

Lot Grading Guidance

Objectives

The City of Fernandina Beach Land Development Code includes requirements for drainage plans and retention for single family home construction. This document is intended to provide guidance on drainage analysis and planning for properties that are not part of an engineered stormwater master plan. The City is perusing a Low Impact Development Manual to provide additional information and guidance on this topic. The following information is provided until such time as that document is complete.

Currently the City of Fernandina Beach land development code includes the following requirements:

3.05.03 Standards for Stormwater Management

- A. All development shall comply with the specifications, standards of design, and detailed technical requirements provided in the manuals adopted by reference in Chapter 1.
- B. No subdivision shall be platted, nor shall construction commence for any single-family, multi-family, commercial, industrial, or institutional project, until the drainage design for such project has been approved by the City, and proof of permit from the SJRWMD, the USACOE, if applicable, and the Amelia Island Mosquito Control District, has been provided to the City.
- C. The drainage design plans for the project shall be prepared, signed, and sealed by a Florida registered professional engineer.
All drainage facilities and easements shall be documented to ensure the City that capacity and right-of-way are adequate from the source, through the development, to the receiving body of water, without adversely affecting upstream or downstream properties. Any improvements or increase in capacity of those facilities required to keep the project in compliance with all applicable regulations shall be made at the expense of the applicant.
- G. All single-family home projects that are not part of a subdivision with a designed stormwater system shall provide for retention of stormwater within the boundaries of the project.
 - 1. Projects that are located outside of a subdivision, but in an area with an available engineered stormwater system shall ensure that stormwater is properly routed to the stormwater structures.
 - 2. Design options for single-family home new construction and additions over 625 square feet:
 - a. Provide engineered solution as completed by an engineer, and/or
 - b. Utilize low impact development (LID) techniques such as rainwater harvesting, roof downspout disconnection, rain gardens, green roofs, trenches and chambers, bioretention, vegetated filter strips, permeable pavement, enhanced grass swales, dry swales, and perforated pipe systems.
- H. Drainage during construction
 - 1. All off-site drainage entering the property prior to the commencement of construction shall be maintained through the construction period.

2. Approved silt barriers in compliance with Section 3.01.05 shall be placed to prevent silt, erosion, or other pollutants from leaving the site. If off-site siltation occurs, it shall be halted immediately, or all work shall cease until the silting is stopped.

7.03.03 Standards for Stormwater Management

E. Design basis

1. All subdivisions and multi-family, commercial, industrial, and institutional projects shall provide for retention of stormwater within the boundaries of the project.
 - a. For projects within areas designated for zero discharge, storage shall accommodate a ten (10) year, twenty-four (24) hour storm event.
 - b. For all other areas, retention shall accommodate the greater of the first one-half (1/2) inch of stormwater within the boundaries of the project, or the first one (1) inch of storm flow from all roofs, sidewalks, paved surfaces, and parking areas (at 100 percent runoff), whether paved or not.

Drainage plans

For properties in developments with engineered drainage systems, the site plan shall demonstrate compliance with the approved lot grading plan for the development. These systems include drainage capacity for each lot in the development drainage system, and onsite storage will not be required. Low impact development techniques are still encouraged for these areas, but are not required.

For properties that are not part of a development that does has an engineered drainage system, are required to provide stormwater retention within the property boundary. A site drainage plan shall be provided with all building permit submittals including the following items:

- a. *The limits of the drainage basin;*
- b. *Topography of the project;*
- c. *Topography between the project and the receiving body of water, or the receiving City-, County- or State-owned drainage facility;*
- d. *Topography of adjacent property as necessary to establish flow patterns;*
- e. *Existing points of entry of water from adjacent property;*
- f. *Points of discharge of water from the project;*
- g. *Limits of fill required to construct facilities;*
- h. *Finished floor slab elevations and minimum elevation of the bottom of floor framing for each structure to accommodate the 100-year flood elevation;*
- i. *Location of National Flood Insurance Program rate map flood zones; and*

The surrounding topography and drainage features should be evaluated along with typical site survey information. The maps available on the Nassau County Property Appraisers website include a topography layer that can help identify the extent of adjacent properties that may be draining towards a subject property. The map can be located at <https://maps.nassauflpa.com/NassauTaxMap/>. This source

will be utilized in review of submitted drainage plans and is enough to determine the extent of offsite drainage flow.

Available low impact development techniques include shallow swales or rain gardens, infiltration systems, and pervious and semi-pervious surfaces in place of concrete or other impervious surfaces. Drainage plans should work with the existing topography to the extent possible, preserving trees and existing drainage features. Shallow swales can be distributed around the property to collect drainage from driveways, patios, and roof drains. These areas can be landscaped and will provide natural irrigation as stormwater infiltrates to function as rain gardens. Distributing the retention among several small areas is preferable to a single larger swale.

The location of outfall for the proposed drainage plan shall be identified on the plans. This is where the water will overflow when the storage area fills up, and shall be consistent with the pre-development flow direction.

While a drainage plan prepared by a licensed engineer is encouraged, if compliance with the below requirements can be sufficiently demonstrated, signed and sealed plans will not be required for single family construction.

Site plans must include the following site information and calculations:

Drainage Area

(A) Lot area (sf) -

(B) Offsite drainage area (sf) – see property appraisers topo map

(C) Total drainage area (sf) – $A+B=C$

Impervious Coverage

(D) Proposed home footprint (sf) –

(E) Proposed semi pervious area (sf) – includes pavers, pervious concrete, elevated decks, etc., Note: the 80% impervious factor applied to this area below is standard unless provided manufacturers information verifies a lower value.

(F) Proposed impervious (sf) – includes concrete and asphalt areas and all parking areas, regardless of surface

(G) Offsite impervious area (sf) – estimate of impervious portion of offsite area (B), use 50% for developed areas if detailed information is not available

(H) Total impervious coverage - $H=D + (E \times 0.8) + F$

Treatment volume requirements (larger of two calculations below is onsite storage requirement)

Rainfall over total drainage area (1/2")

$C \times 1/2" \times (1'/12") = \text{___} \text{ cf}$

Rainfall over impervious area (1")

$H \times 1" \times (1'/12") = \text{___} \text{ cf}$

Provided onsite storage

Tabulation of all proposed swales, rain gardens, and infiltration systems shall meet or exceed the required volume calculated above.

Infiltration design

Infiltration systems including French drains may be utilized to provide the required retention volume. The calculations may utilize only the provide storage volume in the conveyance pipe and drainage media. Examples and sizing tables are provided below. For systems or designs that vary from these examples, specific calculations must be provided.

For a traditional rock infiltration system with perforated pipe and 57-stone, the below table can be used for volume calculations

pipe dia. (in)	area (sf)	rock bed (H&W)(ft)	rock volume/ ft	total volume per ft
3	0.05	1	0.38	0.43
3	0.05	1.5	0.88	0.93
3	0.05	2	1.58	1.63
4	0.12	1	0.35	0.47
4	0.12	1.5	0.85	0.97
4	0.12	2	1.55	1.67
6	0.39	1	0.24	0.64
6	0.39	1.5	0.74	1.14
6	0.39	2	1.44	1.84

The row with the specified pipe size and rock bed dimensions will give you the total volume in the last column. Multiply that by the length of the drain system to get the storage volume provided.

Example 1: 125' of 4" perf pipe in a 1'x1' rock bed would be calculated as: $125' \times 0.47 \text{ cf/ft} = 58.75 \text{ cf}$

For pre-made engineered products like EZ Drain, the manufacturer gives storage volume for the specific products. The design and installation manual gives a volume per 10' section (<https://www.ndspro.com/PDFs/Installation-Instructions/EZDrain-install-and-design-manual.pdf>). This table converts their data to cubic feet per foot, so just take the number in the right column and multiply by the length of the system in feet to get the storage volume. There are lots of other products. This is just one of the more common I see.

EZ Drain		
Product	storage per 10' (Per manuf.)	Volume per ft (cf)
0702P	11.4	0.15
0802P	15.8	0.21

Example 2: 125' of EZ Drain 0802P would be calculated as: $125' \times 0.21 \text{ cf/ft} = 26.25 \text{ cf}$

As-built Survey

A final as-built survey will be required that provides final grading information sufficient to demonstrate that all drainage features shown on the approved site plan have been installed in substantial compliance with the permit drawings.