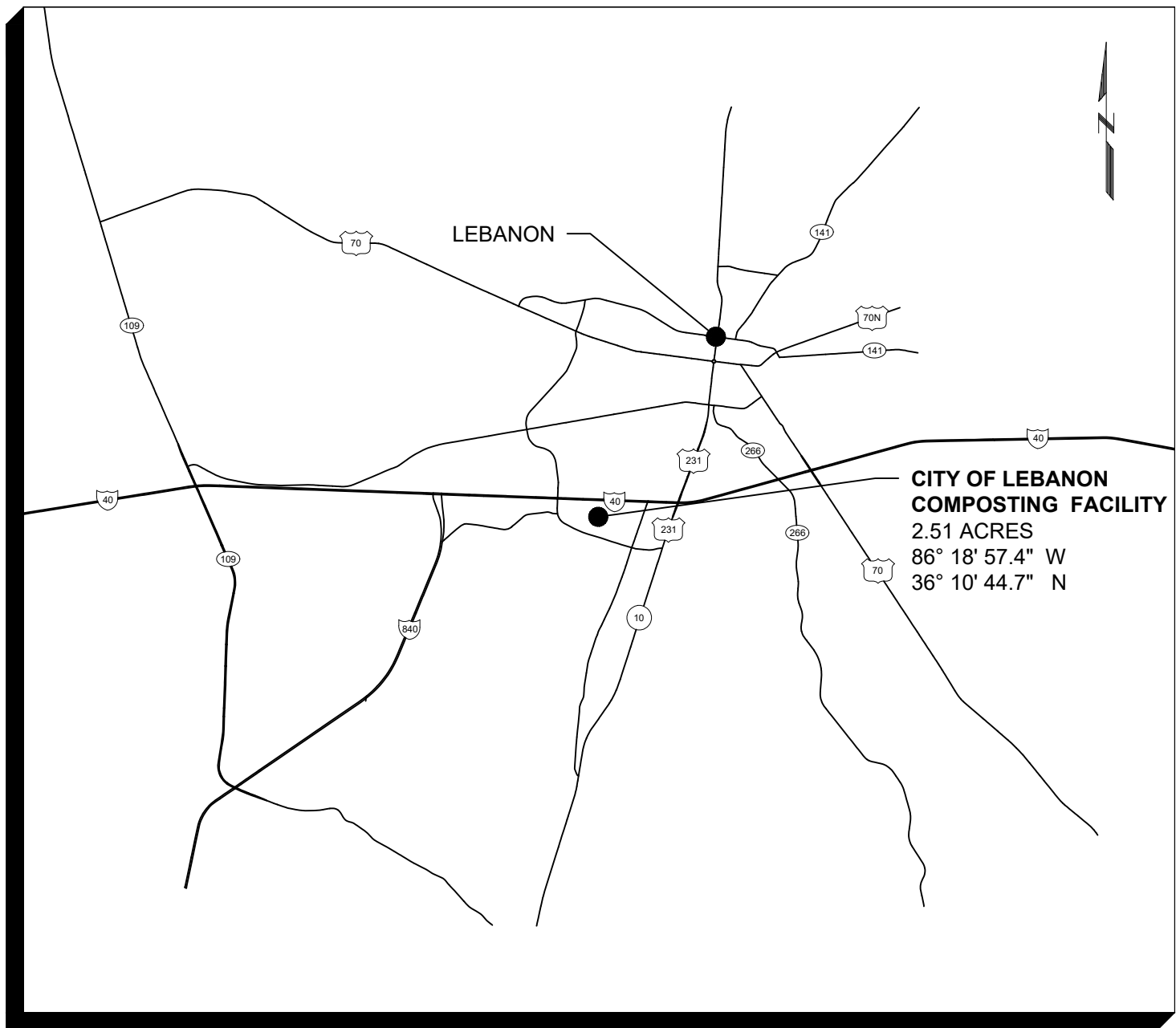
PROJECT No. 3677109

AUGUST 4, 2020
TDEC PART II PERMIT
APPLICATION

OCTOBER 8, 2020
TDEC PART II
REVISION 1



STATE MAP



VICINITY MAP

INDEX OF DRAWINGS

Sheet No.	Description
1	COVER SHEET
2	MASTER PLAN
3	EXISTING SITE PLAN
4	EXISTING CONDITIONS & DEMOLITION SHEET
5	PROPOSED SITE PLAN
6	INITIAL PHASE - FINAL GRADES
7	EPSC PLAN
8	DETAILS
9	DETAILS

GENERAL PROJECT NOTES

- THE PURPOSE OF THIS SET OF DRAWINGS IS TO COMPLETE THE PART II PERMIT APPLICATION FOR THE CONSTRUCTION OF A COMPOST FACILITY FOR THE CITY OF LEBANON (CMP950000010).
- THESE PLANS ARE TO BE USED IN CONJUNCTION WITH THE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN THAT HAS BEEN PREPARED AS PART OF THIS PERMIT APPLICATION.
- EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED AND MAINTAINED AS SHOWN PER THE TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK CURRENT EDITION .
- CLEARING AND GRUBBING ACTIVITIES TO BE MINIMAL AND ARE TO BE CONDUCTED ONLY AS NEEDED.
- EXISTING GROUND TOPOGRAPHICAL CONTOURS SHOWN WERE TAKEN FROM AN AERIAL SURVEY PERFORMED BY CITY OF LEBANON IN JANUARY 2020. ADDITIONAL CONTOURS TAKEN FROM STATE OF TENNESSEE LIDAR.
- THE HORIZONTAL DATUM IS BASED ON THE TENNESSEE STATE PLANE COORDINATE SYSTEM NAD83. THE VERTICAL DATUM IS BASED ON THE NAVD88.

FACILITY INFORMATION

OWNER:	City of Lebanon
LOCATION:	760 Franklin Road Lebanon, TN 37090 Wilson County
OPERATOR:	City of Lebanon Public Works 410 Park Drive Lebanon, TN 37087

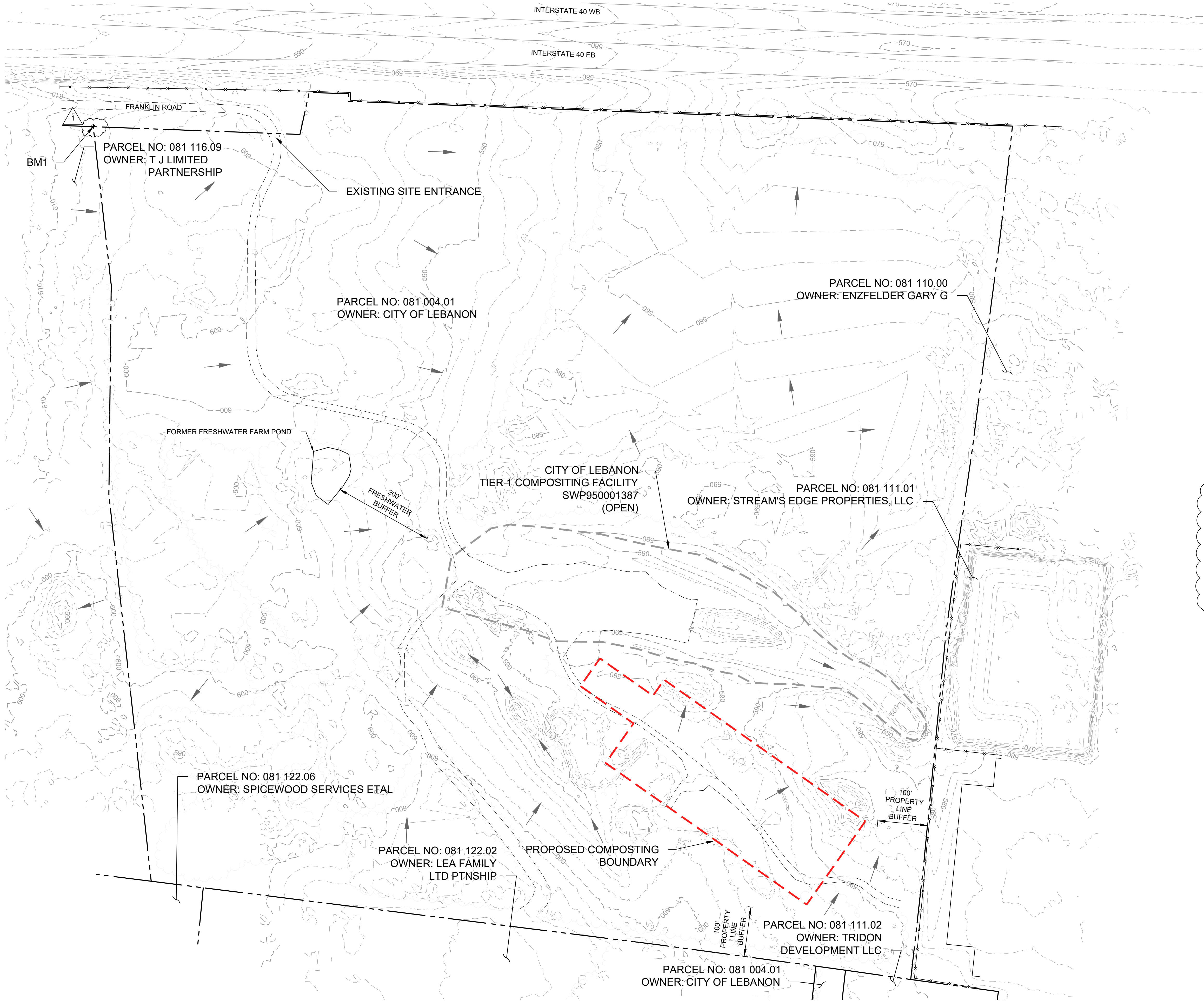


615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572



CITY OF LEBANON
COMPOST FACILITY
LEBANON, TENNESSEE
PART II PERMIT DRAWINGS

USER: ALLIPESE
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SAVED: 10/09/2020 10:52:27
PLOT: 10/09/2020



NOTES:

- EXISTING GROUND TOPOGRAPHICAL CONTOURS SHOWN WERE TAKEN FROM AN AERIAL SURVEY PERFORMED BY LEBANON IN JANUARY 2020. ADDITIONAL CONTOURS TAKEN FROM STATE OF TENNESSEE LIDAR.
- THE HORIZONTAL DATUM IS BASED ON TENNESSEE STATE PLANE COORDINATE SYSTEM NAD83. THE VERTICAL DATUM IS BASED ON NAD88.

LEGEND

PROPOSED

COMPOSTING BOUNDARY

EXISTING

500

MAJOR CONTOUR (10' INTERVAL)

MINOR CONTOUR (2' INTERVAL)

PERMITTED COMPOSTING BOUNDARY

FENCE

PROPERTY LINE

TREELINE

DIRT ROAD

GRAVEL ROAD

PAVED ROAD

FLOW ARROW

BENCHMARK

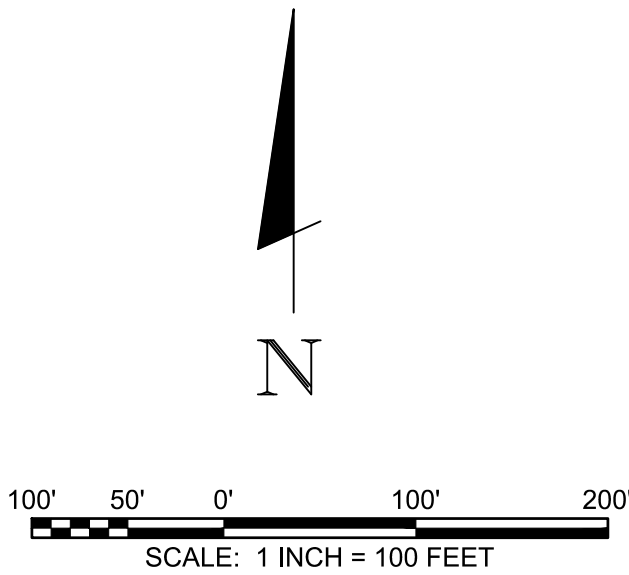
BENCHMARKS

(CONCRETE MONUMENTS)

BM1

TENNESSEE STATE PLANE
(ZONE-4100) (NAD-1983)
NORTHING: 673,158.93'
EASTING: 1,874,120.40'
ELEV: 608.52'

LAT: N36°10'55.9395"
LONG: W86°19'11.2837"



EXISTING SITE PLAN

CITY OF LEBANON
COMPOST FACILITY
LEBANON, TN

REVISION INFORMATION		DATE	DESCRIPTION
REV	OR	CHK	DWG
01	JKG	DAB	BENCHMARK ADDITION



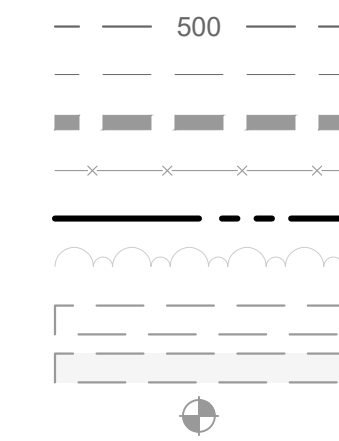


NOTES:

1. EXISTING GROUND TOPOGRAPHICAL CONTOURS SHOWN WERE TAKEN FROM AN AERIAL SURVEY PERFORMED BY CITY OF LEBANON IN JANUARY 2020. ADDITIONAL CONTOURS TAKEN FROM STATE OF TENNESSEE LIDAR.
2. THE HORIZONTAL DATUM IS BASED ON TENNESSEE STATE PLANE COORDINATE SYSTEM NAD83. THE VERTICAL DATUM IS BASED ON NAD88.
3. AERIAL IMAGERY GENERATED FROM ORTHORECTIFIED PHOTOGRAPHY CAPTURED FROM AERIAL SURVEY CONDUCTED BY IN JANUARY 2020.

LEGEND

EXISTING



MAJOR CONTOUR (10' INTERVAL)
MINOR CONTOUR (2' INTERVAL)
PERMITTED COMPOSTING BOUNDARY
FENCE
PROPERTY LINE
TREELINE
DIRT ROAD
GRAVEL ROAD
BENCHMARK

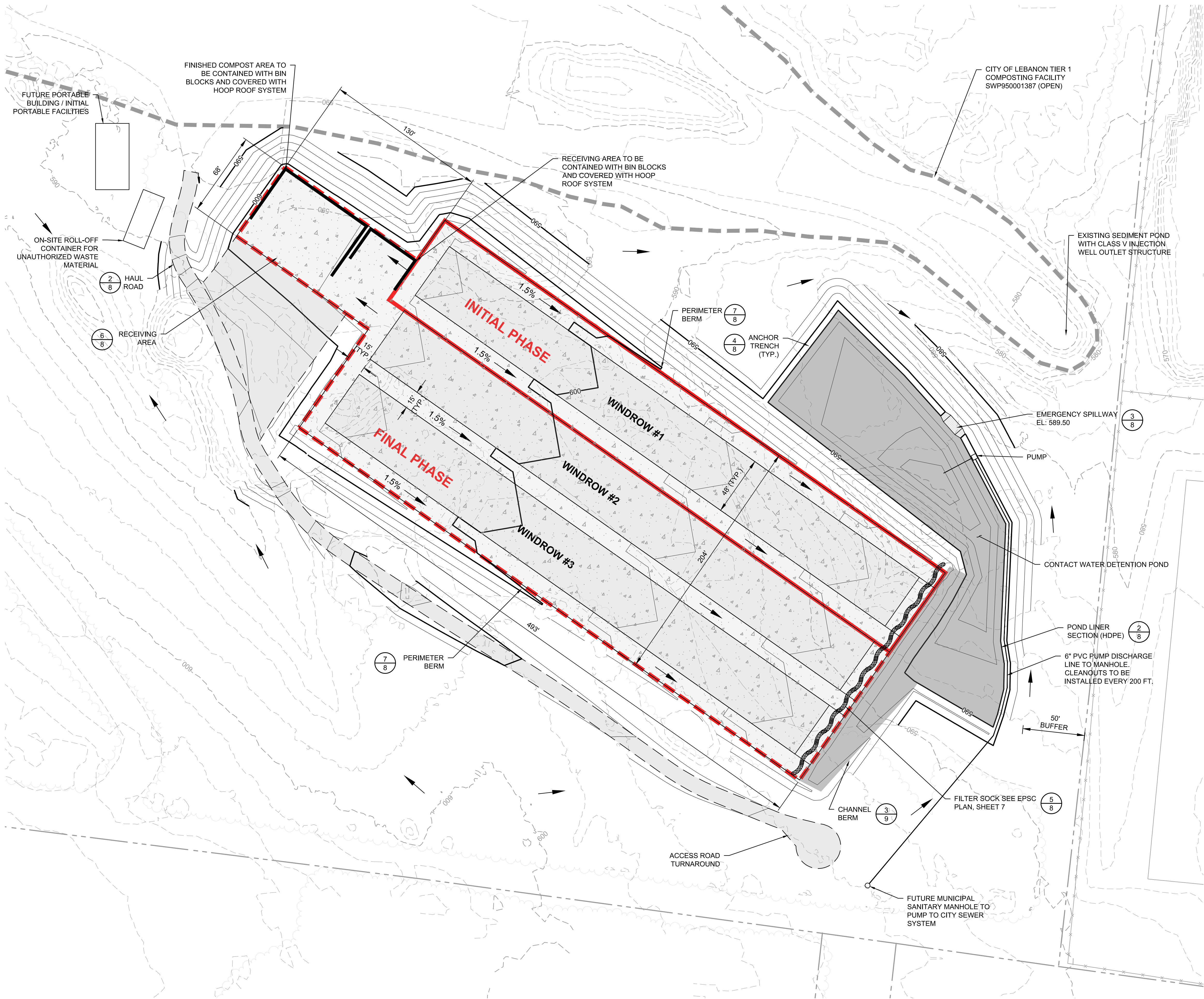


EXISTING CONDITIONS & DEMOLITION SHEET

CITY OF LEBANON
COMPOST FACILITY
LEBANON, TN

[illegible]

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PLOTED: 10/09/2020



NOTES:

- EXISTING GROUND TOPOGRAPHICAL CONTOURS SHOWN WERE TAKEN FROM AN AERIAL SURVEY PERFORMED BY CITY OF LEBANON IN JANUARY 2020. ADDITIONAL CONTOURS TAKEN FROM STATE OF TENNESSEE LIDAR.
- THE HORIZONTAL DATUM IS BASED ON TENNESSEE STATE PLANE COORDINATE SYSTEM NAD83. THE VERTICAL DATUM IS BASED ON NAD88.
- CONTACT WATER DETENTION POND TO BE CONTINUOUSLY DEWATERED BY PUMPING TO FUTURE MUNICIPAL SANITARY SEWER MANHOLE.

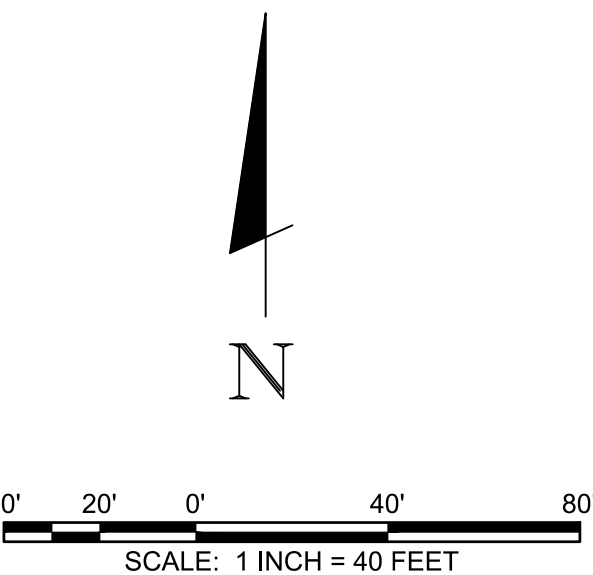
LEGEND

PROPOSED

- 500 MAJOR CONTOUR (10' INTERVAL)
- MAJOR CONTOUR (2' INTERVAL)
- COMPOSTING BOUNDARY
- INITIAL PHASE BOUNDARY
- FLOW ARROW
- GRAVEL ROAD
- POND LINED SECTION (HDPE)
- ROLLER COMPACTED CONCRETE
- ROLLER COMPACTED CONCRETE - WINDROWS
- FILTER SOCK

EXISTING

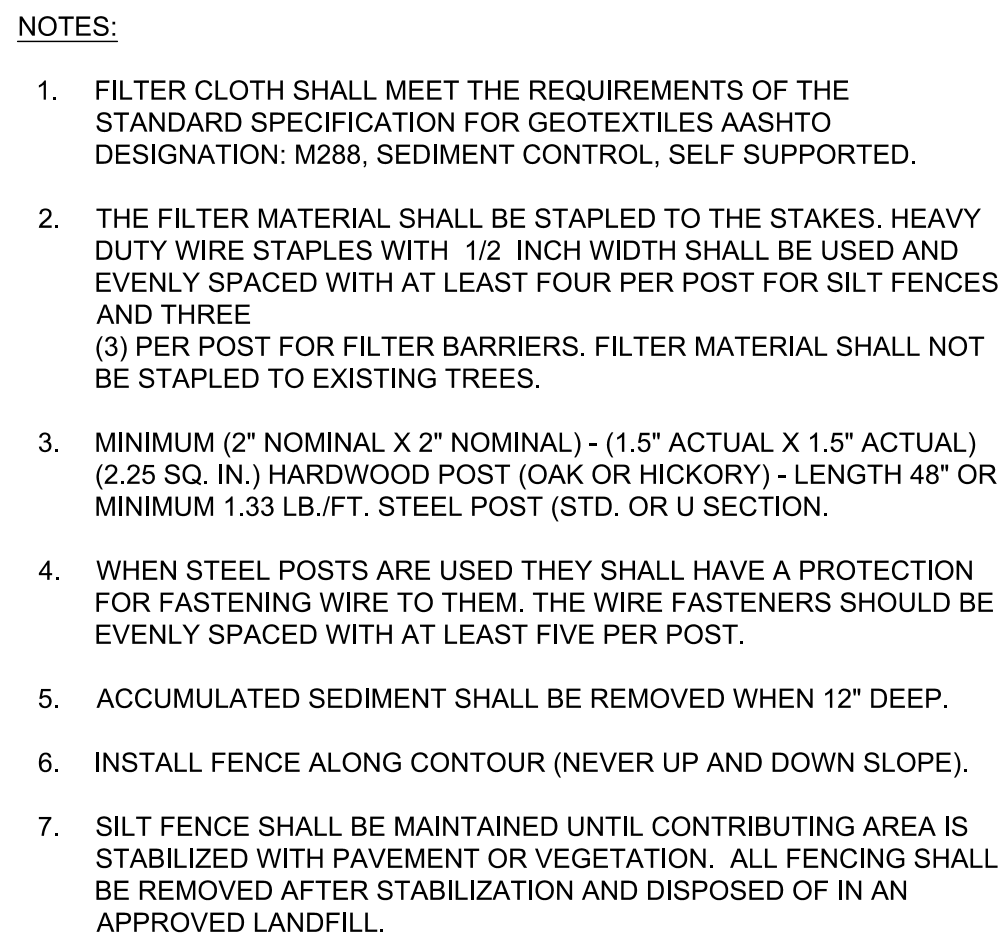
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- MINOR CONTOUR (2' INTERVAL)
- PERMITTED COMPOSTING BOUNDARY
- FENCE
- PROPERTY LINE
- TREELINE
- DIRT ROAD
- BENCHMARK



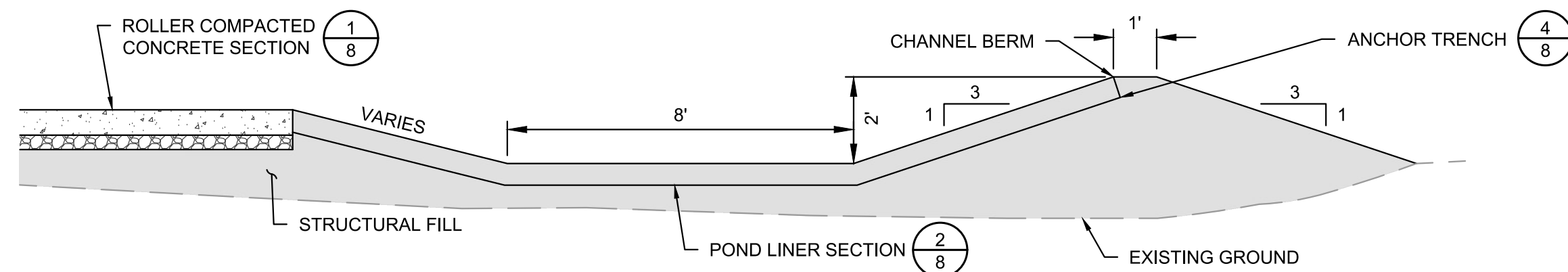
PROPOSED SITE PLAN

CITY OF LEBANON
COMPOST FACILITY
LEBANON, TN

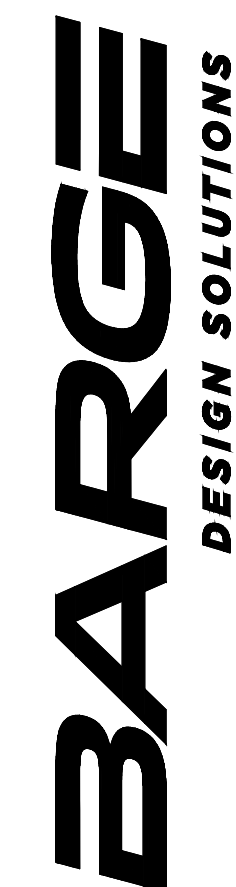
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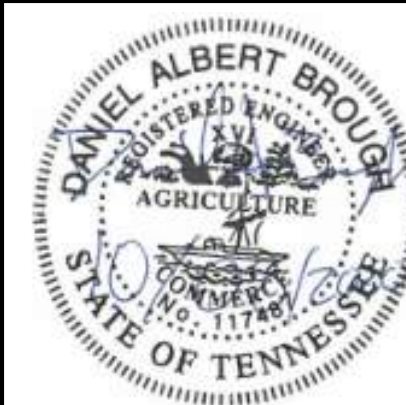
2 HAUL ROAD
SCALE: N.T.S.



3 CHANNEL BERM
SCALE: N.T.S.



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DETAILS

CITY OF LEBANON
COMPOST FACILITY

LEBANON, TN

[illegible]

C

FILE NO. 3677109

ATTACHMENT 5: ENGINEERING DESIGN REPORT

ATTACHMENT V: ENGINEERING DESIGN REPORT

Part II Permit Application

Tier III Compost Facility

CMP: 9500000010



Prepared
For:

The City of Lebanon Tennessee

200 North Castle Heights Avenue

Lebanon, TN 37087

PREPARED BY

BARGE
DESIGN SOLUTIONS

615 3rd Avenue South, Suite 700

Nashville, TN 37210

BARGE # 36771-09



TABLE OF CONTENTS

Attachment A5-1

Attachment A5-2

Attachment A5-3

Attachment A5-4

NOAA Atlas 14 Data

Drainage Maps

Pond Calculations

Aisle Drainage Capacity

NOAA Atlas 14 Data



NOAA Atlas 14, Volume 2, Version 3
Location name: Lebanon, Tennessee, USA*
Latitude: 36.177°, Longitude: -86.3109°
Elevation: 599.54 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.392 (0.363-0.426)	0.460 (0.426-0.501)	0.531 (0.490-0.578)	0.587 (0.542-0.640)	0.658 (0.604-0.717)	0.712 (0.649-0.775)	0.766 (0.693-0.834)	0.817 (0.733-0.891)	0.883 (0.783-0.966)	0.934 (0.819-1.03)
10-min	0.626 (0.579-0.681)	0.735 (0.681-0.802)	0.850 (0.785-0.926)	0.939 (0.866-1.02)	1.05 (0.962-1.14)	1.13 (1.03-1.24)	1.22 (1.10-1.33)	1.30 (1.16-1.41)	1.40 (1.24-1.53)	1.47 (1.29-1.62)
15-min	0.782 (0.724-0.851)	0.924 (0.856-1.01)	1.08 (0.993-1.17)	1.19 (1.10-1.29)	1.33 (1.22-1.45)	1.44 (1.31-1.56)	1.54 (1.39-1.68)	1.64 (1.47-1.78)	1.76 (1.56-1.92)	1.85 (1.62-2.03)
30-min	1.07 (0.993-1.17)	1.28 (1.18-1.39)	1.53 (1.41-1.67)	1.72 (1.59-1.88)	1.97 (1.81-2.15)	2.16 (1.97-2.35)	2.36 (2.13-2.57)	2.55 (2.28-2.78)	2.80 (2.48-3.06)	2.99 (2.62-3.28)
60-min	1.34 (1.24-1.46)	1.60 (1.48-1.75)	1.96 (1.81-2.13)	2.24 (2.07-2.44)	2.62 (2.41-2.86)	2.93 (2.67-3.19)	3.24 (2.94-3.53)	3.57 (3.20-3.89)	4.01 (3.56-4.39)	4.37 (3.83-4.79)
2-hr	1.58 (1.46-1.71)	1.88 (1.75-2.05)	2.29 (2.12-2.49)	2.62 (2.42-2.84)	3.07 (2.82-3.32)	3.43 (3.13-3.72)	3.81 (3.45-4.13)	4.21 (3.78-4.57)	4.75 (4.21-5.18)	5.19 (4.55-5.67)
3-hr	1.71 (1.58-1.86)	2.04 (1.89-2.22)	2.47 (2.28-2.69)	2.83 (2.60-3.08)	3.32 (3.04-3.61)	3.72 (3.39-4.05)	4.14 (3.74-4.50)	4.58 (4.10-4.99)	5.19 (4.58-5.67)	5.67 (4.96-6.22)
6-hr	2.08 (1.91-2.28)	2.47 (2.28-2.72)	3.00 (2.76-3.30)	3.44 (3.16-3.78)	4.06 (3.70-4.46)	4.58 (4.13-5.02)	5.12 (4.57-5.62)	5.69 (5.03-6.25)	6.49 (5.66-7.16)	7.15 (6.15-7.90)
12-hr	2.47 (2.29-2.70)	2.95 (2.72-3.22)	3.58 (3.30-3.90)	4.10 (3.77-4.47)	4.84 (4.42-5.28)	5.44 (4.93-5.93)	6.09 (5.47-6.64)	6.76 (6.02-7.38)	7.71 (6.75-8.44)	8.48 (7.33-9.33)
24-hr	3.05 (2.87-3.26)	3.64 (3.42-3.89)	4.43 (4.17-4.74)	5.08 (4.77-5.42)	5.98 (5.59-6.38)	6.70 (6.24-7.14)	7.45 (6.91-7.94)	8.23 (7.60-8.77)	9.32 (8.54-9.93)	10.2 (9.27-10.9)
2-day	3.65 (3.43-3.90)	4.36 (4.10-4.65)	5.33 (5.01-5.68)	6.12 (5.74-6.51)	7.23 (6.76-7.68)	8.13 (7.58-8.65)	9.08 (8.43-9.66)	10.1 (9.30-10.7)	11.5 (10.5-12.2)	12.6 (11.4-13.5)
3-day	3.87 (3.65-4.13)	4.62 (4.36-4.93)	5.63 (5.31-6.00)	6.45 (6.07-6.86)	7.58 (7.11-8.05)	8.50 (7.94-9.02)	9.45 (8.79-10.0)	10.4 (9.66-11.1)	11.8 (10.8-12.6)	12.9 (11.8-13.7)
4-day	4.10 (3.87-4.36)	4.89 (4.62-5.20)	5.94 (5.61-6.32)	6.78 (6.39-7.20)	7.94 (7.45-8.41)	8.86 (8.30-9.39)	9.81 (9.15-10.4)	10.8 (10.0-11.4)	12.1 (11.2-12.9)	13.2 (12.1-14.0)
7-day	4.87 (4.57-5.19)	5.80 (5.45-6.19)	7.06 (6.62-7.52)	8.06 (7.55-8.57)	9.46 (8.82-10.1)	10.6 (9.83-11.2)	11.8 (10.9-12.5)	13.0 (11.9-13.8)	14.7 (13.4-15.6)	16.0 (14.5-17.1)
10-day	5.56 (5.23-5.91)	6.62 (6.23-7.04)	7.97 (7.49-8.47)	9.03 (8.47-9.59)	10.5 (9.80-11.1)	11.6 (10.8-12.3)	12.8 (11.9-13.5)	14.0 (12.9-14.8)	15.5 (14.3-16.5)	16.8 (15.3-17.9)
20-day	7.57 (7.18-8.01)	8.97 (8.49-9.48)	10.6 (10.0-11.2)	11.8 (11.1-12.4)	13.3 (12.6-14.1)	14.5 (13.7-15.4)	15.7 (14.7-16.6)	16.8 (15.8-17.8)	18.3 (17.0-19.3)	19.3 (18.0-20.5)
30-day	9.31 (8.86-9.79)	11.0 (10.4-11.5)	12.8 (12.1-13.4)	14.2 (13.4-14.9)	15.9 (15.1-16.7)	17.3 (16.4-18.2)	18.6 (17.5-19.6)	19.9 (18.7-20.9)	21.5 (20.2-22.7)	22.7 (21.2-24.0)
45-day	11.7 (11.2-12.3)	13.8 (13.1-14.5)	15.8 (15.1-16.6)	17.4 (16.5-18.2)	19.4 (18.4-20.3)	20.8 (19.8-21.9)	22.3 (21.1-23.4)	23.6 (22.3-24.9)	25.3 (23.8-26.7)	26.5 (24.9-28.1)
60-day	14.1 (13.5-14.8)	16.6 (15.8-17.4)	18.9 (18.1-19.9)	20.7 (19.7-21.7)	22.9 (21.8-24.0)	24.4 (23.2-25.6)	25.9 (24.6-27.2)	27.3 (25.9-28.7)	29.0 (27.4-30.5)	30.1 (28.5-31.7)

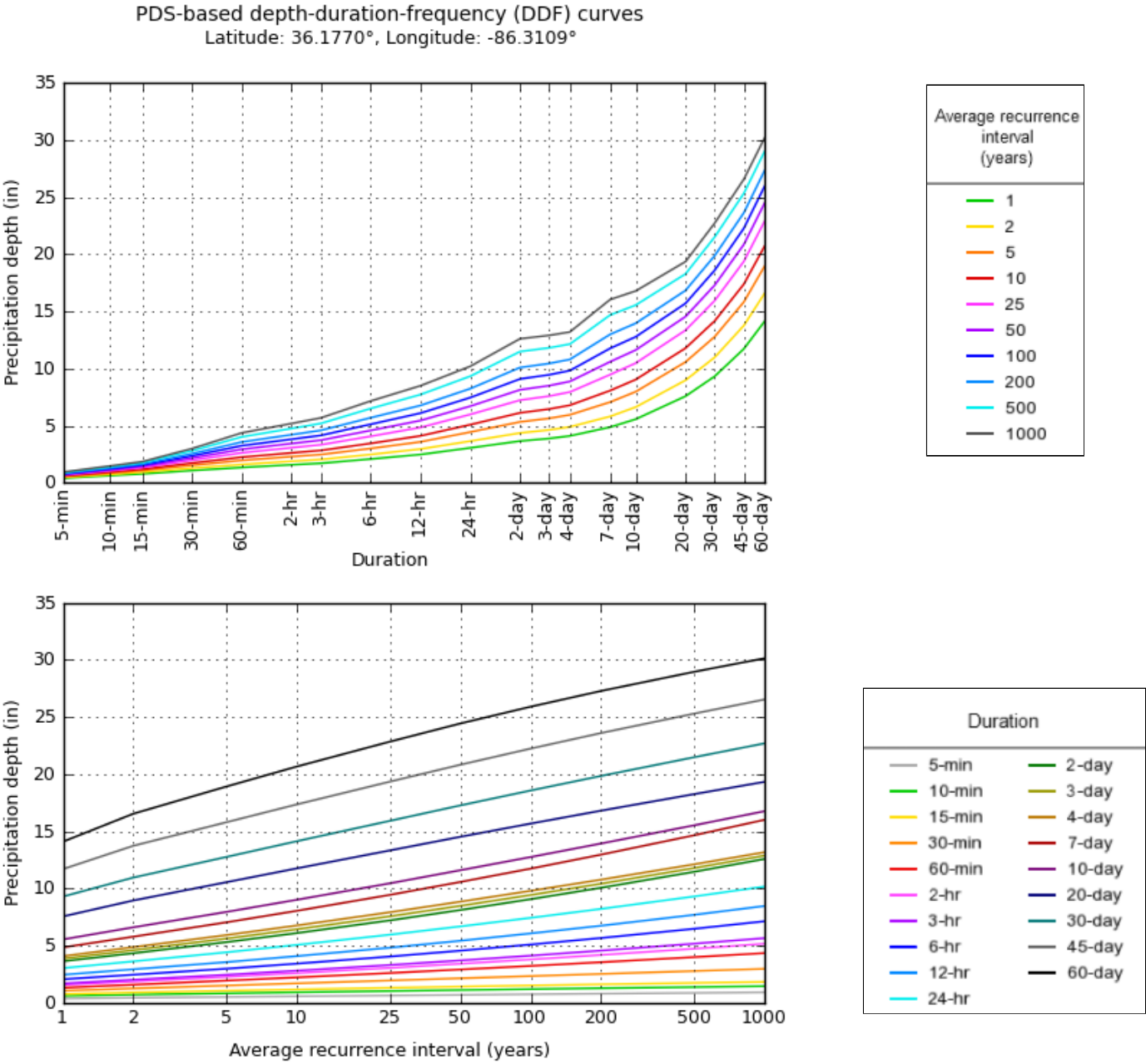
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

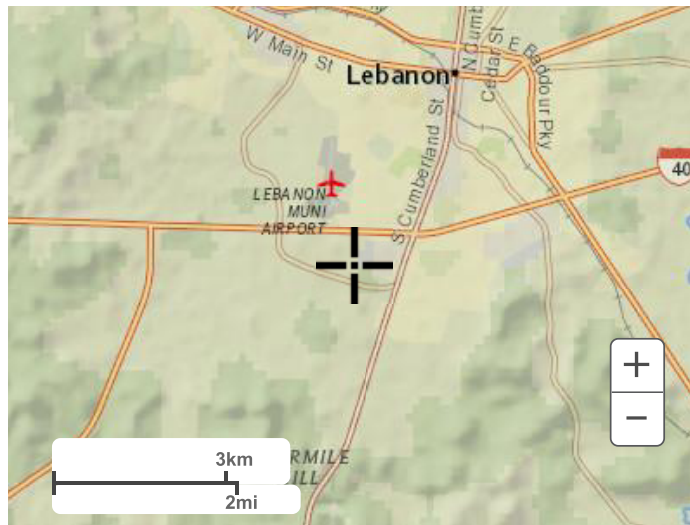
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PF graphical



Maps & aerials

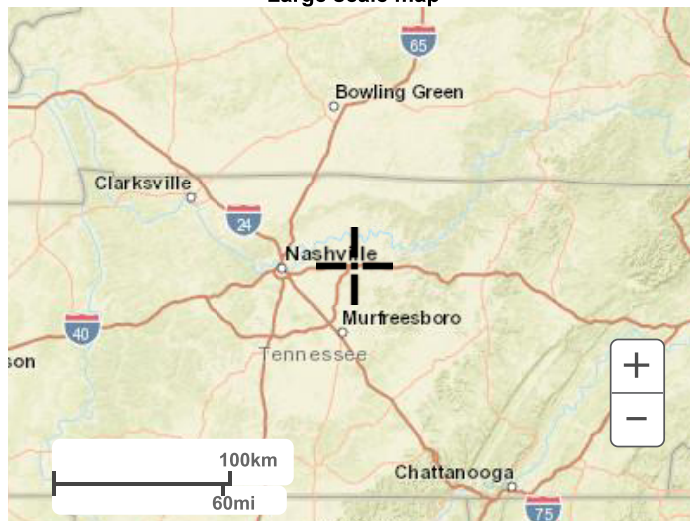
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 2, Version 3
Location name: Lebanon, Tennessee, USA*
Latitude: 36.177°, Longitude: -86.3109°
Elevation: 599.54 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.70 (4.36-5.11)	5.52 (5.11-6.01)	6.37 (5.88-6.94)	7.04 (6.50-7.68)	7.90 (7.25-8.60)	8.54 (7.79-9.30)	9.19 (8.32-10.0)	9.80 (8.80-10.7)	10.6 (9.40-11.6)	11.2 (9.83-12.3)
10-min	3.76 (3.47-4.09)	4.41 (4.09-4.81)	5.10 (4.71-5.56)	5.63 (5.20-6.14)	6.29 (5.77-6.86)	6.80 (6.20-7.41)	7.30 (6.61-7.95)	7.78 (6.97-8.48)	8.38 (7.43-9.16)	8.83 (7.74-9.69)
15-min	3.13 (2.90-3.40)	3.70 (3.42-4.03)	4.30 (3.97-4.69)	4.75 (4.38-5.18)	5.32 (4.88-5.79)	5.74 (5.24-6.25)	6.15 (5.57-6.70)	6.54 (5.86-7.13)	7.03 (6.23-7.69)	7.38 (6.48-8.11)
30-min	2.14 (1.99-2.33)	2.55 (2.36-2.78)	3.06 (2.82-3.33)	3.44 (3.18-3.75)	3.94 (3.61-4.29)	4.33 (3.94-4.71)	4.71 (4.26-5.13)	5.09 (4.56-5.55)	5.60 (4.96-6.12)	5.98 (5.25-6.57)
60-min	1.34 (1.24-1.46)	1.60 (1.48-1.75)	1.96 (1.81-2.13)	2.24 (2.07-2.44)	2.62 (2.41-2.86)	2.93 (2.67-3.19)	3.24 (2.94-3.53)	3.57 (3.20-3.89)	4.01 (3.56-4.39)	4.37 (3.83-4.79)
2-hr	0.788 (0.731-0.855)	0.942 (0.872-1.02)	1.14 (1.06-1.24)	1.31 (1.21-1.42)	1.53 (1.41-1.66)	1.72 (1.57-1.86)	1.91 (1.73-2.07)	2.10 (1.89-2.28)	2.37 (2.10-2.59)	2.59 (2.27-2.83)
3-hr	0.568 (0.526-0.619)	0.678 (0.628-0.740)	0.823 (0.761-0.896)	0.942 (0.866-1.03)	1.11 (1.01-1.20)	1.24 (1.13-1.35)	1.38 (1.25-1.50)	1.53 (1.37-1.66)	1.73 (1.53-1.89)	1.89 (1.65-2.07)
6-hr	0.347 (0.319-0.381)	0.413 (0.381-0.454)	0.501 (0.461-0.551)	0.575 (0.527-0.631)	0.679 (0.617-0.745)	0.764 (0.690-0.839)	0.854 (0.763-0.938)	0.950 (0.840-1.04)	1.08 (0.945-1.20)	1.19 (1.03-1.32)
12-hr	0.205 (0.190-0.224)	0.245 (0.226-0.267)	0.297 (0.274-0.324)	0.340 (0.313-0.371)	0.402 (0.366-0.438)	0.452 (0.410-0.492)	0.505 (0.454-0.551)	0.561 (0.499-0.612)	0.640 (0.560-0.701)	0.704 (0.608-0.774)
24-hr	0.127 (0.119-0.136)	0.152 (0.143-0.162)	0.185 (0.174-0.198)	0.212 (0.199-0.226)	0.249 (0.233-0.266)	0.279 (0.260-0.298)	0.310 (0.288-0.331)	0.343 (0.317-0.366)	0.388 (0.356-0.414)	0.424 (0.386-0.453)
2-day	0.076 (0.072-0.081)	0.091 (0.085-0.097)	0.111 (0.104-0.118)	0.127 (0.120-0.136)	0.151 (0.141-0.160)	0.169 (0.158-0.180)	0.189 (0.176-0.201)	0.210 (0.194-0.223)	0.239 (0.219-0.255)	0.262 (0.238-0.280)
3-day	0.054 (0.051-0.057)	0.064 (0.061-0.068)	0.078 (0.074-0.083)	0.090 (0.084-0.095)	0.105 (0.099-0.112)	0.118 (0.110-0.125)	0.131 (0.122-0.139)	0.145 (0.134-0.154)	0.164 (0.151-0.174)	0.179 (0.163-0.191)
4-day	0.043 (0.040-0.045)	0.051 (0.048-0.054)	0.062 (0.058-0.066)	0.071 (0.067-0.075)	0.083 (0.078-0.088)	0.092 (0.086-0.098)	0.102 (0.095-0.108)	0.112 (0.104-0.119)	0.126 (0.116-0.134)	0.137 (0.126-0.146)
7-day	0.029 (0.027-0.031)	0.035 (0.032-0.037)	0.042 (0.039-0.045)	0.048 (0.045-0.051)	0.056 (0.053-0.060)	0.063 (0.059-0.067)	0.070 (0.065-0.074)	0.077 (0.071-0.082)	0.087 (0.080-0.093)	0.095 (0.086-0.102)
10-day	0.023 (0.022-0.025)	0.028 (0.026-0.029)	0.033 (0.031-0.035)	0.038 (0.035-0.040)	0.044 (0.041-0.046)	0.048 (0.045-0.051)	0.053 (0.049-0.056)	0.058 (0.054-0.062)	0.065 (0.060-0.069)	0.070 (0.064-0.074)
20-day	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.021-0.023)	0.025 (0.023-0.026)	0.028 (0.026-0.029)	0.030 (0.029-0.032)	0.033 (0.031-0.035)	0.035 (0.033-0.037)	0.038 (0.036-0.040)	0.040 (0.037-0.043)
30-day	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.018 (0.017-0.019)	0.020 (0.019-0.021)	0.022 (0.021-0.023)	0.024 (0.023-0.025)	0.026 (0.024-0.027)	0.028 (0.026-0.029)	0.030 (0.028-0.031)	0.032 (0.029-0.033)
45-day	0.011 (0.010-0.011)	0.013 (0.012-0.013)	0.015 (0.014-0.015)	0.016 (0.015-0.017)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.022 (0.021-0.023)	0.023 (0.022-0.025)	0.025 (0.023-0.026)
60-day	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.014 (0.014-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.020 (0.019-0.021)	0.021 (0.020-0.022)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

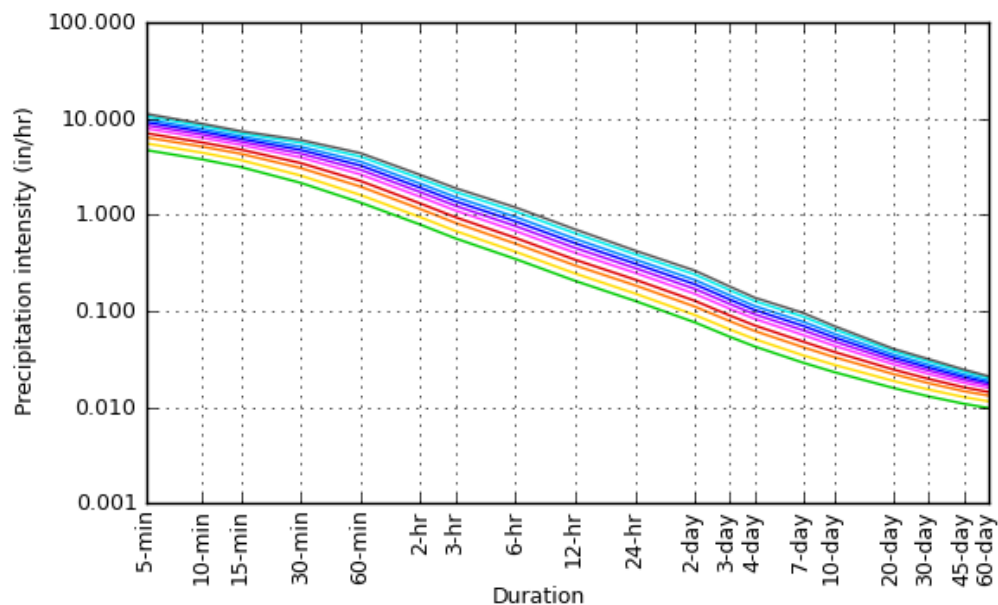
Please refer to NOAA Atlas 14 document for more information.

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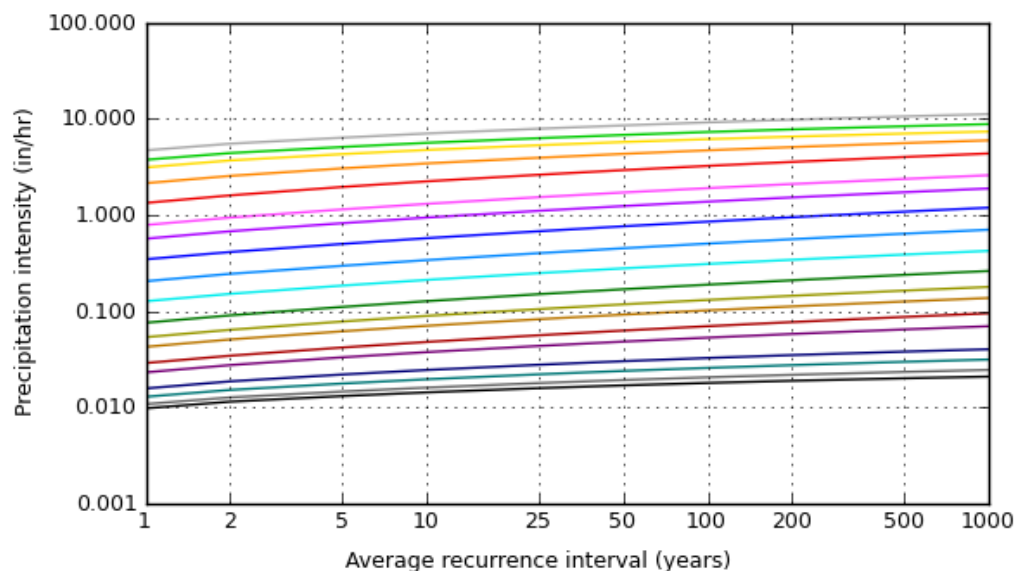
PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 36.1770°, Longitude: -86.3109°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

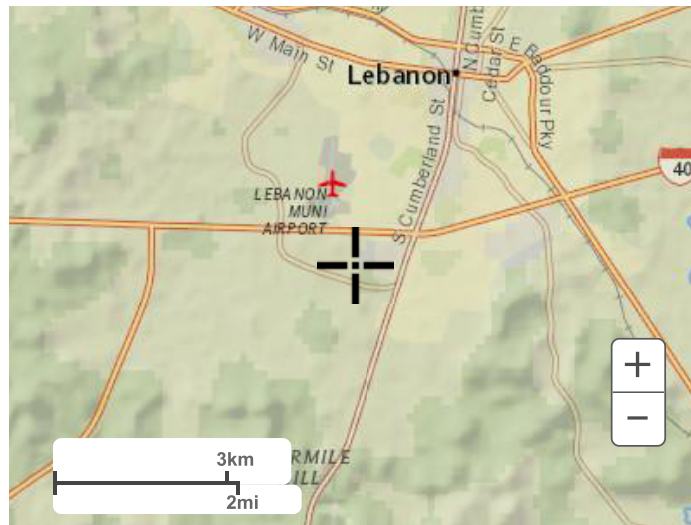
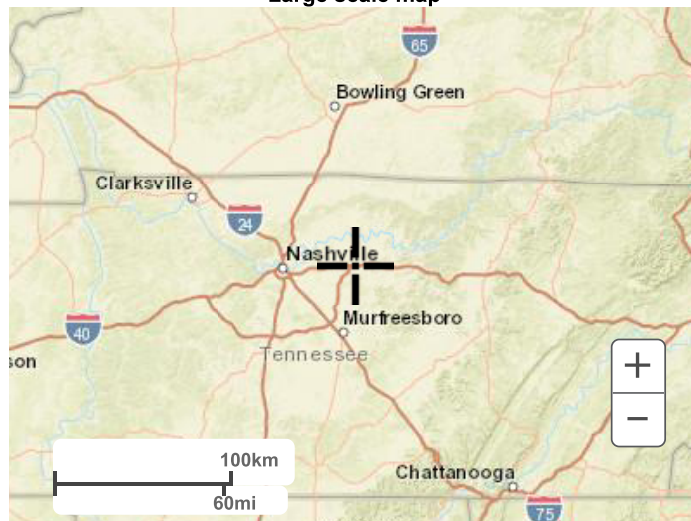


Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Thu Jul 2 13:40:28 2020

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**Large scale terrain****Large scale map****Large scale aerial**



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Questions?: HDSC.Questions@noaa.gov

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Drainage Maps

USER:JKBECKLER


$$V_{25} = 60,482 \text{ FT}^3$$

PRELIMINARY
NOT FOR
CONSTRUCTION

1

CITY OF LEBANON
COMPOSTING FACILITY
LEBANON, TN

REV.	DR.	CHK.	DATE	DESCRIPTION
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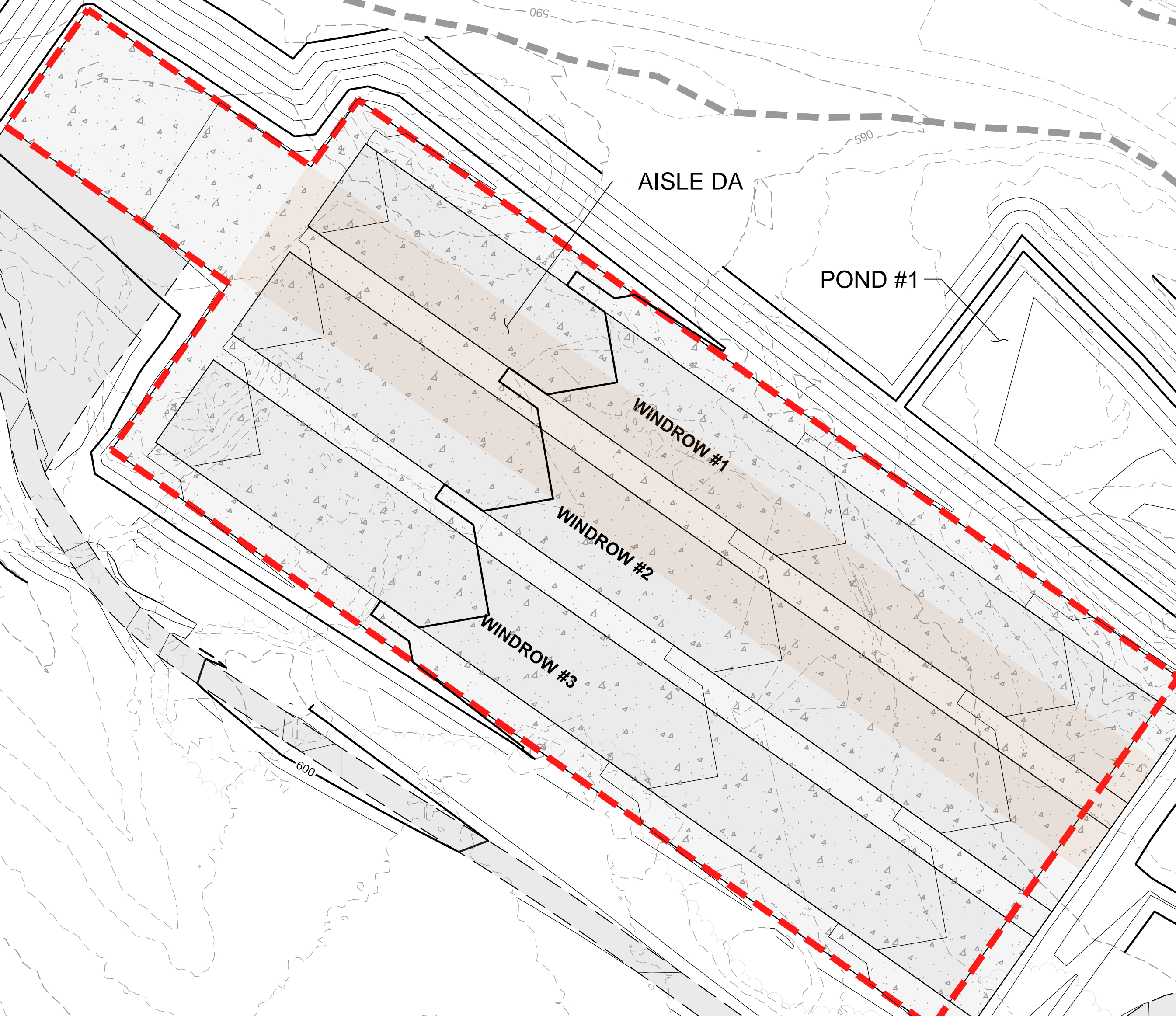
FILE NO. 3677109

USER:JKBECKLER

SAVED:7/29/2020

SAVED:7/29/2020

SAVED:7/29/2020



Area = .71 AC
Toc = 5 mins
C = .99

$$Q_{25} = 5.6 \text{ FT}^3$$

BARGE
DESIGN SOLUTIONS

PRELIMINARY
NOT FOR
CONSTRUCTION

AISLE DA

CITY OF LEBANON
COMPOSTING FACILITY

EBANON, TN

[illegible]

EX-2

FILE NO. #####

USER:JKBECKLER
FILE:\\corp.bwsc.net
SAVED:7/31/2020
PLOTTED:8/4/2020



Area = 1.62 AC
Toc = 5 mins
Composite CN = 97

$$V_{25} = 31,007 \text{ FT}^3$$

BARGE
DESIGN SOLUTIONS

PRELIMINARY
NOT FOR
CONSTRUCTION

DATE _____

POND DA - INITIAL PHASE

CITY OF LEBANON
COMPOSTING FACILITY
LEBANON, TN

[illegible]

EX-3

FILE NO. 3677109

Pond Calculations

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	25.60	2	716	60,482	-----	-----	-----	Final Phase
2	Reservoir	0.000	2	n/a	0	1	589.26	60,482	Pond Final Phase
3	SCS Runoff	13.13	2	716	31,007	-----	-----	-----	Initial Phase
4	Reservoir	0.000	2	n/a	0	3	587.47	31,007	Pond nitial Phase
Lebanon Compost Facility.gpw					Return Period: 25 Year			Monday, 08 / 3 / 2020	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

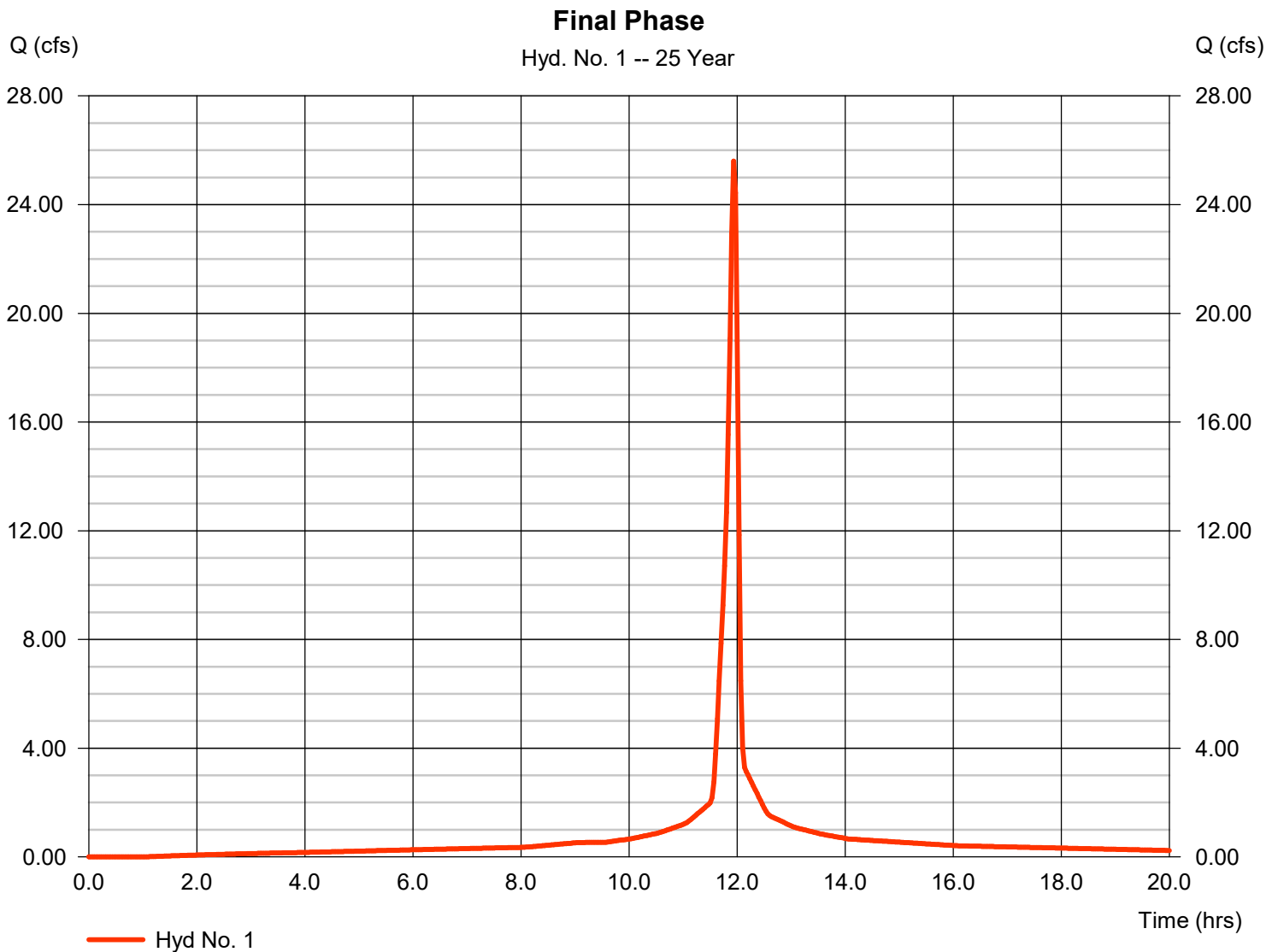
Monday, 08 / 3 / 2020

Hyd. No. 1

Final Phase

Hydrograph type	= SCS Runoff	Peak discharge	= 25.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 60,482 cuft
Drainage area	= 3.160 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.98 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(2.410 \times 98) + (0.650 \times 98) + (0.100 \times 74)] / 3.160$



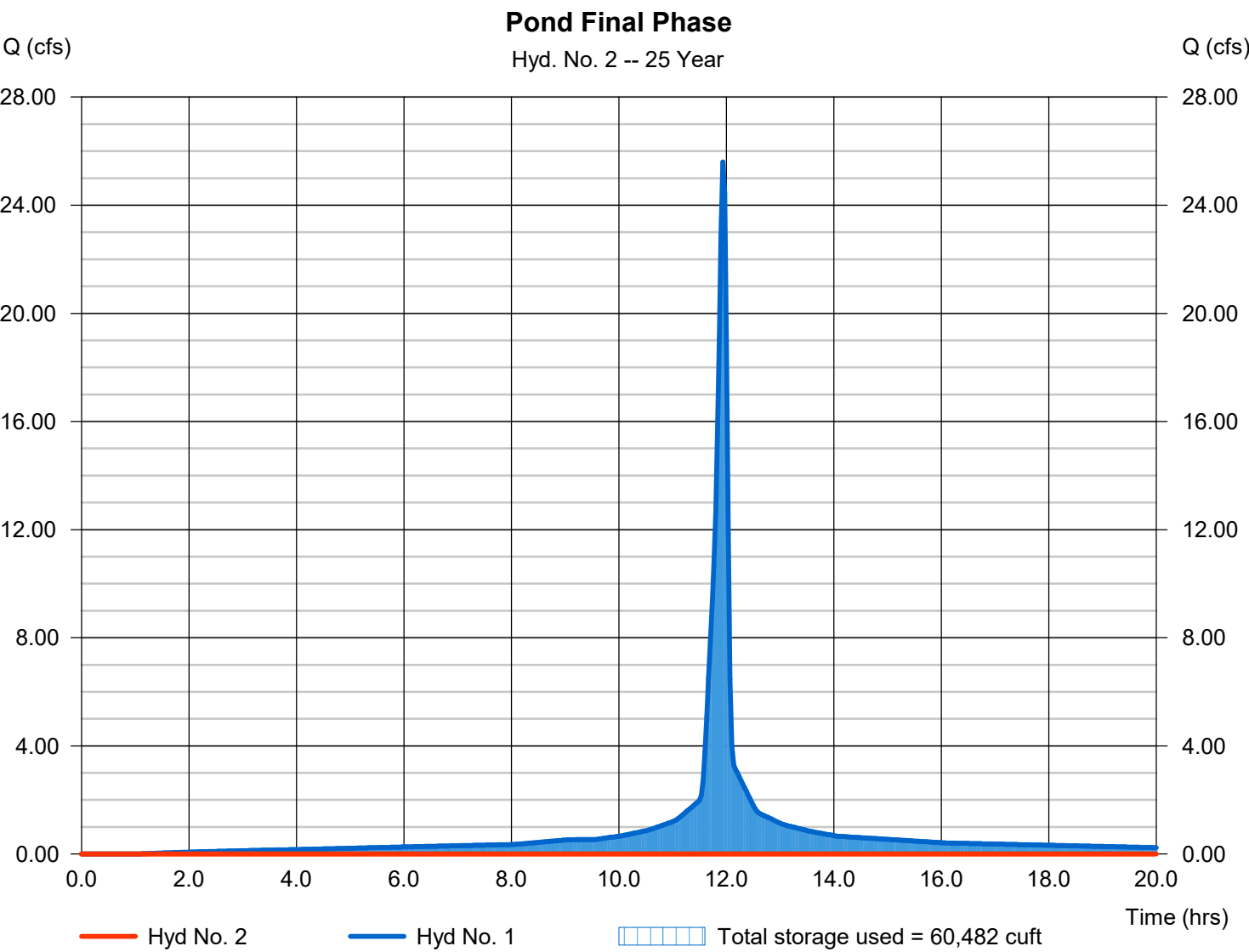
Hydrograph Report

Hyd. No. 2

Pond Final Phase

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - Final Phase	Max. Elevation	= 589.26 ft
Reservoir name	= Pond	Max. Storage	= 60,482 cuft

Storage Indication method used.



Pond Report

4

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 08 / 3 / 2020

Pond No. 1 - Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 582.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	582.00	765	0	0
1.00	583.00	1,655	1,210	1,210
2.00	584.00	2,703	2,179	3,389
3.00	585.00	4,594	3,649	7,038
4.00	586.00	9,221	6,907	13,946
5.00	587.00	12,012	10,617	24,562
6.00	588.00	15,237	13,625	38,187
7.00	589.00	18,671	16,954	55,141
8.00	590.00	22,497	20,584	75,725

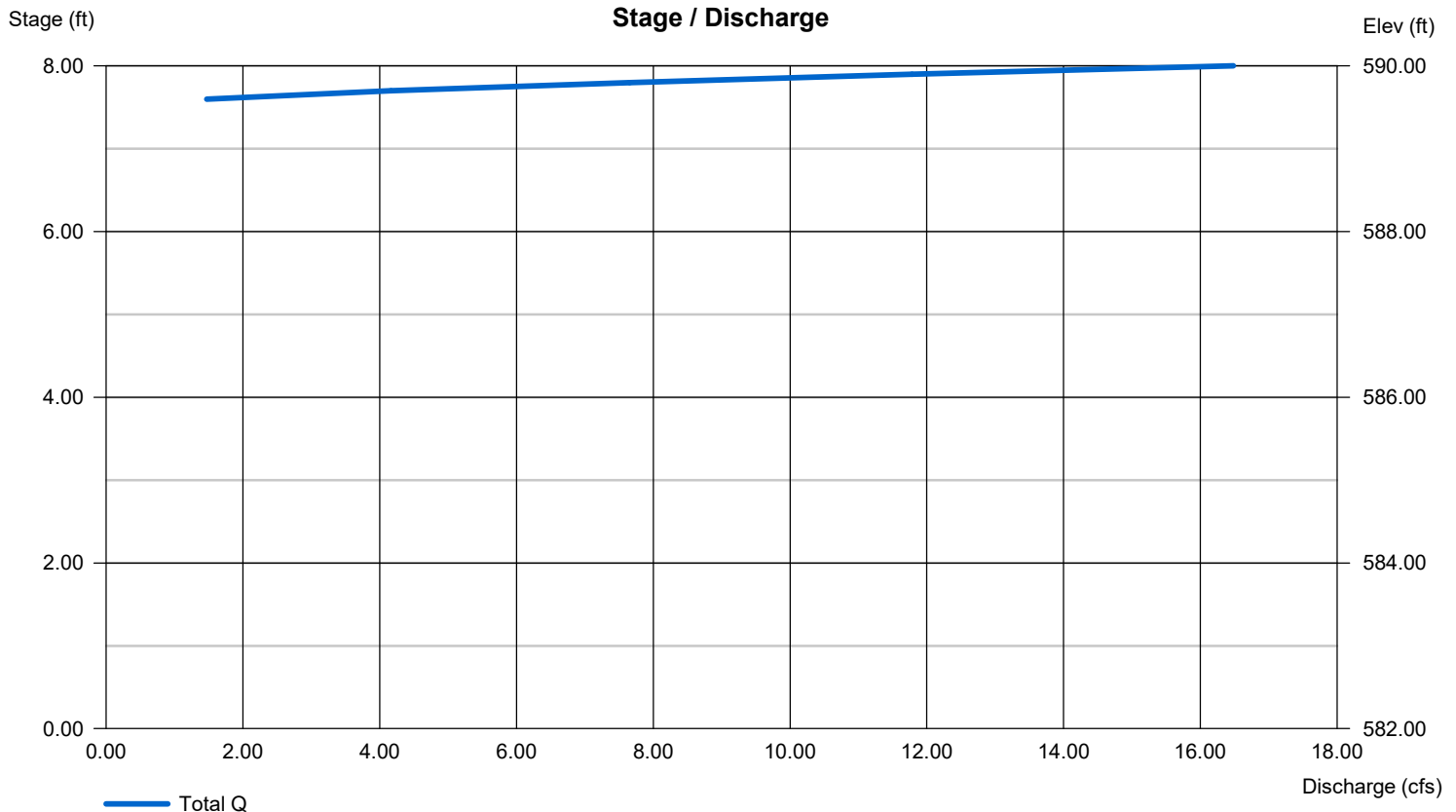
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 14.00	0.00	0.00	0.00
Crest El. (ft)	= 589.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

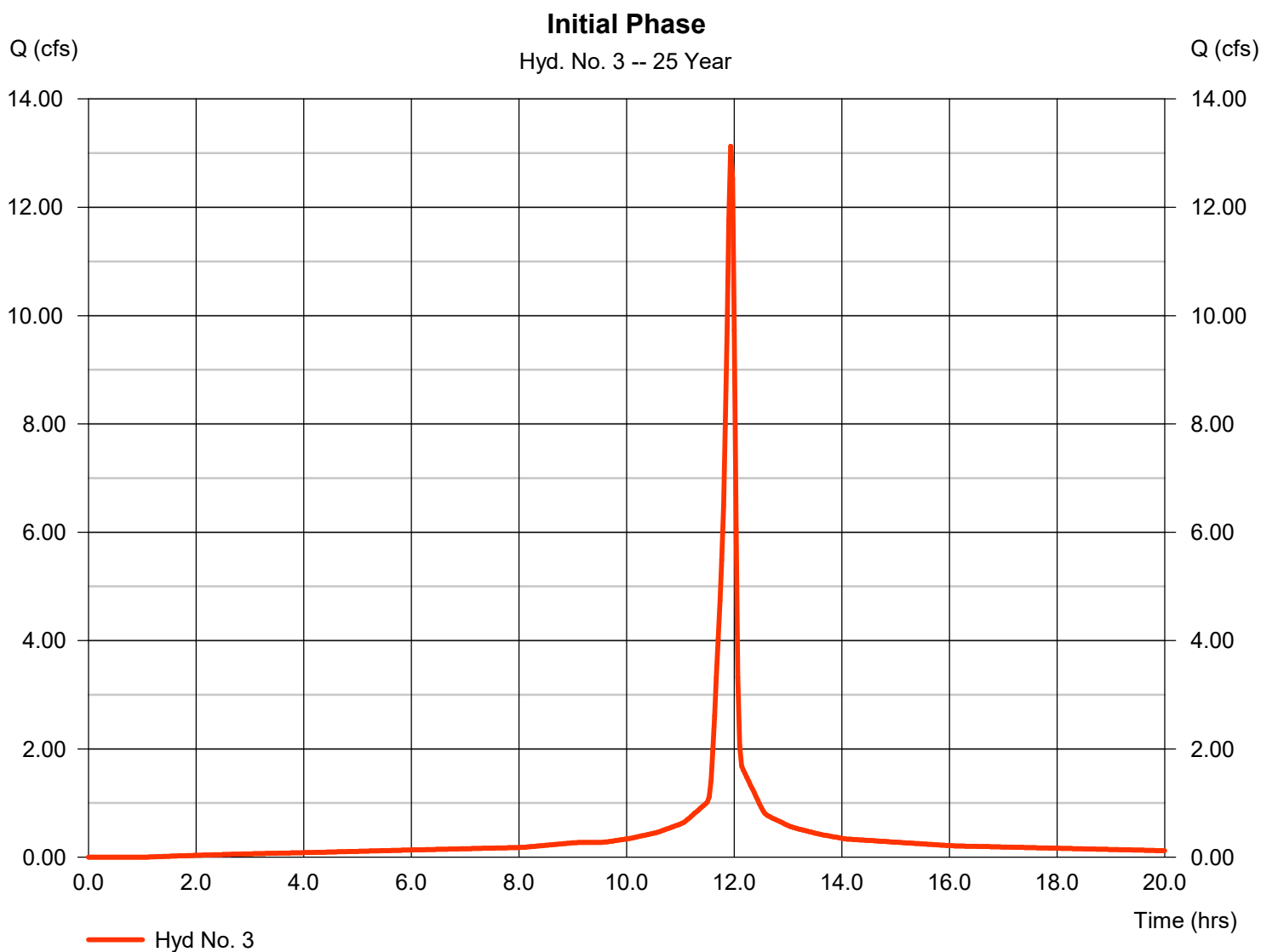
Monday, 08 / 3 / 2020

Hyd. No. 3

Initial Phase

Hydrograph type	= SCS Runoff	Peak discharge	= 13.13 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 31,007 cuft
Drainage area	= 1.620 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.98 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.950 \times 98) + (0.100 \times 74) + (0.570 \times 98)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

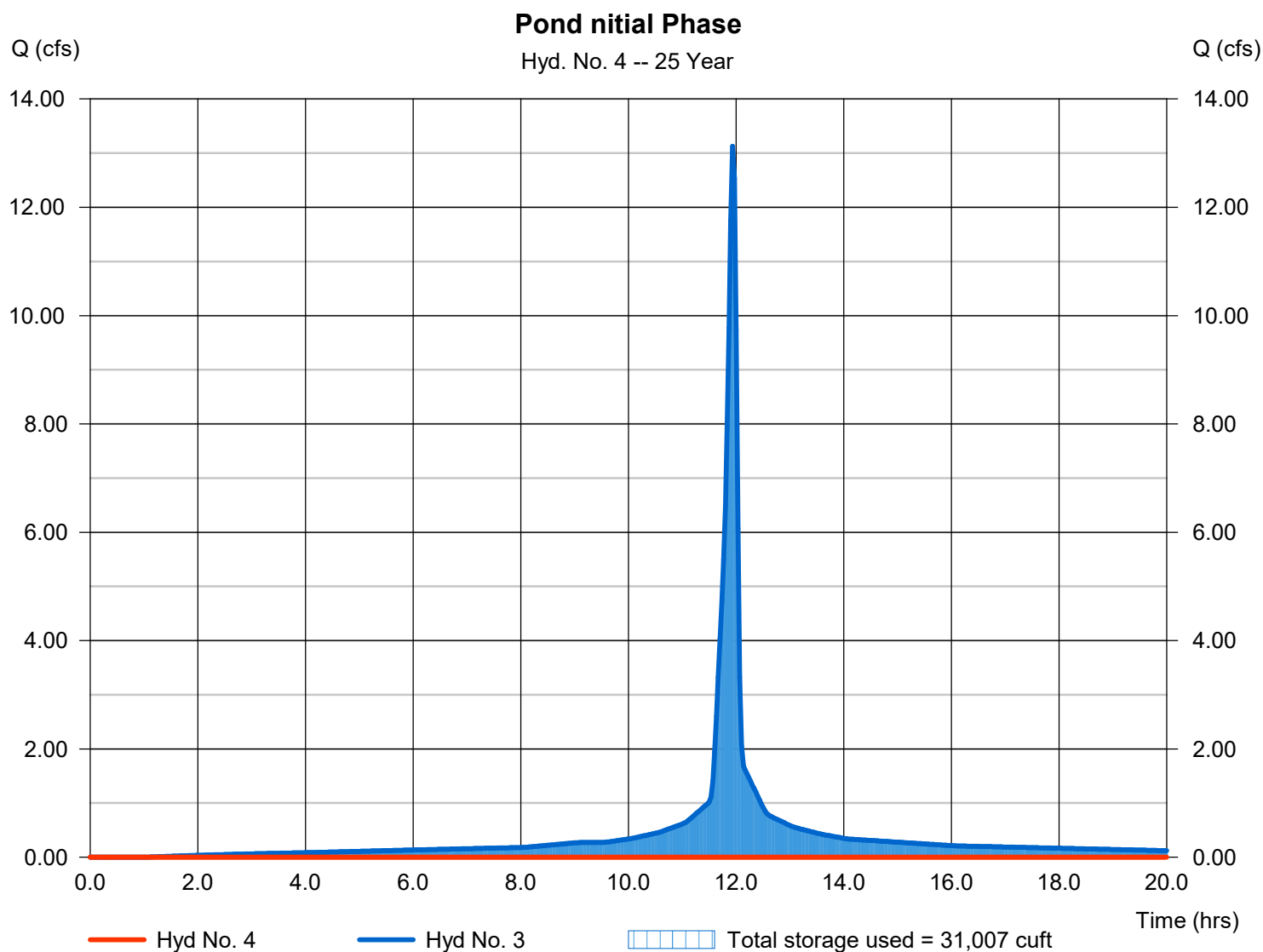
Monday, 08 / 3 / 2020

Hyd. No. 4

Pond nitial Phase

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Initial Phase	Max. Elevation	= 587.47 ft
Reservoir name	= Pond	Max. Storage	= 31,007 cuft

Storage Indication method used.



Pond Report

7

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 08 / 3 / 2020

Pond No. 1 - Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 582.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	582.00	765	0	0
1.00	583.00	1,655	1,210	1,210
2.00	584.00	2,703	2,179	3,389
3.00	585.00	4,594	3,649	7,038
4.00	586.00	9,221	6,907	13,946
5.00	587.00	12,012	10,617	24,562
6.00	588.00	15,237	13,625	38,187
7.00	589.00	18,671	16,954	55,141
8.00	590.00	22,497	20,584	75,725

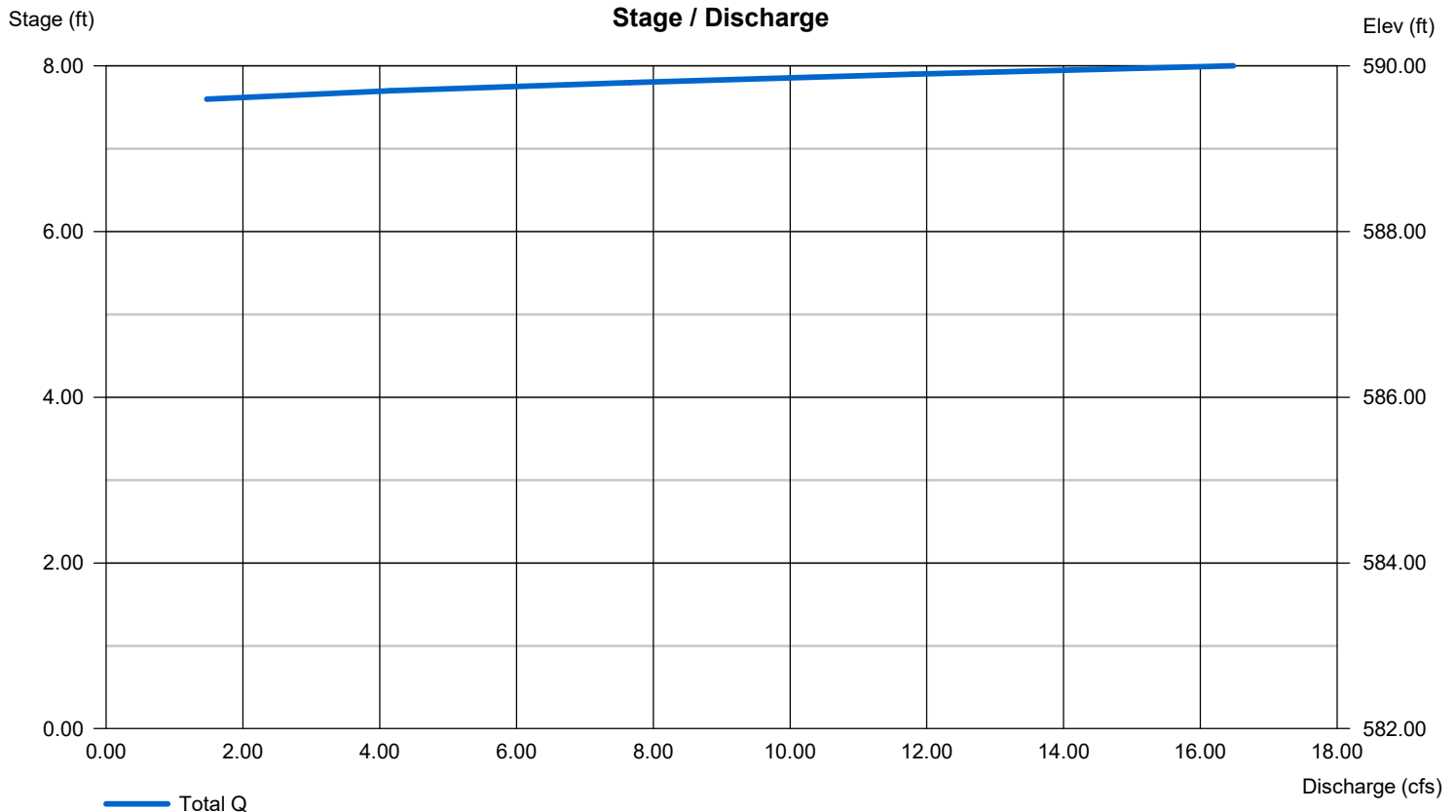
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 14.00	0.00	0.00	0.00
Crest El. (ft)	= 589.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	31.99	2	716	76,259	-----	-----	-----	Final Phase
2	Reservoir	0.478	2	1000	10,825	1	589.53	66,102	Pond Final Phase
3	SCS Runoff	16.40	2	716	39,095	-----	-----	-----	Initial Phase
4	Reservoir	0.000	2	n/a	0	3	588.05	39,095	Pond nitial Phase
Lebanon Compost Facility.gpw					Return Period: 100 Year			Monday, 08 / 3 / 2020	

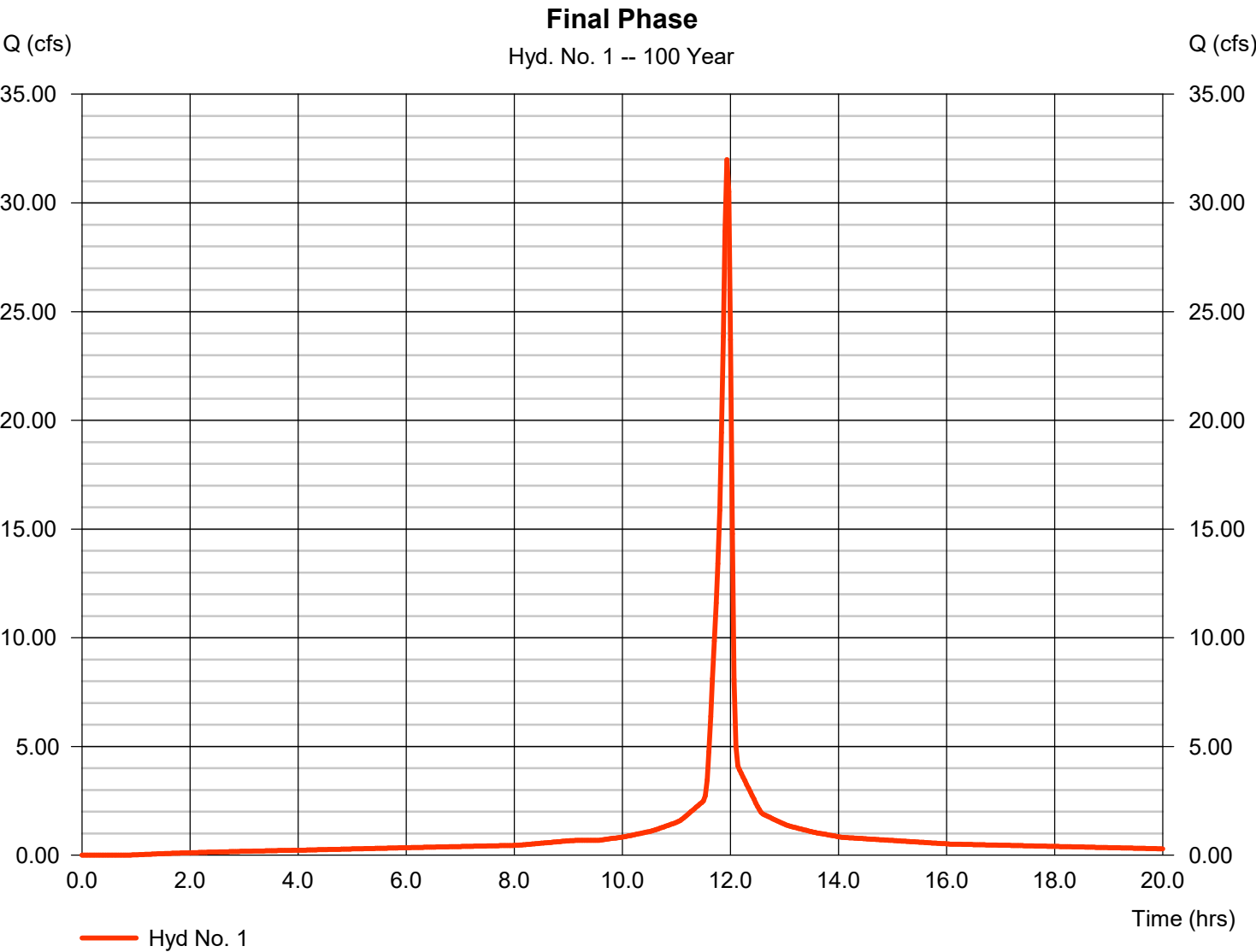
Hydrograph Report

Hyd. No. 1

Final Phase

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.99 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	76,259 cuft
Drainage area	=	3.160 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.410 x 98) + (0.650 x 98) + (0.100 x 74)] / 3.160



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

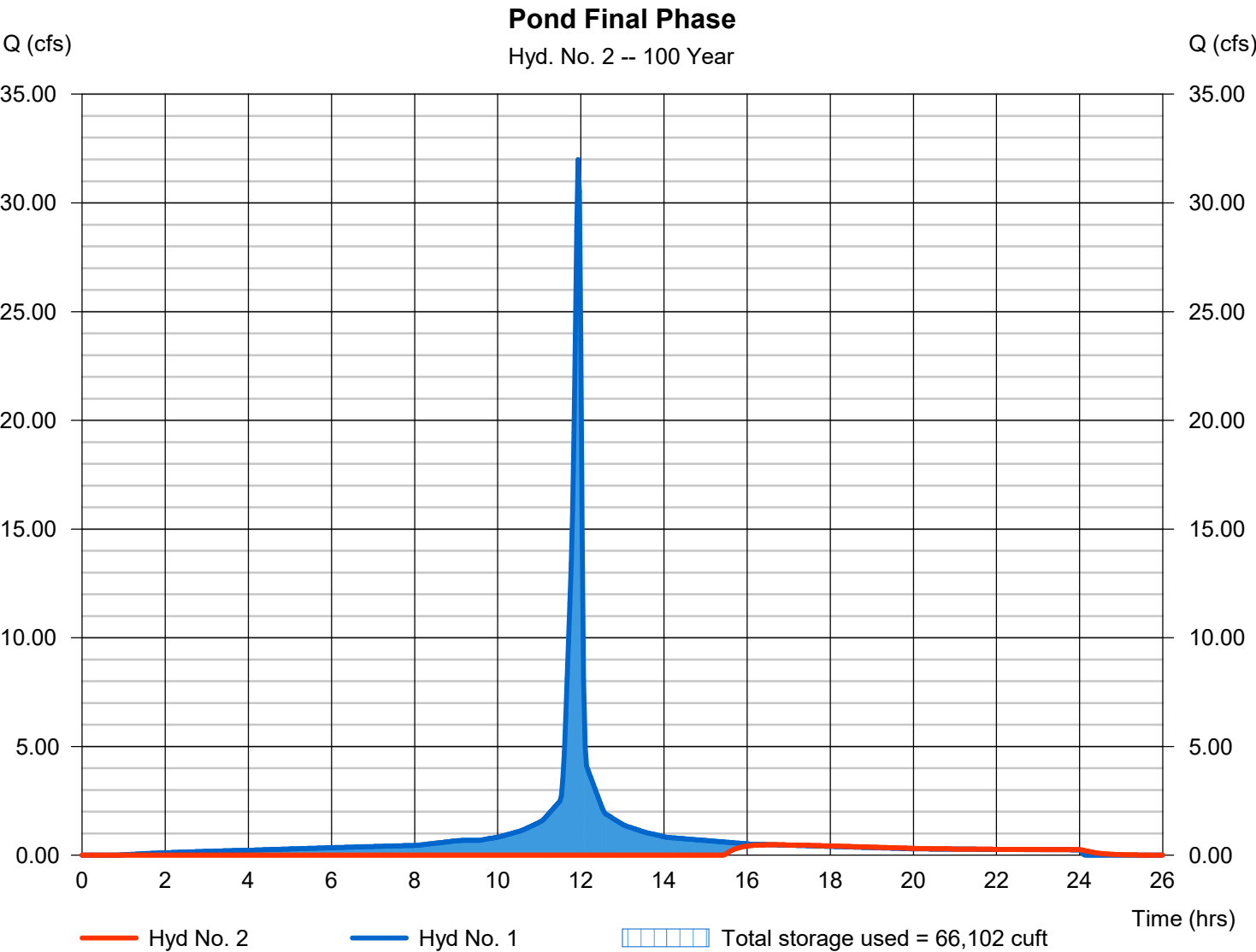
Monday, 08 / 3 / 2020

Hyd. No. 2

Pond Final Phase

Hydrograph type	= Reservoir	Peak discharge	= 0.478 cfs
Storm frequency	= 100 yrs	Time to peak	= 16.67 hrs
Time interval	= 2 min	Hyd. volume	= 10,825 cuft
Inflow hyd. No.	= 1 - Final Phase	Max. Elevation	= 589.53 ft
Reservoir name	= Pond	Max. Storage	= 66,102 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

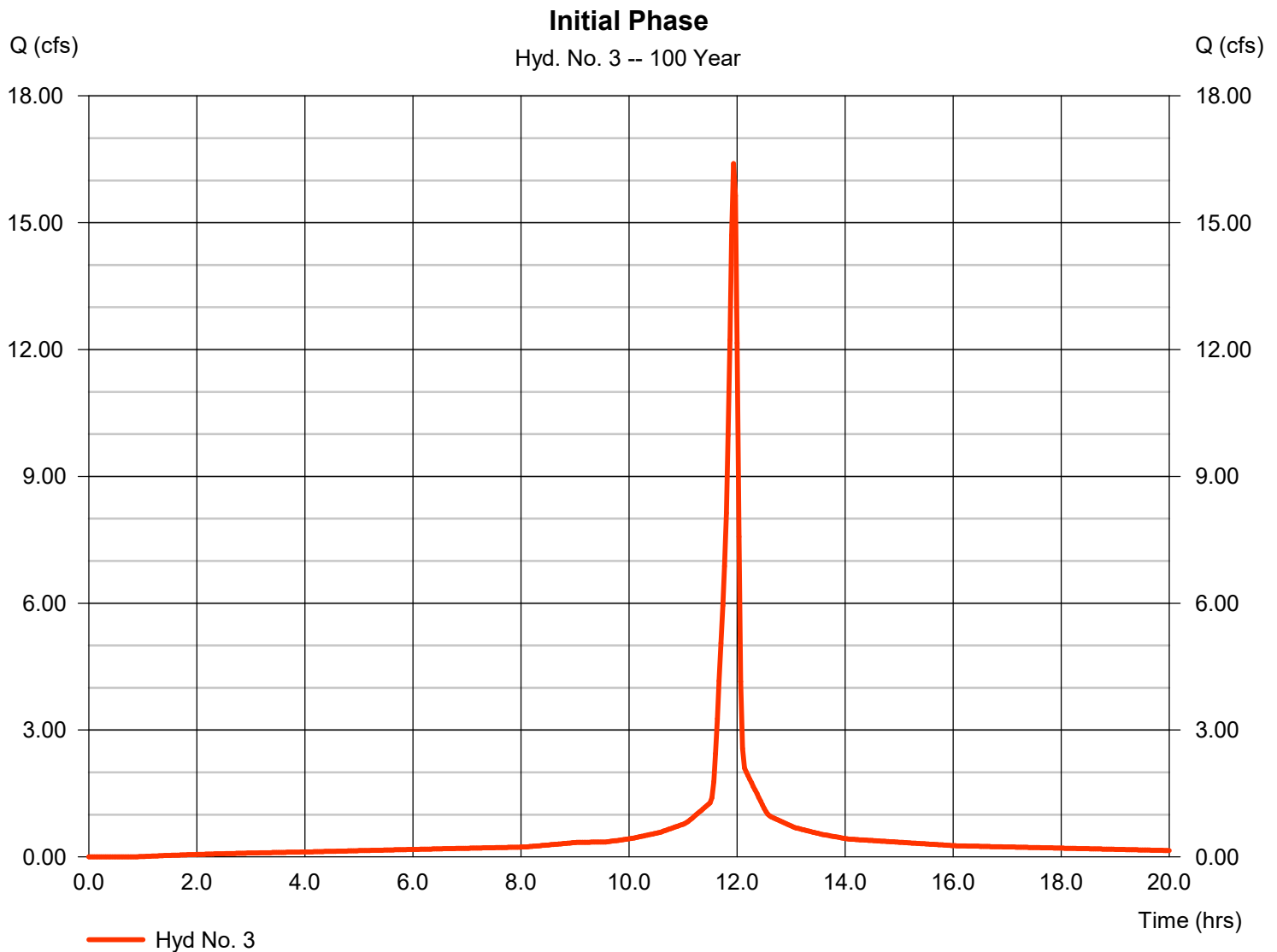
Monday, 08 / 3 / 2020

Hyd. No. 3

Initial Phase

Hydrograph type	= SCS Runoff	Peak discharge	= 16.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 39,095 cuft
Drainage area	= 1.620 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.950 \times 98) + (0.100 \times 74) + (0.570 \times 98)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

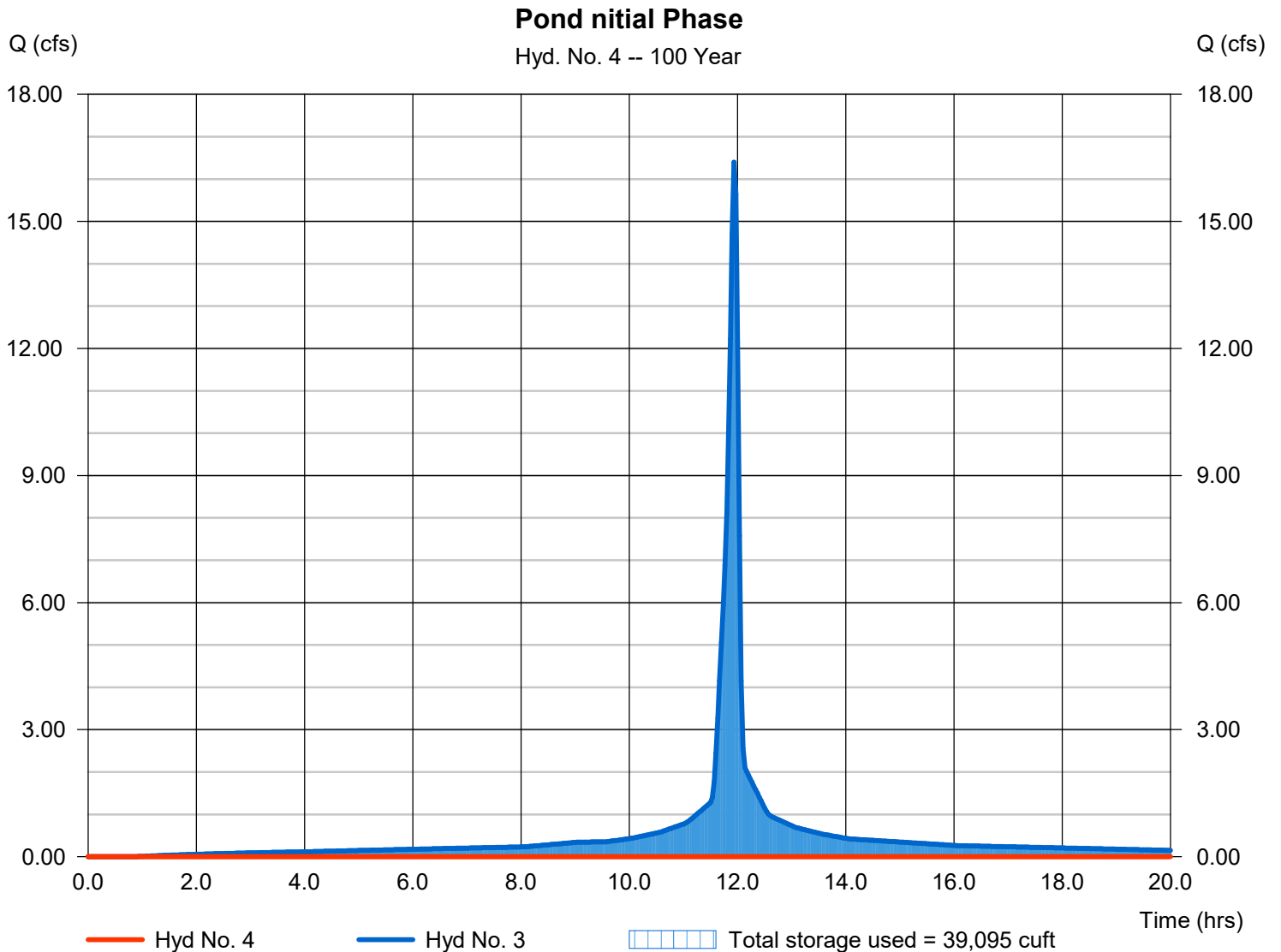
Monday, 08 / 3 / 2020

Hyd. No. 4

Pond nitial Phase

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Initial Phase	Max. Elevation	= 588.05 ft
Reservoir name	= Pond	Max. Storage	= 39,095 cuft

Storage Indication method used.





North American Green
 5401 St. Wendel-Cynthiana Rd.
 Poseyville, Indiana 47633
 Tel. 800.772.2040
 >Fax 812.867.0247
 www.nagreen.com
 ECMDS v7.0

SPILLWAY ANALYSIS

> > > Pond Spillway

Name	Pond	Spillway
Discharge	0.447	
Peak Flow Period	24	
Channel Slope	0.25	
Channel Bottom Width	14	
Low Flow Liner		
Retardence Class	C 6-12 in	
Vegetation Type	Sod Former	
Vegetation Density	Good 65-79%	
Soil Type	Silt Loam (SM)	

Unreinforced Vegetation - Class C - Sod Former - Good 65-79%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	0.45 cfs	1.1 ft/s	0.03 ft	0.064	4 lbs/ft ²	0.46 lbs/ft ²	8.76	STABLE	--
Underlying Substrate	Straight	0.45 cfs	1.1 ft/s	0.03 ft	0.064	5.41 lbs/ft ²	0.45 lbs/ft ²	11.91	STABLE	--

DS75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
DS75 Unvegetated	Straight	0.45 cfs	1.57 ft/s	0.02 ft	0.035	1.6 lbs/ft ²	0.31 lbs/ft ²	5.1	STABLE	D
Underlying Substrate	Straight	0.45 cfs	1.59 ft/s	0.02 ft	0.035	1.17 lbs/ft ²	0.32 lbs/ft ²	3.68	STABLE	D



ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ DS75™ Erosion Control Blanket

DESCRIPTION

The ultra short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 45 days. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The DS75 shall meet Type 1.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content

Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable with photo accelerators	1.5 lb/1000 sq ft (0.73 g/sm)
Thread	Degradable	

Standard Roll Sizes

Width	6.67 (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	112 ft (34.14 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	100 lbs (45.36 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	200 sq yd (167.22 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.45 in. (11.43 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	375%
Mass/Unit Area	ASTM 6475	8.57 oz/sy (291 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	10%
Tensile Strength - MD	ASTM D6818	105.6 lbs/ft (1.57 kN/m)
Elongation - MD	ASTM D6818	34%
Tensile Strength - TD	ASTM D6818	42.0 lbs/ft (0.62 kN/m)
Elongation - TD	ASTM D6818	25.2%
Biomass Improvement	ASTM D7322	286%

Design Permissible Shear Stress

Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors

Slope Gradients (S)

Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021



**NORTH
AMERICAN
GREEN®**

North American Green
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633

nagreen.com
800-772-2040

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Aisle Drainage Capacity

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	5.692	1	5	1,708	-----	-----	-----	Aisle DA

Hydrograph Report

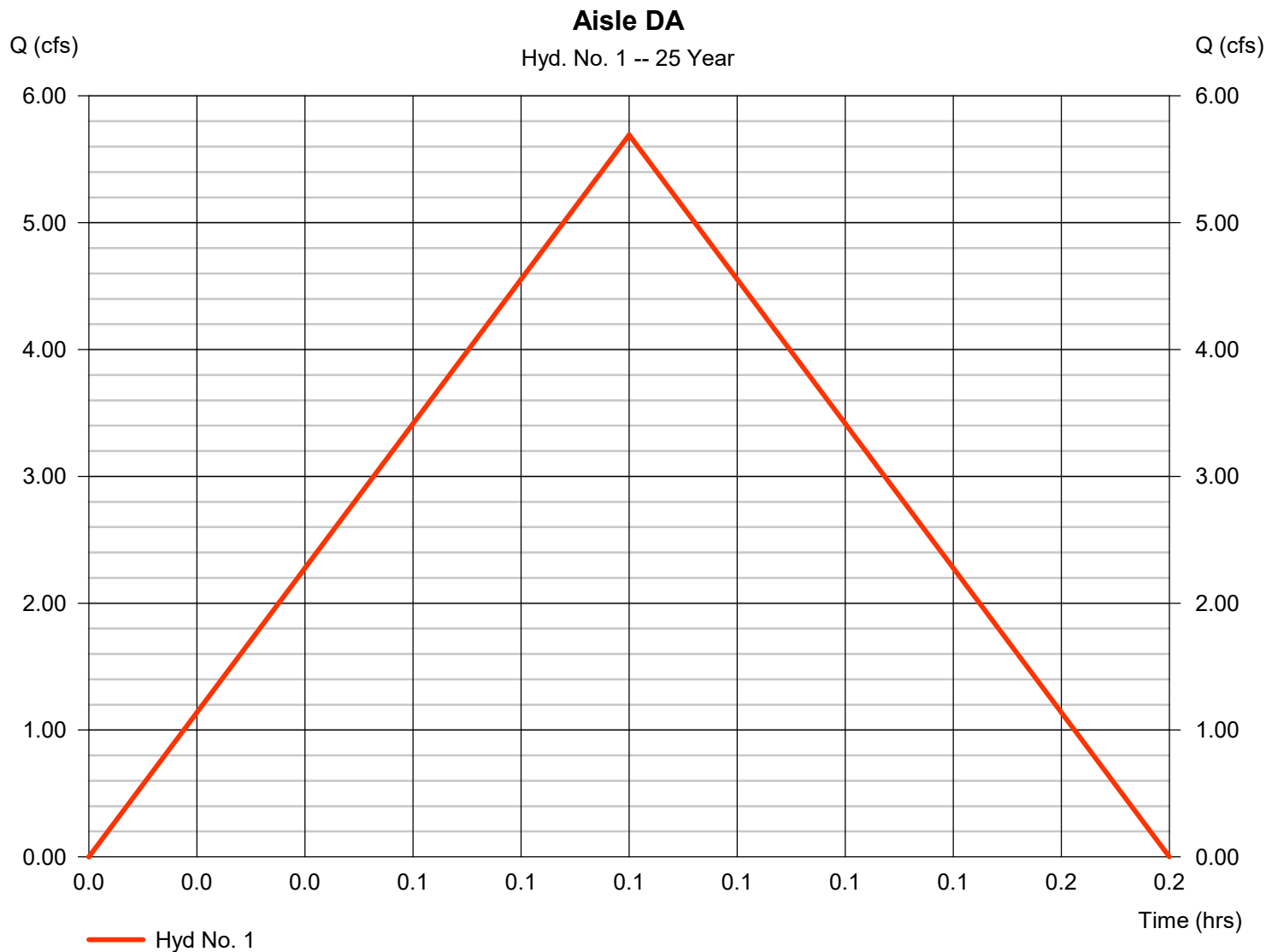
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Tuesday, 07 / 21 / 2020

Hyd. No. 1

Aisle DA

Hydrograph type	= Rational	Peak discharge	= 5.692 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,708 cuft
Drainage area	= 0.710 ac	Runoff coeff.	= 0.99
Intensity	= 8.099 in/hr	Tc by User	= 5.00 min
IDF Curve	= New Johnsonville.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

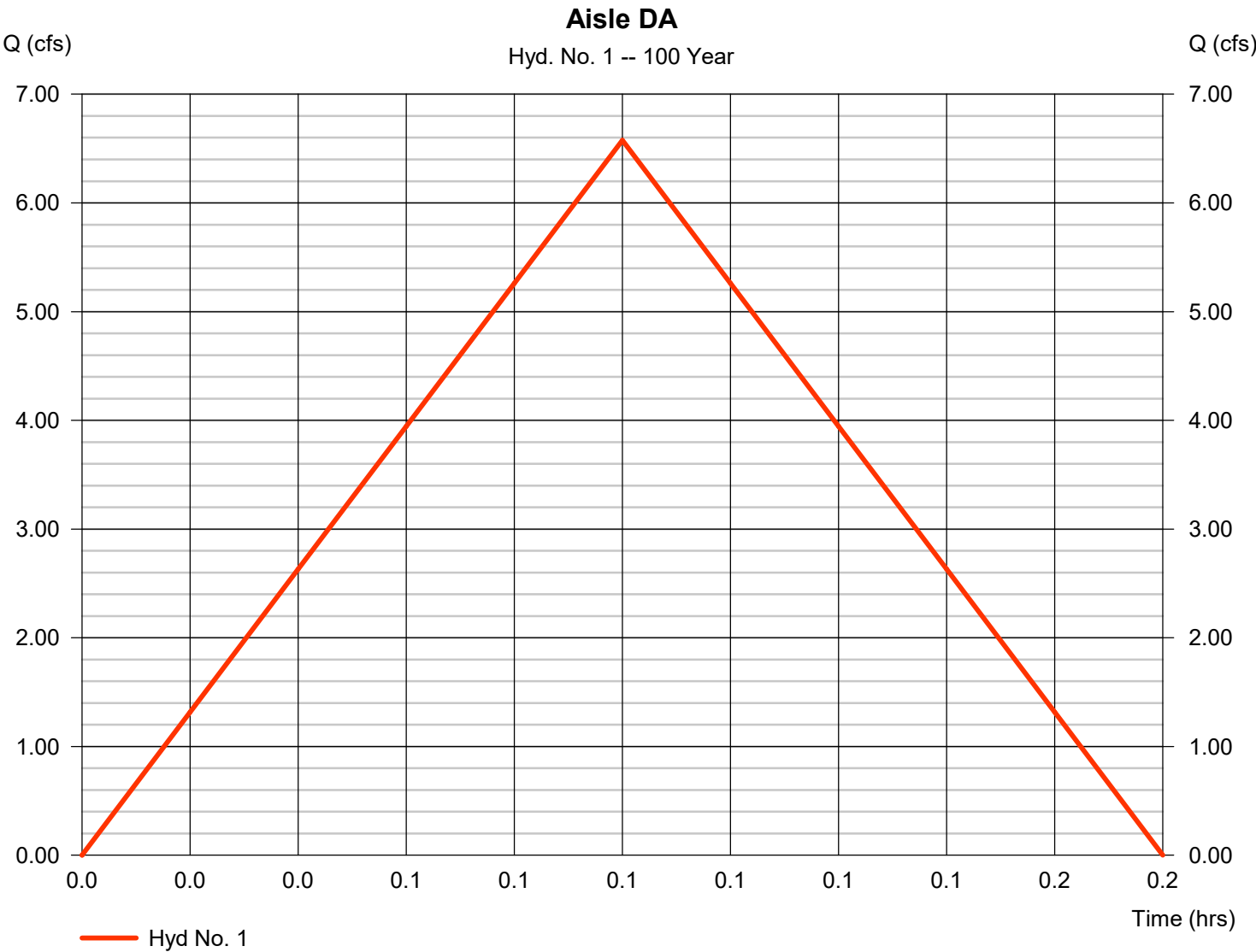
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.576	1	5	1,973	-----	-----	-----	Aisle DA
					\\corp.bwsc.net\data\Projects\36\36771\3677100001-PROJECT-EXECUTION\CIVIL\Calculation\21-1-2020 Aisle Hydrographs.gpw				

Hydrograph Report

Hyd. No. 1

Aisle DA

Hydrograph type	= Rational	Peak discharge	= 6.576 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,973 cuft
Drainage area	= 0.710 ac	Runoff coeff.	= 0.99
Intensity	= 9.356 in/hr	Tc by User	= 5.00 min
IDF Curve	= New Johnsonville.IDF	Asc/Rec limb fact	= 1/1



Worksheet for Rectangular Channel - 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01500	ft/ft
Bottom Width	8.00	ft
Discharge	5.60	ft ³ /s

Results

Normal Depth	0.17	ft
Flow Area	1.35	ft ²
Wetted Perimeter	8.34	ft
Hydraulic Radius	0.16	ft
Top Width	8.00	ft
Critical Depth	0.25	ft
Critical Slope	0.00425	ft/ft
Velocity	4.15	ft/s
Velocity Head	0.27	ft
Specific Energy	0.44	ft
Froude Number	1.78	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.25	ft
Channel Slope	0.01500	ft/ft
Critical Slope	0.00425	ft/ft

ATTACHMENT 6: FEMA FLOOD MAP FIRMETTE

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. Those BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (CBFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Tennessee State Plane Single Zone (FIPSZONE 4100). The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. Those differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the North American Vertical Datum of 1988 and the National Geodetic Vertical Datum of 1929, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at <http://www.ngs.noaa.gov/>.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Wilson County Office of Information Technology. This information was photogrammetrically compiled from digital aerial photography dated 2002, 2004 and 2005. Street centerlines were digitized based on 1989 imagery and updated with georeferenced plats and approved against the 2004 imagery. Stream centerlines were photogrammetrically compiled from digital aerial photography dated 1959.

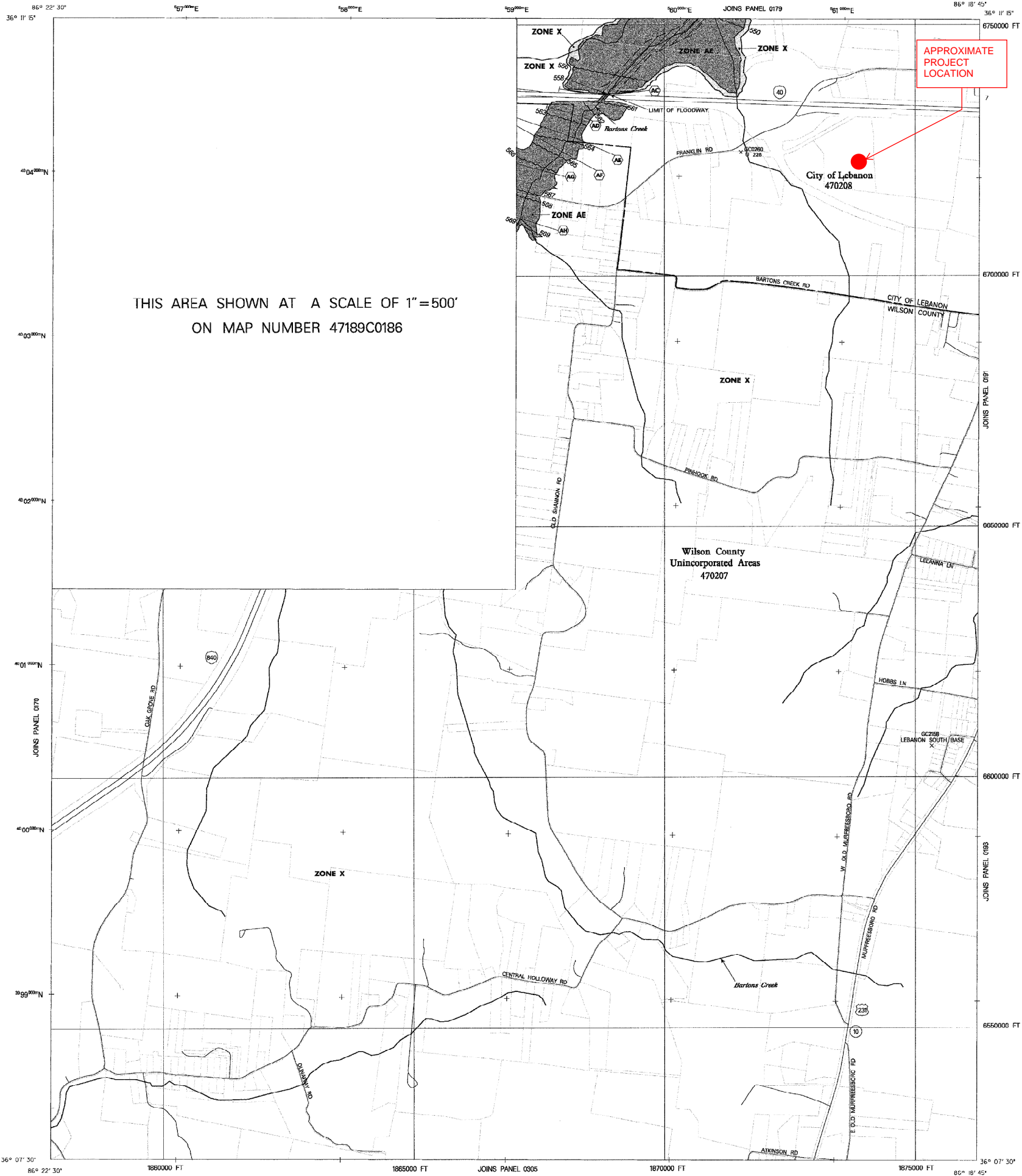
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.



THIS AREA SHOWN AT A SCALE OF 1"=500'
ON MAP NUMBER 47189C0186

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The base flood elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Area of Special Flood Hazard formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no base flood elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Base Flood Elevation line and value; elevation in feet
- Base Flood Elevation value where uniform within zone; elevation in feet

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Traverse line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 16
- 5000-foot grid ticks: Tennessee State Plane coordinate system, (FIPSZONE 4100), Transverse Mercator
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- 1/4 Mile

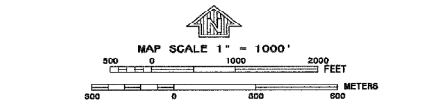
MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
FEBRUARY 20, 2008

EFFECTIVE DATES OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0190D

FIRM
FLOOD INSURANCE RATE MAP
WILSON COUNTY,
TENNESSEE
AND INCORPORATED AREAS

PANEL 190 OF 445
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LEBANON CITY OF	470208	0190	D
WILSON COUNTY	470207	0190	D

MAP NUMBER
47189C0190D
EFFECTIVE DATE
FEBRUARY 20, 2008

Notes to Users: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette



86°19'23"W 36°11'3"N



USGS The National Map: Orthoimagery. Data refreshed April 2020

0 250 500 1,000 1,500 2,000 Feet

1:6,000

86°18'46"W 36°10'34"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



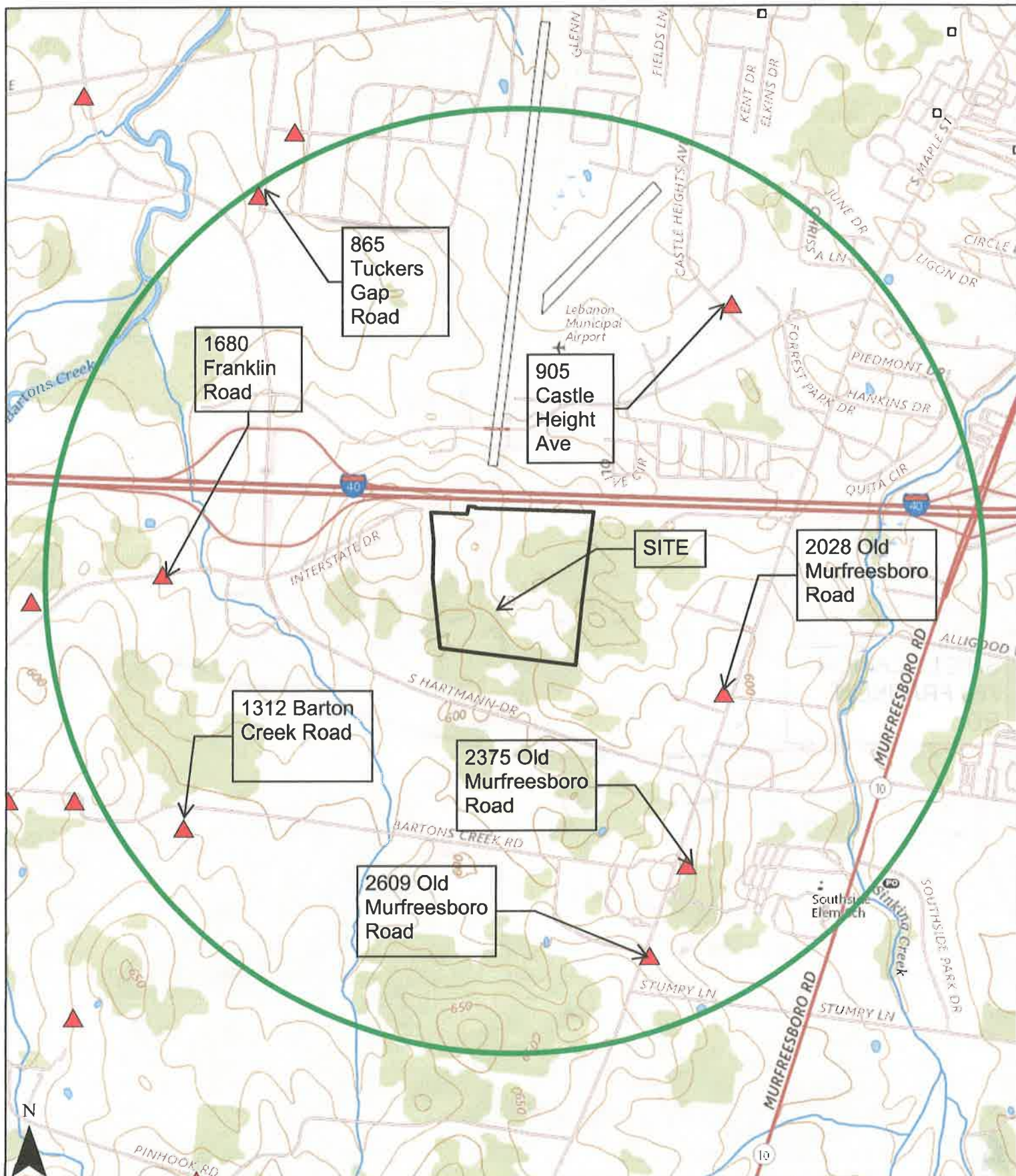
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **7/2/2020 at 2:01 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT 7: WELL LOCATION VICINITY MAP



0 0.075 0.15 0.3 Miles

1" = 4,000 ft
North American Datum 1983

BARGE
BARGE SOLUTIONS

Well Location Assessment Map

City of Lebanon Composting Facility

Lebanon, Wilson County, Tennessee

Legend

- ▲ Lebanon Well Locations
- 1 Mile Radius
- Property

Figure 1

Date: 5/1/2020

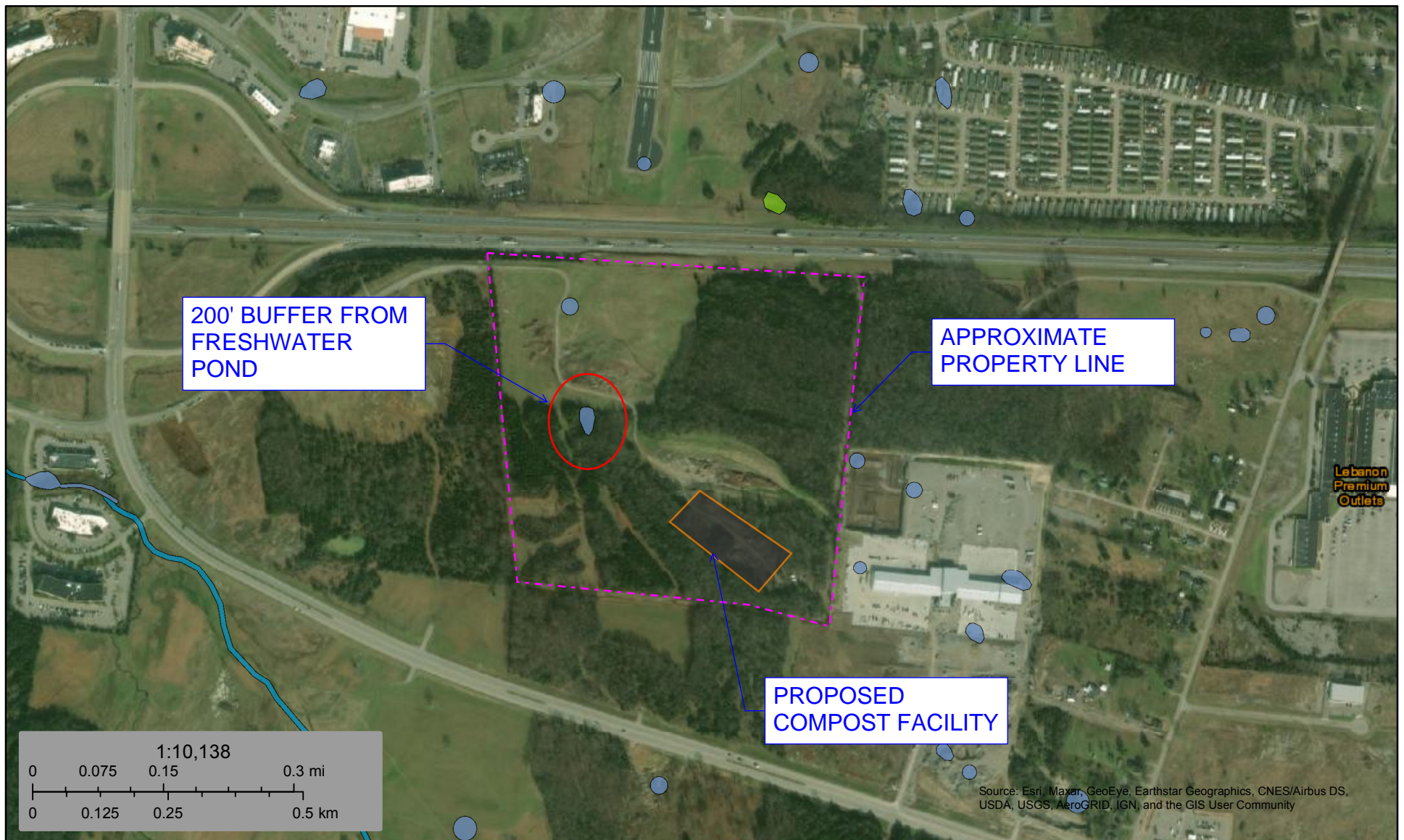
**ATTACHMENT 8:
NATIONAL WETLAND
INVENTORY MAP**



U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetlands and Surface Water



July 10, 2020

Wetlands

	Estuarine and Marine Deepwater		Freshwater Emergent Wetland		Lake
	Estuarine and Marine Wetland		Freshwater Forested/Shrub Wetland		Other
			Freshwater Pond		Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

**ATTACHMENT 9:
US FISH AND WILDLIFE SERVICE:
IPaC THREATENED AND
ENDANGERED SPECIES**

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Lebanon Composting Facility

LOCATION

Wilson County, Tennessee

**DESCRIPTION**

This project is located at 760 Franklin Rd in Lebanon TN will include building a Tier 3 composting facility for the City of Lebanon. It will initially include a 0.85 acre concrete pad which will be gradually increased to a 2.4 acre concrete pad and 0.67 Acre lined pond. The facility will be used for processing compost, and it will be constructed before the end of the 2020. The site is currently used for surplus materials storage for the City of Lebanon Public Works Department.

Local office

Tennessee Ecological Services Field Office

☎ (931) 528-6481

📠 (931) 528-7075

446 Neal Street

Cookeville, TN 38501-4027

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species

¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Bat <i>Myotis grisescens</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Cumberlandian Combshell <i>Epioblasma brevidens</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3119	Endangered
Dromedary Pearlymussel <i>Dromus dromas</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6377	Endangered
Fanshell <i>Cyprogenia stegaria</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4822	Endangered
Orangefoot Pimpleback (pearlymussel) <i>Plethobasus cooperianus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1132	Endangered
Pink Mucket (pearlymussel) <i>Lampsilis abrupta</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7829	Endangered
Purple Cat's Paw (=purple Cat's Paw Pearlymussel) <i>Epioblasma obliquata obliquata</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5602	Endangered

Ring Pink (mussel) <i>Obovaria retusa</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4128	
Rough Pigtoe <i>Pleurobema plenum</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6894	
Tubercled Blossom (pearlymussel) <i>Epioblasma torulosa torulosa</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4126	
White Wartyback (pearlymussel) <i>Plethobasus cicatricosus</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2549	

Flowering Plants

NAME	STATUS
Braun's Rock-cress <i>Arabis perstellata</i>	Endangered
There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4704	
Leafy Prairie-clover <i>Dalea foliosa</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5498	
Spring Creek Bladderpod <i>Lesquerella perforata</i>	Endangered
No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2012	

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Breeds Sep 1 to Jul 31

Blue-winged Warbler *Vermivora pinus*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds May 1 to Jun 30

Kentucky Warbler *Oporornis formosus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 20 to Aug 20

Prairie Warbler *Dendroica discolor*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 1 to Jul 31

Red-headed Woodpecker *Melanerpes erythrocephalus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Sep 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

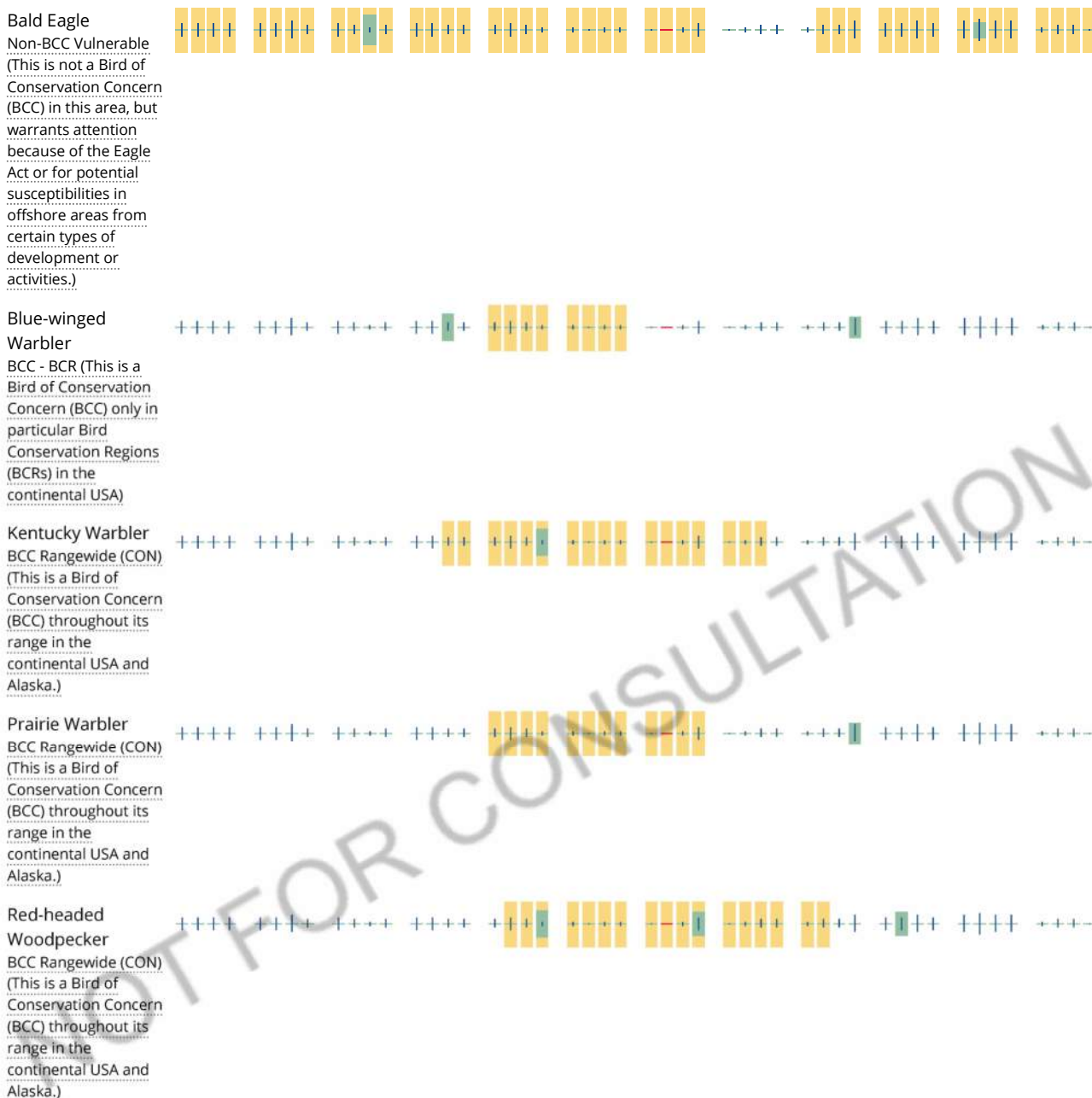
No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

ATTACHMENT 10: HOOP ROOF EXAMPLE

FABRIC COVER



The 12.5 oz. Fabric Cover is energy-efficient and features a 20 year warranty

This 12.5 oz. polyethylene fabric cover is an energy-efficient option that enables users to save money on a monthly basis. Natural light filters through, eliminating the need for artificial daytime lighting, while the climate-sensitive cover keeps it warmer in the winter and cooler in the summer.

The ClearSpan 12.5 oz. Fabric Cover Advantage

Natural lighting - Reduce energy costs by eliminating daytime lighting.

Climate sensitive - Cut heating and cooling costs.

Low maintenance - Rain keeps the cover looking clean.

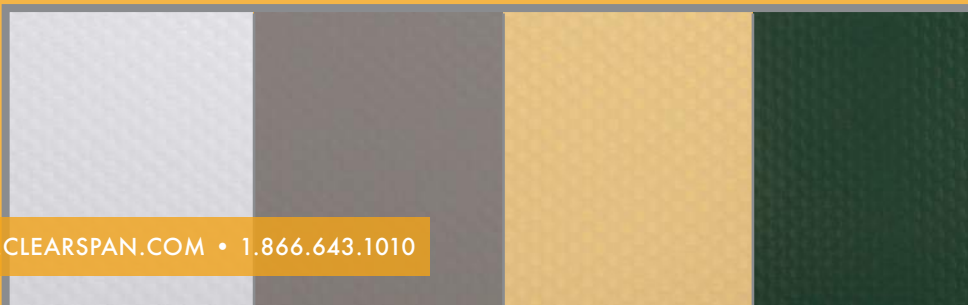
Rip-stop weave - Stops potential tears in their tracks.

100% recyclable.

Flame-retardant options available.

Exceptional 20 year warranty.

Fabric Colors

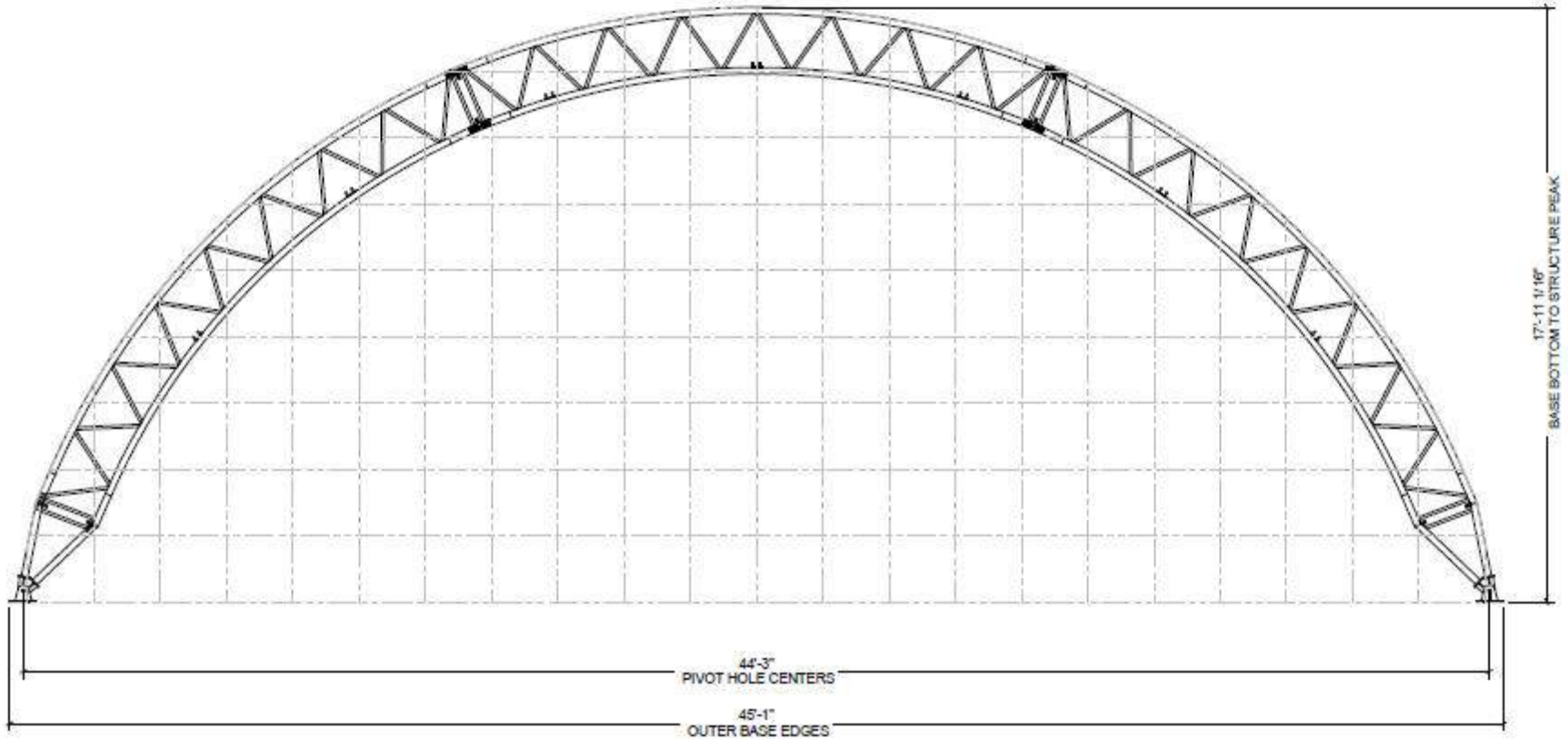








THESE PLANS ARE REPRESENTATIVE EXAMPLES, NOT TO BE USED FOR CONSTRUCTION



24" GRID

THESE PLANS ARE REPRESENTATIVE EXAMPLES, NOT TO BE USED FOR CONSTRUCTION

