City Of Appleton
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DEPARTMENT OF PUBLIC WORKS
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To: Monica Klaeser, Deputy Director, Community & Economic Development

From: Michael Hardy, PE, PTOE, Assistant City Traffic Engineer, Public Works

Date: October 24, 2013

Re: REVISED Traffic Impact Analysis – 935 E. John Street Apartment/Townhouse Developments

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This Traffic Impact Analysis (TIA) is a replacement for the original study conducted in June 2013. The Garden Homes multi-unit apartment development has been updated, reducing from 180 units to 120 units. The property is located at approximately 935 E. John Street, along the west side of the Fox River and east of South Court. New traffic data for existing conditions was also collected beginning the week of Monday, October 7, 2013, while Lawrence University classes were in session. Additional data was collected and analysis was performed based on feedback from the neighborhood.

The Department of Public Works was asked by Community & Economic Development to review the potential traffic and parking impacts associated with a development proposal for the former Foremost Farm property. This report provides an objective analysis of the impacts, along with recommended changes to adequately accommodate the new development trips.

Study Intersections:

The following intersections were identified to quantify the traffic impacts:

1. John Street & Meade Street
2. College Avenue & Meade Street
3. Alton Street & Lawe Street

The intersection of John Street and Meade Street is currently partially stop-controlled, with northbound traffic stopping for westbound and southbound traffic. John Street proceeds to the east of Meade Street and Lawrence University has a private driveway designated as Boldt Way to the west of the intersection. Daily traffic counts were collected on John Street east of Meade Street (314 vehicles/day), and Meade Street north of John Street (1,003 vehicles/day). Morning and evening peak hour turn counts were collected at this intersection and are summarized elsewhere in this report.

The intersection of College Avenue and Meade Street is currently controlled by a traffic signal. Morning and evening peak hour turn counts were collected at this intersection and are summarized elsewhere in this report.

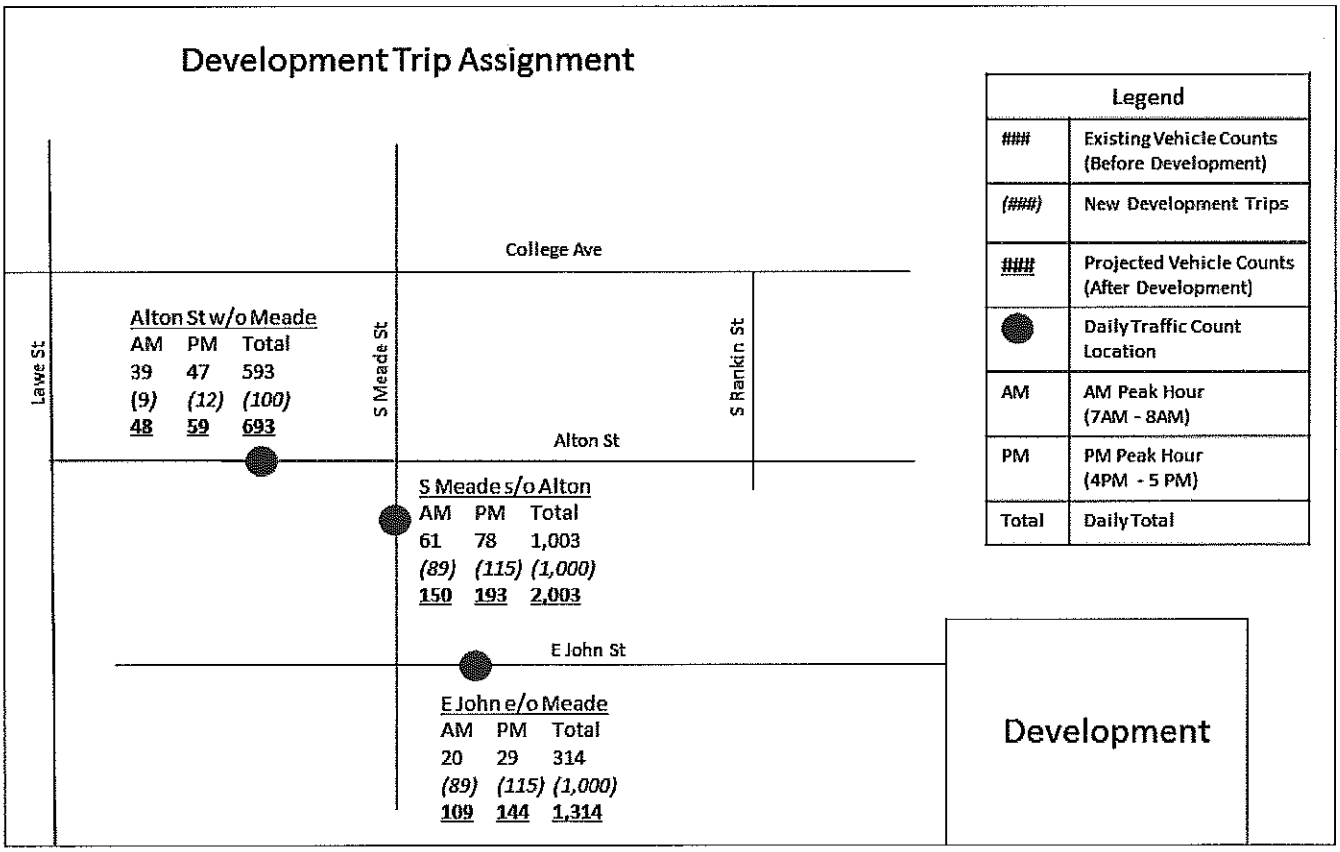
The intersection of Alton Street and Lawe Street is currently controlled by a stop sign on Alton Street. Daily traffic counts were collected on Alton Street east of Lawe Street (593 vehicles/day). Morning and evening peak hour turn counts were collected at this intersection and are summarized elsewhere in this report.

Development Trips & Trip Assignment:

The proposed development is an apartment complex consisting of 120 units, 180 parking stalls, and mostly 2 bedroom apartments/townhouses (see exhibit at end report). The traffic expected to be generated by the proposed development is based on the land use type and size, and trip rates as published in the Institute of Transportation Engineering's (ITE) *Trip Generation Manual, 7th Edition*. There is trip data available for both number of units and number of vehicles. The number of new daily trips projected for 120 units is approximately 900. The number of new daily trips projected for 180 vehicle stalls is approximately 1,000. For this analysis, the proposed development is expected to generate 1,000 new daily trips (500 entering, 500 exiting) during a typical weekday. The following table breaks down the weekday peak hour trips expected.

			Daily	AM Peak Hour			PM Peak Hour		
Site	ITE Code	Type/Size	Total	Total	Enter	Exit	Total	Enter	Exit
Apartment	220	180 Stalls	1,000	89	29%	71%	115	61%	39%
					26	63		70	45

The trips generated are next assigned to the existing street network. We estimate 100% of the trips will travel thru the intersection of John Street and Meade Street. We estimate 90% of the trips will proceed on Meade Street through the College Avenue and Meade Street intersection. We estimate 10% of the trips will proceed on Alton Street through the Alton Street and Lawe Street intersection. We feel this assignment is representative of the path new trips will take to travel to and from the apartment complex, based on turn counts, layout of the region's arterial street system, and major trip destinations. The following diagram breaks down the trip assignment.



Additional trip assignment is summarized in the following tables for each evaluated intersection. Each table summarizes the existing counts, the assignment of new development trips through the intersection, and the total added trips used to analyze development impacts.

1) John Street & Meade Street – Existing Counts & Development Trips

AM Peak Hour Traffic (7AM - 8PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		L	T	R	PED	L	T	R	PED	L	T	R	PED	L	T	R	PED
Existing Counts		2	12	2	4	9	27	3	17	4	0	0	29	1	0	10	5
New Trips	89																
% New Trips at Intersection	100%																
New Trips thru intersection	89																
% Entering & Assignment	29%					100%											
# Entering & Assignment	26					26											
% Exiting & Assignment	71%															100%	
# Exiting & Assignment	63															63	
New Trips						26										63	
Existing Counts + New Trips		2	12	2	4	35	27	3	17	4	0	0	29	1	0	73	5

PM Peak Hour Traffic (4PM – 5PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		L	T	R	PED	L	T	R	PED	L	T	R	PED	L	T	R	PED
Existing Counts		0	26	2	4	7	24	2	54	11	0	1	48	0	3	14	19
New Trips	115																
% New Trips at Intersection	100%																
New Trips thru intersection	115																
% Entering & Assignment	61%					100%											
# Entering & Assignment	70					70											
% Exiting & Assignment	39%															100%	
# Exiting & Assignment	45															45	
New Trips						70										45	
Existing Counts + New Trips		0	26	2	4	77	24	2	54	11	0	1	48	0	3	59	19

2) College Avenue & Meade Street – Existing Counts & Development Trips

AM Peak Hour Traffic (7AM - 8PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		LT	THRU	RT	PED	LT	THRU	RT	PED	LT	THRU	RT	PED	LT	THRU	RT	PED
Existing Counts		27	30	11	7	158	21	20	8	20	291	30	10	17	966	143	3
New Trips	89																
% New Trips at Intersection	90%																
New Trips thru intersection	80																
% Entering & Assignment	29%						10%					50%		40%			
# Entering & Assignment	23						2					12		9			
% Exiting & Assignment	71%	40%	30%	30%													
# Exiting & Assignment	57	23	17	17													
New Trips		23	17	17			2					12		9			
Existing Counts + New Trips		50	47	28	7	158	23	20	8	20	291	42	10	26	966	143	3

PM Peak Hour Traffic (4PM – 5PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		LT	THRU	RT	PED	LT	THRU	RT	PED	LT	THRU	RT	PED	LT	THRU	RT	PED
Existing Counts		20	25	12	2	274	15	11	12	49	907	18	4	10	580	125	6
New Trips	115																
% New Trips at Intersection	90%																
New Trips thru intersection	103																
% Entering & Assignment	61%						10%					50%		40%			
# Entering & Assignment	63						6					32		25			
% Exiting & Assignment	39%	40%	30%	30%													
# Exiting & Assignment	40	16	12	12													
New Trips		16	12	12			6					32		25			
Existing Counts + New Trips		36	37	24	2	274	21	11	12	49	907	50	4	35	580	125	6

3) Alton Street & Lawe Street – Existing Counts & Development Trips

AM Peak Hour Traffic (7AM - 8PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		L	T	R	PED	L	T	R	PED	L	T	R	PED	L	T	R	PED
Existing Counts		4	185	7	15	8	175	0	0	0	1	4	29	9	1	13	34
New Trips	89																
% New Trips at Intersection	10%																
New Trips thru intersection	9																
% Entering & Assignment	29%			75%		25%											
# Entering & Assignment	3			2		1											
% Exiting & Assignment	71%													75%		25%	
# Exiting & Assignment	6													5		2	
New Trips				2		1								5		2	
Existing Counts + New Trips		4	185	9	15	9	175	0	0	0	1	4	29	14	1	15	34

PM Peak Hour Traffic (4PM – 5PM)																	
	Intersection	Turn Movements															
		Northbound				Southbound				Eastbound				Westbound			
		L	T	R	PED	L	T	R	PED	L	T	R	PED	L	T	R	PED
Existing Counts		0	234	9	13	4	267	1	28	5	1	11	62	16	0	6	51
New Trips	115																
% New Trips at Intersection	10%																
New Trips thru intersection	11																
% Entering & Assignment	61%			75%		25%											
# Entering & Assignment	7			5		2											
% Exiting & Assignment	39%													75%		25%	
# Exiting & Assignment	4													3		1	
New Trips				5		2								3		1	
Existing Counts + New Trips		0	234	14	13	6	267	1	28	5	1	11	62	19	0	7	51

Evaluation of New Development Traffic:

Evaluations were completed for the identified intersections. The Meade / John intersection was evaluated for the possible need of All Way Stop Control (AWSC). The College / Meade intersection and Alton / Lawe intersection was evaluated to determine if the current operation could service the new development trips.

Trafficware's *Synchro* simulation software was used to calculate the performance of existing and new development traffic. The Highway Capacity Manual (HCM) has standardized procedures to calculate the intersection performance in terms of *average delay per vehicle* and *Level of Service* (LOS). The simulation software calculates and grades performance applying the HCM procedures. The table below contains the HCM's assignment of grades. The analysis was completed for both the AM and PM peak hours.

Signalized Intersection Level of Service (LOS)

Control Delay Per Vehicle (s)	LOS by Volume to Capacity Ratio	
	≤1	>1
≤10	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Stop Controlled Intersection Level of Service

Control Delay Per Vehicle (s)	LOS by Volume to Capacity Ratio	
	≤1	>1
≤10	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

1) John Street & Meade Street:

This intersection was reviewed for the possible need for All Way Stop Control (AWSC). This is a unique intersection in that it is currently partially stop-controlled. Northbound traffic stops for westbound and southbound traffic. It's believed this stop sign configuration is a legacy from when the old Foremost Farms facility was in operation. The uncontrolled approaches for southbound and westbound accommodated the major traffic movements, as well as trucking to and from the facility. Lawrence University also impacted this intersection more recently by constructing Boldt Way and a new pedestrian overpass across Lawe Street. It's believed the new overpass introduced more pedestrian activity through this intersection. The Boldt Way driveway is a stop controlled approach.

The Federal Highway Administration *Manual on Uniform Traffic Control Devices* (MUTCD) was referenced for recommended criteria to determine if All Way Stop Control (AWSC) is warranted.

Criteria for AWSC requires vehicles entering the major street approaches to average at least 300 vehicles per hour for any eight (8) hours of an average day. The criteria also requires entering vehicles, bicycles and pedestrians entering the minor street approaches to exceed 200 units per hour for any eight (8) hours of an average day. The application of existing counts and the new 1,000 daily trips against this criteria results in the following.

		Existing Conditions		New Trips Added	
MINIMUM CRITERIA	CRITERIA FOR EACH OF 8 HRS.	AVG 8 HIGHEST HOURS	PERCENT OF REQ'D	AVG 8 HIGHEST HOURS	PERCENT OF REQ'D
MINOR ST.	200	67	34%	109	54%
MAJOR ST.	300	87	29%	185	62%
CRITERIA MET?		**NO**	37%	**NO**	67%

The above summary of traffic data indicates that the AWSC is not warranted. Additional MUTCD criteria to be considered for AWSC include the need to control vehicle/pedestrian conflicts, and the intersection of two streets with similar design and operation where multi-way stop control would improve the operational characteristics of the intersection. While the above summary of traffic data indicates AWSC is not warranted, the City would recommend conversion to AWSC based on the additional criteria. The city recommends AWSC as the preferred control to service the combination of the increased pedestrian activity, and the intersection of streets that would have similar operational characteristic with the added development trips.

For additional perspective, the existing and new development peak hour trips were evaluated using Trafficware's *Synchro* and *SimTraffic* simulation software to calculate the performance. The following tables contain a summary of the performance for both the AM and PM peak hours, summarized for the intersection and for each approach.

The first table contains the calculations of the existing intersection control, analyzed with *SimTraffic* since the unique control does not allow *Synchro* to calculate the HCM performance. The *SimTraffic* calculations were graded using the HCM's delays assignments to allow for some level of comparison. Because the new development trips are added to free-flow southbound and westbound approaches, the average intersection delay per vehicle declines. The impacts to the current stop control approaches are negligible in this calculation.

Existing STOP Control (NB)

AM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	1.6	5.4	0.1	5.3	0.0
LOS	A	A	A	A	A
Add Development					
Delay (Sec / Veh)	0.7	5.3	0.0	5.3	0.1
LOS	A	A	A	A	A

PM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	2.0	4.7	0.0	4.5	0.0
LOS	A	A	A	A	A
Add Development					
Delay (Sec / Veh)	1.2	5.6	0.2	5.4	0.1
LOS	A	A	A	A	A

The second table contains the calculations of an AWSC, analyzed with *Synchro's* simulation software to calculate the HCM performance. There is a natural increase in the average intersection delay per vehicle since all approaches now have stop control. John Street and Meade Street, as an AWSC intersection, would perform at LOS A both with or without the added development trips.

All Way Stop Control (AWSC)

AM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	7.1	7.1	7.2	7.3	6.6
LOS	A	A	A	A	A
Add Development					
Delay (Sec / Veh)	7.5	7.3	7.9	7.5	7.0
LOS	A	A	A	A	A

PM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	7.1	7.2	7.2	7.3	6.7
LOS	A	A	A	A	A
Add Development					
Delay (Sec / Veh)	8.1	7.5	8.6	7.8	7.3
LOS	A	A	A	A	A

2) College Avenue & Meade Street:

This intersection was reviewed to determine if the existing traffic signal timing parameters would be adequate to handle the new development trips. The peak hour existing and new trips were evaluated using Trafficware's *Synchro* simulation software to calculate the HCM performance. The following is a summary of the performance for both the AM and PM peak hours, summarized for the intersection and for each movement. The right turn lane is shared with the through lane and summarized together. Trafficware's proprietary Intersection Control Utilization (ICU) calculation has also been included.

AM Peak Hour Performance																	
	Intersection	Northbound				Southbound				Eastbound				Westbound			
		L	T	R	Appr	L	T	R	Appr	L	T	R	Appr	L	T	R	Appr
Existing Conditions																	
Delay (Sec / Veh)	30.5	37.4	31.2	<	31.5	24.8	20.1	<	23.6	19.1	15.9	<	16.1	12.8	36.4	<	31.2
LOS	C	D	C		C	C	C		C	B	B		B	B	D		D
Trafficware ICU (LOS/%)	B / 58.0%																
Added Development																	
Delay (Sec / Veh)	30.6	33.0	34.2	<	33.6	25.1	20.2	<	23.8	19.2	16.5	<	16.6	12.6	37.4	<	36.2
LOS	C	C	C		C	C	C		C	B	B		B	B	D		D
Trafficware ICU (LOS/%)	B / 58.0%																

< Shared Lane Use

PM Peak Hour Performance																	
	Intersection	Northbound				Southbound				Eastbound				Westbound			
		L	T	R	Appr	L	T	R	Appr	L	T	R	Appr	L	T	R	Appr
Existing Conditions																	
Delay (Sec / Veh)	22.6	35.8	39.0	<	38.0	30.0	20.2	<	29.1	13.5	20.8		20.4	14.6	21.3	<	21.1
LOS	C	D	D		D	C	C		C	B	C		C	B	C		C
Trafficware ICU (LOS/%)	C / 64.2%																
Added Development																	
Delay (Sec / Veh)	24.3	37.3	44.2	<	41.9	31.7	20.3	<	30.3	14.1	23.4	<	22.9	15.2	21.3	<	20.7
LOS	C	D	D		D	C	C		C	B	C		C	B	C		C
Trafficware ICU (LOS/%)	C / 65.2%																

< Shared Lane Use

No adjustments to the existing traffic signal timing parameters were made between analyzing either the existing conditions or the added development trips. The above calculations indicate that the College Avenue and Meade Street traffic signal, with added development trips, will accommodate the additional traffic will minimal impact to performance. No changes to the existing signal timings are recommended.

3) Alton Street & Lawe Street:

This intersection was reviewed to determine if the existing stop control on Alton Street at Lawe Street would be adequate to handle the new development trips. The peak hour existing and new trips were evaluated using Trafficware's *Synchro* simulation software to calculate the HCM performance. The following is a summary of the performance for both the AM and PM peak hours, summarized for the intersection and for each approach.

AM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	1.2	0.2	0.4	10.6	11.7
LOS	A	A	A	B	B
Added Development					
Delay (Sec / Veh)	1.4	0.2	0.4	10.6	12.1
LOS	A	A	A	B	B

AM Peak Hour Performance					
	Intersection	Northbound	Southbound	Eastbound	Westbound
		APPR	APPR	APPR	APPR
Existing Conditions					
Delay (Sec / Veh)	1.2	0.0	0.1	13.5	16.2
LOS	A	A	A	B	C
Added Development					
Delay (Sec / Veh)	1.4	0.0	0.2	13.6	16.7
LOS	A	A	A	B	C

The above calculations indicate the intersection of Alton Street and Lawe Street, as currently controlled with a stop sign on Alton Street, with the added development trips, will perform at an acceptable LOS.

An obvious concern is the poor sight of vehicles arriving from the south on Lawe Street from the view of Alton Street approach. This could result in longer average delay than calculated as drivers take extra care to find gaps in traffic for turns. At LOS C, there remains ample ability for this intersection to handle the additional development trips and any additional delay. Drivers also have an alternative route to access south Lawe Street using College Avenue.

Evaluation of On-Street Parking Impacts:

The segment of Meade Street between John Street and College Avenue is currently 32 feet wide (from face of curb to face of curb), with parking allowed on one side only. We recommend no changes to this configuration associated with the proposed development.

The segment of John Street east of Meade Street is currently 28 feet wide (from face of curb to face of curb), with parking allowed on both sides in some areas. We recommend that parking be completely removed from the entire length of one side if the proposed development occurs.

The traffic on John Street would increase from 314 to 1,314 vehicles/day based on this analysis. The traffic on Meade Street would increase from 1,003 to 2,003 vehicles/day. These street segments, with the noted parking adjustments on E. John Street, are able to accommodate the anticipated additional traffic. The following are nearby streets measuring 28 feet wide, with parking restricted to one side of the street;

1. Meade Street, Franklin Street to Pacific Street (over 3,000 vehicles/day)
2. Pacific Street, Meade Street to Peabody Park Bridge (1,000 vehicles/day)
3. Washington Street, Lawe Street to Rankin Street (800 vehicles/day)

Conclusion & Recommendations:

This analysis did not reveal any significant impacts to traffic performance with the introduction of the latest Garden Homes multi-unit apartment development consisting of 120 units, 180 parking stalls, and mostly 2 bedroom apartments/townhouses connected to E. John Street near the west side of the Fox River.

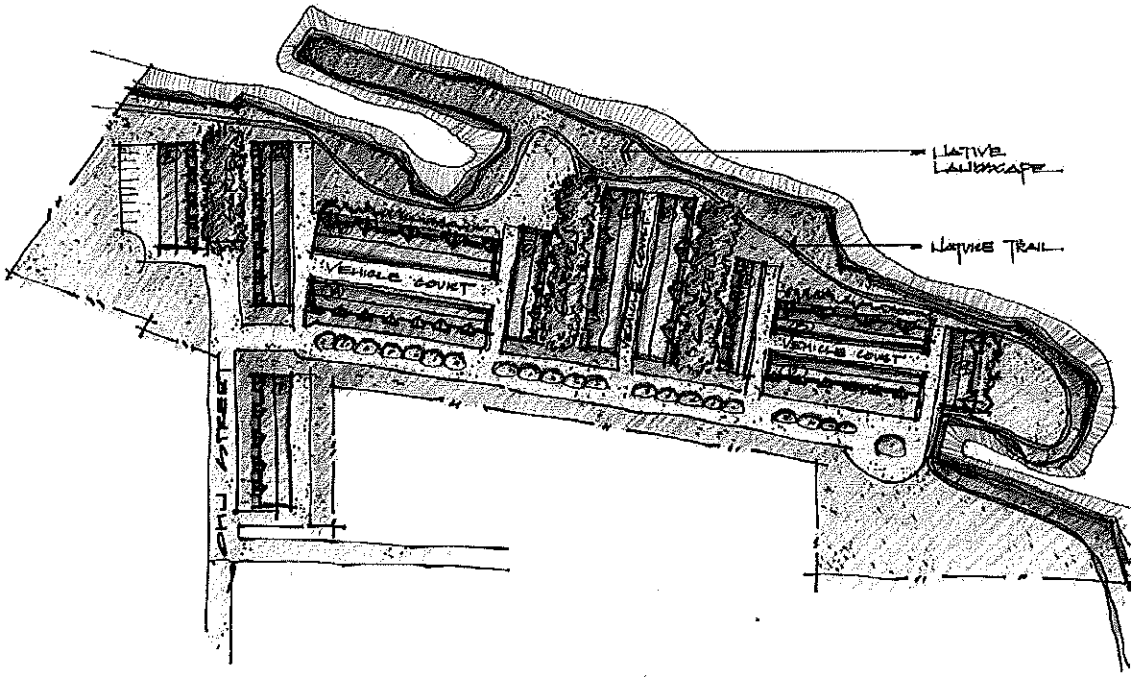
At the Meade / John intersection, the installation of All Way Stop Control AWSC is recommended to service the combination of increased pedestrian activity, and the intersection of streets that would have similar operational characteristic with the added development trips. The analysis indicates this will perform at LOS A with the addition of the new development trips.

At the College / Meade intersection, the increase in delay due to the proposed traffic is not significant. No changes to the intersection or signal timing parameters are recommended with the addition of the new development trips.

At the Alton / Lawe intersection, the increase in delay due to the proposed traffic is not significant. No changes to the intersection control and operation are recommended with the addition of the new development trips.

The segment of John Street east of Meade Street is currently 28 feet wide (from face of curb to face of curb), with parking allowed on both sides in some areas. It is recommended that parking be completely removed from the entire length of one side of John Street if the proposed development occurs.

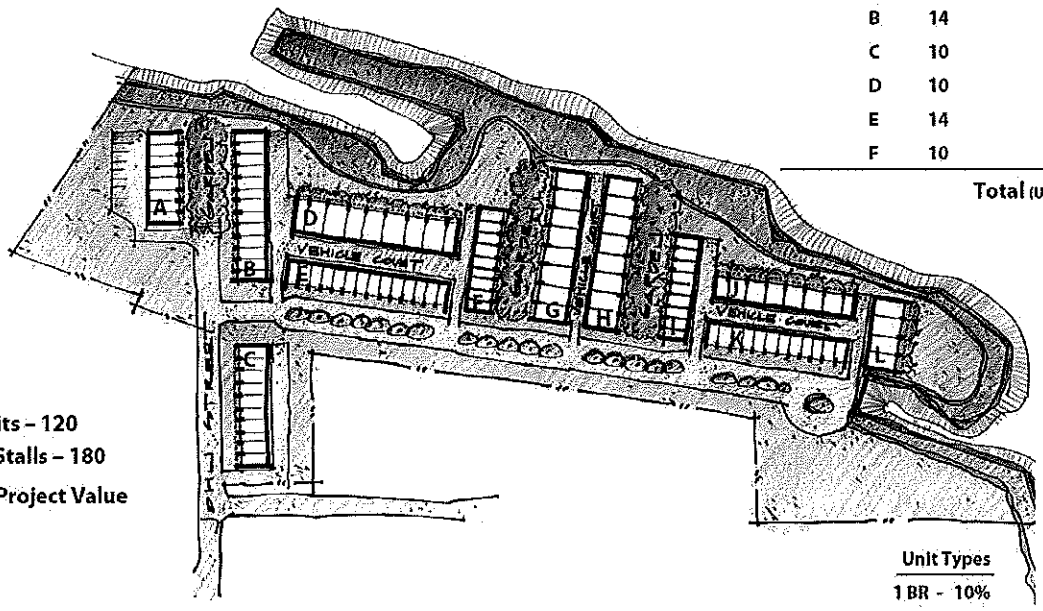
Garden Homes



REVISED CONCEPTUAL SITE PLAN

Garden Homes

Building	Qty.	Building	Qty.
A	8	G	10
B	14	H	10
C	10	I	10
D	10	J	8
E	14	K	12
F	10	L	4
		Total (Units)	120



Total Units – 120
Parking Stalls – 180
$16.0 M Project Value

Unit Types
1 BR - 10%
2 BR - 80%
3 BR - 10%

UNIT COUNTS / DENSITY