STAFF REPORT

Certificate No. 3-B-14-DT
410 Locust St. – Walnut Street Garage (Andy Powers)
Pre-development – 10/24/2013

Description of Work

Revisions to CoA #12-B-13-DT, approved by the board on December 18, 2013.

The previous design provided four vehicular entry bays, two each on Walnut and Locust. Each bay provided one lane in and one lane out. The development team hired a parking consultant because of concerns with vehicular traffic flow and pedestrian/vehicular conflicts, and the consultant recommended changing the entrances and exits as shown on the attached plans (the consultants report is attached).

The new design provides two entry/exit bays, one each on Walnut and Locust (see attached A1.1 & A1.2). Each by contains three lanes. The right lane will be permanently in, the left lane permanently out, and the center land will be flexible and signed to accommodate peak flow.

This change involves the Locust and Walnut elevations. The shear wall has been shifted off center to align the entrances with interior traffic lanes and to provide sufficient lateral stability. There is a 3-foot tall, precast wall to screen the view of cars at street level (see attached A3.2).

The changes also necessitate revisions to the site plan to accommodate the widened bays (see attached SP1.1). The changes include merging two planting areas on both Walnut Street and Locust Street that were previously separated by a curb cut. Along Walnut Street, this will include one additional shade tree and a total of 21 cubic yards of soil (increase of soil volume by 7 cubic yards). Along Locust Street, this will include one additional shade tree and a total of 25 cubic yards of soil (increase of soil volume is undetermined because one of the previous planting areas did not have a tree and therefore it was not calculated -- the one with the tree had 11.6 cubic yards of soil).

The revised plans also show the modifications to the Summer Place retail, which were a condition of the original approval (this are shown for illustrative purposes only and is not intended to be part of the requested approval of modifications).

Staff Comments

The proposed revision to the Walnut Street and Locust Street elevations alter the exterior design of the garage in only a minor fashion compared to the plans previously approved by the board.

The reduction in the number of vehicular access points is consistent with guideline A.1.1g that recommends the consolidation of curb-cuts and should increase pedestrian safety along the sidewalk.

Staff Recommendation

APPROVE Certificate 3-B-14-DT as submitted.

KNOXVILLE·KNOX COUNTY
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METROPOLITAN PLANNING COMMISSION
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Knoxville, Tennessee 37902
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Downtown Knoxville Design Overlay District
Certificate of Appropriateness

Applicant (Interest): Andy Powers (Architect)

Date Filed: 3/2/2014 **Application Accepted By:** Mike Reynolds

Fee Amount: 50.00 **Review Date:** 3/19/2014 **File Number:** 3-B-14-DT rev.

PRE-APPLICATION CONFERENCE Date Completed: 3.4.2014

PROPERTY INFORMATION

Building or Project Name:
Walnut Street Garage

Street Address:
400 Locust St

Parcel Identification Number(s):
94 L H 019.03

PROJECT ARCHITECT/ENGINEER

Andy Powers
404 Bearden Park Cir
Knoxville, TN 37919
Telephone: Fax: 602-7742
Email: apowers@georgeewart.com

PROPERTY OWNER

Walnut Street Garage, LLC
520 W Summit Hill Dr Suite 1201
Knoxville, TN 37902
Telephone: 546-7020 Fax: 971-4881
Email: scottiefrl@aol.com

PROJECT CONTRACTOR

ACCOMPANYING MATERIALS

Please see the second page of this form for a list of information required as part of this application.

FOR OFFICE USE ONLY

PROJECT INFORMATION

LEVEL 1: $50
☑ Minor Alteration of an Existing Building/Structure
☐ Sign

LEVEL 2: $100
☐ Major Alteration of an Existing Building/Structure
☐ Addition to an Existing Building/Structure

LEVEL 3: $250
☐ Construction of New Building/Structure

PROJECT CONTACT

All application-related correspondence should be directed to:

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Email: apowers@georgeewart.com

3/4/2014 11:01:53 AM

GEORGE ARMOUR
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March 3, 2014

Mike Reynolds
Metropolitan Planning Commission
Suite 403, City County Building
400 Main Street
Knoxville, TN 37902

Re: Downtown Design Review Committee
Walnut Street Garage
Reference No. 3-13-14-DT

Dear Mr. Reynolds:

This letter accompanies revisions of our design which was awarded a Certificate of Appropriateness by the Committee on December 18, 2013.

The previous design provided four vehicular entry bays, two each on Walnut and Locust. Each bay provided one lane in and one lane out. We were concerned, and the committee expressed reservations with vehicular traffic flow and pedestrian/vehicular conflicts.

The current scheme provides two entry/exit bays, one each on Walnut and Locust (see attached A1.1 & A1.2). Each bay contains three lanes. The right lane lane will be permanently in, the left lane, permanently out, and the center lane will be flexible and signed to accommodate peak flow. Our parking consultant has reviewed this design and agrees that it provides significant improvements (see attached report).

This change involves the Locust and Walnut Elevations. The shear wall has been shifted off center to align the entrances with interior traffic lanes and to provide sufficient lateral stability. We have provided a 3' tall, precast wall to screen the view of cars at street level (see attached A3.2).

The change also necessitates minor revisions to the site plan where planting has been altered to accommodate the widened bays (see attached site plan). Bike racks are shown adjacent to the retail.

The re-submission also illustrates the Committee's instruction to raise the Summer Place retail to grade level (see attached A3.1). There have been no other design or material changes from what was previously presented. The windows to the west of the retail (above the steps) were shown on the original submission in plan and elevation. They were not shaded to avoid graphic confusion.

We understand that we will need to return to the committee with the signage package including electronic signage for the flexible entry/exit lane.

We believe that these revisions represent significant improvements to the function of the garage without affecting the aesthetics. We look forward to discussing this with the Committee in detail.

Please let me know what other information you need or how we can be of further assistance.

Sincerely,

Andrew P. Powers, Principal
George Armour Ewart, Architect

WALKER
PARKING CONSULTANTS

MEMORANDUM

FLOW CAPACITY AND QUEUING ANALYSIS

DATE:	January 28, 2014
TO:	Andy Powers
COMPANY:	George Armour Ewart Architect
ADDRESS:	404 Bearden Park Circle
CITY/STATE:	Knoxville, Tennessee
CC:	
HARD COPY TO FOLLOW:	No
FROM:	Randy Carwile
PROJECT NAME:	Walnut Street Parking Garage
PROJECT NUMBER:	13-3106.00
SUBJECT:	Flow Capacity and Queuing Analysis

In accordance with your request Walker Parking Consultants (WPC) has performed a flow capacity and queuing analysis for the Walnut Street Parking Garage. The following is a brief summary of our understanding of the project followed by our comments on and analysis of the existing design. We understand that the geometry of the garage is set so we have not reviewed nor made any recommendations regarding parking geometrics or ramping systems.

In order to quantify all aspects of the design of parking structures, WPC has developed and uses the Level of Service (LOS) approach. It is derived from traffic and intersection design that is widely used by Traffic Engineers, and the Levels of Service range from A to F. For example, a LOS A equates to a high level of comfort, generous parking dimensions, little or no delay, etc. A LOS F equates to systems that do not work, dimensions that are too tight to function properly, traffic gridlock, etc.

PROJECT DESCRIPTION

The Walnut Street Parking Garage is a two-bay single thread helix between Locust Street and Walnut Street along Summer Place in Knoxville. The garage has approximately 1,100 spaces with entry/exit points on Locust Street and Walnut Street. The entry/exit on Walnut Street is one level higher than the entry/exit on Locust Street, which is the lowest level of the garage.

The users of the garage consist primarily of employees and office visitors on weekdays and special event attendees and downtown visitors on nights and weekends. The following assumptions, based on our experience for each user type, were used in our analysis.

- **Weekday – Employees:** Use proximity cards for entries and exits and comprise 93% of the available spaces or 1,023. The peak hour volumes for entrances in the AM peak

hour and exits during the PM peak hour are 466 (46%) vehicles and 420 (41%) respectively.

- **Weekday – Office Visitors:** Take a ticket upon entry and pay a variable rate upon exit based on the length of stay. Based on an agreement with the city, parking is free after 6:00 PM. Visitors comprise 7% of the available spaces or 77 spaces. The peak hour volumes are 37 entries in the AM peak hour and 33 exits during the PM peak hour.

- **Nights/Weekends – Special Event Attendees:** This user group has a peak hour volume of 90% entering and 100% exiting in a separate hour. Because the gates are assumed to be up during nights and weekends, no queuing analysis will be performed, but the intent is to determine how many attendees can park in the garage with minimal congestion on the ramping system. We understand that raising the gates on nights and weekends is not the owner's current plan, but it is our recommendation to avoid excessive queues during this time. Refer to the section on downtown residents.

- **Nights/Weekends – Downtown Visitors:** This user group has a peak hour volume of 57% entering and 53% exiting, but this occurs during the same hour creating much more cross traffic than the other cases. Similarly to the special event case, we are not performing a queuing analysis, but will determine how many visitors can park in the garage with minimal congestion on the ramping system. This would the case that examines a typical weeknight or weekend.

QUEUING ANALYSIS

METHODOLOGY

The objective of this analysis is to determine if the number and location of the entry and exit lanes provided are adequate for the parking structure. Our queuing analysis model calculates three results: 1) the design queue, which is how large a reservoir should be provided to keep vehicles from backing into the street on entry or into parking areas on exit; 2) the average queue; and 3) the Level of Service. The Level of Service is based on the average queue in the design hour. The average queue is just as it would seem: the average queue encountered by patrons at that location in that hour. It is converted to average wait, in seconds, which then is used to determine Level of Service. Similar to the system employed by traffic engineers, the LOS is a quantitative measure of the degree of congestion and delay, ranging as follows:

LOS A, little or no delay	<10 sec
LOS B, minimal delay	<30 sec
LOS C, average delay	<60 sec
LOS D, maximum acceptable delay	<120 sec
LOS F, unacceptable delay	>120 sec

In the parking structure context, a "queue" is a line of vehicles or people waiting to be serviced at a device or control point. By definition it does not include the "service" position. Our model uses standard traffic engineering procedures for queuing at intersections but adapted by WPC to the requirements of parking access and revenue controls. The design procedure evaluates the type of equipment in the lane, the type of user (cash, card, etc.) and the volume of traffic by that type of user at each location.

The type of equipment in the lane greatly affects the speed of processing, or service rate at an equipment lane. The service rate is the typical maximum sustainable rate of processing each transaction type in vehicles per hour (vph) or persons per hour (pph). Several examples of base rates are noted in Table 1. We have also converted those volumes to the average time per transaction.

Table 1: Equipment Base Processing Rates

Equipment Type	Vehicles Per Hour	Seconds Per Vehicle
EMPLOYEE ENTRY OR EXIT		
Proximity Card	600	6.0
Automatic Vehicle ID	800	4.5
PAY PER USE ENTRY		
Push Button Ticket	400	9.0
Auto Spit Ticket	450	8.0
PAY PER USE EXIT		
Exit Verifier – Credit Only	182	19.8
Pay-In-Lane – Cash or Credit	83	43.2

ANALYSIS RESULTS

The equipment assumed for the entrances is push button ticket dispensers for visitors and proximity card readers for employees. In the absence of traffic data indicating the distribution of parkers between the two entrances, we have performed a sensitivity analysis. If less than 75% of all parkers use a single plaza, a LOS of A can be achieved with one lane. Although the LOS is A for one lane the design queue is 4 vehicles, which may be objectionable to the city. It is also advisable to have two entry lanes to provide redundancy for situations where one lane is being serviced or is out of service. If two lanes are provided then the design queue is negligible (less than 1) even if 100% of parkers use a single plaza.

The equipment assumed for the exits are Pay-in-Lane machines for visitors and proximity card readers for employees. Again we have no traffic data indicating the expected distribution of parkers between the two exits; however, 91% of the parkers would have to pass the Walnut Street exit to get to the Locust Street exit. Given this fact and the relatively easy external

connection between the two exits via Summer Place, the vast majority of users will exit at Walnut Street. This is especially true for unfamiliar visitors who typically exit the first visitor exit they see. Based on these assumptions the exit at Walnut Street will have a LOS of B, with an 18 second wait and a recommended design queue of 2 vehicles. Although 18 seconds does not seem that objectionable, keep in mind that this is the average delay, not the maximum delay, and this can be frustrating for employees who expect to exit with no delay.

We have assumed that the gates will be up on nights and weekends and have therefore not evaluated the parking equipment for the night and weekend cases. If there is congestion at the exit lanes it will be caused by traffic on the surrounding streets, and is outside the scope of our analysis. Our recommendations for the parking equipment are included at the end of this memo.

DOWNTOWN RESIDENTS

Given the city's requirement of free parking after 6:00 PM we understand the owner wants to avoid downtown residents parking in the garage for extended periods and exiting for free after 6:00 PM. One method that has been discussed to avoid this is keeping the gates down at all times and requiring all users to pull a ticket, even on nights and weekends. At exit parkers who have parked less than 24 hours, or some other prescribed time, would be allowed to exit for free. This approach would add significant delays to the 99% of parkers who have been there less than 24 hours and would not hinder the downtown residents from long term parking. The residents could simply claim that they have lost their ticket.

Our recommendation would be to post signs stating "Overnight Parking for Registered Vehicles Only." Then have the parking operator monitor the garage for unregistered overnight parkers. It is relatively easy to notice when a car is in the same spot for several days, especially at night when the garage should be mostly empty. When violators are caught strict enforcement and towing will be the best deterrent.

ALTERNATE ENTRY/EXIT LAYOUT

It has been proposed to have one entry lane and one exit lane on Locust Street and one entry lane and one exit lane on Walnut Street. We analyzed the condition for entries during the AM peak hour and exits during the PM peak hour. If one assumes the entries are evenly divided between to the two entry plazas, the average delay is 2.6 seconds, LOS A, and the design queue is one vehicle. This will result in queues backed up onto the streets. If either plaza has 75% of the entries, the average delay increases to eleven seconds, LOS B, and the design queue is five vehicles.

For the exiting during the PM peak hour, we again assumed the exits are evenly divided between the two exit plazas. This is somewhat unreasonable because 91% of the users will have to pass the Walnut Street exit to access the Locust Street exit. With the vehicles evenly

divided between the two exits, both exits have average delays in excess of eighty seconds, LOS D, and design queue of fifteen vehicles. The primary cause of the excessive delay is the visitors who must pay-in-lane. If we require all of the visitors to use the Locust Street exit and assume that 91% of the employees will use the Walnut Street exit, the delays at Locust Street are increased to over thirty minutes, LOS F, but the average delay at Walnut Street is five seconds, LOS A, with a design queue of three vehicles. If we provide two lanes at Locust Street, the average delay is eleven seconds, LOS B, and the design queue is three vehicles.

SUMMARY

The following table summarizes the Level of Service for entries and exit for each of the three options. We analyze the processing time of the parking equipment; our analysis does not include the impact of traffic on the streets. The plazas on both streets are the same in all options, so the description applies to both Locust Street and Walnut Street

WEEKDAY QUEUING LEVEL OF SERVICE		
Number of Vehicular Lanes	**Entrances**	**Exits**
One Entry, One Exit, One Reversible	A	B
Two Entry, Two Exit*	A	B
One Entry, One Exit	B	F

*From a queuing standpoint this functions the same as the first option

FLOW CAPACITY

METHODOLOGY

The objective of this analysis is to determine if the ramping system in the parking structure can accommodate the peak hour traffic volumes. The analysis methodology we employ is based primarily on research conducted in Britain by the Transport and Road Research Laboratory, which is equivalent to the Transportation Research Board in the United States. They did extensive research in 1969[1] and again in 1984[2] on the issue of flow capacity of parking circulation systems. Walker has adapted this research for US conditions and developed a computer model for determining the flow capacity at various points, and the resulting level of service when a given ramping system is "loaded" by a prescribed peak hour volume.

Our model essentially evaluates these four types of vehicles (parking, unparking, searching and merging vehicles) in a stream of traffic past a particular point and determines what

[1] Ellson, PB, 1969 *Parking: Dynamic Capacities of Car Parks*, RRL Report LR221, Crowthorne, Berkshire, UK: Road Research Laboratory.

[2] Ellson, PB, 1984 *Parking: Turnover Capacities of Car Parks*, TRRL Report 1126, Crowthorne, Berkshire, UK: Transport and Road Research Laboratory.

percent of the theoretical capacity at that point is used. That is then used to determine Level of Service, ranging as follows:

LOS A, little or no delay	up to 59.9% of capacity used
LOS B, minimal delay	60.0 to 69.9%
LOS C, average delay	70.0 to 79.9%
LOS D, maximum acceptable delay	80.0 to 89.9%

ANALYSIS RESULTS

To evaluate the ramping system we reviewed four conditions: AM Peak Hour, PM Peak Hours, Typical Weekend, and Special Event Weekend. The characteristics for the various users are defined above.

The traffic volume in the AM Peak Hour utilizes 73% of the ramping systems capacity, LOS C. In the PM Peak Hour the traffic volume utilizes 81% of the ramping system capacity. Although the traffic volumes in the afternoon are less, the unparking maneuver takes 17% longer than the parking maneuver creating additional congestion on the exit path. In both cases, although there will be congestion, it should be tolerable for office employees.

Due to the peak hour volumes for both weekend conditions, if the garage is full for either a typical weekend or a special event weekend, the traffic volumes are well in excess of the ramping system capacity. Although the traffic volumes are lower for a typical weekend than any of the other cases, the layout of the garage has several conflicts between entering and exiting vehicles near the entry/exit points. During a typical weekend peak hour there can be a significant traffic volume entering and exiting the garage during the same peak hour, which exacerbates the impact of these conflicts. All of the other cases are primarily tidal flow, that is, either arriving or departing vehicle comprise over 90% of the volume within a given peak hour.

To determine how many parkers we recommend allowing in the garage, we determined the traffic volume that would produce a LOS C (i.e. less than 80% of capacity). For a special event weekend we recommend parking no more than 460 vehicles in the garage. For a typical weekend we recommend parking no more than 520 vehicles in the garage. Parking occupancy higher than this will result in undesirable delays on the ramping system.

SUMMARY OF RECOMMENDATIONS

The following are our recommendations regarding equipment type and location as well as a few operational suggestions.

1. At the Locust Street Plaza provide three (one reversible) lanes as shown. Provide a single unit with a card reader and ticket dispenser for the two entry lanes. For the two exit lanes, provide a card reader in both lanes. For the center lane provide an exit verifier (credit/debit card only) and for the right lane provide a Pay-in-Lane machine (cash or credit/debit). It is important to have at least one way of accepting cash payments at the garage. Providing one lane allow those who want to use cash to exit the garage and keep other lanes less congested for those who can use a credit/debit card.

2. At the Walnut Street Plaza provide three (one reversible) lanes as shown. Provide a single unit with a card reader and ticket dispenser for the two entry lanes. For the two exit lanes, provide a card reader only so that no visitors can exit at Walnut Street when the gates are down. This should keep the exit queues to less than 1 car and allow the employees to exit without waiting behind the much slower pay-per-use parkers.

3. If the garage is limited to one entry and one exit lane on each street and it is operated as assumed in this report, it provides an acceptable wait time for all cases except the exiting onto Locust Street. This exit handles all of the visitors and must have two lanes to function without excessive delays and frustration.

4. Although this only affects 9% of users, parkers required to make a left turn into the exit lanes will have a difficult time, and parkers in large vehicles will likely have to stop and backup to reach the equipment. To minimize this we have two suggestions. One, move the equipment and island forward as far as possible. If the city allows you to move it outside the garage slightly, that would be preferred, but it should be covered with a canopy. Two, use Automatic Vehicle ID (AVI) technology instead of proximity card readers. All of our analysis is based on proximity card readers, but AVI has 33% faster throughput and higher customer service. With AVI the card is mounted in the windshield and gate opens automatically when the card is read. It does not require the user to roll down his window and reach out to a card reader. With AVI the car can be more skewed in the exit lane which is one of the benefits for the left turners having difficulty getting aligned with the equipment. For this garage the initial cost would be about $20,000 for AVI compared to proximity card readers.

5. In order to minimize the instances of left turns into the exit equipment lanes during peak hours, we suggest parking the TVA fleet vehicles "below" the Walnut Street Plaza. Although this is desirable parking because it is close to the entry/exit plaza and is on

grade, it is difficult to access the exit plazas. It is expected that most fleet vehicles would enter or exit the garage during non-peak hours.

6. Do not require patrons to pull tickets and be processed through equipment during free parking periods. It will create backups on the weekends and not be effective in deterring downtown residents from using the garage for long term parking for little or no cost. Use and enforce the no overnight parking for unregistered vehicles prohibition.

7. On nights and weekends limit the garage to 520 vehicles for typical weekends and 460 during special events to minimize congestion on the ramps and conflicts near the entry/exit plazas.

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1 Layout and Materials Plan
Scale: 1" = 10'-0"

0 10' 20' 30'

NORTH

A NEW PARKING GARAGE FOR
WALNUT PARKING GARAGE, LLC
KNOXVILLE, TENNESSEE

PRELIMINARY - NOT FOR CONSTRUCTION

Site Plan

DATE:	10 DEC, 2013
PROJECT NO.:	13-075
PROJECT MGR.:	JTW

REVISION:	DATE
1	12.06.13
2	03.04.14

SP1.1

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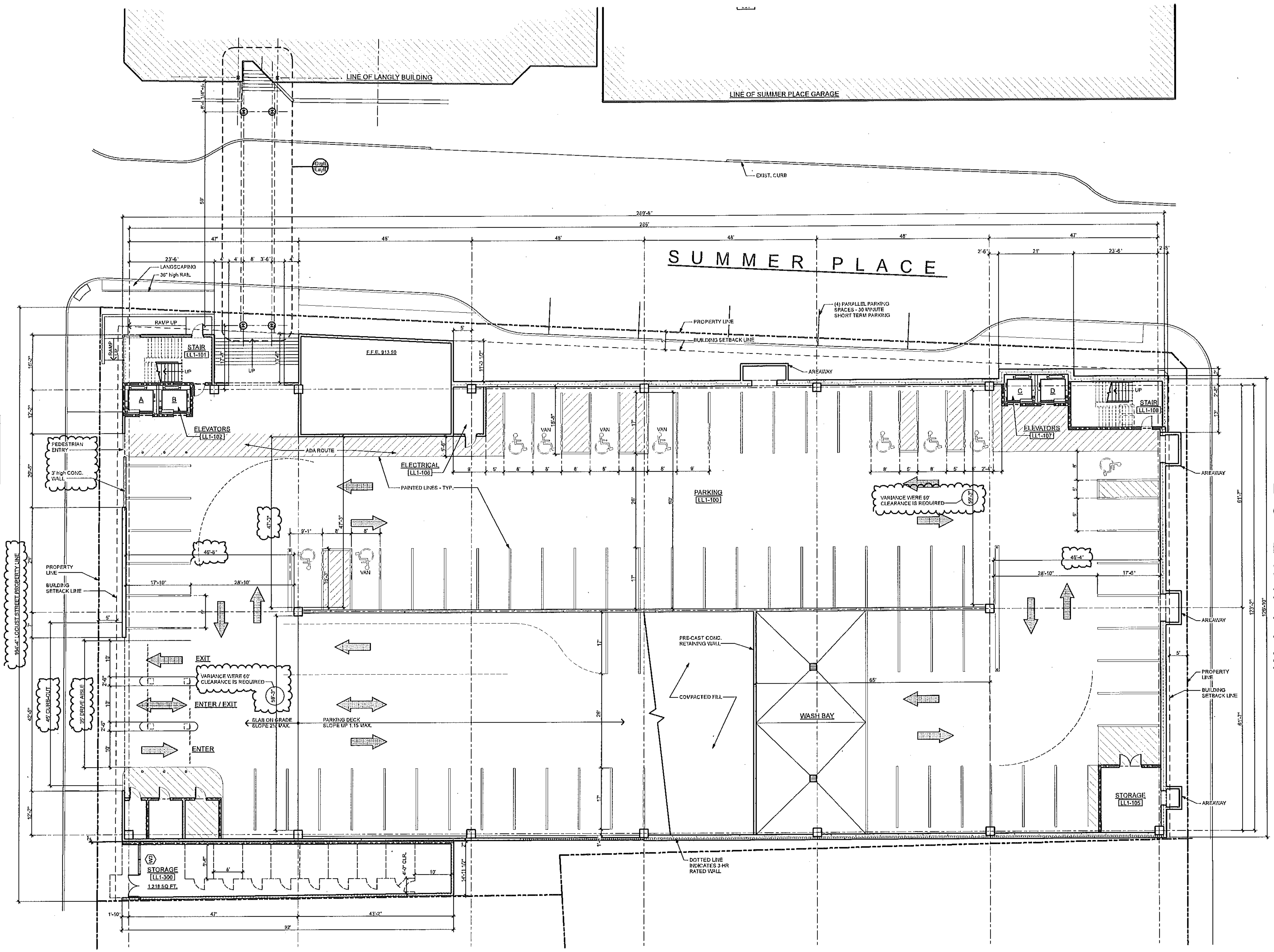
A NEW PARKING GARAGE FOR:
WALNUT PARKING GARAGE, LLC
KNOXVILLE, TENNESSEE

PRELIMINARY - NOT FOR CONSTRUCTION

LOWER FLOOR PLAN



1 LL-1 FLOOR PLAN
SCALE: 3/32" = 1'-0"

DATE:	3 MARCH 2014
PROJECT NO.:	13034
PROJECT MGR.:	WRL

A1.1

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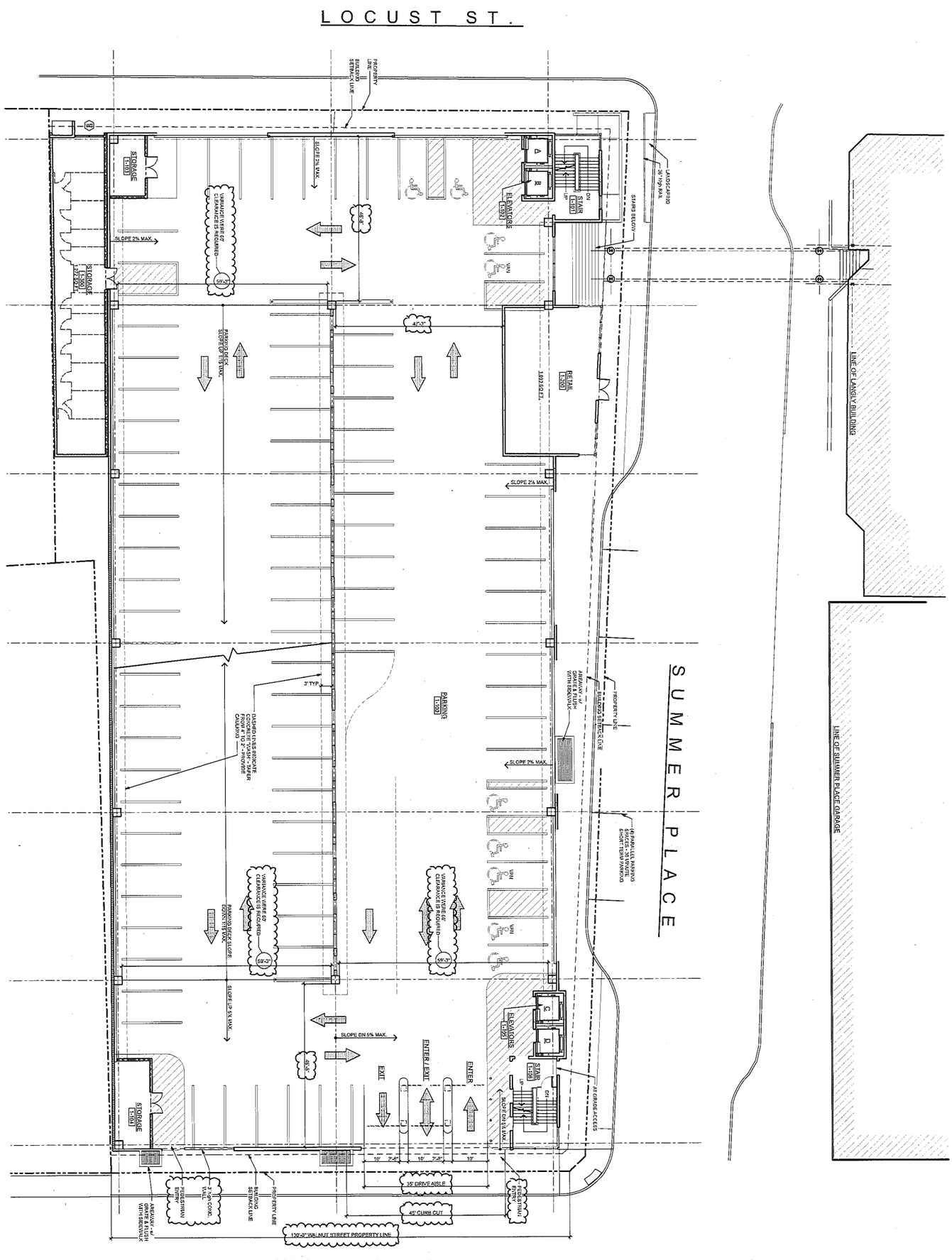

1 FIRST FLOOR PLAN
SCALE: 3/32" = 1'-0"

FIRST FLOOR PLAN

PRELIMINARY - NOT FOR CONSTRUCTION

A NEW PARKING GARAGE FOR:
WALNUT PARKING GARAGE, LLC
KNOXVILLE, TENNESSEE

GEORGE ARMOUR EWART ARCHITECT
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Knoxville, TN 37919
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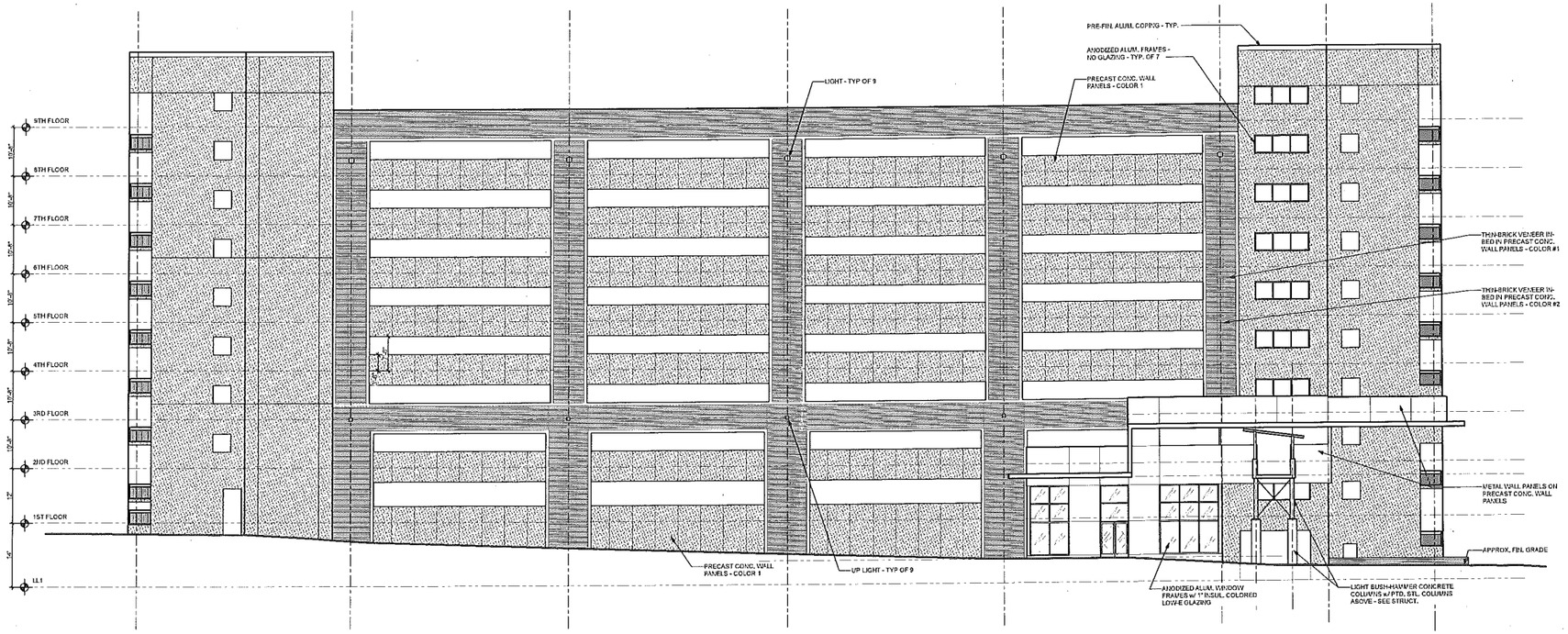
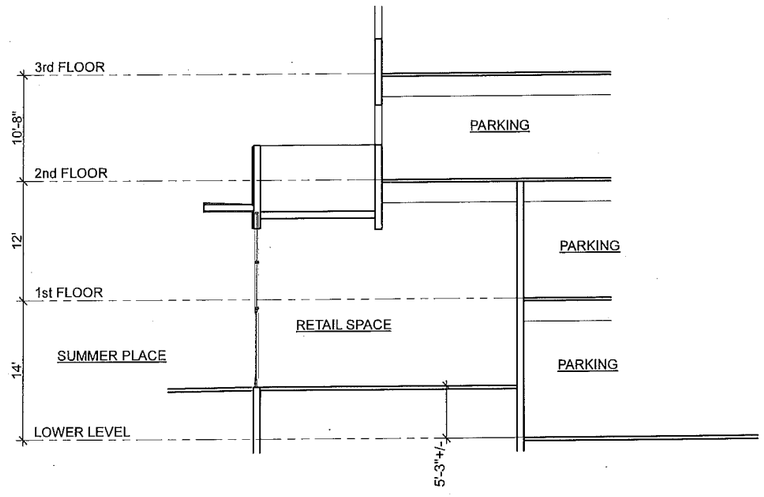
Fax 865.622.7742

DATE: 3 MARCH 2014
PROJECT NO.: 13034
PROJECT MGR.: VRL

A1.2



1 SUMMER PLACE ELEVATION
SCALE: 3/32" = 1'-0"



2 SECTION @ RETAIL
SCALE: 3/16" = 1'-0"

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A NEW PARKING GARAGE FOR:

WALNUT PARKING GARAGE, LLC

KNOXVILLE, TENNESSEE

PRELIMINARY - NOT FOR CONSTRUCTION

ELEVATION

DATE: 3 MARCH 2014
PROJECT NO.: 13034
PROJECT MGR.: WRL

A3.1

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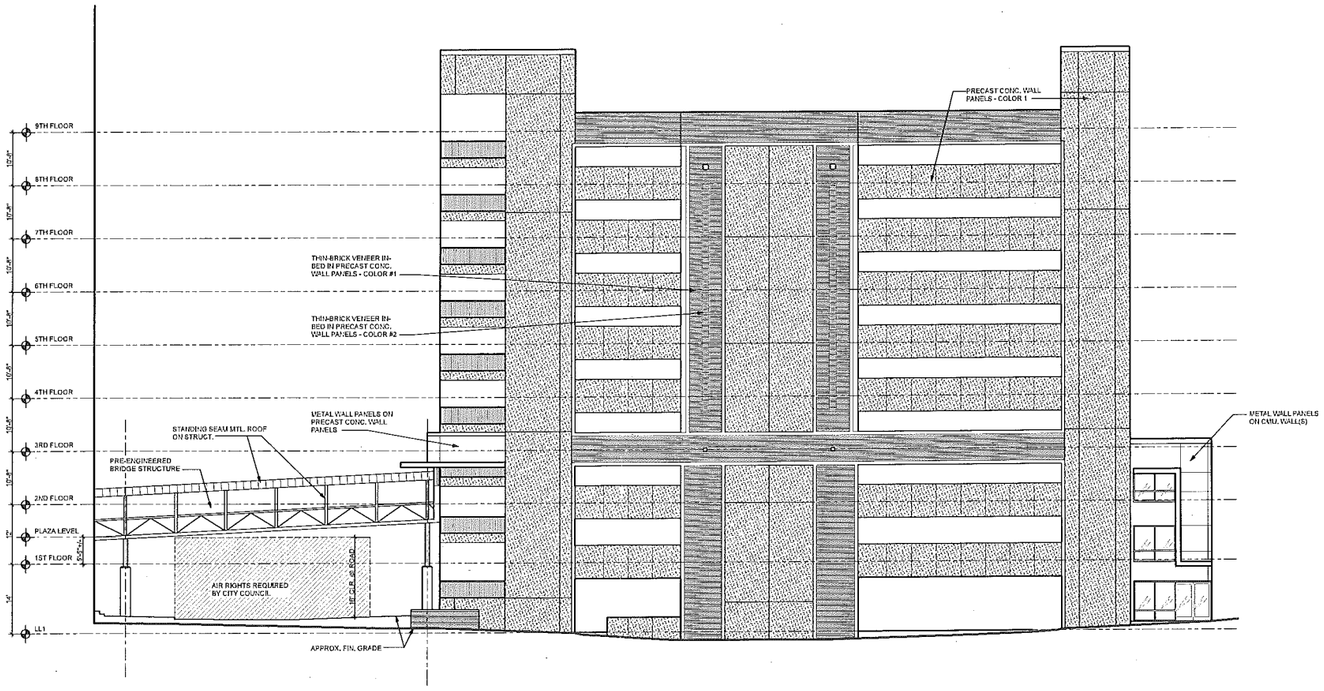
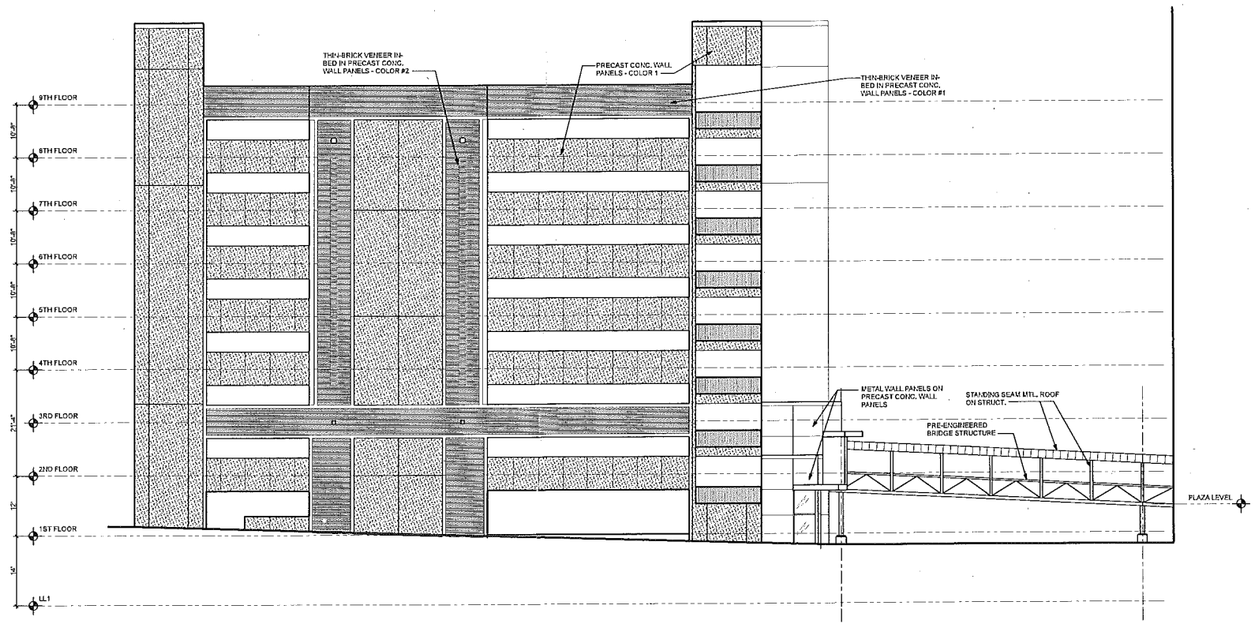


1 LOCUST STREET ELEVATION
SCALE: 3/32" = 1'-0"



2 WALNUT STREET ELEVATION
SCALE: 3/32" = 1'-0"

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A NEW PARKING GARAGE FOR:

WALNUT PARKING GARAGE, LLC

KNOXVILLE, TENNESSEE

PRELIMINARY - NOT FOR CONSTRUCTION

ELEVATION

DATE: 3 MARCH 2014
PROJECT NO.: 13034
PROJECT MGR.: WRL

A3.2

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