

**Re: MPC Item 1-SF-18-C\_1-I-18-UR WHCA Summary of Concerns**

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Apr 5, 2018 7:34 AM

Posted in group: **Commission**

The attached PDF is a summary of concerns within the West Hills community primarily focused on storm water management. It was prepared by the West Hills Community Association for the benefit of the members of the MPC during their deliberations prior to the April 12, 2018 hearing.

Preparation of materials and information contained within this document was completed prior to receiving Mr. Scott Davis email this past Friday, March 30, 2018 in which he informed me he was withdrawing his application and would not be developing the property. Knowing he has informed MPC staff that he will not withdraw until the April 12 hearing, we are submitting this document in advance to have it be part of the public record should it be necessary.

On behalf of the 1,250+ West Hills families and the West Hills Community Association, thank you for your thoughtful consideration of the issues raised in this document.

Sincerely,

Leland C. Hume  
WHCA Ad Hoc Committee Chair



COMMUNITY ASSOCIATION

## The West Hills Community Association

# Summary Report of Engineering Study of the Storm Water Management on the Proposed Site of The Cove in West Hills

MPC Application: 1-SF-18-C\_1-I-18-UR

Consulting Engineering Firm:  
Geosyntec Consulting Engineers and Scientists  
Knoxville and Atlanta

Submitted to Knoxville-Knox County Metropolitan Planning  
Commission April 4, 2018

April 4, 2018

West Hills Community Association  
Ad Hoc Committee to address concerns of proposed development on Broome Road  
identified as The Cove in West Hills  
Committee Chair, Leland C, Hume

Knoxville-Knox County Metropolitan Planning Commission  
City County Building  
400 Main Street  
Knoxville, TN 379??

Re: 1-SF-18-C\_1-I-18-UR WHCA Executive Summary

Members of the Commission:

To benefit members of the commission, the executive summary below precedes the extensive storm water management engineering documentation that follows commissioned by WHCA and the families of West Hills following your postponement of the hearing for the above referenced application in February of this year.

Since first learning about this proposed development and the desire to establish 45 lots, two 26' roadways, two 100' diameter cul de sacs, and a storm water retention reservoir, the West Hills community has been alarmed with the scope and impact of such a large development on such a relatively small and challenging hillside site such as this property on Broome Road.

WHCA and the community in general do not oppose this property being developed. The owner, Wanda Moody and her family have always been held in the highest esteem by those who know the family from a wide range of perspectives be they personal or professional.

Regrettably, there have been accusations by the developer that unidentified individuals have made disparaging remarks and personal attacks aimed at both him and Ms. Moody and her family. I have expressed my deep disappointment if this happened, and further wish to use this opportunity to say I have never witnessed any such confrontation and can say unequivocally that this ad hoc committee has behaved with the highest ethical and professional standards and remained focused on factually based, rational, quantitative concerns such as those listed below.

The community was never approached by the developer to seek a dialogue nor to inform the community about the details of the project or even how safeguards would be implemented to protect adjoining properties and homeowners downstream that have historically had to deal with flooding within the notorious Ten Mile Creek watershed.

To address our concerns the following five general questions/concerns regarding only the storm water management and none of the other major concerns such as traffic impact, preservation of old-growth trees, privacy buffers for adjoining properties, light pollution from street lights, etc. are included.

**1. Flooding and sedimentation issues are already prevalent in Ten Mile Creek. These issues need to be addressed prior to Concept Plan approval.**

**2. The existing stormwater infrastructure appears to be inadequate for additional development and a preliminary engineering evaluation should be done before Concept Plan approval.**

**3. The Concept Plan shows steep slopes adjacent to existing residential properties. A geotechnical evaluation should be done before approval.**

**4. With flooding problems already existing, a preliminary engineering evaluation of retention basin size and design should be performed before Concept Plan approval.**

**5. The property currently is forested with many large trees. A plan for retaining a buffer zone of existing trees between the new development and existing residences should be a condition for Concept Plan approval.**

Additional questions were sent to Mr. Davis on March 26, 2018 and you were copied as well. This correspondence should be in your files for your reference.

The following pages have been prepared by the WHCA ad hoc committee mentioned earlier. The contents contain pertinent information related only to the issues related to storm water management gathered by our consulting engineers as well as twenty-three points of concern raised by WHCA and the community. Any critical engineering data used to prepare this document has been intentionally omitted to protect the financial commitment of WHCA and donations made by numerous West Hills families. We believe any engineering services used to develop plans for use of the site is the responsibility of those developing the property.

We hope this reaches you in a timely manner that allows you an opportunity to thoroughly review and comprehend the issues and concerns of the West Hills community.

Respectfully yours,

Leland C. Hume

## Overview

The WHCA is associated with the West Hills neighborhood in Knoxville, Tennessee, which is located southeast of a 12.4-acre parcel of land that is currently under application with the Knoxville-Knox County Metropolitan Planning Commission (MPC) for a proposed 45-lot subdivision referred to as The Cove in West Hills (The Cove).

The parcel is primarily vegetated with trees and does not contain paved or impervious areas. Topography changes by approximately 80 feet in elevation from the high point in the northeastern corner of the parcel to the low point at the southern boundary of the parcel. Both The Cove and the West Hills neighborhood are **located in the Ten Mile Creek Watershed**.

Ten Mile Creek is classified as an impaired waterbody for sedimentation/siltation, alteration of in stream-side or littoral vegetation, and E. coli by the Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources.

Due to the considerable topography mentioned earlier, surface water tends to flow from north to south across the parcel and continues to drain south onto adjacent parcels in the West Hills neighborhood.

The typical process for submitting plans and plats for a new development is outlined in **Article 2** of the **Knoxville-Knox County Subdivision Regulations**. In general, a developer must: (i) submit a Concept Plan for approval by the MPC and subject to a public hearing process; and (ii) submit a Design Plan providing substantial engineering details conforming with state and local standards for approval by multiple reviewing agencies. Once the Design Plan is approved: (i) the Stormwater Engineering Section of the City Engineering Department will issue a site development permit; and (ii) the developer must submit a final plat for approval by multiple reviewing agencies. Acceptance of the final plat is contingent upon conformance with the approved Design Plan, as determined by the reviewing agencies.

The proposed development at The Cove is currently in the Concept Planning stage; a Concept Plan was filed with the MPC on 28 November 2017 and a Subdivision Report for Concept/Use on Review was published on 4 January 2018 (MPC file # 1-SF-18-C). During MPC hearings held on 11 January 2018 and 8 February 2018, the MPC postponed action regarding the Concept Plan for The Cove for 30 days and 60 days, respectively.

Following the 60-day postponement granted by the MPC on 8 February 2018, the WHCA requested engineering support services to facilitate their discussions with the developer prior to the next MPC hearing, which will be held on 12 April 2018.

Geosyntec reviewed the following two guidance documents for pertinent regulations, requirements, and guidelines related to stormwater management and design considerations for new developments:

- **City of Knoxville Land Development Manual** (Stormwater Engineering Division, Revision 51 published January 2018). Reviewed sections of the manual include Section 2 and Sections 7 through 10, Appendix B (Tree Protection Ordinance and Stormwater and Street Ordinance only), and Appendix C (policies 05, 06, 10, and 27 only); and
- **Knoxville-Knox County Subdivision Regulations** (adopted July 8, 1971; amended through February 8, 2018). Reviewed sections of the regulations include Articles 2 and 3.

The following pages present a brief summary and points to be considered related to the applicable chapter, subchapter or section of each document, that the WHCA is prepared to use in discussions with the developer of The Cove. The developer's responses to these talking points will help the WHCA gain a better understanding of how the developer plans to prepare a Design Plan for The Cove that is protective of adjacent properties and the surrounding watershed.

## Summary of Relevant Guidelines and WHCA Points of Concern

### **GUIDANCE DOCUMENT: CITY OF KNOXVILLE LAND DEVELOPMENT MANUAL**

Key: Point Number, Applicable Ordinance Sub-Section Relevant Language, and Points for Consideration

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#### **APPENDIX B, “STORMWATER AND STREET ORDINANCE OF THE CITY OF KNOXVILLE” -**

The Stormwater and Street Ordinance (Chapter 22.5 of the City of Knoxville Code of Ordinances) lists the stormwater management regulations which apply to site development within the city, both during construction and upon facility completion.

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**1 22.5-21(c)** “All stormwater systems shall be designed to have no additional adverse impact on upstream or adjacent property in the 50- year frequency storm, unless an adequate permanent drainage easement is obtained.”

**FOR CONSIDERATION:** The stormwater system at The Cove (i.e., the series of roadside curbs and gutters, curb inlets, swales, catch basins, pipes, retention basins, and other conveyances) must be sufficiently designed so as not to adversely impact upstream or adjacent properties, including roadways. The WHCA requests that the developer provide a conceptual plan/analysis for how he intends to meet the requirements for attenuating upstream flooding impacts from the 50-year storm event.

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**2 22.5-21(g); 22.5-23(f); 22.5-27(e); 22.5-32(e)** “When existing or documented flooding problems are present, the Director [of the City of Knoxville Department of Engineering] has authority to condition the approval of a permit upon the compliance with additional requirements, including but not limited to detention, conveyance facilities, or other stormwater management solutions required to reduce the adverse impact of the proposed development on public right-of-way, other properties, or on the subject development.”

**FOR CONSIDERATION:** The WHCA has compiled documentation of flooding in the West Hills neighborhood (e.g., emails, photographs, or other written requests made to the City or County) to provide evidence of existing sensitivity to increases in surface water flows and historical flooding.

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**3 22.5-23(a)(3); 22.5-23(g)** Stormwater basins are required for residential developments that disturb five (5) or more acres of land or consist of five (5) or more lots. “Stormwater basins located in residential subdivisions must be located on two or more buildable lots or in a common area with a legally established property owners’ organization with responsibility for maintenance and repair of the stormwater basin.”

**FOR CONSIDERATION:** The Concept Plan shows a “Common Area/Detention Area” near the low point of the site. The WHCA requests confirmation from the developer that a stormwater basin is intended for this space. If so, the developer must be able to design the stormwater basin in accordance with the guidelines presented herein.

To better understand the logistics of how The Cove will be developed in terms of building homes and establishing a property owners' organization, the WHCA wishes to discuss the following items with the developer:

Will homes be built in phases? If so, will the number of residents living at The Cove during earlier phases of home building construction be sufficient to fund and/or organize the property owner's organization?

It will be in the best interest of the WHCA if The Cove has a proactive property owners' organization that will take quickly responsibility for the long-term upkeep of the stormwater basin after the basin is complete.

Preliminary approximate required sizes for a stormwater basin at The Cove are provided in later in this report.

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**4 22.5-24** Erosion prevention and sediment controls (e.g., silt fence, sediment basins, vegetation establishment, etc.) must be installed prior to commencing site development activities "in order to protect, maintain, and enhance the immediate and long-term health, safety, and general welfare of the citizens of the City" by (i) limiting the deposition of sediment in streams and other water bodies and (ii) promoting pollutant removal from stormwater runoff.

**FOR CONSIDERATION:** The developer will be required to properly control sediment onsite during construction of The Cove.

For example, vegetation such as trees, shrubs and vines are recognized by the City of Knoxville as a best management practice (BMP) for sediment and erosion control as they provide long-term stabilization of soil. The WHCA wishes to discuss the site conditions with the developer to understand the following items:

- What erosion and sediment control measures does the developer intends to implement during construction activities at The Cove?
- Is the developer considering retaining vegetation, particularly along the perimeter of the site, to provide sediment and erosion control?
- If not, is the developer considering installing a vegetated filter strip/buffer to: (i) meet sediment and erosion control requirements mandated by the City and (ii) protect downstream properties and water bodies from sediment loads associated with construction activities at The Cove?

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**5 22.5-27(h)** An easement is required for proposed stormwater facilities. Additionally, there should be sufficient access from public streets to the stormwater facility.

**FOR CONSIDERATION:** Given that the developer has indicated he is not willing to reduce the number of lots presented in the Concept Plan, the WHCA asks the developer if he has accounted for stormwater facility easements that will be required at The Cove, as it may represent a need for additional space and/or engineering design.

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**6 22.5-31(a), (b), and (c)** (a) Calculated peak flow rates of stormwater runoff resulting from the 1-year, 2-year, 5-year, 10-year, 25-year, and 100-year frequency storm should not be greater after site development has occurred as compared to pre-development peak flow rates (i.e., pre-development peak flow should “match” post-development peak flow through the use of engineering controls, including stormwater retention basins).

(b) Stormwater retention facilities must meet minimum design requirements for bottom slopes (two percent), side slopes (3:1 H:V), and freeboard (one foot from the highest water surface elevation for the required design storm).

(c) Design Plans must include sufficient supporting engineering design calculations to show the facility will operate as required.

**FOR CONSIDERATION:** The WHCA requests preliminary calculations from the developer that demonstrate that the design in the Concept Plan will meet these requirements.

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**7 22.5-31(d)** “Discharge from the stormwater basins shall be routed to a ditch, channel, or stormwater facility of adequate capacity.” Further, the receiving (i.e., “downstream”) stormwater infrastructure—which may consist of a roadside swale, curb and gutter system, manhole, storm drain, pipe, channel, stream, etc. - must have the capacity to safely convey the 10-year, 24-hour storm event.

**FOR CONSIDERATION:** To better understand where the water from the onsite stormwater basin will be routed (e.g., how and where will stormwater collected at The Cove flow downhill?), the WHCA asks the developer what plan is in place to study and/or mitigate potential impacts to downstream infrastructure.

Based on visual observations, the nearest stormwater infrastructure downstream of The Cove appears to be

a catch basin at the dead-end of Lennox Avenue. Is the existing downstream stormwater infrastructure capable of conveying the flows from the stormwater basin at The Cove?

If not, what type of new stormwater conveyance infrastructure will be built?

Is it feasible to construct additional stormwater conveyance infrastructure given the nature and location of existing homes, buildings, trees, roads, or other structures that could be impacted?

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**8 22.5-32(d)** “Stormwater retention is required for site developments that meet the requirements for stormwater attenuation and are located in one of the following critical watersheds:  
(1) Ten Mile Creek ...”

**FOR CONSIDERATION:** The WHCA requests verification that the developer is planning to use a retention basin for onsite stormwater management, given that the site is located within the Ten Mile Creek Watershed.



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## Appendix B, “Horticulture (Tree Protection) Ordinance of the City of Knoxville” -

The Tree Protection Ordinance (Chapter 14 of the City of Knoxville Code of Ordinances) provides requirements for the preservation and protection of trees within the city.

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**9 14-33** The developer is required to submit a site plan for approval by the city horticulture list showing which trees will be retained or planted and the type of species for said trees.

**FOR CONSIDERATION:** The WHCA asks the developer if this type of information has been gathered and what the proposed plan is for retaining versus removing trees.

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**10 14-34; 14-36** “Where a building permit for new construction or subdivision approval is required, a minimum of six (6) trees per acre shall be retained on the site unless because of cut or fill work such trees cannot be saved.”

“Where trees cannot be retained pursuant to this article, or do not exist on the site, they shall be provided, within twelve (12) months of construction completion, at the rate of eight (8) trees per acres, with at least onehalf of the required number being species capable of attaining a height of fifty (50) feet or more at maturity.”

**FOR CONSIDERATION:** Given that the area proposed for development of The Cove is highly vegetated (predominantly with trees), the WHCA should further discuss the developer’s plan for tree removal, retention, and replanting given that planting new trees may represent additional space and/or landscape design.

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## Appendix C, “Stormwater Engineering Division Policies”

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**11 Policy 05 – Easements for Stormwater Management Facilities** Easement boundaries for retention basins cannot be less than 20 feet x 20 feet and must include at least 5 feet outside the top of cut slope and at least 5 feet outside the top of fill slope.

Easement boundaries should be accounted for in addition to the required footprint of the retention basin as determined through the engineering design process.

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**12 Policy 10—Retaining Walls** As described in Policy 10, additional design requirements pertain to retaining walls greater than four (4) feet in height. These requirements must be met in order to obtain a site development permit for constructing the retaining wall. Further, if the retaining wall is four (4) feet or taller and has the potential to affect the public right-of-way, a geotechnical report and certification from a geotechnical engineer is required as part of the design process.

**FOR CONSIDERATION:** The WHCA asks the developer if he believes retaining walls will be needed, given the considerable change in topography at the site (approximately 80 feet), and if so, his plan to conduct the necessary geotechnical analyses.

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### **13 Policy 27 –Qualified Local Program Construction General Permit, Sections 3.5.1, and 3.5.3**

Disturbance of one (1) or more acres of soil is not permitted without first obtaining a City of Knoxville Qualified Local Program Construction General Permit (CGP). The permit authorizes stormwater discharges associated with construction activities. An owner or developer of a project is a primary permittee and as such, is required to comply with the requirements of this policy. A Stormwater Pollution Prevention Plan (SWPPP) must be submitted to describe the stormwater runoff and erosion prevention/sediment controls to be implemented during construction activities to ensure compliance with permit requirements. Relevant requirements of the SWPPP are as follows:

“Each SWPPP shall provide a description of ... the intended sequence of activities which disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation).”

“Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed more than 14 days prior to grading or earth moving activities unless the area is subsequently temporarily or permanently stabilized.:

“Clearing and grubbing must be held to a minimum necessary for grading and equipment operation. Existing vegetation at the site should be preserved to the maximum extent practicable.”

“Construction phasing is recommended on all projects regardless of size as an effective practice for minimizing erosion and limiting sedimentation.”

**FOR CONSIDERATION:** The WHCA asks the developer what his plan is for sequencing and commencing soil disturbing activities, noting that violations of this provision and all other provisions provided in the Stormwater and Street Ordinance are subject to the penalties described in Section 22.5-8.

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### **14 Policy 27—Qualified Local Program Construction General Permit, Section 3.5.3.2**

“For an on-site outfall that receives drainage from **5 or more acres**, a minimum sediment basin volume that will provide treatment for a calculated volume of runoff from a 5-year, 24-hour storm and runoff from each acre drained, or equivalent control measures as specified in the Tennessee Erosion and Sediment Control Handbook, shall be provided until final stabilization of the site.”

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## **CHAPTER 7, “LARGE RESIDENTIAL AND COMMERCIAL DEVELOPMENT” -**

This chapter provides requirements for “large residential and commercial developments” which are defined as developments disturbing 10,000 square feet or more.

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**15 7.3** The complexity and level of detail required for a site development permit is influenced by several items including, but not limited to:

- “Safety concerns (slopes, excavations, retaining walls, traffic flow, potential flooding).
- Potential for the project to impact the neighboring properties or public right-of-way during construction.
- Potential for the project to impact drainage, flooding levels, or water quality on neighboring properties or public right-of-way.”

**FOR CONSIDERATION:** The listed items are of concern to the WHCA related to the development at The Cove; therefore, the WHCA requests this information from the developer and/or that MPC request these items be addressed prior to issuing a site development permit.

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## **CHAPTER 9, “STORMWATER DESIGN”**

This chapter describes the computational methods to be used for calculating peak flows. This information is used to size stormwater conveyances (e.g., culverts, open channels, curbs and gutters, etc.) or to generate hydrographs for detention routing.

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**16 9.8** “Calculations must be submitted that show the capacity of the receiving stormwater channel to handle the 2-year and 10-year design storms. ... The first reason for analysis of the downstream system is to ensure that known flooding problems are not exacerbated.”

**FOR CONSIDERATION:** As mentioned above under Section 22.5-31(d) of the Stormwater and Street Ordinance, downstream infrastructure must be capable of safely conveying flows generated by the 2-year and 10-year design storms. The WHCA asks the developer what his plan is to mitigate impacts on downstream flooding will be, given that known flooding problems exist downstream of the site (see “FOR CONSIDERATION:” point #2).

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## **CHAPTER 10, “STORMWATER DETENTION AND QUALITY” -**

This chapter largely reiterates the requirements for stormwater detention design which are provided in the Stormwater and Streets Ordinance.

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**17 10.1** “All site development projects exceeding the thresholds listed in Section 22.5-23 [of the Stormwater and Street Ordinance] must incorporate stormwater detention and first flush treatment as part of the design.... Typical detention BMPs [(best management practices)] are dry detention basins, wet detention basins, retention basins and constructed wetlands.”

A stormwater retention basin will be required for stormwater management at The Cove (per Section 22.5-32(d) of the Stormwater and Street Ordinance) which must meet the design requirements for

detention BMPs described in Chapter 10 of the Land Development Manual as well as Section 22.5-23 of the Stormwater and Street Ordinance.

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**18 10.2** “All stormwater detention structures must attenuate the postdevelopment peak flow rates from the 1-year, 2-year, 5-year, 10-year and 100-year NRCS 24-hour design storms to discharge at or below predevelopment peak flow rates.”

**FOR CONSIDERATION:** The WHCA requests preliminary calculations from the developer that demonstrate that the design in the Concept Plan will meet these requirements.

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**19 10.3** The first flush (i.e., the first ½-inch of stormwater runoff from the entire developed site) must be contained onsite within the stormwater detention structure and slowly released over a minimum period of 24 hours.

**FOR CONSIDERATION:** It is required that the first ½-inch of runoff from a development is captured and released slowly to allow settling and filtration of pollutants (e.g., dust, oils and automotive fluids, trash, debris, brake dust, deicing sand/salt, etc.), thereby mitigating negative impacts to water quality and aquatic life of Ten Mile Creek. The stormwater retention basin at The Cove will be required to meet design standards for first flush treatment. The WHCA requests preliminary calculations from the developer that demonstrate that the design in the Concept Plan will meet these requirements.

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**20 10.5** A facility easement is required for a stormwater detention basin. The facility easement “encompasses the entire stormwater detention basin or stormwater quality structure. Minimum size is 20 ft x 20 ft.”

**FOR CONSIDERATION:** The WHCA asks the developer if he has considered the type and number of easements—including a facility easement for the stormwater basin—that will be submitted as part of the site development plan for The Cove, as this may represent a need for additional space and/or engineering design (see “FOR CONSIDERATION:” point #11).

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## **ARTICLE 2, “ADMINISTRATION, PROCEDURES AND SPECIFICATIONS FOR SUBMISSION OF PLANS AND PLATS”**

This section describes the procedures that a developer must follow to submit a subdivision design plan and associated plat to the MPC. It also outlines the requirements and approval process for a subdivision Concept Plan.

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**21 Part 2.07** The Concept Plan submitted by the developer should provide: “sufficient information to determine the practicality, suitability, and conformance with regulations of the proposed concept.”

**FOR CONSIDERATION:** The WHCA will use this statement to justify its inquiries to the developer regarding the level of detail—or lack thereof—presented in the Concept Plan for The Cove.

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**22 Part 2.07** “The Concept Plan shall consist of a scaled drawing of the proposed subdivision, showing the proposed roadway and lot layout, and a general drainage plan.” Further, the Concept Plan must include the following elements:

- Location Map;
- Site Topography;
- Boundary, existing and proposed roads;
- Physical characteristics of the site (e.g. sinkholes, depressions, woods, natural waterways, etc.);
- Existing features (e.g., structures and utilities);
- Drawings that show (i) existing drainageways and the probable location of major drainage structures (i.e., stormwater basins); (ii) road profiles; (iii) a list of required and proposed improvements; and (iv) a statement indicated the availability of public utilities.

**FOR CONSIDERATION:** Based on our review of the Concept Plan for The Cove, it does not appear that the following items are depicted:

- A general drainage plan (a general location referred to as “Detention Area/Common Area is shown but it is not confirmed that this location will be used for a sediment basin/stormwater retention pond, and additional drainage information, such as general flow patterns of stormwater runoff and the location of stormwater conveyances planned for the site, are not shown);
- A description of the physical characteristics of the site;
- Locations of existing structures and utilities;
- Existing drainageways;
- A list of required and proposed improvements.

The WHCA requests that the developer provide information to satisfy the requirements above.

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## **ARTICLE 3, “DESIGN STANDARDS”**

This section describes the minimum standards for the design of subdivisions to promote sound development practices within the County.

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**23 Part 3.02** Lots must be well drained and should not be excessively steep.

**FOR CONSIDERATION:** The WHCA wishes to better understand if the developer has considered the ability of lots to be well drained given the topography of the land to be used for The Cove. Has the amount of cut/fill been considered for appropriate grading such that water will be shed from individual lots and such that lots will not be excessively steep?

## Preliminary Engineering Calculations

Preliminary engineering calculations were prepared for the WHCA to support the points of concern (# 6, 14, and 18) provided above in this report for discussions with the MPC and the developer of The Cove. The preliminary calculations performed support design criteria related to:

(i) pre-development discharge rates from design storm events from The Cove; and (ii) approximate size of a sediment basin for use during construction.

### Design Criteria

The preliminary calculations were performed to comply with design criteria and methodologies presented in: (i) the **Knox County, Tennessee Stormwater Management Manual Volume 2** (“Knox County Stormwater Manual”) (Amec, 2008); (ii) the **Tennessee Erosion and Sediment Control (TNESC) Handbook** (4th edition, 2012); and (iii) the **Stormwater and Street Ordinance of the City of Knoxville** (Ordinance), provided in **Appendix B of the Land Development Manual**.

Specifically, design criteria were evaluated as follows:

- **Pre- vs. Post-Development Flow Rates and Volumes:** Part 22.5-31(a) of the Stormwater and Street Ordinance (Talking Point #6) and Chapter 10.2 of the Land Development Manual (Talking Point #18) requires new development to include a stormwater management system such that the post-development runoff rate from the site is reduced to the pre-development levels runoff rates for the 1-year, 2-year, 5-year, 10-year, 25-year, and 100-year storm events. The storm event is defined based on the probability of the rainfall depth occurring in a given year for a defined storm duration, where the “year” is the annual chance of exceedance (i.e., the 2-year storm represents a 1 in 2 chance of occurring in a given year; the 10-year storm represents a 1 in 10 chance of occurring in a given year).

- **Sediment Basin Sizing:** Section 3.5.3.3 of Stormwater Engineering Division Policy 27, Qualified Local Program Construction General Permit of the Land Development Manual (Talking Point #14) requires that, at a minimum, the sediment basin will provide treatment for a calculated volume of runoff from a 5-year, 24-hour storm. Chapter 7 of the TNESC Handbook defines sediment basins as “temporary engineered structures designed to capture sediment from construction site stormwater runoff prior to being discharged” and are typically constructed through excavation and/or construction of a berm. Chapter 7 of the TNESC Handbook (TDEC, 2012) also includes additional sediment basin sizing requirements including:

- o **Sediment Treatment Area Volume** - The sediment basin treatment area must provide a total volume of 134 cubic yards (or approximately 3,600 cubic feet) per acre of drainage, below the crest of the principal spillway (i.e., the primary outlet for storm flows).

- o **Surface Area** - The surface area of the pond, as measured at the crest of the principal spillway, is required to be at least 1% of the peak inflow for the sediment basin design storm, where the area is measured in acres and the peak inflow for the 5-year, 24-hour storm event is calculated in cubic feet per second (cfs).

- o **Spillways** - The 5-year, 24-hour storm event must be conveyed through a combination of the principal and emergency spillways. In instances where the construction of an emergency spillway is infeasible, the principal spillway should be able to convey the 25-year, 24-hour storm. The size of the principal spillway is to be a minimum of 18 inches in diameter. If the developer selects to construct both a principal and emergency spillway, which is more frequently done if the developer plans to convert the basin to a permanent retention pond after construction, the freeboard requirements shall be that there is: (i) a minimum of one foot from the 25-year, 24-hour peak water surface elevation to the top of the embankment; and

- (ii) a minimum of one foot between the crest of the principal spillway and crest of the emergency spillway. If the developer decides not to construct an emergency spillway, the 25-year, 24-hour peak water surface elevation shall be: (i) two feet below the top of the embankment; and (ii) the crest of the principal spillway shall be three feet below the top of embankment.

- o **Length to Width Ratio** - The basin should be shaped to provide a length to width ratio of 4 to 1, where the length is considered to be the length of the flow path as measured from each discharge location into the basin (e.g., channels, pipes) to the outlet (e.g., principal spillway). The purpose of this requirement is to allow for a longer detention time (i.e., amount of time the sediment is in the basin) to promote settling and trapping of the sediment. In instances where modifying the pond geometry is not feasible, the construction of baffles within the basin, which increase the flow length and facilitate settlement, is permitted.

## Design Parameters

Preliminary engineering calculations of runoff rate and volumes were generally performed using hydrology and hydraulic procedures based on Soil Conservation Service (SCS) Technical Release 55 (TR-55), Manning's equation, and other recognized engineering procedures as encoded in the stormwater engineering software "HydroCADTM" [SCS TR-55, 1986; HydroCAD, 2015]. This method utilizes estimates of drainage area, land cover, soil type, and precipitation amounts to evaluate a runoff rate and/or volume. The following design input parameters were obtained, assumed, or selected based on available resources, documents, and professional experience, to perform preliminary runoff rate and volume calculations.

- **Drainage Area** - The Concept Plan (MPC File # SF-18-C, 2018) indicates that the site is 12.42 acres. It was assumed that the entire site area would (i) be disturbed simultaneously (rather than in phases), and (ii) ultimately drain to the natural low spot of the site labeled as "Common Area - Detention Area" on the south side of the development, which is the assumed location of the sediment basin. Therefore, the drainage area for these preliminary calculations was 12.42 acres. (It is noted that if the developer elects to construct the development in phases, the size of the sediment basin may be able to be reduced.)

- **Land Cover, Soil Type, and Time of Concentration:**

- o Based on aerial imagery and the National Resource Conservation Service (NRCS) Web Soil Survey (2018), the existing site was assumed to consist of woods in good condition and have hydrologic soil group (HSG) type B soils (i.e., soils with a moderately low runoff potential). The time of concentration (i.e. time required for runoff to travel from the most hydrologically distant point of the drainage area to the low point prior to flow being channelized) and geometry of the natural drainage channel onsite were based on existing grades provided as part of the Concept Plan.

- o During construction, The Cove was assumed to consist of compacted bare earth and have HSG type D soils (i.e., soils with low infiltration and high runoff potential). As limited topographic and stormwater management details have been provided by the developer, the time of concentration was assumed to be 10 minutes during construction.

- **Precipitation Depths** - Design storm events were obtained from estimates published by the National Oceanic and Atmospheric Administration (2018), as required by the Knox County Stormwater Manual. These estimates are presented in Table 2.

## RESULTS AND EVALUATION

The sediment basin surface area, sediment storage volume, stormwater runoff volume, and length to flow width ratios that are to be considered in the design of a sediment basin were calculated as follows:

- **Surface Area** - Based on the Concept Plan, it is assumed the **bottom of the basin will be approximately 440 feet by 60 feet** (26,000 square feet or 0.6 acres). The **sediment treatment surface** area, as calculated at the top of the principal spillway would be slightly larger than the bottom area and was calculated to be **450 feet by 70 feet** (31,500 sf or 0.72 acres). This meets the required minimum surface area of 0.56 acres, which was calculated by dividing the 5-year, 24-hour storm event inflow of 56 cfs by 100 (i.e., 1% of the peak inflow for the 5-year, 24-hour storm event).



- **Sediment Storage Volume** (Acres Drained) - The sediment storage volume was calculated to be **1,664 cubic yards or 44,935 cubic feet** by multiplying the site's drainage area (12.42 acres) by the required sediment storage volume of 134 cubic yards per acre. Thus, assuming the sediment treatment area has the dimensions described above (450 feet by 70 feet), in order to provide adequate sediment treatment storage capacity, the crest (or inlet) of the principal spillway would need to be at least 1.7 feet from the bottom of the sediment basin to provide adequate storage for sediment based on the assumed surface area of the basin.

- **5-year, 24-hour Storm Runoff Volume** - The runoff volume for the 5-year, 24-hour storm event during construction was calculated to be 144,140 cubic feet based on hydraulic modeling completed in HydroCADTM. It is unclear from Stormwater Engineering Division Policy 27 how the treatment volume is calculated. If it is assumed the treatment volume is measured from the bottom of the sediment basin and flow is not discharging out of the basin during the 5-year, 24-hour storm event, the treatment volume would be met at a depth of 3.7 feet.

- **Length to Width Ratio** - The Concept Plan shows two stormwater pipes discharging onto the northwestern and northeastern ends of the basin. **Based on the plan, it does not appear a 4 to 1 length width ratio could be achieved as flow paths would short-circuit the basin.** The developer may modify the plans as their design progresses by constructing baffles, moving the discharge locations, or modifying the shape of the sediment basin.

- **Sediment Basin Sizing** -The developer of The Cove has several ways in which they may design a sediment basin based on the selection of basin geometry (width, length, depth, slopes), principal and emergency spillway characteristics (type, sizes, material, invert elevations), selection of upstream stormwater management features, and the discharge location. To provide WHCA with an approximate size of the sediment basin, several assumptions were required as the Concept Plan provided limited details. To approximate the sediment basin size, the assumptions described above for soil types, land use, time of concentrations, basin bottom footprint (440 feet by 60 feet), and side slopes were kept, and it was assumed an 18-inch corrugated metal principal spillway and culvert would be used to convey design storms without the use of an emergency spillway. Based on the preliminary analysis, an 18-inch principal spillway and culvert would be able to convey the calculated 25-year, 24-hour peak discharge of 12 cfs with the water surface reaching a peak depth of approximately 4 feet above the bottom of the sediment basin. **Presuming the developer does not construct an emergency spillway, the total height of the basin (as measured from the top of the pond embankment to bottom of the basin) would need to be 6 feet to achieve freeboard requirements** (i.e., two feet above the peak water surface elevation for the 25-year, 24-hour storm event) outlined in the TNESC Handbook. If an emergency spillway is selected for use by the developer, the height of the basin is not anticipated to change significantly.

**Based on the Concept Plan for The Cove and the calculations presented above, approximately one acre will be required for use as a sediment basin during construction.** It is important to note that this is an approximation of the sediment basin surface area based on the assumptions outlined above, and that other configurations of the sediment basin are possible. Although the area on the Concept Plan that is assumed to be used for the sediment basin (labeled as the "Common Area/Detention Area") is large enough to accommodate a 1-acre sediment basin, **this does not mean that a sediment basin will be easily constructed in that space.** The developer will need to make additional considerations beyond space requirements regarding the constructability of a basin within the topographic constraints of the site.

Sediment basins are commonly modified to become permanent detention or retention ponds after completion of construction. In the case of The Cove, which is located within the Ten Mile Creek Watershed, a stormwater retention pond will be required (per Section 22.5-32 of the Stormwater and Street Ordinance of the City of Knoxville). The size of a retention pond, which would be used as a permanent stormwater control device following completion of development activities, may differ from the size of the sediment basin (the size estimates of which are described herein).



Nonetheless, the developer must ensure that both the sediment basin and the retention basin meet County and City design requirements including, but not limited to, the items outlined in Points of Concern above.

## SUMMARY AND CONCLUSIONS

The points for consideration provided above, supplemented with results from engineering calculations associated with sediment basin and stormwater pond design requirements, are intended for use by the WHCA to gain a better understanding how the developer plans to evaluate and mitigate for potential future risks that The Cove may pose to the WHCA and/or Ten Mile Creek watershed.

Key potential areas of concern, and the related points of concern items, are summarized as follows:

- **Impacts due to clearing of vegetation and creation of impervious surfaces (i.e., rooftops, roadways, driveways, sidewalks).** This has the potential to exacerbate flooding if the associated increases in surface water runoff are not properly managed. It will be important for the developer to provide an adequately sized sediment basin to control offsite migration of eroded sediment during construction of The Cove, and to properly convert the sediment basin to a stormwater retention pond following completion of development activities. Further, it will be important to evaluate the ability of downstream stormwater conveyance infrastructure to safely convey the additional inputs of surface water runoff generated from The Cove. (Talking Points # 2, 4 through 11, and 13 through 22)

- **Impacts to adjacent properties and the public right-of-way in the event of stormwater retention pond failure.** Due to the considerable change in topography (i.e., approximately 80 feet) of the land proposed for The Cove as well as the abutment of the property with other existing residential lots, it is possible that the height of a retaining wall or berm may exceed typical thresholds that trigger geotechnical analysis per Stormwater Engineering Division Policy 10 (for retaining walls that exceed 4 feet in height). (Talking Points # 1, 2, 7, 8, 12, 15, 16 through 19, 21, and 22)

- **Long-term maintenance of permanent stormwater control devices (e.g., stormwater retention basin) by a property owners' organization.** It will be important to understand the ability of a property owners' organization to become established at The Cove, and whether there will be a contingency mechanism for providing adequate oversight and maintenance of the stormwater retention pond over time. (Talking Points # 3 and 23)

### **Overall, the developer must abide by the requirements set forth by the City of Knoxville and Knox County prior to obtaining approval of the Concept Plan, and henceforth the Design Plan and final plat.**

The WHCA should further discuss (with the MPC and the developer) the information and details that are lacking in the Concept Plan, particularly items that (i) may require additional space to be set aside for the purpose of easements, access to stormwater management facilities, or retention of trees, and therefore will not be available for lot development; or (ii) items that may require additional engineering or landscape design, and therefore may become more costly to the developer to implement. Ultimately, it will be up to several principal agencies and departments (e.g., the MPC, Knox County Engineering Department, City of Knoxville Stormwater Engineering Division, and City of Knoxville Plans Review and Inspections Division) to provide final approval of the Design Plan and issuance of an accompanying site development permit for The Cove.

However, as part of the plan review process, the public—namely, the WHCA—has the ability to participate in public meetings and voice their comments, questions, and concerns. Communication between the WHCA, the developer, and the departments involved in the plan review process will be an important factor in pursuing a path that is not only mutually agreeable, but also protective of existing properties, property owners (i.e., the residents of West Hills), and the environment.