

**PLANNING COMMISSION REPORT**  
**Regular Agenda -Public Hearing Item**

PC Staff Report  
3/21/2016

**ITEM NO. 5B: PRELIMINARY DEVELOPMENT PLAN FOR ALVAMAR; 1800, 1809, 2021 CROSSGATE DR (SLD)**

**PDP-16-00052:** Consider a Revised Preliminary Development Plan for Alvamar PD, Lots 1, 2a, 2b, and 3, located at 1800, 1809, & 2021 Crossgate Dr. Submitted by Paul Werner Architects, for Eagle 1968, LC, (contract purchaser). Alvamar Inc. is the property owner of record.

**STAFF RECOMMENDATION ON PRELIMINARY DEVELOPMENT PLAN:** Planning Staff recommends approval of PDP-16-00052 Alvamar Preliminary Development Plan (also serving as the Preliminary Plat) based upon the findings of fact presented in the body of the staff report and forwarding a recommendation for approval to the City Commission subject to the following conditions:

1. The applicant shall provide a revised Preliminary Development Plan that includes the following notes:
  - a. Applicant shall execute an agreement, at the time of recording the Final Plat, not to protest the formation of a benefit district, for a period of 20 years, for the installation of a traffic signal at the intersection of Bob Billings Parkway and the new street, if one is determined by the City Engineer to be needed in the future.
  - b. The development shall include the installation of traffic calming devices installed on Crossgate Drive north of Clinton Parkway to mitigate concerns of the neighbors. The timing of the installation shall be prior to issuance of a certificate of occupancy for any residential structure. The design of the improvements shall be coordinated with the Public Improvement Plans for the development.
  - c. Per section 20-1009 (b) of the Land Development Code, any use of artificial turf, located on any lot or as part of the golf course, shall require City Commission approval prior to installation.
  - d. The development shall adhere to the construction and phasing plan as approved by the City Commission.
2. The applicant shall provide a revised Preliminary Development plan that includes the following changes:
  - a. Revise the width of the 30' access/utility easement for the "private street segment" to include sidewalks on both sides of the private street.
  - b. Revise drawing to remove all references to "Sports Medicine".
  - c. Revise drawing to provide parking for the chapel use.
  - d. Revise parking table to show the required parking for the Banquet Facility based on the standard for *Event Center, Large* at 1 space per 4 occupancy. This correct parking requirement should show 103 spaces.
  - e. Revise the parking table per this staff report to show the total required off-street parking.

**Reason for Request:** This plan represents a change to the approved Preliminary Development Plan in excess of what could be considered as a Final Development Plan. This request includes a change in the type and number of dwellings proposed for Lot 2B, includes a new use shown on Lot 3 (Sports Medicine) and revisions to Lot 1 to renovate and expand the existing clubhouse.

In addition to this application, the applicant has submitted a rezoning request to allow office uses on Lot 3.

### **KEY POINTS**

- Proposed request modified Lot 1 to accommodate the retention of the existing clubhouse and includes building additions.
- Modifications to Lot 2 include a change in the building orientation, revised housing type to include duplex units and a building for independent, senior housing.
- A chapel use has been added to Lot 2
- Lot 3 includes revisions to the pool and fitness/wellness center and includes a new building labeled "Sports Medicine", this use is defined in the Land Development Code as *Health Care Office*.
  - This use also requires the property to be rezoned to allow for independent office uses that are not accessory to the golf course.
  - The previous plan included a banquet facility and 24 guest rooms on Lot 3. The revised plan relocates the banquet facility to Lot 1 as part of the renovated clubhouse and does not include a current proposal for the 24 guest rooms.
- A construction phasing plan has been developed per a condition of the previous Preliminary Development Plan and is attached.

### **FACTORS TO CONSIDER**

- Compliance with Development Code.
  - Adequacy of off-street parking.
  - Area, Height, Bulk and massing design.
  - Adequacy of open space.
- Conformance with *Horizon 2020*.

### **ASSOCIATED CASES/OTHER ACTION REQUIRED**

#### **Associated Cases**

- Z-14-00552; RM24-PD; Ordinances 9154.
- SUP-15-00389; *Active Recreation Uses* in RM24-PD district
- PP-14-00554; Alvamar One Preliminary Plat; application replaced by PDP-15-00247.
  - The preliminary plat elements are updated by this application.
- PDP-15-00247; Approved by the City Commission on Oct. 27, 2015 subject to conditions.
- Z-16-00026; RM24-PD to RMO-PD, concurrent with this application.
- PF-16-00051; Final Plat, administrative review concurrent with this application.

#### **Other Action Required**

- City Commission approval of Preliminary Development Plan and requested modifications.
- Submittal and approval of Final Development Plan.
- Recording of Final Development Plan and Final Plat with the Douglas County Register of Deeds.
- Submission and approval of public improvement plans.
- Building permits must be obtained prior to construction of structures.

### **PLANS AND STUDIES REQUIRED**

- *Traffic Study* – Revised Traffic Study was provided for project to reflect changes in use.
- *Downstream Sanitary Sewer Analysis* – The downstream sanitary sewer analysis and cover letter dated January 11, 2015 provided by Landplan Engineering was reviewed and accepted

for this project to satisfy the criteria required for the DSSA as outlined in Administrative Policy 76.

- *Drainage Study* – The drainage study dated 2-11-2016 meets the specified requirements and is approved. Any major changes to the submitted plan will require a revision to the drainage study.
- *Retail Market Study* – Not applicable to this request.

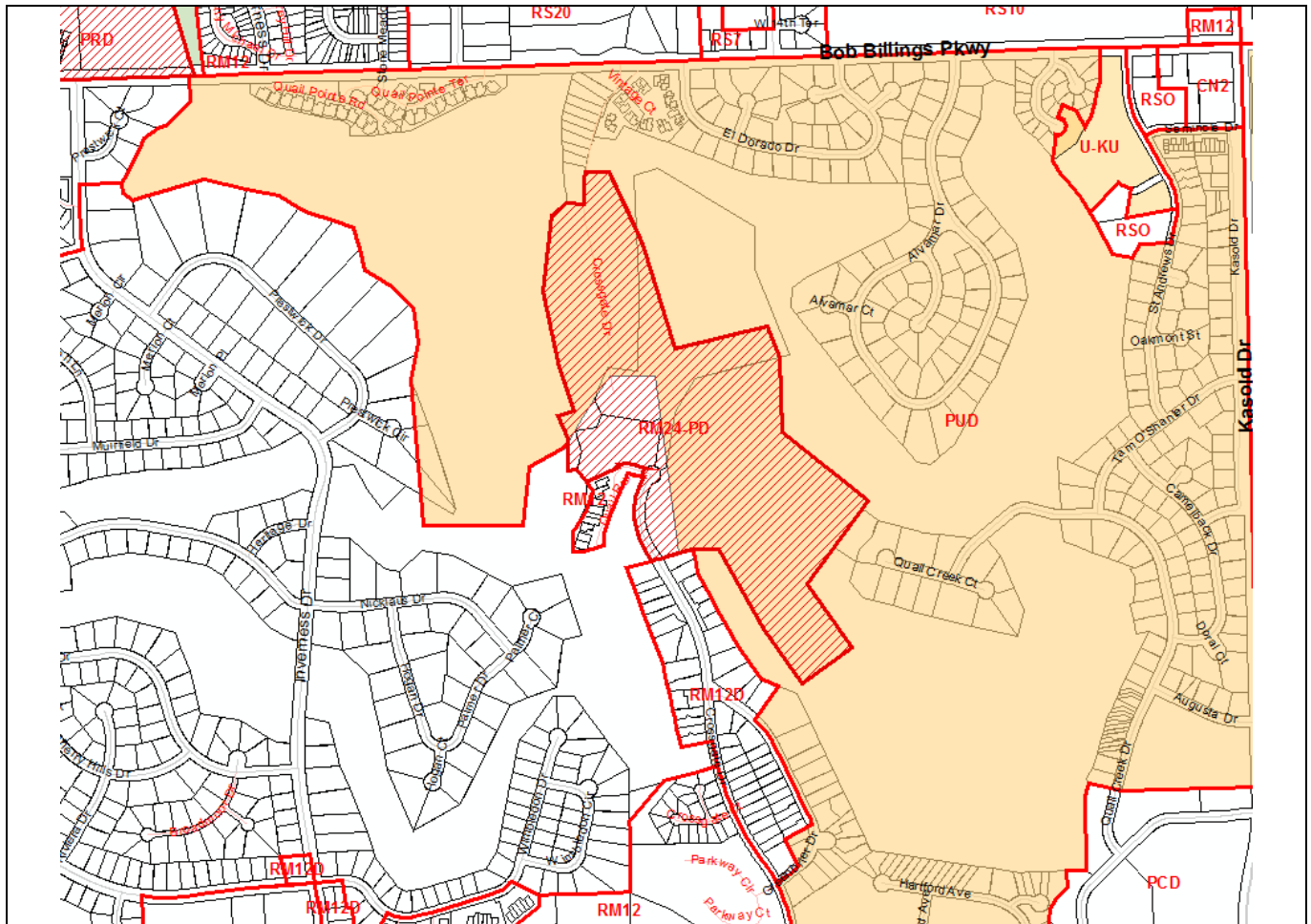
#### ATTACHMENTS

1. Approved Preliminary Development Plan.
2. Proposed revised Preliminary Development Plan.
3. Proposed residential building elevations
4. Proposed Final Plat – No action on the Final Plat is required by the Planning Commission.
5. Crossgate Drive on-street parking map.
6. Construction phasing plan
7. Parking Analysis provided by applicant
8. Drainage Study
9. Traffic Impact Study

#### PUBLIC COMMENT

- See list included in related rezoning request

GENERAL INFORMATION	
Current Zoning and Land Use:	RM24-PD (Multi-Dwelling Residential Planned Development Overlay) District. Existing golf course and amenities.
Surrounding Zoning and Land Use:	<p>Alvamar Planned Unit Development. Golf course and residential development to the north and east and west of proposed Lot 2 and east of lots 3 and 4.</p> <p>RM12 (Multi-Dwelling Residential) District to the south of the existing clubhouse, Quails Nest Neighborhood Association, existing duplex homes located along Quail Run Street (A private Street) and RS7 (Single-Dwelling Residential) District. Existing development consists of a portion of the Alvamar Golf Course located on the west side of Crossgate Drive.</p> <p>RM12D (Multi-Dwelling Residential Duplex) located along Crossgate Drive south of proposed Lot 3. Existing detached and attached housing.</p>



The application submitted for a Preliminary Development Plan assumes approval of the proposed RMO-PD request for Lot 3 as shown on the attached plan. The staff recommendation included in the rezoning report does not support approval of the proposed RMO-PD district and does not support the location of office uses that are not immediately accessory to the operation and management of the golf course and its accessory uses within this development.

The previous application included a discussion of the compliance of the project with the adopted Subdivision Regulations. The preliminary plat element of the Alvarado project was approved with the previous development plan (PDP-15-00247; Approved by the City Commission on Oct. 27, 2015 subject to conditions). This plan includes the remainder of the Jayhawk Golf Training Center Addition which will be replatted as a tract as shown on the attached Final Plat. This report does not include a discussion of the subdivision regulations.

### **Alvarado Golf Course.**

The current Alvarado Golf Course is made up of two 18 hole courses. The course on the east side of Crossgate Drive is designated as the "public course" and the course on the west side of Crossgate Drive is designated as the "private course". The submission of this application indicates that the proposed development will result in a change to the golf course facility from 36 holes to 27 holes. This application does not address specific changes to the management or design of the golf course with the exception of the required public street extension from Bob Billings Parkway and the addition of a detention pond located on the south side of Bob Billings



Parkway. Modifications to the golf course are not subject to site plan or development plan review.

This application has resulted in questions from the public regarding the area referred to as “The Back 9” that will presumably be taken out of service. Questions regarding the development potential, density and impact on infrastructure have been posed to staff for this area. It should be made clear that this application does not entitle any area outside of the boundary of the zoning and the development plan for development.

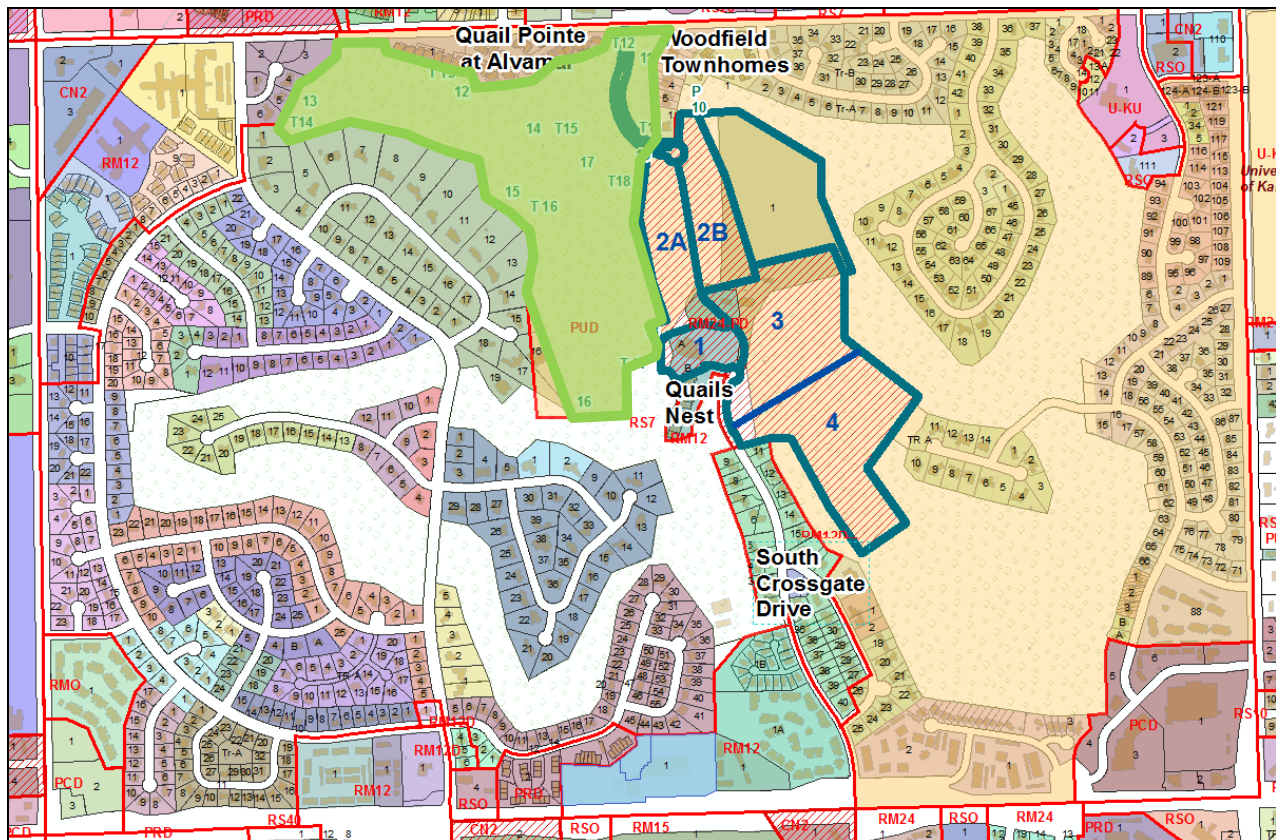


Figure 1: Back 9

- Back 9 is highlighted in green. The tee boxes and holes are located based on approximate location.

Future development of any portion of “The Back 9” would be considered a new and separate development application. It would require a complete zoning, subdivision, development plan and infrastructure review and related public hearings.

This application is a review of a specific area included in the attached Preliminary Development Plan drawing. Each lot is discussed separately in this report. The following is a brief description of each lot included in the Preliminary Development Plan and the Final Plat. Refer to the previous exhibit and the Cover Sheet of the development plan for location of each lot.

- **Lot 1** – Existing Clubhouse located at 1809 Crossgate Drive, located north of the Quails Nest neighborhood and on the west side of Crossgate Drive.

- **Lot 2** – Proposed residential development to be completed as a phased portion of the project.
  - Lot 2A – Located on the west side of Crossgate Drive, extended as a private street and north of the clubhouse.
  - Lot 2B – Located on the east side of Crossgate Drive, extended as a private street and north of Lot 3.
- **Lot 3** – Located on the east side of Crossgate Drive, extended as a private street to include non-residential uses.
- **Lot 4**- Located at the south end of the development on the east side of Crossgate Drive. No uses have been proposed for this lot. Future uses will require a new Preliminary Development Plan.
- **Tract A** – as shown on the Final Plat is the remaining area of the original plat of the University Golf Training Facility. Specific development is not proposed for Tract A other than continued operation of the training facility with associated buildings located on Lot 3.

The following table provides a general summary of the proposed development.

SITE SUMMARY					
	Area (Acres)		Unit Count Summary		Required at 20% of lot
Lot	Approved PDP	Revised PDP	Approved PDP	Revised PDP	Revised PDP Open Space
Lot 1	2.63	3.41	Maximum: 63 Units Proposed: 0 Units	Maximum: 63 Units Proposed: 0 Units	Required: .68 Acres Proposed: 1.60 Acres
Lot 2	15.98	15.5	Maximum: 384 Units Proposed: 292 Units	Maximum: 372 Units Proposed: 392 Units Calculated 209 Units	
Lot 2A	NA	7.90		168 Units [Multi-Dwelling] 96 Calculated Units	Required: 1.58 Acres Proposed: 3.55 Acres
Lot 2B	NA	7.60		164 Units [Mixed Dwelling] 113 Calculated Units	Required: 1.52 Acres Proposed: 3.23 Acres
Lot 3 **	13.99	14.22	Maximum: 336 Units Proposed: 0 Units	Maximum: 336 Units Proposed: 0 Units	Required: 2.84 Acres Proposed: 7.00 Acres
Lot 4	17.32	17.32	Maximum: 416 Units Proposed: 0 Units	Maximum: 416 Units Proposed: 0 Units	Required: 3.46 Acres Proposed: 17.32 Acres
Total	49.92	50.45*	Maximum: 1,198 Units Proposed: 292 Units	Proposed: 392 Units	
<b>Notes:</b> *Changes in area are attributed to additional detail available with newer information, surveys and detail development of project. Adjustment also attributed to changes in proposed right-of-way for Crossgate Drive. ** Lot 3 proposed for RMO-PD zoning, not supported by planning staff.					

Planned Developments are designed to provide some level of shared parking. The initial parking assessment reviews the required parking per use as a discrete use with no shared parking. The distribution of parking, the location of parking lots, garages and on-street parking in proximity to a use is a site design consideration. The following table provides a gross summary of the required parking and the parking provided. Staff's calculation of parking includes uses that are shown on the plan and based on the requirements set in section 20-902 of the Land Development Code.

Parking Summary All Uses			
Use	Required	Provided (excludes on-Street)	Parking Shortage
Residential Uses (All)	644 spaces	603 spaces	41 spaces
Non Residential Uses	523 spaces	366 spaces	157 spaces
Total On-Street Parking		114 spaces	
Total Required Parking All Uses	1,167spaces	1,083 spaces	84 spaces

Parking for each lot and group of uses is discussed separately.

### **Discussion of Plans and Studies.**

#### *A. Traffic Study*

The original Preliminary Development Plan included a traffic study submitted by the applicant that included 612 total residential units, a 36 hole golf course and a variety of accessory uses, 6,000 Sf fitness/wellness center, a 15,000 SF event center and 24 units for transient accommodations. The conclusion of the study was that some improvements were needed to Clinton Parkway and to the north leg of Crossgate Drive where it currently intersects Bob Billings Parkway, as well as and a dedicated westbound left turn lane on Bob Billings Parkway.

As a result of that study and a discussion of the project, a new public street segment was proposed to eliminate the need to access the development from the north through the existing private street segment of Crossgate Drive (Woodfield Townhomes area).

The revised traffic study assumed a total of 356 total dwelling units, a 27 hole golf course, 30,000 SF of space in the clubhouse to be renovated (located on Lot 1), an 18,000 Sf fitness/wellness center, and a new 19,200 SF sports medicine use. Predictably, the overall traffic impact compared between the two studies is lower for the revised development.

- The proposed improvements to Clinton Parkway and to Bob Billings Parkway are not altered by the findings in the traffic study.

At this time the intersection of the new street with Bob Billings Parkway does not meet warrants for a traffic signal. With additional development a traffic signal that could be necessary in the future.

**Recommendation:** Staff recommends that the applicant execute an agreement not to protest the formation of a benefit district, for a period of 20 years, for the installation of a traffic signal at the intersection of Bob Billings Parkway and the new street, if one is needed in the future as determined by the City Engineer. This recommendation is typically included in a final plat recommendation but is included in this report as part of the overall traffic discussion.

Several comments have been received regarding this development related to the safety of Crossgate Drive. The north segment of Crossgate Drive is a private street that is not currently designed to City standards. As part of the construction of the new street segment connecting to Bob Billings Parkway access to the private street will be cutoff during development/construction activity with new access provided at the conclusion of the property. It is probable that the current intersection of Crossgate Drive and Bob Billings Parkway will become an emergency access only with restricted access. Daily traffic

accessing that street segment will be provided via a new intersection and may or may not include access control.

No changes to the south leg of Crossgate Drive from the Clubhouse to Clinton Parkway are proposed. Residents along this segment of Crossgate Drive have voiced concerns about traffic safety, speed, and lack of adequate sight distance. This segment of Crossgate Drive is an existing public street, and is on the list of previously approved but unfunded traffic calming projects.

However, the traffic calming cannot be designed until funding is available for the project. At this time funding is not designated for that specific project. On street parking along this segment of Crossgate is also restricted from the area south of Greenbrier to Clinton Parkway on both sides of the street and from the west side of the street north of Greenbrier to the Clubhouse (see attached map).

**Recommendation:** Staff recommends that the development include the installation of traffic calming devices, at the developments cost, to mitigate concerns of the neighbors. The timing of the installation shall be prior to certificate of occupancy for any residential structure. The design of the improvements should be coordinated with the Public Improvement Plans for the development.

*B. Downstream Sanitary Sewer Analysis -*

The preliminary development plan was accepted by the Department of Utilities as a conceptual plan only. The use proposed in the PDP appears to be consistent with the approved DSSA. The study used a maximum density for the entire development. The conclusion of the study was that there is sufficient downstream sanitary sewer capacity. There will be areas within the development that have a significantly lower density (pools, clubhouse, etc.) and thus will keep the overall impact lower than that assessed in the study.

The existing 8" water line is anticipated to have sufficient capacity and continue to be evaluated and modeled when information about fire flows are available for the development. This is typically provided at the time of a Final Development Plan.

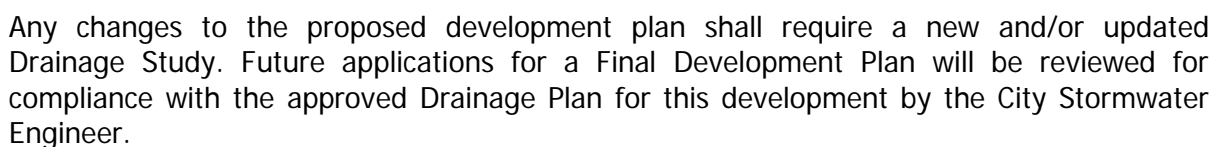
Public improvement plans for both sanitary sewer and water will be required for the development. Public improvement plans must be submitted and approved prior to the recording of a final plat.

*C. Drainage Study –*

A Drainage Study was submitted for the development and was reviewed and approved by the City Stormwater Engineer. The study consists of a written report and a plan.

The plan proposes two detention ponds. A large pond will be located on the west side of the development near Bob Billings Parkway. The pond will be located outside of the development area and is considered an "off-site" improvement. This pond is expected to detain stormwater runoff north of Bob Billings Parkway to compensate for the additional runoff from the proposed development. A second detention pond is proposed on the east side of the development on Lot 3 that is more conveniently located and will detain the majority of the development runoff. Both ponds are designed to detain the 1% storm (or otherwise known as the 100-year storm) which complies the City's Stormwater Management Criteria.





Plans for the proposed development include an intention to grade areas included within the development area defined by the boundary of the proposed Preliminary Development Plan and areas outside of the area to generate the volume of fill needed for the new road construction. At this time a grading plan has not been submitted for this project but will be required as part of the Public Improvement Plans.

#### D. Retail Market Study –

Retail uses included in this project are expressly accessory to the operation and maintenance of the golf course. Retail activity is not permitted in the RM24-PD district except as approved in the development plan. All commercial uses included in the proposed development are accessory to the golf course. A retail market study was not required for this project.

### STAFF ANALYSIS


Development Plan Discussion by Lot.

### NON-RESIDENTIAL USES – DISCUSSION

Non-residential uses are located on Lots 1 and 4 of the proposed development. The primary use is the golf course. All uses are intended to be accessory to the golf course and its related amenities.

**Lot 1: Existing Zoning is RM24-PD.** No changes in the zoning are proposed for this project. Additionally, no residential uses are proposed for this lot. Lot 1 and the clubhouse provide the primary access and support for the golf course as a *Passive Recreation* use.

- The golf course use requires a total of 108 parking spaces

	Site Surface Summary			
		Existing	Proposed	Change
	Building (SF)	14,060	19,321	+5,261
	Pavement (SF)	61,386	59,524	
	Impervious (SF)	75,446	78,845	+3,399
			53%	
	Pervious (SF)	73,036	69,637	-3,399
			47%	
	Area (SF)	148,482	148,482	100%
	Acres	3.41	3.41	
Common open space @ 20% =				29,697 SF
Area Provided				69,637 SF
Area Provided				1.59 Acres

Lot 1 includes the existing clubhouse that will be remodeled and the footprint increased to accommodate clubhouse uses and the *Event Center* uses. The existing building includes two stories located on the west side of Crossgate Drive. The rear of the building overlooks the golf course. The parking lot along Crossgate Drive includes 97 surface parking spaces. Various paths and sidewalks connect the lot to the surrounding development and golf course. North of the clubhouse, located on Lot 2, is a proposed chapel. This use is new to the development plan from previous versions. This feature is intended to be complementary to the *Event Center* use

for weddings and similar events but has potential to be rented to religious organizations for services.

- The Event Center requires a total of 103 parking spaces.
- The chapel use requires a total of 25 parking spaces. These spaces were not accounted for by the applicant in the proposed plan.

The existing building is located in the rear of the lot with open space provided largely located along the north and west sides of the building. The existing building complies with the building setbacks of the RM-24-PD District and allows a 5' interior sideyard setback. The site also exceeds the required open space. The applicant should be advised that changes to the development plan submitted for Final Development Plan that reduce open space on the lot may be considered a Major Change. Section 20-1304 (e) (2)(iii) require a rehearing and reapproval of a Preliminary Development Plan.

The primary uses of the clubhouse include support for the golf course and the banquet facility (*Event Center*). Off street parking for these two uses is summarized in the following table.

Required off-street parking – Lot 1 Uses	
<b><u>Use 1: Golf Course: <i>Passive Recreation</i></u></b> Parking Standard: 4 space per hole.	<b><u>Use 2: Banquet Facility: <i>Event Center, Large</i></u></b> Parking Standard: 1 space per 4 occupants (including staff/employee)
Proposed 27 holes	Proposed Banquet Facility with planned occupancy of 400 + 9 employees/staff
Required Parking for 27 hole Golf Course = <b>108 parking spaces.</b>	Required parking for Banquet Facility for 409 occupants = <b>103 parking spaces</b>
The total required parking for both uses is	
<b>211 spaces</b>	
Total parking provided on Lot 1 is	
<b>97 spaces</b>	
Spaces to be shared in development including residential uses	
<b>114 spaces</b>	

The parking lot located east of the building and included in Lot 1 provides 97 parking spaces. Additional parking spaces for these uses are intended to be shared along the private street segment of Crossgate Drive and in the parking lot located on Lot 3.

**Lot 3: Existing Zoning is RM24-PD; Proposed Zoning is RMO-PD.** This lot includes 14.22 acres and is located on the east side of Crossgate Drive. This lot is intended for development of the pool and fitness/wellness center and will remain as the location for the University practice facility. These uses are accessory to the golf course as discussed in the original applications. Existing improvements include a clubhouse and cart barn that will be removed as part of the redevelopment.

Lot 3 also includes an 18,400 SF, multi-story building proposed for a "Sports Medicine" use. This use is intended as an independent, primary use that is a *Medical Office*. The use is not permitted in the existing RM24-PD zoning. A discussion of the use is included in the related zoning request Z-16-00026. Staff does not recommend approval of the proposed zoning that would also include a wide variety of *Office* uses in addition to the *Medical Office* use. This structure would need to be removed from the Preliminary Development plan if the rezoning is denied.

- This use requires a total of 64 parking spaces.





*Existing clubhouse and cart barn proposed to be removed.*

**Site Summary; Lot 3; 14.22 Acres**

	Existing	Proposed	Change
<b>Building (SF)</b>	7,299	160,367	+ 153,068
<b>Pavement (SF)</b>	43,462	155,709	
<b>Impervious (SF)</b>	50,761	313,997	+263,236
		51%	
<b>Pervious (SF)</b>	568,502	303,187	-265,345
		49%	
<b>Area (SF)</b>	619,263	619,263	
<b>Acres</b>	14.21	14.21	
<b>Common open space @ 20% =</b>			123,852.60 SF
<b>Area Provided</b>			305,266 SF
<b>Area Provided</b>			6.96 Acres

The previously approved plan included a banquet facility (*Event Center, Large*) and 24 guest rooms (*Transient Accommodations*). This revised plan relocates the banquet use to Lot 1 and excludes the 24 guest rooms. The applicant has stated, that while not shown on the plan currently, a future request to provide the use may be submitted. The use remains a permitted use as part of the development plan. The location of the transient accommodations would either need to be included in the clubhouse building on Lot 1 or shown as a future use on Lot 3. A copy of the approved Preliminary Development Plan is attached to this report for reference.

- The Event Center Use requires a total of 103 parking spaces that are shared on Lots 1 and 3.

Lot 3 also includes a large pond located on the east side of the lot that will provide some of the stormwater detention for development. The site exceeds the required open space. The proposed buildings meet the required setback for the RM24-PD District and specifically the 25' front yard setback and the 5' interior side yard setback. Sidewalks and pathways connect the proposed amenities with the rest of the development.

Specific uses shown on Lot 3 are:

1. Pool Area – 40,000 SF that includes multiple pools and one and two-story cabanas.
2. Grill near pool area - 1,800 SF
3. Practice Range building Alvarado- 1,324 SF
4. University Practice Facility, 10,600 SF (basement & 1 story)
5. Fitness/Wellness/Clubhouse/Restaurant - 27,000 SF (two-story with basement)
6. Sports Medicine Building – 19,000 SF (two story with basement)

The north side of Lot 3 includes a practice field area. Located to the west of the Fitness/Wellness/Clubhouse/Restaurant building is a one-story 1,324 SF building intended as an accessory use to the golf course. Off-street parking for this use is captured in the golf course parking summary of 1 space per hole. Additional parking for the golf course use is not required. Located east of the Fitness/Wellness building is a two-story, 10,600 SF building labeled University Golf Practice Facility. This building provides separate locker rooms, team meeting room and coaches office space.

- This use requires 22 parking spaces.



The Fitness/Wellness/Clubhouse/Restaurant building includes two-stories and a basement totaling 27,000 SF. This mixed use building requires parking for each of the uses proposed within the structure. The proposed plan only provides parking for a portion of the restaurant use. The required parking for this building is likely to change as a F

- This use requires 104 parking spaces.

Lot 3 does not include any residential uses. Off-street parking for these uses is shared with the banquet and golf course uses located on Lot 1. The following table provides a summary of the required off street parking for the non-residential uses located on Lots 1 and 3.

This site is designed to share parking between the uses located on Lots 1 and 3. Additional review of off-street parking will continue as Final Development Plans are submitted. Parking for the 24 guest rooms for *Transient Accommodations* is not included in this calculation since the use is not currently shown on the plan.

One additional non-residential use, new to this plan, is also not included in the parking summary. The proposed plan includes a 2,400 SF chapel located on Lot 2A. Parking for *Religious Assembly* is calculated at 1 per 4 seats in the sanctuary or principal worship or assembly space.

#### Non-Residential Off-Street Parking Conclusion;

- The total off-street parking required for all non-residential uses = **523 spaces**
- Total parking provided on Lots 1 and 3 = **366 spaces**
- Parking Shortage = **157 spaces**

The plan shows 114 spaces provided along the private street, however some of these spaces are required to support the residential use. All total, parking for the non-residential uses of this development is short 41 spaces of the Development Code requirements.

The parking summary includes the proposed office use with 64 spaces. Excluding this use results in more available parking for the proposed uses.

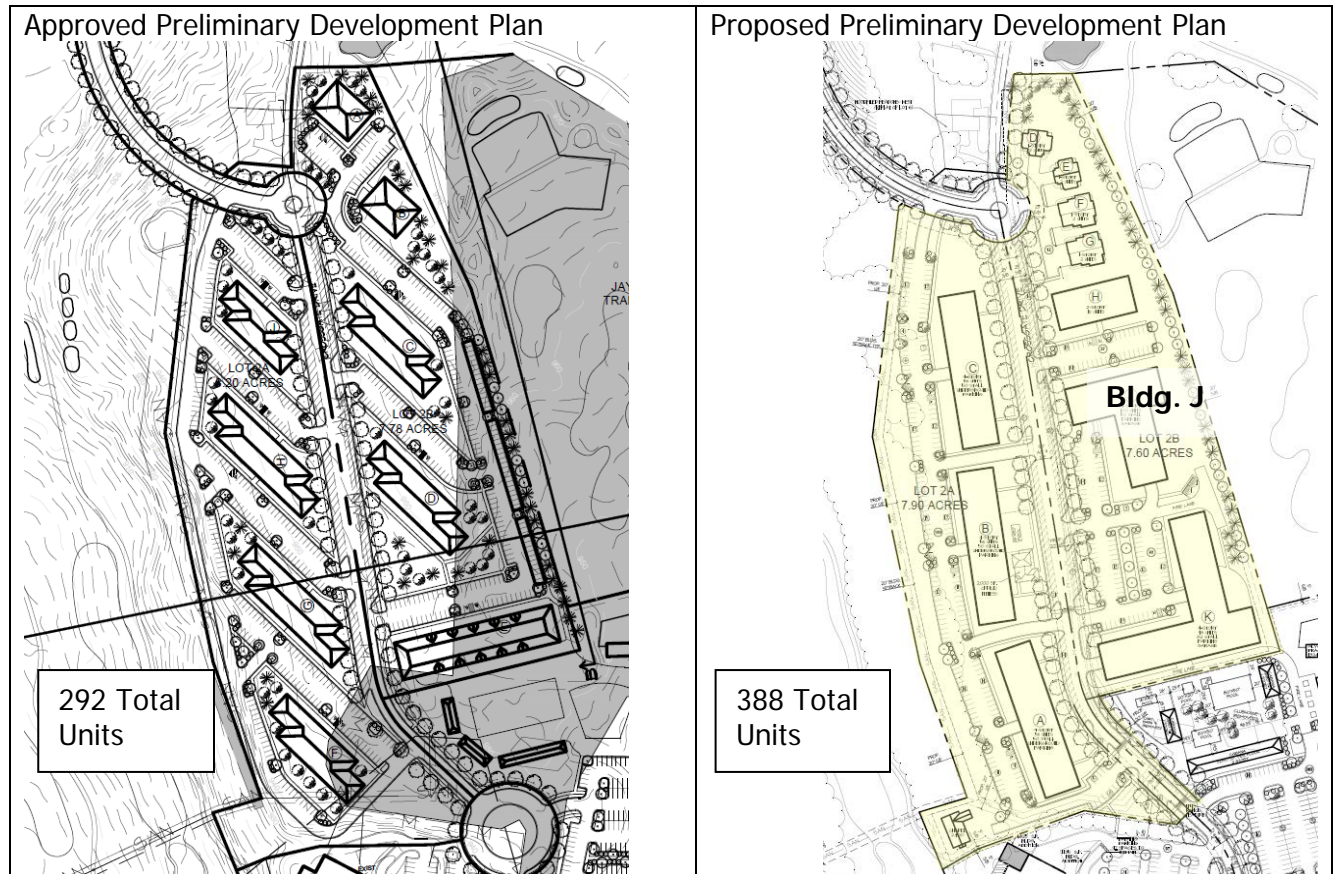
The pool use is seasonal between Memorial Day and Labor Day. Off-season will provide more parking availability on Lot 3.

Non-Residential Off-Street Parking Summary			
Use – Located on Lot 3	Parking Standard	Parking Required	
1. Pool ( <i>Sports and Recreation, Outdoor</i> )	1 space per 500 SF	40,000 SF area	<b>80 Spaces</b>
2. Outdoor Grill ( <i>Fast Order Food</i> ) 1,800 SF Customer Service area	1 space per 100 SF of service area + 1 per employee (5 employees) See note below	1,800 SF building. 1,200 SF	<b>17 spaces</b> 12 5
3. Practice Range – Alvarado	Accessory to golf course	1,324 SF	0
4. Practice Range – University – 10,600 SF	1 space per 500 SF	5,300 1 <sup>st</sup> floor 5,300 basement	0 spaces <b>22 spaces</b>
5. Mixed Use Building -27,000 SF a. Fitness/ Wellness 22,700 SF i. Personal Improvement ii. Active Recreation	1 space per 200 SF [20% of 22,700] 1 space per 500 SF [80% of 22,700]	22,700 SF Total 4,540 SF 18,160 SF	<b>60 Spaces</b> 23 37

b. Clubhouse/Restaurant (4300 SF) i. <i>Passive Recreation</i>	<i>Clubhouse use Accessory to golf course count in 4 spaces per hole 27 holes, see Lot 1.</i>		0
ii. <i>Fast Order Food 3,400 SF customer service area of 4,300 SF of building</i>	1 space per 100 service area + 1 space per emp. (10 employees)	3,400 SF	34 10 <b>44 Spaces</b>
6. Sports Medicine ( <i>Medical Office</i> )	1 space per 300 SF	1st floor =7,200 2nd floor =7,200 Basement=4,800 19,200 SF building	<b>64 spaces</b>
Total Required Parking for Lot 3 [80 + 17+ 22+60 +44 +64]			287
Total Parking Provided Lot 3			269
<b>Parking Shortage</b>			<b>18</b>
<b>Use – Located on Lot 1</b>			
Golf Course ( <i>Passive Recreation</i> )	4 spaces per hole	27 holes	108 spaces
Banquet Facility ( <i>Event Center</i> )	1 space per 4 occupancy	Maximum occupancy 409	103 spaces
Total Required Parking for Lot 1			211 spaces
Chapel Use located on Lot 2	1 space per 4 seats (maximum seating 100)		25 spaces
Total Parking Provided for Lot 1			97 spaces
<b>Parking Shortage</b>			<b>139 spaces</b>
<b>Total Required Parking All Non Residential Uses = 287 + 211 + 25 = 523 spaces</b> <b>Total Off-Street Parking Provided Lots 1 and 3 = 269 + 97 = 366 spaces</b> <b>Total spaces provided along Crossgate Drive (on street – private street) = 114 spaces</b> <b>On Street spaces required for residential use = 41 spaces</b> <b>On street spaces unencumbered by residential uses 73</b> <b>Total Spaces available for non-residential uses = 366+ 73 = 439 spaces</b>			

## Lot 2 – Lot 2A and Lot 2B Residential Uses

**Lot 2: Existing Zoning is RM24-PD.** Lot 2A includes 7.9 Acres and Lot 2B includes 7.6 Acres. Lot 2 is located along the north end of the development with access to the new public street extension from Bob Billings Parkway. Crossgate Drive, as a private street, bisects the lot into an east and west side. Lot 2 is also proposed as a phased residential development. Lot 2 has been identified in the review of the project as an area where significant grading will occur. The site grade will be altered with much of the earth and dirt removed from within the boundary of the Lot 2 area to be used for the construction of the new road. Also proposed with this revised plan are multi-story multi-dwellings with garage parking. The previous plan included only one type of residential use (Multi-Dwelling) and only surface parking.



This revised plan alters the mix and type of multi-dwelling uses from the original approved development plan and includes a mix of garage and surface parking.

### Density Review

Density for *Multi-Dwelling* uses in a Planned Development Overlay is calculated based on net density per Section 20-701(f) (3). This standard applies only to *Multi-Dwelling* uses. Net density for *Multi-Dwelling* uses within a Planned Development is calculated based on the number of bedrooms rather than the number of dwelling units. Duplex and Detached Dwelling residential uses are not included in the calculated density. The density for the proposed residential development is calculated based on the following ratio:

Number of bedrooms	Density factor (Calculated Density)
Studio or one-bedroom	.4 dwelling unit x number of units
Two-bedroom	.6 dwelling unit x number of units
Three-bedroom	.8 dwelling unit x number of units
Four-bedroom or more	1 dwelling unit x number of units

Lot 2A includes three multi-story multi-dwelling buildings as well as a 2,400 SF chapel building discussed above. The units are identical for lot 2A. The gross density for Lot 2A is 21.30 dwelling units per acre. The net density is 12.2 dwelling units per acre. The buildings do not include any four-bedroom units and does not include any residential use other than *Multi-Dwelling*.

<b>Lot 2A</b> Unit type – Multi-Dwelling. (Buildings A, B & C) 168 units Gross Density = 168 units /7.9 Acres is 21.30 DU/AC Total Calculated Units = 32 + 32+ 32 = 96 units Net Density = 96/7.9 12.2 DU/AC		
Building A - Multi-Dwelling 16 1-BR Units (6.4 C. Units) 32 2-BR Units (19.2 C. Units) 8 3-BR Units (6.4 C. Units) Total Calculated Units =32	Building B- Multi-Dwelling 16 1-BR Units (6.4 C. Units) 32 2-BR Units (19.2 C. Units) 8 3-BR Units (6.4 C. Units) Total Calculated Units =32	Building C- Multi-Dwelling 16 1-BR Units (6.4 C. Units) 32 2-BR Units (19.2 C. Units) 8 3-BR Units (6.4 C. Units) Total Calculated Units =32

Lot 2B includes three types of residential uses including 4 *Duplex* buildings located at the north end of the lot; multi-story, *Multi-Dwelling* (apartment) buildings and a proposed senior building intended for “Independent Living” with 100 units, Building J shown on the plan. “Independent Living” is not a use listed in Article 4 of the Land Development Code. *Assisted Living* is defined in section 20-1701 as a “*Building or group of buildings containing Dwellings designed for occupancy by persons 55 years or older where the Dwelling Units are independent but include special support services such as central dining and limited medical or nursing care.* The “Independent Living” use, Building J, included in this request is counted as a *Multi-Dwelling* use for the purpose of calculating density.

<b>Lot 2B</b> Unit Type – Duplex (Building D, E, F & G) 8 units - Multi-Dwelling (Building H & K) 112 units - Independent Living (Building J) 100 units - Total Units 220 units Gross Density – 220 Units / 7.6 Acres is 28.9 DU/Ac units Total Calculated Units = 7 + 44 + 54 + 8= 113 Net Density – 113 units /7.6 is 14.9 DU/AC			
Building H - Multi-Dwelling 16 Total Units 16 Total Bedroom	Building J - Multi-Dwelling 100 Total Units 120 Total Bedrooms	Building K - Multi-Dwelling 96 Total Units 172 Total Bedrooms	Unit Type – Duplex (Buildings D, E, F & G)
16 1-BR Units (6.4 C. Units) 0 2-BR Units (0 C. Units) 0 3-BR Units (0 C. Units) 0 4-BR Units (0 C. Units) Total Calculated Units =6.4	80 1- BR Units (32 C. Units) 20 2-BR Units (12 C. Units) 0 3-BR Units (0 C. Units) 0 4-BR Units (0 C. Units) Total Calculated Units = 44	32 1- BR Units (12.8 C. Units) 52 2-BR Units (31.2 C. Units) 12 3-BR Units (9.6 C. Units) 0 4-BR Units (0 C. Units) Total Calculated Units = 53.6	4 1-BR Units 4 2-BR Units Total Units = 8

### Open Space and Balconies

Common open space is required for the development and for individual lots. The Minimum Outdoor Area required in section 20-601 (a) shall be met based on the total calculated dwelling unit count and not on the actual number of Dwellings (20-701 (f)(3)(ii)). Parking is discussed later in this section. Each lot is required to provide a minimum of 20% of common open space.

LOT		OPEN SPACE		SPACE PER UNIT		
Name	Area	Required @20%	Proposed Open	Units Proposed	50 SF per Unit Required	Proposed
Lot 2A	7.9 AC	1.58 AC	3.6 AC	168 Units <i>96 Cal. Units</i>	8,400 SF	156,816 SF
Lot 2B	7.6 AC	1.52 AC	3.2 AC	220 Units <i>113 Cal. Units</i>	10,600 SF	139,392 SF

The design standards for Planned Developments require that 50% of the “Common Open Space” be developed as recreational open space. This plan includes approximately 3,500 SF of active recreation area along the east side of building B (pool and deck area) that is intended to serve the residential uses separate from the golf course amenities. Likewise building K includes a 3,200 SF patio area that overlooks the golf course practice field. The Duplex units are setback from the east property line to provide connected rear yards that include more than 26,400 SF. Each building includes a front and rear yard area that provide connectivity to the interior sidewalks. Additionally green/open space areas are located along the periphery of the residential lots that provide opportunities for passive recreation. Additional review of required open space will be included with the submission of a future Final Development Plan.

The revised plan includes extensive open space within the residential lots. Larger connected open space areas are provided along the perimeter of the lots. Additionally, the revised plan includes a pool, fitness and office space on Lot 2A that is separate from the golf club facility. This space is intended to serve the residential uses separate from the golf course amenities and provides added open space to the residential use. Building elevations show balcony spaces for residential units that contribute to the open space requirements applicable to the development.

Balconies above the 2<sup>nd</sup> story of a multi-dwelling unit building are prohibited along the exterior of a Planned Development unless the building setback is increased to at least double the minimum required setback and landscaping is enhanced. Building setback along the boundary of the development exceeds the minimum requirement.

### **Building Height**

The base zoning district is RM24 (Multi-Dwelling Residential) District. The maximum height of the district is 45 feet. The applicant has provided documentation to show the proposed buildings will comply with the maximum building height of the district; however, the diagrams are conceptual given that site grading is undetermined at this time. The proposed project intends to use the existing and proposed grade changes of the site to provide underground parking. Additional review of building height will be included in the Final Development Plan as this project evolves.

Building elevations are provided for the multi-dwelling buildings and the duplex units. The City has not adopted residential design guidelines.

### **Residential Off Street Parking**

The revised plan includes three residential uses; Multi-Dwelling, Duplex, and Independent Living. Off street parking is based on the gross number of units and applicable bedroom count. The Off-Street parking requirements for each use are:

**Multi-Dwelling:** 1 space per bedroom + 1 space per 10 units.

**Duplex:** 1 space per bedroom

**Assisted Living:** 1 space per Independent Living Unit and .5 spaces for each Assisted Living Unit.

Lot 2A includes only Multi-Dwelling residential uses while Lot 2B includes all three types of residential uses. Each residential lot is discussed separately.

Lot 2A is proposed as a Multi-Dwelling Residential Development (with a small accessory clubhouse/ pool area). Lot 2B includes all three types of residential development. Staff reviewed

the residential parking both including and excluding the spaces located along the private street segment.

Lot 2A – Off-Street Parking			Parking	
Standard and Use		Total	Requirement	
Parking Standard	Multi-Dwelling: Clubhouse/Pool:	1 space per bedroom + 1 space per 10 units. 1 space per 500 SF		
		Bedrooms		
Multi-Dwelling = 168 units		312 BR	18 guest parking	330 total spaces
Buildings A, B, C = 56 units (each)		104 BR (each)	56/10 5.6 (6 each)	150 in garage
Clubhouse/Pool= 2,000 SF			2,000/500= 4	180 surface
Total Residential Spaces			334 spaces required	330 spaces
Chapel use, located on lot 2A, discussed previously			25 space required	0 provided

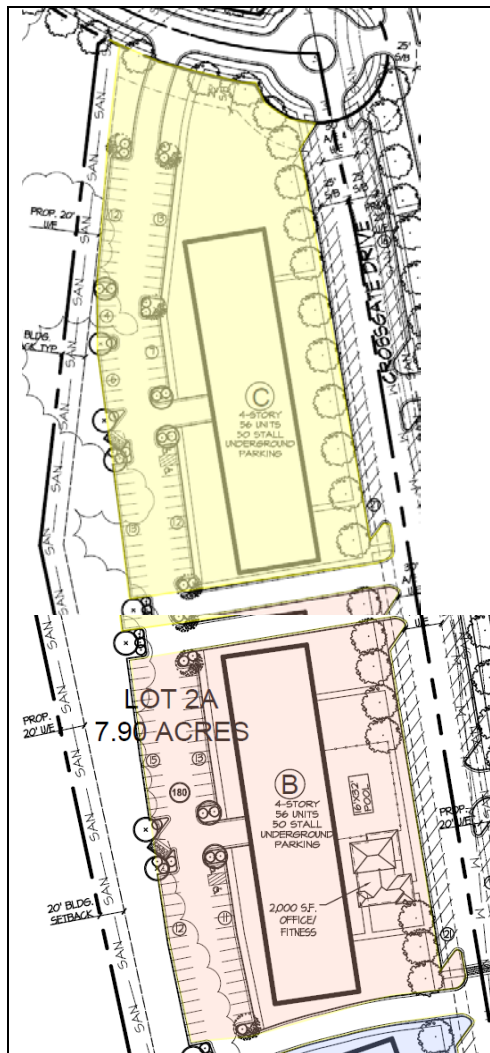
Each building includes surface parking located to the west (rear) of the building and 50 garage parking spaces.

**Lot 2A Parking Conclusion.** Lot 2A is short 4 spaces associated with the pool/clubhouse space for the Multi-dwelling uses. Off-street parking related to the chapel use is not accounted for in either the residential or non-residential list proposed by the applicant but should be with the Final Development Plan. This parking summary excludes the parking located along the “private street”. Clearly the building is designed and oriented that access to the residential units can be accommodated either from the surface parking lot or the angled parking spaces along the private street. However, some uses included in the non-residential part of the development require use of these spaces especially during high volume events such as tournaments and large reception type uses. This will result in a slight impact on the multi-dwelling uses up to approximately 4 spaces. The location of the chapel use near Building A is the most likely to impact the residential parking.

Additional parking is recommended for the residential uses located on lot 2A. Options for providing additional parking include reducing some of the small islands, extending parking further to the north, adding parking to the north side of Building C and/or increasing the number of garage spaces within the buildings.

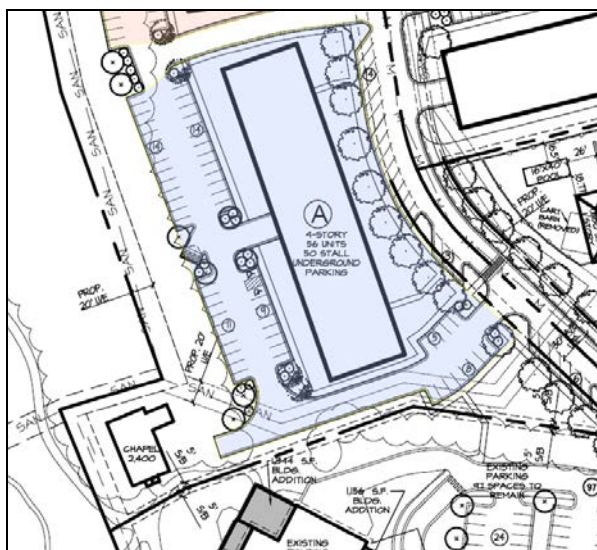
- Each residential building located on Lot 2A requires 110 spaces.
- Each building includes a garage with 50 spaces.





**Building C**, located at the north end of the lot includes 67 surface spaces in addition to the 50 garage spaces for this building. The excess spaces serve part of the need for activity associated with Building B.

**Building B** includes the pool/clubhouse use located along the east side of the building. This space provides an amenity to the apartments separate from the golf course facilities. This is a new revision to the plan. This building includes 50 garage spaces and 51 surface spaces located to the west of the building. Parking for the apartments and the pool/clubhouse area require 114 spaces. The garage and surface parking provide a total of 101 spaces, excluding the 21 spaces along the "private street segment".



**Building A** includes 50 garage spaces and 61 surface spaces located to the west and south of the building. Parking for the apartment building is met without the 17 "on-street parking spaces".

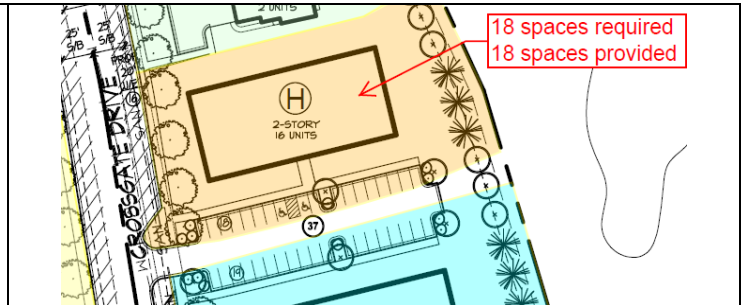
Lot 2B includes three types of residential uses. These uses were previously described in this report. The north portion of Lot 2B includes 4 duplex buildings providing 8 total units. These units provide a transition between the multi-dwelling uses located to the south and west and the existing residential development to the north. Duplex uses are similar to detached dwellings but require 1 parking space per bedroom. Separate guest parking does not apply.

Lot 2B			Parking		
		Total	Requirement		
Parking Standard:	Multi-Dwelling: Duplex: Assisted Living:	1 space per bedroom + 1 space per 10 units. 1 space per bedroom 1 space per Independent Living Unit and .5 spaces for each Assisted Living Unit.			
Use		Bedrooms	Guest	Required	Provided
Multi-Dwelling = 112 Units		188 BR			50 garage spaces
Building H = 16 units		16 BR	112/10 = 12	200 spaces	37 surface spaces
Building K = 96 units		172 BR			92 surface spaces
Duplex Dwelling 8 units		12 BR	Does not apply	12 spaces	12 garage spaces
Independent Living Building J = 100 units		120 BR	Does not apply	100 spaces	82 garage spaces
Total Spaces				312 spaces	273 spaces
Total On Street Spaces					39 spaces

**Buildings D, E, F & G** are designated on the Preliminary Development Plan as 1 story units. Each unit has either one or two bedrooms. All units have an attached one or two car garage. Off-street parking is met in the garages of the units. Buildings D and E are proposed as one-bedroom units while F & G are proposed as two-bedroom units. A total of 12 bedrooms are provided in the 8 duplex units. Off-street parking is met for this use.

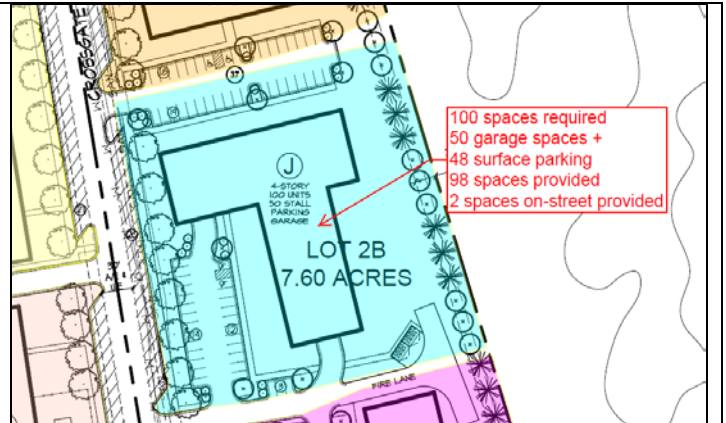


**Building H and K** are proposed *Multi-Dwelling* residential use buildings. Building H includes 16 one-bedroom units. Building H does not propose covered or garage parking. The plan shows 18 spaces located immediately adjacent to the building on the south side. Parking for this building is met.

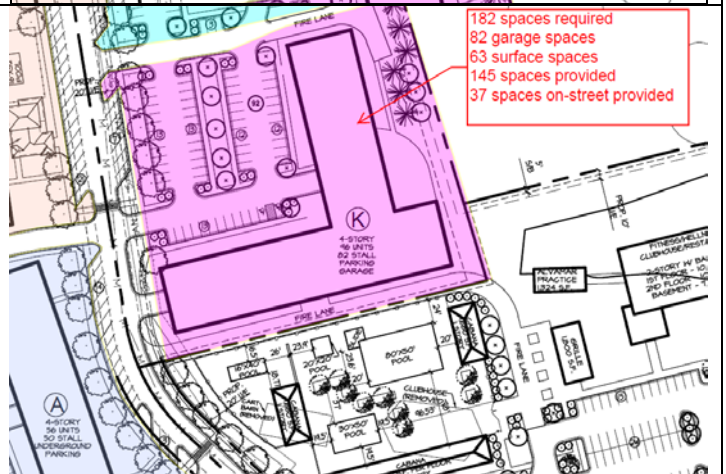




**Building J** is proposed as a senior housing – Independent Living use with 100 units and 50 garage spaces and 48 surface spaces. Off-street parking for this use is based only on the number of units. Guest parking is not required. Two spaces located “on street” are required to meet the required off-street parking for this building.



**Building K** is located at the south end of Lot 2B. It is the largest of the multi-dwelling buildings and includes 96 units and 172 total bedrooms. Total parking for this building is 182 spaces. The proposed building includes 82 garage spaces and 50 surface parking spaces located on the north side of the building. To meet the residential parking requirement 37 on-street parking spaces are required.



**Lot 2B Parking Conclusion.** Lot 2B is short 39 spaces. This parking summary excludes the parking located along the “private street”. Buildings on Lot 2B are oriented to interior parking areas. Parking along the private street (on-street parking) is required to meet the residential demand. 39 spaces are proposed to be included in the residential parking for this development. These spaces should not be counted toward the non-residential parking.

However, some uses included in the non-residential part of the development require use of on-street parking, especially during high volume events such as tournaments and large reception type uses. This will result in an impact on the multi-dwelling uses up to approximately 39 spaces.

**Total Residential Off-Street Parking Conclusion:**

- |  |              |
|--|--------------|
| • The total off-street parking required for all residential uses | = 644 spaces |
| • Total parking provided Lot 2A & Lot 2B                         | = 603 spaces |
| • Parking Shortage   | = 41 spaces  |

The balance of the residential parking is provided along the private street so that the residential parking is met with this use. This reduces the available parking for other non-residential uses included in the development and leaves 73 on-street spaces to be shared.

The plan shows 114 spaces provided along the private street, however some of these spaces are required to support the residential use. All total, parking for the non-residential uses of this development is short 41 spaces of the Development Code requirements.

The parking summary includes the proposed office use with 64 spaces. Excluding this use results in more available parking for the proposed uses.

The pool use is seasonal between Memorial Day and Labor Day. Off-season will provide more parking availability on Lot 3.

Parking Summary All Uses			
Use	Required	Provided (excludes on-Street)	Parking Shortage
Residential Uses (All)	644 spaces	603 spaces	41 spaces
Non Residential Uses	523 spaces	366 spaces	157 spaces
Total On-Street Parking		114 spaces	
Total Required Parking All Uses	1,167spaces	1,083 spaces	84 spaces

### **Sidewalks, Landscaping and Preservation of Natural Features**

A preliminary review of sidewalks, open space, and natural features has been included in this application. Additional review regarding specific elements is required with the submission of a final development plan for each lot.

**Sidewalks:** Pedestrian connectivity is a key element within this development. Sidewalks are required on both sides of the public and private street network. The plan as proposed shows a 30' Access and Utility Easement that incorporates the private street section. The City Engineer recommends that the easement include the sidewalks. This would increase the easement to approximately 60'. The easement does not impact the lot line or building setback. This easement will also be considered with the Final Plat.

**Landscaping:** The proposed Preliminary Development Plan exceeds the required open space requirements for a Planned Development. The plan includes street trees along the public and private street network and interior landscaping for individual parking lot areas and around buildings. This plan does not include a specific request for the use of artificial turf. The applicant indicates that some artificial turf is currently in place for all of the existing ranges. Areas where this material is being considered are for the putting clock, driving range, possible pool area and some areas around the chapel. These spaces must be identified and properly labeled on a Final Development Plan.

Use of artificial turf requires City Commission approval. Future applications of this material will require review and approval prior to installation. Staff recommends that a general note be added to the plan to notify the public and the developer that future development may be subject to additional review and approval prior to installation of this material if proposed in the future.

**Natural Features:** The property included in this request is part of a mature golf course. West of the proposed development is the Inverness Tributary and is regulated as part of the floodplain subject to section 20-1308 of the Land Development Code. The eastern portion of Lots 3 and 4 are encumbered by an existing unnamed open stream segment that is enclosed along Quail Creek Ct. to the southeast of the proposed development. There is no regulatory floodplain within the boundary of the proposed development. Stormwater runoff and site grading are key considerations for this development. The applicant has provided the necessary drainage study for this site. It has been conditionally approved. Also, a specific grading plan is required prior to

development of the site. The grading plan must be provided with the submission of a Final Development Plan and corresponding Public Improvement Plans for development of the site.

Existing mature trees located within the boundary of the development that are located on the golf course will be removed as part of this redevelopment. Changes to the vegetation within the golf course are not subject to review.

The existing grade of Lot 2 will be substantially altered as a result of this development. The golf course has not been subject to subdivision or site plan review. Alterations to the existing golf course that will remain after the development are not at this time subject to any additional review for site plan, subdivision approval or development plan approval. The exception to review requirements relate to stormwater management. The proposed project includes grading changes that are outside of the development area and are subject to review and approval by the City Stormwater Engineer.

One objective of the proposed development is to create ponds within the development and on the golf course that provide a means to irrigate the course. The location and creation of these ponds and proposed irrigation may be subject to review to ensure compliance with the approved stormwater drainage study and separation from existing and planned utilities in the area.

### **Preliminary Development Plan Review**

The proposed Preliminary Development Plan for Alvamar, Lot 1, 2A, 2B and 3 has been evaluated based upon findings of fact and conclusions per Section 20-1304(d)(9) of the Development Code for the City of Lawrence, requiring consideration of the following nine items:

#### ***1) The Preliminary Development Plan's consistency with the Comprehensive Plan of the City.***

Compliance with the Comprehensive Plan was discussed with the original zoning and preliminary development plan. But for the golf course, high-density residential development would not typically be located interior to an established neighborhood. This revised plan increases the overall density and total number of units but provides more housing options than the previous plan.

Recommendations for medium- and higher-density residential development from Chapter 5 of *Horizon 2020* are listed below.

"Development proposals shall be reviewed for compatibility with existing land uses. The review should include use, building type, density and intensity of use, architectural style, scale, access and its relationship to the neighborhood, and the amount and treatment of screening and open space." (Policy 1.1, page 5-23)

"Encourage new and existing medium- and higher-density residential development which is compatible in size, architectural design, orientation, and intensity with the surrounding land uses in established areas." (Policy 3.4, page 5-29)

This project must consider and respond to the existing development within the PD to provide compatibility through the design and form of the project. The physical design of this project provides a transition of uses from the existing development along Bob Billings Parkway south by adding duplex units and a two story multi-dwelling building limited to 16 units at the north end

of the development. Higher density buildings with larger massing are located closer to the activity area in the center of the development site.

The revised project does not alter the plans consistency with the Comprehensive Plan findings included in PDP-15-00247 and Z-14-00552.

**Staff Finding –** The proposed development complies with the land use goals and policies for medium- and higher-density residential development of the Comprehensive Plan.

***2) Preliminary Development Plan's consistency with the Planned Development Standards of Section 20-701 including the statement of purpose.***

The purpose statement includes the following (staff comments follow in *italics*):

**a) Ensure development that is consistent with the comprehensive plan.**

*This is a unique infill development centered on an existing golf course. Each lot within the development must be considered individually. The primary justification of the Planned Development Overlay is to provide a wider range of public input for the proposed development especially as it pertains to the residential elements.*

*Provision of the direct public street access to Bob Billings Parkway facilitates the ability to accommodate higher density residential development and incorporate that development into the surrounding golf course. Similar high-density residential development at the south end of the development area (Lot 4) would not meet the consistency test.*

*As discussed previously, the development is consistent with the comprehensive plan as conditioned.*

**b) Ensure that development can be conveniently, efficiently and economically served by existing and planned utilities and services.**

*A general review of this proposed development based on the available data shows that the property can be adequately provided with municipal services.*

**c) Allow design flexibility which results in greater public benefits than could be achieved using conventional zoning district regulations.**

*The intent of the developer is to provide a mixed use development that supplements and augments the Alvamar Golf Course.*

*The proposed development includes both public street and private street improvements for access. The benefit of the private street as proposed for the multi-dwelling residential development is the placement of buildings and the providing of "on-street" parking. Details for Lot 4 are generally not available for review and will require a revised Preliminary Development Plan prior to further development.*

**d) Preserve environmental and historic resources.**

*There are no known historical or environmental resources on this property.*

**e) Promote attractive and functional residential, nonresidential, and mixed-use developments that are compatible with the character of the surrounding area.**

*The nature of the proposed Multi-Dwelling residential use within this project is of a significantly higher density and comprised of larger buildings than in the immediately surrounding subdivisions though the buildings are buffered by distance and trees.*

*The mixed-use character of the development is derived from the Active Recreation, Passive Recreation and limited Commercial uses proposed as accessory to the golf course.*

*Limiting the amount of commercial uses can be reasonably managed and enforced through the base zoning and the combined development plan approval.*

**Staff Finding** – The proposed Preliminary Development Plan is consistent with the Statement of Purpose of Planned Development as conditioned

***3) The nature and extent of the common open space in the Planned Development.***

Section 20-701(j) notes that 20% of the site must be developed as common open space. As each phase of development is submitted for review minimum open space requirements must be met. A portion of this open space must be for recreational open space. As discussed in the body of the staff report the Preliminary Development Plan demonstrates that adequate open space is provided for this development in and around the residential buildings. Within Lots 1 and 3 opens space includes accessory elements to the golf course such as putting clocks, driving range, outdoor pools as well as sidewalks and cart paths that connect uses throughout the development.

**Staff Finding** – This plan includes planned open spaces within the development. Additional detail will be required with future applications for individual lot development.

***4) The reliability of the proposals for maintenance and conservation of the common open space.***

This project includes amenities directly related to the golf course and are expected to be desirable to existing and new residents in the area. Shared common open space within the development is expected. Adequate pedestrian connections are provided and will continue to be reviewed.

**Staff Finding** –The review assumes the property owner will own and maintain the common open space. The placement of the note on the Preliminary Development Plan will identify the ownership and maintenance responsibilities.

***5) The adequacy or inadequacy of the amount and function of the common open space in terms of the densities and dwelling types proposed in the plan.***

The minimum outdoor area, as required on Article 20-601(a) is based on the total calculated Dwelling Unit count and not the actual number of dwelling units. As discussed in the body of the staff report, the proposed development meets the required open space design standards.

**Staff Finding** – The amount and function of the common open space appears to meet the requirements of the Development Code.

***6) Whether the Preliminary Development Plan makes adequate provisions for public services, provides adequate control over vehicular traffic, and furthers the amenities of light and air, recreation and visual enjoyment.***

This project includes public street access from Bob Billings Parkway to the north and Clinton Parkway to the south. These two access points for this area are a result of the surrounding development. Access from the east or west is not anticipated for this property. This project includes a new public street extension between Bob Billings Parkway and the proposed development. This new access is in response to concerns from residents and property owners located at the north end of the Alvamar PUD (outside of the proposed development project). The current access at the north end is not a public street and is not designed as a public street. The proposed north leg of new Crossgate Drive will be constructed as a public street.

The remaining segment of access at the north end will be reconfigured to limit or restrict access from Bob Billings Parkway to the proposed development. The exact plans have not been determined but will be required with the submission of a Final Plat and Final Development Plan. This could include removing the access drive connection to Bob Billings Parkway or restricting turning movements at the north or south end where it will intersect with the new public street.

A significant feature of this revised plan is a phasing requirement related to the construction of the new street from Bob Billings Parkway prior to development of lots within the PD. The phasing plan is discussed separately. Staff recommends a note be added to the face of the plan to reference the phasing plan. Approval of the phasing plan is subject to City Commission approval.

The Preliminary Development Plan's provisions for Fire/Medical access will continue to be reviewed as part of the Final Development Plan as well as the construction documents.

Amenities of light and air, recreation and visual enjoyment are generally protected.

**Staff Finding** – The planned development meets the requirements of this standard in the general form. Approval of the project, subject to the approval of the phasing plan will ensure that the adequate provisions for traffic are maintained throughout the development of the project.

***7) Whether the plan will measurably and adversely impact development or conservation of the neighborhood area by:***

***a) doubling or more the traffic generated by the neighborhood;***

This property is located south of Bob Billings Parkway and north of Clinton Parkway. The proposed development is self-contained within the Alvamar PUD and will result in increased traffic. A new public street extension is proposed to mitigate traffic in the north end of the development. Other recommended improvements include turn lanes and signal timing changes to also improve the traffic in the area.

***b) proposing housing types, building heights or building massings that are incompatible with the established neighborhood pattern; or***

The building type for the residential uses includes multi-story multi-dwelling structures on Lot 2 as well as duplex housing and independent living. Much of the surrounding area is open space as a part of the golf course facility.

This revised plan provides a better transition between the existing development to the north and the higher density buildings proposed in the center of the development. The proposed plans demonstrate compliance with the building height standards of the district.

Specific land uses for Lot 4 is not provided at this time.

***c) increasing the residential density 34% or more above the density of adjacent residential properties.***

The proposed development is predominantly surrounded by the golf course. Residential development south of proposed Lot 1 includes duplex housing with a private street providing access to these dwellings known as Quail's Nest at Alvamar. Density of this area is 4 dwelling units per acre. The residential development immediately north of proposed Lot 2 along the existing private street segment of Crossgate Drive known as Woodfield Meadows is developed at 5 dwelling units per acre. Development along the south leg of Crossgate Drive and Greenbrier Drive is also approximately 4 dwelling units per acre. As previously discussed the proposed development includes a much higher residential density than the existing development.

**Staff Finding--** The proposed development is unique in that it does not immediately abut residential development except in some narrow and specific areas. Access is limited to this overall area and change will be noticeable as the area develops. Traffic impacts and building type and massing have been two dominant concerns expressed by residents in the area.

***8) Whether potential adverse impacts have been mitigated to the maximum practical extent.***

Potential adverse impacts that are anticipated by this development include traffic and stormwater. Traffic is initially addressed for this development by the inclusion of the new street to intersect with Bob Billings Parkway. This does not, however, address the concerns that have continued to be expressed by the residents located south of the existing clubhouse along Crossgate Drive. As noted in the body of the staff report the south leg of Crossgate Drive was approved for traffic calming but has not been designed or funded to date. The need for traffic calming is exacerbated with the intensification this project brings.

Stormwater is being addressed by a regional plan that includes ponds located off-site near Bob Billings Parkway and on Lot 3. As each lot is developed additional review of the project will be required to ensure that the final development is consistent with the approved studies.

Impacts related to site lighting are also deferred to the Final Development Plan. Special attention will be given to those areas around the perimeter of the development where the only separation between the proposed development and the existing development is the golf course. A detailed light study will be required to prevent light glare from the activity areas and parking lots spilling to the golf course or impacting the existing residential subdivisions. A photometric plan and lighting detail are required with the submission of a Final Development Plan.

A current adverse impact results from the on-street parking that is associated with special or large events that take place on the golf course or in the associated clubhouse area. The proposed plan extends parking along the street within the development to mitigate parking for uses in the overall area.

**Staff Finding** – Possible adverse impacts of exterior lighting will be addressed with a photometric plan to insure there is no spillover light. Other possible adverse impacts have been identified and mitigated to a practical extent.

***9) The sufficiency of the terms and conditions proposed to protect the interest of the public and the residents of the Planned Unit Development in the case of a plan that proposes development over a period of years.***

Development of this site requires the approval and implementation of a phasing plan to mitigate impacts on the existing development. Initial construction of the new street must be completed prior to development of proposed improvements to Lots 2A, 2B and 3. The applicant has proposed remodel of the existing clubhouse located on Lot 1. While some remodel of the building is reasonable and acceptable and an existing use full development of the facility will be limited by the available parking. Additional review is needed via a Final Development plan to determine the scope of the full impact of Lot 1 and the related parking.

**Staff Finding-** A phased development is recommended for this project.

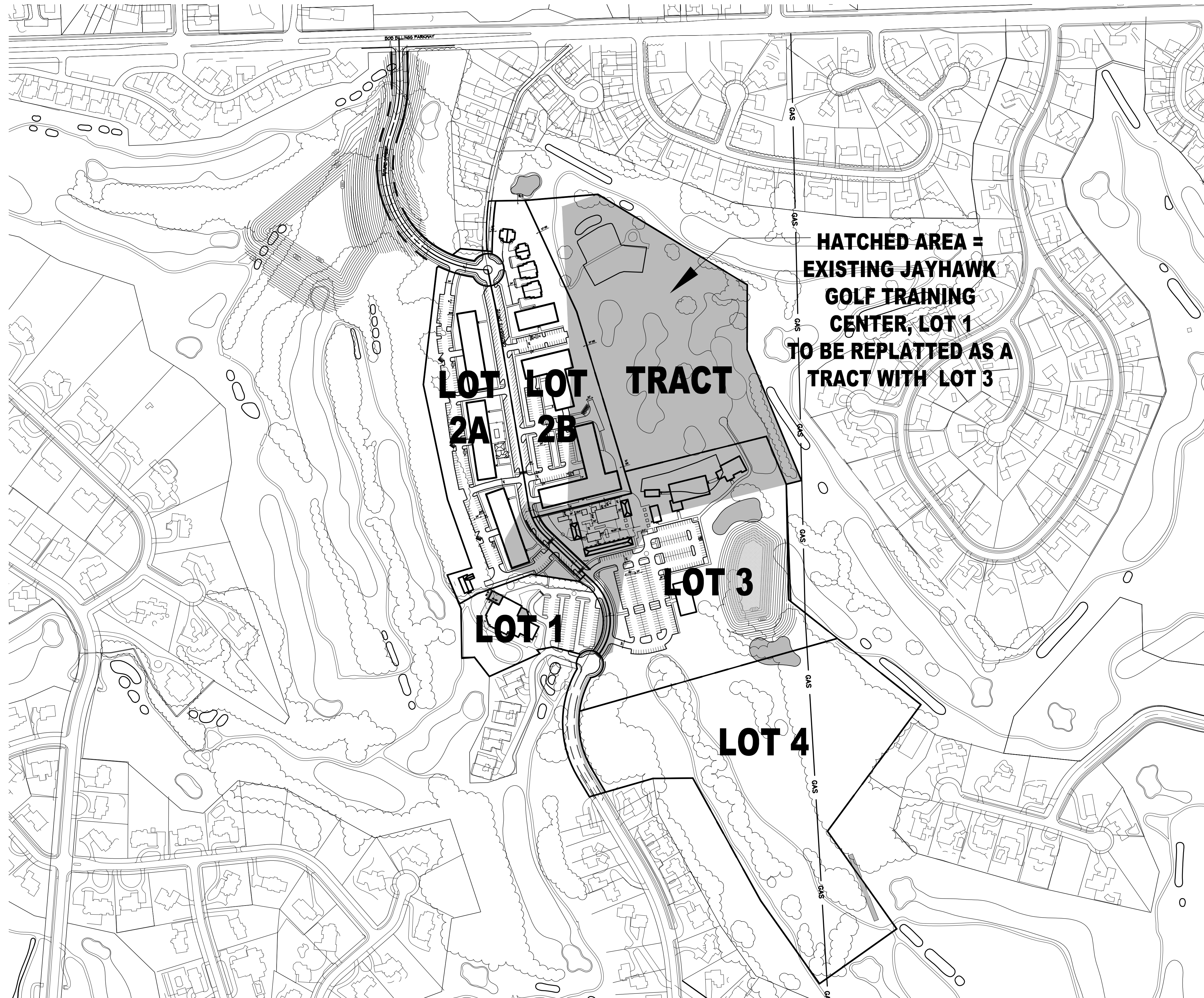
**Staff Review and Conclusion**

The proposed Preliminary Development Plan conforms to the land use requirements for a Planned Development subject to conditions discussed in the staff report. The previous plan approval included far less detail than included in this application. A condition of the original approval made the project subject to Final Development Plan approval by the Planning Commission following a public hearing. This project proposes to remove that condition (note 1.18) given that added detail reflected in this Preliminary Development Plan. A separate Final Development Plan processed administratively is required prior to development of lots within the Planned Development. Also required are public improvement plans, final building elevations, and a Final Plat. Each phase of development is subject to review for an assessment of the consistency of the project with the approved studies and plans noted in this review.



# ALVAMAR

## LOT 1, 2A, 2B & 3 PRELIMINARY DEVELOPMENT PLAN LAWRENCE, KANSAS



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**ALVAMAR LOT 1, 2A, 2B & 3  
PRELIMINARY  
DEVELOPMENT PLAN**

LAWRENCE, KANSAS

PROJECT # 213-560

RELEASE: 1.0 DATE: 2.16.16  
1.1 3.01.16

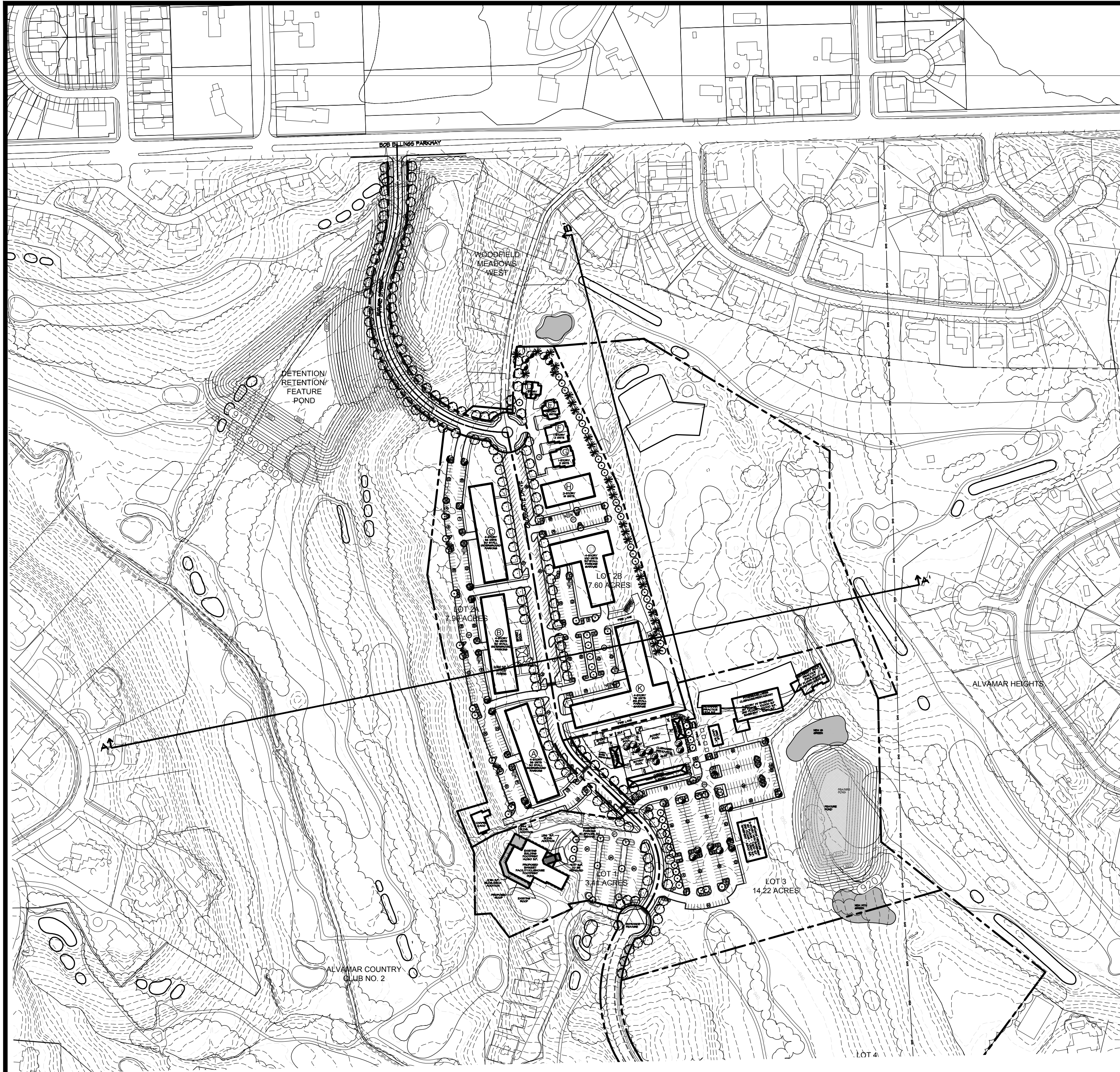
**COVER**



SCALE: 1" = 200'-0"

0 100 200 400 600





IMPERVIOUS SURFACE SUMMARY:

LOT 1: 3.41 ACRES (148,482 SQ. FT. +/-)

EXISTING SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	14,060	12%
PAVEMENT AREAS:	61,306	41%
TOTAL IMPERVIOUS:	75,446	53%
TOTAL PERVIOUS:	73,036	41%
PROPERTY AREA:	148,482	100%

POST DEVELOPMENT SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	19,321	13%
PAVEMENT AREAS:	54,524	40%
TOTAL IMPERVIOUS:	73,845	53%
TOTAL PERVIOUS:	64,637	41%
PROPERTY AREA:	148,482	100%

LOT 2A: 7.40 ACRES (343,962 SQ. FT. +/-)

EXISTING SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	0	0%
PAVEMENT AREAS:	46,214	13%
TOTAL IMPERVIOUS:	46,214	13%
TOTAL PERVIOUS:	297,748	87%
PROPERTY AREA:	343,962	100%

POST DEVELOPMENT SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	63,300	18%
PAVEMENT AREAS:	126,083	37%
TOTAL IMPERVIOUS:	189,383	55%
TOTAL PERVIOUS:	154,579	45%
PROPERTY AREA:	343,962	100%

LOT 2B: 7.60 ACRES (331,081 SQ. FT. +/-)

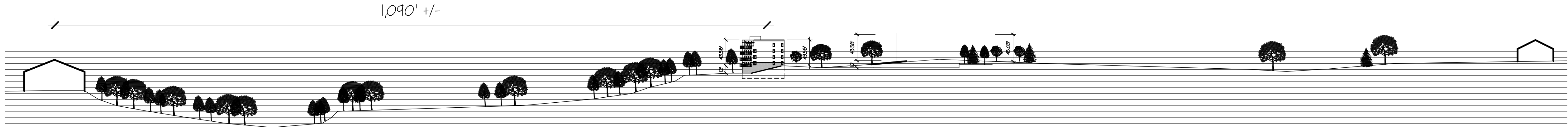
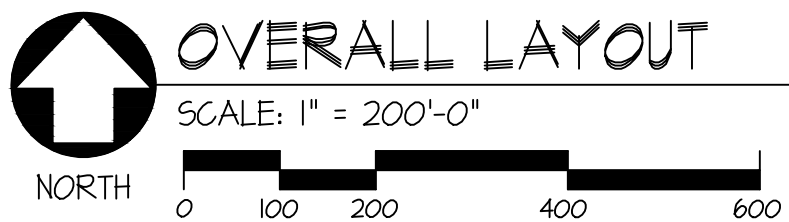
EXISTING SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	0	0%
PAVEMENT AREAS:	28,653	9%
TOTAL IMPERVIOUS:	28,653	9%
TOTAL PERVIOUS:	302,428	91%
PROPERTY AREA:	331,081	100%

POST DEVELOPMENT SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	78,411	24%
PAVEMENT AREAS:	110,871	33%
TOTAL IMPERVIOUS:	189,282	57%
TOTAL PERVIOUS:	140,799	43%
PROPERTY AREA:	331,081	100%

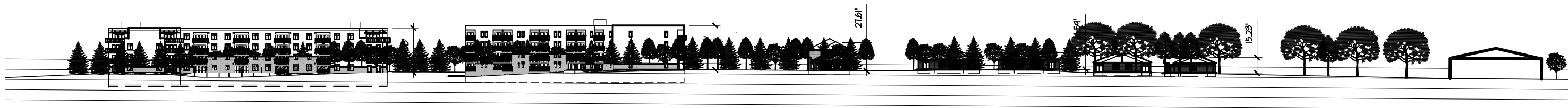
LOT 3: 14.22 ACRES (619,263 SQ. FT. +/-)

EXISTING SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	1,294	1%
PAVEMENT AREAS:	43,462	7%
TOTAL IMPERVIOUS:	50,761	8%
TOTAL PERVIOUS:	568,502	92%
PROPERTY AREA:	619,263	100%

POST DEVELOPMENT SUMMARY:	SQ. FT.	%
BUILDING FOOTPRINT:	160,367	26%
PAVEMENT AREAS:	155,104	25%
TOTAL IMPERVIOUS:	315,471	51%
TOTAL PERVIOUS:	303,792	49%
PROPERTY AREA:	619,263	100%



SECTION A - A' SCALE: 1" = 100'-0"



SECTION B - B' SCALE: 1" = 100'-0"

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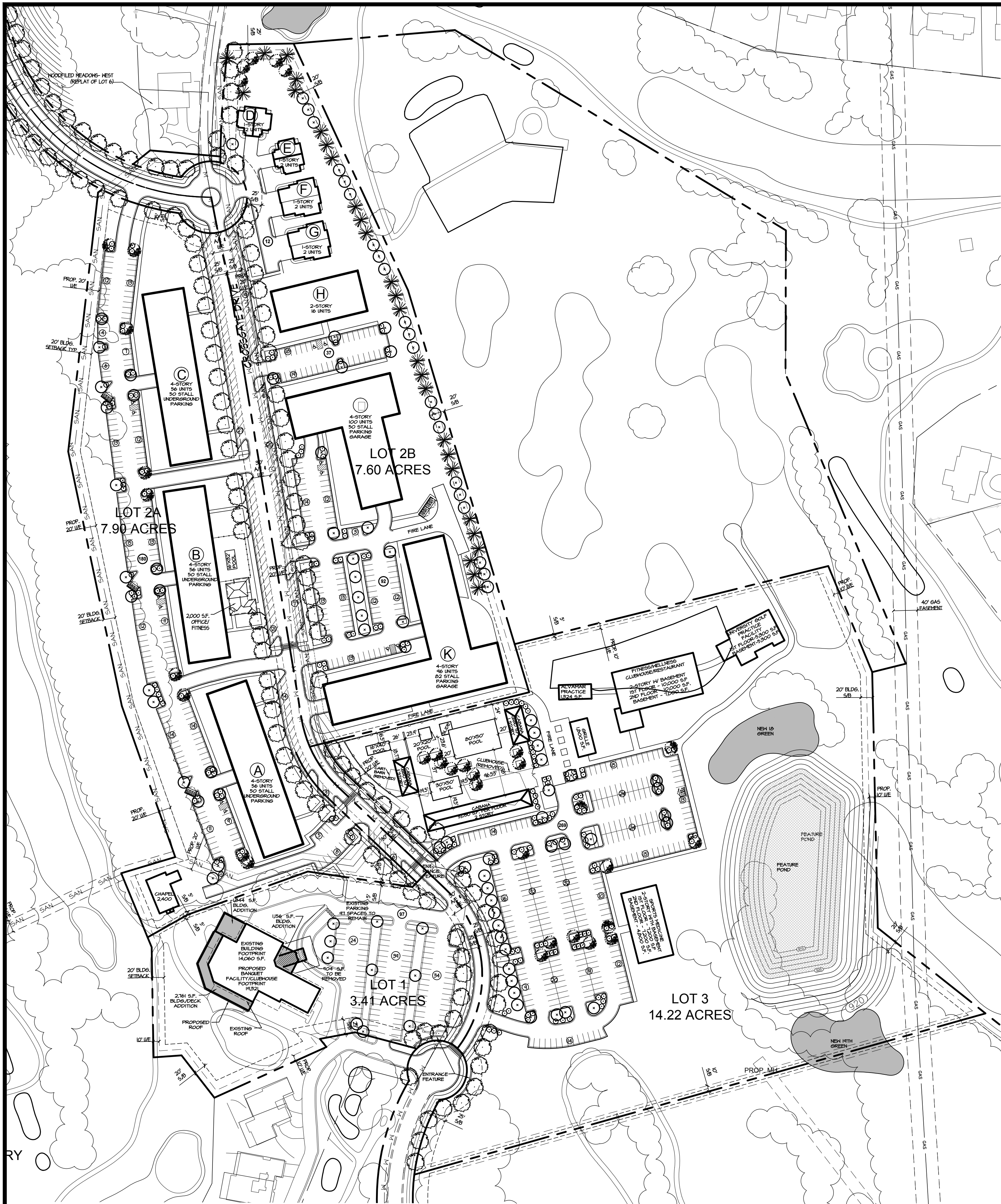
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DEVELOPMENT PLAN

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PROJECT # 213-560

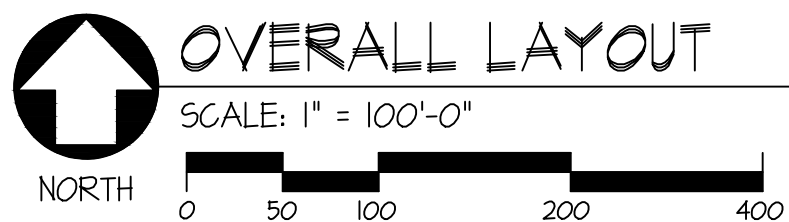
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### ALLOWED NON RESIDENTIAL USES:

- RETAIL USES AS ACCESSORY TO THE GOLF COURSE
- OFFICE USES ACCESSORY TO THE DIRECT OPERATION OF THE GOLF COURSE AND EVENT CENTER OR MANAGEMENT OF ACCESSORIES USES DIRECTLY ASSOCIATED WITH THE GOLF COURSE
- EATING AND DRINKING ESTABLISHMENTS TO INCLUDE EVENT CENTER (TO BE OPERATED AS A BANQUET/RECEPTION FACILITY ONLY), FAST ORDER FOOD, QUALITY RESTAURANT, AND ACCESSORY BAR USES.



### LEGAL DESCRIPTION:

PENDING APPROVAL OF FINAL PLAT FOR LOT 1-3 - ALVAMAR, INC. ONE ADDITION (DEVELOPMENT PROPOSAL FOR LOT 4 IS NOT INCLUDED AT THIS TIME AND IS SHOWN FOR CONTEXT ONLY)

### GENERAL SITE PLAN NOTES:

- ALL GROUND MOUNTED MECHANICAL UNITS SHALL BE SCREENED IN ACCORDANCE WITH SECTION 20-1006(B).
- ALL REQUIRED ACCESSIBLE SIDEWALK RAMP PER A.D.A. STANDARDS.
- SITE PLAN HAS BEEN DESIGNED TO COMPLY WITH THE PROVISIONS OF THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) FOR BUILDINGS AND FACILITIES, APPENDIX II, OF THE FAIR HOUSING ACT OF 1968, AS AMENDED.
- SITE PLAN HAS BEEN DESIGNED TO COMPLY WITH THE MINIMUM PROVISIONS OF THE FINAL FAIR HOUSING ACCESSIBILITY GUIDELINES, 24 CFR, CHAPTER 1, SUBCHAPTER A, APPENDIX II, OF THE FAIR HOUSING ACT OF 1968, AS AMENDED.
- THE CITY OF LAWRENCE WILL NOT BE HELD RESPONSIBLE FOR PAVEMENT DAMAGE CAUSED BY TRASH TRUCKS.
- PLAN FOR CITY APPROVAL ONLY! CONSTRUCTION DOCUMENTS TO BE FURNISHED AT THE REQUEST OF OWNER.
- INFORMATION TAKEN FROM AERIAL PHOTOS, TOPOGRAPHIC SURVEY, AVAILABLE DOCUMENTS, AND ON SITE INVESTIGATIONS.
- ALL TRAFFIC CONTROL SIGNS PLACED ON PRIVATE PROPERTY OPEN TO THE GENERAL PUBLIC SHALL COMPLY WITH THE "MANUAL ON UNIFORMS TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION, WITH RESPECT TO SIZE, SHAPE, COLOR, RETROREFLECTIVITY, AND POSITION.
- MAXIMUM BUILDING HEIGHT SHALL BE 45 FEET PER CITY CODE 20-60L, OR RECEIVE A WAIVER FROM PLANNING DIRECTOR OR PLANNING COMMISSION.
- SIGN APPROVAL AND PERMITTING IS NOT PART OF THE SITE PLAN APPROVAL. SEPARATE APPROVAL IS REQUIRED THROUGH PLANNING AND DEVELOPMENT SERVICES.
- NO BUILDING STRUCTURES SHALL BE PLACED WITHIN UTILITY EASEMENTS OR WITHIN 15 FEET OF THE PUBLIC SANITARY SEWER OR PUBLIC WATERLINE. NO OTHER STRUCTURES OR LANDSCAPING SHALL BE PLACED WITHIN UTILITY EASEMENT OR WITHIN 8 FEET OF THE PUBLIC SANITARY SEWER OR PUBLIC WATERLINE.
- THE SWIMMING POOL CONSTRUCTION WILL COMPLY WITH CITY CODE CHAPTER 14, ARTICLE II.
- SLOPE EXTERIOR WALKS A MINIMUM OF 1/4" PER FOOT (BUT NOT GREATER THAN 1:20) SO THAT ALL EXTERIOR DRAINAGE WILL BE AWAY FROM STRUCTURE TO EXTERIOR.
- PROPERTY OWNERS WAIVES RIGHTS TO PROTEST CHANGES TO THIS DEVELOPMENT PLAN.
- APPLICANT SHALL SUBMIT A COMPLETE DRAINAGE STUDY FOR REVIEW AND APPROVAL BY THE CITY STORMWATER ENGINEER CONJUNCT WITH EACH FINAL DEVELOPMENT PLAN APPLICATION FOR ANY LOT OR PHASE OF THE DEVELOPMENT. OCCUPANCY PERMITS FOR PROPOSED BUILDINGS WILL NOT BE ISSUED UNTIL THE REQUIRED PUBLIC DRAINAGE IMPROVEMENTS ARE COMPLETE, FINAL INSPECTED AND ACCEPTED BY THE PUBLIC WORKS DEPARTMENT. ALL CURB INLETS WILL BE CONSTRUCTED PER CITY STORM SEWER STANDARD DETAILS.
- SIDEWALKS SHALL BE REQUIRED ON BOTH SIDES OF ALL PUBLIC AND PRIVATE STREETS.
- PROPERTY OWNER SHALL MAINTAIN COMMON OPEN SPACE ON LOTS 1 - 4
- FINAL DEVELOPMENT PLANS FOR THIS PROPERTY ARE REQUIRED TO BE PRESENTED TO THE PLANNING COMMISSION FOR APPROVAL FOLLOWING THE NOTICE REQUIREMENTS OF SECTION 20-1501(G).
- PHASING PLAN SHALL BE SUBMITTED WITH THE FIRST FINAL DEVELOPMENT PLAN FOR REMODEL OF THE EXISTING CLUBHOUSE ON LOT 1, CONSTRUCTION OF IMPROVEMENTS PROPOSED ON LOTS 2 AND 3, AND STREET AND UTILITY INSTALLATION.
- SHARED PARKING REVIEW AND FINAL PARKING SPACE REQUIREMENTS WILL OCCUR WITH REVIEW OF EACH FINAL DEVELOPMENT PLAN SUBMISSION.
- THE BANQUET/RECEPTION FACILITY SHALL ONLY BE USED FOR CONVENTIONAL BANQUET/RECEPTION USES. THE NIGHTCLUB USE ASSIGNED TO THIS FACILITY FOR DEVELOPMENT CODE PURPOSES SHALL NOT PROVIDE A RIGHT TO USE THE FACILITY AS A BAR OR NIGHTCLUB OPERATION.
- A REVISED TRAFFIC IMPACT STUDY, STATING PROPOSED USES, SHALL BE REQUIRED WITH THE SUBMISSION OF A FUTURE APPLICATION FOR A PRELIMINARY DEVELOPMENT PLAN FOR LOT 1 AND LOT 4.
- PRIVATE PARKING ALONG THE GOLF COURSE HOLES WILL BE SCREENED FROM ERRANT GOLF BALLS PER STAFF APPROVAL.
- ROUNDABOUTS WILL NEED TO BE DESIGNED APPROPRIATELY WITH PUBLIC IMPROVEMENT PLANS TO SUPPORT TURNING TRUCK TRAFFIC AND PEDESTRIAN CROSSINGS.
- THE FEATURE POND(S) WILL BE PRIVATELY OWNED AND MAINTAINED. THE LAND OWNER IS RESPONSIBLE FOR THE MAINTENANCE OF THE FEATURE POND(S). FAILURE TO MAINTAIN THE FEATURE POND(S) WILL RESULT IN THE LOSS OF THE STORMWATER DETENTION CREDIT. THE FEATURE POND(S) WILL REMAIN FREE OF ANY NATURAL OR NON-NATURAL STRUCTURES OR VEGETATIVE BARRIERS (INCLUDING BUT NOT LIMITED TO TREES, SHRUBBERY, BERMS, FENCES, AND WALLS).

### LANDSCAPING CALCULATION

	Lot 1	Lot 2A	Lot 2B	Lot 3
Parking Stalls Provided	93	180	131	255
Interior Parking Lot Greenspace Provided (SF)	10,275	7,667	6,366	10,562
Interior Parking Lot Greenspace Required (SF)	3,720	7,200	5,240	10,200
Interior Parking Lot Shrubs Provided	Exst.	56	40	77
Interior Parking Lot Shrubs Required	28	54	40	77
Interior Parking Lot Trees Provided	10	28	16	26
Interior Parking Lot Trees Required	10	18	14	26
Perimeter Parking Lot Frontage (FT)	160	45	306	252
Perimeter Parking Lot Trees Provided	7 (double as street trees)	2	13 (double as street trees)	11
Perimeter Parking Lot Trees Required	7	2	13	11
Crossgate Street Trees Provided	10	31	30	23
Crossgate Street Trees Required	370 L.F. /40=10	1,219 L.F. /40=31	1,188 L.F./40=30	855 L.F./40=22

### SITE SUMMARY:

PROJECT SUMMARY	LOT	CURRENT ZONING	PROPOSED ZONING	CURRENT USE	PROPOSED USE	LAND AREA		PROPOSED UNITS	PROPOSED UNITS PER ACRE
	LOT 1	RM24-PD	RM24-PD	PASSIVE RECREATION	PASSIVE RECREATION	3.41	148,482		
	LOT 2A	RM24-PD	RM24-PD	PASSIVE RECREATION	MULTI DWELLING STRUCTURE	7.90	343,962	168	21.27
	LOT 2B	RM24-PD	RM24-PD	PASSIVE RECREATION	ASSISTED LIVING/ MULTI DWELLING STRUCTURE	7.60	331,087	164	21.58
	LOT 3	RM24-PD	RM24-PD	PASSIVE RECREATION	VARIED USES - SEE TABLE BELOW	14.22	619,263		
	LOT 4	RM24-PD	RM24-PD	PASSIVE RECREATION	PASSIVE RECREATION	17.32	754,588		
	TOTAL					50.44	2,197,382	332	

### SHARED PARKING INFORMATION:

PARKING SUMMARY			APART- MENTS	FITNESS/W ELL-NESS AREA	POOL AREA	GOLF COURSE	BANQUET FACILITY AREA	INDEPEN -DENT/ ASSISTED LIVING	RESTAURANT IN CLUBHOUSE (ACCESSORY)	OUTDOOR GRILLE BY POOL (ACCESSORY)	FUTURE OFFICE	DUPLEX		
	USE CATEGORY		MULTI-D WELLING STRUC- TURE	PERSONAL IMPROVE- MENT/ACT- IVE REC.	PARTICIPANT SPORTS & RECREATION, OUTDOOR	PASSIVE RECREATION	QUALITY & ACCESSORY RESTAURANT [b]	INDEPEN -DENT/ ASSISTED LIVING	FAST ORDER FOOD OR QUALITY RESTAURANT	FAST ORDER FOOD OR QUALITY RESTAURANT	OFFICE	DUPLEX		
	PARKING SPACES REQUIRED		1 PER BDRM (500 BEDS) + 1 PER 10 UNITS (280)[A]	80% @ 1/500 20% @ 1/200 1 PER 200 S.F. (22,700 S.F.)	1 PER 500 S.F. OF CUSTOMER SERVICE AREA (40,000 S.F.)	4 SPACES PER HOLE (27 HOLES) + 20 FOR UNIVERSITY GOLF PRACTICE FACILITY	[D]  1 SPACE PER 3 PERSONS BASED ON MAX OCCU- PANCY OF 400 + 1 PER EMPLOYEE (9)	1 PER INDEPENDENT LIVING UNIT (100) + 0.5 PER ASSISTED LIVING UNIT (0)	1 PER 100 SF OF CUSTOMER SERVICE AREA (3,400 S.F.) PLUS 1 PER EMPLOYEE ON LARGEST SHIFT (10)	1 PER 100 SF OF CUSTOMER SERVICE AREA (1,200 S.F.) PLUS 1 PER EMPLOYEE ON LARGEST SHIFT (5)	1 PER 300 S.F.	1 PER BDRM (12 BEDS)	TOTAL	
			528[A]	59	80	128	126	100	10	5	64	12	1112 [C]	
	PARKING PROVIDED	LOT 1					43	54						97
		LOT 2A	330[A]											330
		LOT 2B	163 [A]						98				12	273
		LOT 3		53	56	72	16		10	5	57			269
		LOT 4												0
		Crossgate	37		16	0 [B]	59[B]	2						114
TOTAL [C]		530 [A]	53 [C]	72 [C]	115 [C]	129 [C]	100	10 [C] [E]	5 [C] [E]	57 [C]	12	1083 [C]		

- A LOT 2A: BLDGS - A, B, C = 168 UNITS - 312 BEDS; INTERIOR PARKING = 150; EXTERIOR PARKING 180; TOTAL = 329 SPACES REQUIRED
- A LOT 2B: BLDGS - F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z = 168 UNITS = 16 SPACES REQUIRED
- A LOT 2B: BLDGS - L, ASSISTED INDEPENDENT LIVING - 100 UNITS - 100 SPACES REQUIRED; DENSITY = (24 STUDIO X .4 = 9.6; 56 - 1 BED UNITS X .4 = 22.4; 20 - 2 BED UNITS X .6 = 12) 100 SPACES REQUIRED
- A LOT 2B: BLDGS - K, 96 UNITS - 172 BEDS; 182 SPACES REQUIRED
- A LOT 2B: DUPLEX D & E - (4 BEDS); DUPLEX F & G - (6 BEDS) = 1 SPACE PER BEDROOM = 12 SPACES REQUIRED
- A ADDITIONAL SPACES ALLOWED FOR GOLF AND BANQUET FACILITY (111 TOTAL) 37 USED FOR APARTMENTS ON 2B
- C OTHER THAN RESIDENTIAL UNITS PARKING HAS BEEN PROVIDED AT 90% OF THE REQUIRED AMOUNT;
- D ANY BANQUETS OVER 354 PEOPLE SHALL BE COORDINATED WITH THE CLOSURE OF SOME OTHER ACTIVITIES IN ORDER TO PROVIDE THE NECESSARY PARKING
- E PARKING FOR EMPLOYEES

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**ALVAMAR LOT 1, 2A, 2B & 3**  
**PRELIMINARY**  
**DEVELOPMENT PLAN**





LAWRENCE, KANSAS

PROJECT # 213-560

RELEASE: 1.0  
DATE: 2.16.16  
1.1



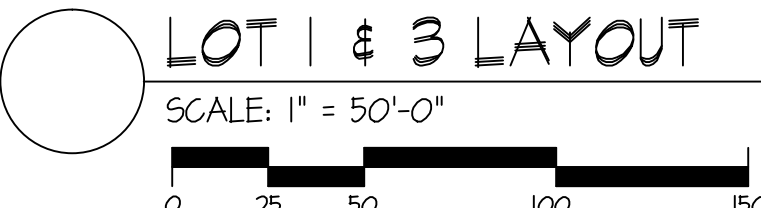
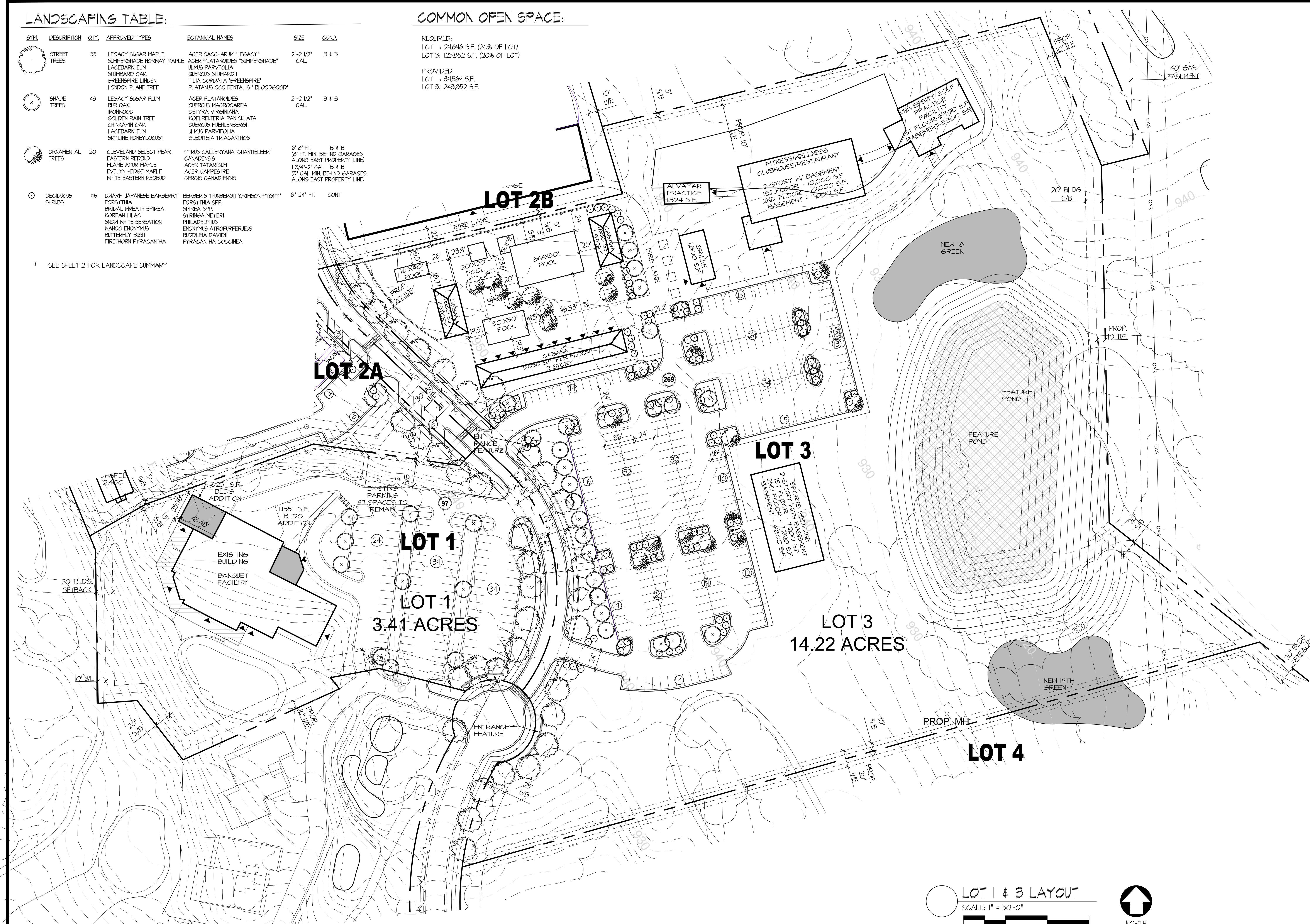
LANDSCAPING TABLE:

SYM	DESCRIPTION	QTY	APPROVED TYPES	BOTANICAL NAMES	SIZE	COND.
	STREET TREES	35	LEGACY SUGAR MAPLE SUMMERSHADE NORWAY MAPLE LACEBARK ELM SHUMBARD OAK GREENSPIRE LINDEN LONDON PLANE TREE	ACER SACCCHARUM "LEGACY" ACER PLATANOIDES "SUMMERSHADE" ULMUS PARVIFOLIA QUERCUS SHUMARDII TILIA CORDATA "GREENSPIRE" PLATANUS OCCIDENTALIS "BLOODGOOD"	2'-2 1/2" CAL.	B & B
	SHADE TREES	43	LEGACY SUGAR PLUM BUR OAK IRONWOOD GOLDEN RAIN TREE GHINIFAPIN OAK LACEBARK ELM SKYLINE HONEYLOCUST	ACER PLATANOIDES QUERCUS MACROCARPA OSTYRA VIRGINIANA KOELREUTERIA PANICULATA QUERCUS MEHLERBERGII ULMUS PARVIFOLIA GLEDITSIA TRIACANTHOS	2'-2 1/2" CAL.	B & B
	ORNAMENTAL TREES	20	CLEVELAND SELECT PEAR EASTERN REDBUD FLAME AMUR MAPLE EVELYN HEDGE MAPLE WHITE EASTERN REDBUD	PYRUS CALLERYANA "GHANTILEER" CANADENSIS ACER TATARICUM ACER CAMPESTRE CERCIS CANADENSIS	6'-8' HT. (8' HT. MIN. BEHIND GARAGES ALONG EAST PROPERTY LINE) 1 3/4"-2" CAL. B & B (3" CAL. MIN. BEHIND GARAGES ALONG EAST PROPERTY LINE)	B & B
	DECIDUOUS SHRUBS	48	DWARF JAPANESE BARBERRY FORSYTHIA BRIDAL WREATH SPIREA KOREAN LILAC PHILADELPHUS SNOW WHITE SENSATION NANO ENONYMUS BUTTERFLY BUSH FIRETHORN PYRACANTHA	BERBERIS THUNBERGII "CRIMSON PYGMY" FORSYTHIA SPP. SPIREA SPP. SYRINGA MEYERI ENONYMUS ATROPURPUREUS BUDLEIA DAVIDII PYRACANTHA COCCINEA	18"-24" HT.	CONT

\* SEE SHEET 2 FOR LANDSCAPE SUMMARY

COMMON OPEN SPACE:

REQUIRED:  
LOT 1 : 24,646 S.F. (20% OF LOT)  
LOT 3: 123,852 S.F. (20% OF LOT)  
  
PROVIDED:  
LOT 1 : 34,564 S.F.  
LOT 3: 243,852 S.F.



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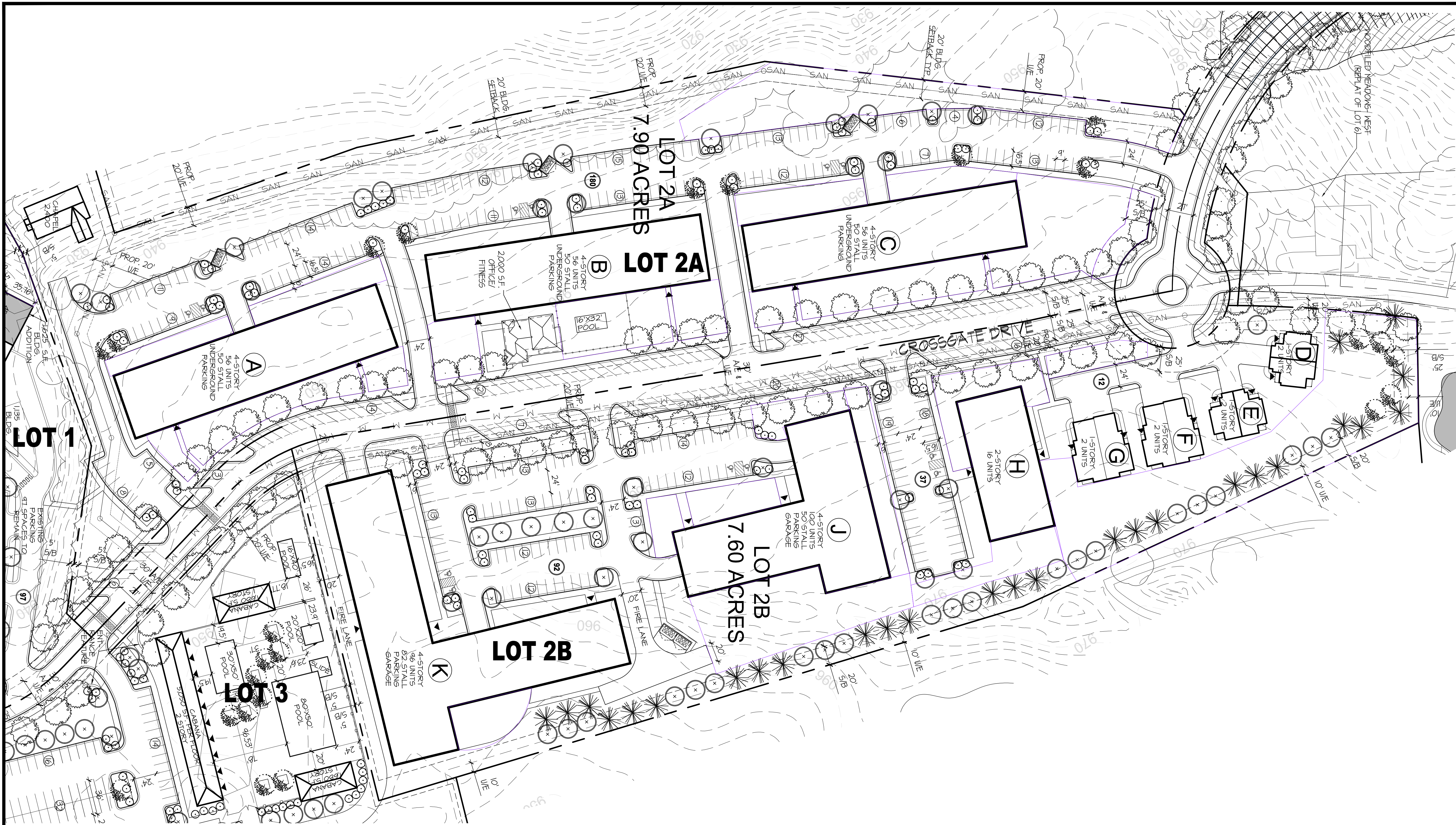
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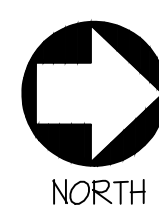
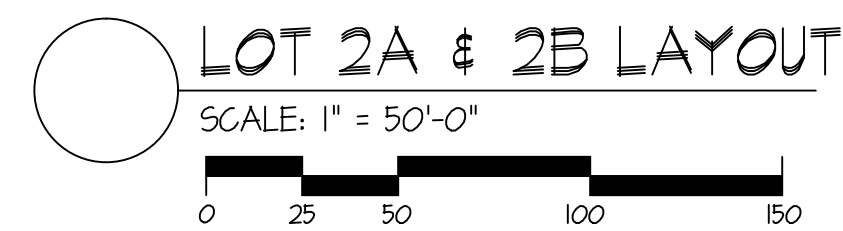
LANDSCAPING TABLE:

SYM.	DESCRIPTION	QTY.	APPROVED TYPES	BOTANICAL NAMES	SIZE	COND.	ORNAMENTAL TREES	14
	STREET TREES	63	LEGACY SUGAR MAPLE SUMMER SHADE NORWAY MAPLE LACEBARK ELM SHUMBARD OAK GREENSPIRE LINDEN LONDON PLANE TREE	ACER SACCCHARUM 'LEGACY' ACER PLATANOIDES 'SUMMER SHADE' ULMUS PARVIFOLIA QUERCUS SHUMARDII TILIA CORDATA 'GREENSPIRE' PLATANUS OCCIDENTALIS 'BLOODGOOD'	2"-2 1/2" CAL.	B & B		CLEVELAND SELECT PEAR EASTERN REDBUD FLAME AMUR MAPLE EVELYN HEDGE MAPLE WHITE EASTERN REDBUD
	SHADE TREES	51	LEGACY SUGAR PLUM BUR OAK IRONWOOD GOLDEN RAIN TREE CHINKAPIN OAK LACEBARK ELM SKYLINE HONEYLOCUST	ACER PLATANOIDES QUERCUS MACROCARPA OSTYRA VIRGINIANA KOELREUTERIA PANICULATA QUERCUS MUEHLBERGII ULMUS PARVIFOLIA GLEDITSIA TRIACANTHOS	2"-2 1/2" CAL.	B & B		PYRUS CALLERYANA 'CHANTIELEER' CANADENSIS ACER TATARICUM ACER CAMPESTRE CERCIS CANADENSIS
	EVERGREEN TREES	27	EASTERN RED CEDAR VANDERWOLF LIMBER PINE WHITE PINE	JUNIPERUS VIRGINIANA PINUS FLEXILIS PINUS STROBUS				(8' HT. MIN. BEHIND GARAGES ALONG EAST PROPERTY LINE) 1 3/4"-2" CAL. B & B (8" CAL. MIN. BEHIND GARAGES ALONG EAST PROPERTY LINE)
	DECIDUOUS SHRUBS	43	DWARF JAPANESE BARBERRY FORSYTHIA BRIDAL WREATH SPIREA KOREAN LILAC SNOW WHITE SENSATION WAKOO ENONYMUS BUTTERFLY BUSH FIRETHORN PYRACANTHA	BERBERIS THUNBERGII 'CRIMSON PYGMY' FORSYTHIA SPP. SPIREA SPP. SYRINGA MEYERI PHILADELPHUS ENONYMUS ATROPURPUREUS BUDDLEIA DAVIDII PYRACANTHA COCCINEA	10"-24" HT.	CONT		

COMMON OPEN SPACE:

REQUIRED:  
LOT 2A : 68,792 S.F. (20% OF LOT)  
LOT 3: 66,217 S.F. (20% OF LOT)

PROVIDED  
LOT 2A : 14,584 S.F.  
LOT 2B: 11,688 S.F.



paulwerner  
ARCHITECTS

123 W. 8TH STREET  
SUITE B2  
LAWRENCE, KS 66044

OFFICE: 785.832.0804  
FAX: 785.832.0890  
INFO@PAULWERNERARCHITECTS.COM

BUILDER:  
GENE FRITZEL CONSTRUCTION  
643 MASSACHUSETTS  
SUITE 300  
LAWRENCE, KS 66044  
OFFICE: 785.841.6355  
FAX: 785.841.6342

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WERNER ARCHITECTS, L.L.C.

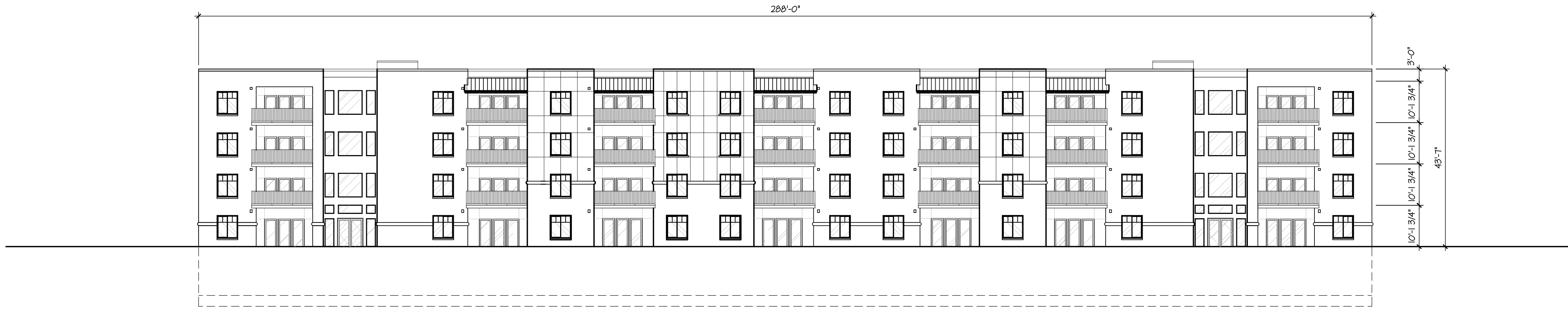
ALVAMAR LOT 1, 2A, 2B & 3  
PRELIMINARY  
DEVELOPMENT PLAN

LAWRENCE, KANSAS

PROJECT # 213-560

RELEASE: 1.0 DATE: 2.16.16  
1.1 3.01.16

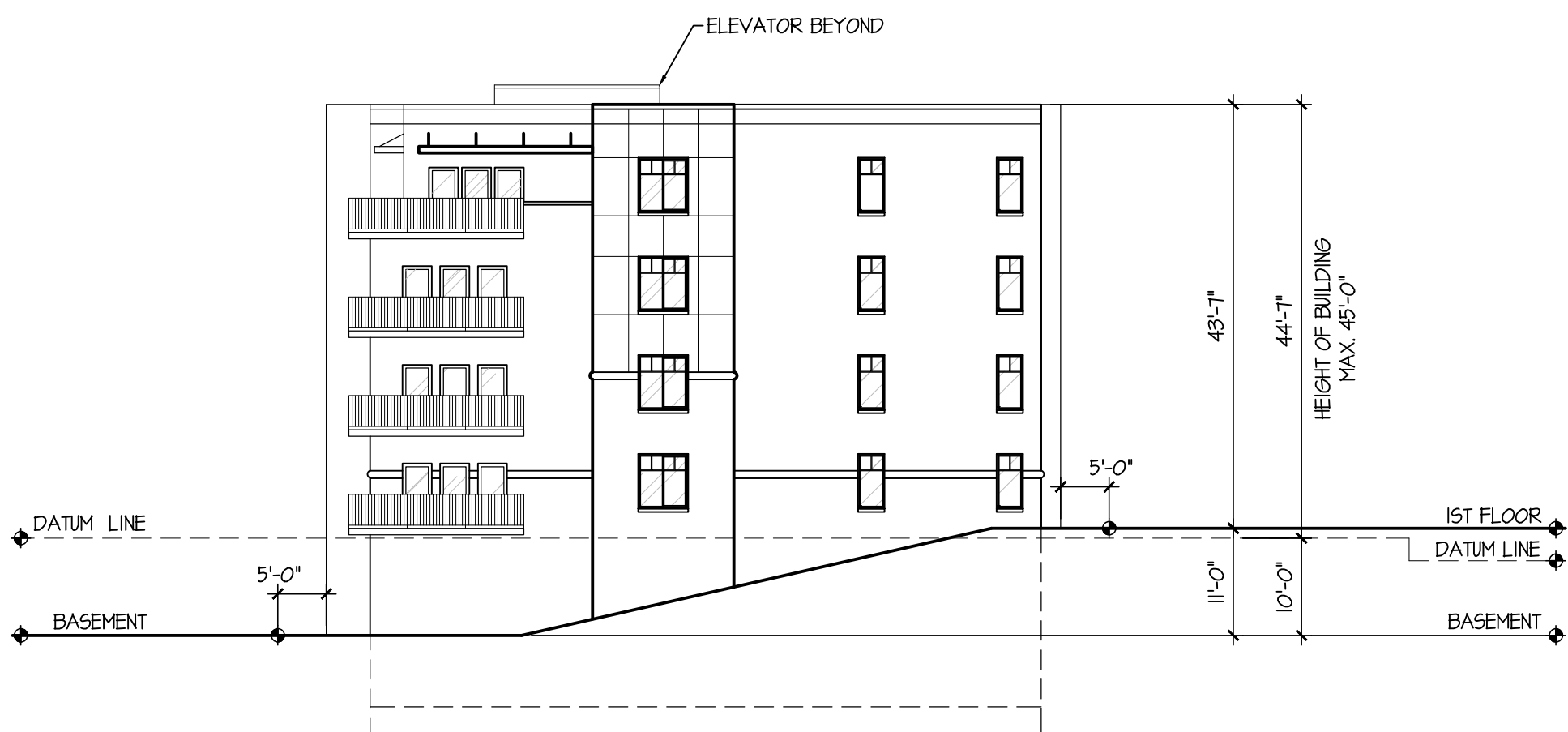




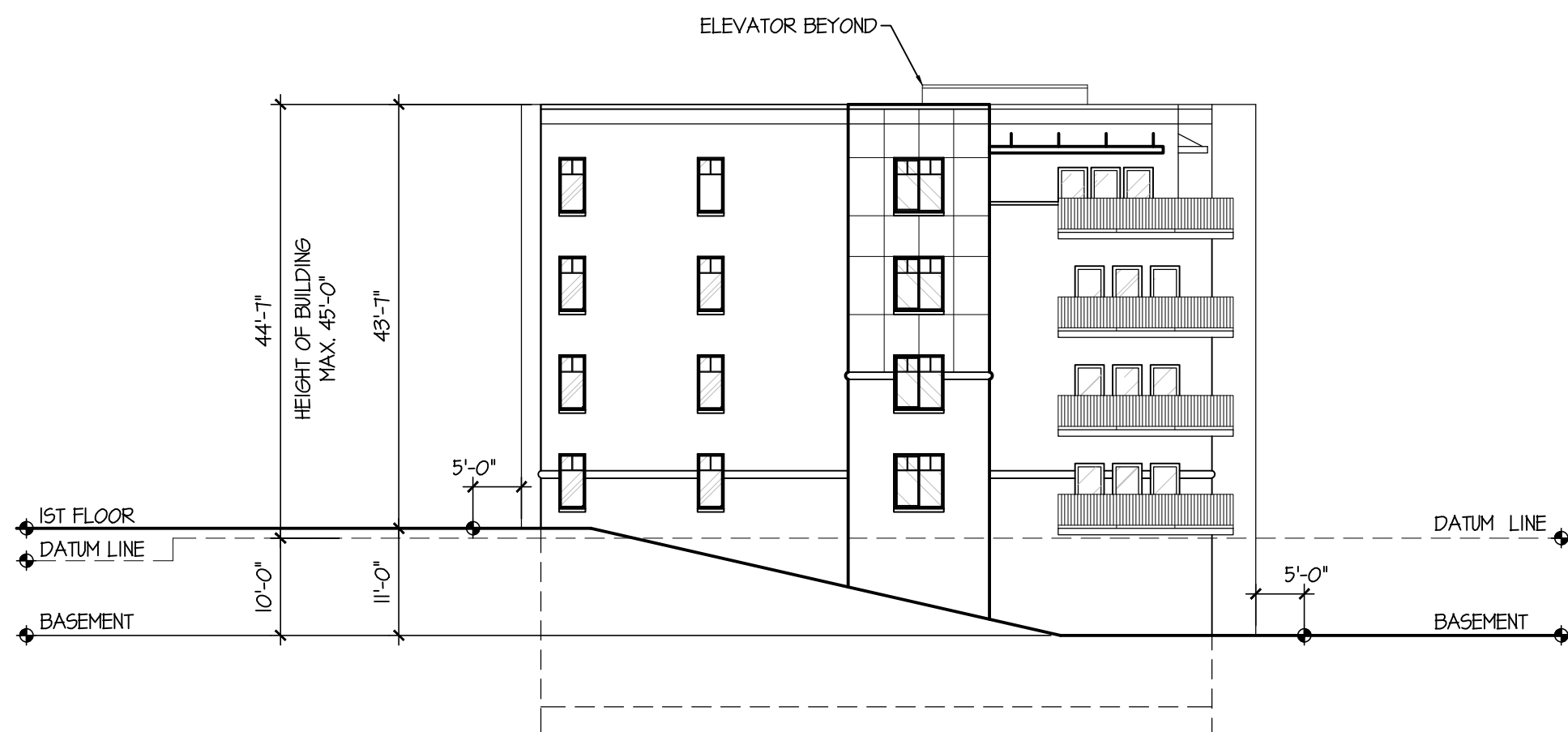
1 EAST ELEVATION, CROSSGATE  
SCALE: 1/16" = 1'- 0"



1 WEST ELEVATION  
SCALE: 1/16" = 1'- 0"



1 SOUTH ELEVATION  
SCALE: 1/16" = 1'- 0"



1 NORTH ELEVATION  
SCALE: 1/16" = 1'- 0"

1 APARTMENT BUILDINGS 'A' 'B' 'C', LOT 2A  
SCALE: 1/16" = 1'- 0"



1 APARTMENT BUILDING  
SOUTH ELEVATION, POOLSIDE  
SCALE: 1/16" = 1'- 0"

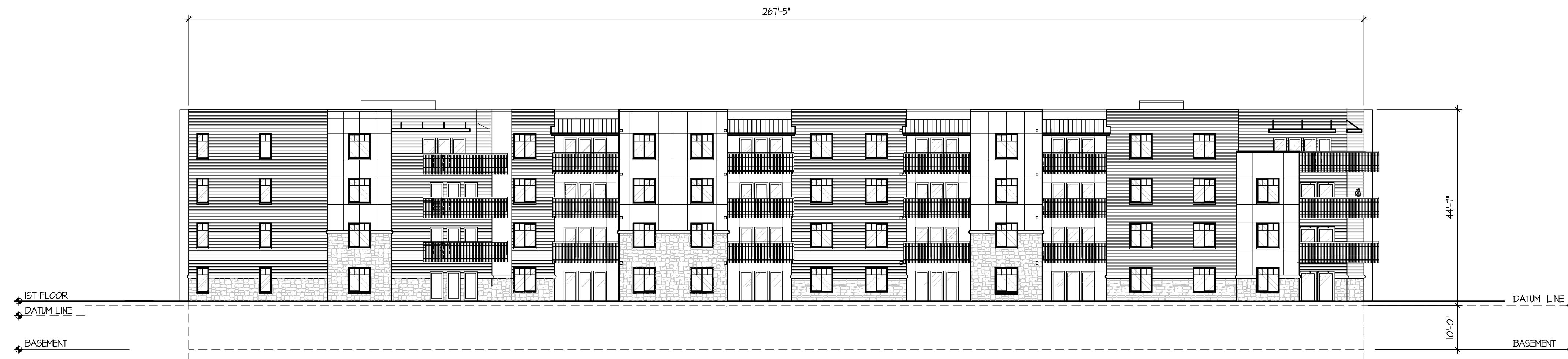


1 APARTMENT BUILDING  
WEST ELEVATION, CROSSGATE  
SCALE: 1/16" = 1'- 0"



1 APARTMENT BUILDING  
NORTH ELEVATION  
SCALE: 1/16" = 1'- 0"

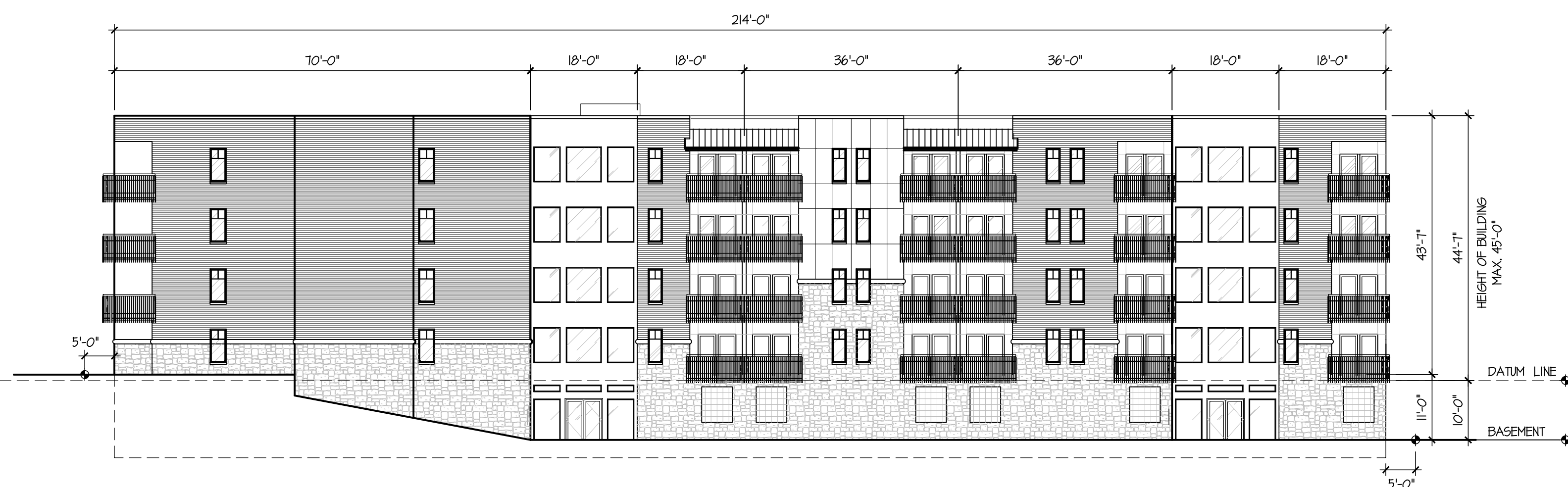
1 APARTMENT BUILDINGS 'K', LOT 2B  
SCALE: 1/16" = 1'- 0"



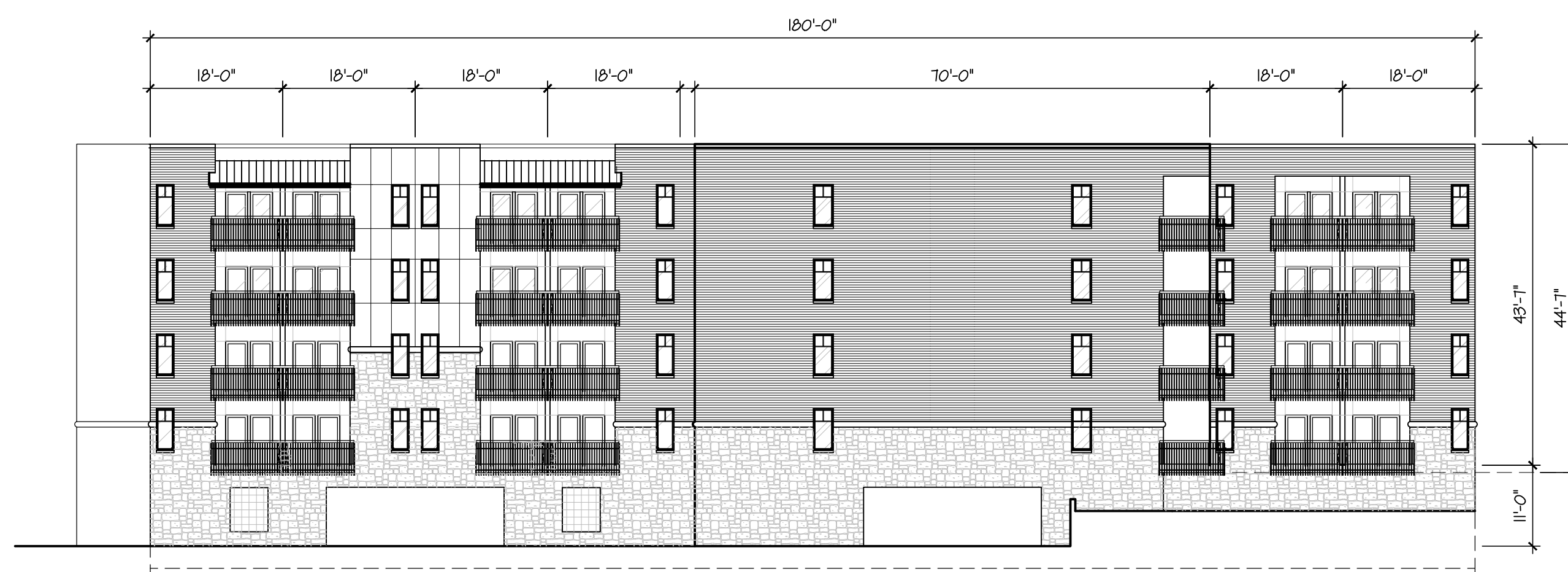
**APARTMENT BUILDING 'K'  
EAST ELEVATION, GOLF COURSE**  
SCALE: 1/16" = 1'- 0"



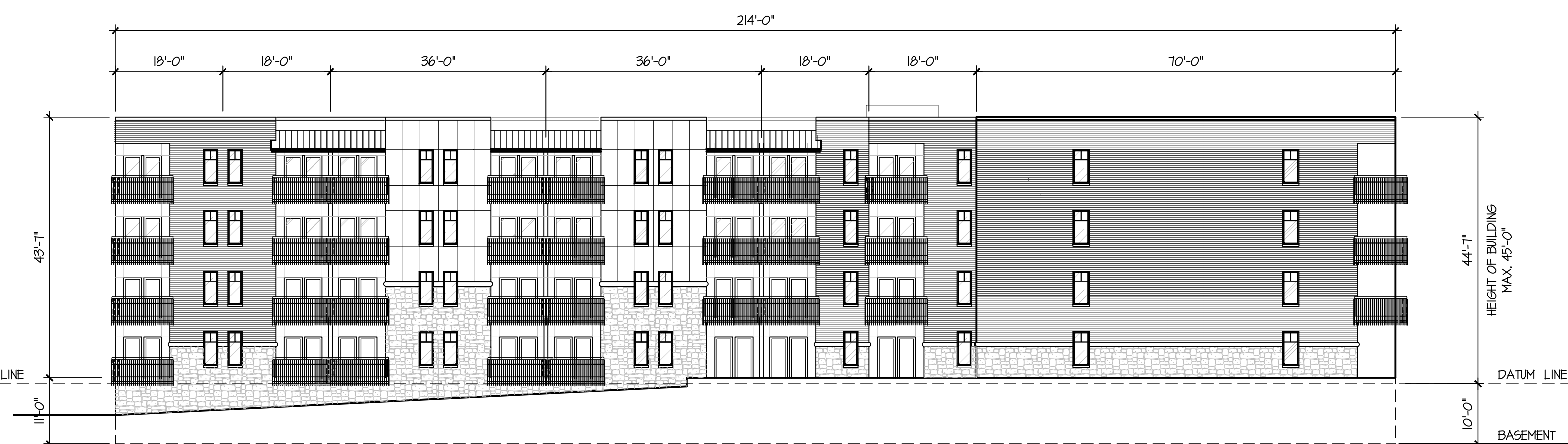
**INDEPENDENT LIVING BUILDING  
NORTH ELEVATION**  
SCALE: 1/16" = 1'- 0"



**INDEPENDENT LIVING BUILDING  
WEST ELEVATION, CROSSGATE**  
SCALE: 1/16" = 1'- 0"



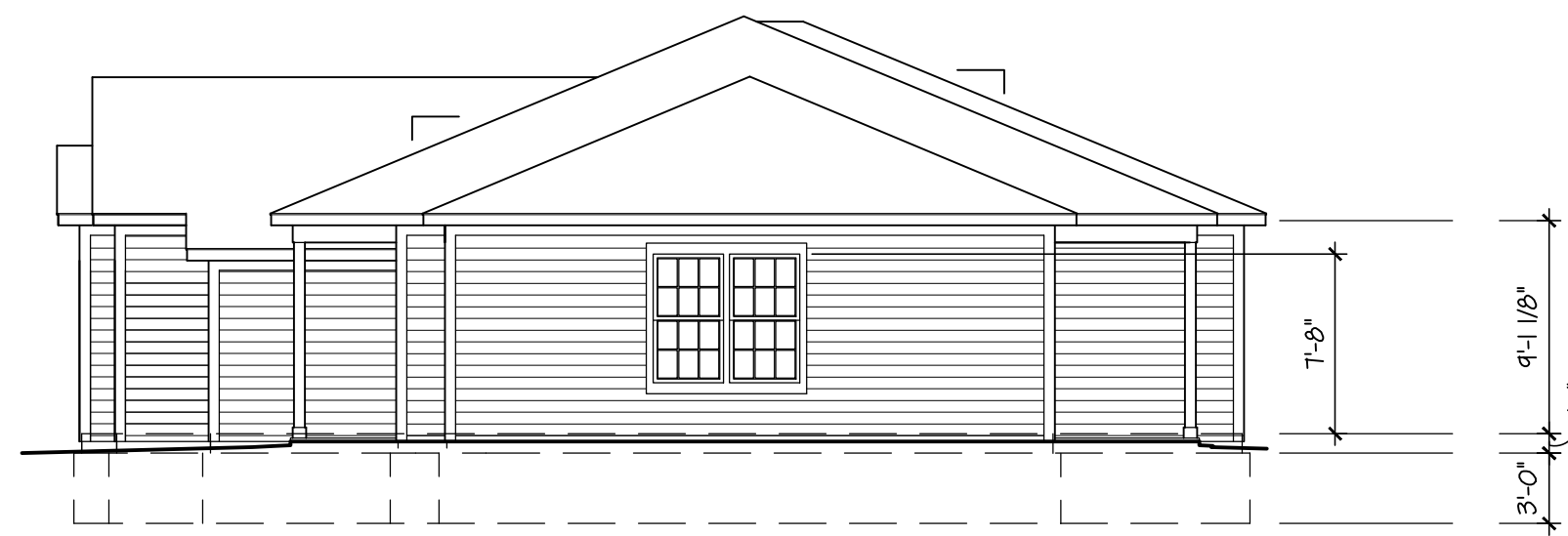
**INDEPENDENT LIVING BUILDING  
SOUTH ELEVATION**  
SCALE: 1/16" = 1'- 0"



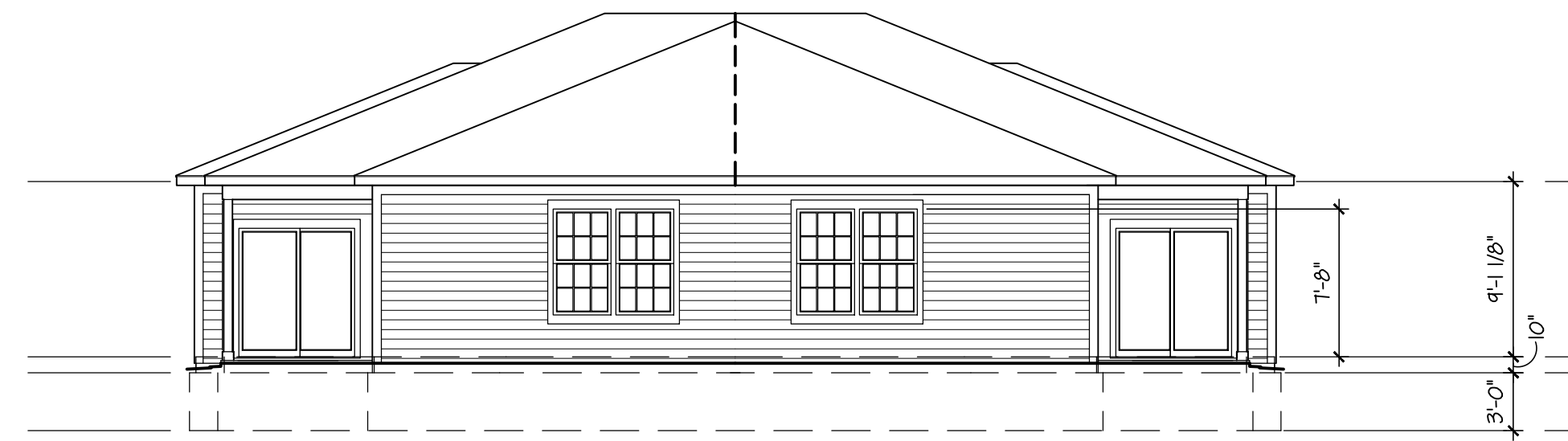
**INDEPENDENT LIVING BUILDING  
EAST ELEVATION, GOLF COURSE**  
SCALE: 1/16" = 1'- 0"

**APARTMENT BUILDINGS 'J' 'K', LOT 2B**  
SCALE: 1/16" = 1'- 0"

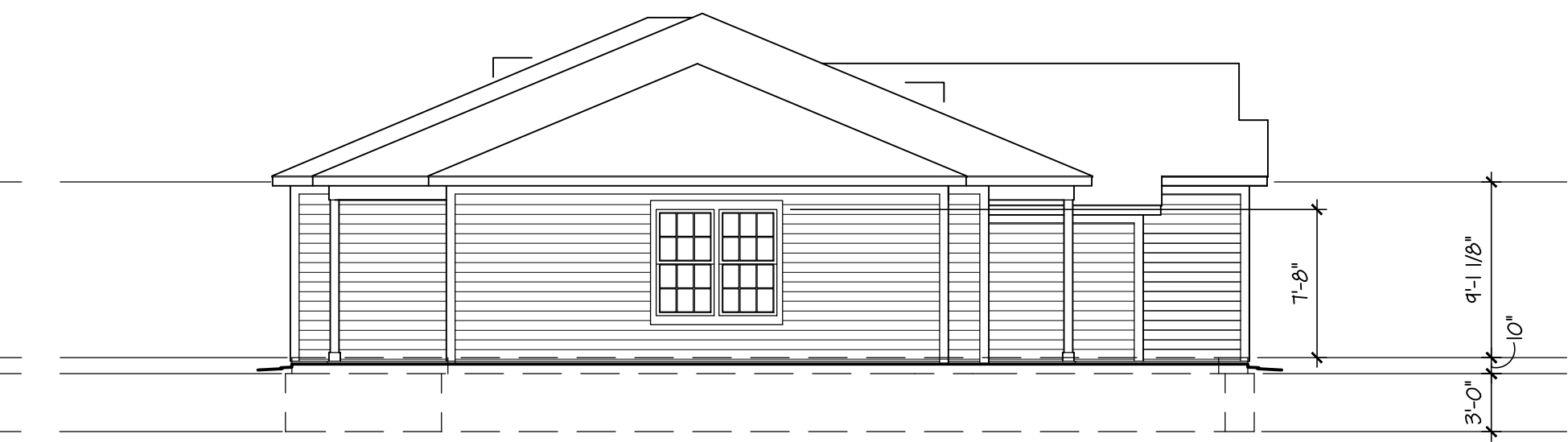




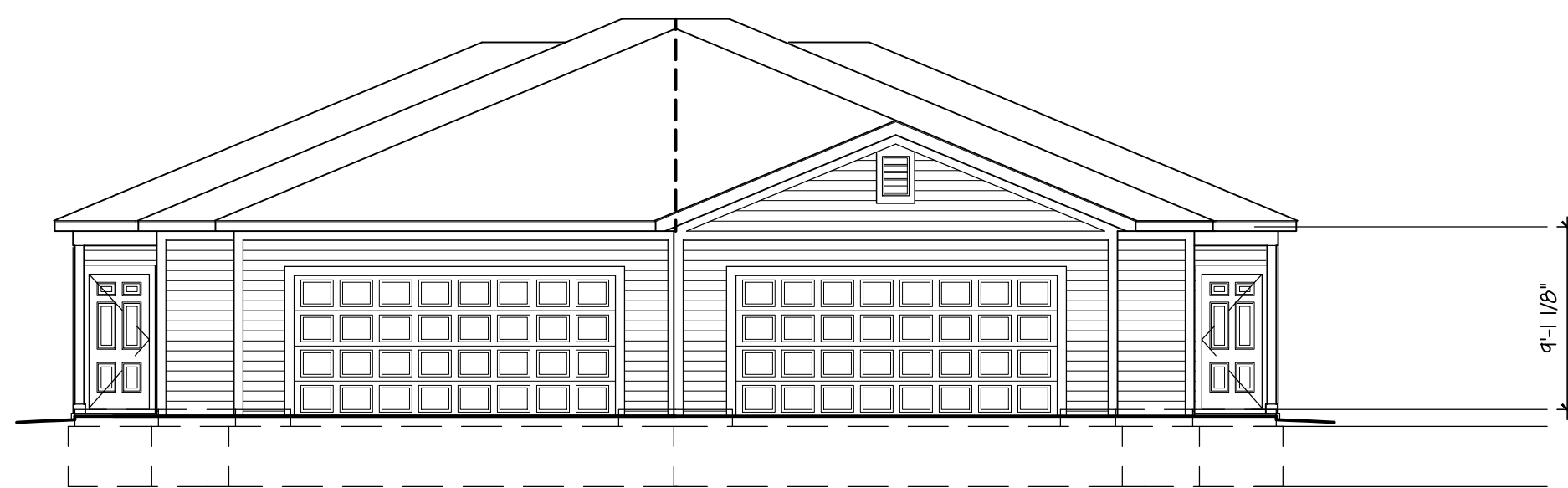
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LEFT SIDE ELEVATION  
SCALE: 1/8" = 1'- 0"



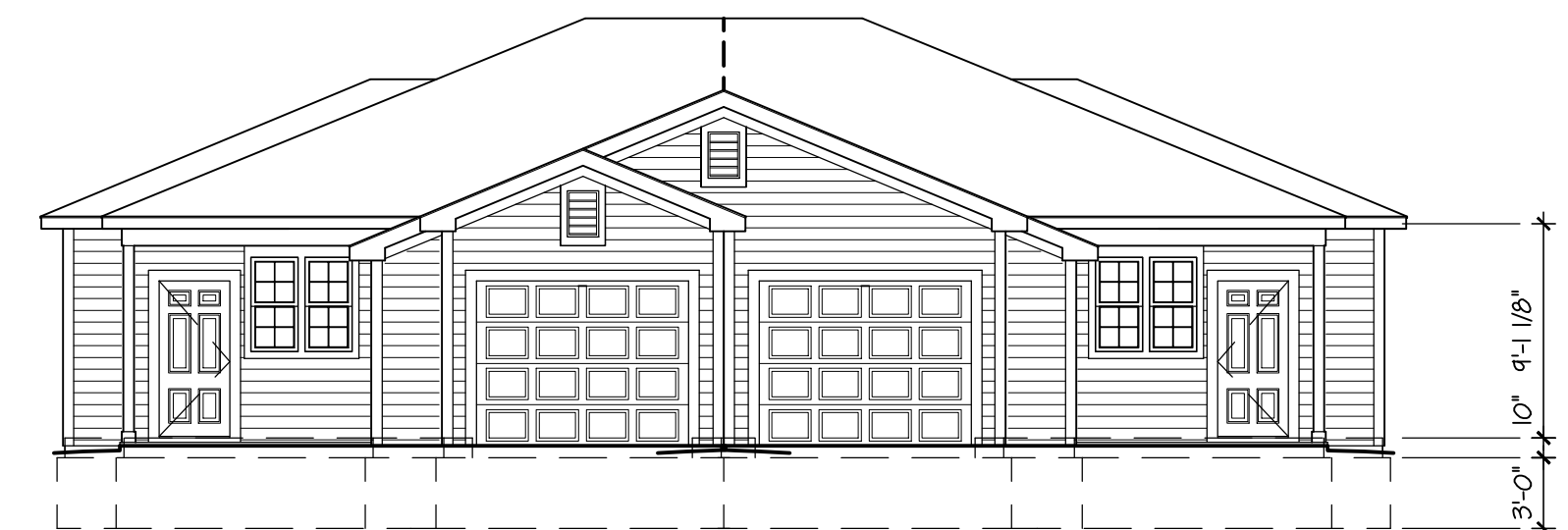
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REAR ELEVATION  
SCALE: 1/8" = 1'- 0"



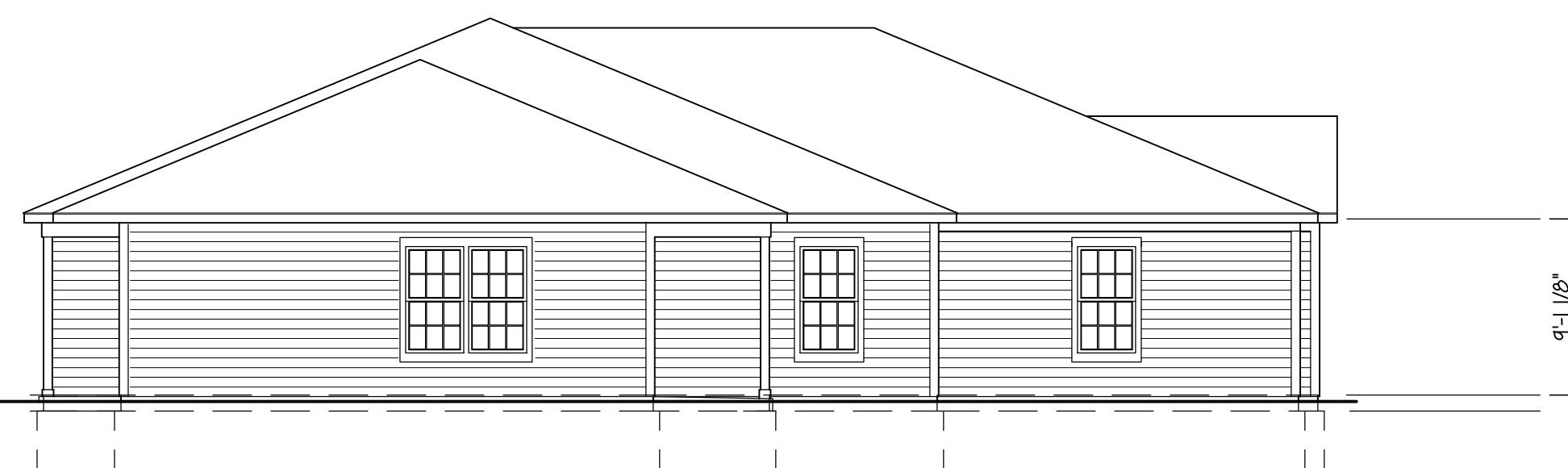
1-BEDROOM DUPLEX, 'D', 'E'  
RIGHT SIDE ELEVATION  
SCALE: 1/8" = 1'- 0"



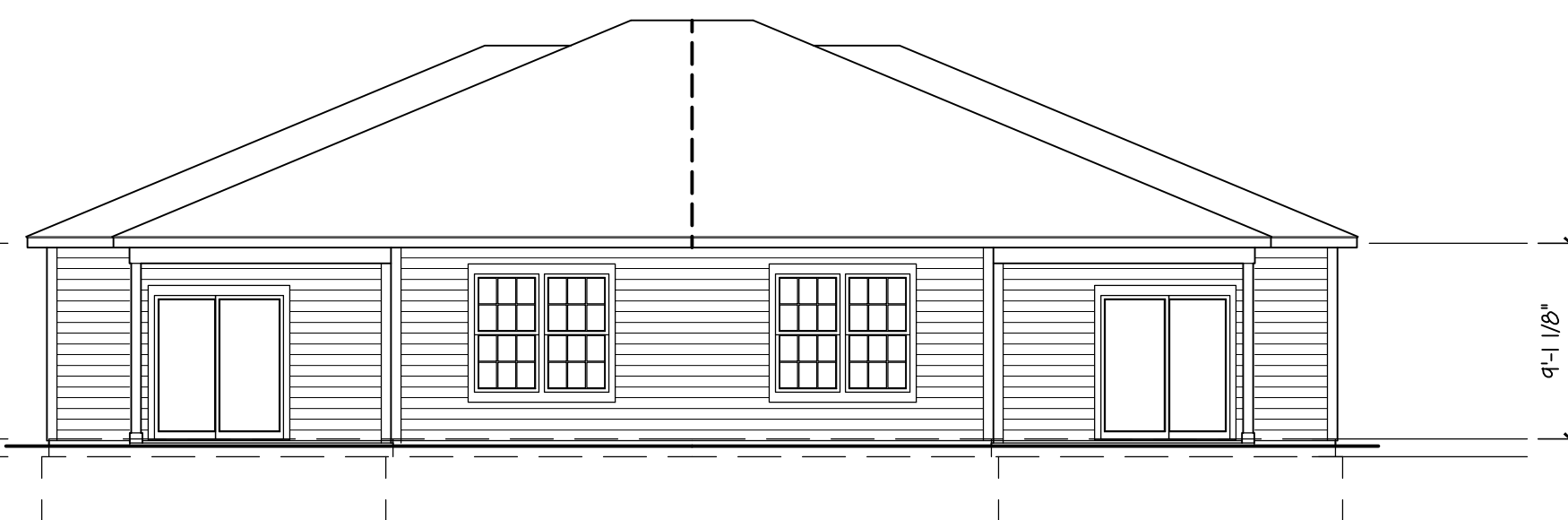
2-BEDROOM DUPLEX, 'F', 'G'  
FRONT ELEVATION  
SCALE: 1/8" = 1'- 0"



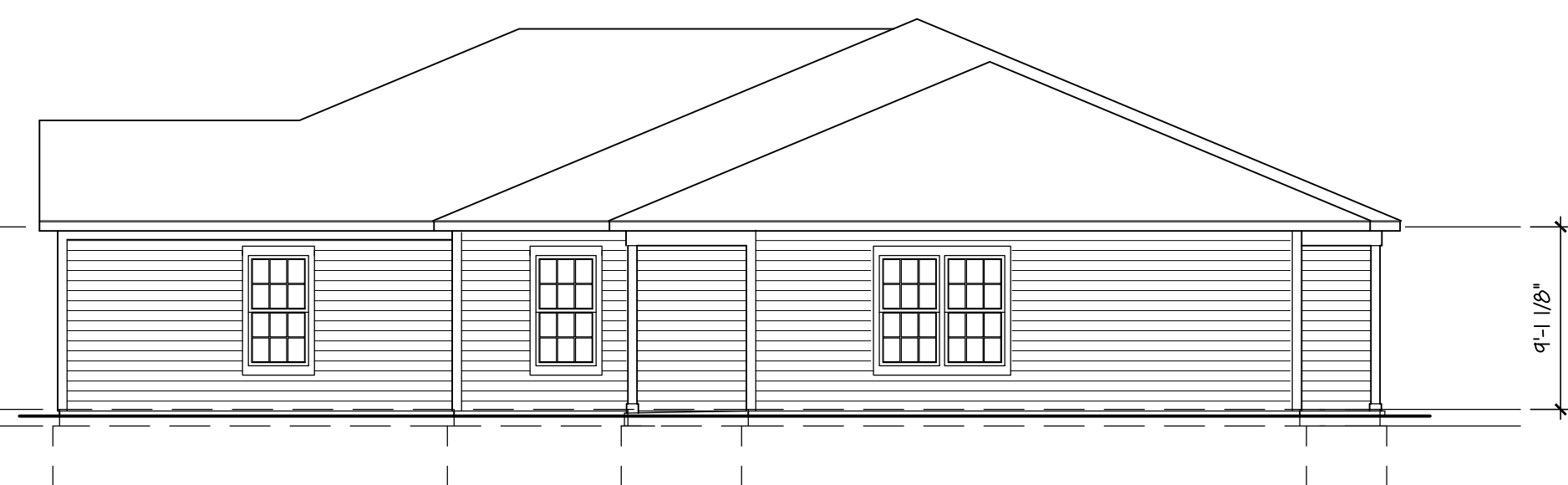
1-BEDROOM DUPLEX, 'D', 'E'  
FRONT ELEVATION  
SCALE: 1/8" = 1'- 0"



2-BEDROOM DUPLEX, 'F', 'G'  
LEFT SIDE ELEVATION  
SCALE: 1/8" = 1'- 0"



2-BEDROOM DUPLEX, 'F', 'G'  
REAR ELEVATION  
SCALE: 1/8" = 1'- 0"



2-BEDROOM DUPLEX, 'F', 'G'  
RIGHT SIDE ELEVATION  
SCALE: 1/8" = 1'- 0"





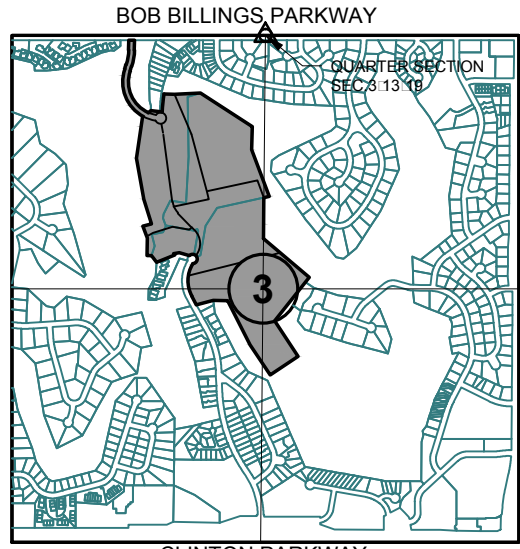


FILE NAME: T:\20142015\CAD\Planning\FP\Alvamar FP.dwg LAST SAVED BY: Mitch Walthers SAVED DATE: 2/23/2016 11:16 AM PLOTTED: 2/23/2016 3:18 PM

CURVE TABLE				
CURVE	LENGTH	RADIUS	CHORD	BEARING
C1	83.42'	350.00'	83.23'	S75° 03' 28"E
C2	314.00'	60.00'	60.14'	S3° 52' 04"W
C3	74.32'	60.00'	69.66'	S69° 25' 44"W
C4	9.96'	1628.92'	9.96'	S0° 33' 16"W
C5	161.19'	60.00'	116.91'	N1° 52' 33"E
C6	78.49'	60.00'	73.01'	S63° 41' 07"E
C7	135.09'	410.00'	134.48'	S73° 04' 08"E
C8	129.33'	200.00'	127.09'	S27° 55' 48"E
C9	48.60'	200.00'	48.48'	S16° 21' 57"E
C10	80.73'	200.00'	80.19'	S34° 53' 28"E
C11	290.41'	200.00'	265.56'	N4° 51' 28"W
C12	75.03'	50.00'	68.19'	S89° 09' 52"W
C13	117.25'	50.00'	92.17'	N19° 20' 07"E
C14	131.91'	333.16'	131.05'	S18° 31' 42"W
C15	219.72'	333.16'	215.76'	S11° 42' 28"E
C16	20.39'	413.50'	20.38'	N10° 49' 02"W
C17	241.30'	1618.92'	241.08'	S3° 03' 13"W

LINE TABLE		
LINE NO.	LENGTH	BEARING
L1	110.00'	S51° 01' 46"W
L2	429.25'	S6° 35' 09"W
L3	431.68'	S11° 54' 15"E
L4	275.26'	S19° 27' 37"E
L5	98.89'	S69° 28' 51"E
L6	114.07'	N71° 35' 18"E
L7	84.92'	S81° 53' 23"E
L8	124.44'	N38° 59' 43"E
L9	80.46'	N52° 39' 27"W
L10	129.38'	N34° 18' 58"W
L11	333.08'	N9° 12' 24"W
L12	60.87'	N5° 09' 23"W
L13	248.24'	N10° 56' 20"W

LOCATION MAP:



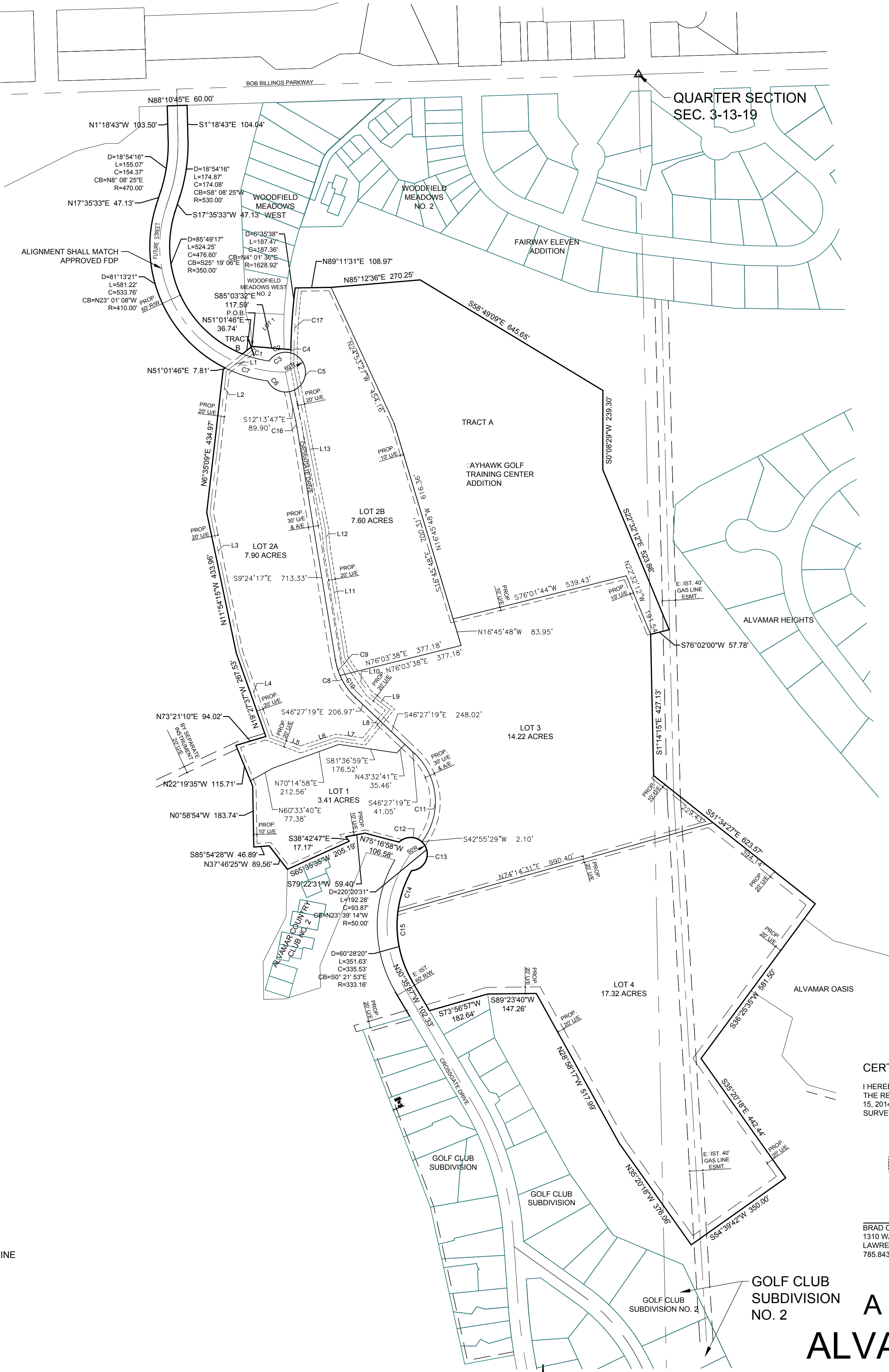
SEC. 3-13-19  
CITY OF LAWRENCE  
DOUGLAS COUNTY, KANSAS  
NOT TO SCALE

MONUMENTATION:

- SECTION CORNER
- SET 1/2" = 24" REBAR W / "PLS 889" CAP

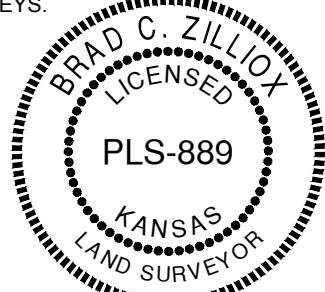
LEGEND:

- PLAT LINE
- PROPOSED DIVISION LINE
- SECTION LINE
- STREET CENTERLINE
- R/W RIGHT-OF-WAY
- U/E UTILITY EASEMENT
- A/E ACCESS EASEMENT



CERTIFICATION:

I HEREBY CERTIFY THAT THE PLATTED AREA AND THE LOCATION MAP SHOWN HEREON ARE THE RESULTS OF A FIELD SURVEY PERFORMED UNDER MY DIRECT SUPERVISION SEPTEMBER 15, 2014. THIS SURVEY CONFORMS TO THE KANSAS MINIMUM STANDARDS FOR BOUNDARY SURVEYS.



BRAD C. ILLIO, P.L.S., 889  
1310 WAKARUSA DRIVE, SUITE 100  
LAWRENCE, KS 66049  
785.843.7530

GOLF CLUB  
SUBDIVISION  
NO. 2

# A FINAL PLAT OF ALVAMAR INC ONE ADDITION

A TRACT OF LAND LYING IN SECTION 3, TOWNSHIP  
13 SOUTH, RANGE EAST OF THE SIXTH PRINCIPAL  
MERIDIAN, IN THE CITY OF LAWRENCE,  
DOUGLAS COUNTY, KANSAS

LEGAL DESCRIPTION:

A TRACT OF LAND LYING IN SECTION 3, TOWNSHIP 13 SOUTH, RANGE 19 EAST OF THE SIXTH PRINCIPAL MERIDIAN, IN THE CITY OF LAWRENCE, DOUGLAS COUNTY, KANSAS, AND BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWESTERLY CORNER OF LOT 1, WOODFIELD MEADOWS WEST NO. 2, A SUBDIVISION IN THE CITY OF LAWRENCE, AS RECORDED IN PLAT BOOK 15, PAGE 168 IN THE OFFICE OF THE DOUGLAS COUNTY REGISTER OF DEEDS; THENCE SOUTH 85°03'32" EAST ALONG THE SOUTHERLY LINE OF SAID LOT 1, A DISTANCE OF 117.59 FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 1628.92 FEET, AN ARC LENGTH OF 167.47 FEET; AN ARC LENGTH OF 167.36 FEET ON A BEARING OF NORTH 04°01'36" EAST, AND A DELTA OF 8°35'38"; THENCE NORTH 89°11'31" EAST, A DISTANCE OF 108.97 FEET; THENCE NORTH 85°12'36" EAST, A DISTANCE OF 270.25 FEET; THENCE SOUTH 58°49'09" EAST, A DISTANCE OF 645.65 FEET; THENCE SOUTH 0°08'29" WEST, A DISTANCE OF 239.30 FEET; THENCE SOUTH 22°32'12" EAST, A DISTANCE OF 523.86 FEET; THENCE SOUTH 76°02'00" WEST, A DISTANCE OF 57.78 FEET; THENCE SOUTH 1°14'15" EAST, A DISTANCE OF 427.13 FEET; THENCE SOUTH 51°34'27" EAST, A DISTANCE OF 623.57 FEET; THENCE SOUTH 36°25'35" WEST, A DISTANCE OF 581.50 FEET; THENCE SOUTH 35°20'18" EAST, A DISTANCE OF 442.44 FEET; THENCE SOUTH 54°39'42" WEST, A DISTANCE OF 350.00 FEET; THENCE NORTH 35°20'18" WEST, A DISTANCE OF 376.06 FEET; THENCE NORTH 28°58'17" WEST, A DISTANCE OF 517.99 FEET; THENCE SOUTH 89°23'40" WEST, A DISTANCE OF 147.26 FEET; THENCE SOUTH 73°56'57" WEST, A DISTANCE OF 182.64 FEET; THENCE NORTH 30°35'57" WEST, A DISTANCE OF 102.33 FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 333.16 FEET, AN ARC LENGTH OF 351.63 FEET, A CHORD LENGTH OF 335.53 FEET ON A BEARING OF NORTH 19°21'53" EAST, AND A DELTA OF 60°28'20"; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 50.00 FEET, AN ARC LENGTH OF 192.28 FEET, A CHORD LENGTH OF 93.87 FEET ON A BEARING OF NORTH 23°39'14" WEST, AND A DELTA OF 22°20'31"; THENCE NORTH 75°16'58" WEST, A DISTANCE OF 106.58 FEET; THENCE SOUTH 79°22'31" WEST, A DISTANCE OF 59.40 FEET; THENCE SOUTH 38°42'47" EAST, A DISTANCE OF 17.17 FEET; THENCE SOUTH 65°35'35" WEST, A DISTANCE OF 205.19 FEET; THENCE NORTH 37°46'25" WEST, A DISTANCE OF 89.56 FEET; THENCE SOUTH 85°54'28" WEST, A DISTANCE OF 46.89 FEET; THENCE NORTH 0°58'54" WEST, A DISTANCE OF 183.74 FEET; THENCE NORTH 22°19'35" WEST, A DISTANCE OF 115.71 FEET; THENCE NORTH 73°21'10" EAST, A DISTANCE OF 94.02 FEET; THENCE NORTH 19°27'37" WEST, A DISTANCE OF 267.53 FEET; THENCE NORTH 11°54'15" WEST, A DISTANCE OF 433.96 FEET; THENCE NORTH 6°35'09" EAST, A DISTANCE OF 434.97 FEET; THENCE NORTH 51°01'46" EAST, A DISTANCE OF 7.81 FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 410.00 FEET, AN ARC LENGTH OF 581.22 FEET, A CHORD LENGTH OF 533.76 FEET ON A BEARING OF NORTH 23°01'08" WEST, AND A DELTA OF 81°13'21"; THENCE NORTH 17°39'33" EAST, A DISTANCE OF 47.13 FEET; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 470.00 FEET, AN ARC LENGTH OF 155.07 FEET, A CHORD LENGTH OF 154.37 FEET ON A BEARING OF NORTH 8°08'25" EAST, AND A DELTA OF 18°54'16"; THENCE NORTH 1°18'43" WEST, A DISTANCE OF 103.50 FEET TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY LINE OF BOB BILLINGS PARKWAY; THENCE NORTH 88°10'45" EAST ALONG THE SOUTHERLY RIGHT-OF-WAY LINE OF BOB BILLINGS PARKWAY, A DISTANCE OF 60.00 FEET; THENCE SOUTH 1°18'43" EAST, A DISTANCE OF 104.04 FEET; THENCE ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 530.00 FEET, AN ARC LENGTH OF 174.87 FEET, A CHORD LENGTH OF 174.08 FEET ON A BEARING OF SOUTH 8°08'25" WEST, AND A DELTA OF 18°54'16"; THENCE SOUTH 17°35'33" WEST, A DISTANCE OF 47.13 FEET; THENCE ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 350.00 FEET, AN ARC LENGTH OF 524.25 FEET, A CHORD LENGTH OF 476.80 FEET ON A BEARING OF SOUTH 25°19'06" EAST, AND A DELTA OF 85°49'17"; THENCE NORTH 51°01'46" EAST, A DISTANCE OF 36.74 FEET TO THE POINT OF BEGINNING. CONTAINING 2,819,227 SQUARE FEET OR 64.72 ACRES, MORE OR LESS.

DEDICATION:

BE IT KNOWN TO ALL MEN THAT I (WE), THE UNDERSIGNED OWNER(S) OF THE ABOVE DESCRIBED TRACT OF LAND, HAVE HAD CAUSE FOR THE SAME TO BE SURVEYED AND PLATTED UNDER THE NAME OF "ALVAMAR INC ONE ADDITION" AND HAVE CAUSED THE SAME TO BE SUBDIVIDED INTO LOTS AND STREETS AS SHOWN AND FULLY DEFINED ON THIS PLAT. ALL STREETS, DRIVES, ROADS, ETC. SHOWN ON THIS PLAT AND NOT HERETOFORE DEDICATED TO PUBLIC USE ARE HEREBY SO DEDICATED. AN EASEMENT IS HEREBY GRANTED TO THE CITY OF LAWRENCE AND PUBLIC UTILITY COMPANIES TO ENTER UPON, CONSTRUCT AND MAINTAIN UTILITIES UPON, OVER, AND UNDER THOSE AREAS OUTLINED ON THIS PLAT AS "UTILITY EASEMENT" OR "U/E".

THOMAS S. FRIT, EL, TRUSTEE OF THE THOMAS S. FRIT, EL, REVOCABLE TRUST U.T.D.  
STACIA D. FRIT, EL (AK/A DRU S. FRIT, EL, TRUSTEE OF THE THOMAS S. FRIT, EL, REVOCABLE TRUST U.T.D.  
THOMAS S. FRIT, EL, MEMBER EAGLE 1968, L.C.

ACKNOWLEDGEMENT:

STATE OF KANSAS  
COUNTY OF DOUGLAS

BE IT REMEMBERED THAT ON THIS \_\_\_\_ DAY OF \_\_\_\_, 2016, BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, IN AND FOR SAID COUNTY AND STATE, CAME ROBERT THOMAS S. FRIT, EL, TRUSTEE OF THE THOMAS S. FRIT, EL, REVOCABLE TRUST U.T.D., WHO IS (ARE) PERSONALLY KNOWN TO ME TO BE THE SAME PERSON(S) WHO EXECUTED THE FOREGOING INSTRUMENT OF WRITING AND DULY ACKNOWLEDGE THE EXECUTION OF THE SAME.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND AND AFFIXED MY SEAL ON THE DAY AND YEAR LAST WRITTEN ABOVE.

NOTARY PUBLIC MY COMMISSION EXPIRES

ACKNOWLEDGEMENT:

STATE OF KANSAS  
COUNTY OF DOUGLAS

BE IT REMEMBERED THAT ON THIS \_\_\_\_ DAY OF \_\_\_\_, 2016, BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, IN AND FOR SAID COUNTY AND STATE, CAME STACIA D. FRIT, EL (AK/A DRU S. FRIT, EL, TRUSTEE OF THE THOMAS S. FRIT, EL, REVOCABLE TRUST U.T.D., WHO IS (ARE) PERSONALLY KNOWN TO ME TO BE THE SAME PERSON(S) WHO EXECUTED THE FOREGOING INSTRUMENT OF WRITING AND DULY ACKNOWLEDGE THE EXECUTION OF THE SAME.

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ACKNOWLEDGEMENT:

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COUNTY OF DOUGLAS

BE IT REMEMBERED THAT ON THIS \_\_\_\_ DAY OF \_\_\_\_, 2016, BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, IN AND FOR SAID COUNTY AND STATE, CAME ROBERT THOMAS S. FRIT, EL, MEMBER EAGLE 1968, L.C., WHO IS (ARE) PERSONALLY KNOWN TO ME TO BE THE SAME PERSON(S) WHO EXECUTED THE FOREGOING INSTRUMENT OF WRITING AND DULY ACKNOWLEDGE THE EXECUTION OF THE SAME.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND AND AFFIXED MY SEAL ON THE DAY AND YEAR LAST WRITTEN ABOVE.

NOTARY PUBLIC MY COMMISSION EXPIRES

ENDORSEMENTS:

APPROVED AS A MAJOR SUBDIVISION UNDER THE SUBDIVISION REGULATIONS OF THE CITY OF LAWRENCE & THE UNINCORPORATED AREAS OF DOUGLAS COUNTY  
ASSOCIATED PRELIMINARY PLAT APPROVED BY THE LAWRENCE DOUGLAS COUNTY PLANNING COMMISSION, DOUGLAS COUNTY, KANSAS

SCOTT MCCULLOUGH DATE CLAY BRITTON DATE

DIRECTOR, PLANNING & DEVELOPMENT SERVICES

CHAIR

RIGHTS OF WAY AND EASEMENTS ACCEPTED BY CITY COMMISSION, LAWRENCE, KANSAS

MIKE AMY, MAYOR DATE BRANDON MCGUIRE, CITY CLERK DATE

REVIEWED IN COMPLIANCE WITH K.S.A. 58-2005

MICHAEL D. KELLY, P.S., 889 DOUGLAS COUNTY SURVEYOR DATE

FILING RECORD:

STATE OF KANSAS  
COUNTY OF DOUGLAS

THIS IS TO CERTIFY THAT THIS INSTRUMENT WAS FILED FOR RECORD IN THE OFFICE OF THE DOUGLAS COUNTY REGISTER OF DEEDS ON THIS \_\_\_\_ DAY OF \_\_\_\_, 2016, AND IS DULY RECORDED AT \_\_\_\_ AM/FM, IN PLAT BOOK \_\_\_\_ PAGE \_\_\_\_

REGISTER OF DEEDS

KAY PESNELL

NOTES:

ERROR OF CLOSURE = 1:6,094.124

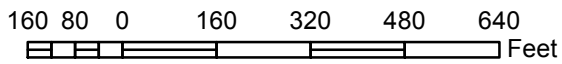
BASIS OF BEARINGS: RECORDED PLAT OF

STREET TREES SHALL BE PROVIDED IN ACCORDANCE WITH THE MASTER STREET TREE

PLAN FILED WITH THE REGISTER OF DEEDS IN BOOK \_\_\_\_ PAGE \_\_\_\_

THE LOTS WILL BE PINNED PRIOR TO THE RECDORDATION OF THE FINAL PLAT AT THE REGISTER OF DEEDS OFFICE, PER SECTION 20-811(K).



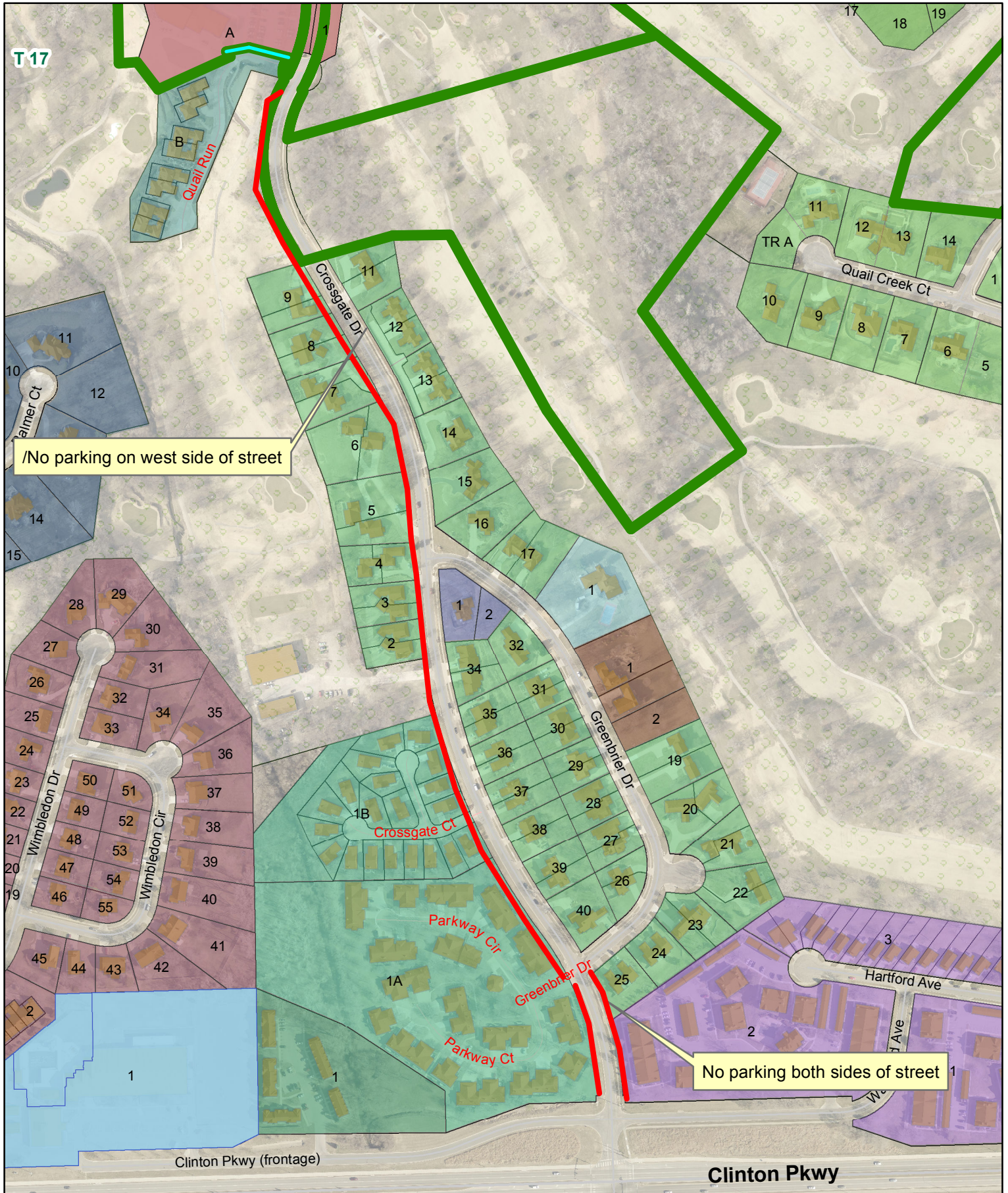


1 inch = 326 feet

DISCLAIMER NOTICE

The map is provided "as is" without warranty or any representation of accuracy, timeliness or completeness. The burden for determining accuracy, completeness, timeliness, merchantability and fitness for or the appropriateness for use rests solely on the requester. The City of Lawrence makes no warranties, express or implied, as to the use of the map. There are no implied warranties of merchantability or fitness for a particular purpose. The requester acknowledges and accepts the limitations of the map, including the fact that the map is dynamic and is in a constant state of maintenance, correction and update.

Date: 3/8/2016







## **MEMORANDUM**

FROM : Paul Werner  
TO : Scott McCullough, Sandra Day  
RE : Alvamar - Phasing  
DATE : February 8, 2016

---

**This is a tentative schedule of events we are foreseeing on the Alvamar Property.**

### **Milestones:**

- 
- **Upon Approval of Development Plan(s):**
  - Acquire permit and begin renovation of existing clubhouse, located at 1809 Crossgate Drive, Proposed Lot 1.
  - Move in earth moving equipment per Access Plan outlined later in this memo and begin grading for new “street” (Name of new street to be provided; for this memo, it will be called “street”)
  - Complete “street” to an all-weather surface prior to building permits being issued for Lots 2A, 2B and 3. This excludes building permits related to the clubhouse located at 1809 Crossgate Drive, proposed Lot 1.
- **Upon Completion of All-Weather Construction Road**
  - Acquire permits and begin construction of structures on Lot 2A & 2B
  - Acquire permits and begin construction of structures on Lot 3
- **Fall 2016:**
  - Complete renovation of existing clubhouse
  - Tear down existing cart barn and public clubhouse
  - Begin construction on new pools and amenities
- **Spring 2017:**
  - Complete new “street” to City standards

- Complete construction of new structures
  - Note: No new structures to be occupied until “street” is complete

### Details:

- **Existing Clubhouse**

Renovation of the existing clubhouse will begin immediately upon receiving an approved building permit.

We anticipate a majority of the work to be interior, with minor deck/patio additions planned to the south and west. We also plan to add an addition to the east end of the building, which will be approximately 2,500 square feet in size. This addition would be a second story above the existing storage area. We also plan on removing the existing mezzanine. The square footage of the addition would be an 8% increase in the footprint and a 12% increase in the overall square footage.

It is critical that this renovation be completed as soon as possible, ideally early fall, in order to complete the pool amenity package by April of 2017.

#### Related applications required

1. Final Plat
2. Preliminary and Final Development Plan Approval

- **Development Plans**

Upon approval of the Final Development Plans and revised Preliminary Development Plans, the owner of Alvamar will begin construction of the new “street”. This “street” will connect Bob Billings Parkway to the existing private drive “Crossgate” to the north of the clubhouse.

Also required are a Final Plat, Public Improvement Plans and a detailed grading plan. All erosion and sediment control measures need to be completed at the very beginning of the project. This includes detention basins which may act as sediment basins. These basins will need to be cleaned out during the final phase of construction.

In order to generate the fill needed to build this new street, and to gain access to its location, construction will have to begin with **grading** some of the multi-family buildings’ **pad sites** along Crossgate Drive. **Construction of buildings shall not be permitted until the all-weather access road is installed and related construction traffic can be directed to use the “access road”.** In addition, the installation of a pond to the west of Crossgate will be required for fill, as well as for future stormwater management of the development. Due to the timing of this



construction, excavation equipment will have to be delivered to the site from Crossgate Drive, north of Clinton Parkway. This equipment can be delivered to the site at convenient time, such as, avoiding traffic generated by Bishop Seabury. Once this equipment is delivered it will remain on site during the mass grading efforts. After this equipment is delivered, the only “construction” vehicles that will be required to come and go from the site will be for the construction workers.

During the mass grading for the new “street”, signs will be posted at the Crossgate Drive entrance at Bob Billings Parkway, directing any construction deliveries to use Crossgate Drive, north of Clinton Parkway.

**Related applications required**

1. Final Plat
2. Public Improvement Plan
3. Preliminary and Final Development Plan Approval
4. A KDHE approved Notice of Intent (NOI) and corresponding SWP3 needs to be provided prior to construction (this includes a grading plan).
5. Depending upon upstream drainage areas a US Army Corps, DWR and Kansas Wildlife and Parks permits maybe needed.

▪ **Construction of the ‘Amenity package’**

This construction would include the structures shown on Lot 3.

▪ **Construction of the Multi-Family buildings**

This would include the structures shown on Lot 2A and 2B.

The goal is to have the construction on Lots 2A, 2B, and 3 completed for opening in spring of 2017, including the ‘New Access public street’.

▪ **Access Plan**

Rough grading of proposed new access road, south of 15<sup>th</sup> street, will begin as soon as possible ~~no sooner than approval of the Final Development Plan, or~~ upon approval of the first Final Development Plan and public improvement plans by the City.

Until the new, all-weather, access road can be utilized, construction traffic will be forced to use Crossgate Drive north of Clinton Parkway by barricading access from using Bob Billings Parkway via signs and a barricade placed south of the Ogden property. **Construction traffic shall be limited to that required to construct the new all-weather access road.** Construction traffic, exceeding large pick-up trucks, will be coordinated around school traffic at Bishop Seabury.

~~Once construction on Lot 2A and 2B is heavily underway, Access from Bob Billings Parkway to the south shall be blocked prior to transporting any earth moving equipment to the site to begin construction of the all-weather access road. There will be a gate, per the approval of the City Fire Marshal, installed south of 1522 Crossgate Drive (Ogden Residence). There will also be signs stating “No Access to Alvamar” posted at Crossgate Drive and Bob Billings Parkway. Ideally the time between when all traffic must use Crossgate Drive to when the new “street” will be open to construction traffic, will be a very short period of time.~~

~~I would anticipate the “street” being used for several months and then shutting it down to finish it and then opening it back up again once completed. The finishing of the street should be able to be completed during a time when large construction vehicles will not be required on site very often. The street shall be completed prior to issuance of a Certificate of Occupancy for any building or structure, excluding the clubhouse, located at 1809 Crossgate Drive, within the development.~~

After completion of the all weather access road and permits are issued for the construction of the new facilities for Lots 2A, 2B, and 3, all patron access to Alvamar will be on Crossgate Drive north of Clinton Parkway and construction traffic for constructing the new structures on Lots 2A, 2B, and 3 shall use the new all-weather access road from Bob Billings Parkway with the intention of separating club patron traffic from construction traffic. Construction traffic shall include all delivery vehicles, contractor and subcontractor vehicles, cement trucks, etc.

#### **Phase1: Initialization of Construction**

1. Earth Moving Equipment delivered to site via Crossgate Drive/Clinton Parkway.
2. All erosion and sediment control measures need to be completed at the very beginning of the project. This includes detention basins which may act as sediment basins. These basins will need to be cleaned out during the final phase of construction.
3. Access closed to Crossgate Drive south of Ogden Property, 1522 Crossgate Drive.
4. Signage added to Bob Billings Parkway notice of Street Closed. Use Clinton Parkway access.
5. Coordinate with Bishop Seabury and neighbors on moving in equipment.
6. Begin rough grading.

#### **Phase 2: All Weather Surface for new “Street”**

1. Complete construction of all-weather surface, acceptable to Fire Department’s code standards, prior to issuance of a building permit for Lots 2a, 2b, or 3.
2. Regular residential and patron access to Alvamar restricted to south leg of Crossgate Drive from Clinton Parkway.
3. All construction access for Lots 2a, 2b and 3 shall be restricted to all-weather access drive (new “Street”).
4. All residents north of the Ogden Residence to Bob Billings Parkway, shall be restricted to the existing north (private street) leg of Crossgate Drive.

**Phase 3: Completion of new “street” construction prior to issuance of Certificates of Occupancy.**

1. Complete Street to city Standards including sidewalks on both sides of street.
2. Complete street prior to issuance of any certificates of occupancy.
3. Complete connection to the north leg of Crossgate Drive.

▪ **Signage**

The developer shall provide detailed signage and specific language directing traffic and indicating street closures to the City for approval by the Public Works Director. Signage shall direct contractors and Alvarado patrons to access as appropriate. Additionally, the developer shall install construction fencing south of 1522 Crossgate Drive (Ogden residence) prior to grading of the site.

Signage and strict conversations with subcontractors and suppliers will be provided to deter all construction traffic from using Crossgate Drive south of Bob Billings Parkway.

*See attached signage map*

▪ **Ponds**

More details about other activity on the course will be provided once the drainage study(ies) have been analyzed.

All erosion and sediment control measures need to be completed at the very beginning of the project. This includes detention basins which may act as sediment basins. These basins will need to be cleaned out during the final phase of construction.

▪ **Golf Course**

The course will be reconfigured to play as 27 holes. The development team is pursuing proposals and analysis from several golf course architects to determine the final layout and design of the course(s).

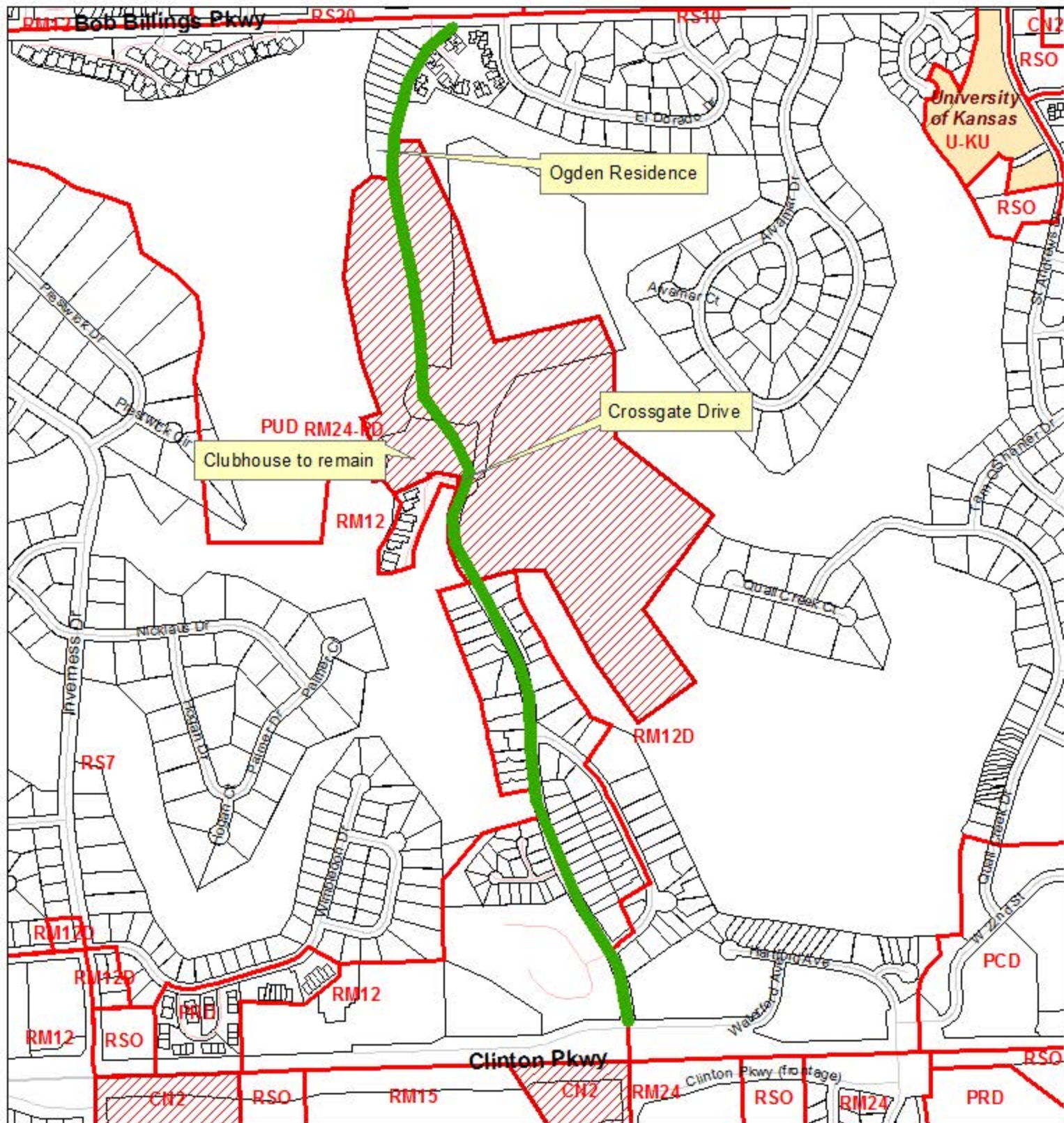
It is the developer’s intent to keep all or some of the golf course open and operational during construction.



# Phase 1 Construction Phasing Plan

DISCLAIMER NOTICE  
The map is provided "as is" without warranty or any representation of accuracy, timeliness or completeness. The burden for determining accuracy, completeness, timeliness, merchantability and fitness for or the appropriateness for use rests solely on the requester. The City of Lawrence makes no warranties, express or implied, as to the use of the map. There are no implied warranties of merchantability or fitness for a particular purpose. The requester acknowledges and accepts the limitations of the map, including the fact that the map is dynamic and is in a constant state of maintenance, correction and update.

Date: 2/16/2016



## Phase 1

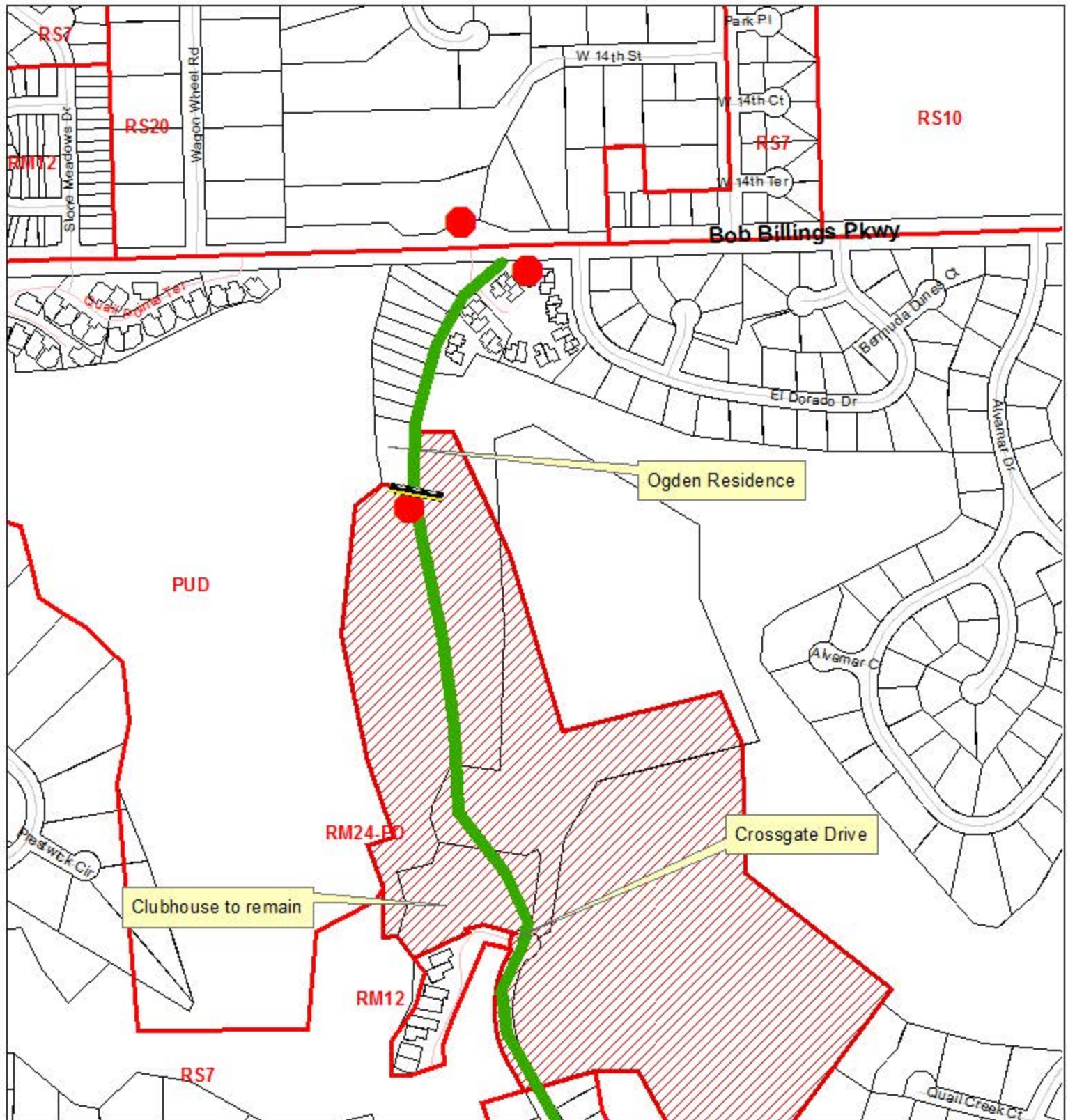
1. Earth Moving equipment delivered to site via Crossgate Drive/Clinton Parkway.
2. Construction of sediment basis and installation of all erosion control measures.
3. Access closed to Crossgate Drive south of Ogden Residence, 1522 Crossgate Drive.
4. Signage added to Boob Billings Parkway, Street closed. Use Clinton Parkway access.



# Phase 1 Signage

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Date: 2/17/2016



Phase 1  
Signage



Barricade





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This map illustrates the proposed North Leg Crossgate Drive, highlighted in blue. The drive is shown connecting to the Ogden Residence, which is marked with a red dot. A yellow box labeled "Access Road" points to the connection point. A yellow box labeled "NO ACCESS" points to a specific location on the drive. The map also shows the "Clubhouse to remain" and the "South to Clinton Parkway" direction. The map includes various zoning designations (RS7, RS20, RS10, RM12, RM24-EO, PUD) and street names (Wagon Wheel Rd, W 14th St, Park Pl, W 14th Ct, W 14th Ter, Bermuda Dunes Ct, El Dorado Dr, Alvarado Ct, Quail Creek Ct, Meadow Cir). A legend at the bottom right indicates "Signage" (red dot) and "Barricade" (yellow box).

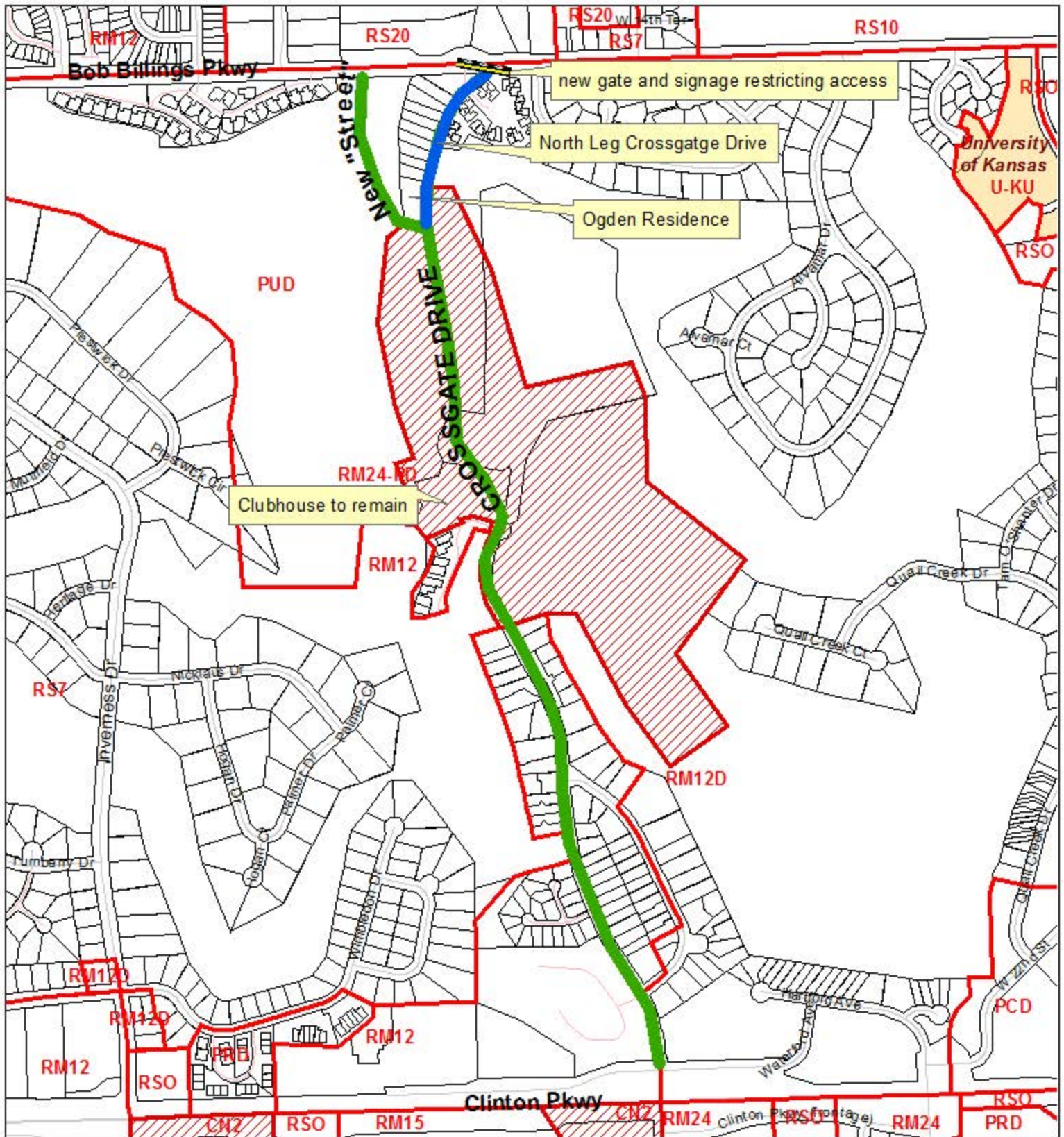
1. Complete construction of all-weather surface access road prior to issuance of a building permit for Lots 2A, 2B or 3.
2. Regular residential and patron access to Alvamar shall be restricted to the south leg of Crossgate Drive from Clinton Parkway.
3. All construction access for lots 2A, 2B and 3 shall be restricted to the all-weather access road (new "Street").
4. All residents north of the Ogden residence to Bob Billings Parkway, shall be restricted to the existing north leg of Crossgate Drive.



# Phase 3 New Street


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Date: 2/17/2016



## Phase 3: Completion of new "Street"

1. Complete new "Street" to City Standards including sidewalks on both sides of street.
2. Complete street prior to issuance of any certificates of occupancy.
3. Complete connection to the north leg of Crossgate Drive.

Barracade 

Alvamar Redevelopment  
Parking analysis -

During Golf and Pool Season

Use	Required Parking	Monday	Tuesday thru Thursday	Friday 8 am - 5 pm	5pm -	Saturday 8 am - 5 pm	5pm -	Sunday
Apartments	541	541	541	541	541	541	541	541
Ind. Living	110	110	110	110	110	110	110	110
Fitness/ Wellness	70	70	70	70	0	70	0	70
Pool Area	80	80	80	80	0	80	0	80
Golf Course	128	0	128	128	0	128	0	128
Banquet	126	0	0	0	126	126	126	126
Office	64	64	64	64	0	0	0	0
Total Spaces Required	1119	865	993	993	777	1055	777	1055

Alvamar Redevelopment  
Parking analysis -

During Golf Season - no Pool

Use	Required Parking	Monday	Thursday	Friday 8 am - 5 pm	5pm -	Saturday 8 am - 5 pm	5pm -	Sunday
Apartments	541	541	541	541	541	541	541	541
Ind. Living	110	110	110	110	110	110	110	110
Fitness/ Wellness	70	70	70	70	0	70	0	70
Pool Area	0	0	0	0	0	0	0	0
Golf Course	128	0	128	128	0	128	0	128
Banquet	126	0	0	0	126	126	126	126
Office	64	64	64	64	0	0	0	0
Total Spaces Required	1039	785	913	913	777	975	777	975

Alvamar Redevelopment  
Parking analysis -

No Golf or Pool

Use	Required Parking	Monday	Tuesday thru Thursday	Friday 8 am - 5 pm	5pm -	Saturday 8 am - 5 pm	5pm -	Sunday
Apartments	541	541	541	541	541	541	541	541
Ind. Living	110	110	110	110	110	110	110	110
Fitness/ Wellness	70	70	70	70	0	70	0	70
Pool Area	0	0	0	0	0	0	0	0
Golf Course [a]	74	0	74	74	0	74	0	74
Banquet	126	0	0	0	126	126	126	126
Office	64	64	64	64	0	0	0	0
Total Spaces Required	985	785	859	859	777	921	777	921

[a] 20 spaces for KU and 50% of 104 - (54) for use of clubhouse facilities.

# DRAINAGE STUDY

*for*

**Alvamar, Lots 1 - 4 and Tract**

**Final Development Plan**

**Lawrence, Kansas**

February 2016

LPE Project No. 20142015

**Prepared for:**

Gene Fritzel Construction

**Prepared by:**

Landplan Engineering, P.A.

Lawrence, KS



Christopher M. Storm, PE  
Kansas License 17277

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**GENERAL**

The Alvamar site is located south of Bob Billings Parkway along both sides of Crossgate Drive. Pending zoning for the 63.5 acres is multi-family residential with a planned development overlay district (RM-24) which will allow other land uses (fitness, banquet, restaurant, and office). The site is located within the Quail Creek and Hidden Valley Tributary drainage basins.

---

**EXISTING CONDITIONS**

The existing site is a golf course with a club house, accessory buildings and parking. Currently the site runoff flows either east to Quail Creek or west to Hidden Valley Tributary with Crossgate Drive generally dividing the two basins. Runoff from approximately 132 acres north of Bob Billings Parkway is conveyed to Hidden Valley Tributary immediately northwest of the development. The area's soil types north and south of Bob Billings Parkway include Sogn-Vinland complex (4752), Kennebec silt loam (7051), Martin silty clay loam (7302), Oska silty clay loam (7460), Pawnee clay loam (7500), Vinland complex (7651), Viland-Martin complex (7657) and Vinland-Rock outcrop complex (7658) and Woodson silt loam (8962). These soils are all classified as hydrologic group D soils with the exception of Kennebec silt loam. Refer to Figures 1 and 2 for the area's soil maps from the USDA Websoil Survey website.

---

**PROPOSED IMPROVEMENTS**

Proposed improvements include remodeling of the existing club house on Lot 1 to a banquet facility; multi-dwelling residential on Lots 2A, 2B and 4; and restaurant, pool and office uses on Lot 3. Refer to Figure 3 for the developed drainage area map.

The proposed detention pond for the west basin is located upstream of the proposed development. This detention pond will detain stormwater runoff from north of Bob Billings Parkway to compensate for the additional runoff from the development. The 100-year peak developed stormwater runoff from Lot 1, Lot 2A, and portions of 2B, 3 and 4 is 166 cfs (Appendix A, Hydrograph #5). The allowable site runoff from this area is about 39 cfs (21.6 acres at 1.8 cfs/ac). At a minimum, the proposed detention should result in a decrease peak flow of 127 cfs (peak developed minus allowable). The modeled 100-year peak flow to the proposed west detention pond is 781 cfs (Appendix B, Hydrograph #6). The proposed riser and 42" diameter outlet structure limit the detention pond's 100-year peak flow to 161 cfs (Appendix B, Hydrograph #7), resulting in a 620 cfs reduction in peak basin flow.

The proposed detention pond for the east basin is more conventional with the majority of the developed runoff conveyed to the pond. The existing pond will be regraded and enlarged to provide adequate detention for the east basin. The allowable site runoff from this area is about 74 cfs (41.9 acres at 1.8 cfs/ac) plus offsite detainable flow (67 cfs, Appendix B, Hydrograph 12). The proposed 30" diameter outlet pipe limit the detention pond's 100-year peak flow to 62 cfs and total site discharge of 87 cfs (Appendix B, Hydrograph #15 and #16).

---

**ANALYSIS**

All storm routing calculations were performed using Hydraflow<sup>®</sup> hydraulic modeling software. Times of concentration were calculated per Lawrence's Stormwater Management Criteria (SWMC) using overland, shallow concentrated, and hydraulic routing through the proposed channel and storm system. CNs for each drainage area are based on proposed land use and adjusted for D soils. The peak flows for the 100, 10 and 2-year storm events were modeled for a 12 hour hypothetical storm using KDOT's rainfall information for Douglas County.

---

**CONCLUSION**

This report indicates that the proposed detention ponds will provide adequate detention for the increased runoff resulting from the proposed site development. The detention ponds and outlet structures have been sized to limit Alvamar's developed stormwater discharge below the allowable release rates of the Lawrence Stormwater Management Criteria.

**TABLE 1A - DEVELOPED CONDITION CN CALCULATIONS - WEST BASIN**

	CURVE NUMBER							AREA	COMP. CN
	80	84	86	91	94	96	98		
1 Lot 1 (West)						3.4 ac		3.4 ac	96.0
2 Lot 2A, ROW, Lot 2B (West)				14.1 ac				14.1 ac	91.0
3 Tract (West)	1.0 ac							1.0 ac	80.0
4 Lot 3 & 4 (West)				2.3 ac	0.8 ac			3.1 ac	91.8
						West Developed Area =		21.6 ac	
1 Pond N. of BBP		66.3 ac	42.4 ac				5.0 ac	113.7 ac	85.4
2 North of BBP		17.9 ac						17.9 ac	84.0
3 South of BBP	17.0 ac	13.7 ac					2.2 ac	32.9 ac	82.9
						Area to West Detention Pond =		164.50 ac	

**TABLE 1B - DEVELOPED CONDITION CN CALCULATIONS - EAST BASIN**

	CURVE NUMBER							AREA	COMP. CN
	80	84	86	91	94	96	98		
8 Offsite (East)	6.7 ac	5.5 ac						12.2 ac	81.8
9 Tract (East)	11.6 ac							11.6 ac	80.0
10 Lot 2B (East)				1.9 ac				1.9 ac	91.0
11 Lot 3 (East)					12.2 ac			12.2 ac	94.0
12 Lot 4 (East)				9.6 ac				9.6 ac	91.0
13 Lot 3 & 4 D/S East Pond	6.4 ac							6.4 ac	80.0
						Area to East Detention Pond =		53.90 ac	

**TABLE 2 - DEVELOPED CONDITION TIME OF CONCENTRATION CALCULATIONS**

	OVERLAND FLOW				SHALLOW CONCENTRATED FLOW				CHANNEL/SYSTEM FLOW				TIME OF CONC.
	C	D	S	T(OLF)	D	S	T(SCF)		D	S	V	T(C/S)	
1 Lot 1 (West)	0.9	50 ft	4%	1.6 min	Paved	200 ft	2%	1.2 min	760 ft	9%	8 fps	1.6 min	5.0 min
2 Lot 2A, ROW, Lot 2B (West)	0.4	50 ft	6%	5.0 min	Unpaved	200 ft	4%	0.9 min	1260 ft	6%	6 fps	3.5 min	9.4 min
3 Tract (West)	0.4	200 ft	5%	10.4 min	Unpaved	170 ft	7%	0.7 min	610 ft	8%	7 fps	1.5 min	12.6 min
4 Lot 3 & 4 (West)	0.4	50 ft	4%	5.6 min	Unpaved	280 ft	12%	0.7 min	540 ft	7%	8 fps	1.1 min	7.4 min
1 Pond N. of BBP	0.4	100 ft	4%	8.3 min	Unpaved	200 ft	3%	1.2 min	4150 ft	2%	5 fps	13.8 min	23.3 min
2 North of BBP	0.4	100 ft	2%	11.0 min	Unpaved	180 ft	4%	2.0 min	920 ft	3%	5 fps	3.1 min	16.1 min
3 South of BBP	0.4	100 ft	1%	12.9 min	Unpaved	170 ft	4%	2.0 min	2060 ft	4%	6 fps	5.7 min	20.6 min
8 Offsite (East)	0.4	115 ft	2%	10.6 min	Unpaved	220 ft	3%	1.2 min	1750 ft	3%	5 fps	5.8 min	17.6 min
9 Tract (East)	0.4	200 ft	2%	13.3 min	Unpaved	400 ft	4%	2.0 min	730 ft	3%	5 fps	2.4 min	17.7 min
10 Lot 2B (East)	0.4	150 ft	5%	9.0 min	Unpaved	250 ft	4%	1.2 min	500 ft	4%	6 fps	1.4 min	11.6 min
11 Lot 3 (East)	0.4	50 ft	3%	6.2 min	Unpaved	150 ft	1%	1.6 min	560 ft	5%	6 fps	1.6 min	9.4 min
12 Lot 4 (East)	0.4	50 ft	2%	7.1 min	Unpaved	140 ft	3%	0.9 min	1230 ft	1%	5 fps	4.1 min	12.1 min
13 Lot 3 & 4 D/S East Pond	0.4	80 ft	5%	6.6 min	Unpaved	100 ft	7%	0.6 min	300 ft	3%	5 fps	1.0 min	8.2 min

**TABLE 3 - DEVELOPED SUMMARY OF HYDROLOGICAL MODELING**

Hydrograph		100-YR	10-YR	2-YR
West Basin Developed	5*	165.9 cfs	110.9 cfs	72.9 cfs
Q to West Detention Pond	6	780.7 cfs	214.3 cfs	87.6 cfs
West Detention Pond	7	161.5 cfs	115.4 cfs	51.2 cfs
West Detention W/S Elev.	7	908.9	903.1	900.8
Reduction in Peak Discharge [1]		-619.2	-98.9	-36.4
Offsite (East)	8	69.1 cfs	40.9 cfs	21.4 cfs
Q to East Detention Pond	14	287.3 cfs	180.9 cfs	108.1 cfs
East Detention Pond	15	62.3 cfs	46.6 cfs	30.3 cfs
East Detention W/S Elev.	15	926.2	923.1	920.9
East Basin Q	16	86.9 cfs	56.3 cfs	32.9 cfs
Allowable Site Discharge [2]		144.5 cfs	91.2 cfs	48.64 ac
[1] West Basin Allowable Discharge		1.8 cfs/ac	1.2 cfs/ac	0.7 cfs/ac
West Onsite Area	21.6 ac	38.9 cfs	25.9 cfs	14.0 cfs
Calculated Peak Q		165.9 cfs	110.9 cfs	72.9 cfs
Target Reduction in Peak Discharge		-127.0 cfs	-85.0 cfs	-58.9 cfs
[2] East Basin Allowable Discharge		1.8 cfs/ac	1.2 cfs/ac	0.7 cfs/ac
East Onsite Area	41.9 ac	75.4 cfs	50.3 cfs	27.2 cfs
Offsite		69.1 cfs	40.9 cfs	21.4 cfs
Allowable Site Discharge		144.5 cfs	91.2 cfs	48.6 cfs

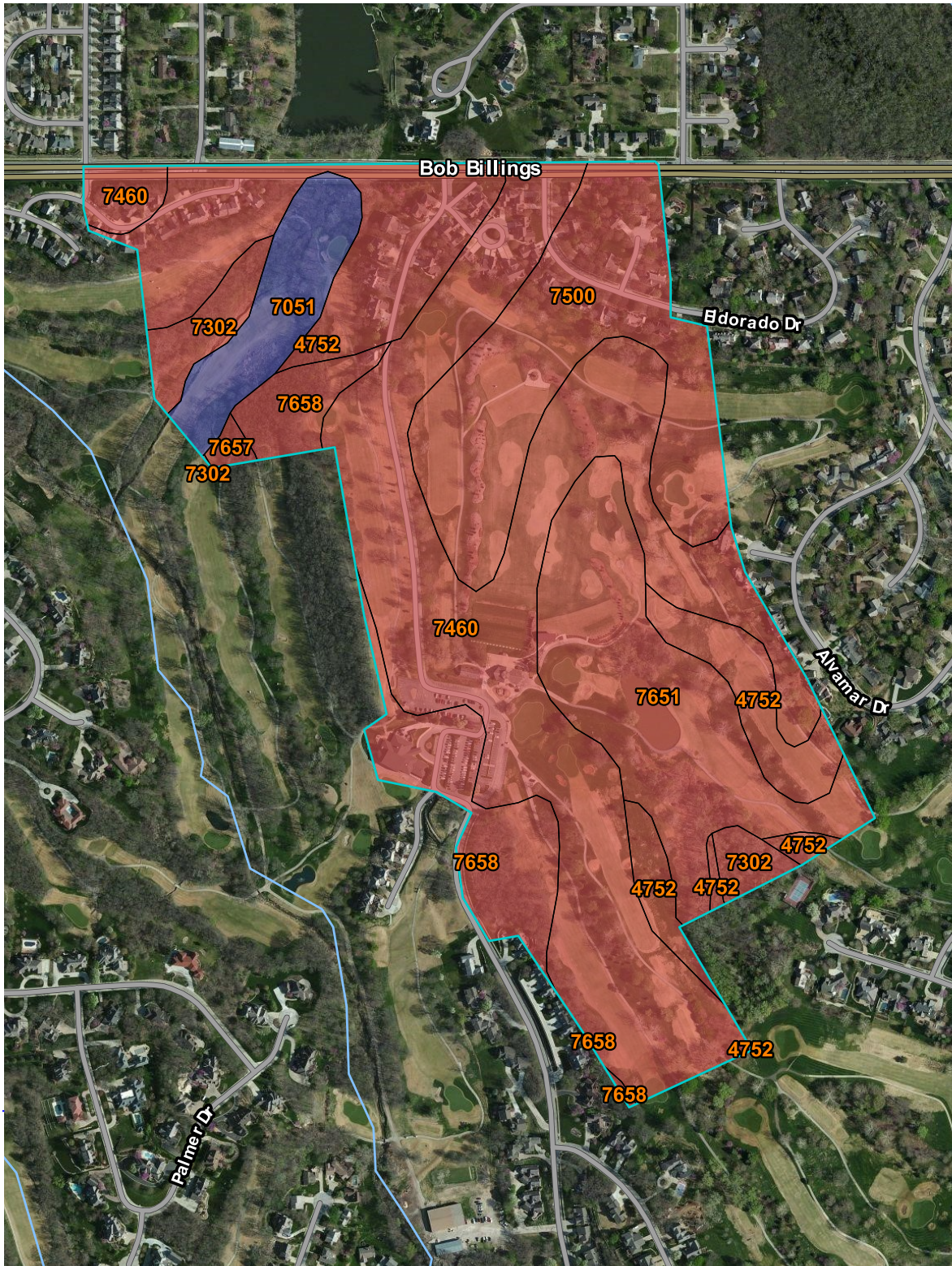
Hydrologic Soil Group—Douglas County, Kansas  
(Alvamar South of Bob Billings Parkway)

95° 17' 49" W

95° 17' 5" W

38° 57' 31" N

38° 57' 31" N



38° 56' 45" N

38° 56' 45" N

95° 17' 49" W

95° 17' 5" W



Map Scale: 1:6,920 if printed on A portrait (8.5" x 11") sheet.

0 100 200 400 600 Meters

0 300 600 1200 1800 Feet

Map projection: Web Mercator Corner coordinates: WGS84



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

2/8/2016  
Page 1 of 4



## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Douglas County, Kansas (KS045)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
4752	Sogn-Vinland complex, 3 to 25 percent slopes	D	18.9	16.1%
7051	Kennebec silt loam, frequently flooded	B	6.0	5.1%
7302	Martin silty clay loam, 3 to 7 percent slopes	D	3.6	3.1%
7460	Oska silty clay loam, 3 to 6 percent slopes	D	42.6	36.4%
7500	Pawnee clay loam, 1 to 4 percent slopes	D	18.9	16.1%
7651	Vinland complex, 3 to 7 percent slopes	D	16.8	14.3%
7657	Vinland-Martin complex, 7 to 15 percent slopes	D	0.5	0.4%
7658	Vinland-Rock outcrop complex, 15 to 45 percent slopes	D	9.9	8.4%
<b>Totals for Area of Interest</b>			<b>117.0</b>	<b>100.0%</b>

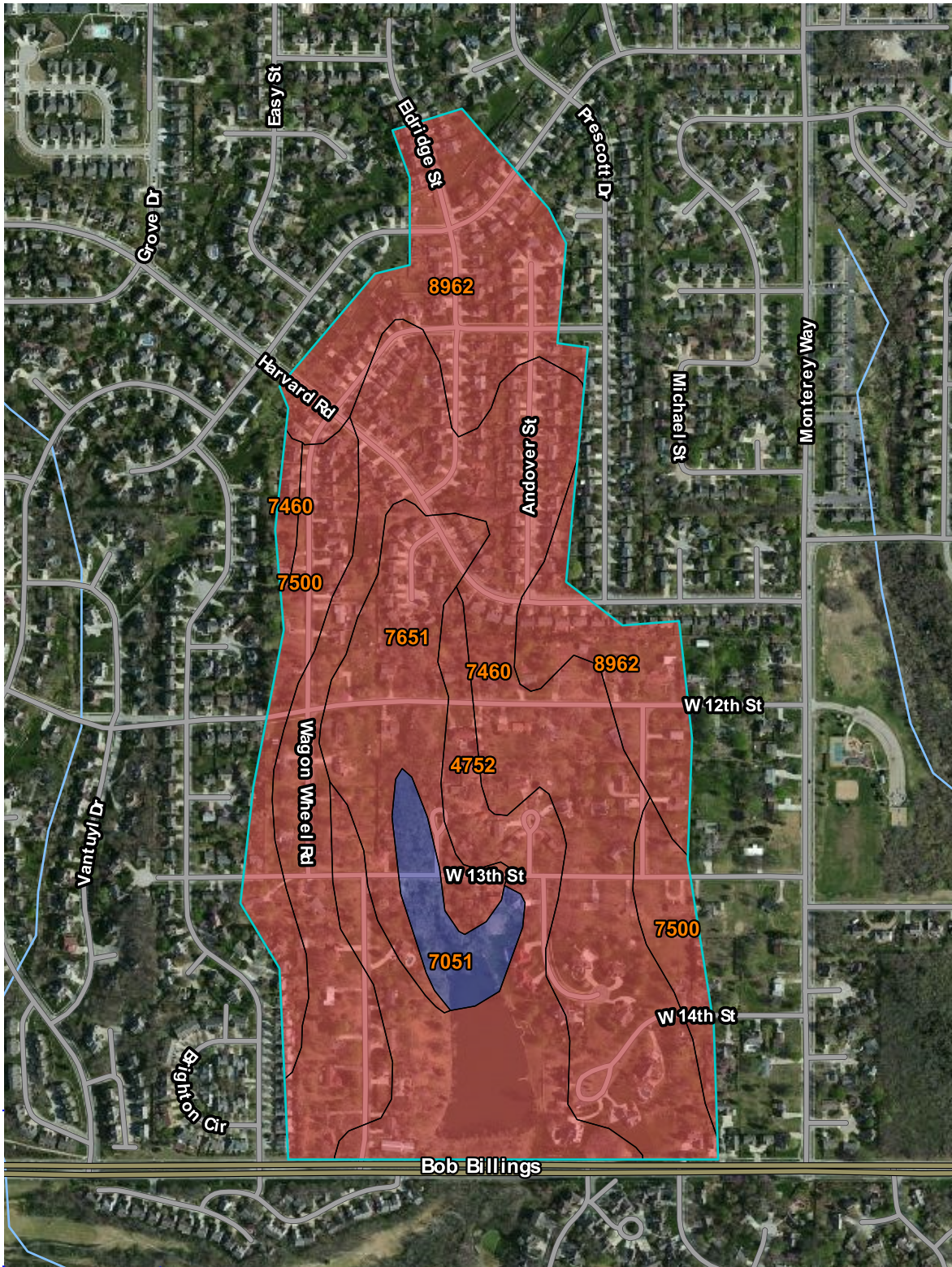
# Hydrologic Soil Group—Douglas County, Kansas (Offsite North of Bob Billings Parkway)

95° 17' 59" W

95° 17' 10" W

38° 58' 11" N

38° 58' 11" N



38° 57' 21" N

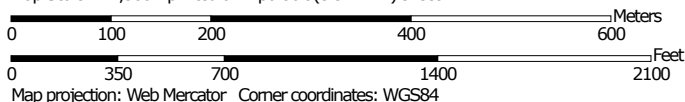
38° 57' 21" N

95° 17' 59" W

95° 17' 10" W



Map Scale: 1:7,560 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

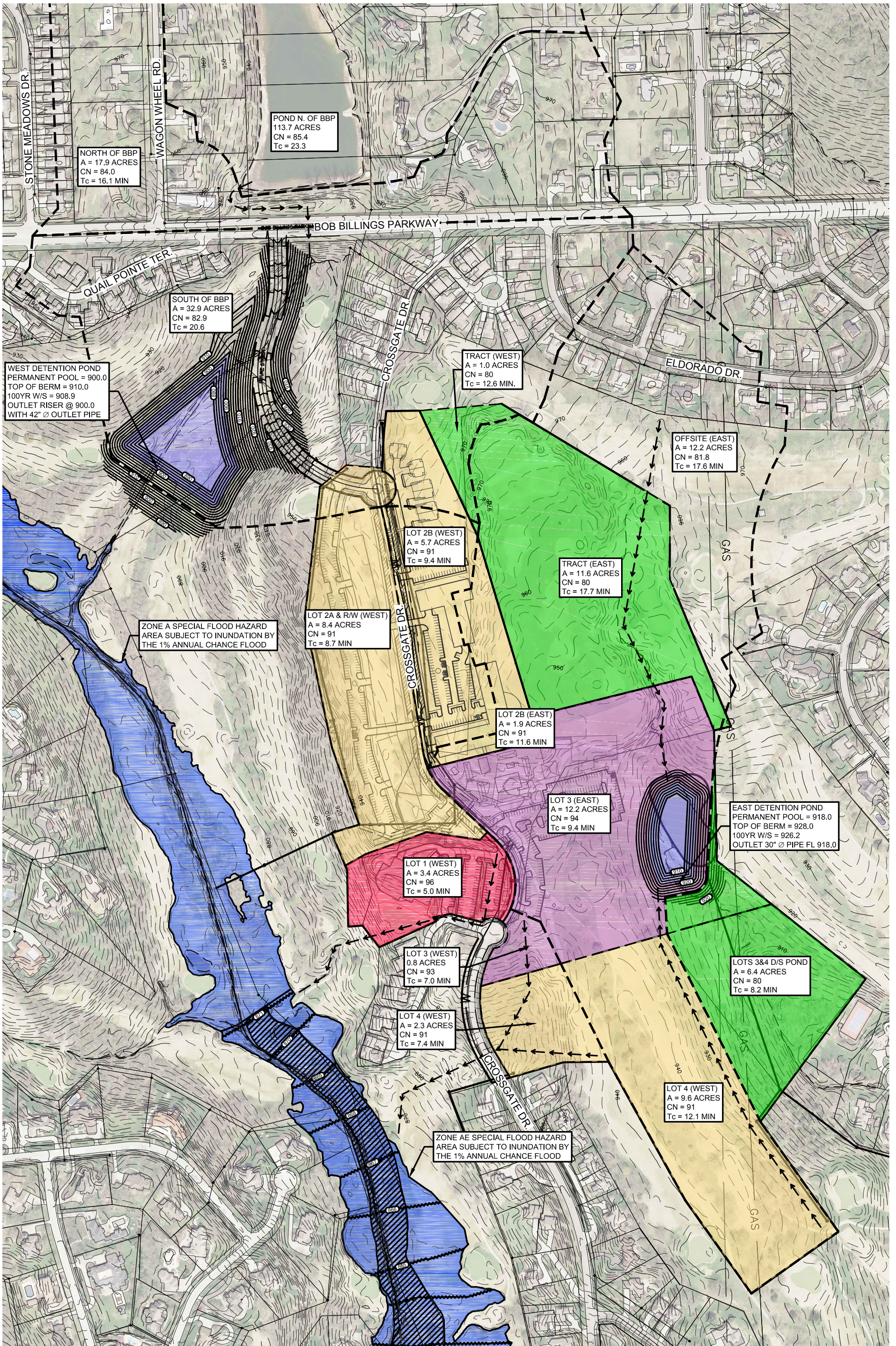
2/8/2016  
Page 1 of 4



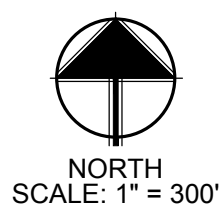
## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Douglas County, Kansas (KS045)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
4752	Sogn-Vinland complex, 3 to 25 percent slopes	D	21.8	16.7%
7051	Kennebec silt loam, frequently flooded	B	4.9	3.7%
7460	Oska silty clay loam, 3 to 6 percent slopes	D	50.0	38.3%
7500	Pawnee clay loam, 1 to 4 percent slopes	D	12.9	9.9%
7651	Vinland complex, 3 to 7 percent slopes	D	15.0	11.5%
8962	Woodson silt loam, 1 to 3 percent slopes	D	26.1	20.0%
<b>Totals for Area of Interest</b>			<b>130.6</b>	<b>100.0%</b>





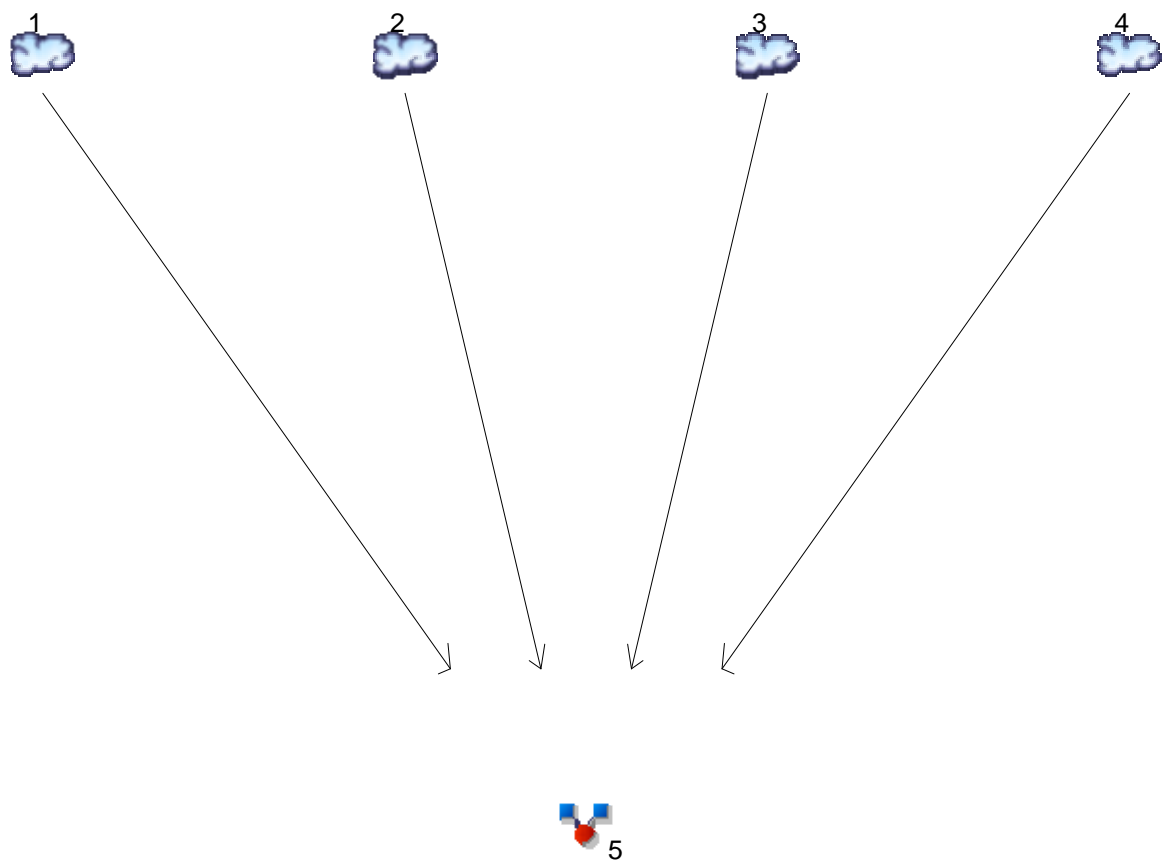
Alvamar Drainage Study  
Figure 3: Drainage Area Map  
February 11, 2016





# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

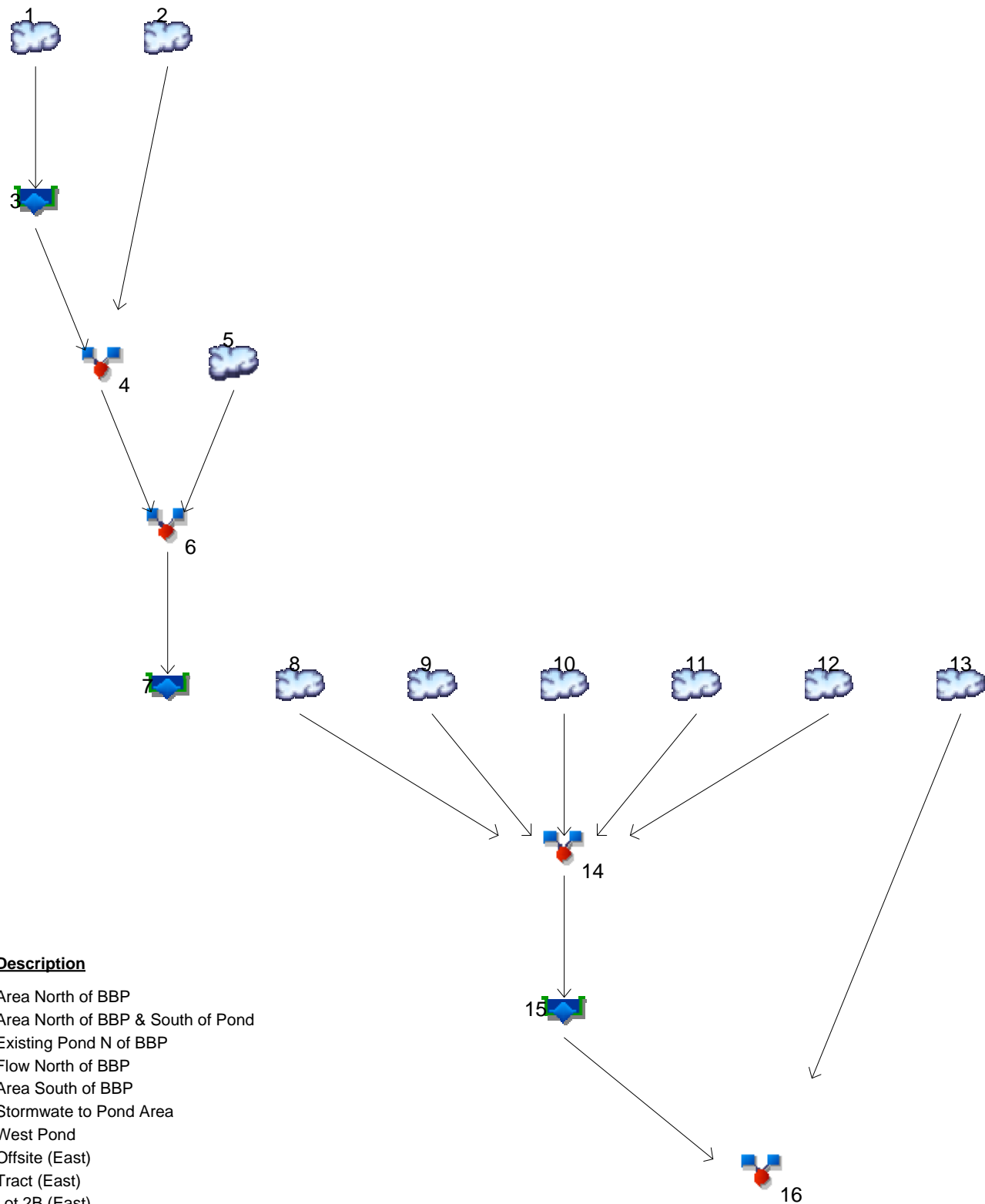


## Legend

Hyd.	Origin	Description
1	SCS Runoff	Lot 1 (West)
2	SCS Runoff	Lot 2A, ROW, Lot 2B (West)
3	SCS Runoff	Tract (West)
4	SCS Runoff	Lot 3 & 4 (West)
5	Combine	West Basin Developed

# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



**Legend**

Hyd.	Origin	Description
1	SCS Runoff	Area North of BBP
2	SCS Runoff	Area North of BBP & South of Pond
3	Reservoir	Existing Pond N of BBP
4	Combine	Flow North of BBP
5	SCS Runoff	Area South of BBP
6	Combine	Stormwater to Pond Area
7	Reservoir	West Pond
8	SCS Runoff	Offsite (East)
9	SCS Runoff	Tract (East)
10	SCS Runoff	Lot 2B (East)
11	SCS Runoff	Lot 3 (East)
12	SCS Runoff	Lot 4 (East)
13	SCS Runoff	Lots 3 & 4 D/S East Pond
14	Combine	Flow to East Pond
15	Reservoir	East Pond
16	Combine	East Basin

## **APPENDIX A**

### **100, 10, 2-YEAR STORM EVENTS DEVELOPED LOTS WEST BASIN**

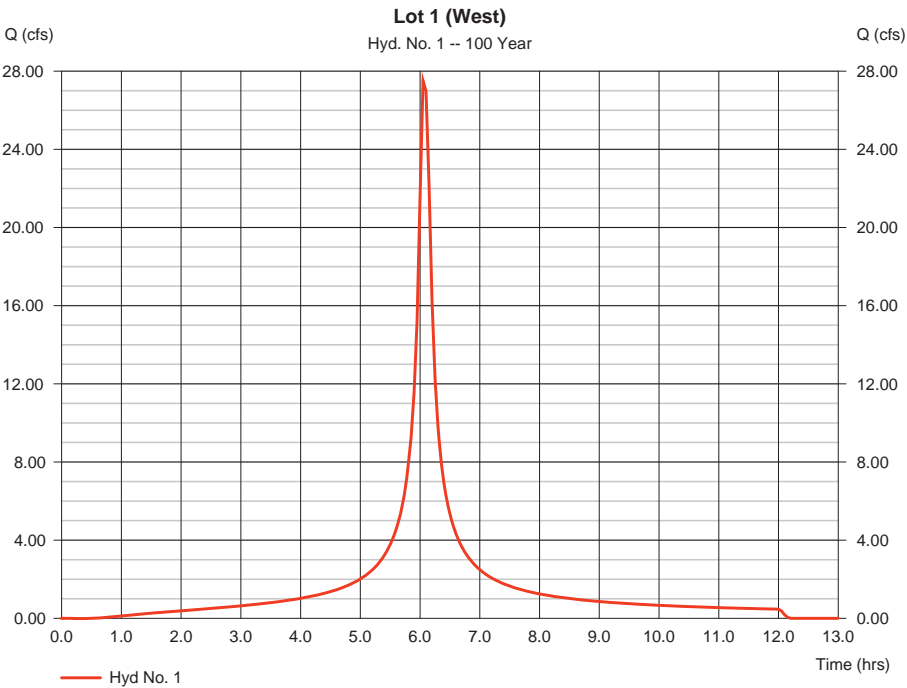


# Hydrograph Report

## Hyd. No. 1

Lot 1 (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 27.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 80,702 cuft
Drainage area	= 3.400 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

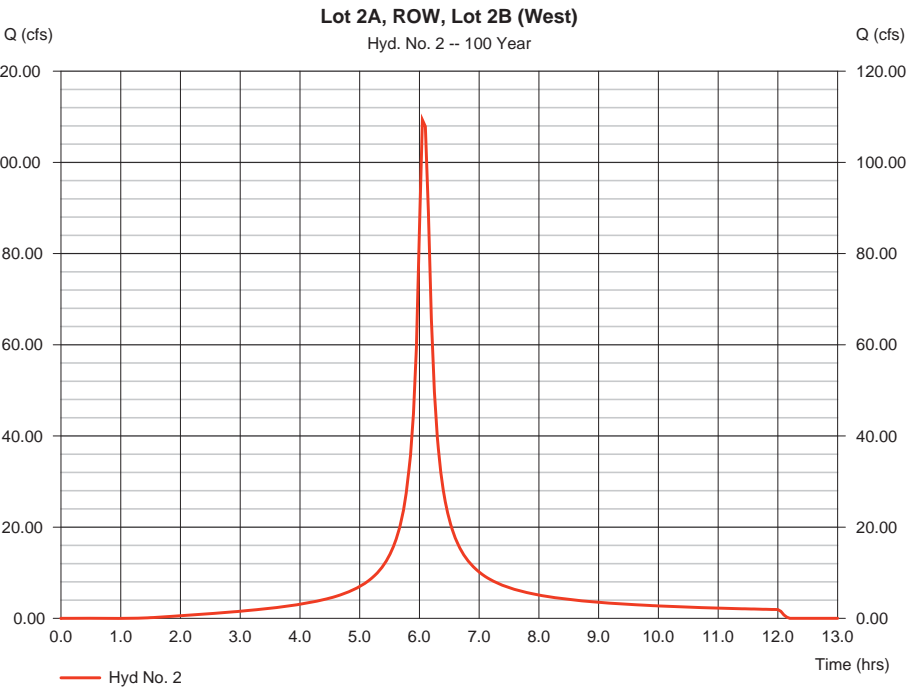


# Hydrograph Report

## Hyd. No. 2

Lot 2A, ROW, Lot 2B (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 109.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 306,343 cuft
Drainage area	= 14.100 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

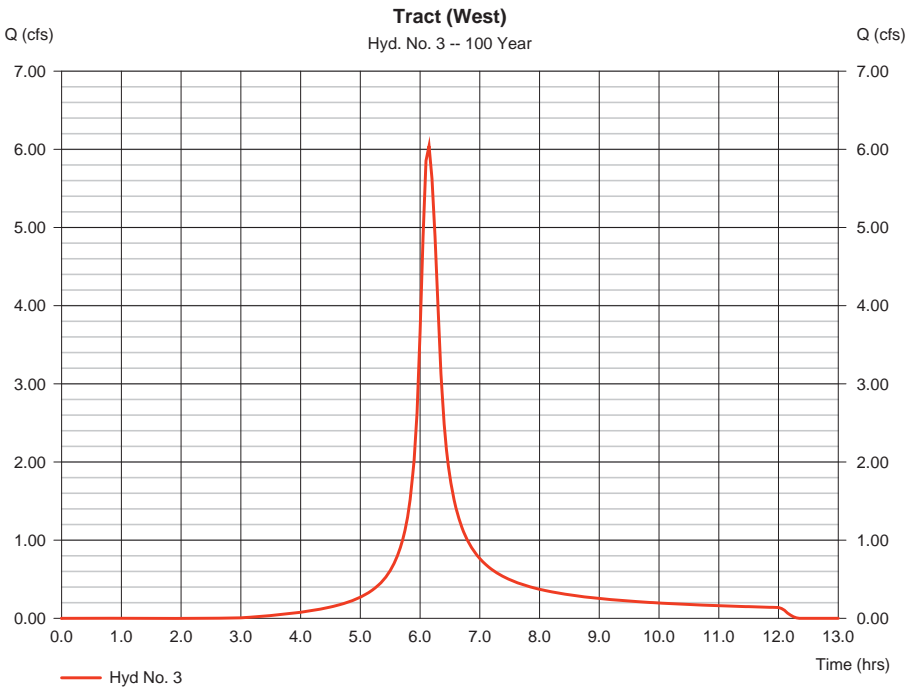


# Hydrograph Report

## Hyd. No. 3

Tract (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.043 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 18,562 cuft
Drainage area	= 1.000 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.60 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



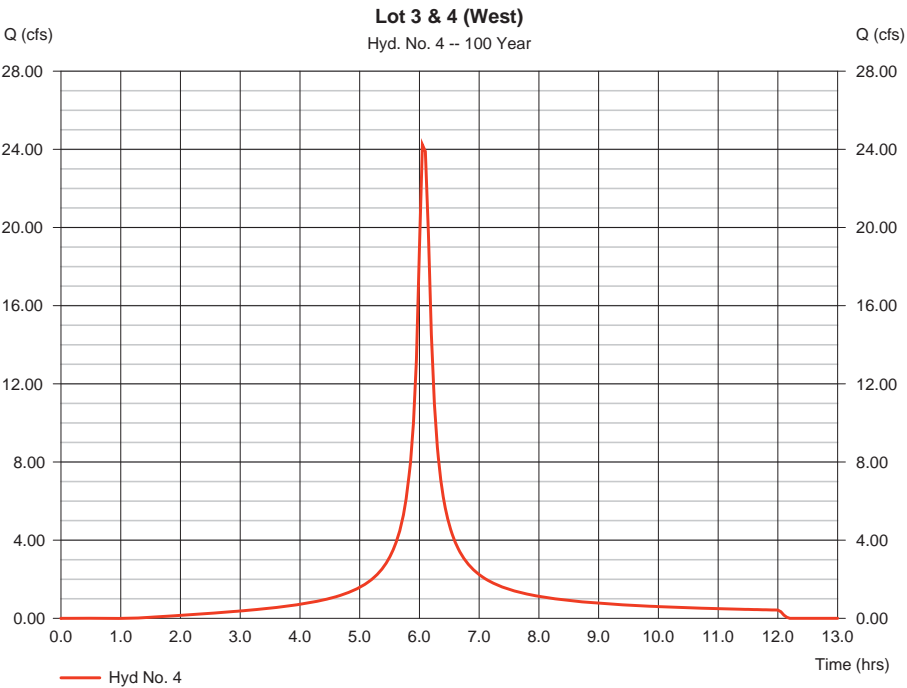
# Hydrograph Report

## Hyd. No. 4

Lot 3 & 4 (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 24.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 68,343 cuft
Drainage area	= 3.100 ac	Curve number	= 91.8*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.40 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

\* Composite (Area/CN) = [(0.800 x 94) + (2.300 x 91)] / 3.100

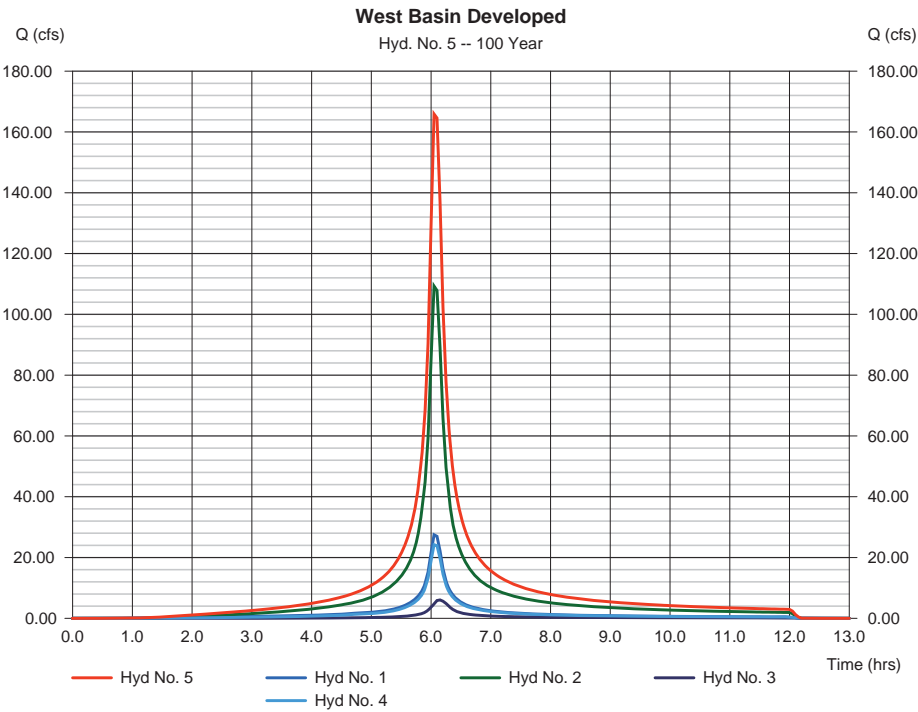


# Hydrograph Report

## Hyd. No. 5

West Basin Developed

Hydrograph type	= Combine	Peak discharge	= 165.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 473,951 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 21.600 ac

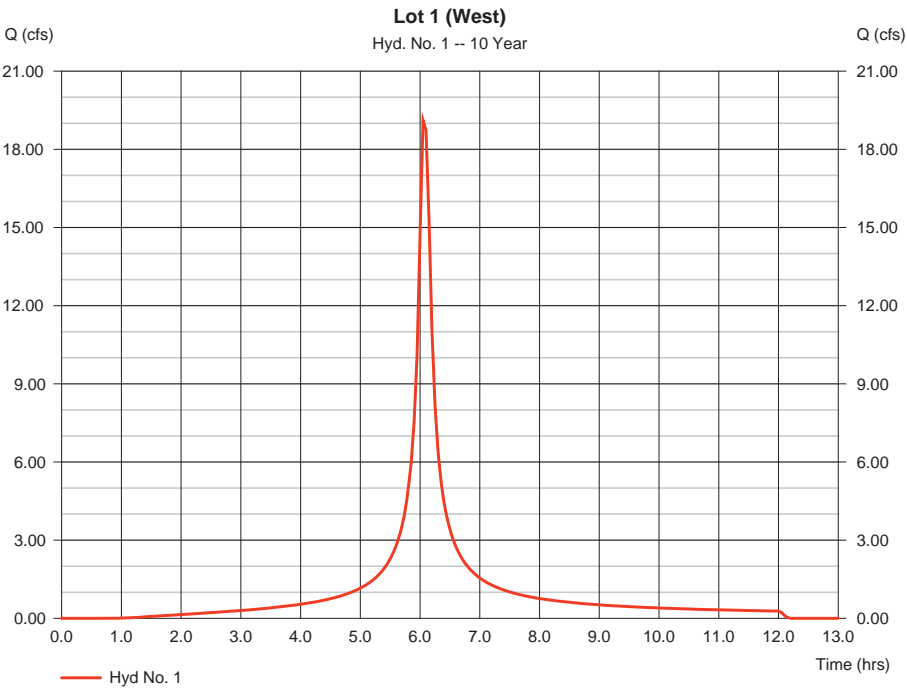


# Hydrograph Report

## Hyd. No. 1

Lot 1 (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 19.11 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 50,236 cuft
Drainage area	= 3.400 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

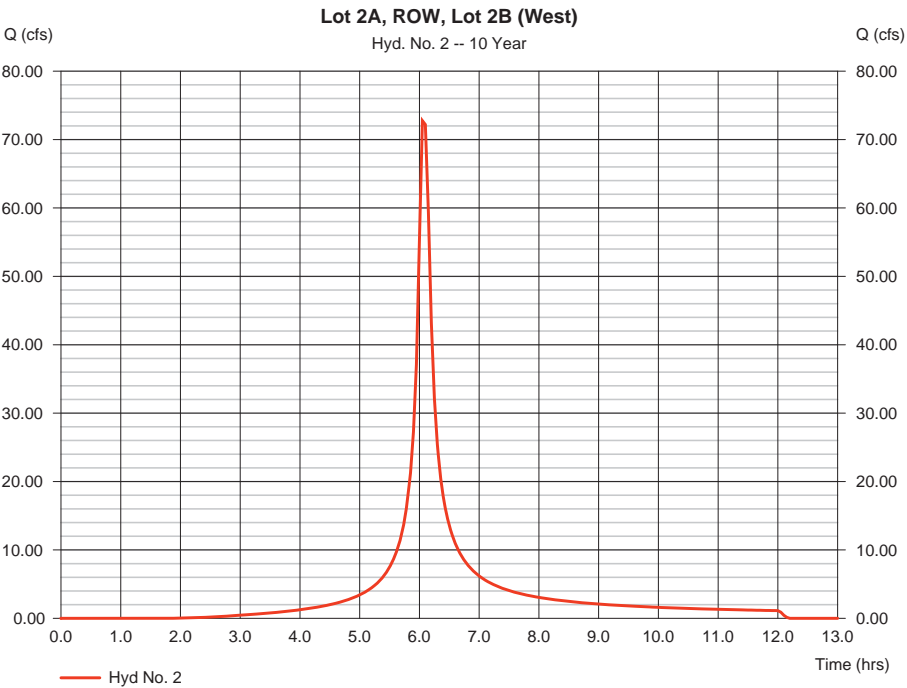


# Hydrograph Report

## Hyd. No. 2

Lot 2A, ROW, Lot 2B (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 72.76 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 182,139 cuft
Drainage area	= 14.100 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



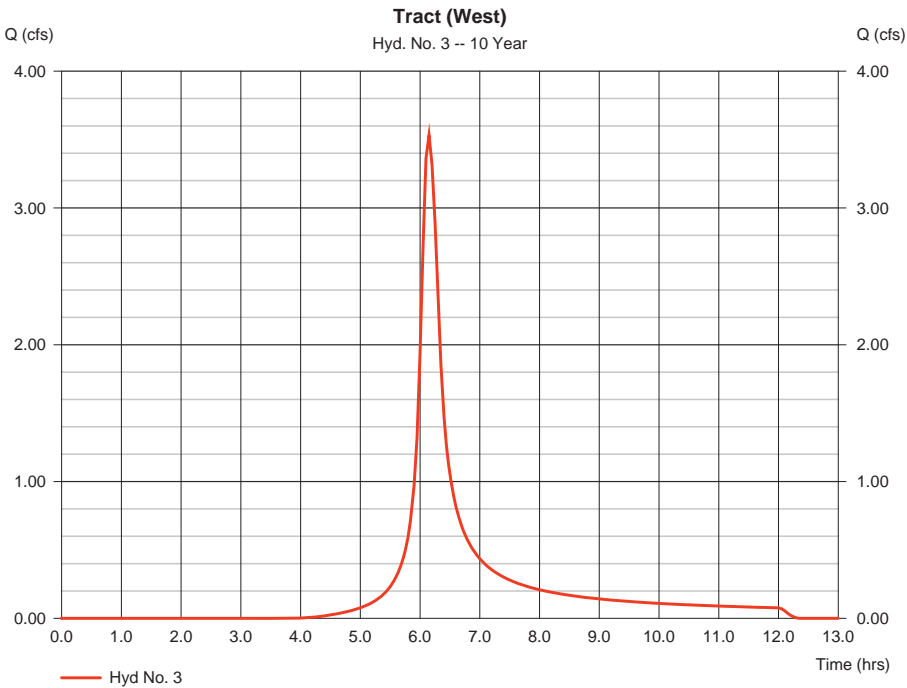


# Hydrograph Report

## Hyd. No. 3

Tract (West)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.532 cfs
Storm frequency	=	10 yrs	Time to peak	=	6.15 hrs
Time interval	=	3 min	Hyd. volume	=	9,895 cuft
Drainage area	=	1.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.60 min
Total precip.	=	4.81 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484



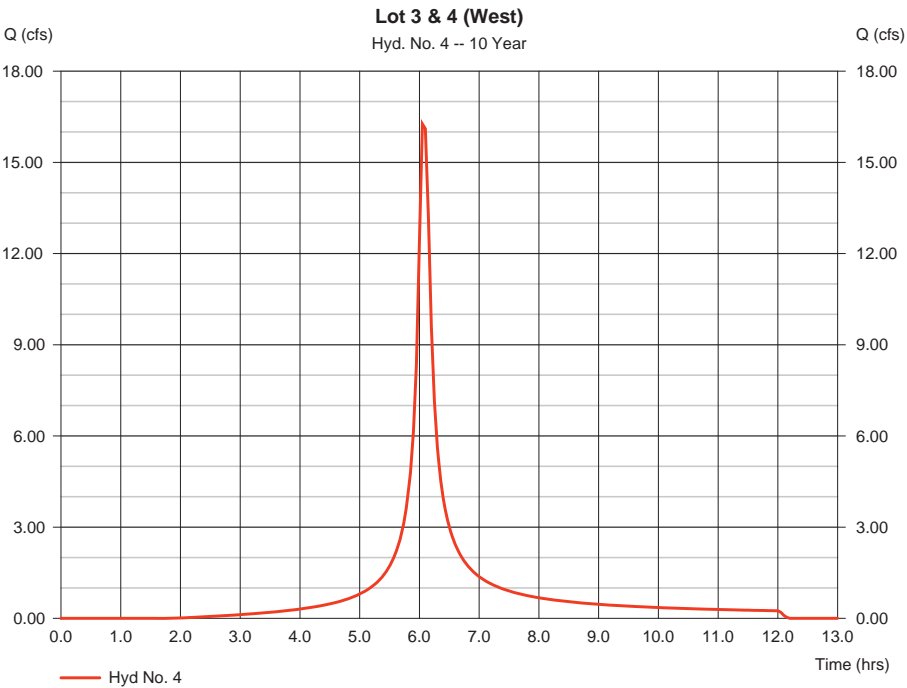
# Hydrograph Report

## Hyd. No. 4

Lot 3 & 4 (West)

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.26 cfs
Storm frequency	=	10 yrs	Time to peak	=	6.05 hrs
Time interval	=	3 min	Hyd. volume	=	40,938 cuft
Drainage area	=	3.100 ac	Curve number	=	91.8*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.40 min
Total precip.	=	4.81 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484

\* Composite (Area/CN) = [(0.800 x 94) + (2.300 x 91)] / 3.100

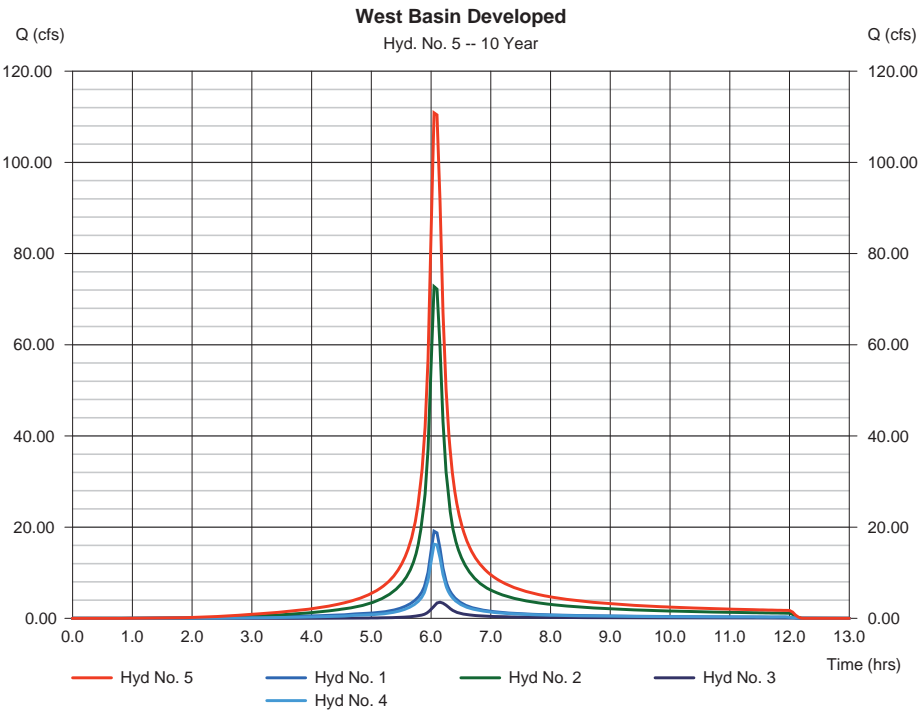


# Hydrograph Report

## Hyd. No. 5

West Basin Developed

Hydrograph type	= Combine	Peak discharge	= 110.85 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 283,209 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 21.600 ac

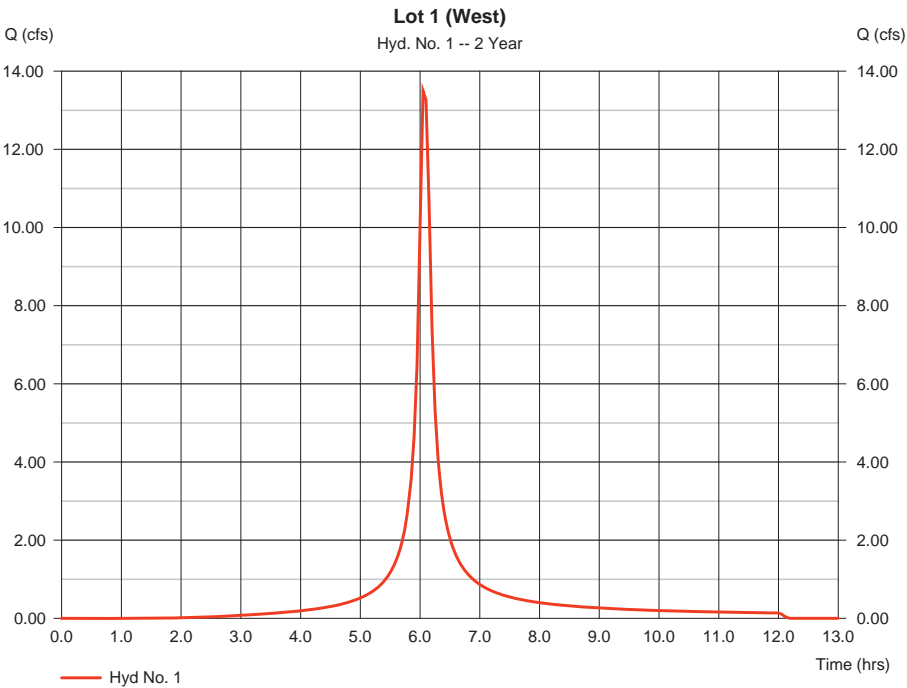


# Hydrograph Report

## Hyd. No. 1

Lot 1 (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.49 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 28,906 cuft
Drainage area	= 3.400 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

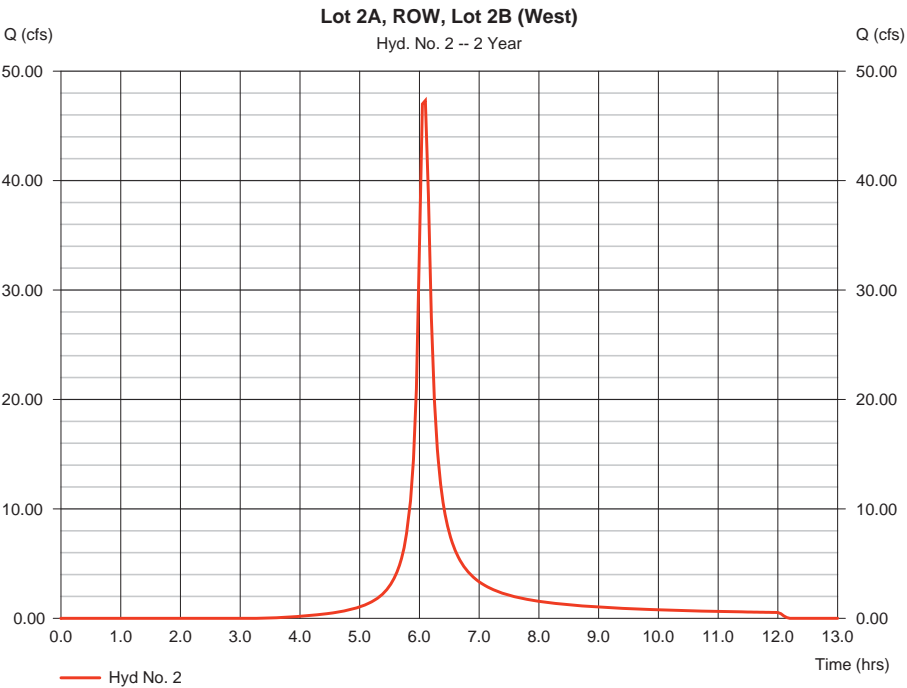


# Hydrograph Report

## Hyd. No. 2

Lot 2A, ROW, Lot 2B (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 47.32 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 96,940 cuft
Drainage area	= 14.100 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

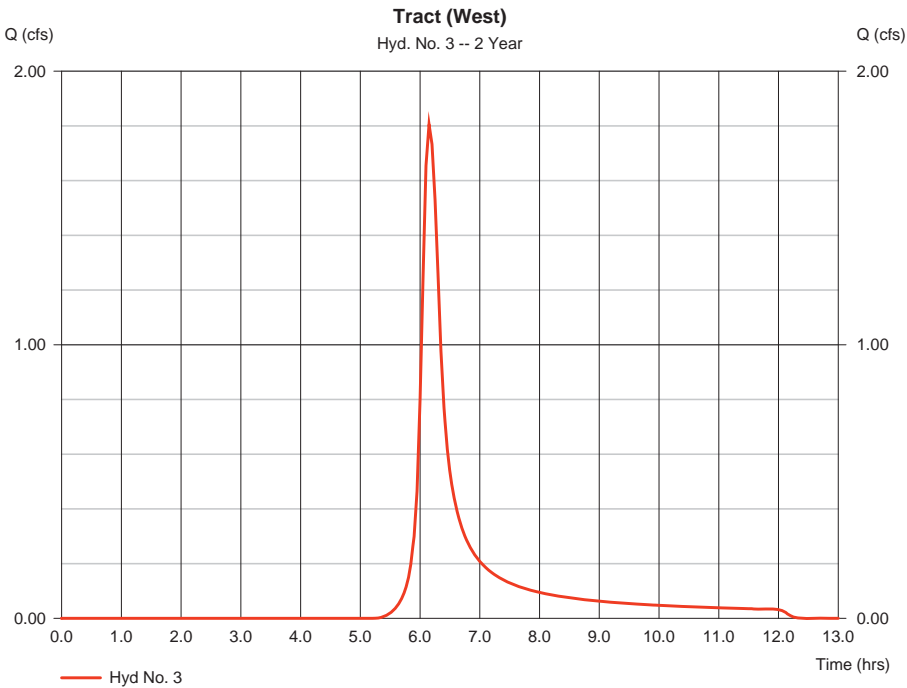


# Hydrograph Report

## Hyd. No. 3

Tract (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.806 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 4,389 cuft
Drainage area	= 1.000 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.60 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



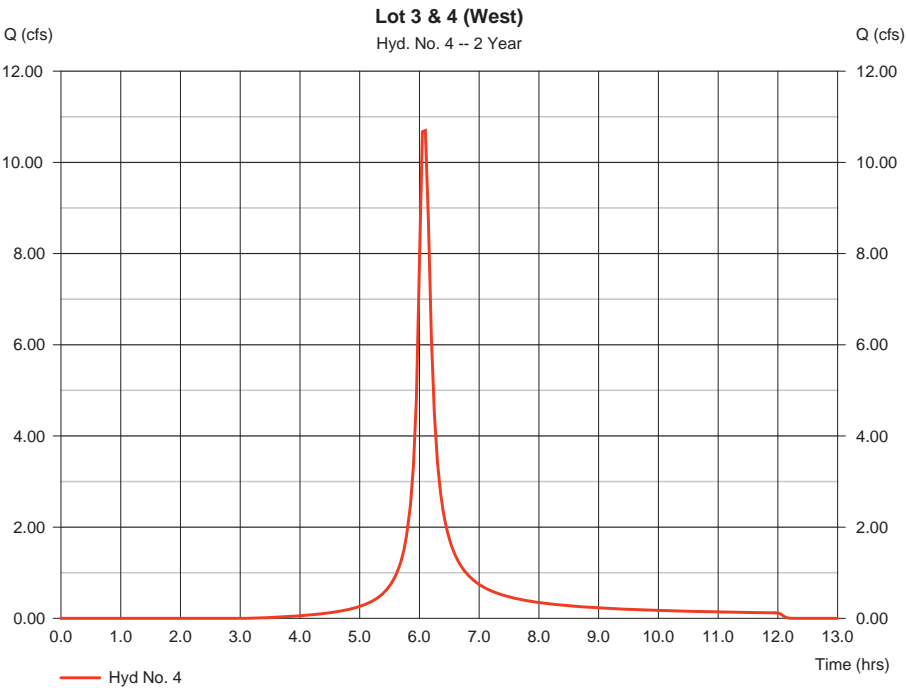
# Hydrograph Report

## Hyd. No. 4

Lot 3 & 4 (West)

Hydrograph type	= SCS Runoff	Peak discharge	= 10.70 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 22,064 cuft
Drainage area	= 3.100 ac	Curve number	= 91.8*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.40 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

\* Composite (Area/CN) = [(0.800 x 94) + (2.300 x 91)] / 3.100





# Hydrograph Report

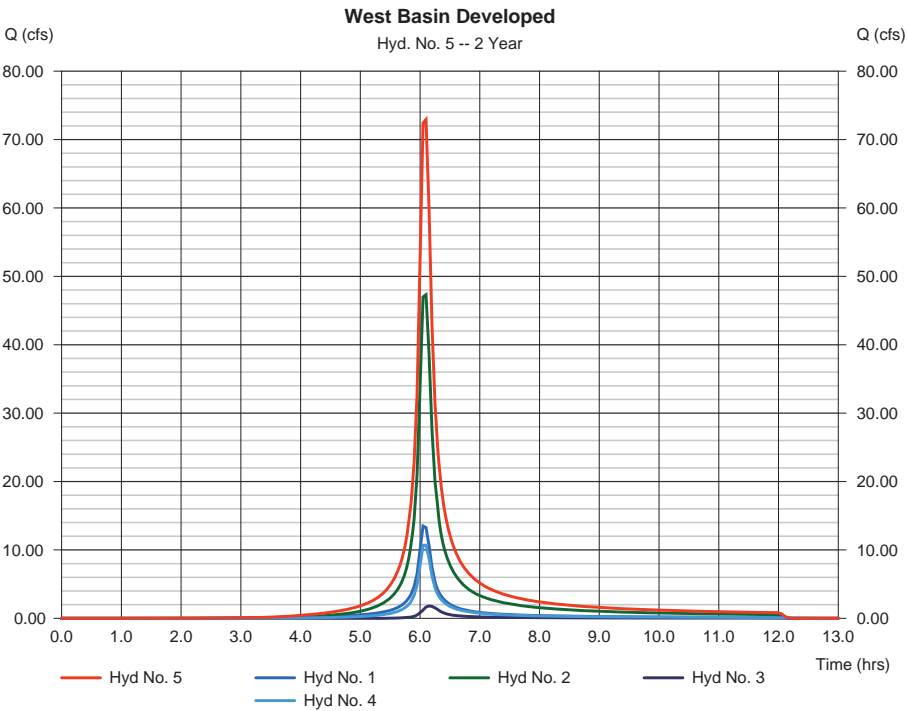
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Thursday, 02 / 11 / 2016

## Hyd. No. 5

West Basin Developed

Hydrograph type	= Combine	Peak discharge	= 72.93 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 152,299 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 21.600 ac



## **APPENDIX B**

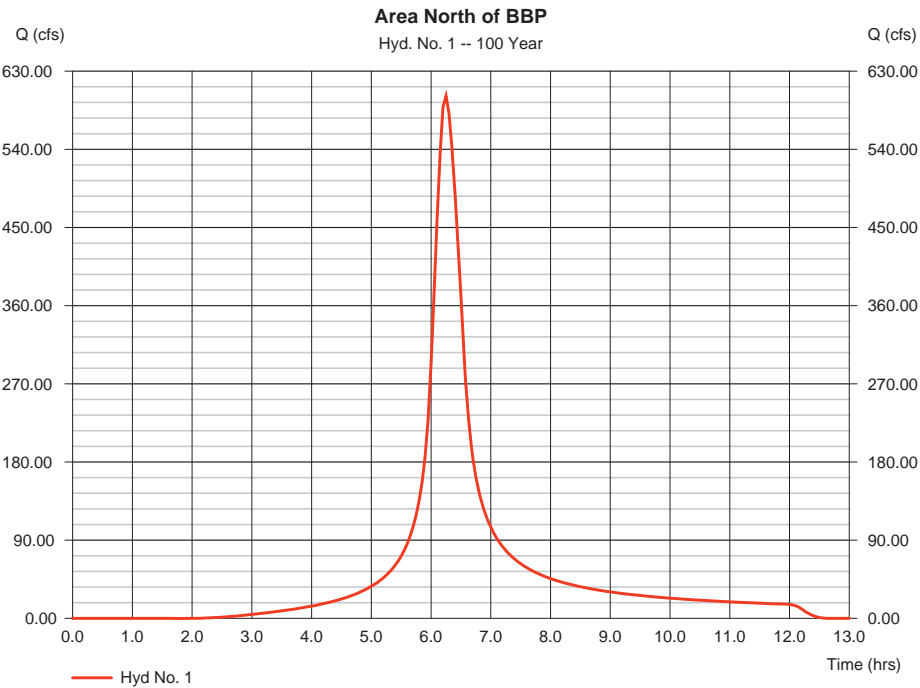
### **100-YEAR STORM EVENT EAST AND WEST BASINS**

# Hydrograph Report

## Hyd. No. 1

Area North of BBP

Hydrograph type	= SCS Runoff	Peak discharge	= 601.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.25 hrs
Time interval	= 3 min	Hyd. volume	= 2,306,742 cuft
Drainage area	= 113.700 ac	Curve number	= 85.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

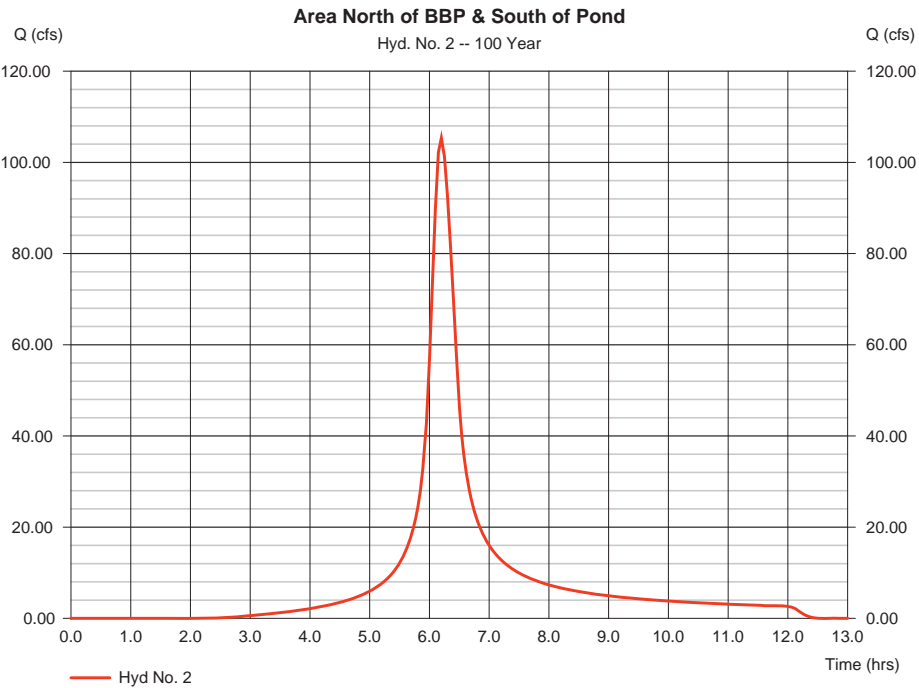


# Hydrograph Report

## Hyd. No. 2

Area North of BBP & South of Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 105.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 373,292 cuft
Drainage area	= 17.900 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.10 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



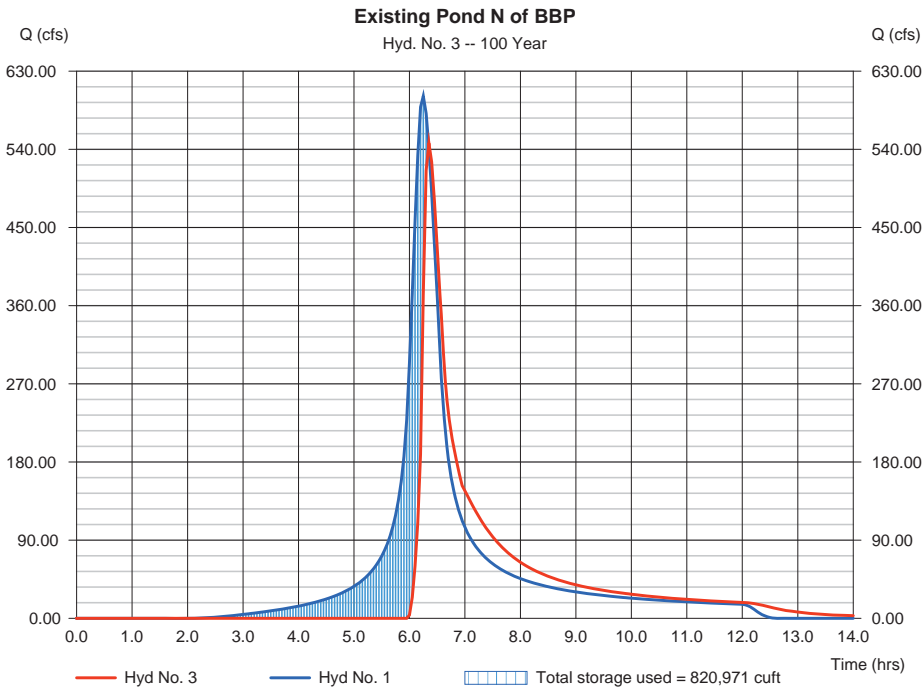
# Hydrograph Report

## Hyd. No. 3

Existing Pond N of BBP

Hydrograph type	= Reservoir	Peak discharge	= 547.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.35 hrs
Time interval	= 3 min	Hyd. volume	= 1,867,688 cuft
Inflow hyd. No.	= 1 - Area North of BBP	Max. Elevation	= 937.89 ft
Reservoir name	= Existing Pond	Max. Storage	= 820,971 cuft

Storage Indication method used.

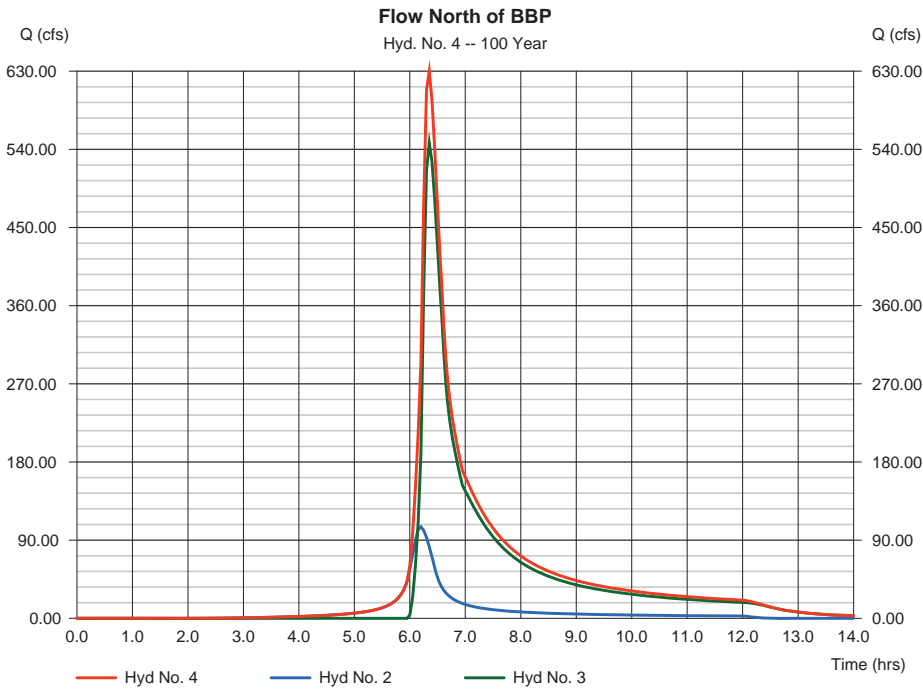


# Hydrograph Report

## Hyd. No. 4

Flow North of BBP

Hydrograph type	= Combine	Peak discharge	= 629.63 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.35 hrs
Time interval	= 3 min	Hyd. volume	= 2,240,979 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 17.900 ac



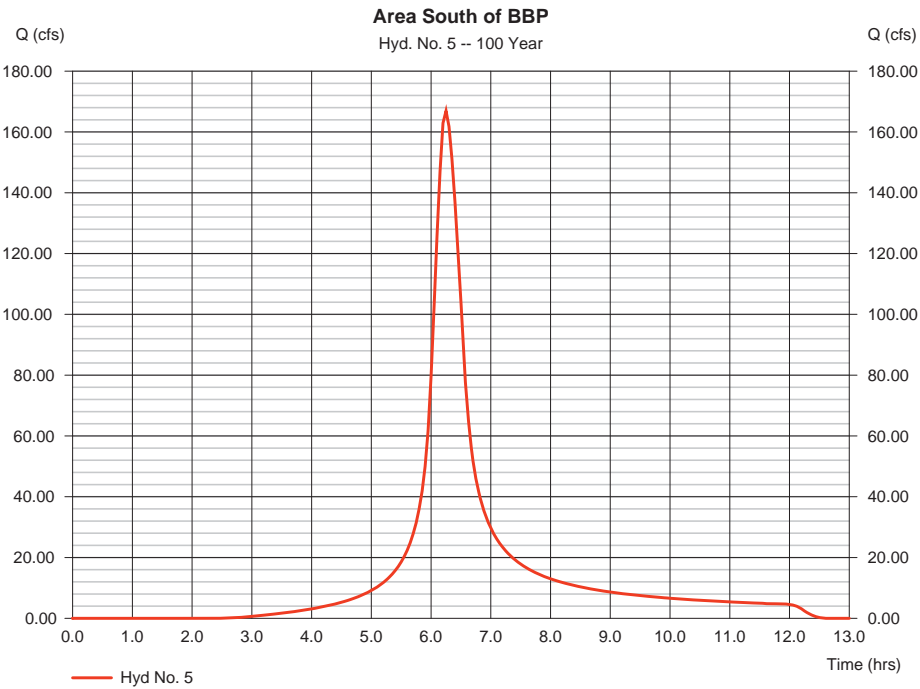


# Hydrograph Report

## Hyd. No. 5

Area South of BBP

Hydrograph type	= SCS Runoff	Peak discharge	= 166.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.25 hrs
Time interval	= 3 min	Hyd. volume	= 633,974 cuft
Drainage area	= 32.900 ac	Curve number	= 82.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.60 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

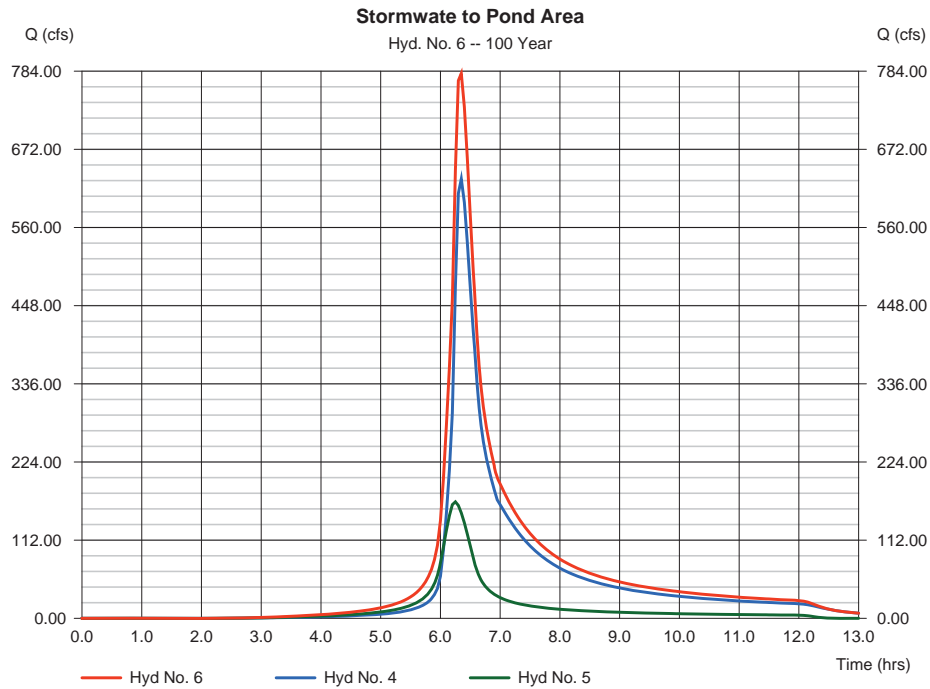


# Hydrograph Report

## Hyd. No. 6

Stormwater to Pond Area

Hydrograph type	= Combine	Peak discharge	= 780.72 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.35 hrs
Time interval	= 3 min	Hyd. volume	= 2,874,953 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 32.900 ac



# Hydrograph Report

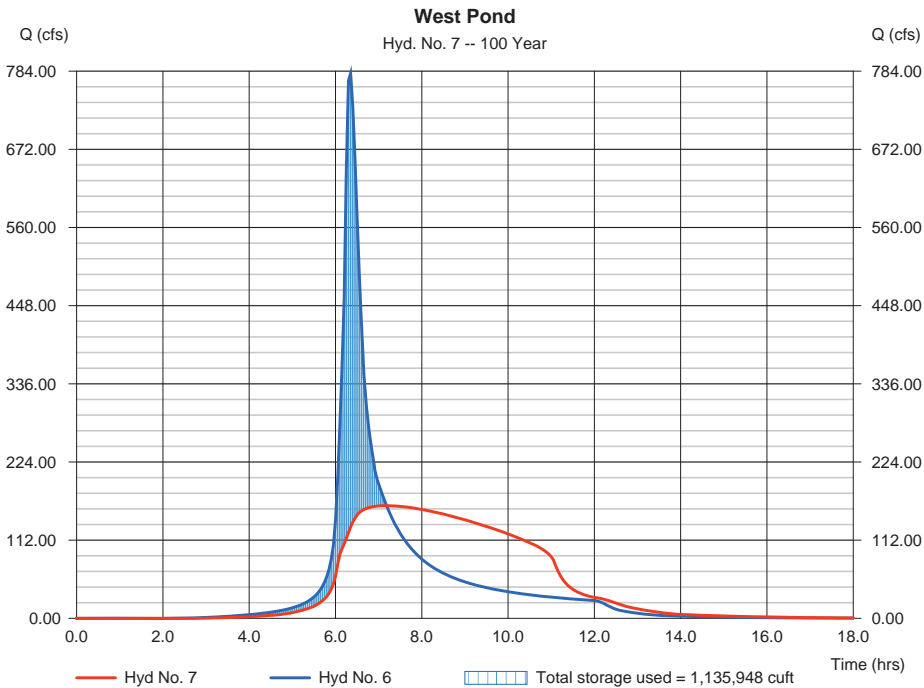
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 161.46 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.20 hrs
Time interval	= 3 min	Hyd. volume	= 2,874,951 cuft
Inflow hyd. No.	= 6 - Stormwate to Pond Area	Max. Elevation	= 908.94 ft
Reservoir name	= West Pond	Max. Storage	= 1,135,948 cuft

Storage Indication method used.



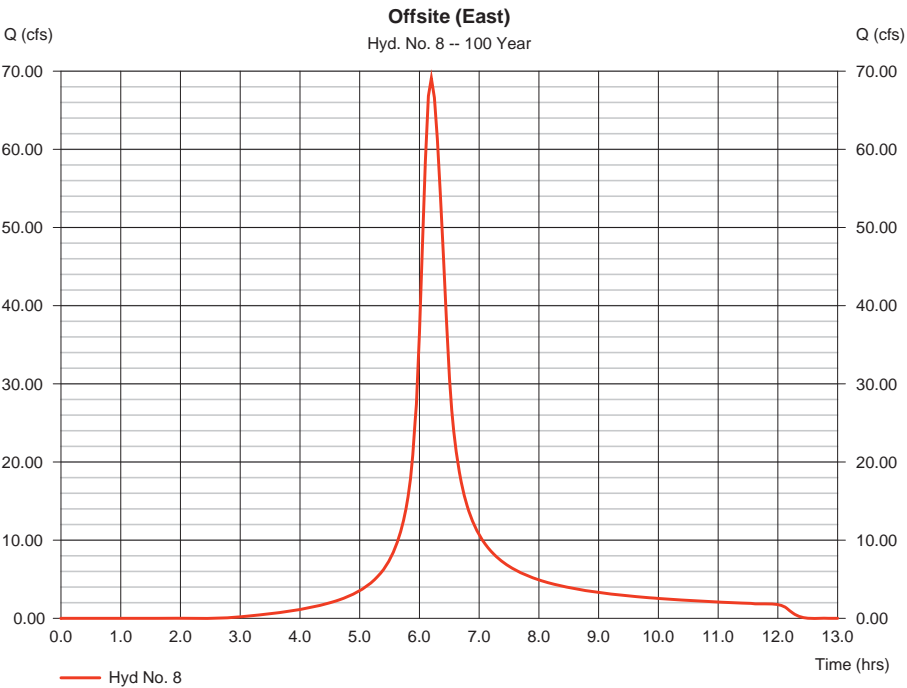
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 8

Offsite (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 69.09 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 242,904 cuft
Drainage area	= 12.200 ac	Curve number	= 81.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.60 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

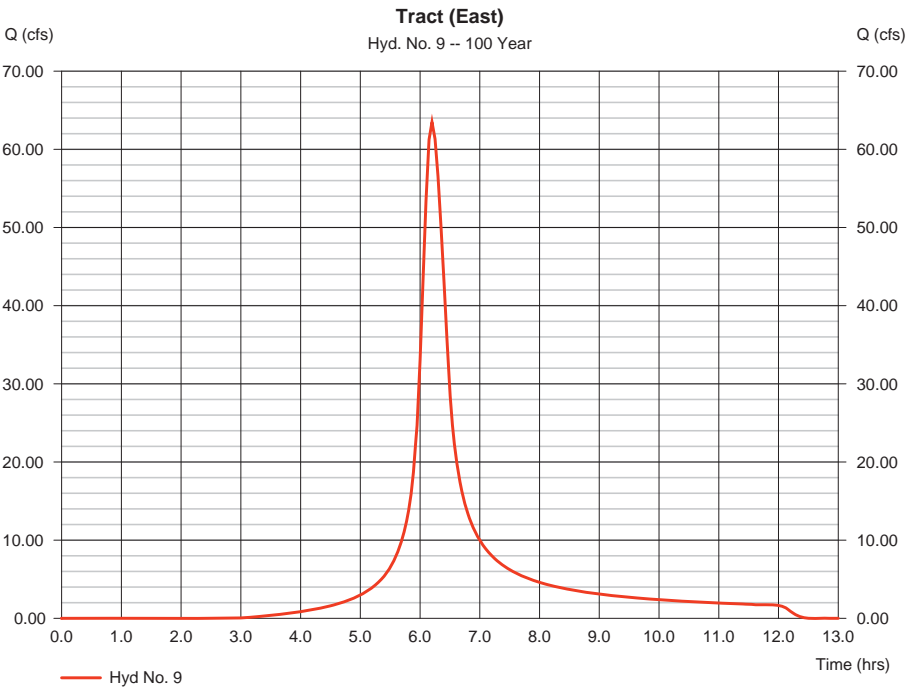


# Hydrograph Report

## Hyd. No. 9

Tract (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 63.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 222,054 cuft
Drainage area	= 11.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.70 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

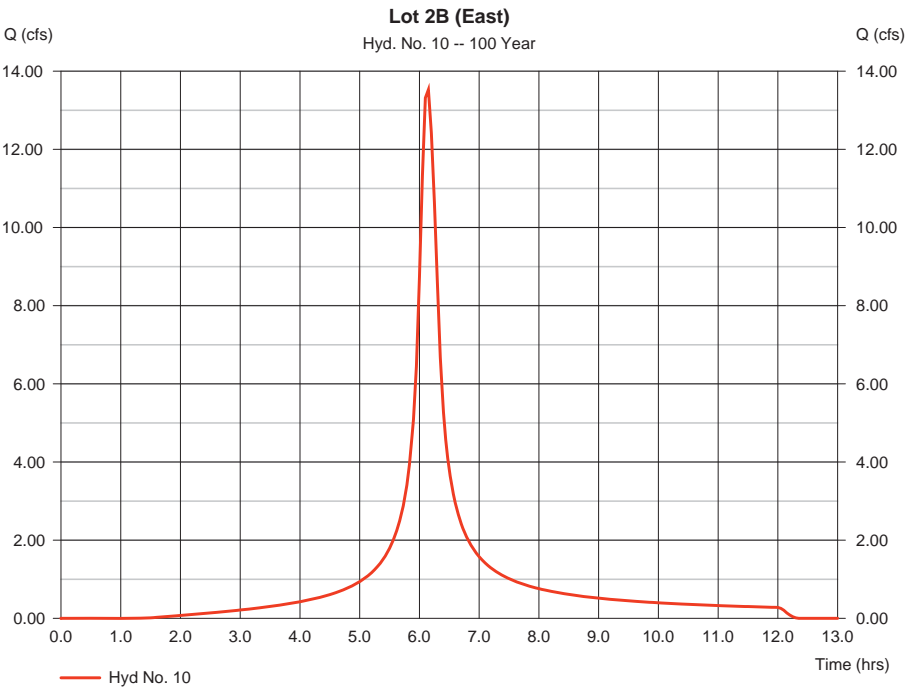


# Hydrograph Report

## Hyd. No. 10

Lot 2B (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.53 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 44,032 cuft
Drainage area	= 1.900 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.60 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

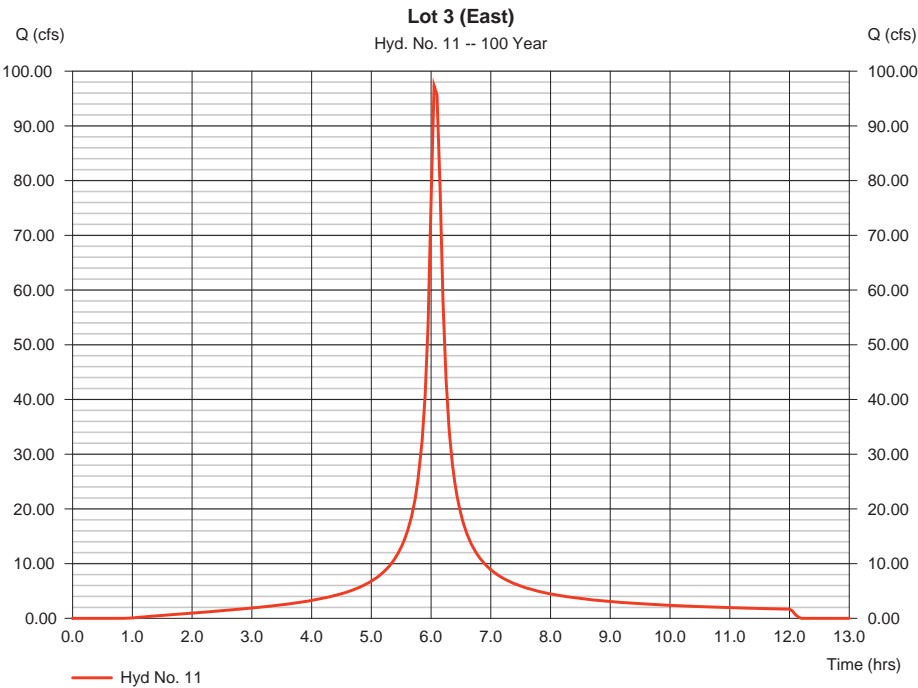


# Hydrograph Report

## Hyd. No. 11

Lot 3 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 97.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 279,733 cuft
Drainage area	= 12.200 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

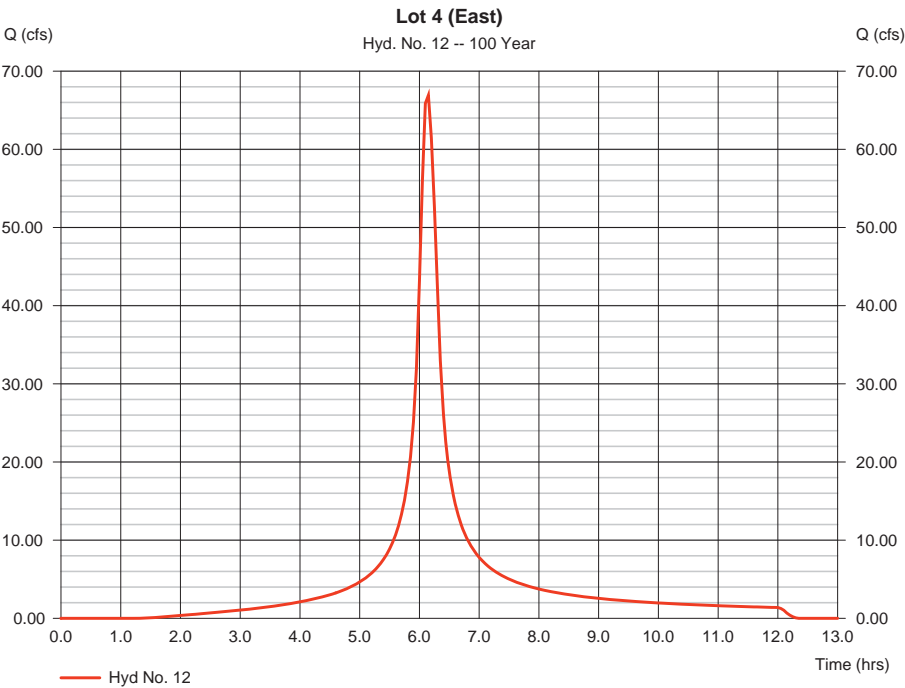


# Hydrograph Report

## Hyd. No. 12

Lot 4 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 66.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 217,844 cuft
Drainage area	= 9.400 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



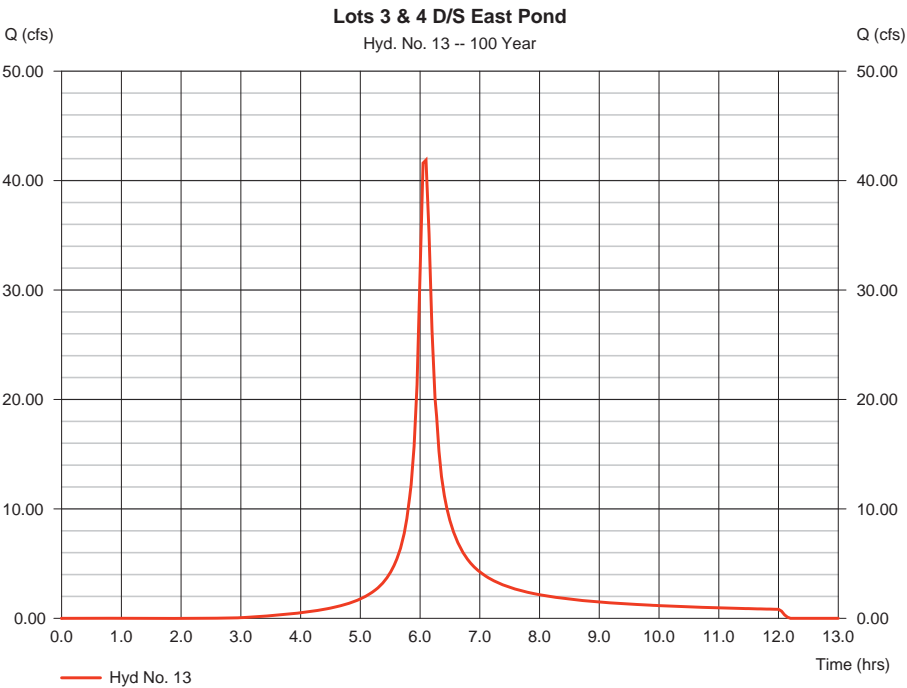


# Hydrograph Report

## Hyd. No. 13

Lots 3 & 4 D/S East Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 41.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 111,375 cuft
Drainage area	= 6.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.20 min
Total precip.	= 7.45 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

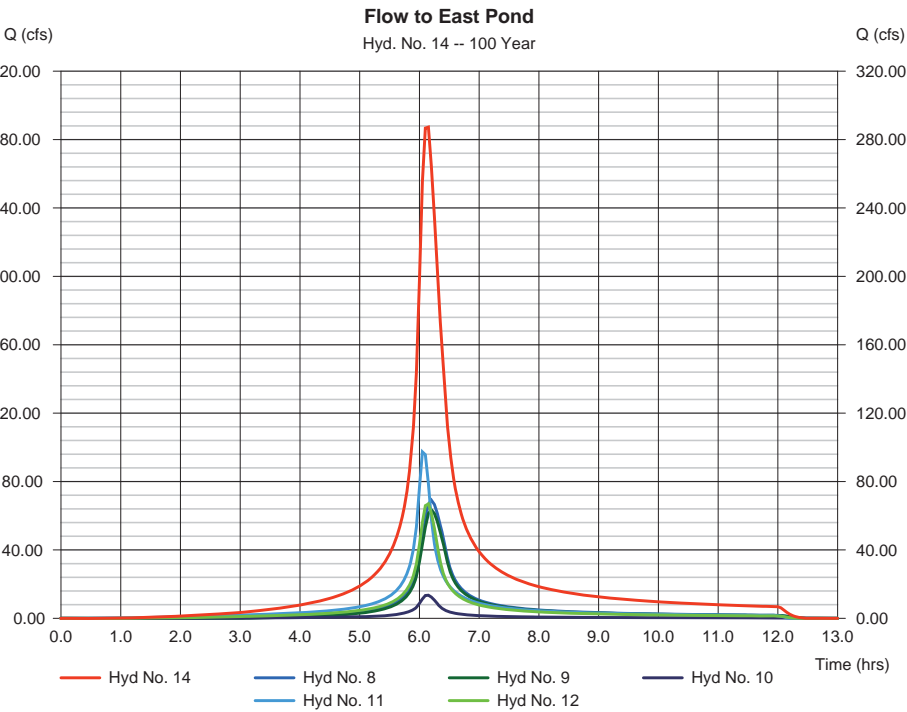


# Hydrograph Report

## Hyd. No. 14

Flow to East Pond

Hydrograph type	= Combine	Peak discharge	= 287.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 1,006,567 cuft
Inflow hyds.	= 8, 9, 10, 11, 12	Contrib. drain. area	= 47.300 ac



# Hydrograph Report

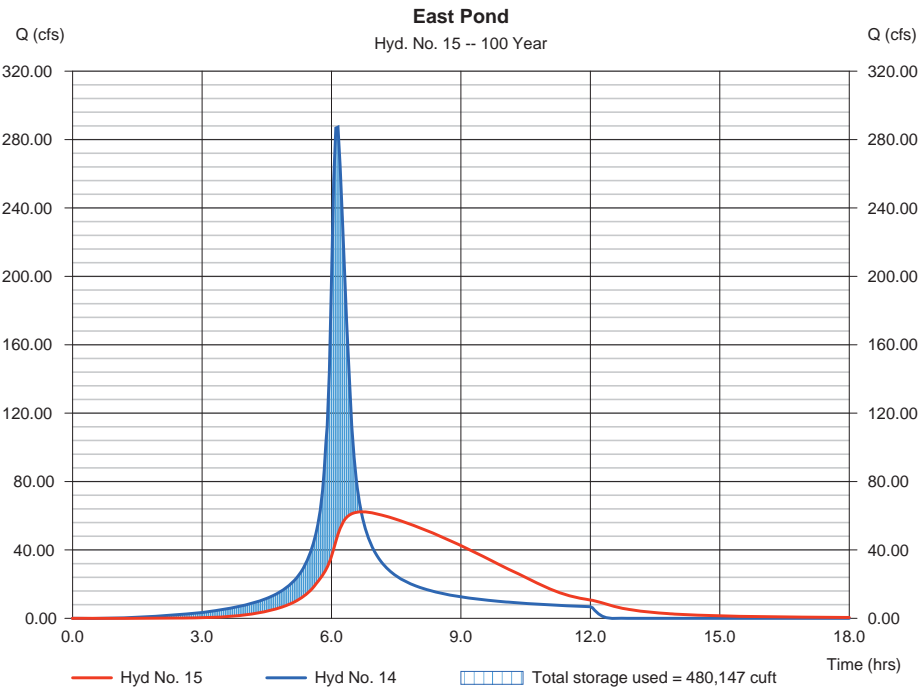
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 15

East Pond

Hydrograph type	= Reservoir	Peak discharge	= 62.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.70 hrs
Time interval	= 3 min	Hyd. volume	= 1,006,534 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 926.19 ft
Reservoir name	= East Pond	Max. Storage	= 480,147 cuft

Storage Indication method used.



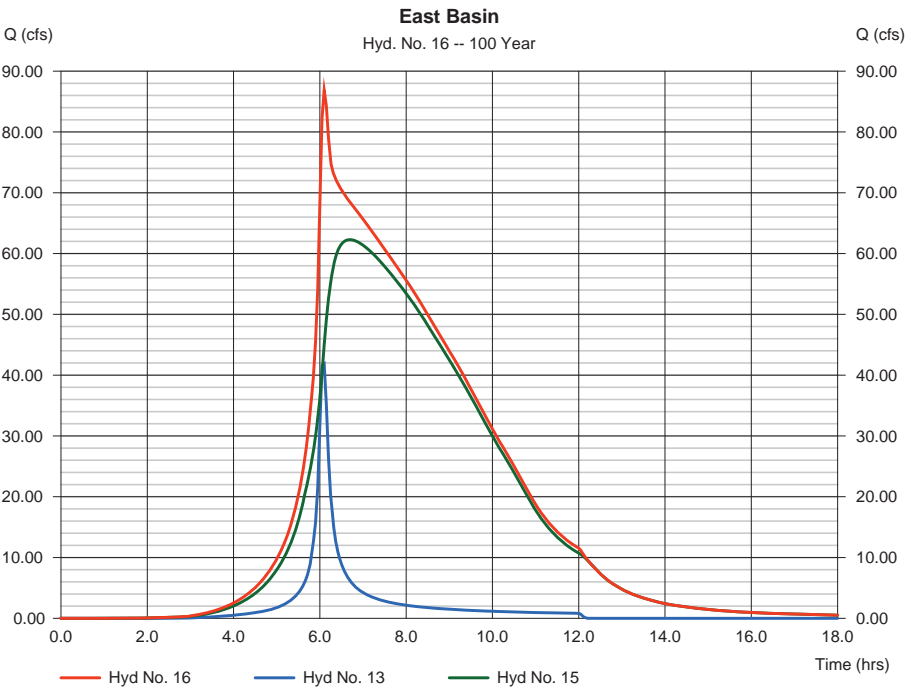
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 16

East Basin

Hydrograph type	= Combine	Peak discharge	= 86.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,117,907 cuft
Inflow hyds.	= 13, 15	Contrib. drain. area	= 6.400 ac



## **APPENDIX C**

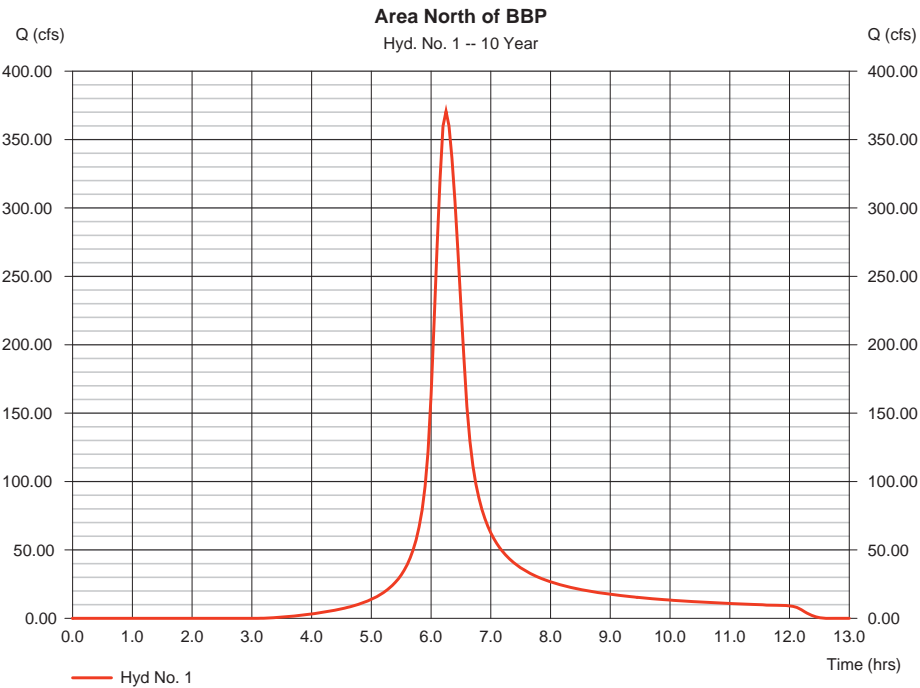
### **10-YEAR STORM EVENT EAST AND WEST BASINS**

# Hydrograph Report

## Hyd. No. 1

Area North of BBP

Hydrograph type	=	SCS Runoff	Peak discharge	=	370.63 cfs
Storm frequency	=	10 yrs	Time to peak	=	6.25 hrs
Time interval	=	3 min	Hyd. volume	=	1,299,668 cuft
Drainage area	=	113.700 ac	Curve number	=	85.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	23.30 min
Total precip.	=	4.81 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484

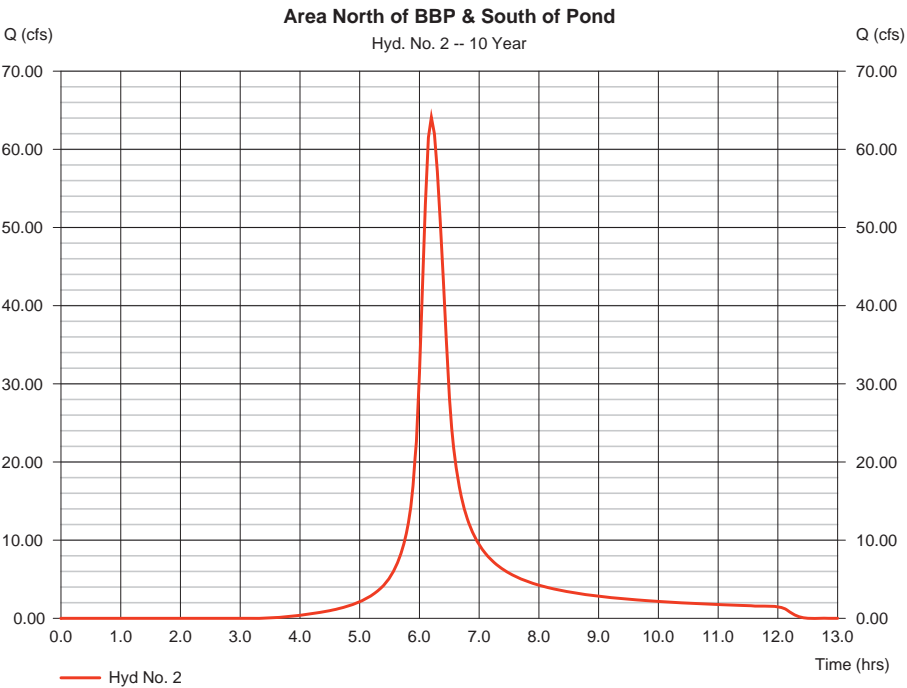


# Hydrograph Report

## Hyd. No. 2

Area North of BBP & South of Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	64.10 cfs
Storm frequency	=	10 yrs	Time to peak	=	6.20 hrs
Time interval	=	3 min	Hyd. volume	=	207,403 cuft
Drainage area	=	17.900 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.10 min
Total precip.	=	4.81 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484



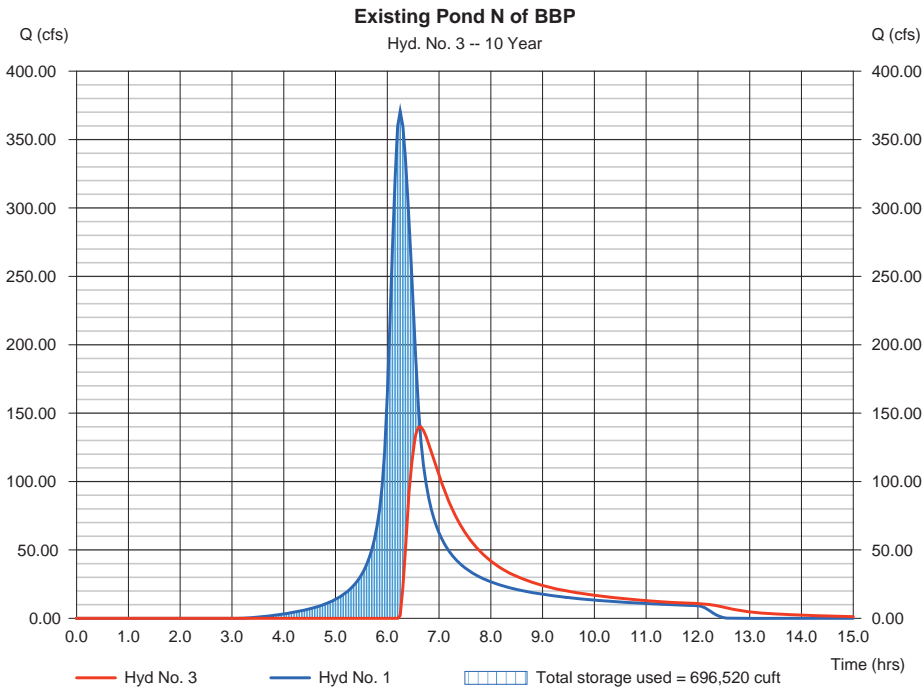
# Hydrograph Report

## Hyd. No. 3

Existing Pond N of BBP

Hydrograph type	= Reservoir	Peak discharge	= 139.92 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.65 hrs
Time interval	= 3 min	Hyd. volume	= 860,614 cuft
Inflow hyd. No.	= 1 - Area North of BBP	Max. Elevation	= 936.94 ft
Reservoir name	= Existing Pond	Max. Storage	= 696,520 cuft

Storage Indication method used.

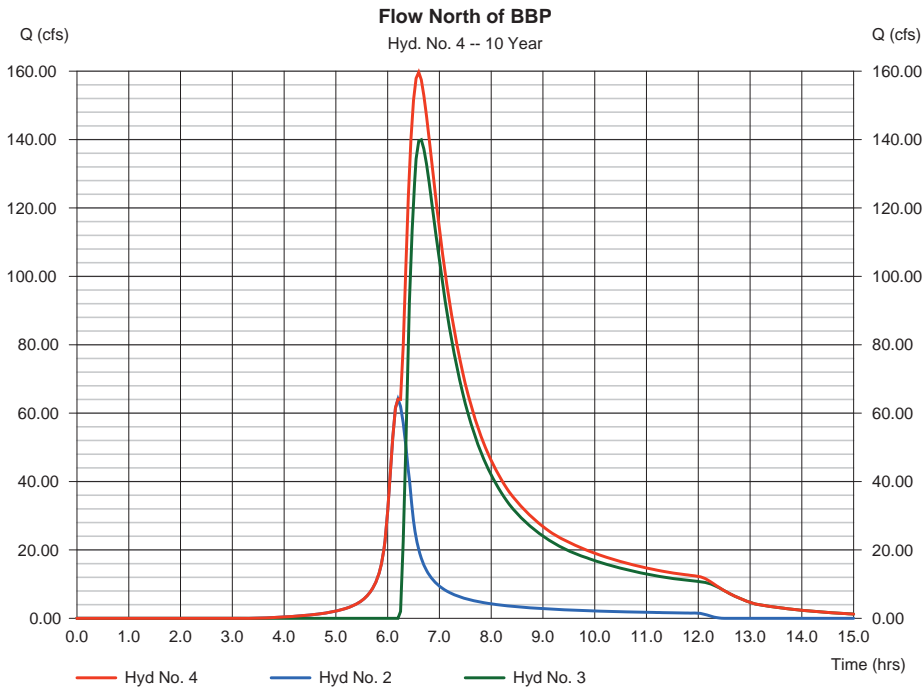


# Hydrograph Report

## Hyd. No. 4

Flow North of BBP

Hydrograph type	= Combine	Peak discharge	= 159.67 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.60 hrs
Time interval	= 3 min	Hyd. volume	= 1,068,017 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 17.900 ac



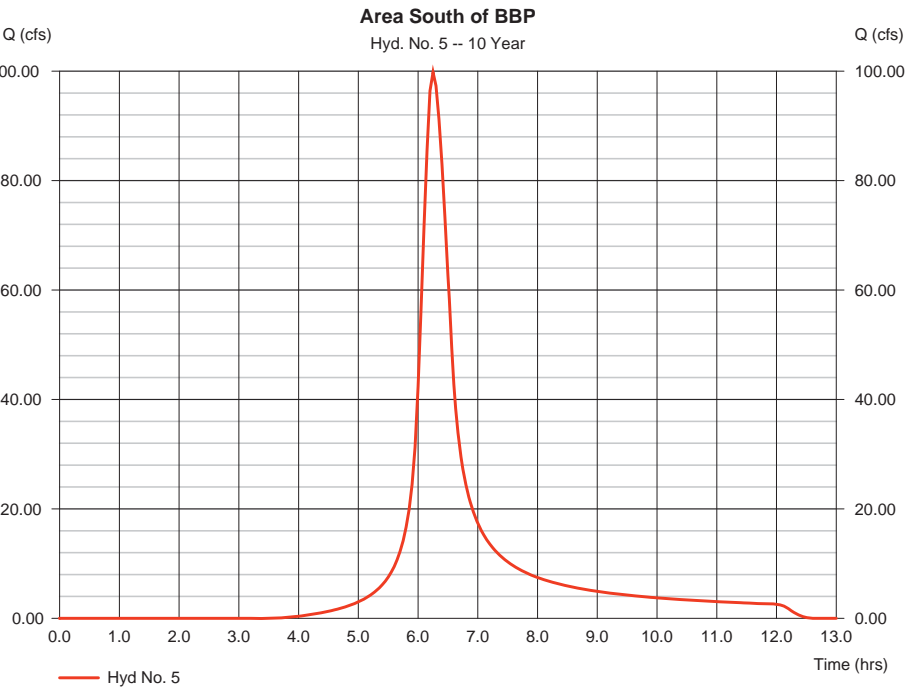


# Hydrograph Report

## Hyd. No. 5

Area South of BBP

Hydrograph type	= SCS Runoff	Peak discharge	= 99.80 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.25 hrs
Time interval	= 3 min	Hyd. volume	= 348,335 cuft
Drainage area	= 32.900 ac	Curve number	= 82.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.60 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

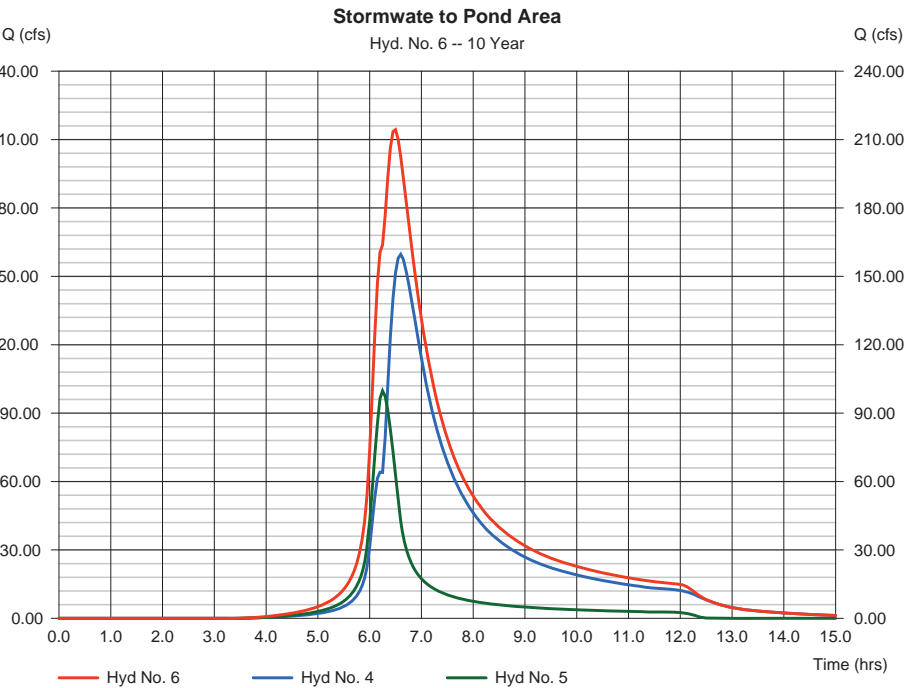


# Hydrograph Report

## Hyd. No. 6

Stormwater to Pond Area

Hydrograph type	= Combine	Peak discharge	= 214.34 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.50 hrs
Time interval	= 3 min	Hyd. volume	= 1,416,352 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 32.900 ac



# Hydrograph Report

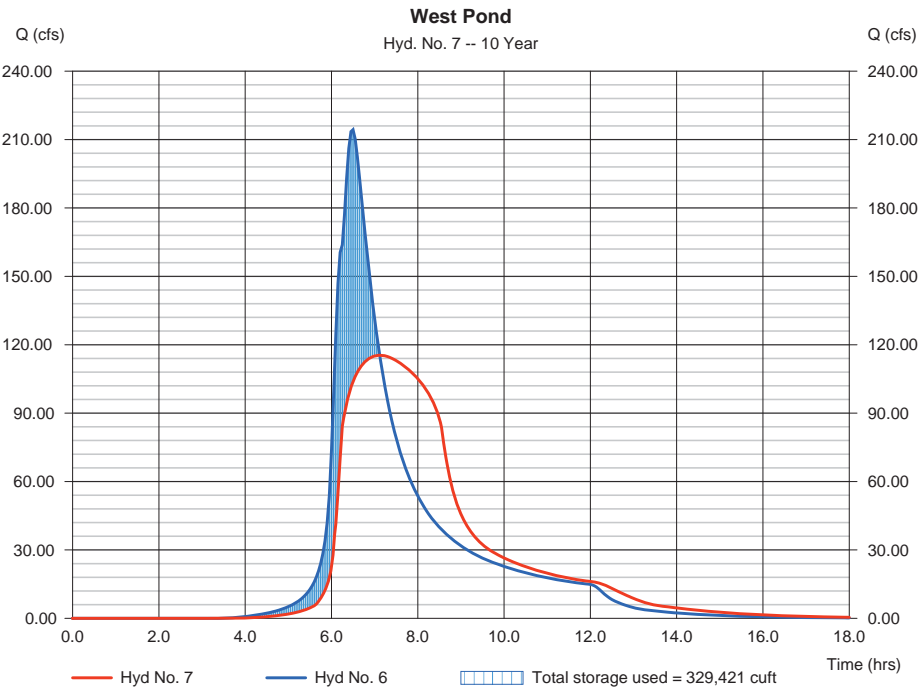
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 115.36 cfs
Storm frequency	= 10 yrs	Time to peak	= 7.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,416,349 cuft
Inflow hyd. No.	= 6 - Stormwater to Pond Area	Max. Elevation	= 903.07 ft
Reservoir name	= West Pond	Max. Storage	= 329,421 cuft

Storage Indication method used.



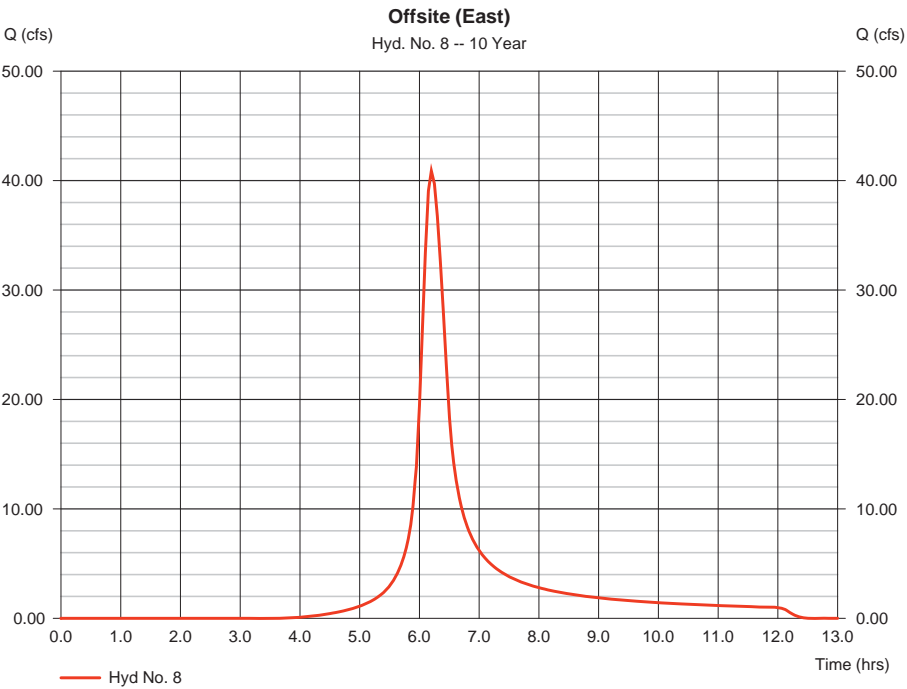
# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 8

Offsite (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 40.89 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 131,961 cuft
Drainage area	= 12.200 ac	Curve number	= 81.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.60 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

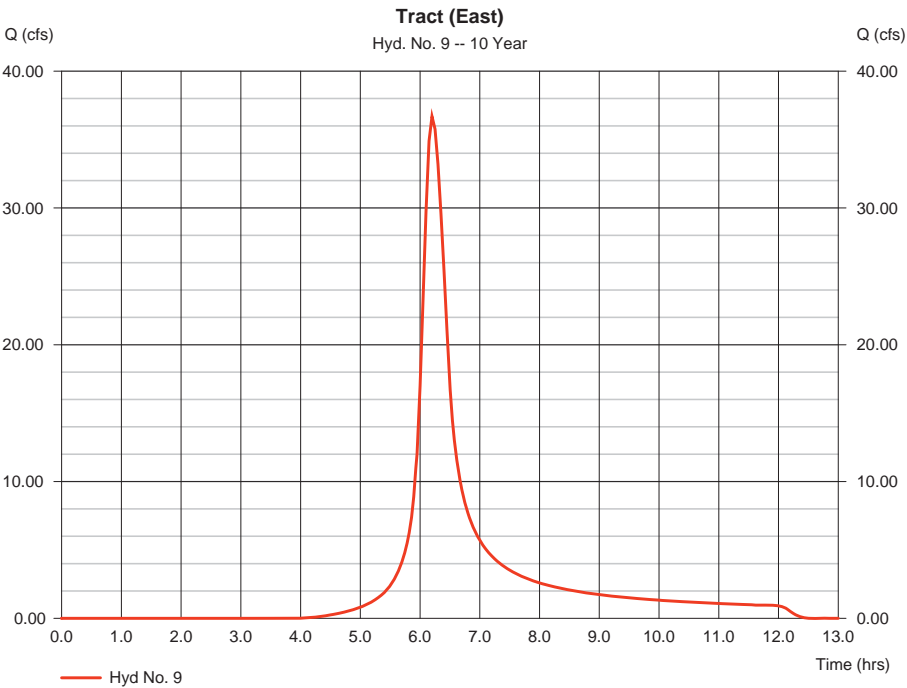


# Hydrograph Report

## Hyd. No. 9

Tract (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 36.69 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 118,373 cuft
Drainage area	= 11.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.70 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

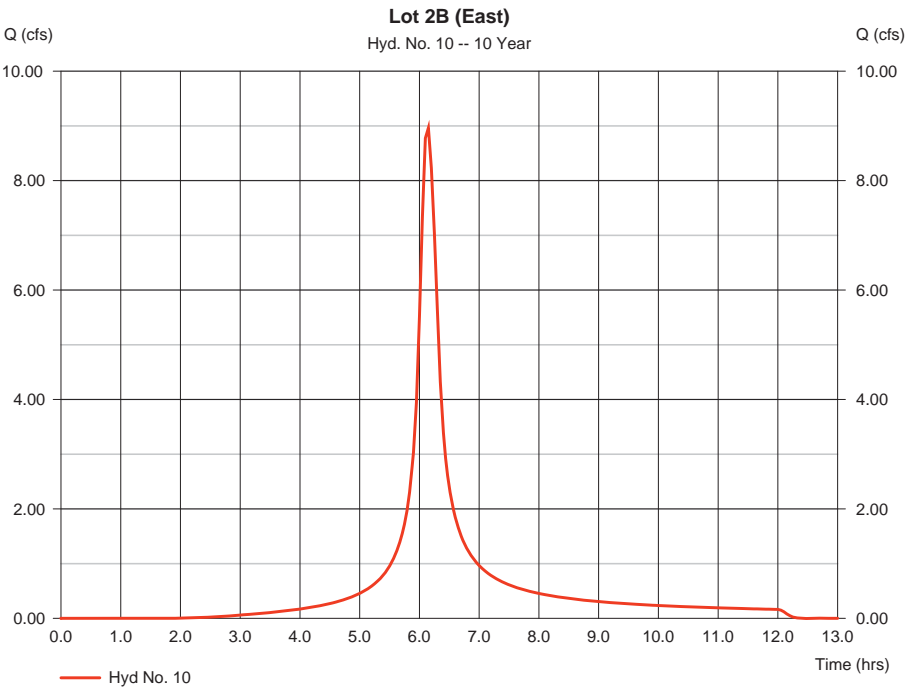


# Hydrograph Report

## Hyd. No. 10

Lot 2B (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.962 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 26,180 cuft
Drainage area	= 1.900 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.60 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



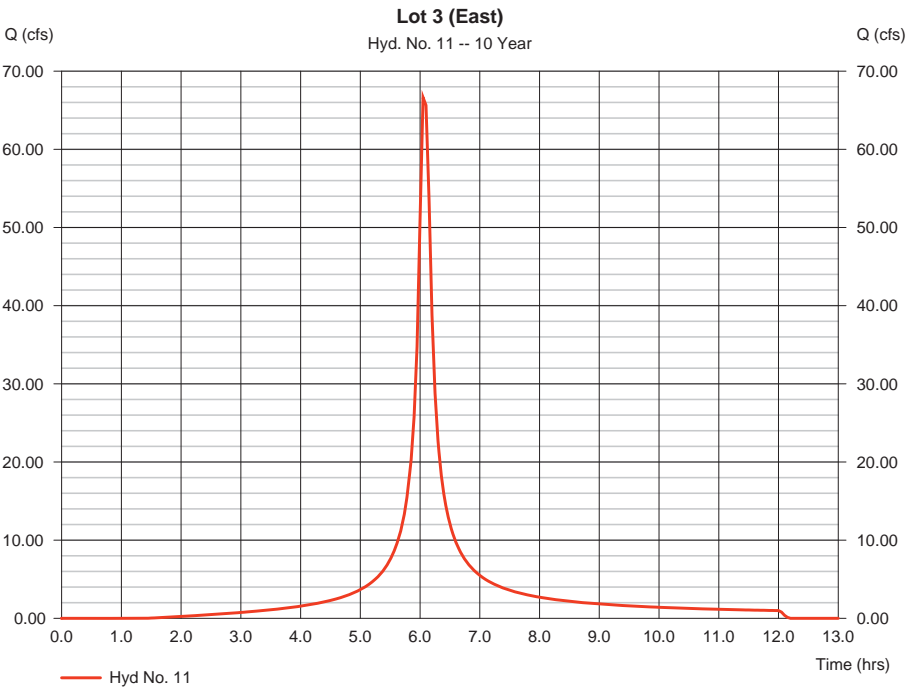


# Hydrograph Report

## Hyd. No. 11

Lot 3 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 66.64 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 170,996 cuft
Drainage area	= 12.200 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

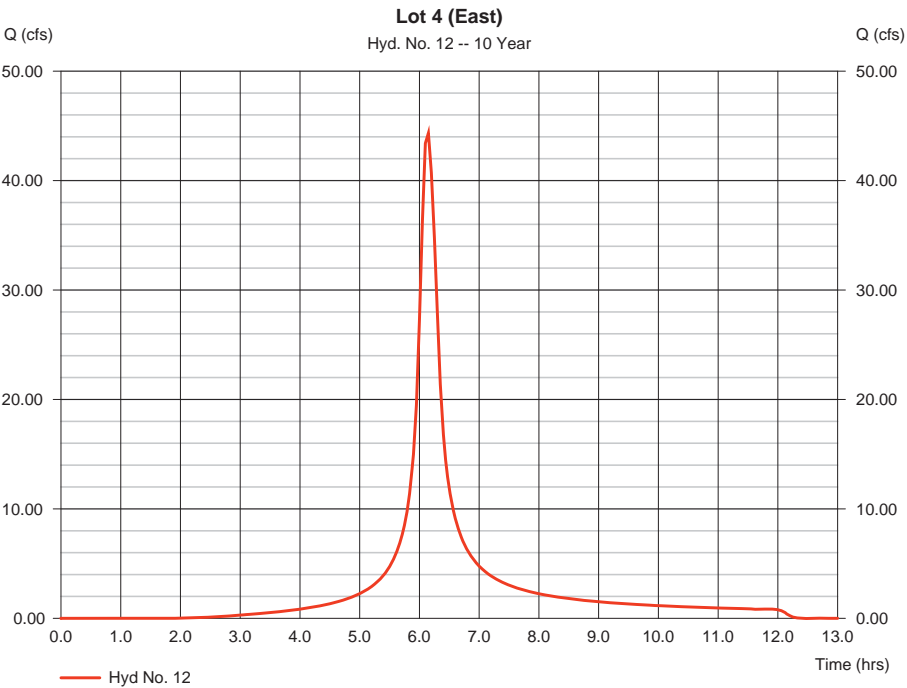


# Hydrograph Report

## Hyd. No. 12

Lot 4 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 44.34 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 129,521 cuft
Drainage area	= 9.400 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

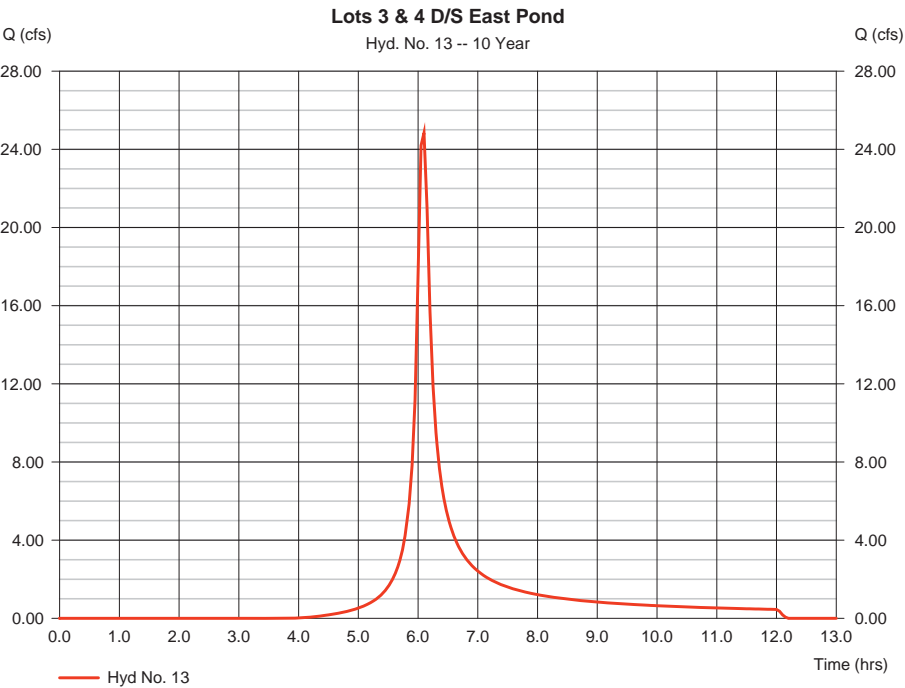


# Hydrograph Report

## Hyd. No. 13

Lots 3 & 4 D/S East Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 24.84 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 59,372 cuft
Drainage area	= 6.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.20 min
Total precip.	= 4.81 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

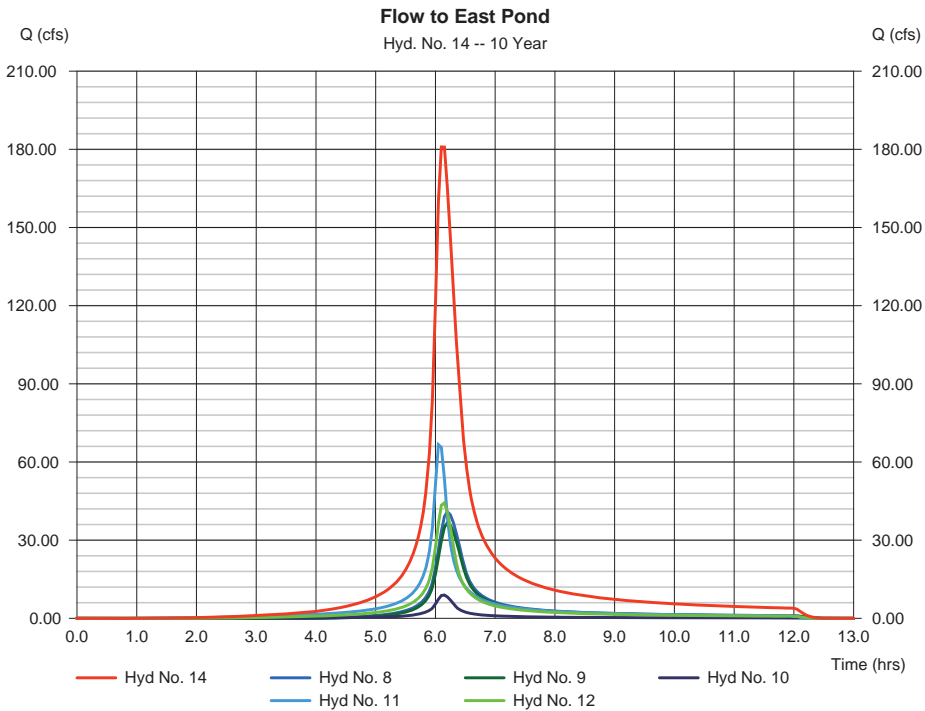


# Hydrograph Report

## Hyd. No. 14

Flow to East Pond

Hydrograph type	= Combine	Peak discharge	= 180.92 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 577,030 cuft
Inflow hyds.	= 8, 9, 10, 11, 12	Contrib. drain. area	= 47.300 ac



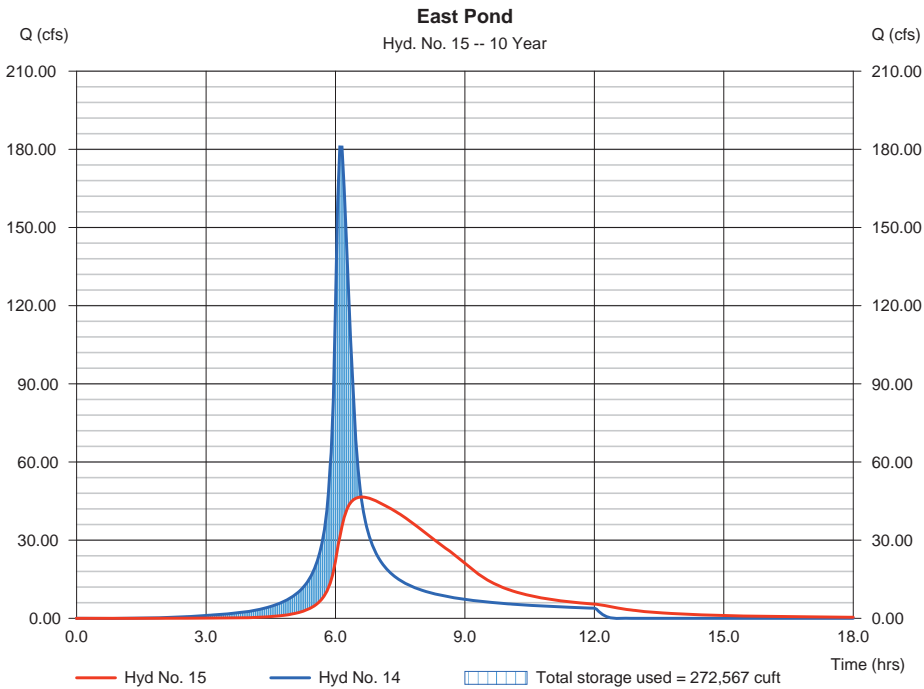
# Hydrograph Report

## Hyd. No. 15

East Pond

Hydrograph type	= Reservoir	Peak discharge	= 46.57 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.60 hrs
Time interval	= 3 min	Hyd. volume	= 576,997 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 923.13 ft
Reservoir name	= East Pond	Max. Storage	= 272,567 cuft

Storage Indication method used.

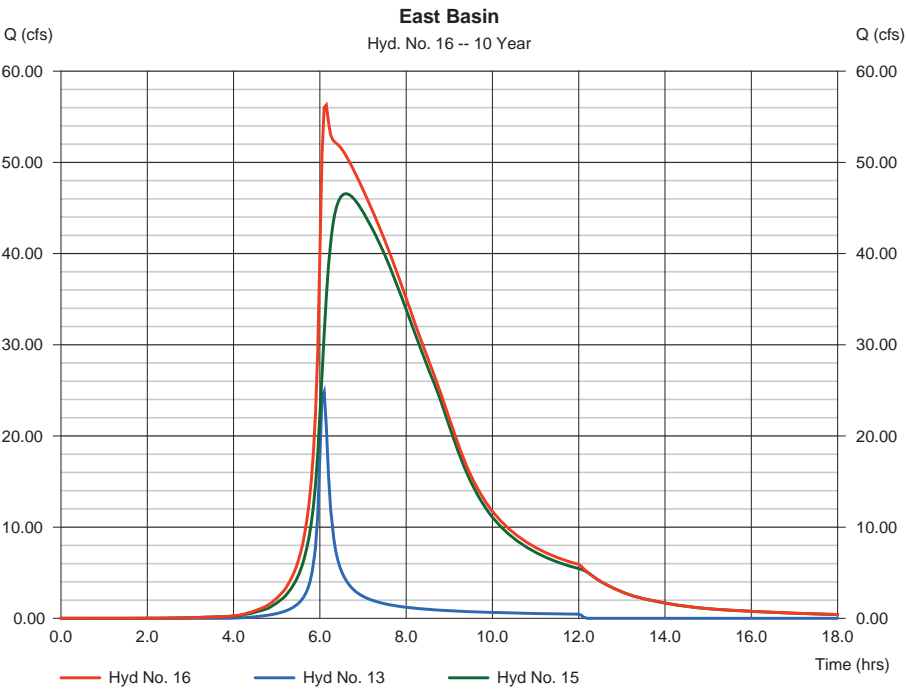


# Hydrograph Report

## Hyd. No. 16

East Basin

Hydrograph type	= Combine	Peak discharge	= 56.30 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 636,369 cuft
Inflow hyds.	= 13, 15	Contrib. drain. area	= 6.400 ac





## **APPENDIX D**

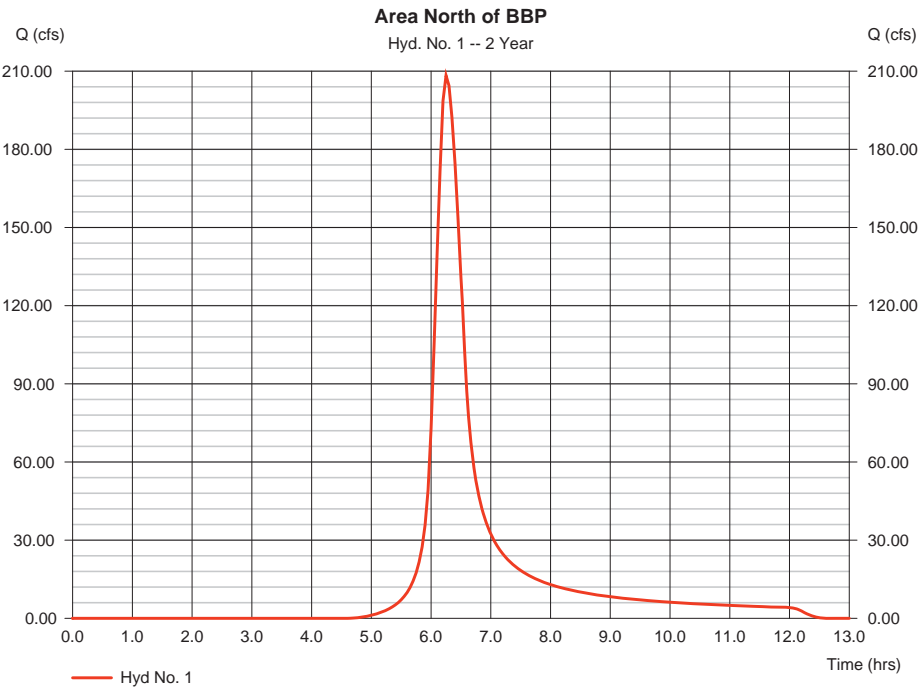
### **2-YEAR STORM EVENT EAST AND WEST BASINS**

# Hydrograph Report

## Hyd. No. 1

Area North of BBP

Hydrograph type	=	SCS Runoff	Peak discharge	=	208.35 cfs
Storm frequency	=	2 yrs	Time to peak	=	6.25 hrs
Time interval	=	3 min	Hyd. volume	=	632,361 cuft
Drainage area	=	113.700 ac	Curve number	=	85.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	23.30 min
Total precip.	=	2.95 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484

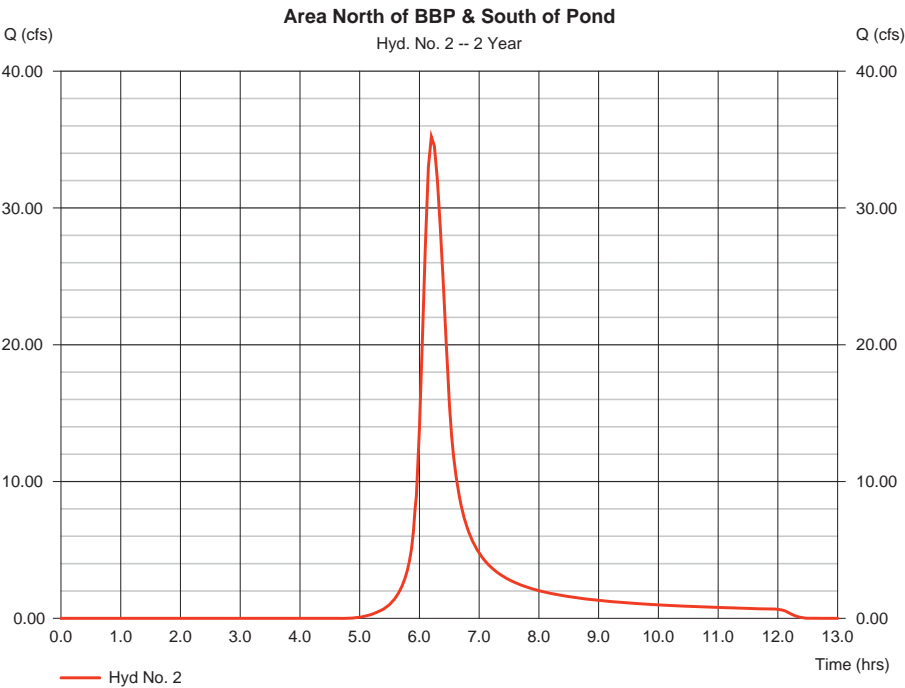


# Hydrograph Report

## Hyd. No. 2

Area North of BBP & South of Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.21 cfs
Storm frequency	=	2 yrs	Time to peak	=	6.20 hrs
Time interval	=	3 min	Hyd. volume	=	98,594 cuft
Drainage area	=	17.900 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.10 min
Total precip.	=	2.95 in	Distribution	=	Synthetic
Storm duration	=	12.00 hrs	Shape factor	=	484



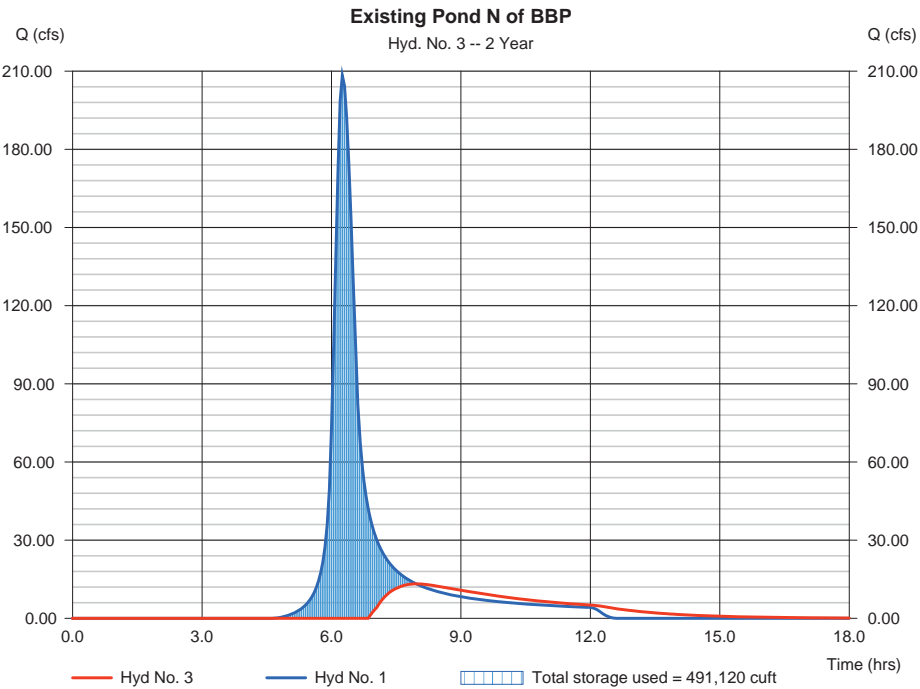
# Hydrograph Report

## Hyd. No. 3

Existing Pond N of BBP

Hydrograph type	= Reservoir	Peak discharge	= 13.23 cfs
Storm frequency	= 2 yrs	Time to peak	= 7.95 hrs
Time interval	= 3 min	Hyd. volume	= 193,306 cuft
Inflow hyd. No.	= 1 - Area North of BBP	Max. Elevation	= 936.11 ft
Reservoir name	= Existing Pond	Max. Storage	= 491,120 cuft

Storage Indication method used.

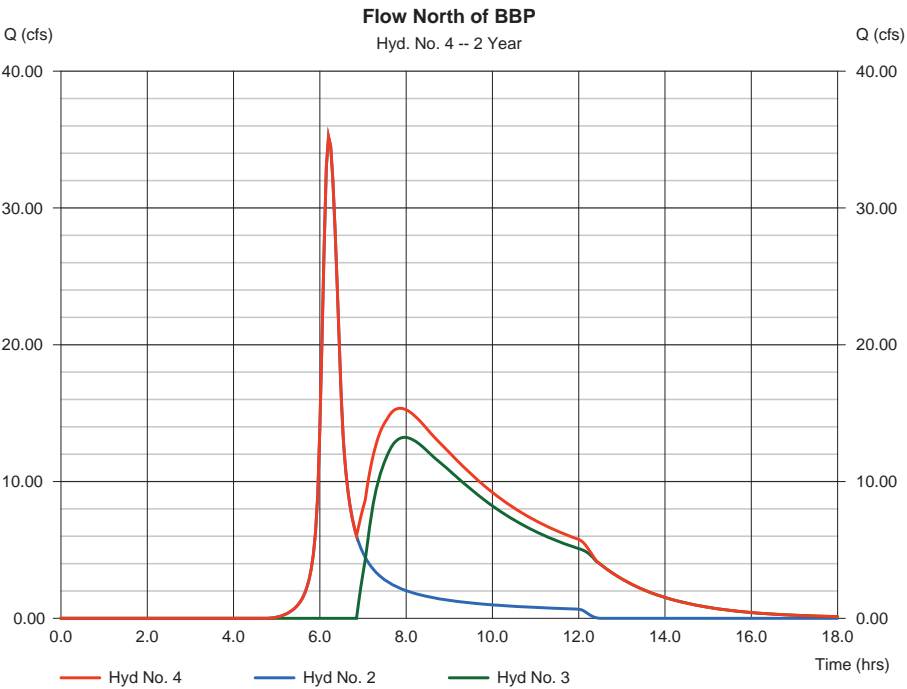


# Hydrograph Report

## Hyd. No. 4

Flow North of BBP

Hydrograph type	= Combine	Peak discharge	= 35.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 291,901 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 17.900 ac



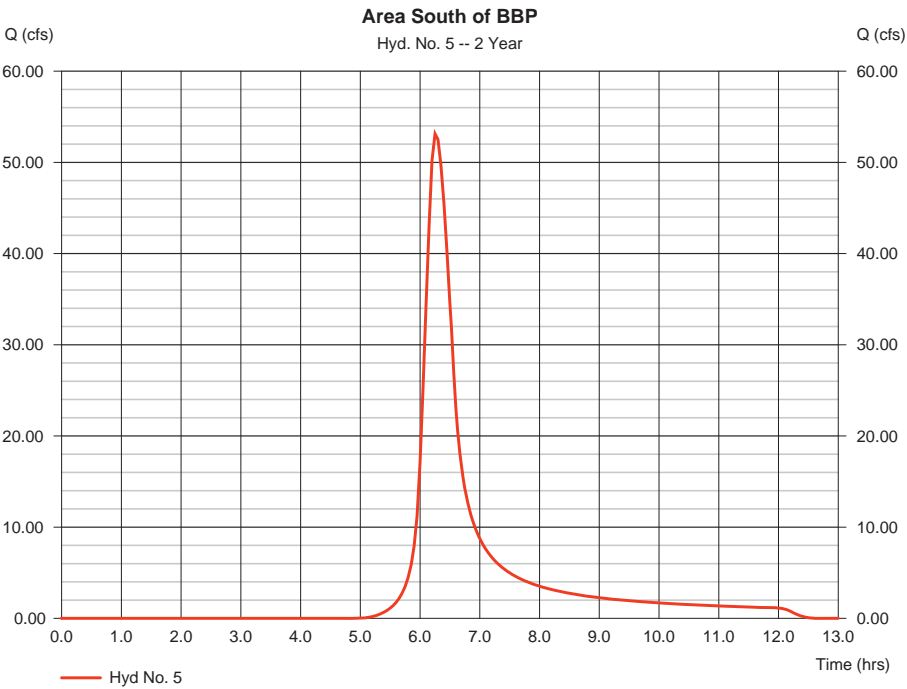


# Hydrograph Report

## Hyd. No. 5

Area South of BBP

Hydrograph type	= SCS Runoff	Peak discharge	= 53.13 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.25 hrs
Time interval	= 3 min	Hyd. volume	= 162,539 cuft
Drainage area	= 32.900 ac	Curve number	= 82.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.60 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

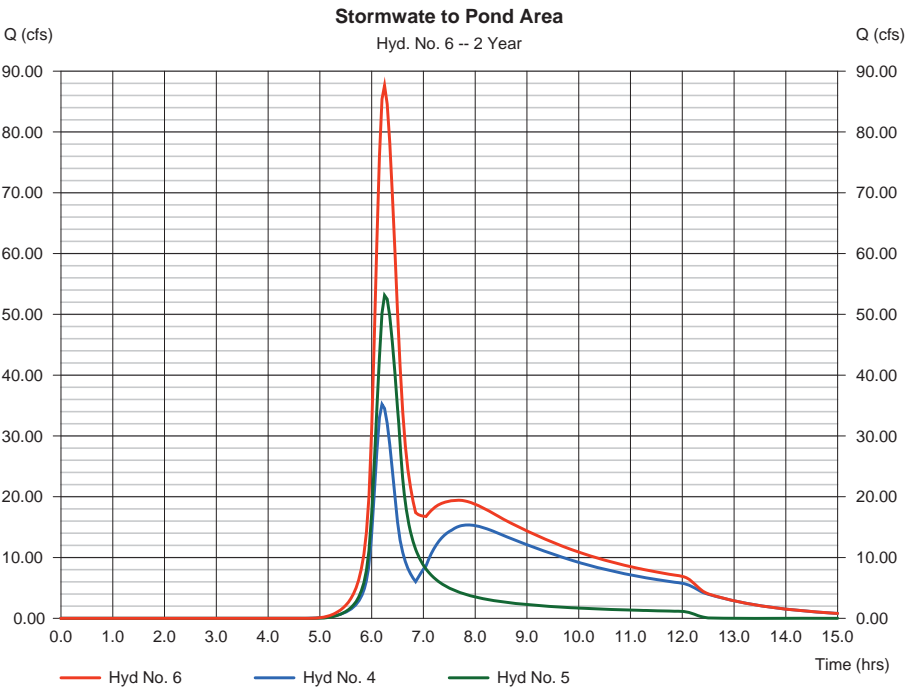


# Hydrograph Report

## Hyd. No. 6

Stormwater to Pond Area

Hydrograph type	= Combine	Peak discharge	= 87.64 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.25 hrs
Time interval	= 3 min	Hyd. volume	= 454,440 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 32.900 ac



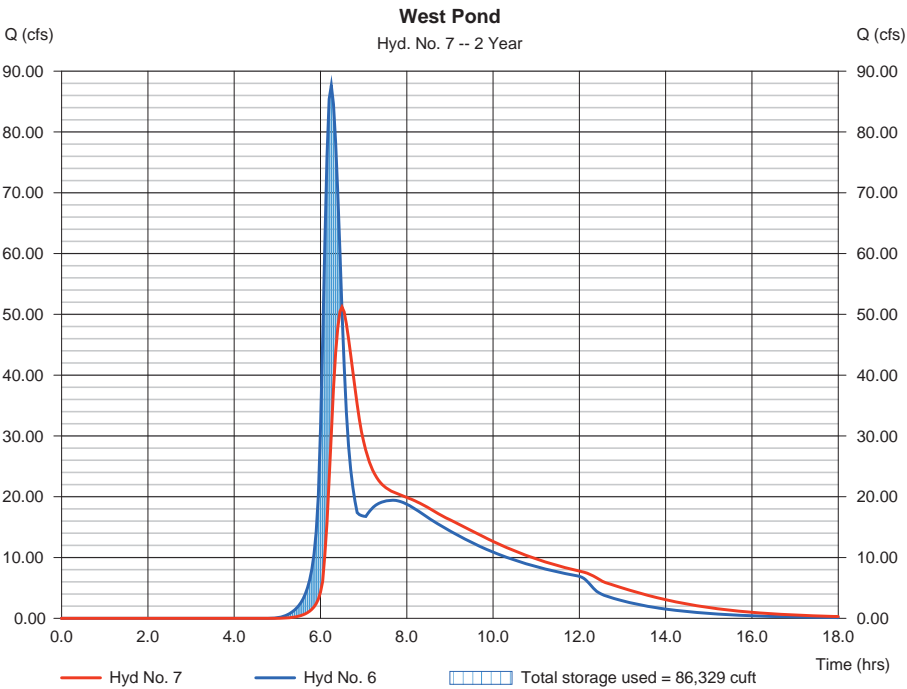
# Hydrograph Report

## Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 51.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.50 hrs
Time interval	= 3 min	Hyd. volume	= 454,436 cuft
Inflow hyd. No.	= 6 - Stormwater to Pond Area	Max. Elevation	= 900.84 ft
Reservoir name	= West Pond	Max. Storage	= 86,329 cuft

Storage Indication method used.

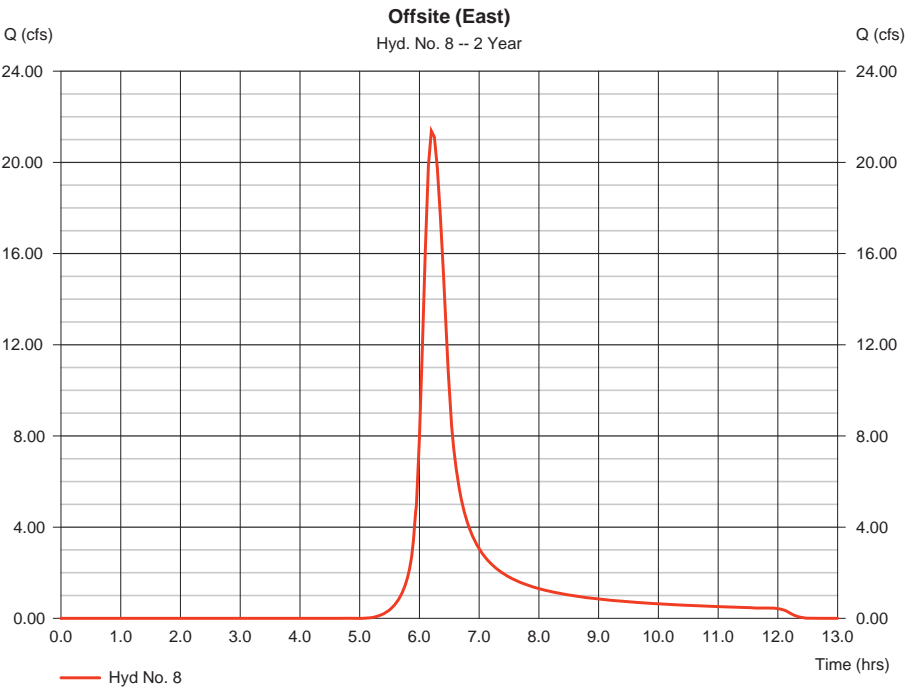


# Hydrograph Report

## Hyd. No. 8

Offsite (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 21.38 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 60,421 cuft
Drainage area	= 12.200 ac	Curve number	= 81.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.60 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

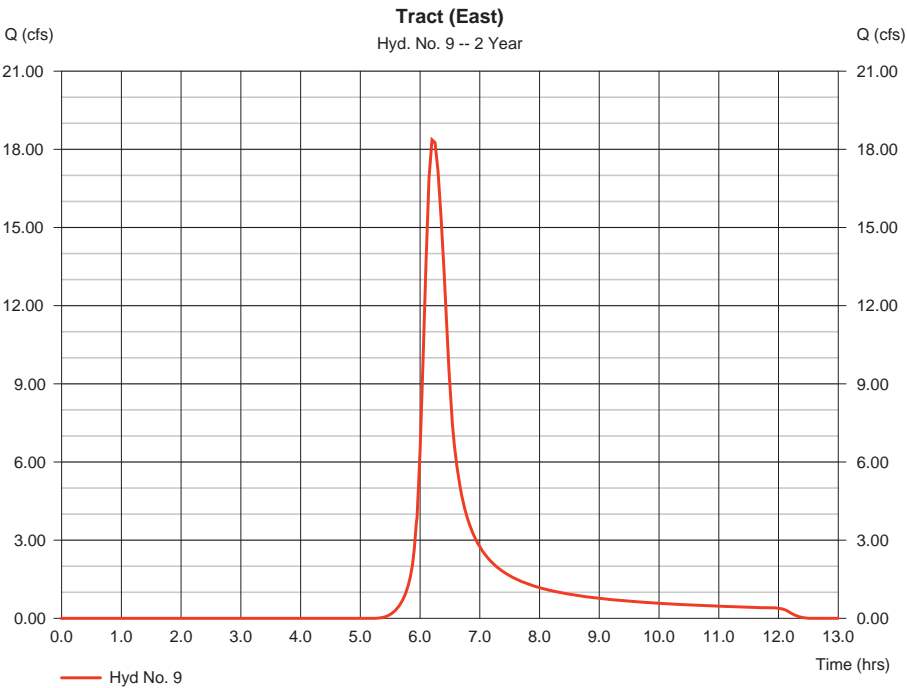


# Hydrograph Report

## Hyd. No. 9

Tract (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 18.37 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.20 hrs
Time interval	= 3 min	Hyd. volume	= 52,504 cuft
Drainage area	= 11.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.70 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

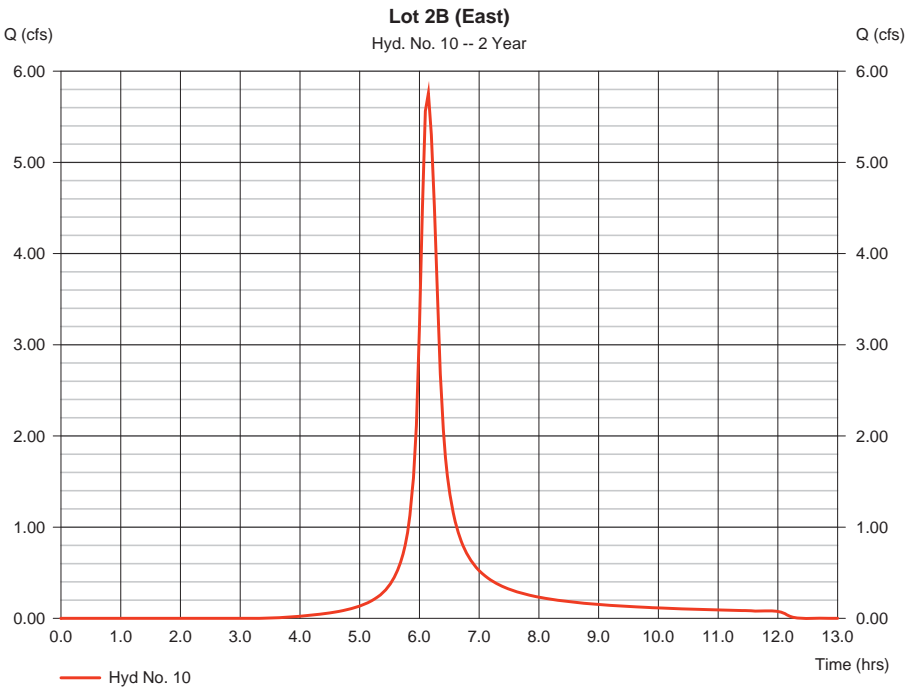


# Hydrograph Report

## Hyd. No. 10

Lot 2B (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 5.758 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 13,934 cuft
Drainage area	= 1.900 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.60 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484



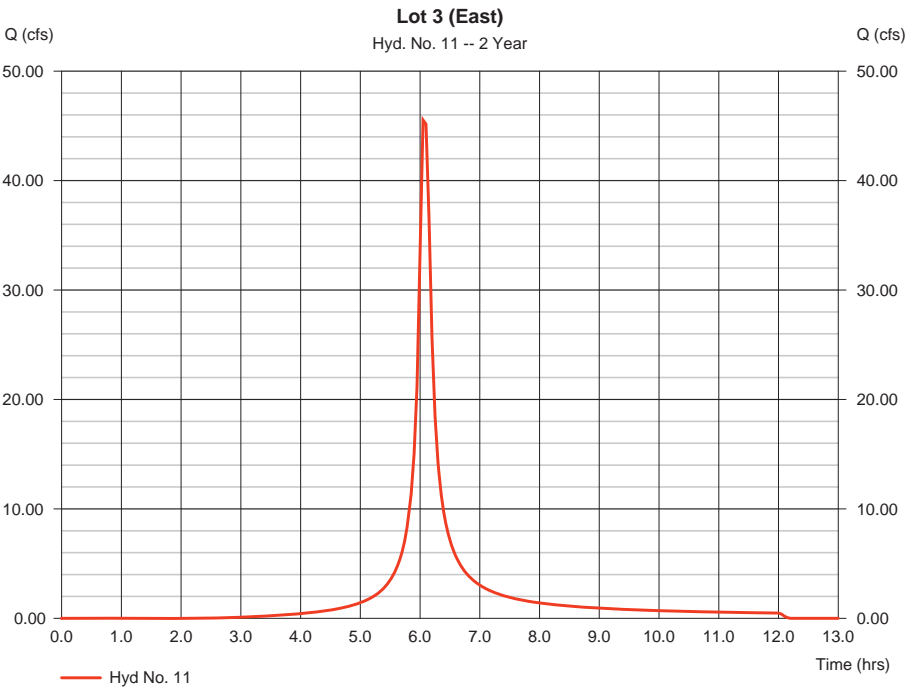


# Hydrograph Report

## Hyd. No. 11

Lot 3 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 45.53 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.05 hrs
Time interval	= 3 min	Hyd. volume	= 95,376 cuft
Drainage area	= 12.200 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.40 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

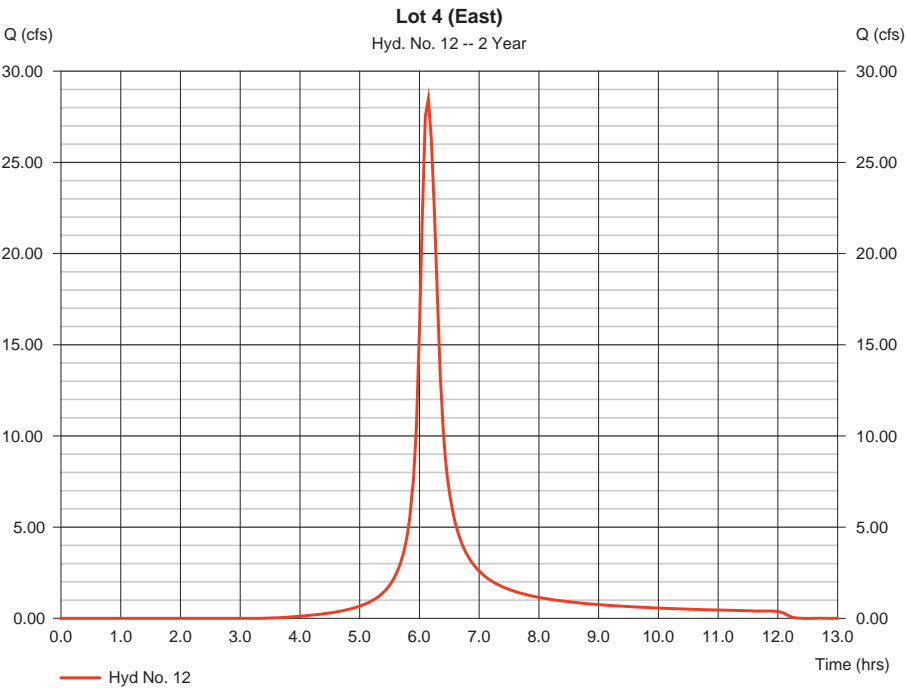


# Hydrograph Report

## Hyd. No. 12

Lot 4 (East)

Hydrograph type	= SCS Runoff	Peak discharge	= 28.49 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.15 hrs
Time interval	= 3 min	Hyd. volume	= 68,935 cuft
Drainage area	= 9.400 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

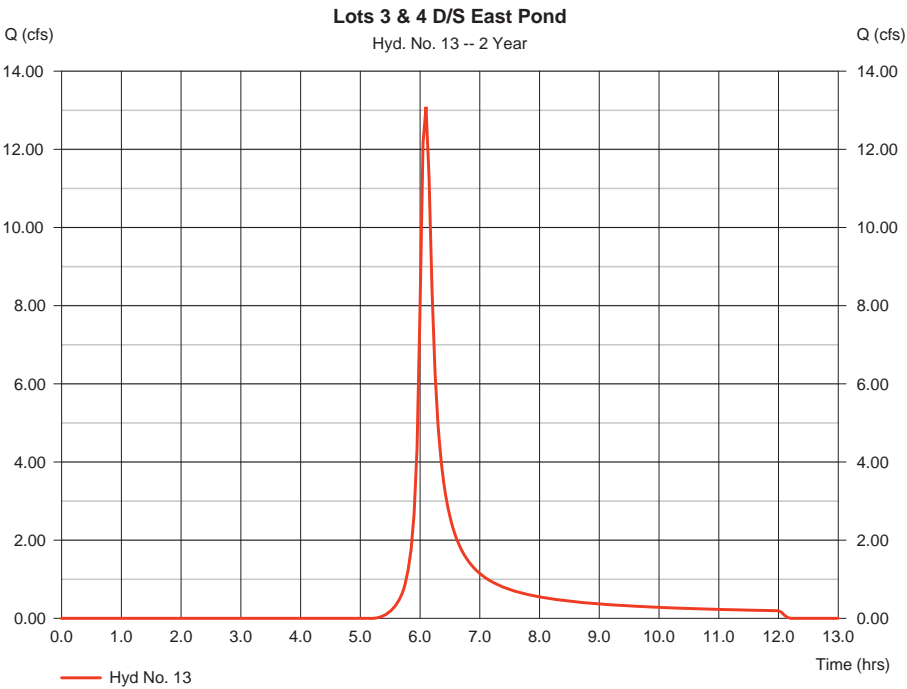


# Hydrograph Report

## Hyd. No. 13

Lots 3 & 4 D/S East Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 13.09 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 26,334 cuft
Drainage area	= 6.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.20 min
Total precip.	= 2.95 in	Distribution	= Synthetic
Storm duration	= 12.00 hrs	Shape factor	= 484

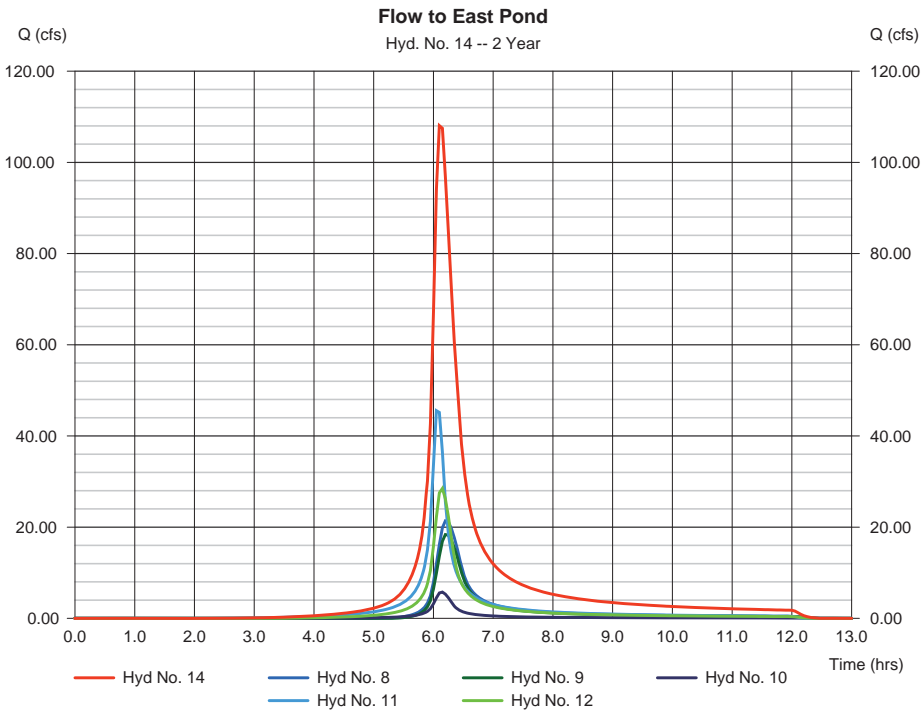


# Hydrograph Report

## Hyd. No. 14

Flow to East Pond

Hydrograph type	= Combine	Peak discharge	= 108.05 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.10 hrs
Time interval	= 3 min	Hyd. volume	= 291,170 cuft
Inflow hyds.	= 8, 9, 10, 11, 12	Contrib. drain. area	= 47.300 ac



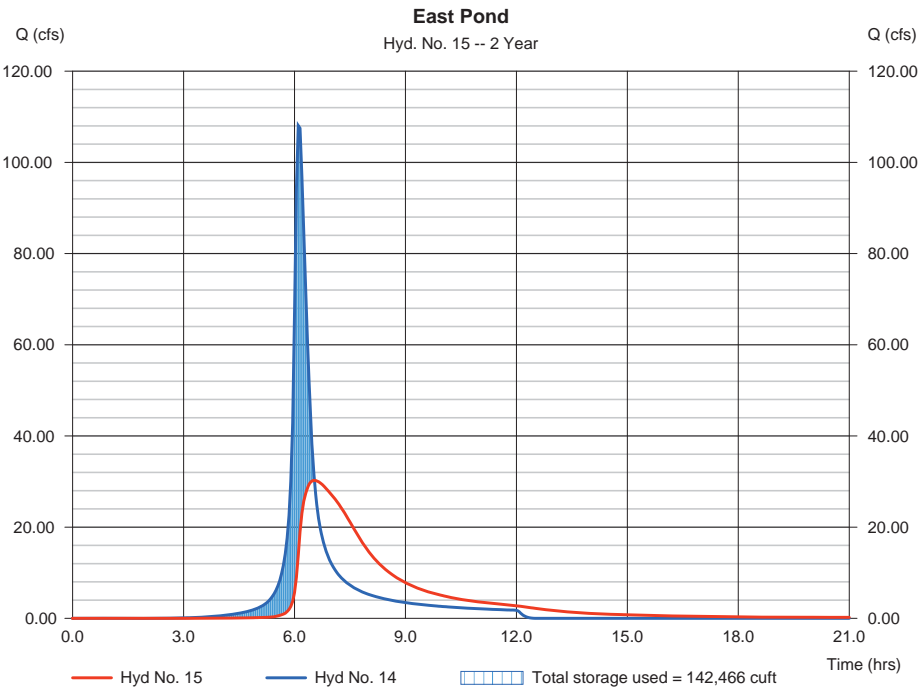
# Hydrograph Report

## Hyd. No. 15

East Pond

Hydrograph type	= Reservoir	Peak discharge	= 30.25 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.55 hrs
Time interval	= 3 min	Hyd. volume	= 291,137 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 920.89 ft
Reservoir name	= East Pond	Max. Storage	= 142,466 cuft

Storage Indication method used.

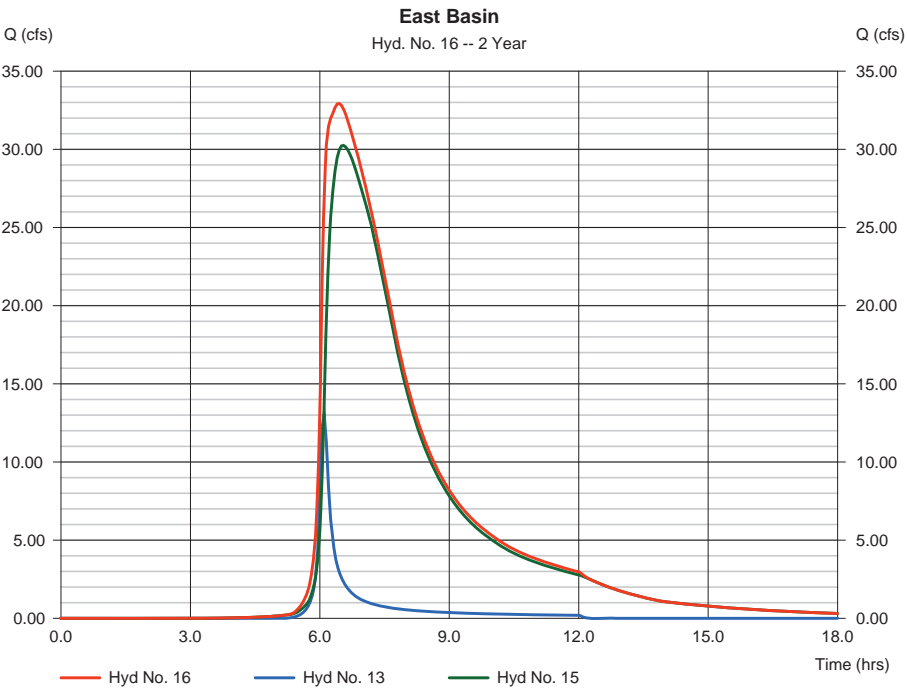


# Hydrograph Report

## Hyd. No. 16

East Basin

Hydrograph type	= Combine	Peak discharge	= 32.93 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.45 hrs
Time interval	= 3 min	Hyd. volume	= 317,471 cuft
Inflow hyds.	= 13, 15	Contrib. drain. area	= 6.400 ac





## **APPENDIX E**

### **RESERVOIR REPORTS**

# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Pond No. 3 - East Pond

### Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 918.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	918.00	43,700	0	0
2.00	920.00	50,600	94,206	94,206
4.00	922.00	57,900	108,407	202,614
6.00	924.00	65,600	123,408	326,021
8.00	926.00	73,700	139,208	465,229
10.00	928.00	82,300	155,905	621,134

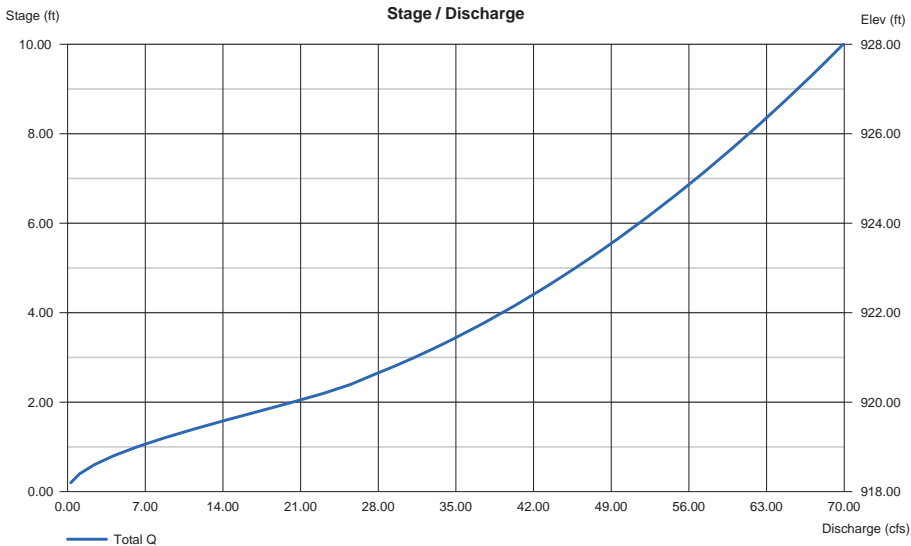
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 918.00	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 2.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
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

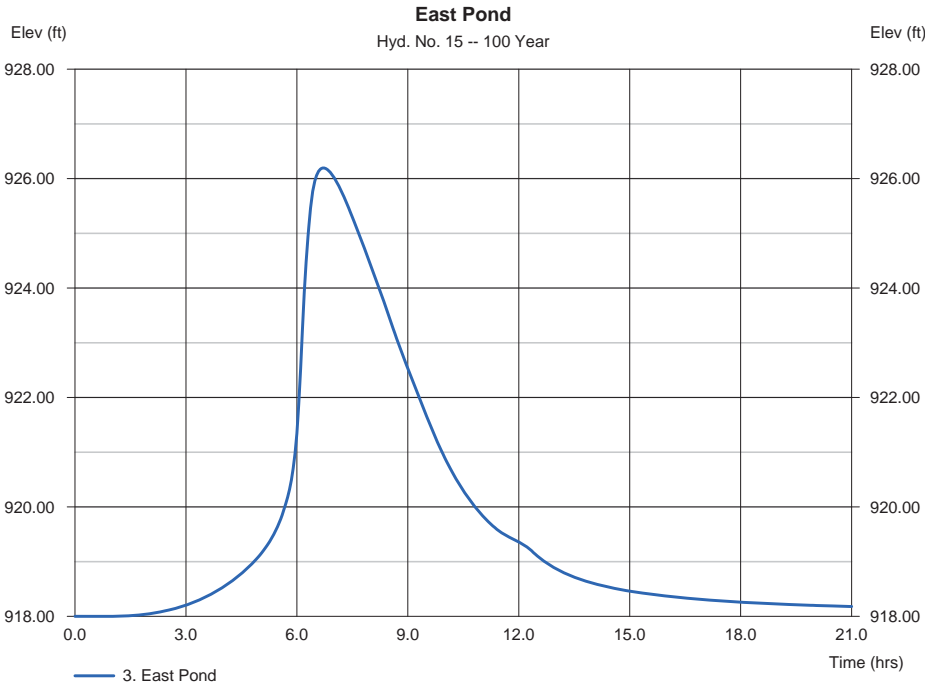
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Thursday, 02 / 11 / 2016

## Hyd. No. 15

### East Pond

Hydrograph type	= Reservoir	Peak discharge	= 62.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 6.70 hrs
Time interval	= 3 min	Hyd. volume	= 1,006,534 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 926.19 ft
Reservoir name	= East Pond	Max. Storage	= 480,147 cuft

Storage Indication method used.



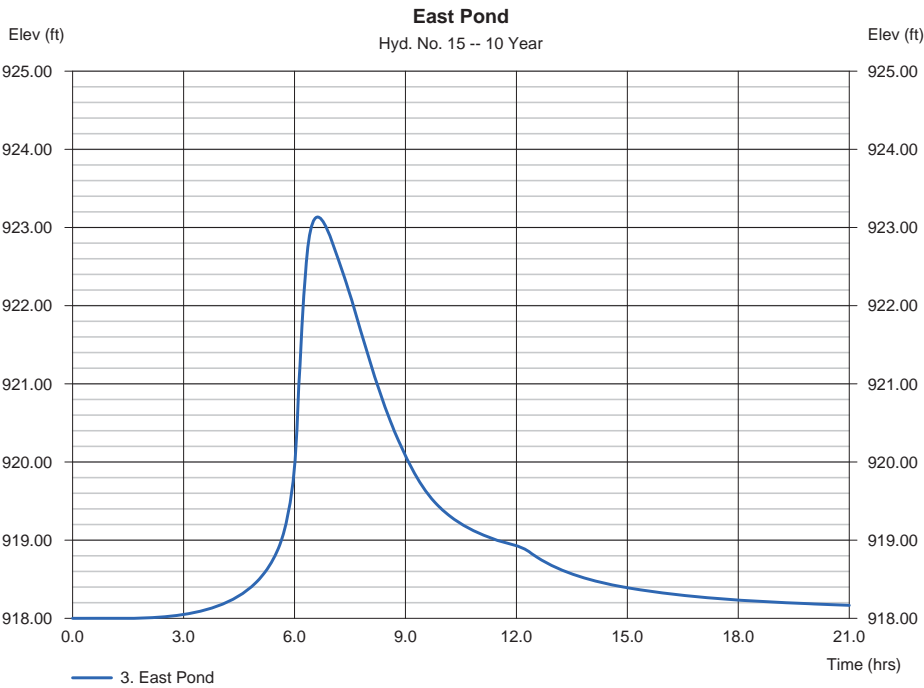
# Hydrograph Report

## Hyd. No. 15

East Pond

Hydrograph type	= Reservoir	Peak discharge	= 46.57 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.60 hrs
Time interval	= 3 min	Hyd. volume	= 576,997 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 923.13 ft
Reservoir name	= East Pond	Max. Storage	= 272,567 cuft

Storage Indication method used.



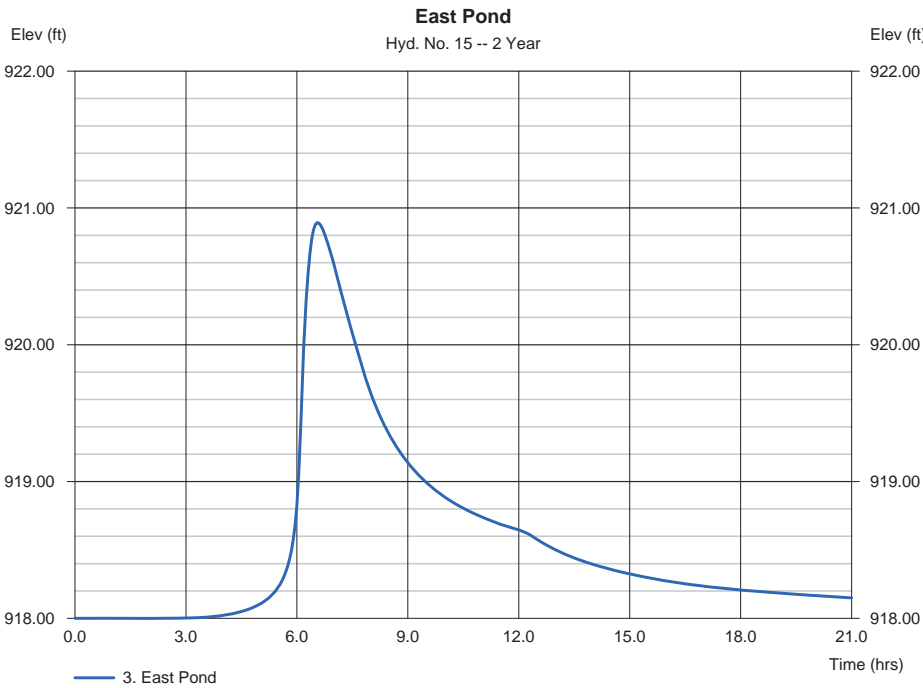
# Hydrograph Report

## Hyd. No. 15

East Pond

Hydrograph type	= Reservoir	Peak discharge	= 30.25 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.55 hrs
Time interval	= 3 min	Hyd. volume	= 291,137 cuft
Inflow hyd. No.	= 14 - Flow to East Pond	Max. Elevation	= 920.89 ft
Reservoir name	= East Pond	Max. Storage	= 142,466 cuft

Storage Indication method used.





Pond Report

Pond No. 2 - West Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 900.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	900.00	97,200	0	0
2.00	902.00	109,100	206,165	206,165
4.00	904.00	122,200	231,153	437,318
6.00	906.00	136,800	258,837	696,155
8.00	908.00	152,600	289,227	985,382
10.00	910.00	169,500	321,920	1,307,302

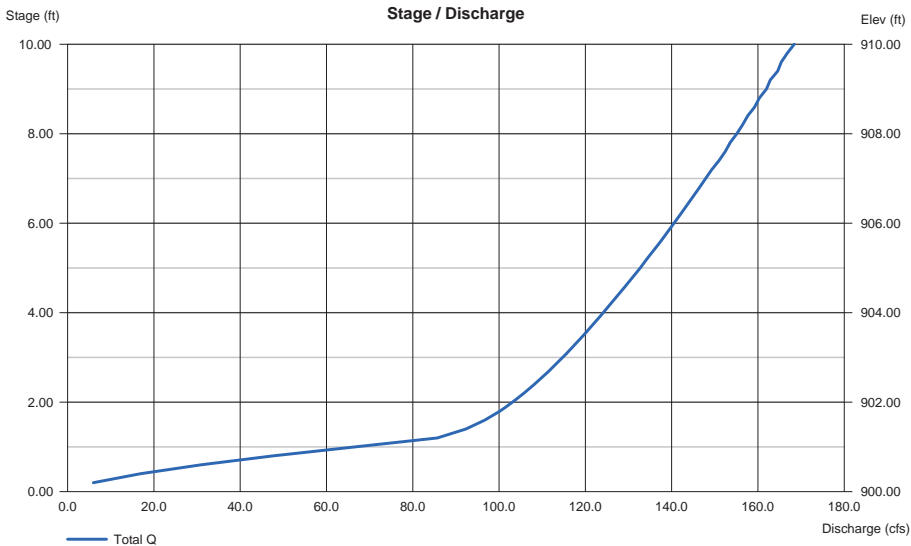
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	0.00	0.00	0.00
Span (in)	= 42.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 895.00	0.00	0.00	0.00
Length (ft)	= 150.00	0.00	0.00	0.00
Slope (%)	= 2.50	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)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 900.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



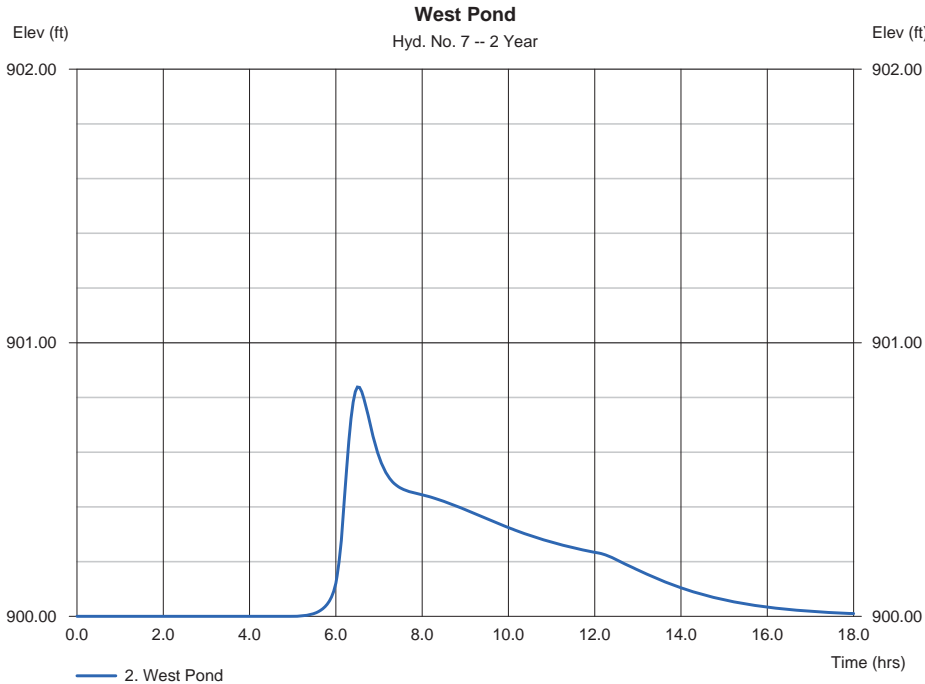
Hydrograph Report

Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 51.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.50 hrs
Time interval	= 3 min	Hyd. volume	= 454,436 cuft
Inflow hyd. No.	= 6 - Stormwate to Pond Area	Max. Elevation	= 900.84 ft
Reservoir name	= West Pond	Max. Storage	= 86,329 cuft

Storage Indication method used.



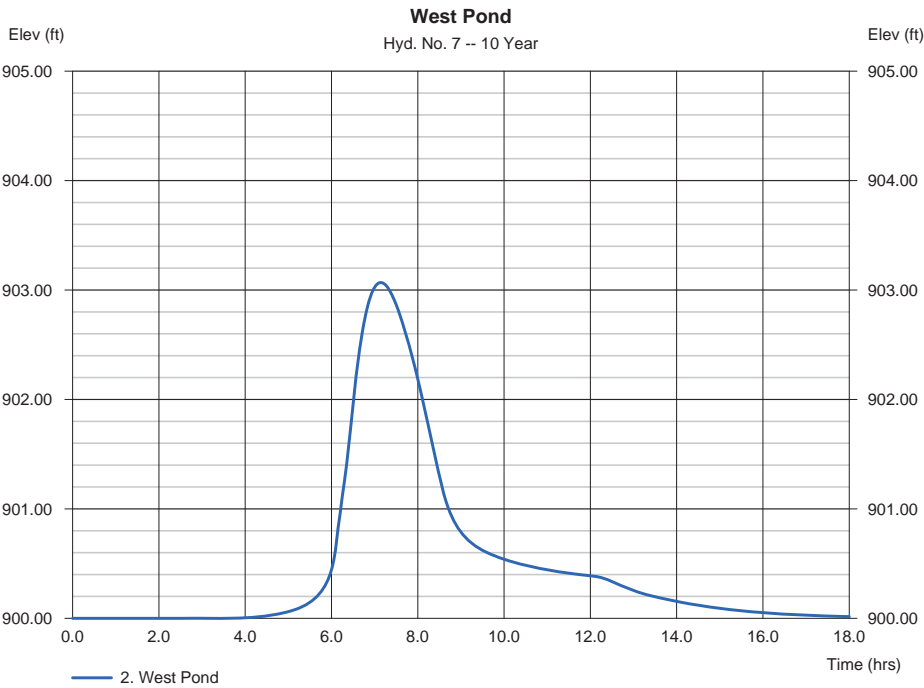
# Hydrograph Report

## Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 115.36 cfs
Storm frequency	= 10 yrs	Time to peak	= 7.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,416,349 cuft
Inflow hyd. No.	= 6 - Stormwate to Pond Area	Max. Elevation	= 903.07 ft
Reservoir name	= West Pond	Max. Storage	= 329,421 cuft

Storage Indication method used.



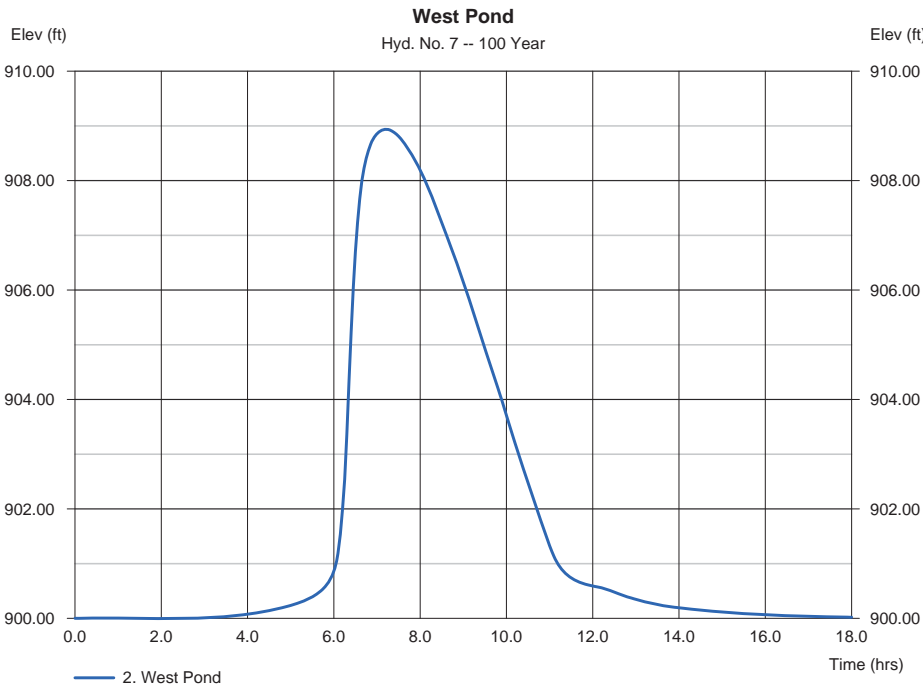
# Hydrograph Report

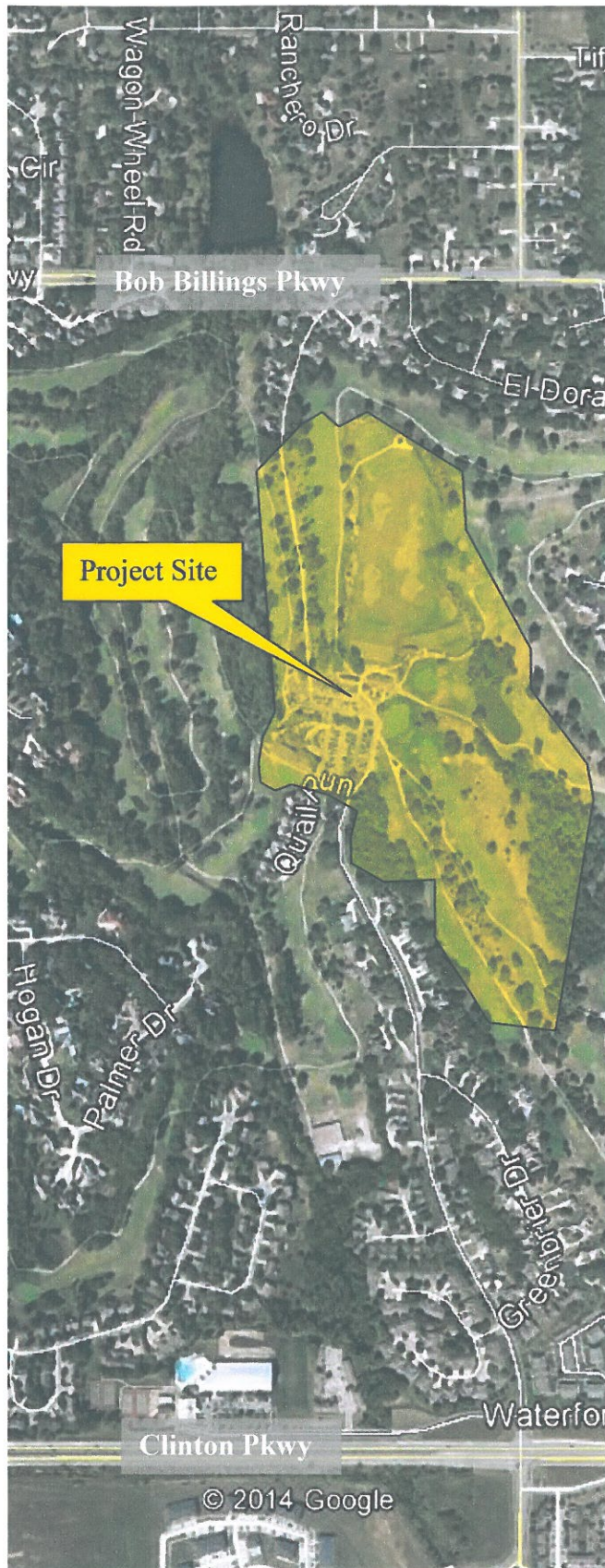
## Hyd. No. 7

West Pond

Hydrograph type	= Reservoir	Peak discharge	= 161.46 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.20 hrs
Time interval	= 3 min	Hyd. volume	= 2,874,951 cuft
Inflow hyd. No.	= 6 - Stormwate to Pond Area	Max. Elevation	= 908.94 ft
Reservoir name	= West Pond	Max. Storage	= 1,135,948 cuft

Storage Indication method used.





# **Amended Traffic Impact Study for Proposed Alvamar Inc One Addition**

Crossgate Drive, Between  
Bob Billings Pkwy and Clinton Pkwy

Lawrence, Kansas

Prepared  
for  
Paul Werner Architects

Prepared By



Mehرداد Givechi, PE, PTOE

**February 2016**



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## ***Introduction***

### **Background**

This document is prepared as an amendment to the Traffic Impact Study (TIS) dated 1/15/2015 that was prepared for “Alvamar Inc. One Addition” development located along Crossgate Drive between Bob Billings Parkway and Clinton Parkway, all nested in the existing Alvamar Golf Courses and clubhouse site, in Lawrence, Kansas (See Location Map, Figure 1 of Appendix I). The purpose of this amendment is to re-assess impact of traffic resulted by a number of changes to the previously submitted site plan.

### **Revised Land Use**

The new site plan for this development consists of:

- 256 Apartments (ITE Land Use Code 220) – 168 units on Lot #2A and 88 units on Lot #2B. *This is a reduction of 76 units from the previous plan.*
- 8 Owned Patio Homes / Townhomes (ITE Land Use Code 230) – all on Lot #2B. *This is a reduction of 88 units from the previous plan.*
- 24 Owned Condos (ITE Land Use Code 230) – all on Lot #2B. *This is a reduction of 72 units from the previous plan.*
- Owned Luxury Condos (ITE Land Use Code 233) are eliminated. *This is a reduction of 88 units from the previous plan.*
- A new Senior Adult Housing – Attached (ITE Land Use Code 252) with 100 dwelling units.
- The existing 36-hole golf course will be operating as a 27-hole course to make room for the proposed development. In addition, the existing clubhouse will be renovated and expanded having a total square footage of approximately 30,000 for use by club members; those playing golf; and participants of the special events and tournaments held on the golf course. The clubhouse will have a number of amenities (all of which are designated under ITE Land Use Code 430 “Golf Course”, except as noted) including:
  - Banquet / event facility;
  - Outdoor snack bar/grill;
  - Swimming pools;

- A 1,500 square feet Kansas Golf Hall of Fame (ITE Land Use Code 580). *This is a slight increase (by 300 square feet) from the previous plan;* and
- A 2,000 square feet office space for golf course administration use.
- Extended stay cabins/suites are eliminated. *This is a reduction of 24 units from the previous plan.*
- A new sports medicine office building (ITE Land Use Code 720) on Lot #3 with a floor area of approximately 19,200 square.
- A new Fitness/Wellness Center (ITE Land Use Code 492) on Lot #3 with a floor area of approximately 18,000 square feet.
- Renovation and expansion of the existing KU practice facility on Lot #3 from 2,000 square feet to 10,000 with no change in the current uses (ITE Land Use 492).
- Under the revised development plan, no specific use for Lot #4 is being proposed.

#### *Revised Access*

Under the revised plan, project site traffic will access Bob Billings Parkway via a new street connection west of Crossgate Drive, which will also serve the existing residential dwelling units just to the south of Bob Billings Parkway (See Site Plan, Figure 2 of Appendix I). Provision of this access drive requires a median break on Bob Billings Parkway. The existing Crossgate Drive (private) will be utilized as the emergency access only. Access to the south will remain at signalized intersection on Clinton Parkway.

#### ***Revised Trip Generation Analysis***

Using the same methodology mentioned in the original TIS and the ITE Land Use Codes mentioned earlier in this report, the trip generation numbers are recalculated to reflect the proposed changes.



### Assumptions

- The trips for the entire development site are broken into two components – residential and non-residential because they have different distribution patterns during the peak-hours;
- The trips for the golf course includes all trips for the clubhouse amenities as described in the ITE Trip Generation Manual with the exception of trips for Kansas Golf Hall of Fame; and
- All trips are assumed to be “primary (new)” trips with zero “pass-by” trips. In addition, it is assumed that the “internal capture” rate between the residential component and the non-residential component is zero to account for a “conservative” scenario.
- At the time this amendment was prepared, no specific use for Lot #4 was planned. Therefore, for the purpose of this amendment, Lot #4 is assumed to be undeveloped.

The results, as summarized in Appendix II, indicate that the revised development plan will likely add new trips to the adjacent street network as follows:

- On average, 209 trip-ends (68 inbound and 141 outbound) during the morning peak-hour of a typical weekday. A reduction of approximately 45% from the previous plan.
- On average, 311 trip-ends (171 inbound and 140 outbound) during the afternoon peak-hour of a typical weekday. A reduction of approximately 33% from the previous plan; and
- On average, 3,116 trip-ends during 24-hour period of a typical weekday. A reduction of approximately 33% from the previous plan.

### Analysis Time Period

An overview of existing traffic volumes in the study area and their peak characteristics, in conjunction with estimated trips generated from the proposed development, indicate that the most critical peak period will likely occur during the afternoon peak-hour of a typical weekday. For this study, however, both morning and afternoon peak-hours are selected for analysis.

## ***Revised Trip Distribution and Assignment Analysis***

Using the trip distribution patterns mentioned in the original TIS (illustrated in Figures 6 and 7 of Appendix I of this Amendment), site-generated trips are assigned to individual movements within the study area (See Figure 8 of Appendix I).

## ***Impact Assessment for Revised Development***

### ***Volume/Capacity Analysis***

Results of the volume/capacity analysis, as shown in Appendix III and illustrated in Figures 9 and 10 of Appendix I, indicate that LOS for individual movements in the study area will remain the same as that of the previous plan.

### ***Dedicated Turn Lane Analysis***

Results of the turn lane analysis indicate that a dedicated westbound left-turn lane on Bob Billings Parkway at the new access drive location is required. This improvement requires modification of the existing median on Bob Billings Parkway. The results also indicate that provision of a dedicated eastbound right-turn lane on Bob Billings Parkway at this location is not required.

## ***Findings***

This amendment evaluates impact of the revised “Alvamar Inc One Addition” development plan on the intersections under study during the critical analysis period (morning and afternoon peak-hours of a typical weekday) and recommends mitigation measures resulted thereof. Results of the analysis indicate that the revised plan generates significantly less trips than the previous plan:

- 45% less during the morning peak-hour of a typical weekday;
- 33% less during the afternoon peak-hour of a typical weekday; and
- 33% less over a typical 24-hour period.

In summary, number of trips generated by the revised plan is approximately 67% of that of the previous plan. The recommended off-site improvements, however, is the same as what is mentioned in the original TIS report as follows:

1. With added trips generated by the proposed development site, LOS for the intersection of Clinton Parkway and Crossgate Drive (as a whole) will remain at acceptable LOS “C” or higher with reserve capacity for both east and west approaches. The north and south approaches, however, will experience excessive delays with northbound left-turn movement at LOS “F” and southbound left-turn movement at LOS “E”.

**Recommended Improvement:** Modify signal timing plan at this intersection while maintaining the existing 120 second cycle length for coordination purposes and reassigning the green time in favor of north/south approaches.

2. With the added trips generated by the proposed development site, the requirements for provision of a dedicated westbound left-turn lane on Bob Billings Parkway at Crossgate Drive are met.

**Recommended Improvement:** Provide a dedicated westbound left-turn lane on Bob Billings Parkway at Crossgate Drive. This lane should have a minimum storage length of 75' with a desirable deceleration and taper length.

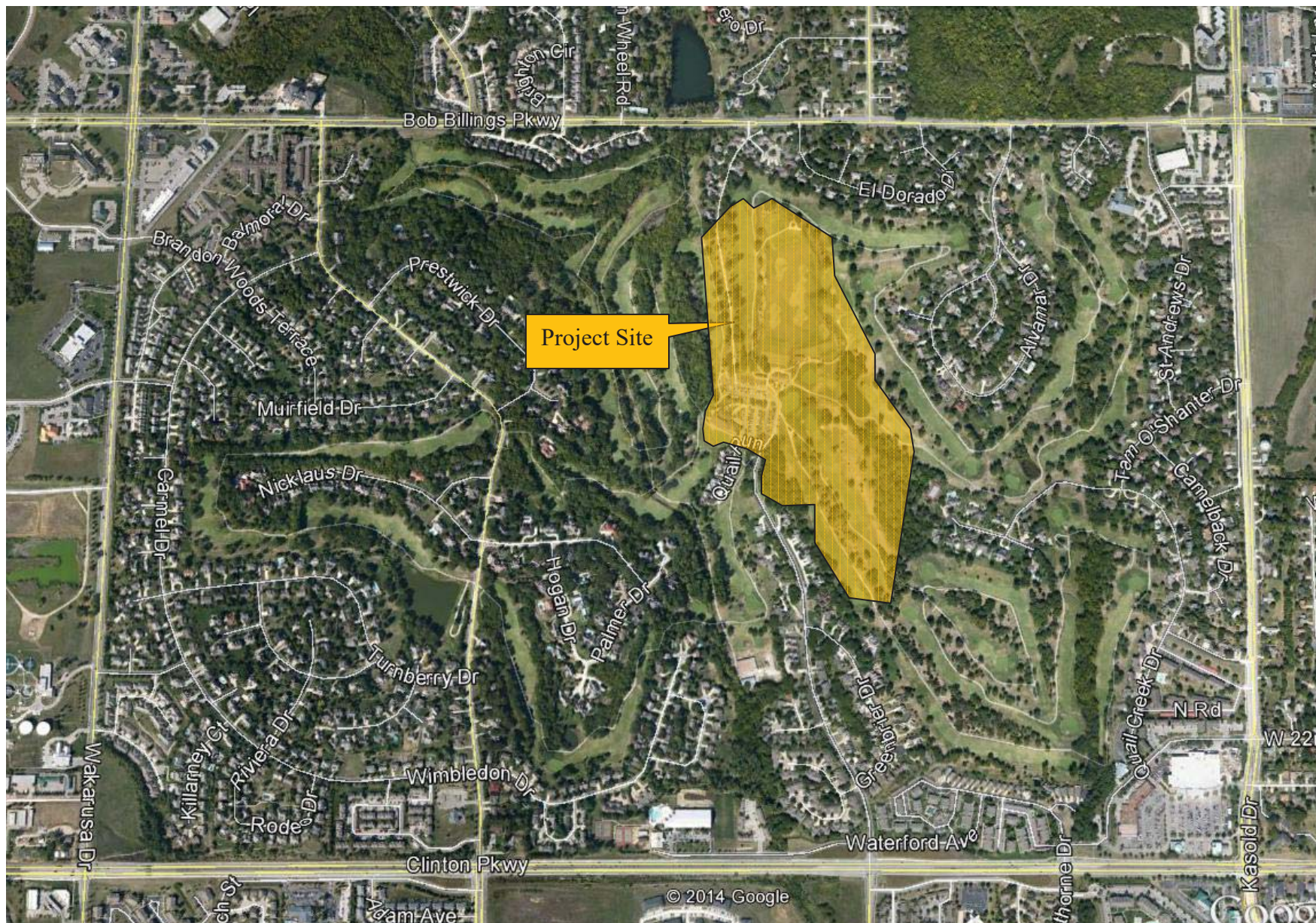
3. To minimize delay for the northbound movement at the intersection of Bob Billings Parkway and Crossgate Drive, it is desirable to separate the northbound left-turn and northbound right-turn movements from one another.

**Recommended Improvement:** Provide a dedicated northbound right-turn lane (or left-turn lane) on Crossgate Drive at Bob Billings Parkway with minimum storage length of 50'.



# **APPENDIX I**

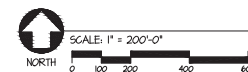
Figures



**Figure 1**  
**Location Map**



LOT 1, 2A, 2B & 3 PRELIMINARY DEVELOPMENT PLAN  
LAWRENCE, KANSAS



LAURENCE KANSAS

RELEASE:	DATE:
1.0	2.16.16

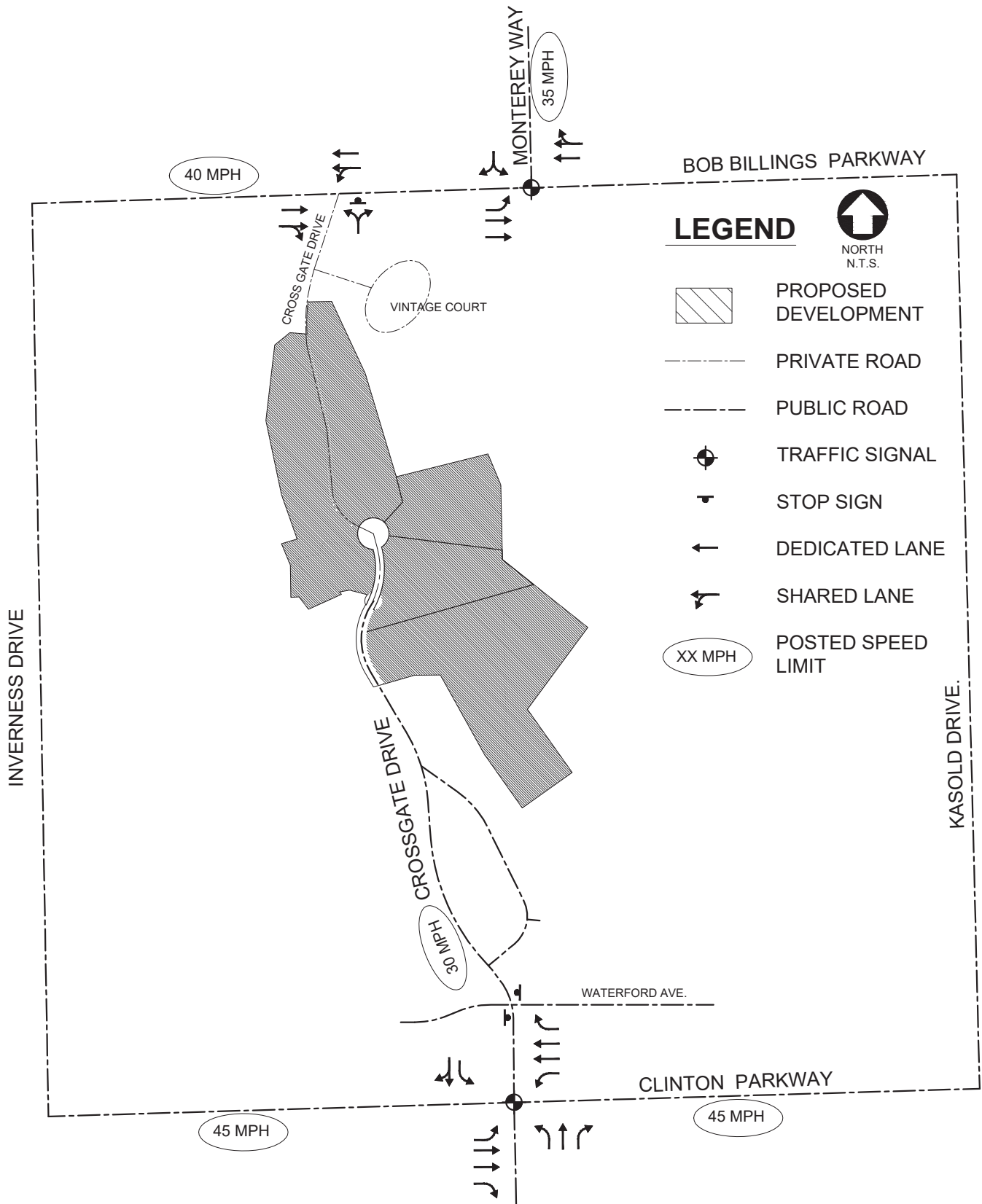
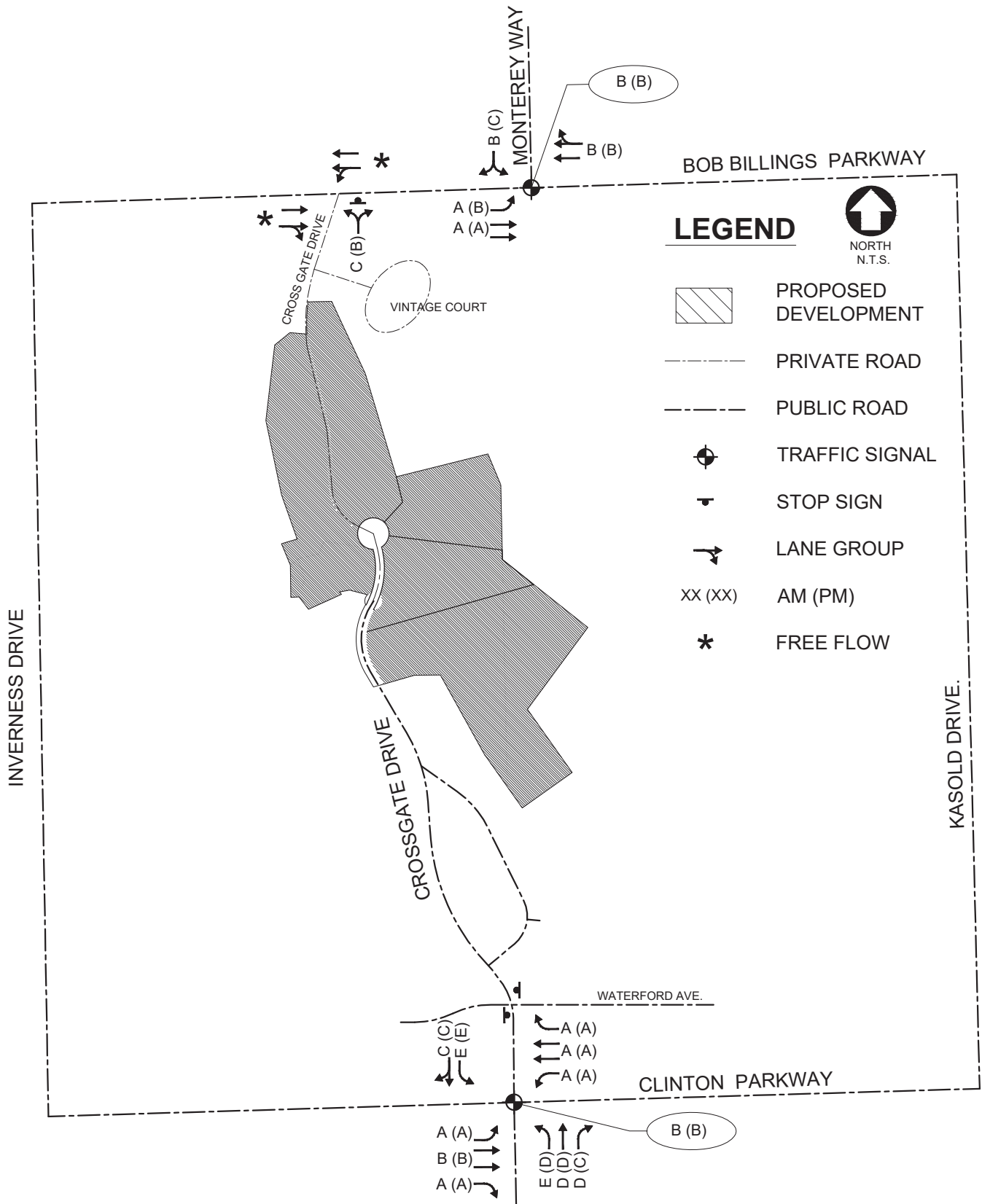


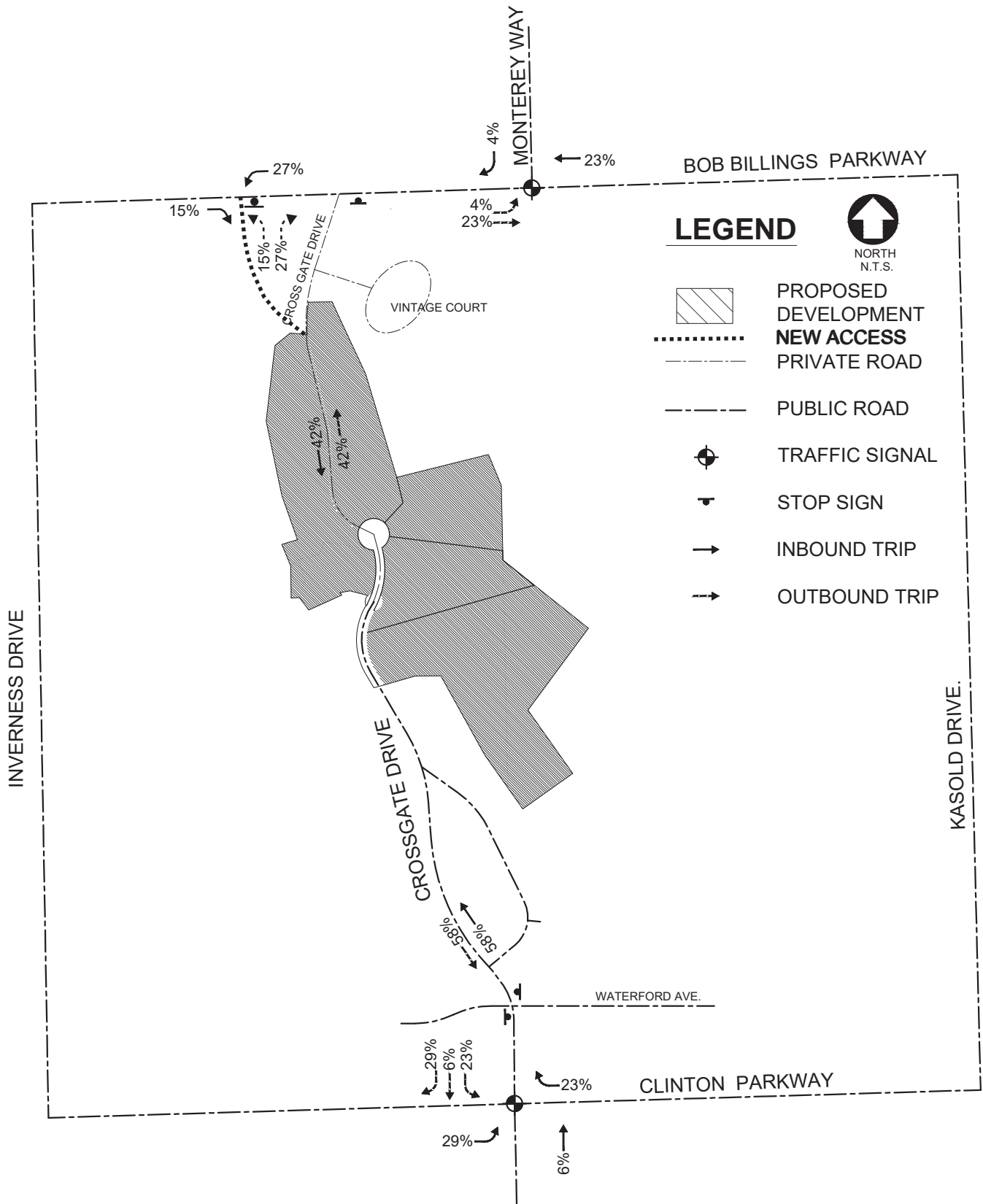
FIGURE 3  
EXISTING LANE CONFIGURATIONS AND POSTED  
SPEED LIMITS (DECEMBER 2014)



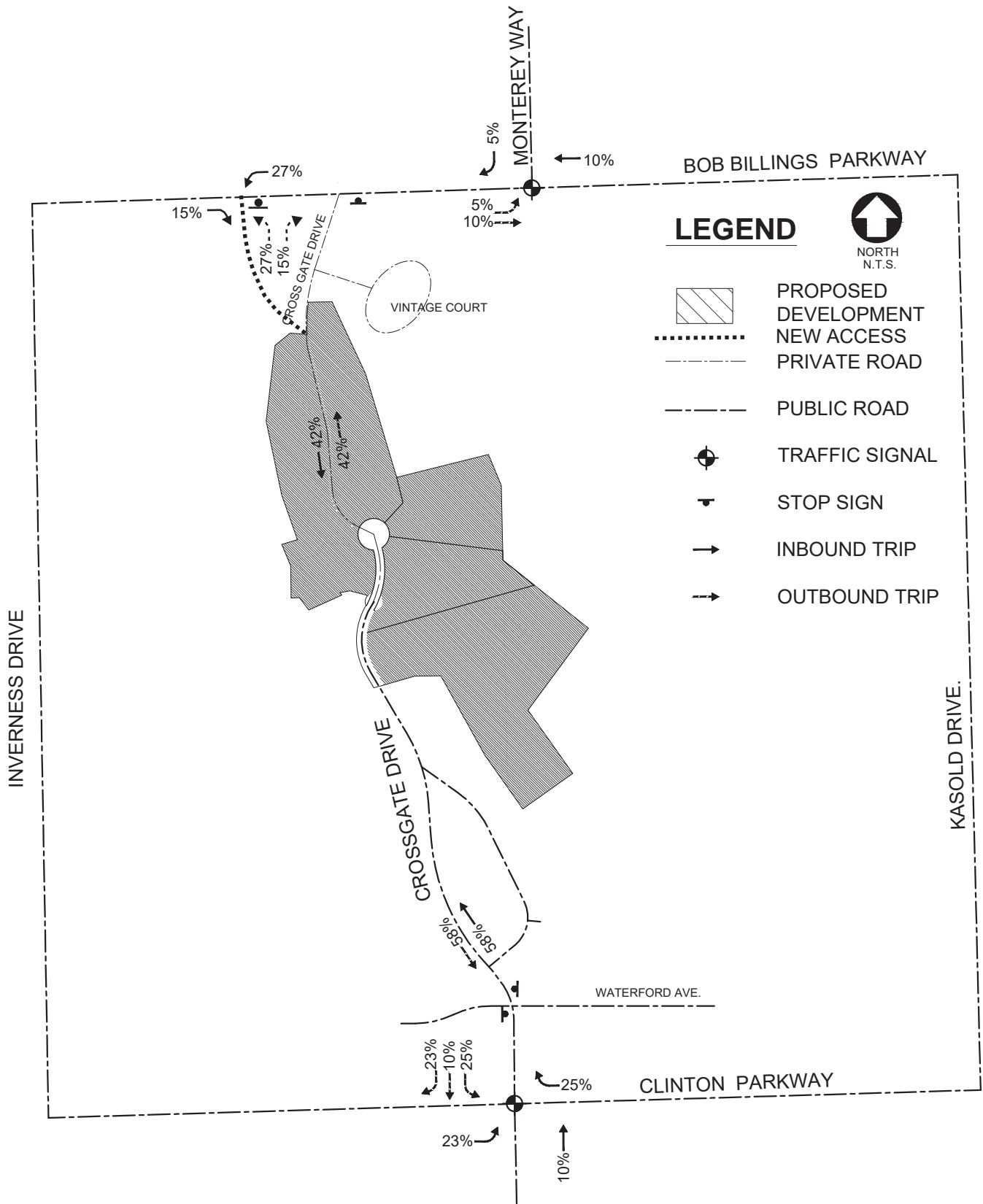




**FIGURE 5**  
**SUMMARY OF L.O.S. FOR EXISTING CONDITIONS**  
**(PEAK HOURS OF A TYPICAL WEEKDAY)**



REVISED FIGURE 6  
TRIP DISTRIBUTION PATTERNS FOR RESIDENTIAL  
COMPONENT OF PROPOSED DEVELOPMENT  
(PEAK HOURS OF A TYPICAL WEEKDAY)

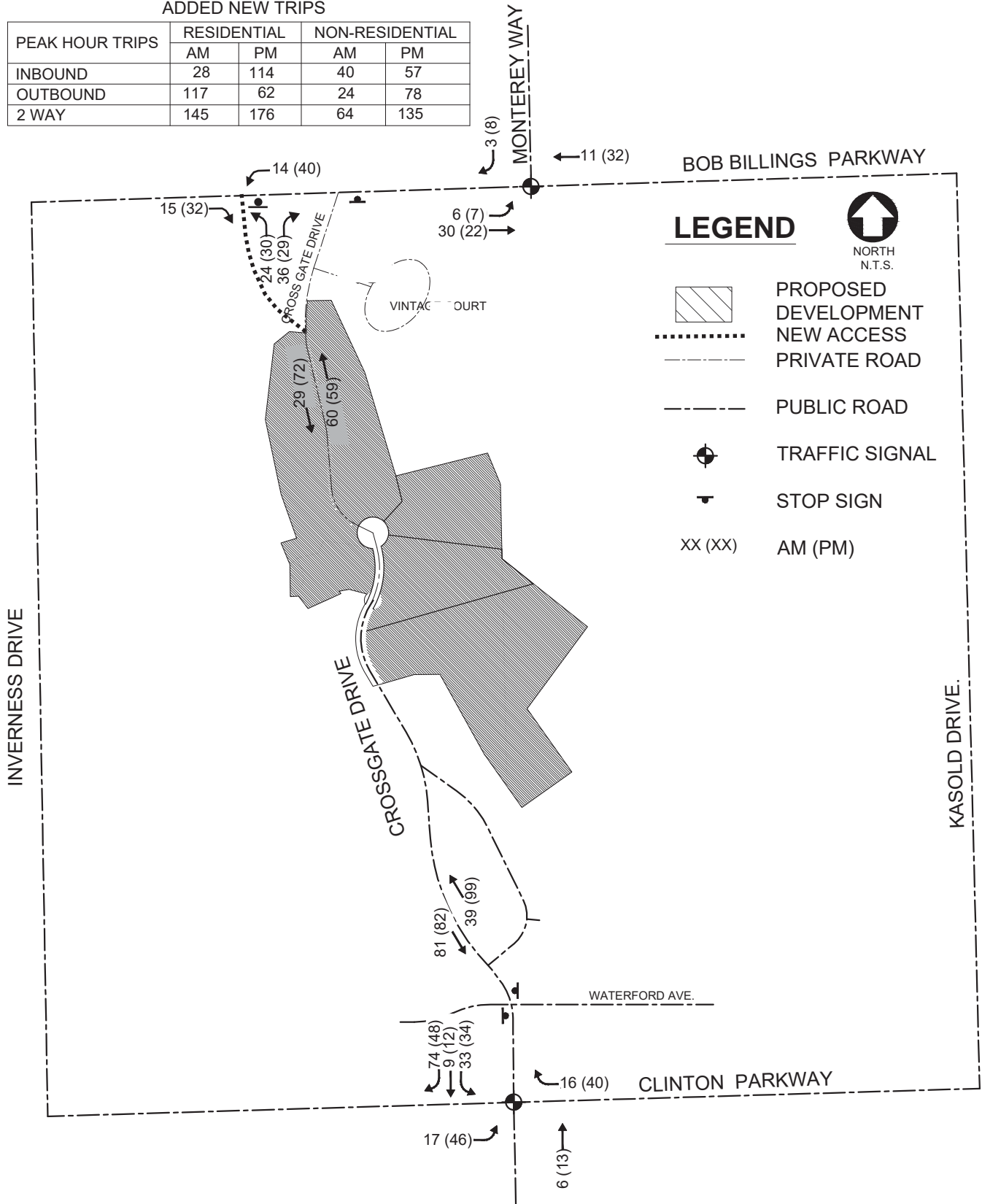


REVISED FIGURE 7  
TRIP DISTRIBUTION PATTERNS FOR NON-RESIDENTIAL  
COMPONENT OF PROPOSED DEVELOPMENT  
(PEAK HOURS OF A TYPICAL WEEKDAY)

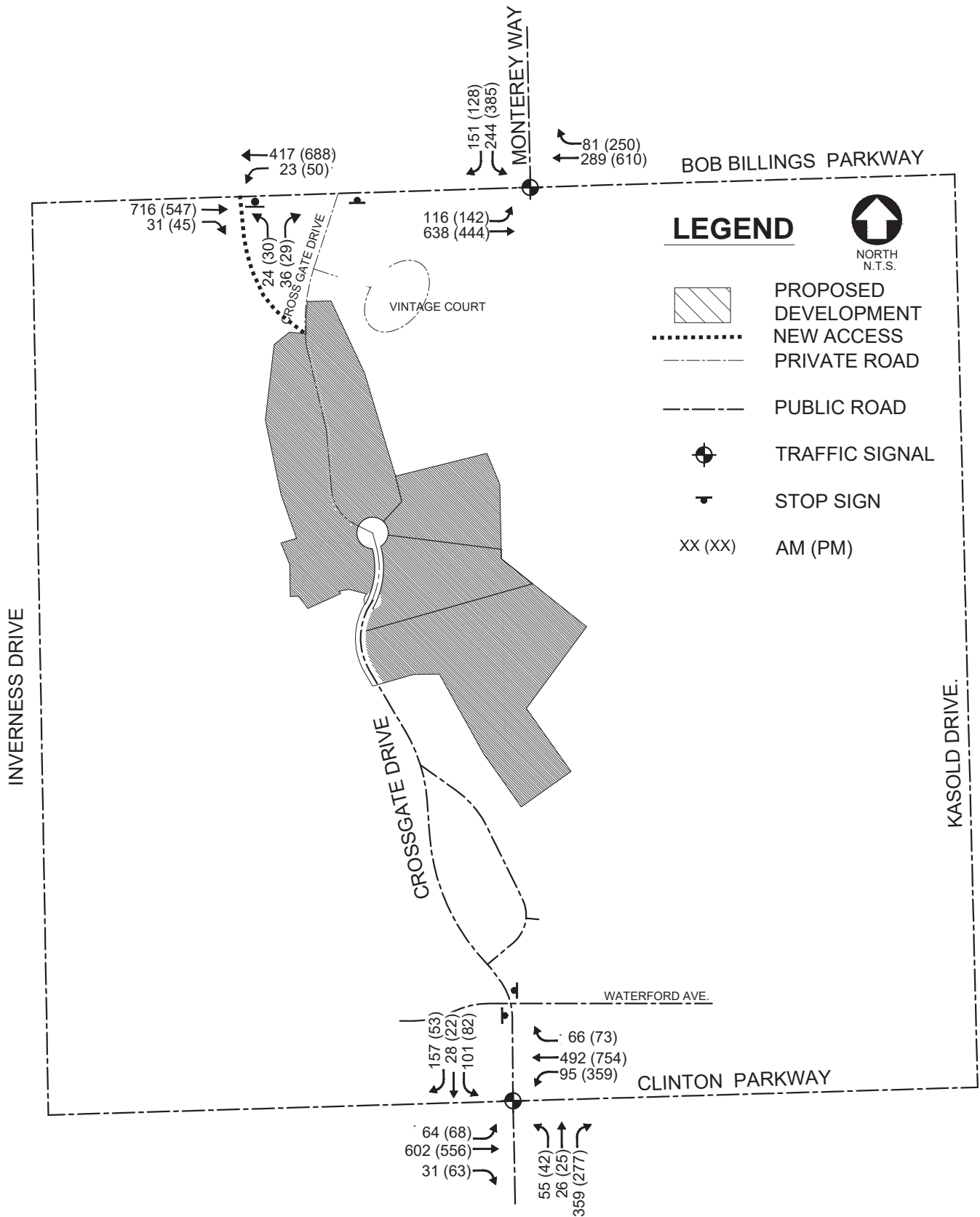


# ADDED NEW TRIPS

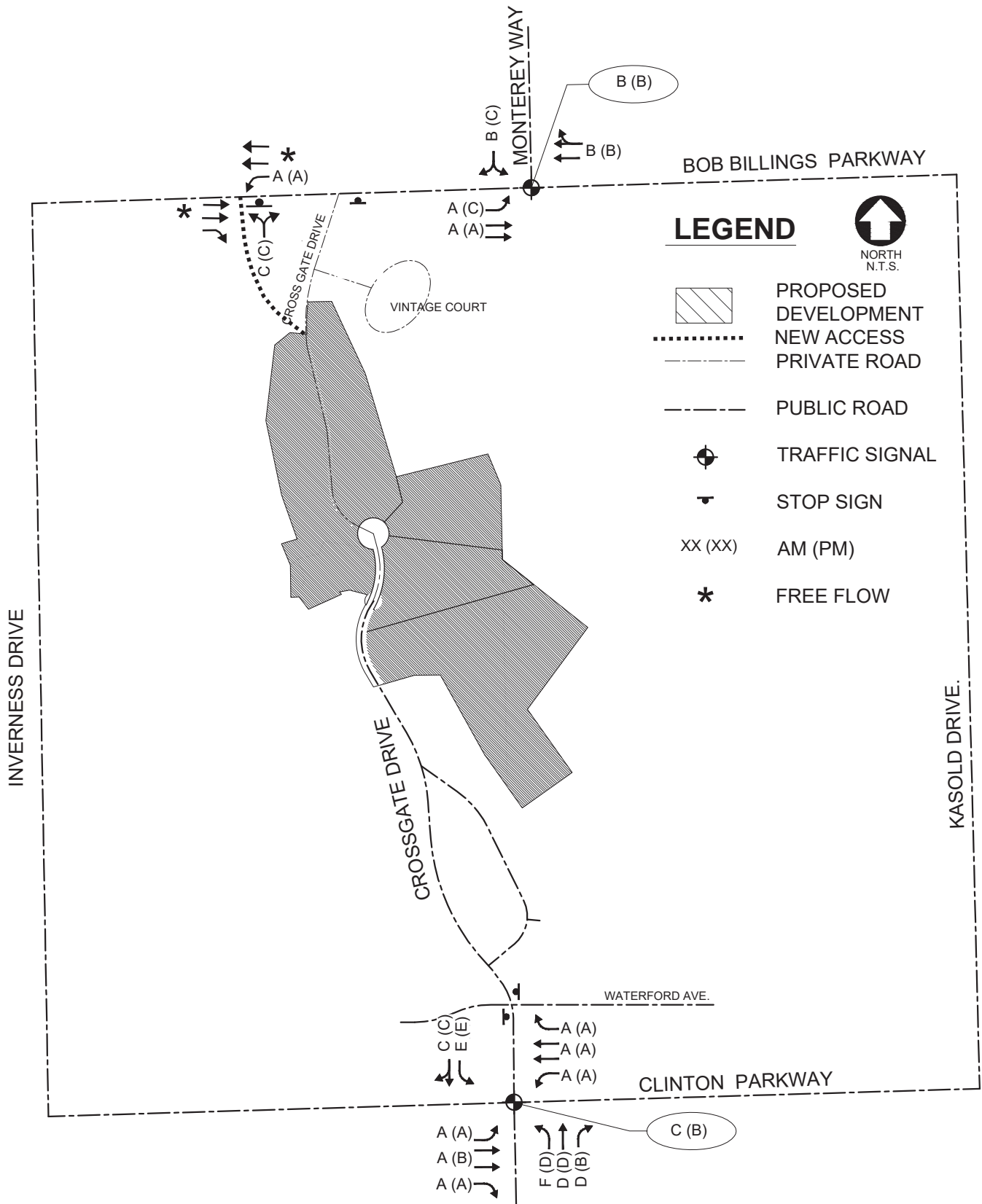
PEAK HOUR TRIPS	RESIDENTIAL		NON-RESIDENTIAL	
	AM	PM	AM	PM
INBOUND	28	114	40	57
OUTBOUND	117	62	24	78
2 WAY	145	176	64	135



REVISED FIGURE 8  
 SITE-GENERATED TRIPS FOR PROPOSED  
 DEVELOPMENT  
 (PEAK HOURS OF A TYPICAL WEEKDAY)



REVISED FIGURE 9  
 "EXISTING + PROPOSED DEVELOPMENT"  
 PEAK HOUR TRAFFIC VOLUMES  
 (TYPICAL WEEKDAY)



REVISED FIGURE 10  
SUMMARY OF L.O.S. FOR "EXISTING + REVISED  
DEVELOPMENT" TRAFFIC CONDITIONS  
(PEAK HOURS OF A TYPICAL WEEKDAY)

# **APPENDIX II**

Results of Trip Generation Analysis  
Using  
ITE Trip Generation Manual, 9<sup>th</sup> Edition



Trip Generation Summary - Existing townhomes/patio homes just S/O BB Pkwy  
Average Weekday Driveway Volumes

Project: Alvamar Inc One Addition  
Alternative: Existing Conditions

Open Date: 12/28/2014  
Analysis: 12/28/2014

ITE	Land Use	Average Daily Trips			AM Peak Hour Adjacent Street Traffic			PM Peak Hour Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
230	CONDO 1	82	81	163	2	10	12	10	5	15
	28 Dwelling Units									
Unadjusted Driveway Volume		82	81	163	2	10	12	10	5	15
Unadjusted Pass-By Trips		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Adjusted Driveway Volume		82	81	163	2	10	12	10	5	15
Adjusted Pass-By Trips		0	0	0	0	0	0	0	0	0
Adjusted Volume Added to Adjacent Streets		82	81	163	2	10	12	10	5	15
Total AM Peak Hour Internal Capture = 0 Percent										
Total PM Peak Hour Internal Capture = 0 Percent										

## Trip Generation Summary - Existing Conditions

Project: Alvamar Inc One Addition  
 Alternative: Existing Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
430	GOLF 1	644	643	1287	58	16	74	54	51	105
	36 Golf Holes									
492	CLUBHEALTH 1	33	33	66	2	1	3	4	3	7
	2 Gross Floor Area 1000 SF									
<b>Unadjusted Volume</b>		<b>677</b>	<b>676</b>	<b>1353</b>	<b>60</b>	<b>17</b>	<b>77</b>	<b>58</b>	<b>54</b>	<b>112</b>
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		677	676	1353	60	17	77	58	54	112

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Proposed Conditions

Project: Alvamar Inc One Addition  
 Alternative: **Proposed Conditions**

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	APT 1 256 Dwelling Units	851	851	1702	26	105	131	103	56	159
230	CONDO 1 32 Dwelling Units	93	93	186	2	12	14	11	6	17
430	GOLF 1 27 Golf Holes	483	482	965	44	12	56	40	39	79
492	CLUBHEALTH 1 18 Gross Floor Area 1000 SF	297	296	593	13	12	25	36	28	64
492	CLUBHEALTH 2 10 Gross Floor Area 1000 SF	165	164	329	7	7	14	20	15	35
580	MUSEUM 1 1.5 Gross Floor Area 1000 SF				0	0	0	0	0	0
720	OFFICEMEDICAL 2 19.2 Gross Floor Area 1000 SF	347	347	694	36	10	46	19	50	69
<b>Unadjusted Volume</b>		<b>2236</b>	<b>2233</b>	<b>4469</b>	<b>128</b>	<b>158</b>	<b>286</b>	<b>229</b>	<b>194</b>	<b>423</b>
Internal Capture Trips		0	0	0	1	1	2	3	3	6
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		2236	2233	4469	127	157	284	226	191	417

Total AM Peak Hour Internal Capture = 1 Percent

Total PM Peak Hour Internal Capture = 1 Percent

## Trip Generation Summary - Existing Golf Course

Project: Alvamar Inc One Addition  
 Alternative: Existing Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
430	GOLF 1	644	643	1287	58	16	74	54	51	105
	36 Golf Holes									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent



## Trip Generation Summary - Practice Facility

Project: Alvamar Inc One Addition  
 Alternative: Existing Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
492	CLUBHEALTH 1	33	33	66	2	1	3	4	3	7
	2 Gross Floor Area 1000 SF									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Apartments

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	APT 1	851	851	1702	26	105	131	103	56	159
	256 Dwelling Units									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Owned Condos/Patio Homes/Townhomes

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
230	CONDO 1	93	93	186	2	12	14	11	6	17
	32 Dwelling Units									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - 27-Hole Golf Course

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
430	GOLF 1	483	482	965	44	12	56	40	39	79
	27 Golf Holes									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent



## Trip Generation Summary - KS Golf Hall of Fame

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
580	MUSEUM 1				0	0	0	0	0	0
	1.5 Gross Floor Area 1000 SF									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Sport Medicine Office

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
720	OFFICEMEDICAL 2	347	347	694	36	10	46	19	50	69
	19.2 Gross Floor Area 1000 SF									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Fitness/Wellness Center

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
492	CLUBHEALTH 1	297	296	593	13	12	25	36	28	64
	18 Gross Floor Area 1000 SF									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

## Trip Generation Summary - Practice Facility

Project: Alvamar Inc One Addition  
 Alternative: Proposed Conditions

Open Date: 2/19/2016  
 Analysis Date: 2/19/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
492	CLUBHEALTH 2	165	164	329	7	7	14	20	15	35
	10 Gross Floor Area 1000 SF									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent



# **APPENDIX III**

Results of Highway Capacity Analysis  
Using  
Synchro 8 Software  
(HCM 2010 Methodology)

Intersection

Int Delay, s/veh 1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	716	31	23	417	29	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	6	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	778	34	25	453	32	41

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1072
Stage 1	-	-	795
Stage 2	-	-	277
Critical Hdwy	-	4.14	6.84
Critical Hdwy Stg 1	-	-	5.84
Critical Hdwy Stg 2	-	-	5.84
Follow-up Hdwy	-	2.22	3.52
Pot Cap-1 Maneuver	-	810	215
Stage 1	-	-	405
Stage 2	-	-	745
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	810	206
Mov Cap-2 Maneuver	-	-	206
Stage 1	-	-	405
Stage 2	-	-	714

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	327	-	-	810	-
HCM Lane V/C Ratio	0.223	-	-	0.031	-
HCM Control Delay (s)	19.1	-	-	9.6	0.2
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

**Intersection**

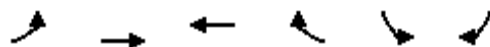
Int Delay, s/veh 1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	547	55	50	688	42	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	6	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	595	60	54	748	46	42

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	654	0	1107	327
Stage 1	-	-	-	-	624	-
Stage 2	-	-	-	-	483	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	929	-	204	669
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	586	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	929	-	184	669
Mov Cap-2 Maneuver	-	-	-	-	184	-
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	528	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	23.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	283	-	-	929	-
HCM Lane V/C Ratio	0.311	-	-	0.059	-
HCM Control Delay (s)	23.4	-	-	9.1	0.4
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.3	-	-	0.2	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	116	638	289	81	244	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	16	16
Grade (%)		6%	6%		0%	
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.967		0.948	
Flt Protected	0.950				0.970	
Satd. Flow (prot)	1659	3319	3209	0	1941	0
Flt Permitted	0.355				0.970	
Satd. Flow (perm)	620	3319	3209	0	1941	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			78		63	
Link Speed (mph)		40	40		35	
Link Distance (ft)		670	328		355	
Travel Time (s)		11.4	5.6		6.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	126	693	314	88	265	164
Shared Lane Traffic (%)						
Lane Group Flow (vph)	126	693	402	0	429	0
Turn Type	pm+pt	NA	NA		Prot	
Protected Phases	5	2	6		7	
Permitted Phases	2					
Detector Phase	5	2	6		7	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	8.6	20.6	20.6		8.6	
Total Split (s)	9.0	31.0	22.0		19.0	
Total Split (%)	18.0%	62.0%	44.0%		38.0%	
Yellow Time (s)	3.6	3.6	3.6		3.6	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.6	4.6	4.6		4.6	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	None	None		None	
Act Effect Green (s)	16.9	16.9	10.3		12.0	
Actuated g/C Ratio	0.44	0.44	0.27		0.31	
v/c Ratio	0.32	0.48	0.44		0.66	
Control Delay	9.0	8.9	12.2		16.7	
Queue Delay	0.0	0.0	0.0		0.0	
Total Delay	9.0	8.9	12.2		16.7	
LOS	A	A	B		B	
Approach Delay		8.9	12.2		16.7	
Approach LOS		A	B		B	
Queue Length 50th (ft)	16	52	33		68	





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	38	88	64		#163	
Internal Link Dist (ft)		590	248		275	
Turn Bay Length (ft)	100					
Base Capacity (vph)	396	2346	1560		798	
Starvation Cap Reductn	0	0	0		0	
Spillback Cap Reductn	0	0	0		0	
Storage Cap Reductn	0	0	0		0	
Reduced v/c Ratio	0.32	0.30	0.26		0.54	

#### Intersection Summary

Area Type: Other

Cycle Length: 50

Actuated Cycle Length: 38.6

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 11.7

Intersection LOS: B

Intersection Capacity Utilization 51.3%

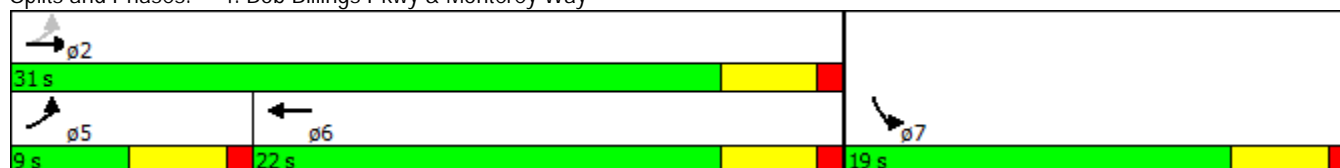
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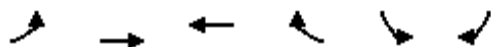
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Bob Billings Pkwy & Monterey Way





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	142	444	610	250	385	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	16	16
Grade (%)		6%	6%		0%	
Storage Length (ft)	100			0	0	0
Storage Lanes	1			0	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.956		0.966	
Flt Protected	0.950				0.964	
Satd. Flow (prot)	1659	3319	3173	0	1966	0
Flt Permitted	0.198				0.964	
Satd. Flow (perm)	346	3319	3173	0	1966	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			118		29	
Link Speed (mph)		40	40		35	
Link Distance (ft)		670	328		355	
Travel Time (s)		11.4	5.6		6.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	483	663	272	418	139
Shared Lane Traffic (%)						
Lane Group Flow (vph)	154	483	935	0	557	0
Turn Type	pm+pt	NA	NA		Prot	
Protected Phases	5	2	6		7	
Permitted Phases	2					
Detector Phase	5	2	6		7	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	8.6	20.6	20.6		8.6	
Total Split (s)	9.0	36.0	27.0		24.0	
Total Split (%)	15.0%	60.0%	45.0%		40.0%	
Yellow Time (s)	3.6	3.6	3.6		3.6	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.6	4.6	4.6		4.6	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	None	None		None	
Act Effect Green (s)	27.6	26.2	19.6		17.9	
Actuated g/C Ratio	0.51	0.49	0.36		0.33	
v/c Ratio	0.53	0.30	0.76		0.83	
Control Delay	22.1	8.6	18.4		30.3	
Queue Delay	0.0	0.0	0.0		0.0	
Total Delay	22.1	8.6	18.4		30.3	
LOS	C	A	B		C	
Approach Delay		11.9	18.4		30.3	
Approach LOS		B	B		C	
Queue Length 50th (ft)	27	46	130		176	



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	#55	71	195		#341	
Internal Link Dist (ft)		590	248		275	
Turn Bay Length (ft)	100					
Base Capacity (vph)	291	2048	1463		767	
Starvation Cap Reductn	0	0	0		0	
Spillback Cap Reductn	0	0	0		0	
Storage Cap Reductn	0	0	0		0	
Reduced v/c Ratio	0.53	0.24	0.64		0.73	

#### Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 53.8

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 19.6

Intersection LOS: B

Intersection Capacity Utilization 73.4%

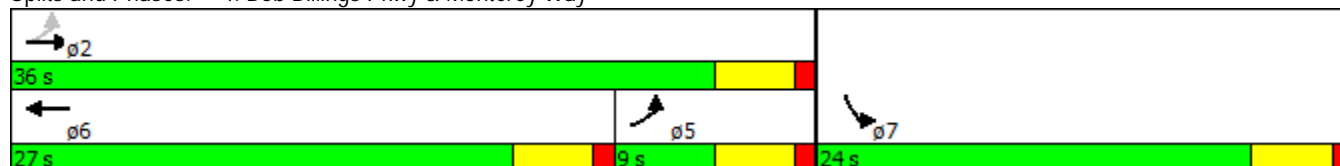
ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

























Splits and Phases: 4: Bob Billings Pkwy & Monterey Way















## Clinton Pkwy &amp; Crossgate Drive

## EXISTING + REVISED DEVELOPMENT

Morning Peak-Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	602	31	95	492	66	55	26	359	101	28	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	265		155	325		200	0		0	0		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	75			75			0			0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.888	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1654	0
Flt Permitted	0.436			0.363			0.195			0.728		
Satd. Flow (perm)	812	3539	1583	676	3539	1583	363	1863	1583	1356	1654	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			73			85			100		151	
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		800			600			150			100	
Travel Time (s)		12.1			9.1			3.4			2.3	
Peak Hour Factor	0.56	0.93	0.79	0.94	0.91	0.78	0.92	0.58	0.90	0.75	0.42	0.79
Adj. Flow (vph)	114	647	39	101	541	85	60	45	399	135	67	199
Shared Lane Traffic (%)												
Lane Group Flow (vph)	114	647	39	101	541	85	60	45	399	135	266	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	11.0	35.0	35.0	11.0	35.0	35.0	36.0	36.0	11.0	37.0	37.0	
Total Split (s)	22.0	46.0	46.0	22.0	46.0	46.0	52.0	52.0	22.0	52.0	52.0	
Total Split (%)	18.3%	38.3%	38.3%	18.3%	38.3%	38.3%	43.3%	43.3%	18.3%	43.3%	43.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-3.0	-3.0	-2.0	-3.0	-3.0	-3.0	-3.0	-2.0	-3.0	-3.0	
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effect Green (s)	88.6	79.1	79.1	92.1	81.0	81.0	20.5	20.5	34.9	20.5	20.5	
Actuated g/C Ratio	0.74	0.66	0.66	0.77	0.68	0.68	0.17	0.17	0.29	0.17	0.17	
v/c Ratio	0.17	0.28	0.04	0.16	0.23	0.08	0.97	0.14	0.75	0.58	0.65	
Control Delay	4.6	10.0	0.6	4.4	8.6	2.2	157.0	40.7	36.8	55.0	26.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	4.6	10.0	0.6	4.4	8.6	2.2	157.0	40.7	36.8	55.0	26.6	
LOS	A	A	A	A	A	A	F	D	D	E	C	
Approach Delay		8.8			7.2			51.5			36.2	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	17	100	0	15	76	0	47	30	215	97	82	
Queue Length 95th (ft)	25	173	1	37	130	14	#120	38	286	124	13	
Internal Link Dist (ft)		720			520			70			20	



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	265		155	325		200						
Base Capacity (vph)	784	2332	1068	699	2388	1095	148	760	625	553	764	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.28	0.04	0.14	0.23	0.08	0.41	0.06	0.64	0.24	0.35	

**Intersection Summary**

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 21.7

Intersection LOS: C

Intersection Capacity Utilization 54.5%

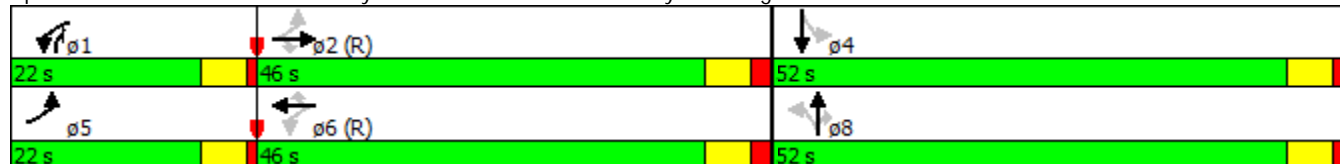
ICU Level of Service A

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

























Splits and Phases: 3: Clinton Pkwy / Clinton Pkwy &amp; Crossgate Dr.















# Clinton Pkwy & Crossgate Drive

# EXISTING + REVISED DEVELOPMENT

Afternoon Peak-Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	68	556	63	359	754	73	42	25	277	82	22	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	265		155	325		200	0		0	0		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	75			75			0			0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.907	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1690	0
Flt Permitted	0.340			0.359			0.564			0.728		
Satd. Flow (perm)	633	3539	1583	669	3539	1583	1051	1863	1583	1356	1690	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			97			120		67	
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		800			600			150			100	
Travel Time (s)		12.1			9.1			3.4			2.3	
Peak Hour Factor	0.91	0.93	0.58	0.84	0.91	0.73	0.85	0.57	0.81	0.68	0.54	0.79
Adj. Flow (vph)	75	598	109	427	829	100	49	44	342	121	41	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	598	109	427	829	100	49	44	342	121	108	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6			8	1		4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	8	8	1	4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	11.0	35.0	35.0	11.0	36.0	36.0	36.0	36.0	11.0	38.0	38.0	
Total Split (s)	24.0	46.0	46.0	24.0	46.0	46.0	50.0	50.0	24.0	50.0	50.0	
Total Split (%)	20.0%	38.3%	38.3%	20.0%	38.3%	38.3%	41.7%	41.7%	20.0%	41.7%	41.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-3.0	-3.0	-2.0	-3.0	-3.0	-3.0	-3.0	-2.0	-3.0	-3.0	
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes			
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effect Green (s)	76.9	68.1	68.1	94.8	85.2	85.2	19.2	19.2	45.9	19.2	19.2	
Actuated g/C Ratio	0.64	0.57	0.57	0.79	0.71	0.71	0.16	0.16	0.38	0.16	0.16	
v/c Ratio	0.15	0.30	0.12	0.57	0.33	0.09	0.29	0.15	0.50	0.56	0.33	
Control Delay	6.4	15.8	3.7	7.3	8.1	1.9	46.9	42.1	18.8	55.4	20.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	6.4	15.8	3.7	7.3	8.1	1.9	46.9	42.1	18.8	55.4	20.7	
LOS	A	B	A	A	A	A	D	D	B	E	C	
Approach Delay		13.2			7.4			24.3			39.1	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	10	122	0	75	122	1	34	30	127	87	28	
Queue Length 95th (ft)	27	205	4	132	194	12	64	37	140	103	26	
Internal Link Dist (ft)		720			520			70			20	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	265		155	325		200						
Base Capacity (vph)	665	2009	946	758	2512	1152	411	729	696	531	702	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.30	0.12	0.56	0.33	0.09	0.12	0.06	0.49	0.23	0.15	

**Intersection Summary**

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 90 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 14.2

Intersection LOS: B

Intersection Capacity Utilization 56.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Clinton Pkwy / Clinton Pkwy &amp; Crossgate Dr.



**From:** Douglas Lawrence [<mailto:dlawrenceconsult@me.com>]

**Sent:** Sunday, March 20, 2016 7:27 PM

**To:** Sandra Day

**Subject:** Monday Alvamar Meeting

Hi Sandy

I have some photos that could be loaded for Monday night's meeting.  
I don't know the protocol, but I thought I would give it a shot.

Doug

Douglas Lawrence  
[dlawrenceconsult@me.com](mailto:dlawrenceconsult@me.com)





