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PLANNING COMMISSION MEETING AGENDA REGULAR MEETING

David Lambert, Chairman, Marianna Perakis, Vice Chairman
Toby Buechner, Carlton Faison, Tyler Fox, Michael W. Hutson, Tom Krent,
Lakshmi Malalahalli and John J. Tagle

January 10, 2023

7:00 P.M.

Council Chambers

1. ROLL CALL
2. APPROVAL OF AGENDA
3. APPROVAL OF MINUTES – December 13, 2022
4. PUBLIC COMMENT – For Items Not on the Agenda

ZONING ORDINANCE TEXT AMENDMENT

5. PUBLIC HEARING – ZONING ORDINANCE TEXT AMENDMENT (File Number ZOTA 257) – Places of Worship

SPECIAL USE AND PRELIMINARY SITE PLAN APPROVAL

6. SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 2690 Crooks Road Apartments, East side of Crooks, South of Big Beaver (2690 Crooks), Section 28, Currently Zoned BB (Big Beaver) District.
7. PUBLIC HEARING - SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 911 & 999 W. Big Beaver Mixed Use Development, Southeast corner of Big Beaver and Crooks (PIN 88-20-28-101-032, -034 and -047), Section 28, Currently Zoned BB (Big Beaver) District.

OTHER ITEMS

8. ELECTION OF OFFICERS
9. PUBLIC COMMENT – For Items on the Agenda
10. PLANNING COMMISSION COMMENT
11. ADJOURN

NOTICE: People with disabilities needing accommodations for effective participation in this meeting should contact the City Clerk by e-mail at clerk@troymi.gov or by calling (248) 524-3317 at least two working days in advance of the meeting. An attempt will be made to make reasonable accommodations

Televised Live, Government Channel WTRY (10 WideOpenWest and 17 Comcast) Replayed Wednesdays 3:00 pm, 6:00 pm and 11:00 pm

Chair Lambert called the Regular meeting of the Troy City Planning Commission to order at 7:01 p.m. on December 13, 2022, in the Council Chamber of the Troy City Hall. Chair Lambert presented opening remarks relative to the role of the Planning Commission and procedure of tonight’s meeting.

1. ROLL CALL

Present:

- Toby Buechner
- Carlton M. Faison
- Tom Krent
- David Lambert
- Lakshmi Malalahalli
- Sadek Rahman
- John J. Tagle

Absent:

- Michael W. Hutson
- Marianna Perakis

Also Present:

- Ben Carlisle, Carlisle Wortman Associates
- Julie Quinlan Dufrane, Assistant City Attorney
- Kathy L. Czarnecki, Recording Secretary

2. APPROVAL OF AGENDA

Chair Lambert opened discussion on revising the agenda, as follows:

- Add 2023 Planning Commission Regular Meeting Dates.
- Applicant’s request to postpone Agenda item #5, Special Use Approval and Preliminary Site Plan Review for 2690 Crooks Road Apartments. Chair Lambert noted the Board is required to open the Public Hearing this evening.
- Consideration to address all and/or a limited number of items, and/or set a time limit on the meeting, and/or change the order of business items.

Resolution # PC-2022-12-059

Moved by: Malalahalli
 Support by: Rahman

RESOLVED, To revise the agenda as follows: 1) postpone Agenda item #5 to the January 10, 2023 meeting with exception to open the Public Hearing; 2) postpone Agenda item #9 to the January 10, 2023 meeting; and 3) add the 2023 Planning Commission Regular Meeting Dates at the end of the Agenda.

Yes: All present (7)
 Absent: Hutson, Perakis

MOTION CARRIED

3. APPROVAL OF MINUTES – October 25, 2022 and November 1, 2022

Resolution # PC-2022-12-060

Moved by: Krent
Support by: Tagle

RESOLVED, To approve the minutes of the October 25, 2022 Regular meeting as submitted.

Yes: All present (7)
Absent: Hutson, Perakis

MOTION CARRIED

Resolution # PC-2022-12-061

Moved by: Faison
Support by: Malalahalli

RESOLVED, To approve the minutes of the November 1, 2022 Special meeting as submitted.

Yes: All present (7)
Absent: Hutson, Perakis

MOTION CARRIED

4. PUBLIC COMMENT – For Items Not on the Agenda

There was no one present who wished to speak.

SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW

5. SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 2690 Crooks Road Apartments, East side of Crooks, South of Big Beaver (2690 Crooks), Section 28, Currently Zoned BB (Big Beaver) District

(Item postponed, refer to Resolution # PC-2022-12-059)

PUBLIC HEARING OPENED

There was no one present who wished to speak.

PUBLIC HEARING CLOSED

PRELIMINARY SITE PLAN REVIEWS

6. PRELIMINARY SITE PLAN REVIEW (File Number SP JPLN2022-0023) – Proposed 5920 Livernois Office Building, East side of Livernois, South of Square Lake (PIN 88-20-10-101-018), Section 10, Currently Zoned O (Office) District

Mr. Carlisle reviewed the Preliminary Site Plan application for 5920 Livernois Office Building. He addressed the proposed uses of the first and second stories, the required 50-foot residential setback, parking as relates to the first and second floor uses, applicant's request to waive the loading space requirement and consideration to allow required parking lot trees to be located outside of the parking lot.

In summary, Mr. Carlisle asked the Board to take into consideration in its discussion and deliberation:

- Condition approval that the second story shall remain storage for the first-floor use.
- Allowance of loading space waiver.
- Allowance for parking lot trees outside of parking lot.
- Architectural and material details.
- Compliance with Site Plan Standards set forth in Section 8.06.

Discussion among administration and Planning Commission:

- Parking calculations.
- Dedication of second story storage space as relates to first story office space.
- Building height and placement as relates to surrounding office and residential uses.
- Building entrance off Cutting; no requirement that entrance must front primary street.

Erion Nikolla addressed the flexible office arrangement as relates to small business owners, dedicated offices and assigned storage space. He indicated the maximum number of people on site at any given time is eight (8). He said at times off-site visitors for conference meetings might bring a total of (12) to fifteen (15) people. Mr. Nikolla addressed the building height in relation to the roof slope and placement of the building in relation to the required setback to residential.

There was discussion, some comments related to:

- Communication with adjacent residential.
- Setback requirements as relates to office and neighborhood node zoning classifications.
- Storage space sectioned off to accommodate file cabinets, shelving, paperwork, small equipment, etc.
- Management of office and storage space by an administrative scheduler.
- Twelve (12) offices and four (4) conference rooms on first floor.
- Screening of residential with six-foot arborvitaes.
- Confirmation of fourteen (14) parking spaces provided.
- Perspective of building placement with existing buildings/residential.
- Building entrances.

Chair Lambert opened the floor for public comment. Acknowledging there was no one present who wished to speak, Chair Lambert closed the floor for public comment.

Resolution # PC-2022-12-062

Moved by: Krent
 Seconded by: Rahman

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed office building located on the east side of Livernois, south of Square Lake (5920 Livernois), Section 10, within the O (Office) District, be granted, subject to the following:

1. The second story shall remain storage for the first-floor use and shall not be used for purposes that require parking.
2. The loading space is not required due to the proposed office use.
3. Allowance for parking lot trees outside of the parking lot.

Discussion on the motion on the floor.

In reply to questions on the parking lot, Mr. Carlisle clarified the layout of striped parking spaces and noted a section of pavement would not be striped for parking but used for turnarounds.

Vote on the motion on the floor.

Yes: All present (7)
 Absent: Hutson, Perakis

MOTION CARRIED

7. PRELIMINARY SITE PLAN REVIEW (File Number SP JPLN2022-0025) – Proposed Lange View Townhouses, Southeast corner of Livernois and Leetonia (4080 Livernois), Section 15, Currently Zoned NN Neighborhood Node (Node “H”) District

Mr. Carlisle said the proposed Lange View Townhomes application was last reviewed by the Planning Commission on May 24, 2022. He reviewed the discussion points at the May meeting and reported that the Planning Commission denied the application because it found the development did not meet the Zoning Ordinance requirements for transition.

Mr. Carlisle reviewed the revisions to the application since last reviewed and displayed comparisons between the May 2022 site plan and the Site Plan before the Board this evening. Mr. Carlisle addressed the changes to the application as identified on page 6 of his report dated November 22, 2022. He addressed concerns with the office site being overparked.

Mr. Carlisle asked the Planning Commission to take into consideration Section 5.06E Design Standards, Section 5.06E (3) Transitional Features and Section 8.06 Site Plan Review Standards, and the following items in its discussion and deliberation:

- Proposed transitional features as it relates to reducing height to two stories but adding an additional unit thus creating one singular massing along Leetonia.
- Proposed changes to architectural style.
- Relief of overall site parking.
- Relocation of parking lot light.

Discussion among administration and Planning Commission:

- Approval process of potential future development of southern parcel.
- No requirement in the Zoning Ordinance to break up massing of a building.
- Resolution of approval should address the required number of barrier-free and bicycle parking spaces.

Vince Pangle, owner of all three parcels, addressed the revisions to the Site Plan application, noticeably the reduction of building height to facilitate Planning Commission concerns.

There was discussion on:

- Architectural style of townhomes, building materials, massing of building.
- Screening of residential property to the east.
- Vision of potential future development of southern parcel.
- Relocation of parking lot light.
- Setback requirements.
- Alternatives to break up massing of building.

Chair Lambert opened the floor for public comment.

- Feiling Li, 58 Leetonia, addressed concerns with architectural style fitting in with the neighborhood, existing drainage and building placement so near Leetonia. She expressed her preference for a six-foot screening wall. Ms. Li thanked the applicant for being open and transparent about the development.
- Yijun Deng, 58 Leetonia, thanked the applicant for being open and communicating with them. He addressed concerns with the existing drainage and expressed his preference for a screening wall.

Chair Lambert closed the floor for public comment.

Mr. Carlisle addressed various setback zoning requirements as relates to different zoning districts.

Resolution # PC-2022-12-063

Moved by: Tagle

Seconded by: Krent

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed Lange View Townhouses, 9 units, located on the Southeast corner of Livernois and Leetonia (4080 Livernois), Section 15, Zoned

Neighborhood Node (Node “H”) District, be postponed, so that the applicant can return with the following:

1. A three-dimensional (3D) modeling to show the context of the building with the surrounding buildings.
2. Appropriate building materials showing what the applicant is proposing to use.
3. A revised design that would take away the flatness of the face, the long elevation of the building.
4. Show the screen wall that would be between the residential property to the east and the property in question.

Yes: All present (7)
 Absent: Hutson, Perakis

MOTION CARRIED

PLANNED UNIT DEVELOPMENTS

8. PLANNED UNIT DEVELOPMENT (File Number PUD 019 JPLN2022-0013) – Proposed Village of Troy PUD, South side of Long Lake, West of Rochester (Parcels 88-20-15-201-046 and 88-20-15-201-033), Section 15, Currently Zoned RT (One Family Attached Residential), R-1C (One Family Residential) and CB (Community Business) District

Mr. Tagle disclosed his firm is currently working with Robertson Brothers Homes on a project that has no association with the project before the Board this evening. He assured Board members that he can act upon the project in an unbiased way.

Board members agreed there is no reason for Mr. Tagle to recuse himself.

Mr. Carlisle said the Village of Troy Planned Unit Development (PUD) application has been before the Board multiple times for review. Mr. Carlisle reviewed discussion points during the September 13, 2022 meeting and changes to the application since last reviewed by the Planning Commission. Mr. Carlisle displayed comparisons between the September 2022 site plan and the Site Plan before the Board this evening.

In summary, Mr. Carlisle said as part of the deliberation the Planning Commission should consider:

- Has the applicant sufficiently redesigned/improved plan to address comments from the Planning Commission and public?
- Has the applicant met the site plan standards?
- Has the applicant met the PUD standards?
- Has the applicant presented a project where the benefits are commensurate with requested deviations?

Tim Loughrin and Darian Neubecker of Robertson Brothers Homes were present.

Some items Mr. Loughrin addressed in a PowerPoint presentation were:

- Various revisions to the plan.
- Project renderings/drawings from different perspectives.
- Village concept, project summary, highlights, product design, housing options and pedestrian conveyance.

There was discussion, some comments related to:

- Redesign of southwest corner to offer a year-round amenity.
- Development phases/ stages.
- Establishment of Master Homeowners Association (HOA).
- Homebuyers' preferences would determine number of ranch style homes.
- Architecture, exterior building materials; consideration to adding elements to flat area.
- Energy efficiency resources; electric vehicle charging stations.
- Long Lake and Rochester Road entrances.

Mr. Neubecker of Robertson Brothers addressed energy efficiency resources proposed for the development.

Mr. Neubecker stated that development phases have not yet clearly been defined. He indicated single family homes, amenities and the regional detention pond would be most likely the first phase and the townhomes would be the second phase.

Ms. Dufrane addressed the draft PUD Agreement. She asked the applicant to flush out the development phases prior to the City Council presentation and indicated there would be forthcoming changes relating to the regional detention pond.

Chair Lambert opened the floor for public comment. Acknowledging there was no one present who wished to speak, Chair Lambert closed the floor for public comment.

City Traffic Consultant Stephen Dearing of OHM addressed:

- Rochester Road entrance in relation to imminent road widening and expansion.
- Long Lake entrance as relates to vehicular turning lanes.
- Neighborhood safety issues associated with the plan layout.
- Fire Department approval for no T-turnarounds in multi-family townhome aisles.
- Dimensions of proposed curb radii.

Resolution # PC-2022-12-064

Moved by: Faison

Seconded by: Krent

WHEREAS, The applicant Robertson Brothers Homes seeks Conceptual Development Plan (CDP) and Preliminary Development Plan (PDP) approval for the Village of Troy Planned Unit Development (PUD), located on the south side of Long Lake, west of Rochester, in Section 15, approximately 20.48 acres in area; and

WHEREAS, The Village of Troy PUD features 20 detached single-family homes, 56 attached single-family homes (2 stories) and 70 attached townhomes (3 stories); and

WHEREAS, The PUD provides a walkable urban environment that is compact, designed to human scale, and exhibits contextual integration of buildings and city spaces; and

WHEREAS, The PUD provides a compatible mix of open space, landscaped areas and pedestrian amenities, including incorporation of a regional railway system; and

WHEREAS, The PUD proposes appropriate land use transitions between the PUD and surrounding properties, and

WHEREAS, The PUD will reasonably mitigate impacts to the transportation system and enhance non-motorized facilities and amenities; and

WHEREAS, The PUD provides a complementary variety of housing types; and

BE IT RESOLVED, That the Planning Commission recommends to City Council that Concept Development Plan Approval and Preliminary Development Plan Approval for the proposed Village of Troy, be granted.

Discussion on the motion on the floor.

Comments related to whether the Resolution should reference development phases and Fire Department approval for no T-turnarounds in multi-family aisles.

Chair Lambert thanked the applicant for working with the Planning Commission and City staff.

Vote on the motion on the floor.

Yes: All present (7)
Absent: Hutson, Perakis

MOTION CARRIED

- 9. POTENTIAL PLANNED UNIT DEVELOPMENT (PUD) APPLICATION – Concept Plan Discussion, East of Livernois, North of Square Lake (PIN 88-20-03-301-088, 88-20-03-301-025, -024, -023), Section 35, Currently Zoned Neighborhood Node (Node “Q”) and R-1B (One Family Residential) Districts

(Item postponed, refer to Resolution # PC-2022-12-059)

OTHER ITEMS

- 10. 2023 CALENDAR DATES

Resolution # PC-2022-12-065

Moved by: Buechner
Seconded by: Faison

RESOLVED, To approve the 2023 calendar dates as submitted.

Yes: All present (7)
Absent: Hutson, Perakis

MOTION CARRIED

11. PUBLIC COMMENT – For Items on the Agenda

Tyler Fox, 1623 Milverton, recently appointed by the City Council to the Planning Commission, said he was looking forward to working with the Planning Commission.

12. PLANNING COMMISSION COMMENT

Board members graciously thanked Mr. Rahman for his service to the Board and wished him well.

Mr. Rahman thanked the entire staff for their support.

Board members welcomed Mr. Fox to the Planning Commission.

Happy holidays were wished by one and to all.

13. ADJOURN

The Regular meeting of the Planning Commission adjourned at 9:23 p.m.

Respectfully submitted,

David Lambert, Chair

Kathy L. Czarnecki, Recording Secretary

ITEM #5

DATE: January 4, 2023
TO: Planning Commission
FROM: R. Brent Savidant, Community Development Director
SUBJECT: PUBLIC HEARING – ZONING ORDINANCE TEXT AMENDMENT (File Number ZOTA 257) – Places of Worship

The attached draft zoning ordinance text amendments are related to the regulation of places of worship in the City of Troy. The attached memo explains the proposed revisions.

A public hearing has been scheduled for the January 10, 2023 Planning Commission meeting.

Attachments:

1. Memo, prepared by Carlisle/Wortman Associates, Inc., dated December 27, 2022.
2. Planning Commission Public Hearing Draft ZOTA 257.

PROPOSED RESOLUTION

PUBLIC HEARING – ZONING ORDINANCE TEXT AMENDMENT (File Number ZOTA 257)
– Places of Worship

Resolution # PC-2023-01-

Moved by:

Seconded by:

RESOLVED, That the Planning Commission hereby recommends to the City Council that Article 5 of Chapter 39 of the Code of the City of Troy, which includes provisions related to places of worship, be amended as printed on the proposed Zoning Ordinance Text Amendment.

Yes:

No:

Absent:

MOTION CARRIED / DENIED

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Carlisle | Wortman
ASSOCIATES, INC.

117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

To: Troy Planning Commission
Brent Savidant, AICP

From: Ben Carlisle, AICP

Date: December 27, 2022

RE: Places of Worship

The City has recently resolved the remaining issues with the Department of Justice and settled its case with ADAM Community Center that involved the Religious Land Use and Institutionalized Persons Act (RLUIPA). RLUIPA protects individuals, houses of worship, and other religious institutions from discrimination in zoning and land regulations. RLUIPA prohibits zoning and land regulations that substantially burden the religious exercise of churches or other religious assemblies or institutions absent the least restrictive means of furthering a compelling governmental interest. RLUIPA is not a blanket exemption from zoning laws. However, RLUIPA prohibits a local government from applying zoning laws or regulations in a way that:

- a. Substantially burdens religious exercise without a compelling justification pursued through the least restrictive means;
- b. Treats religious uses less favorably than nonreligious assemblies and institutions;
- c. Discriminates based on religion or religious denomination; or
- d. Totally or unreasonably restricts religious uses in the local jurisdiction.

With regards to land use regulations, the most common RLUIPA violation is placing land use regulations on religious institutions that do not apply to similar nonreligious places of assembly and institutions. Nonreligious assemblies and institutions in the City Zoning Ordinance include libraries, theaters, assembly halls, concert halls, halls for private clubs, recreational clubs and centers, fraternal order halls, lodge halls, civic organizations, unions and membership halls, schools, and government buildings.

We took a comprehensive view of the Zoning Ordinance and recommend specific zoning amendments. For this memo, each proposed amendment has three parts: A) the ordinance section number, page number, and existing ordinance language; B) details outlining the proposed text amendment and explanation as to why the amendment is warranted; and C) proposed amended language. Removed text is ~~struck through~~ and proposed new text is **red** and underlined

Amendments:

1. **A. Section 4.21: Schedule of Use Regulations:** Currently, the Schedule of Use table requires that places of worship are a Special Use in the Community Facility District. Similar nonreligious assembly uses such as primary / secondary schools, fine and performing arts Facilities, post-secondary schools are permitted uses.

B. Issue: Treating religious uses less favorably than nonreligious assemblies and institutions by requiring them to obtain a Special Use could be subject to challenge under RLUIPA. By making places of worship a permitted use in the Community Facility District treats the use in a similar manner to other assembly uses.

C. Proposed Amendment:

Make places of worship a “permitted use” in the Community Facility District.

Uses	R-1	RT	MF	UR	MHP	CF	EP	CB	GB	IB	O	OM	RC	PV	P
Places of Worship	S	S	S	S	S	S P	NP	P	P	P	P	P	P	NP	NP
Primary / Secondary Schools	S	S	S	S	S	P	NP	P	P	P	P	P	P	NP	NP
Fine and Performing Arts Facilities	NP	NP	NP	NP	NP	P	NP	P	P	P	NP	S	NP	NP	NP
Post Secondary Schools	NP	NP	NP	NP	NP	P	NP	P	P	P	P	P	P	NP	NP
Health Fitness Center	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	A	NP	NP	NP
Indoor Commercial Recreation	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	NP	NP	NP	NP
Private Clubs, Fraternal Organization, and Lodge Halls	NP	NP	NP	NP	NP	S	NP	S	S	P	S	S	NP	NP	NP
Theaters and Places of Assembly	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	S	S	NP	NP

2. **A. Section 6.21: Places of Worship:** Section 6.21 establish specific use standards for Places of Worship. Standards include access, setback, and parking location requirements.

B. Issue: There are specific use standards that are applied to places of worship that are not applied to similar assembly uses.

- Specific use standards for a place of worship require that *facilities incidental to the main religious sanctuary must be used for church, worship, or religious education purposes, in a manner which is consistent with residential zoning and compatible with adjacent residential property.* This requirement does not apply to other similar assembly uses. Furthermore, the requirement that the

incidental facilities are used in a manner “which is consistent with residential zoning and compatible with adjacent residential property” may be deemed subjective and difficult to quantify.

- A place of worship is required to meet a 50-foot setback along all property lines. This requirement does not apply to other similar assembly uses. Furthermore, people today are worshiping in different ways and in different locations than previously. Traditional places of worship were often large free-standing buildings on larger lots, where the 50-foot setback was easy to meet. Modern places of worship are done in smaller spaces, in office parks, commercial strip centers, and other retrofit locations. The 50-foot setback provision severely restricts these non-traditional worship locations and reuse and retrofitting of existing buildings cannot often meet the 50-foot setback.
- Parking is not allowed between a place of worship building and a street, and in any yard adjacent to residential. Again, this requirement does not apply to other similar assembly uses. Furthermore, these parking restrictions for places of worship severely restrict non-traditional worship locations. We suggest replacing this language by allowing parking in front, side, and rear yards with a required 20-foot landscaped setback. This language is consistent with parking requirements for similar uses.
- A place of worship must have frontage and access to a major or minor arterial. This standard is consistent with similar assembly uses such as schools. However, there may be instances where a place of worship is able to locate on a non-arterial street and such use can mitigate negative impacts such as traffic, noise, and hours of operation. We suggest adding language that allows the Planning Commission the ability waive this requirement as part of the site plan review process.

Outlined below are proposed amendments to ensure consistency of regulations with other like assembly uses.

C. Proposed Amendment:

SECTION 6.21 PLACES OF WORSHIP

- A. All religious activities shall take place in a fully enclosed building except as may be approved by the City.
- B. ~~Facilities incidental to the main religious sanctuary must be used for church, worship, or religious education purposes, in a manner which is consistent with residential zoning and compatible with adjacent residential property.~~ Associated uses on the site such as recreation centers, retreat facilities, conference centers, schools, convents, and others shall meet all requirements of this Ordinance for such uses.
- C. The site shall have frontage on and primary access to a major or minor arterial. In residential districts, this requirement may be waived by the Planning Commission if the applicant is able to demonstrate that impacts such as but not

limited to traffic, parking, noise, and hours of operations, do not negatively impact adjacent properties.

1. Parking is permitted in front, side, and rear yards provided there is compliance with the landscape requirements of Section 13.02.
 2. Traffic from events, including church worship services and other large assemblies, shall be controlled so as not to create congestion or unreasonable delays on the public street.
- D. Buildings of greater than the maximum height allowed in the District in which a place of worship is located, may be allowed provided that the front, side and rear yards are increased one (1) foot for each foot of building height which exceeds the maximum height allowed.
- E. ~~Front, side and rear yard setbacks shall be a minimum of fifty (50) feet.~~
- F. ~~Parking shall not be permitted in the required yards adjacent to any public street or adjacent to any land zoned for residential purposes, other than that which is developed or committed for uses other than the construction of residential dwellings.~~

I look forward to discussing this memo at your upcoming meeting.



CARLISLE/WORTMAN ASSOC., INC.
Benjamin R. Carlisle, LEED AP, AICP

PLANNING COMMISSION PUBLIC HEARING DRAFT
CITY OF TROY
AN ORDINANCE TO AMEND
CHAPTER 39 OF THE CODE
OF THE CITY OF TROY

The City of Troy ordains:

Section 1. Short Title

This Ordinance shall be known and may be cited as an amendment to Chapter 39, Zoning Ordinance, of the Code of the City of Troy.

Section 2. Amendments

Chapter 39 of the Code of the City of Troy is amended as follows:

Amend Section 4.21 Schedule of Regulations to read as follows: (Underlining and Strikeout Denotes Changes)

Uses	R-1	RT	MF	UR	MHP	CF	EP	CB	GB	IB	O	OM	RC	PV	P
Places of Worship	S	S	S	S	S	<u>S</u> P	NP	P	P	P	P	P	P	NP	NP
Primary / Secondary Schools	S	S	S	S	S	P	NP	P	P	P	P	P	P	NP	NP
Fine and Performing Arts Facilities	NP	NP	NP	NP	NP	P	NP	P	P	P	NP	S	NP	NP	NP
Post Secondary Schools	NP	NP	NP	NP	NP	P	NP	P	P	P	P	P	P	NP	NP
Health Fitness Center	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	A	NP	NP	NP
Indoor Commercial Recreation	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	NP	NP	NP	NP
Private Clubs, Fraternal Organization, and Lodge Halls	NP	NP	NP	NP	NP	S	NP	S	S	P	S	S	NP	NP	NP
Theaters and Places of Assembly	NP	NP	NP	NP	NP	NP	NP	P	P	P	NP	S	S	NP	NP

Amend Section 6.21 to read as follows: (Underlining and Strikeout Denotes Changes)

SECTION 6.21 PLACES OF WORSHIP

- A. All religious activities shall take place in a fully enclosed building except as may be approved by the City.
- B. ~~Facilities incidental to the main religious sanctuary must be used for church, worship, or religious education purposes, in a manner which is consistent with residential zoning and~~

~~compatible with adjacent residential property.~~ Associated uses on the site such as recreation centers, retreat facilities, conference centers, schools, convents, and others shall meet all requirements of this Ordinance for such uses.

- C. The site shall have frontage on and primary access to a major or minor arterial. In residential districts, this requirement may be waived by the Planning Commission if the applicant is able to demonstrate that impacts such as but not limited to traffic, parking, noise, and hours of operations, do not negatively impact adjacent properties.
1. Parking is permitted in front, side, and rear yards provided there is compliance with the landscape requirements of Section 13.02.
 2. Traffic from events, including church worship services and other large assemblies, shall be controlled so as not to create congestion or unreasonable delays on the public street.
- D. Buildings of greater than the maximum height allowed in the District in which a place of worship is located, may be allowed provided that the front, side and rear yards are increased one (1) foot for each foot of building height which exceeds the maximum height allowed.
- E. ~~Front, side and rear yard setbacks shall be a minimum of fifty (50) feet.~~
- F. ~~Parking shall not be permitted in the required yards adjacent to any public street or adjacent to any land zoned for residential purposes, other than that which is developed or committed for uses other than the construction of residential dwellings.~~

Section 3. Repeal

All ordinances or parts of ordinances in conflict herewith are hereby repealed only to the extent necessary to give this ordinance full force and effect.

Section 4. Savings

All proceedings pending, and all rights and liabilities existing, acquired or incurred, at the time this Ordinance takes effect, are hereby saved. Such proceedings may be consummated under and according to the ordinance in force at the time such proceedings were commenced. This ordinance shall not be construed to alter, affect, or abate any pending prosecution, or prevent prosecution hereafter instituted under any ordinance specifically or impliedly repealed or amended by this ordinance adopting this penal regulation, for offenses committed prior to the effective date of this ordinance; and new prosecutions may be instituted and all prosecutions pending at the effective date of this ordinance may be continued, for offenses committed prior to the effective date of this ordinance, under and in accordance with the provisions of any ordinance in force at the time of the commission of such offense.

Section 5. Severability Clause

Should any word, phrase, sentence, paragraph or section of this Ordinance be held invalid or unconstitutional, the remaining provisions of this ordinance shall remain in full force and effect, and any such ruling shall not affect any other provisions of this Ordinance not specifically included in such ruling.

Section 6. Effective Date

This Ordinance shall become effective ten (10) days from the date hereof or upon publication, whichever shall later occur.

This Ordinance is enacted by the Council of the City of Troy, Oakland County, Michigan, at a Regular Meeting of the City Council held at City Hall, 500 W. Big Beaver, Troy, MI, on the _____ day of _____, _____.

Ethan Baker, Mayor

M. Aileen Dickson, CMC, City Clerk

ITEM #6

DATE: January 5, 2023

TO: Planning Commission

FROM: R. Brent Savidant, Community Development Director

SUBJECT: SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 2690 Crooks Road Apartments, East side of Crooks, South of Big Beaver (2690 Crooks), Section 28, Currently Zoned BB (Big Beaver) District.

The petitioner Tower Construction, LLC submitted the above referenced Special Use Approval and Preliminary Site Plan Approval application to convert an existing 4-story office building into 62 residential units and construct a new 5-story, 94-unit multiple-family residential building on the parcel.

This item was originally on the agenda of the December 13, 2022 Planning Commission Regular meeting but postponed to the January 10, 2023 agenda. The public hearing was opened and closed. No one spoke.

The attached report prepared by Carlisle/Wortman Associates, Inc. (CWA), the City's Planning Consultant, summarizes the application. CWA prepared the report with input from various City departments including Planning, Engineering, Public Works and Fire. City Management supports the findings of fact contained in the report and recommends approval of the project, as noted.

Attachments:

1. Maps
2. Report prepared by Carlisle/Wortman Associates, Inc.
3. Traffic/parking study, prepared by ROWE, dated February 21, 2022.
4. OHM traffic/parking memo, dated November 29, 2022.
5. RCOC memo, dated November 8, 2022.

G:\SPECIAL USE\SU JPLN2022-0004 2690 CROOKS\PC Memo 01 10 2023.docx

PROPOSED RESOLUTION

SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 2690 Crooks Road Apartments, East side of Crooks, South of Big Beaver (2690 Crooks), Section 28, Currently Zoned BB (Big Beaver) District.

Resolution # PC-2023-01-

Moved by:

Seconded by:

RESOLVED, The Planning Commission hereby approves a reduction in the total number of required parking spaces for the proposed 2690 Crooks Road residential development to 221 when a total of 312 spaces are required on the site based on the off-street parking space requirements for multi-family residential. This 91-space reduction is sufficient to meet parking demands based on shared parking provided on the abutting site to the north; and,

RESOLVED, That Special Use Approval and Preliminary Site Plan Approval for the proposed 2690 Crooks Road Apartments, east side of Crooks, south of Big Beaver (2690 Crooks), Section 28, Currently Zoned BB (Big Beaver) District, be (granted, subject to the following conditions)

1. Increase drive-aisle width to at least 26-feet.
2. Improve pedestrian circulation based on OHMs comments.
3. Confirm existing screening of trash enclosure.
4. Confirm building lighting.
5. Verify unit numbers.
6. Provide a shared parking agreement to the satisfaction of the City Attorney prior to Final Site Plan Approval.
7. Provide transparency calculations.

_____) or

(denied, for the following reasons: _____) or

(postponed, for the following reasons: _____)

Yes:

No:

Absent:

MOTION CARRIED / FAILED



Carlisle | Wortman
ASSOCIATES, INC.

117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

Date: June 23, 2022
January 4, 2022

Preliminary Site Plan and Special Use Review For City of Troy, Michigan

Applicant: Jordan Jonna

Project Name: 2690 Crooks Road Multiple Family Residential

Location: 2690 Crooks Road

Plan Date: October 11, 2022

Zoning: BB, Big Beaver

Action Requested: Preliminary Site Plan and Special Use

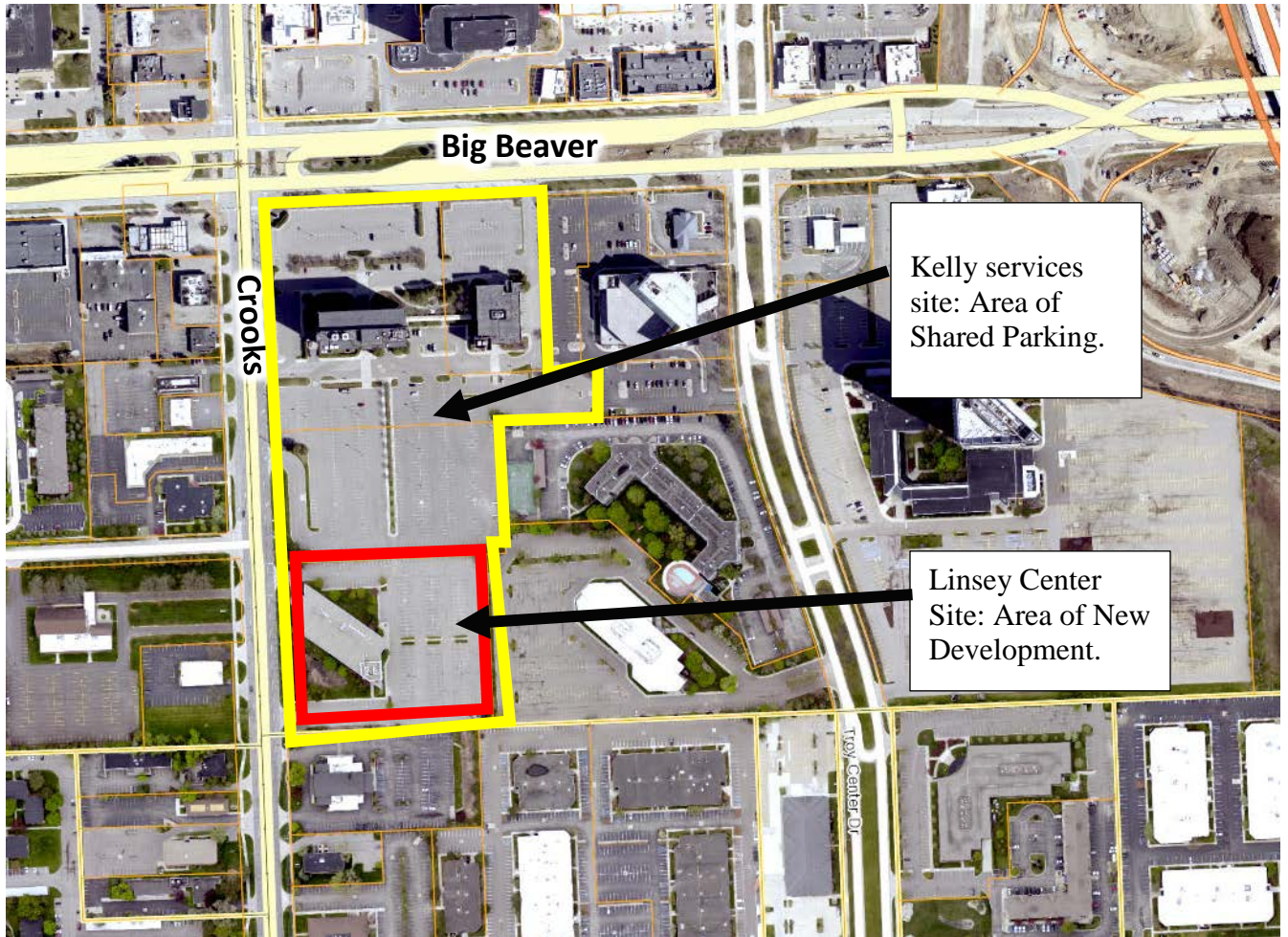
SITE DESCRIPTION

An application has been submitted to repurpose the existing 4-story building on site (Lindsey Center) to create 62 units and construct a new five-story 94-unit multiple-family residential building at 2960 Crooks Road. The applicant's civil plans note 151 units but based on the submitted floor plans we count a total of 156 units. We used 156 units for parking calculations. The applicant should verify unit numbers. The new building is located to the east (rear) of the existing four-story building. The area of the newly proposed five-story building is currently a parking lot.

Access will remain as is with two points of access off Crooks Road with cross-access to the north and east. The applicant is proposing shared parking for both buildings at 2690 Crooks with the Kelly Services site (north of proposed building).

The portion of the first floor that faces Crooks Road will include general amenity uses such as a pool and community center. The portion of the first floor that does not front Crooks is used for residential uses. Residential uses on the first floor, not fronting on a public right-of-way, requires a Special Use permit.

Site Location:



Detailed Location:



Proposed Uses of Subject Parcel:

Existing building to be converted to 62 multi-family units and new building to include 94 multi-family dwelling units.

Current Zoning:

The property is currently zoned BB, Big Beaver Form Based District

Surrounding Property Details:

Direction	Zoning	Use
North	BB, Big Beaver	Office Parking
South	O, Office	Funeral Home
East	O, Office	Office
West	O, Office and R1-C, One Family Residential	Office and Place of Worship

REZONING AND ZONING TEXT AMENDMENT

In the summer of 2021, 2690 Crooks was rezoned, in part, to allow for the conversion of the existing four-story building to be converted from office to residential. The previous zoning of O, Office did not permit residential uses. Please see our May 5, 2021 review memo for more information.

In the fall of 2021, a text amendment was adopted which permitted residential uses on the first floor as a Special Use for the section of the building that does not front on a public right-of-way.

NATURAL FEATURES

The site has been graded and improved for an office building and an associated parking lot.

Items to be addressed: None.

SITE ARRANGEMENT

The new five-story building will be placed to the east (rear) of the existing four-story Lindsey Center building lot. Access to the site will be via one point of access on Crooks, and cross access to the site to the north and east. There is a row of shared parking between the existing and new building.

Access and circulation have been reviewed by the City Fire Marshall who notes that they need the drive aisles around the buildings to be at least 26-feet in width.

In addition, OHM has reviewed site circulation and notes a number of comments. The applicant should review and revised based on OHMs comments.

Items to be addressed: 1). Increase drive-aisle width to at least 26-feet; and 2). Review and revise pedestrian circulation based on OHMs comments.

AREA, WIDTH, HEIGHT, SETBACKS

The applicant does not propose any changes to the footprint of the existing building. The new building is being reviewed as Building Form D as set forth in Table 5.03.B.3:

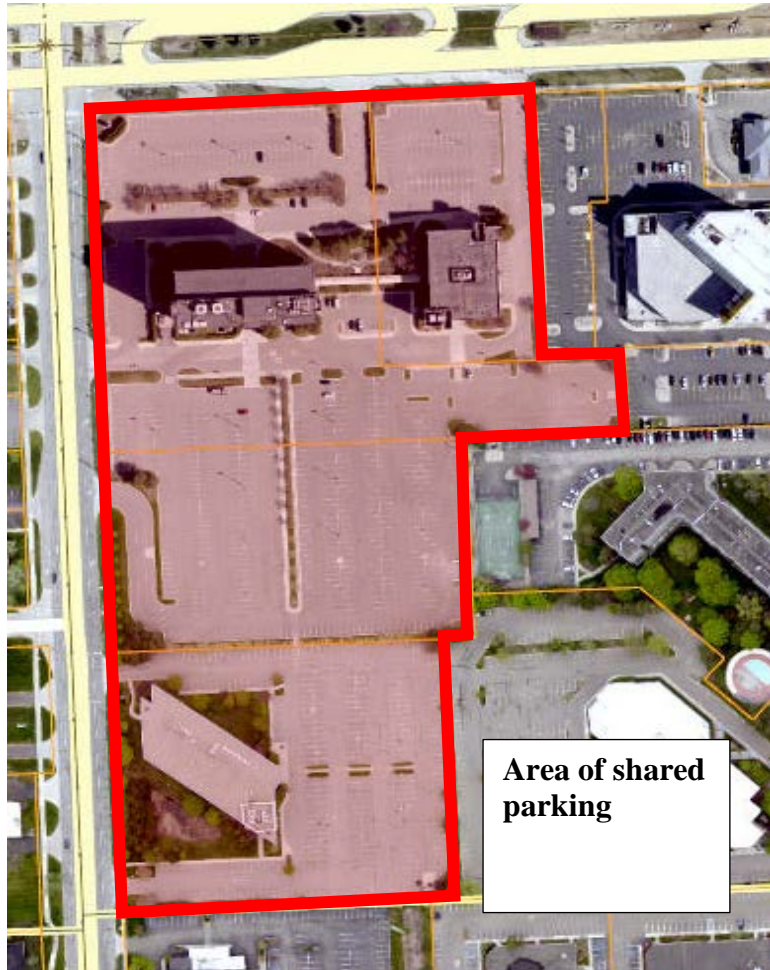
	Required	Provided	Compliance
Front (Crooks)	10-foot build-to-line	Over 10 feet	Complies as Lindsey Center is legal non-conforming and new building is placed behind existing building
Side (north)	N/A, building may be placed up to property line	47.9-feet	Complies
Side (south)	N/A, building may be placed up to property line	57.9-feet	Complies
Rear (South)	30-foot minimum setback	54.4-feet	Complies
Building Height	6 stories, 66 feet	5 stories, 60 feet	Complies
Lot Coverage (Building, overall site)	30%	24.1	Complies
Parking Location	Cannot be located in front yard	Parking lots not in front yard	Complies

The applicant is proposing a pedestrian connection between the exiting Lindsey Center building and the new apartment complex.

Items to be addressed: None

PARKING

The applicant proposes to share parking for both buildings with the Kelly service buildings and parking areas.



The applicant is proposing shared parking to include both sites as noted. As set forth in Section 13.06, off-street parking for uses in all districts shall be on the same lot as the use or building served by the parking, unless joint parking with abutting properties and uses is provided in a form acceptable to the City Attorney and executed and recorded by the parties sharing the parking.

OHM has reviewed the shared parking. Please review our 911 and 999 Big Beaver (Kelly Services) regarding shared parking details. OHM plans on attending the Planning Commission meeting to discuss shared parking.

Items to be Addressed: Review OHM's memo regarding shared parking.

TRAFFIC

The applicant submitted a traffic study that was reviewed by both OHM and the Oakland County Road Commission. Please see OHMs and Road Commission review for comments.

Items to be addressed: None

LANDSCAPING

A landscaping plan has been provided on Sheet L101. The following table discusses the development’s compliance with the landscape requirements set forth in Section 13.02.

	Required:	Provided:	Compliance:
Greenbelt Planting			
Crooks: 1 tree every 30 feet	369 / 30 = 13 trees	+14 trees	Complies
Parking Lot Landscaping			
1 tree per every 8 parking spaces	221 spaces / 8 = 28 trees	3 in parking lot and 25 on perimeter	Complies, with Planning Commission approval
Overall			
<u>Site landscaping:</u> A minimum of twenty percent (20%) of the site area shall be comprised of landscape material. Up to twenty-five percent (25%) of the required landscape area may be brick, stone, pavers, or other public plaza elements, but shall not include any parking area or required sidewalks.	20%	Applicant notes 29%	Complies

The applicant is required to provide 28 parking lot trees. Three (3) of the required 28 are in parking lot and 25 are along perimeter of parking lot. Planning Commission may allow alternative location of parking lot trees.

Transformer / Trash Enclosure:

The applicant has indicated they propose to reuse the existing trash enclosure. Applicant shall confirm existing screening of the trash enclosure.

Items to be Addressed: 1). Planning Commission to discuss parking lot tree location; and 2). Confirm existing screening of trash enclosure.

PHOTOMETRICS

The applicant is proposing thirteen (13) parking lot lights. The lighting fixture and photometrics meet ordinance requirements.

The applicant did not indicate any building lighting.

Items to be Addressed: Confirm building lighting.

FLOOR PLAN AND ELEVATIONS

Existing Lindsey Building:

The applicant proposes the following:

1. Existing metal panel and glass to remain
2. New metal wrap and balconies to be added to exterior skin
3. Exterior metal and glass to be removed for new balcony doors and windows
4. Other elements of current façade to remain.

The proposed color scheme is dark and light greys, and orange accents.

New Building:

Floor plans and elevations have been provided on sheets A.201. The first three floors are utility brick of different grey colors and the fourth and fifth floors are hardie panel siding. The elevations provided show architectural details, variations in material and pattern (brick, hardie panel siding) as well as general color scheme of dark and light greys, and orange accents.

The east, south and north elevations do not appear to meet the 30% transparency requirement.

The applicant has provided a rendering of the buildings; however, it would be helpful if the applicant was able to show a 3-D model of the buildings in context to the site and to each other.

Items to be Addressed: Confirm transparency for east, south, and north side elevation of new building; and 2). Provide 3-D model.

DESIGN STANDARDS AND SITE PLAN REVIEW STANDARDS

The Big Beaver Node design standards as well as Site Plan review standards provide the Planning Commission with direction when reviewing the proposed site plan and design features of this development.

Section 5.04.E. outlines Design Standards:

1. *Building Orientation and Entrance*
2. *Ground Story Activation*
3. *Transitional Features*
4. *Site Access, Parking, and Loading*

Please see Section 5.04.E for standard details.

Section 8.06 outlines Site Plan Review Design Standards.

1. *Development shall ensure compatibility to existing commercial districts and provide a transition between land uses.*
 - a. *Building design shall enhance the character of the surrounding area in relation to building and parking placement, landscape and streetscape features, and architectural design.*
 - b. *Street fronts shall provide a variety of architectural expression that is appropriate in its context and prevents monotony.*
 - c. *Building design shall achieve a compatible transition between areas with different height, massing, scale, and architectural style.*
2. *Development shall incorporate the recognized best architectural building design practices.*
 - a. *Foster a lasting impact on the community through the provision of high quality design, construction, and detailing.*
 - b. *Provide high quality, durable materials, such as but not limited to stone, brick, glass, and metal. E.I.F.S. or material equivalent shall only be used as an accent material.*
 - c. *Develop buildings with creativity that includes balanced compositions and forms.*
 - d. *Design roofs that are appropriate to the architectural style of the building and create an appropriate visual exterior mass of the building given the context of the site.*
 - e. *For commercial buildings, incorporate clearly defined, highly visible customer entrances using features such as canopies, porticos, arcades, arches, wing walls, ground plane elements, and/or landscape planters.*
 - f. *Include community amenities that add value to the development such as patio/seating areas, water features, art work or sculpture, clock towers, pedestrian plazas with park benches or other features located in areas accessible to the public.*
3. *Enhance the character, environment and safety for pedestrians and motorists.*
 - a. *Provide elements that define the street and the pedestrian realm.*
 - b. *Create a connection between the public right of way and ground floor activities.*
 - c. *Create a safe environment by employing design features to reduce vehicular and pedestrian conflict, while not sacrificing design excellence.*

- d. *Enhance the pedestrian realm by framing the sidewalk area with trees, awnings, and other features.*
- e. *Improve safety for pedestrians through site design measures.*

SPECIAL USE STANDARDS

For any special use, according to Section 9.02.D, the Planning Commission shall “...review the request, supplementary materials either in support or opposition thereto, as well as the Planning Department’s report, at a Public Hearing established for that purpose, and shall either grant or deny the request, table action on the request, or grant the request subject to specific conditions.”

Section 9.03 states that before approving any requests for Special Use Approval, the Planning Commission shall consider:

1. *Compatibility with Adjacent Uses.*
2. *Compatibility with the Master Plan.*
3. *Traffic Impact.*
4. *Impact on Public Services.*
5. *Compliance with Zoning Ordinance Standards.*
6. *Impact on the Overall Environment.*
7. *Special Use Approval Specific Requirements.*

SUMMARY

As part of the deliberation, the Planning Commission and applicant shall discuss:

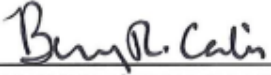
- a. Compliance with Section 5.04.E Big Beaver Design Standards
- b. Compliance with Section 8.06 Site Plan Review Standards
- c. Compliance with 9.02.D Special Use Standards
- d. Architecture and material use:
 - a. Transparency for east, north, and south elevation on new building
 - b. Consideration of a 3-D model of the buildings in context to the site and to each other
- e. Parking lot tree location
- f. Shared parking

If Planning Commission approves preliminary site plan the following conditions shall as part of final site plan submittal:

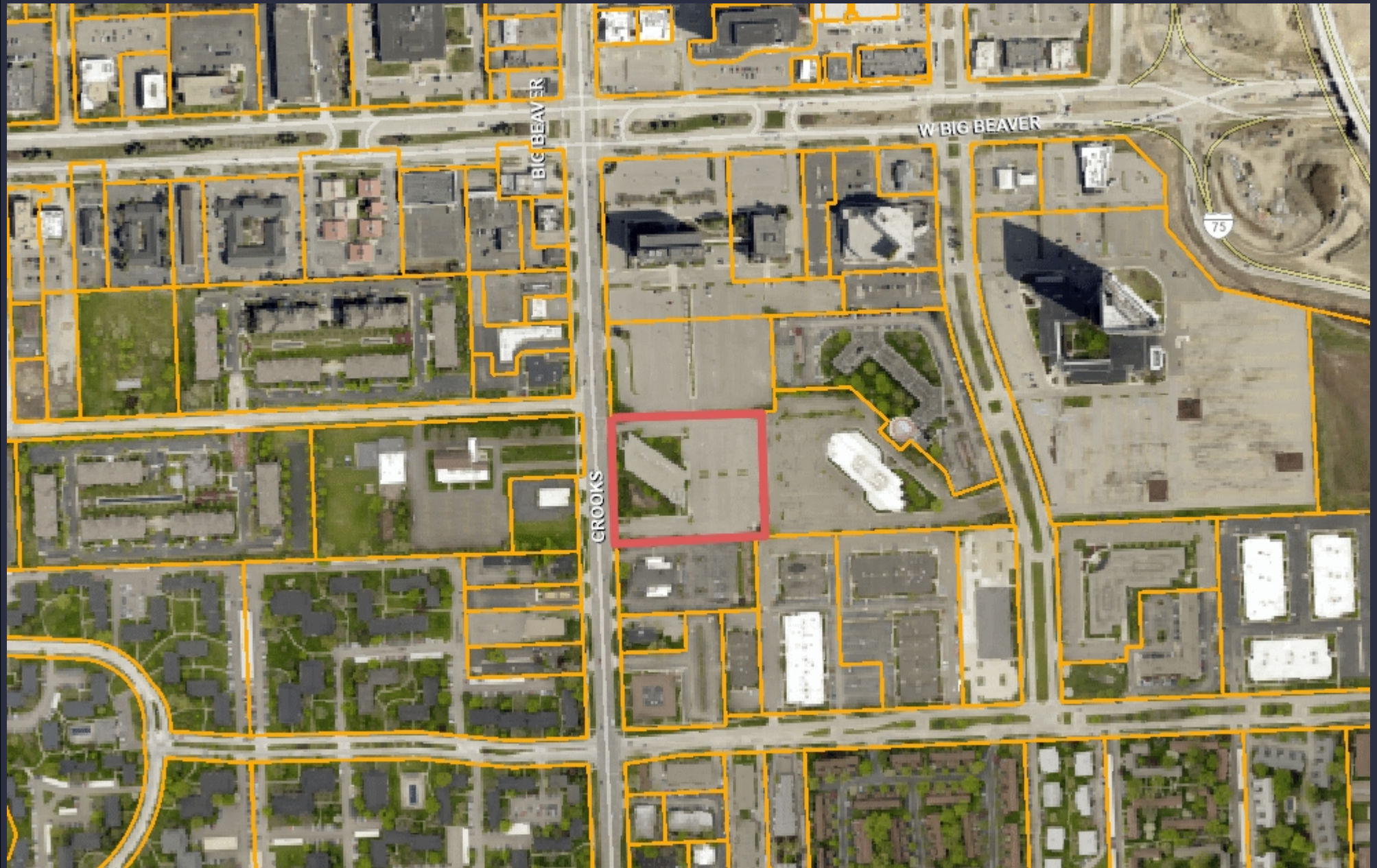
1. Increase drive-aisle width to at least 26-feet.
2. Improve pedestrian circulation based on OHMs comments.
3. Confirm existing screening of trash enclosure.
4. Confirm building lighting.
5. Verify unit numbers.
6. Provide a shared parking agreement to the satisfaction of the City Attorney.
7. Provide transparency calculations.

2690 Crooks Road
January 4, 2023

Sincerely,



CARLISLE/WORTMAN ASSOC., INC.
Benjamin R. Carlisle, LEED AP, AICP



Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.



February 21, 2022

Mr. Jason Gekiere
Tower Construction
2093 Orchard Lake Road
Sylvan Lake, MI 48230

RE: Trip Generation Comparison and Shared Parking Analysis for 999 and 991 W. Big Beaver Road and 2690 Crooks Road in Troy, MI

Dear Mr. Gekiere:

Pursuant to your request, ROWE Professional Services Company has completed a trip generation comparison and shared parking analysis for the proposed redevelopment of 999 and 991 W. Big Beaver Road and 2690 Crooks Road in Troy, MI. This analysis is intended to give you, the Road Commission for Oakland County (RCOC) and the City of Troy information regarding the difference in trip generation when comparing the existing site to the proposed site plan traffic forecasts and shared parking analysis for the development.

Trip Generation Comparison for 2690 Crooks Road

Through information you have provided, as well as our review of the materials received via email, we understand the following regarding your proposed project:

- Existing Site:
 - 4-story General Office building with 21,878 square foot (SF) footprint (87,512 SF total area)
- Proposed Site Plan:
 - 5-story Multifamily building with 90 units (Multifamily Housing [Mid-Rise]) – new construction to the east of the existing building
 - 4-story Multifamily building with 61 units (Multifamily Housing [Mid-Rise]) – existing building

Using the information and methodologies specified in the latest version of Trip Generation (Trip Generation Manual, 11th Edition, 2021), ROWE forecast the weekday AM and PM peak hour trips associated with the amended site plan. The results of the trip generation comparison forecasts are provided in Table 1.

Farmington Hills, MI: 27280 Haggerty Road, Suite C-2, 48331 | Phone: (248) 675-1096

Civil Engineering | Surveying | Landscape Architecture | Aerial Imagery/Mapping | Planning

Flint, MI (HQ) | Lapeer, MI | Farmington Hills, MI | Kentwood, MI | Mt. Pleasant, MI | Grayling, MI | Myrtle Beach, SC | www.rowepsc.com

Table 1: Trip Generation Comparison

Land Use	Land Use Code	Units	AM Peak Hour			PM Peak Hour			Week Day	
			In	Out	Total	In	Out	Total		
Existing Land Use										
General Office	710	87,512 SFT	131	18	149	25	124	149	1,033	
Proposed Land Use										
Multifamily Housing (Mid-Rise)	221	151 DU	13	42	55	36	23	59	674	
Difference			-118	24	-94	11	-101	-90	-359	

Compared to the trip generation potential of the proposed site changed to the existing land use, the site is anticipated to generate 94 fewer total trips during the AM peak hour (118 fewer inbound trips and 24 additional outbound trips), 90 fewer total trips during the PM peak hour (11 additional inbound trips and 101 fewer outbound trips), and 359 fewer daily vehicle trips.

Shared Parking for 999 and 991 W. Big Beaver Road and 2690 Crooks Road

A shared parking analysis was completed for the two sites in accordance with both Urban Land Institute (ULI) and City of Troy standards. The City of Troy allows for a shared parking analysis based on parking supply rates specified in the City Ordinance and ULI rates for hourly, daily, and monthly variations in parking demand for the various land uses specified. Additionally, ULI rates for employees versus visitors were also utilized for the various land uses within the proposed site. This analysis was performed to determine the number of parking spaces necessary on site.

The site located at 999 and 991 W. Big Beaver Road includes an existing 168,200 square foot office building and the following proposed uses: 9,200 square feet of Retail space, 2,000 square feet of Bank space with two drive-through lanes, a 300 seat Restaurant, 3,200 square foot Fast Food Restaurant, and a 5-Story Multifamily Housing building containing 166 dwelling units (DU). The site located at 2690 includes a new 5-story Multifamily Housing building containing 90 DU and the renovation of an existing office building into Multifamily Housing containing 61 DU for a total of 151 DU.

Per the City Ordinance, parking requirements for the office space and fast-food restaurant are calculated using the net square footage, which was assumed to be 80 percent of the total square footage areas listed above. Additionally, each of the drive-through lanes at the proposed bank can accommodate four vehicles, which meets the minimum requirement listed in the City Ordinance.

The ULI Shared Parking methodologies were implemented to determine an accurate parking demand for the proposed site. It is common for sites with a mixture of uses to have varying peak hourly and monthly parking demands, as well as being shared destinations (i.e., a shopper may also visit a restaurant). Therefore, a shared parking analysis is necessary to accurately determine the amount in which the number of required parking spaces could be reduced by, as compared to the sum of the individual parking requirements for each land use on the site.

ROWE analyzed the differences in activity patterns, which include monthly and time of day variances, for each land use. This is because the combination of land uses within the site do not have peak utilization during the same time periods. Time-of-Day factors for weekdays and weekends and monthly adjustment factors for the various land uses can be found in the attached ULI Shared Parking spreadsheets.

Mr. Jason Gekiere
February 21, 2022
Page 3

The final step of the analysis was to determine the critical parking periods for the site. All hours of operation from 6 a.m. to midnight were analyzed for each month of the year. The result showed that the month of December has the highest peak demands of the year. Furthermore, the overall peak time of the day for the entire site was determined to be 10 a.m. for weekdays and 11 a.m. for weekends. The overall peak period of the proposed site would be 11 a.m. on a weekend in December, resulting in a maximum demand of 1,208 required parking spaces. Detailed tables can be found in the attached ULI Shared Parking spreadsheet. The proposed site plans show 1,017 parking spaces for 991 and 999 W. Big Beaver Road and 221 parking spaces for 2690 Crooks Road, for a total of 1,238 parking spaces.

We hope that this letter meets your current needs. Please feel free to contact us if you have any questions.

Sincerely,
ROWE Professional Services Company

Michael J. Labadie, PE
Senior Project Manager

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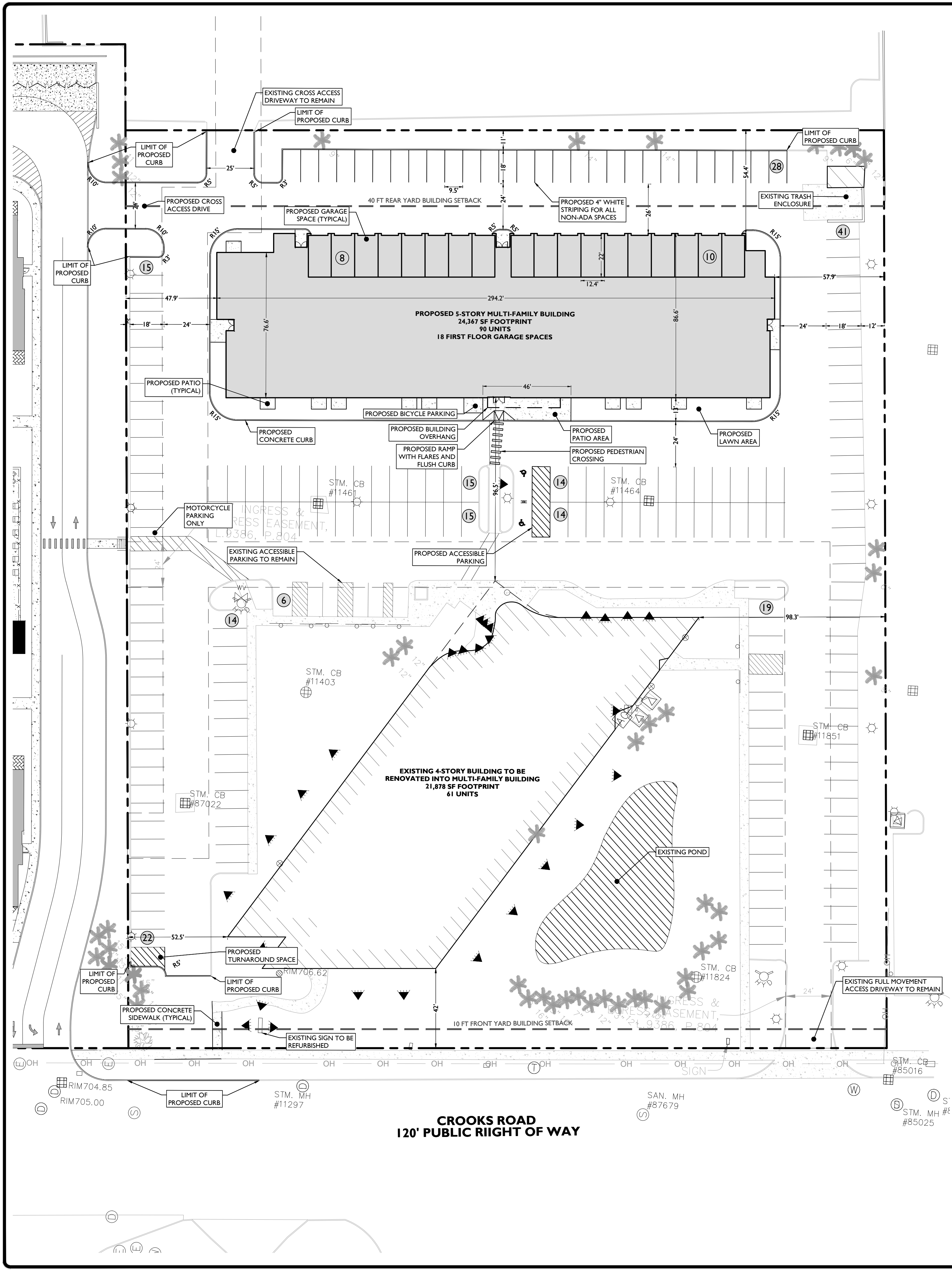


TABLE OF LAND USE AND ZONING		
PARCEL ID: 20-28-101-003		
BIG BEAVER ROAD (BB) - (STREET TYPE: B, BUILDING FORM-D)		
PROPOSED USE	MULTI-FAMILY APARTMENTS	PERMITTED USE
	GROUND FLOOR UNITS	SPECIAL LAND USE
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	193,599 SF (4.44 AC)
LOT COVERAGE BY ALL BUILDINGS	30% (58,080 SF)	22.8% (44,302 SF)
MINIMUM BUILDING HEIGHT	35 FT (6 STORIES)	60.0 FT (5 STORIES)
MAXIMUM BUILDING HEIGHT	66 FT (6 STORIES)	60.0 FT (5 STORIES)
REQUIRED BUILDING LINE	10 FT	42.0 FT (EN)
MINIMUM SIDE YARD SETBACK	0 FT	44.5 FT
MINIMUM REAR YARD SETBACK	40 FT	64.1 FT

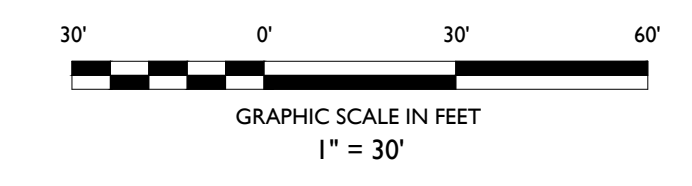
(EN) EXISTING NON-CONFORMITY

OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	MULTI-FAMILY DWELLING: 2 SPACES PER DWELLING UNIT (151 UNITS)(2 SPACES PER UNIT) = 302 SPACES	221 SPACES (V)
§ TABLE 13.06-B	90° PARKING: 9.5 FT X 19 FT W/ 24 FT AISLE	9.5 FT X 19 FT W/ 24 FT AISLE
§ 13.06.F.3	MAXIMUM PARKING: 120% OF REQUIRED PARKING (302 SPACES)(1.2) = 363 SPACES	221 SPACES
§ 13.11.C.4	BICYCLE PARKING: 2 SPACES PER BUILDING (2 BUILDINGS)(2 SPACES/BUILDING) = 4 SPACES	TO BE PROVIDED
§ 13.02E-1	SITE LANDSCAPING: 15% OF THE SITE AREA SHALL BE LANDSCAPED (193,599 SF)(0.15) = 29,040 SF	29.6% (57,277 SF)
§ 4.09.D.5	RECREATIONAL AREA: 300 SF RECREATIONAL AREA PER UNIT (142 UNITS)(300 SF/UNIT) = 42,600 SF	46,682 SF

(V) VARIANCE

SYMBOL	DESCRIPTION
---	PROPERTY LINE
▨	EXISTING BUILDING
---	PROPOSED CURB
▭	PROPOSED BUILDING
▭	PROPOSED CONCRETE

- GENERAL NOTES**
- THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 - ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 - THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
 - THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
 - THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTOR'S EXPENSE.
 - CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
 - THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 - THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 - THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
 - SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.



FOR CITY SUBMISSION	RAC	DATE	BY	DESCRIPTION
2	02/14/2022			
1	02/09/2021			

NOT APPROVED FOR CONSTRUCTION

STONEFIELD
engineering & design

Detroit, MI • New York, NY • Rutherford, NJ
Princeton, NJ • Tampa, FL • Boston, MA
www.stonefielddesign.com

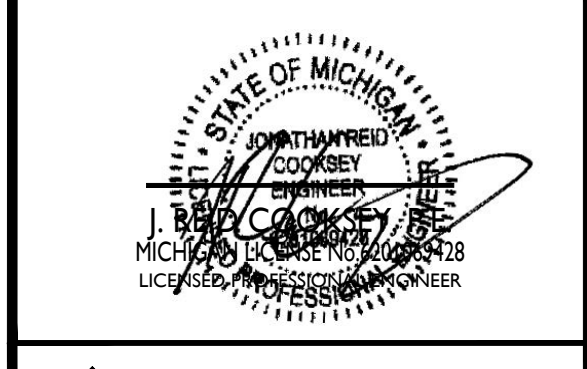
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN



STONEFIELD
engineering & design

SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE: **SITE PLAN**

DRAWING: **C-2**

Project: 999 & 991 W Big Beaver Rd & 3690 Crooks Rd
Description: City of Troy Rates

Shared Parking Demand Summary																		
Peak Month: DECEMBER -- Peak Period: 11 AM, WEEKEND																		
Land Use	Project Data		Weekday					Weekend					Weekday			Weekend		
			Base Ratio	Driving Adj	Non-Captive Ratio	Project Ratio	Unit For Ratio	Base Ratio	Driving Adj	Non-Captive Ratio	Project Ratio	Unit For Ratio	Peak Hr Adj	Peak Mo Adj	Estimated Parking Demand	Peak Hr Adj	Peak Mo Adj	Estimated Parking Demand
	Quantity	Unit										10 AM	December		11 AM	December		
Retail																		
Retail (<400 ksf)	9,200	sf GLA	3.22	100%	86%	2.77	ksf GLA	3.22	100%	86%	2.77	ksf GLA	55%	100%	14	85%	100%	22
Employee			0.78	100%	96%	0.75		0.78	100%	94%	0.74		75%	100%	6	95%	100%	7
Food and Beverage																		
Family Restaurant	8,000	sf GLA	16.43	100%	80%	13.16	ksf GLA	16.43	100%	85%	13.97	ksf GLA	85%	100%	90	90%	100%	101
Employee			2.32	100%	96%	2.23		2.32	100%	94%	2.19		100%	100%	18	100%	100%	18
Fast Casual/Fast Food	2,560	sf GLA	12.31	100%	10%	1.23	ksf GLA	12.31	100%	10%	1.23	ksf GLA	55%	96%	2	85%	96%	3
Employee			1.98	100%	96%	1.91		1.98	100%	94%	1.87		75%	100%	4	100%	100%	6
Entertainment and Institutions																		
Hotel and Residential																		
Residential, Suburban																0%		
Studio Efficiency		units	0.00	100%	100%	0.00	unit	0.00	100%	100%	0.00	unit	50%	100%	-	70%	100%	-
1 Bedroom		units	0.00	100%	100%	0.00	unit	0.00	100%	100%	0.00	unit	50%	100%	-	70%	100%	-
2 Bedrooms	317	units	0.00	100%	100%	0.00	unit	0.00	100%	100%	0.00	unit	50%	100%	-	70%	100%	-
3+ Bedrooms		units	0.00	100%	100%	0.00	unit	0.00	100%	100%	0.00	unit	50%	100%	-	70%	100%	-
Reserved	100%	res spaces	1.89	100%	100%	1.89	unit	1.83	100%	100%	1.83	unit	100%	100%	600	100%	100%	581
Visitor	317	units	0.11	100%	100%	0.11	unit	0.17	100%	100%	0.17	unit	20%	100%	7	20%	100%	11
Office																		
Office 100 to 500 ksf	134,560	sf GFA	0.24	100%	100%	0.24	ksf GFA	0.24	100%	100%	0.24	ksf GFA	100%	100%	33	100%	100%	33
Reserved		emp	0.00	100%	100%	0.00		0.00	100%	100%	0.00		100%	100%	-	100%	100%	-
Employee			3.09	100%	100%	3.09		3.09	100%	100%	3.09		100%	100%	416	100%	100%	416
Bank (Drive In Branch)	2,000	sf GFA	2.92	100%	48%	1.42	ksf GFA	2.92	100%	100%	2.92	ksf GFA	100%	100%	3	100%	100%	6
Employee			2.08	100%	97%	2.02		2.08	100%	97%	2.02		100%	100%	5	100%	100%	5
Additional Land Uses																		
													Customer/Visitor	149	Customer	175		
													Employee/Resident	449	Employee/Resident	452		
													Reserved	600	Reserved	581		
													Total	1,198	Total	1,208		

Project: 999 & 991 W Big Beaver Rd & 3690 Crooks Rd
Description: City of Troy Rates

Monthly Comparison Summary								
Month	Weekday							
	Overall Pk		AM Peak Hr		PM Peak Hr		Eve Peak Hr	
	Time	Demand	Time	Demand	Time	Demand	Time	Demand
January	10 AM	1,180	10 AM	1,180	2 PM	1,133	6 PM	853
February	10 AM	1,179	10 AM	1,179	2 PM	1,133	6 PM	853
March	10 AM	1,192	10 AM	1,192	2 PM	1,142	6 PM	867
April	10 AM	1,187	10 AM	1,187	2 PM	1,139	6 PM	862
May	10 AM	1,193	10 AM	1,193	2 PM	1,143	6 PM	868
June	10 AM	1,189	10 AM	1,189	2 PM	1,141	6 PM	864
July	10 AM	1,167	10 AM	1,167	2 PM	1,119	6 PM	859
August	10 AM	1,167	10 AM	1,167	2 PM	1,167	6 PM	859
September	10 AM	1,182	10 AM	1,182	2 PM	1,136	6 PM	857
October	10 AM	1,187	10 AM	1,187	2 PM	1,139	6 PM	862
November	10 AM	1,185	10 AM	1,185	2 PM	1,139	6 PM	860
December	10 AM	1,198	10 AM	1,198	2 PM	1,153	6 PM	877
Late December	10 AM	1,097	10 AM	1,097	2 PM	1,060	6 PM	843

Monthly Comparison Summary								
Month	Weekend							
	Overall Pk		AM Peak Hr		PM Peak Hr		Eve Peak Hr	
	Time	Demand	Time	Demand	Time	Demand	Time	Demand
January	11 AM	1,185	11 AM	1,185	12 PM	1,151	6 PM	748
February	11 AM	1,185	11 AM	1,185	12 PM	1,150	6 PM	748
March	11 AM	1,199	11 AM	1,199	12 PM	1,166	6 PM	759
April	11 AM	1,194	11 AM	1,194	12 PM	1,161	6 PM	755
May	11 AM	1,200	11 AM	1,200	12 PM	1,167	6 PM	760
June	11 AM	1,196	11 AM	1,196	12 PM	1,163	6 PM	757
July	11 AM	1,174	11 AM	1,174	12 PM	1,143	6 PM	755
August	11 AM	1,174	11 AM	1,174	12 PM	1,143	6 PM	756
September	11 AM	1,188	11 AM	1,188	12 PM	1,154	6 PM	751
October	11 AM	1,193	11 AM	1,193	12 PM	1,160	6 PM	755
November	11 AM	1,192	11 AM	1,192	12 PM	1,158	6 PM	754
December	11 AM	1,208	11 AM	1,208	12 PM	1,178	6 PM	766
Late December	11 AM	1,103	11 AM	1,103	12 PM	1,082	7 PM	756

Project: 999 & 991 W Big Beaver Rd & 3690 Crooks Rd
 Description City of Troy Rates

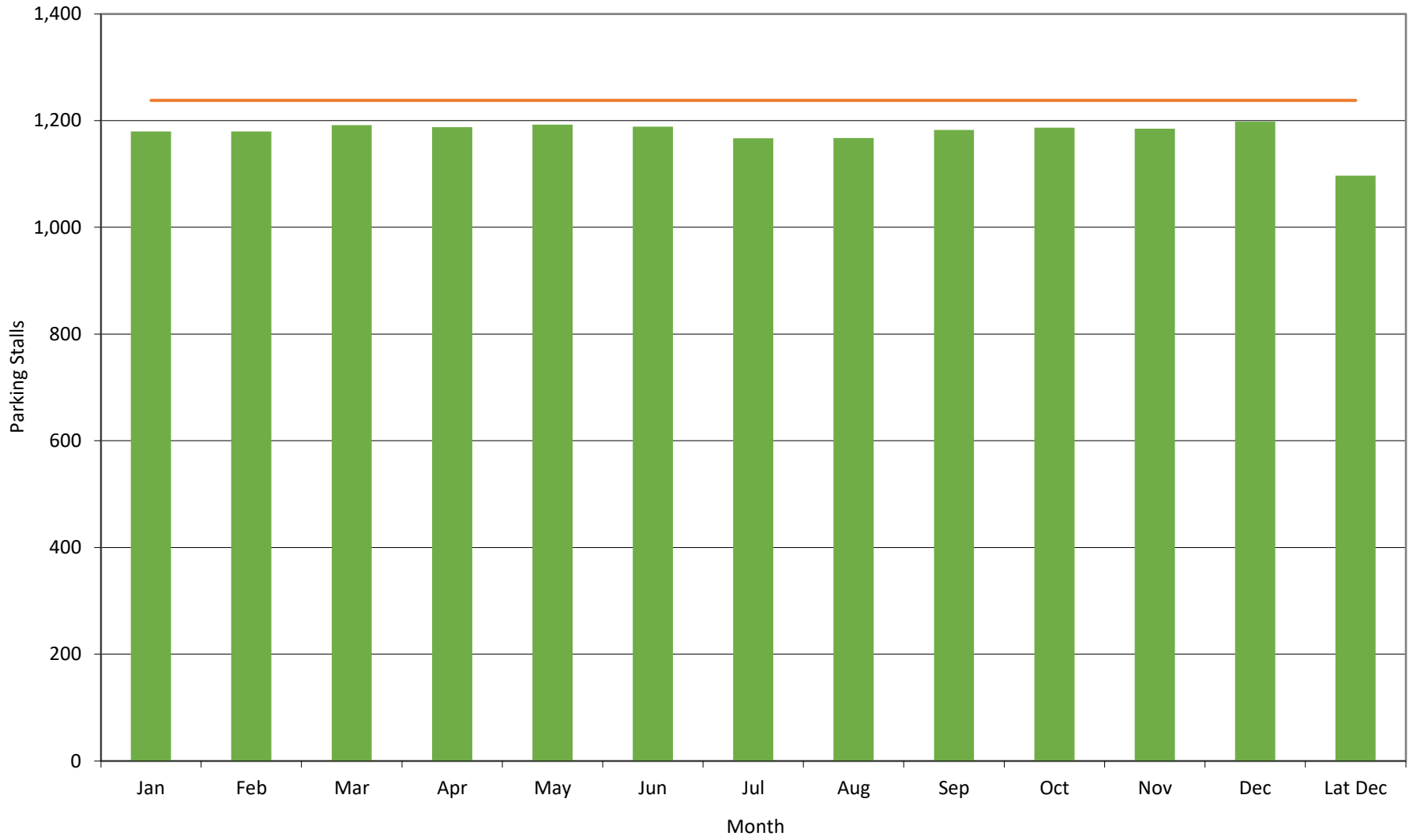
Distribution of Weekday Demand by Zone									
Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Retail									
Retail (<400 ksf)	14	0	0	0	0	0	0	0	14
Employee	6	0	0	0	0	0	0	0	6
Food and Beverage									
Family Restaurant	90	0	0	0	0	0	0	0	90
Employee	18	0	0	0	0	0	0	0	18
Fast Casual/Fast Food	2	0	0	0	0	0	0	0	2
Employee	4	0	0	0	0	0	0	0	4
Entertainment and Institutions									
Hotel and Residential									
Residential, Suburban									
Studio Efficiency	0	0	0	0	0	0	0	0	0
1 Bedroom	0	0	0	0	0	0	0	0	0
2 Bedrooms	0	0	0	0	0	0	0	0	0
3+ Bedrooms	0	0	0	0	0	0	0	0	0
Reserved	314	286	0	0	0	0	0	0	600
Visitor	4	3	0	0	0	0	0	0	7
Office									
Office 100 to 500 ksf	33	0	0	0	0	0	0	0	33
Reserved	0	0	0	0	0	0	0	0	0
Employee	416	0	0	0	0	0	0	0	416
Bank (Drive In Branch)	3	0	0	0	0	0	0	0	3
Employee	5	0	0	0	0	0	0	0	5
Additional Land Uses									
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Parking Demand	Customer/Visitor	146	3	0	0	0	0	0	149
	Employee/Resident	449	0	0	0	0	0	0	449
	Reserved	314	286	0	0	0	0	0	600
	Total	909	289	0	0	0	0	0	0
Parking Supply	Customer/Visitor								0
	Employee/Resident								0
	Reserved								0
	Total	0	0	0	0	0	0	0	0
Surplus (+)/Deficit (-)	Customer/Visitor	-146	-3	0	0	0	0	0	-149
	Employee/Resident	-449	0	0	0	0	0	0	-449
	Reserved	-314	-286	0	0	0	0	0	-600
	Total	-909	-289	0	0	0	0	0	0

Note: Zone 1 adjusted to have totals equal values on Summary Sheets

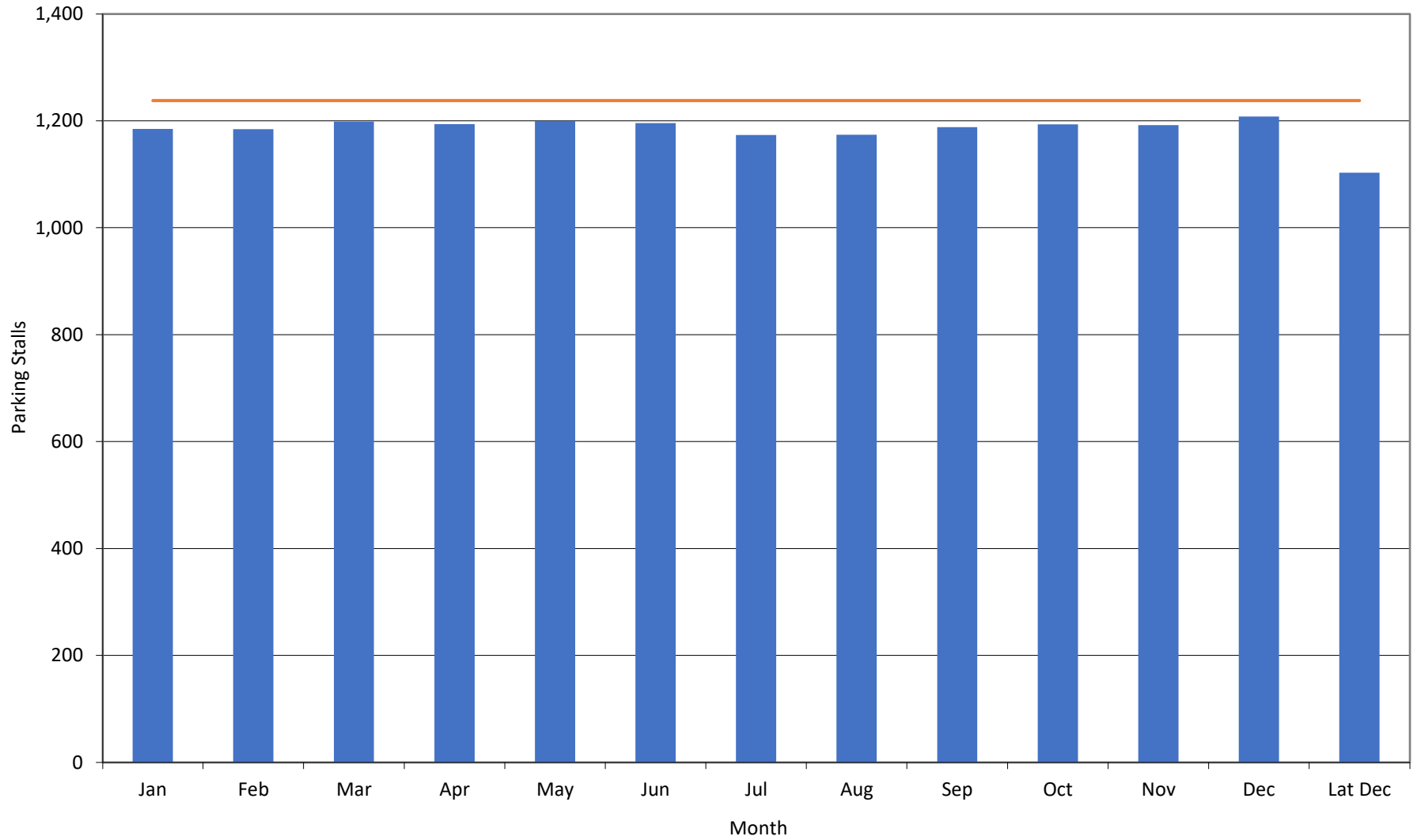
Distribution of Weekend Demand by Zone									
Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Retail									
Retail (<400 ksf)	22	0	0	0	0	0	0	0	22
Employee	7	0	0	0	0	0	0	0	7
Food and Beverage									
Family Restaurant	101	0	0	0	0	0	0	0	101
Employee	18	0	0	0	0	0	0	0	18
Fast Casual/Fast Food	3	0	0	0	0	0	0	0	3
Employee	6	0	0	0	0	0	0	0	6
Entertainment and Institutions									
Hotel and Residential									
Residential, Suburban									
Studio Efficiency	0	0	0	0	0	0	0	0	0
1 Bedroom	0	0	0	0	0	0	0	0	0
2 Bedrooms	0	0	0	0	0	0	0	0	0
3+ Bedrooms	0	0	0	0	0	0	0	0	0
Reserved	304	277	0	0	0	0	0	0	581
Visitor	6	5	0	0	0	0	0	0	11
Office									
Office 100 to 500 ksf	33	0	0	0	0	0	0	0	33
Reserved	0	0	0	0	0	0	0	0	0
Employee	416	0	0	0	0	0	0	0	416
Bank (Drive In Branch)	6	0	0	0	0	0	0	0	6
Employee	5	0	0	0	0	0	0	0	5
Additional Land Uses									
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Parking Demand	Customer/Visitor	171	5	0	0	0	0	0	176
	Employee/Resident	452	0	0	0	0	0	0	452
	Reserved	304	277	0	0	0	0	0	581
	Total	927	282	0	0	0	0	0	0
Parking Supply	Customer/Visitor	0	0	0	0	0	0	0	0
	Employee/Resident	0	0	0	0	0	0	0	0
	Reserved	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0
Surplus (+)/Deficit (-)	Customer/Visitor	-171	-5	0	0	0	0	0	-176
	Employee/Resident	-452	0	0	0	0	0	0	-452
	Reserved	-304	-277	0	0	0	0	0	-581
	Total	-927	-282	0	0	0	0	0	0

Note: Zone 1 adjusted to have totals equal values on Summary Sheets

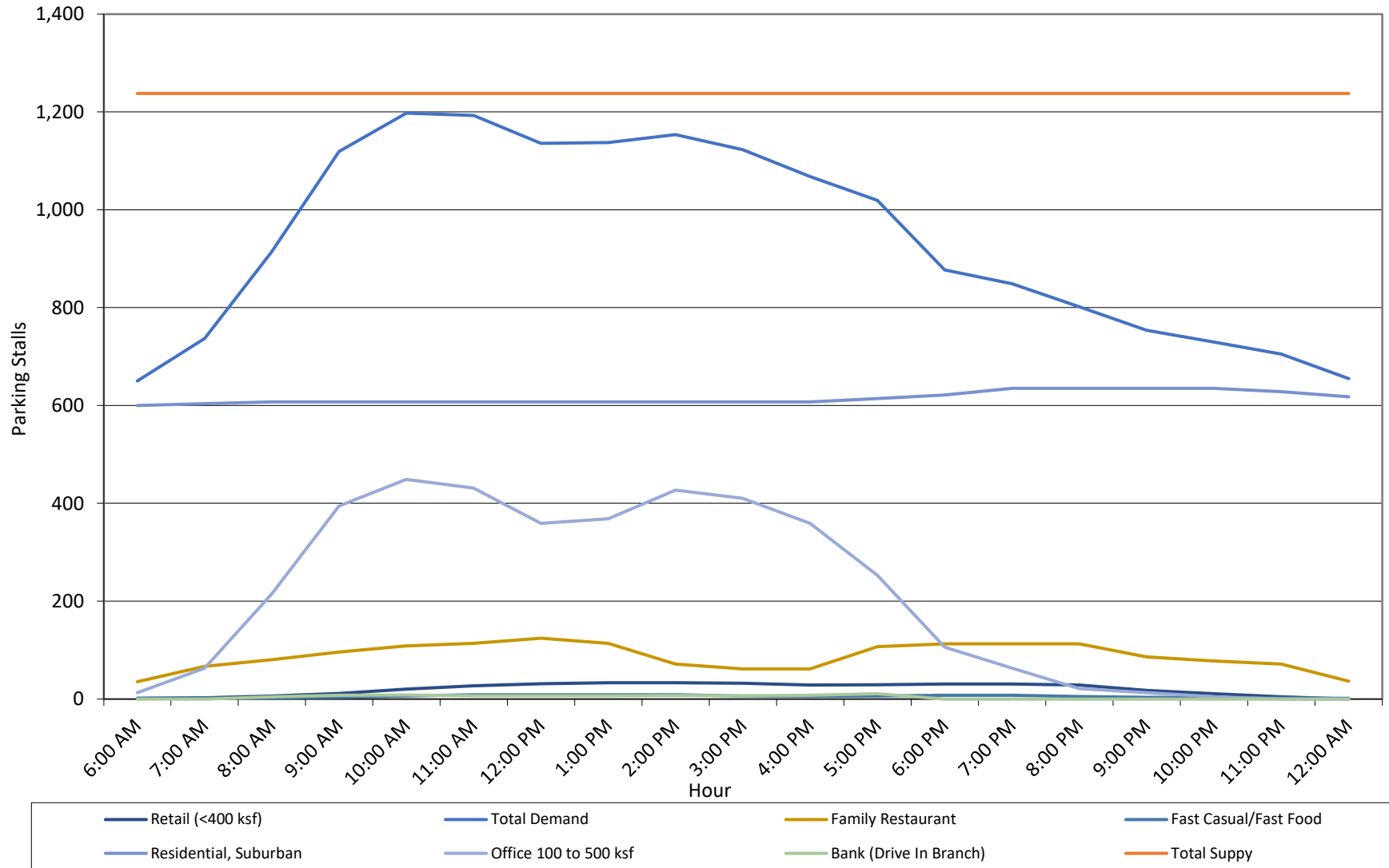
Weekday Month-by-Month Estimated Parking Demand



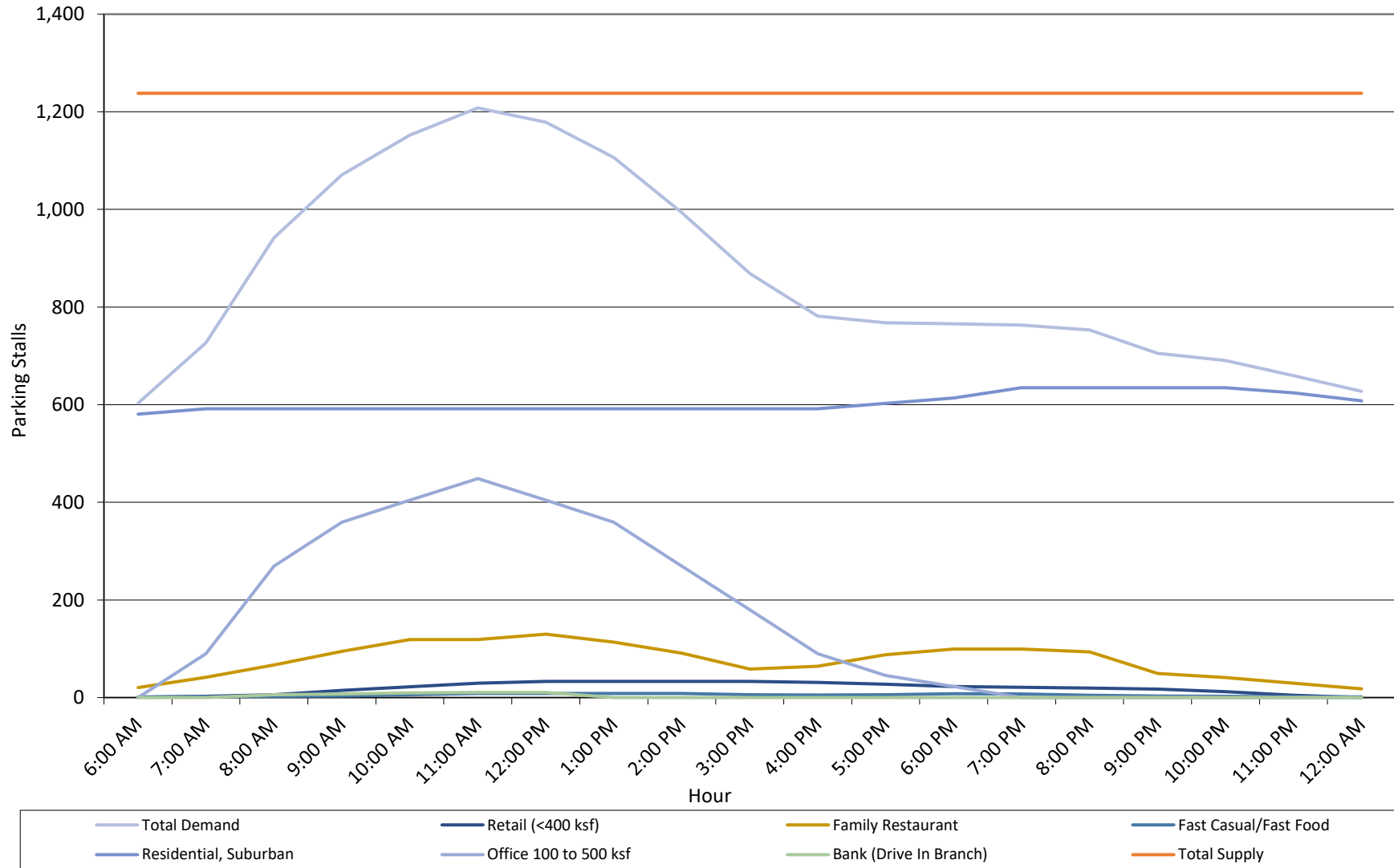
Weekend Month-by-Month Estimated Parking Demand



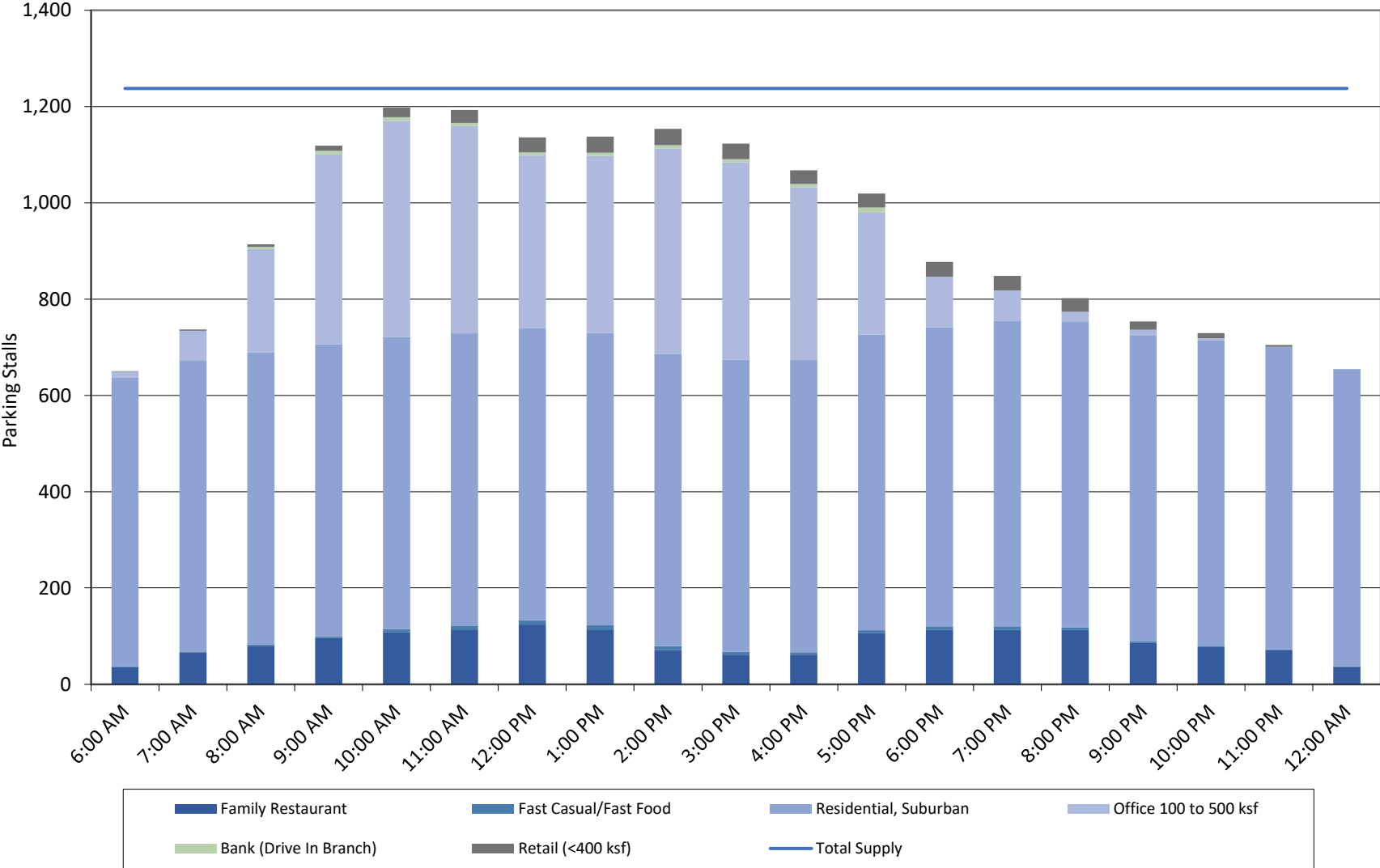
Peak Month Daily Parking Demand by Hour (Weekday)



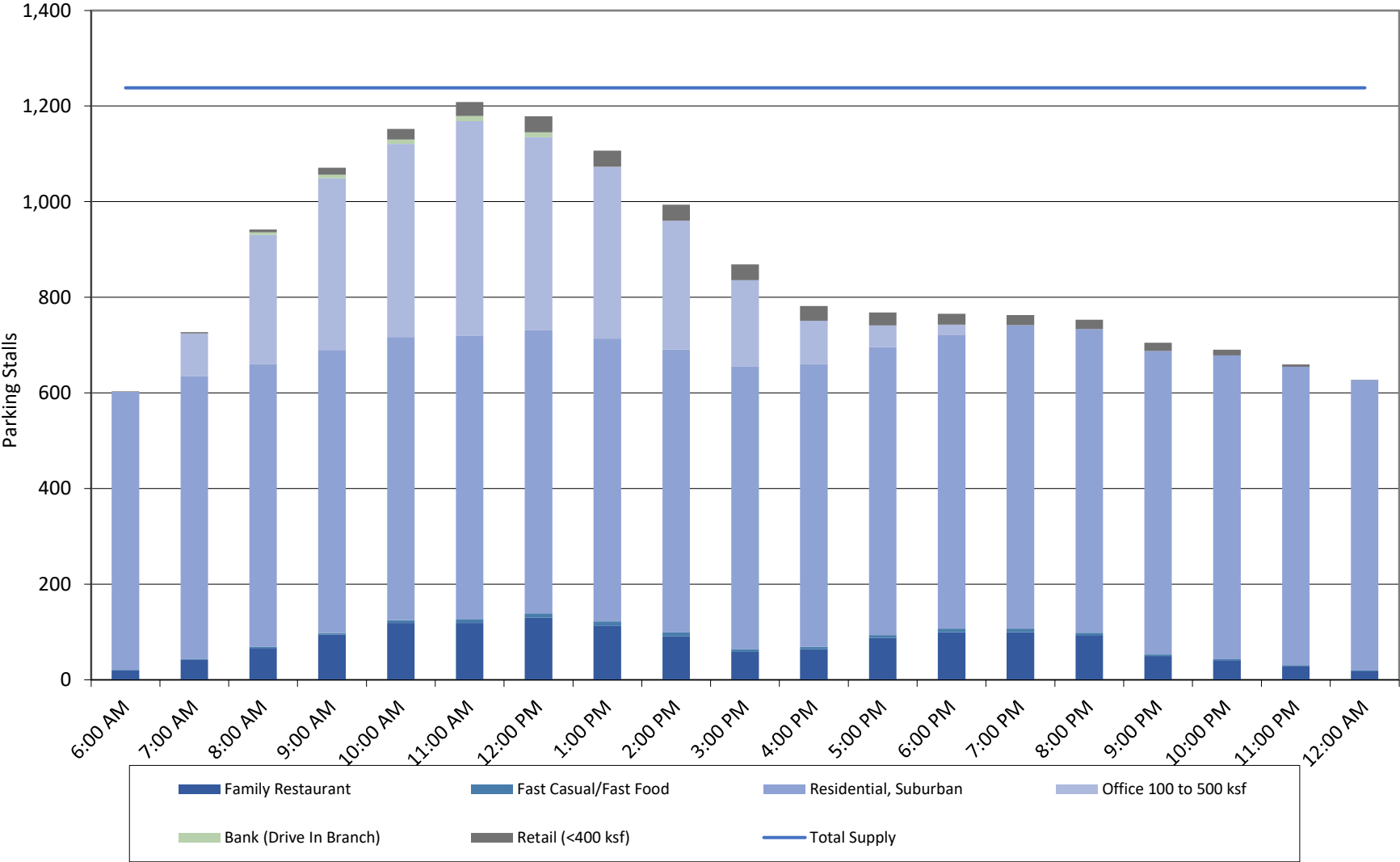
Peak Month Daily Parking Demand by Hour (Weekend)



Peak Month Daily Parking Demand by Hour (Weekday)



Peak Month Daily Parking Demand by Hour (Weekend)



memorandum

Date: November 29, 2022

To: Scott Finlay, PE

From: Lauren Hull & Sara Merrill, PE, PTOE

Re: 2690 Crooks Multi-Family Apartments
Traffic Review

I have reviewed the preliminary site plans for 2690 Crooks Road. The plans propose renovating and repurposing the existing 4-story office building into a Multi-Family Apartment building (62-units), and also constructing a new proposed 5-story Multi-Family Apartment building (94-units) to the east of the existing building. Previous plan submittals were based on a total of 151 units. The plans were prepared by Stonefield Engineering & Design and are dated November 11, 2022.

A shared parking analysis (for 991 & 999 Big Beaver and 2690 Crooks) was previously submitted; no updates to the parking study were provided for this review. The original parking study was prepared by Rowe and dated February 21, 2022.

OHM offers the following comments:

1. Shared Parking:
 - a. It appears there is uncertainty as to the configuration of the adjacent site as it relates to shared parking. OHM requests clarification whether the Applicant is seeking shared parking based on the existing or future configuration of the adjacent site (999 Big Beaver). Discrepancies between plans and shared parking analysis should be resolved.
 - b. This development has a parking deficit of 91 spaces and proposes to utilize shared parking at the adjacent site to the north. The shared parking analysis (previously reviewed) from February 2022 was based on 151 units, instead of the 156 units currently proposed. The parking study also presumed the redevelopment of 999 Big Beaver, which was to include a new parking structure and substantial changes to the site. An updated shared parking analysis, reflecting the existing parking capacity of the adjacent site, is necessary.
 - c. The proposed shared parking area is located on a separate parcel, regardless of ownership. A shared parking agreement must be in place in case either parcel is sold at a later date, as well as to preserve appropriate parking facilities in the event either parcel is redeveloped.
2. Improve pedestrian connectivity.
 - a. The proposed sidewalk connection to the north is noted on the plans: "...to be installed during adjacent site construction." Since this development proposes shared parking on the adjacent site, there must be suitable pedestrian connections constructed as part of this development. Additionally, we note that the proposed connection on the adjacent site contains stairs and



therefore is not ADA-accessible.

- b. The pedestrian connection to the property to the North should not remain as-is. Visually impaired pedestrians experience unnecessary difficulty navigating unusual geometry. The stairs can be relocated further west to create a perpendicular crossing.
- c. Existing sidewalks abutting parking spaces (on the north and east side of the existing building) must be widened to 7 feet, to avoid vehicle bumper overhang obstructing the sidewalk.
- d. We strongly recommend adding sidewalks along the north and south side of the proposed Building B. The purpose of the sidewalk is to provide a dedicated space for pedestrians.



November 8, 2022

Jason Gekiere
314 Lakeside Drive
White Lake, MI 48386

RE: 999 BIG BEAVER ROAD TRAFFIC IMPACT DISCUSSION

Dear Mr. Gekiere:

Thank you for taking the time to meet with the City of Troy and the Road Commission for Oakland County (RCOC) to discuss this matter. In light of that meeting, and after discussing this matter internally, RCOC is willing to approve this development in concept, under the following conditions:

- A) The existing traffic signal heads facing outbound traffic from the easterly driveway should be relocated to the north side of eastbound Big Beaver Road and modernized. In lieu of that, RCOC is also willing to accept relocation of the stop bar for outbound traffic, with prohibition of right turns on red.
- B) The westerly driveway and access can remain as existing, with right-in ingress and dual right turn lane egress.
- C) Outbound left turns will be prohibited from the northerly driveway to Crooks Road. All other ingress and egress will continue to be allowed.

These conditions are required for conceptual approval. A detailed field and engineering review of the final plans will be conducted during the permit application process.

If you have any questions or require additional information, please feel free to contact me at 248-858-4835.

Respectfully,

Scott Sintkowski, P.E.
Permit Engineer
Department of Customer Services

Copied via e-mail:
Mark Soma – Tower Construction
Paula Arwady – Tower Construction
Julie M. Kroll, PE, PTOE – Fleis & Vandenbrink
Eric Williams, PE – Stonefied Engineering
Jordan Jonna – A.F. Jonna
Dennis Cowan – Plunkett Cooney
Bill Huotari, PE, City Engineer – City of Troy
Brent Savidant, AICP, Community Development Director – City of Troy
Gary Piotrowicz, PE, PTOE, Deputy Managing Director – RCOC
Dave Czerniakowski, Director of Customer Services – RCOC
Danielle Deneau, PE, Director of Traffic and Safety – RCOC
Alex Rucinski, PE, Traffic Engineer - RCOC

Board of Road Commissioners

Ronald J. Fowkes
Commissioner

Andrea LaLonde
Commissioner

Nancy Quarles
Commissioner

Dennis G. Kolar, P.E.
Managing Director

Gary Piotrowicz, P.E., P.T.O.E.
Deputy Managing Director
County Highway Engineer

Department of
Customer Services
Permits

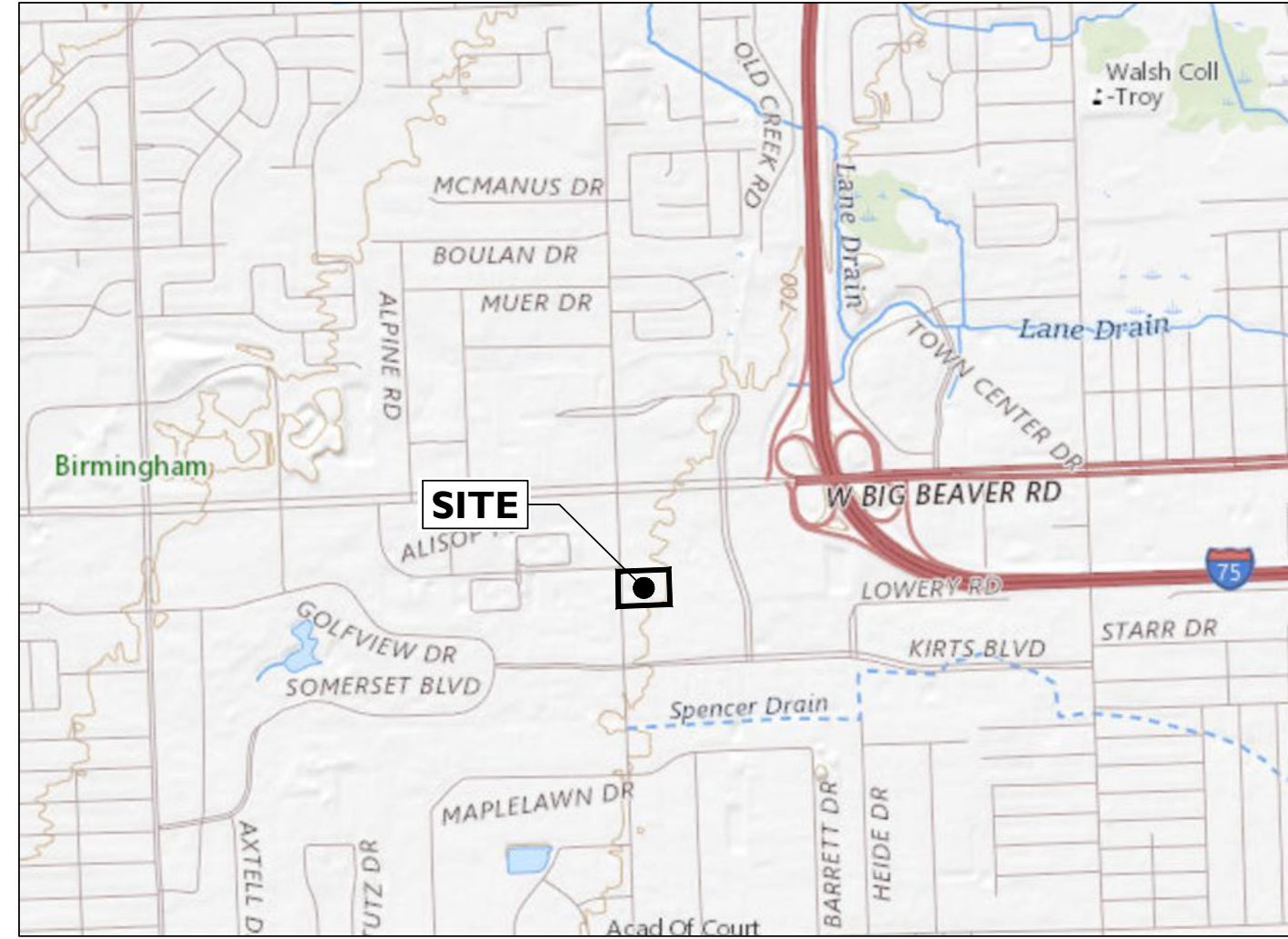
2420 Pontiac Lake Road
Waterford, MI 48328

248-858-4835

FAX
248-858-4773

TDD
248-858-8005

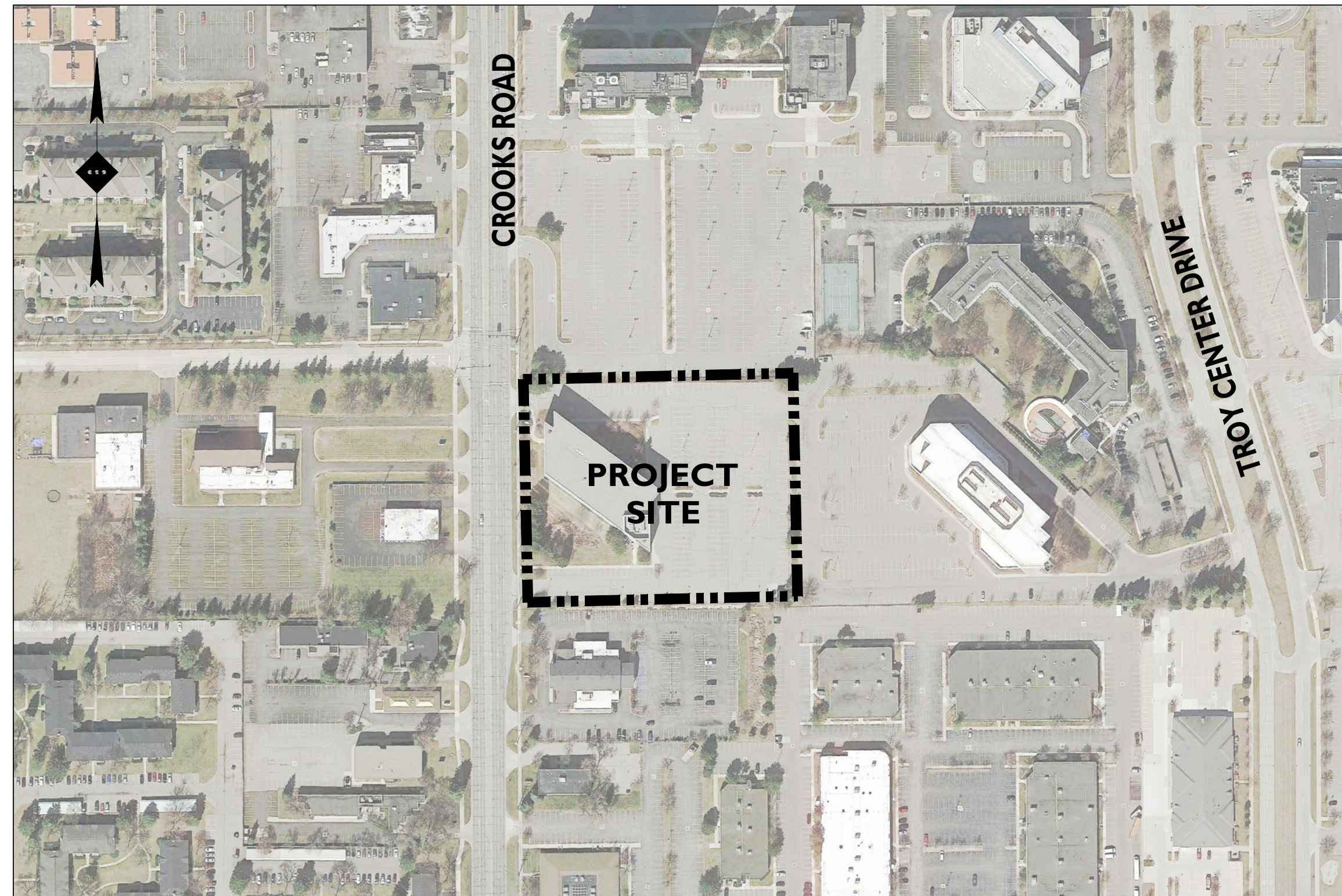
www.rcocweb.org



SOURCE: USGS MAPS

LOCATION MAP

SCALE: 1" = 2,000'±



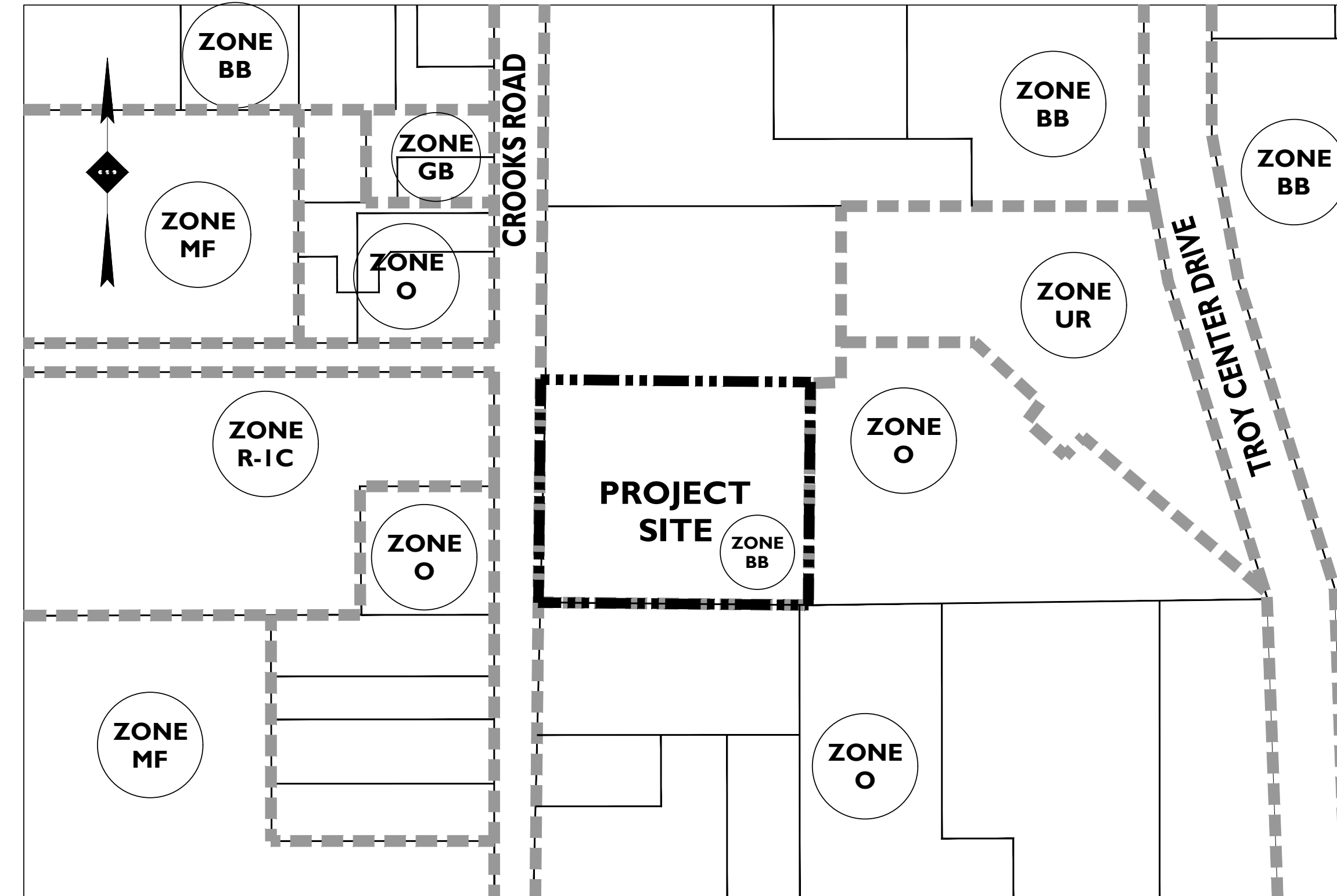
SOURCE: GOOGLE EARTH PRO

AERIAL MAP

SCALE: 1" = 200'±

SITE DEVELOPMENT PLANS FOR 2690 CROOKS ROAD EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

PARCEL ID: 20-28-101-003
2690 CROOKS ROAD
CITY OF TROY, OAKLAND COUNTY, MICHIGAN



SOURCE: OAKLAND COUNTY PROPERTY GATEWAY & CITY OF TROY ZONING MAP

ZONING MAP

SCALE: 1" = 200'±

APPLICANT

TROY KS DEVELOPMENT, LLC
4036 TELEGRAPH ROAD, SUITE 201
BLOOMFIELD HILLS, MI 48302

ISSUE	DATE	BY	DESCRIPTION
5	10/11/2022	KTH	FOR RCOC / PLANNING APPROVAL
4	07/11/2022	KTH	FOR ENGINEERING APPROVAL
3	05/11/2022	KTH	FOR SITE PLAN APPROVAL
2	02/14/2022	KTH	FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION
1	02/09/2021	RAC	FOR CITY SUBMISSION

NOT APPROVED FOR CONSTRUCTION



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Princeton, NJ · Tampa, FL · Boston, MA
www.stonefielddeng.com
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

**SITE DEVELOPMENT PLANS
2690 CROOKS ROAD
EXISTING BUILDING RENOVATION &
PROPOSED MULTI-FAMILY APARTMENTS**

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

PLAN REFERENCE MATERIALS:

- THIS PLAN SET REFERENCES THE FOLLOWING DOCUMENTS INCLUDING, BUT NOT LIMITED TO:
 - ALTA/TOPOGRAPHIC SURVEY PREPARED BY KEM-TEC SURVEY DATED 03/16/2022
 - ARCHITECTURAL DRAWINGS PREPARED BY BIDDISON ARCHITECTURE + DESIGN, DATED 06/03/2022
 - AERIAL MAP OBTAINED FROM GOOGLE EARTH PRO
 - LOCATION MAP OBTAINED FROM USGS ONLINE
 - ZONING INFORMATION OBTAINED FROM CITY OF TROY ZONING MAP
- ALL REFERENCE MATERIAL LISTED ABOVE SHALL BE CONSIDERED A PART OF THIS PLAN SET AND ALL INFORMATION CONTAINED WITHIN THESE MATERIALS SHALL BE UTILIZED IN CONJUNCTION WITH THIS PLAN SET. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN A COPY OF EACH REFERENCE AND REVIEW IT THOROUGHLY PRIOR TO THE START OF CONSTRUCTION.



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PLANS PREPARED BY:



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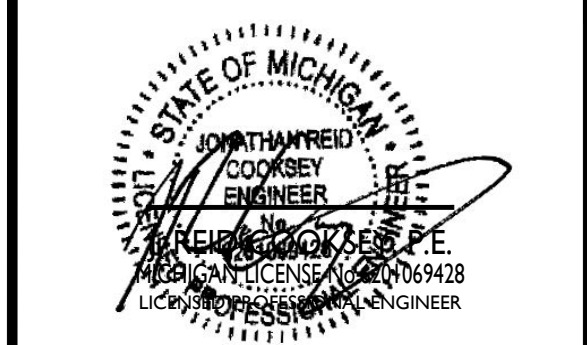
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SHEET INDEX

DRAWING TITLE	SHEET #
COVER SHEET	C-1
DEMOLITION PLAN	C-2
SITE PLAN	C-3
OVERALL SITE PLAN	C-4
GRADING PLAN	C-5
STORMWATER MANAGEMENT PLAN	C-6
UTILITY PLAN	C-7
LIGHTING PLAN	C-8
LANDSCAPING PLAN	C-9
LANDSCAPING DETAILS	C-10
SOIL EROSION AND SEDIMENT CONTROL PLAN	C-11
CONSTRUCTION DETAILS	C-12 & C-13

ADDITIONAL SHEETS

DRAWING TITLE	SHEET #
ALTA / TOPOGRAPHIC SURVEY	1 OF 1
CITY OF TROY - STANDARD SANITARY SEWER DETAILS	2 OF 2
CITY OF TROY - STANDARD WATER MAIN DETAILS	1 OF 1
CITY OF TROY - STANDARD STORM SEWER DETAILS	1 OF 1
CITY OF TROY - STANDARD SOIL EROSION CONTROL DETAILS	1 OF 1



SCALE: AS SHOWN PROJECT ID: M-19301.01

TITLE:

COVER SHEET

DRAWING:

C-1

OWNER OF RECORD:
CONTINENTAL PLAZA
VENTURES LLC

ASPHALT

CONCRETE CURB

ASPHALT

EDGE OF ASPHALT

ASPHALT

CONC.

CONC.

ASPHALT

ASPHALT

EDGE OF ASPHALT

CONC.

ASPHALT

ASPHALT

ASPHALT

CONC.

ASPHALT

CONC.

ASPHALT

CONC.

CONC.

CONC.

CONC.

SYMBOL DESCRIPTION

--- FEATURE TO BE REMOVED / DEMOLISHED

--- LOD --- LIMIT OF DISTURBANCE

[Pattern] AREA OF FULL-DEPTH ASPHALT REMOVAL

[Pattern] AREA OF CONCRETE REMOVAL

PROPOSED TEST PIT

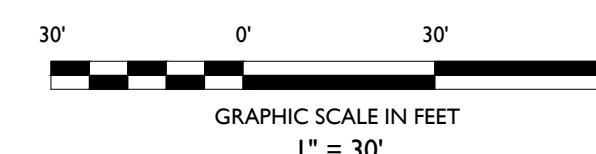
ALL SITE FEATURES WITHIN THE LIMIT OF DISTURBANCE INDICATED ON THIS PLAN ARE TO REMAIN UNLESS OTHERWISE NOTED. THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IF SIGNIFICANT DISCREPANCIES ARE DISCERNED BETWEEN THIS PLAN AND FIELD CONDITIONS



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DEMOLITION NOTES

- 1. THE WORK REFLECTED ON THE DEMOLITION PLAN IS TO PROVIDE GENERAL INFORMATION TOWARDS THE EXISTING ITEMS TO BE DEMOLISHED AND/OR REMOVED. THE CONTRACTOR IS RESPONSIBLE TO REVIEW THE ENTIRE PLAN SET AND ASSOCIATED REPORTS/REFERENCE DOCUMENTS INCLUDING ALL DEMOLITION ACTIVITIES AND INCIDENTAL TASKS NECESSARY TO COMPLETE THE SITE IMPROVEMENTS.
2. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF DEMOLITION ACTIVITIES.
3. EXPLOSIVES SHALL NOT BE USED UNLESS WRITTEN CONSENT FROM BOTH THE OWNER AND ANY APPLICABLE GOVERNING AGENCY IS OBTAINED. BEFORE THE START OF ANY EXPLOSIVE PROGRAM, THE CONTRACTOR IS RESPONSIBLE TO OBTAIN ALL LOCAL, STATE, AND FEDERAL PERMITS. ADDITIONALLY, THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL SEISMIC TESTING AS REQUIRED AND ANY DAMAGES AS THE RESULT OF SAID DEMOLITION PRACTICES.
4. ALL DEMOLITION ACTIVITIES SHALL BE PERFORMED IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL CODES. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING ALL UTILITIES ARE DISCONNECTED IN ACCORDANCE WITH THE UTILITY AUTHORITY'S REQUIREMENTS PRIOR TO STARTING THE DEMOLITION OF ANY STRUCTURE. ALL EXCAVATIONS ASSOCIATED WITH DEMOLISHED STRUCTURES OR REMOVED TANKS SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO SUPPORT SITE AND BUILDING IMPROVEMENTS. A GEOTECHNICAL ENGINEER SHOULD BE PRESENT DURING BACKFILLING ACTIVITIES TO OBSERVE AND CERTIFY THAT BACKFILL MATERIAL WAS COMPACTED TO A SUITABLE CONDITION.
5. DEMOLISHED DEBRIS SHALL NOT BE BURIED ON SITE. ALL WASTE/DEBRIS GENERATED FROM DEMOLITION ACTIVITIES SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REQUIREMENTS. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL RECORDS OF THE DISPOSAL TO DEMONSTRATE COMPLIANCE WITH THE ABOVE REGULATIONS.



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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN



SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE:

DEMOLITION PLAN

DRAWING:

C-2

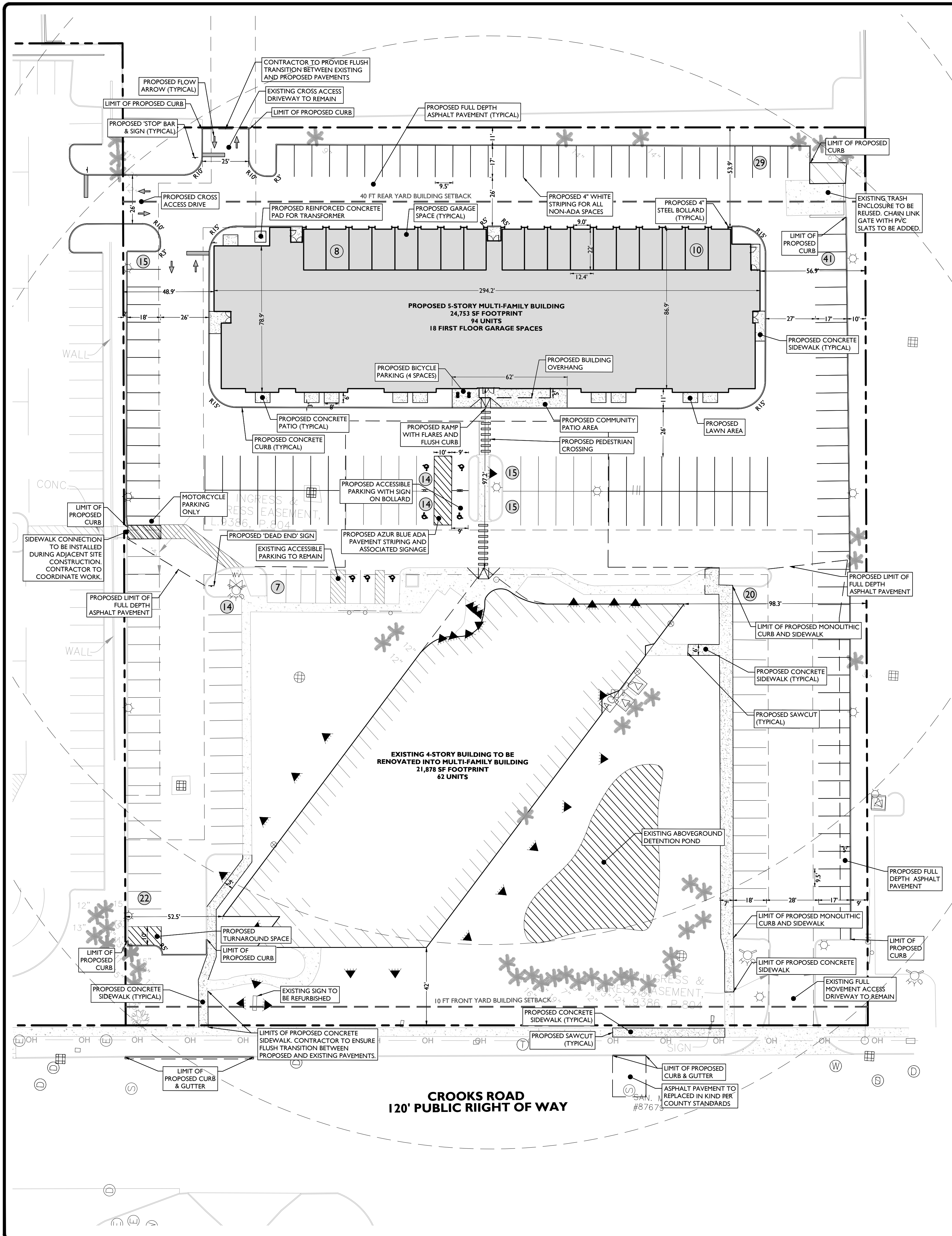


TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-28-101-003
 BIG BEAVER ROAD (BB) - (STREET TYPE: B, BUILDING FORM-D)

PROPOSED USE	PERMITTED USE	PROPOSED
MULTI-FAMILY APARTMENTS	SPECIAL LAND USE	
GROUND FLOOR UNITS		
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	193,599 SF (4.44 AC)
LOT COVERAGE BY ALL BUILDINGS	30% (58,080 SF)	24.1% (46,631 SF)
MINIMUM BUILDING HEIGHT	35 FT	60.0 FT (5 STORIES)
MAXIMUM BUILDING HEIGHT	66 FT (6 STORIES)	60.0 FT (5 STORIES)
REQUIRED BUILDING LINE	10 FT	42.0 FT (EN)
MINIMUM SIDE YARD SETBACK	0 FT	48.9 FT
MINIMUM REAR YARD SETBACK	40 FT	53.9 FT

(EN) EXISTING NON-CONFORMITY

OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	MULTI-FAMILY DWELLING: 2 SPACES PER DWELLING UNIT (156 UNITS)(2 SPACES PER UNIT) = 312 SPACES	224 SPACES (V)
§ TABLE 13.06-B	90° PARKING: 9.5 FT X 19 FT W/ 24 FT AISLE	9.5 FT X 19 FT W/ 24 FT AISLE
§ 13.06.F.3	MAXIMUM PARKING: 120% OF REQUIRED PARKING (312 SPACES)(1.2) = 374 SPACES	224 SPACES
§ 13.11.C.4	BICYCLE PARKING: 2 SPACES PER BUILDING (2 BUILDINGS)(2 SPACES/BUILDING) = 4 SPACES	TO BE PROVIDED
§ 13.02.E-1	SITE LANDSCAPING: 15% OF THE SITE AREA SHALL BE LANDSCAPED (193,599 SF)(0.15) = 29,040 SF	27.8% (53,849 SF)
§ 4.09.D.5	RECREATIONAL AREA: 300 SF RECREATIONAL AREA PER UNIT (156 UNITS)(300 SF/UNIT) = 46,800 SF	50,655 SF

(V) VARIANCE

SYMBOL DESCRIPTION

---	PROPERTY LINE
▨	EXISTING BUILDING
---	PROPOSED CURB
▨	PROPOSED BUILDING
▭	PROPOSED CONCRETE
---	PROPOSED FLUSH CURB
○	PROPOSED SIGNS / BOLLARDS
⊕	PROPOSED BIKE RACK

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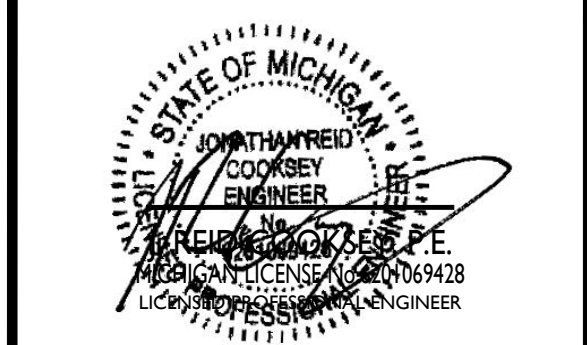
SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
 2690 CROOKS ROAD
 CITY OF TROY
 OAKLAND COUNTY, MICHIGAN

- GENERAL NOTES**
- THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 - ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 - THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
 - THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
 - THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTOR'S EXPENSE.
 - CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
 - THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 - THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 - THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION AND DEMOLITION ACTIVITIES.
 - SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

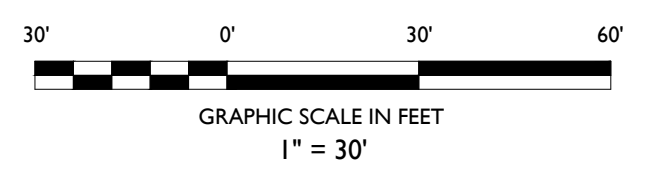


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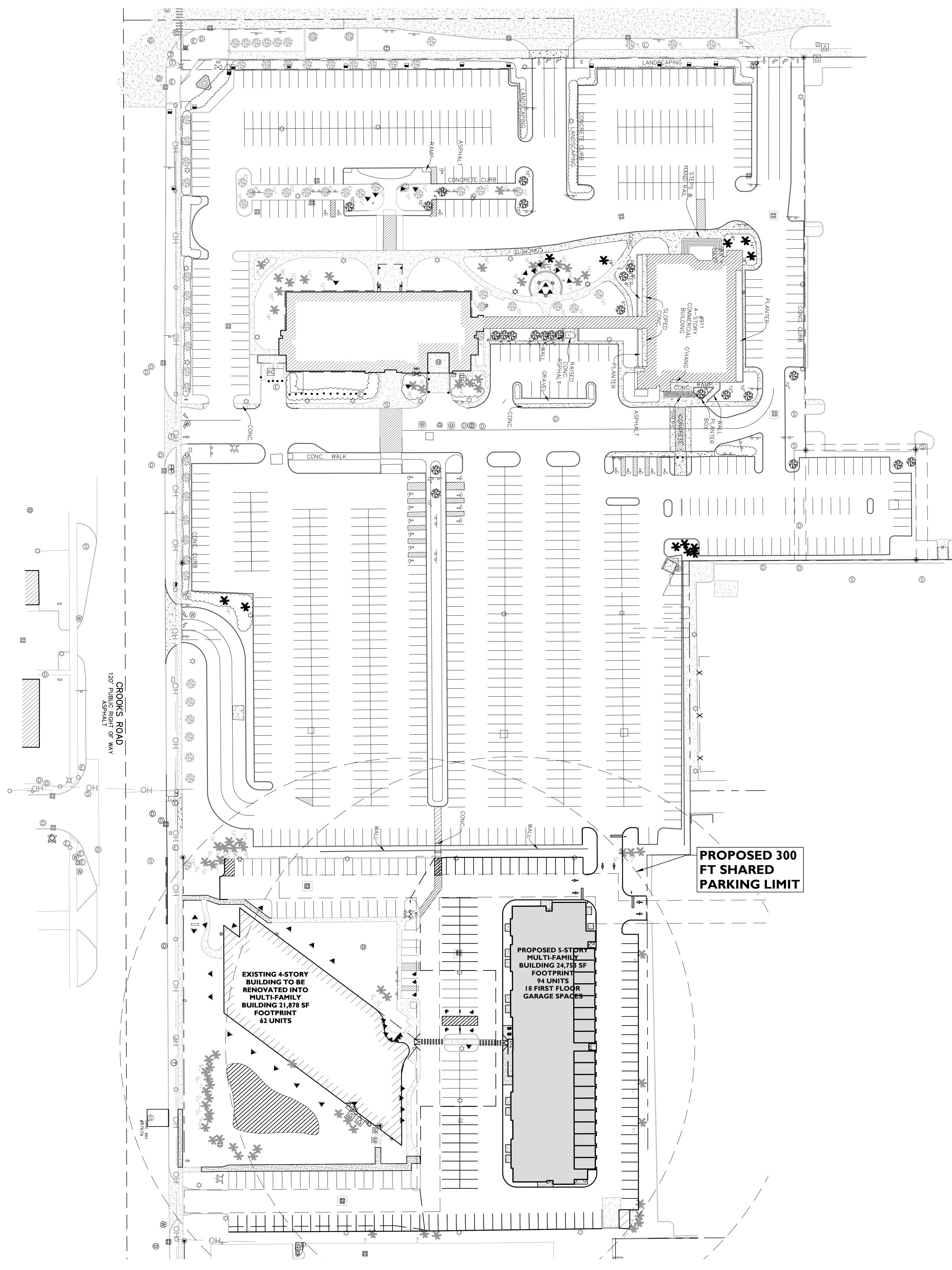
SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE: **SITE PLAN**

DRAWING: **C-3**



\P\2019\101-003\101-003-01\2690 CROOKS ROAD - 2690 CROOKS ROAD - 120' PUBLIC RIGHT OF WAY - 10/11/2022



OFF-STREET PARKING REQUIREMENTS - KELLY

CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	PROFESSIONAL OFFICE 1 SPACE PER 300 NFA (175,827 NFA)/(1,300 NFA) = 586 SPACES	883 SPACES

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
 (168,200 SF + 51,584 SF)(0.8) = 175,827 SF

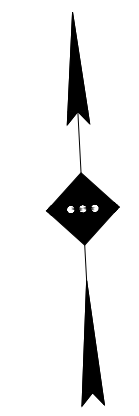
OFF-STREET PARKING REQUIREMENTS - LINDSEY CENTRE

CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	MULTI-FAMILY DWELLING: 2 SPACES PER DWELLING UNIT (156 UNITS)(2 SPACES PER UNIT) = 312 SPACES	224 SPACES (V)

(V) VARIANCE

OFF-STREET PARKING REQUIREMENTS - COMBINED

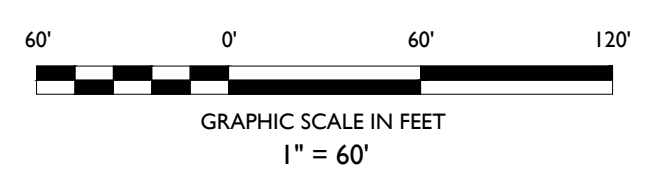
PARCEL	REQUIRED	PROPOSED
KELLY PARCEL	586 SPACES	883 SPACES
LINDSEY CENTRE	312 SPACES	224 SPACES
TOTAL:	586 + 312 = 898 SPACES	TOTAL: 1,107 SPACES



SYMBOL DESCRIPTION

	PROPERTY LINE
	EXISTING BUILDING
	PROPOSED CURB
	PROPOSED BUILDING
	PROPOSED CONCRETE

- GENERAL NOTES**
- THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 - ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 - THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
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 - THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 - THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
 - SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.



ISSUE	DATE	BY	DESCRIPTION
5	10/11/2022	KTH	FOR RCOC / PLANNING APPROVAL
4	07/11/2022	KTH	FOR ENGINEERING APPROVAL
3	05/31/2022	KTH	FOR SITE PLAN APPROVAL
2	02/14/2022	KTH	FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION
1	02/09/2021	RAC	FOR CITY SUBMISSION

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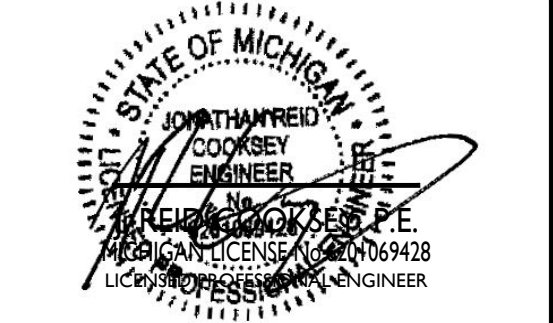
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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
 2690 CROOKS ROAD
 CITY OF TROY
 OAKLAND COUNTY, MICHIGAN



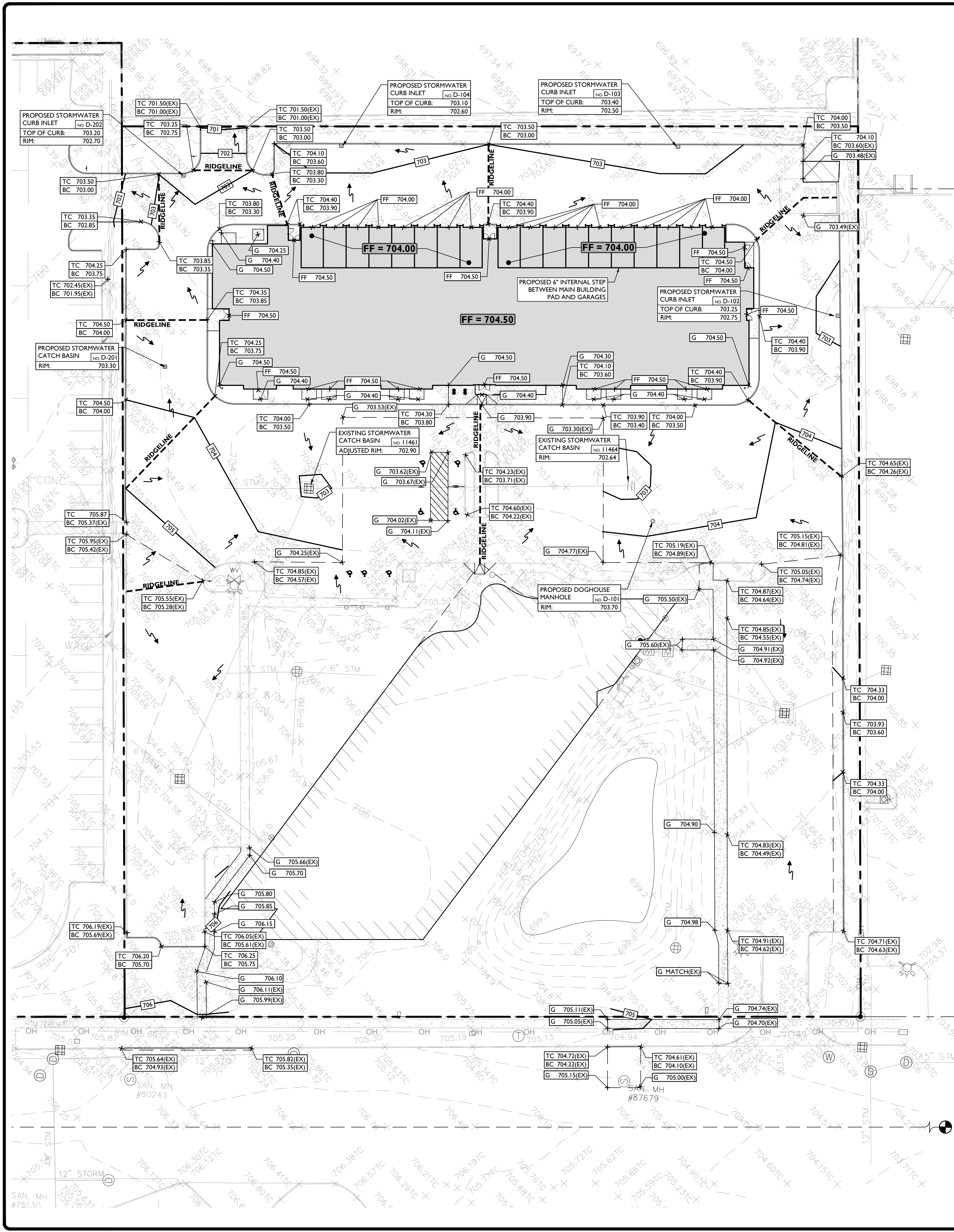
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SCALE: 1" = 60' PROJECT ID: M-19301.01

TITLE:
OVERALL SITE PLAN

DRAWING:

C-4



SYMBOL	DESCRIPTION
---	PROPERTY LINE
---	PROPOSED GRADING CONTOUR
---	PROPOSED GRADING RIDGELINE
---	PROPOSED DIRECTION OF DRAINAGE FLOW
X G 100.00	PROPOSED GRADE SPOT SHOT
X TC 100.50 BC 100.00	PROPOSED TOP OF CURB / BOTTOM OF CURB SPOT SHOT
X FF 100.00	PROPOSED FINISHED FLOOR SPOT SHOT

MANHOLE SCHEDULE

#	TYPE	RIM (FT)	SIZE (IN)	DIRECTION	DIP	INVERT (FT)
11297	STORM MANHOLE	705.38	12	N	4.2	701.18
11355	CATCH BASIN	704.21	6	NE	3.7	700.51
				SE	3.95	700.26
				SE	3.8	700.41
11403	BEEHIVE CATCH BASIN	704.55	6	S	3.85	700.70
				W	3.9	700.65
				NW	4.05	700.50
11461	CATCH BASIN	702.66	6	N	2.75	699.91
				SE	2.85	699.81
				NW	3	699.66
				S	3.2	699.46
				NE	3.2	699.31
11462	CATCH BASIN	702.51	6	NE	3.15	699.36
				S	3.25	699.26
				NW	3.05	699.46
11463	CATCH BASIN	702.57	6	N	3.25	699.32
				E	3.15	699.42
				W	3.05	699.52
11464	CATCH BASIN	702.64	6	E	4.4	698.24
				SW	3.85	698.80
				NW	3.75	698.89
11824	BEEHIVE CATCH BASIN	703.48	6	E	6	697.48
				T/PIPE	4.2	699.28
				T/WATER	7.4	696.08
				B/STRUCTURE	4.25	698.65
11851	CATCH BASIN	702.9	6	NE	4.25	698.65
				N	4.15	698.75
				NW	5.8	697.10
				S	4.3	698.60
85015	STORM MANHOLE	703.39	12	NW	5	698.39
				S	6.5	696.89
85016	CATCH BASIN	703.37	12	SW	4.45	698.92
85025	STORM MANHOLE	703.59	12	S	4	699.59
				W	5.2	698.39
				E	4.85	698.74
				NE	4.6	698.99
87679	SANITARY MANHOLE	705.04	8	N	11.45	693.59
				S	11.5	693.54
				NW	11	694.04

SITE BENCHMARK #3
ARROW ON HYDRANT, 140' SW OF SW CORNER OF POND.
ELEVATION = 707.24' (NAVD 88 DATUM)

SITE BENCHMARK #4
ARROW ON HYDRANT, NE CORNER OF BUILDING.
ELEVATION = 708.34' (NAVD 88 DATUM)

- ### GRADING NOTES
- ALL SOIL AND MATERIAL REMOVED FROM THE SITE SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL STATE AND FEDERAL REQUIREMENTS. ANY GROUNDWATER DE-WATERING PRACTICES SHALL BE PERFORMED UNDER THE SUPERVISION OF A QUALIFIED PROFESSIONAL. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL NECESSARY PERMITS FOR THE DISCHARGE OF DE-WATERED GROUNDWATER. ALL SOIL IMPORTED TO THE SITE SHALL BE CERTIFIED CLEAN FILL. CONTRACTOR SHALL MAINTAIN RECORDS OF ALL FILL MATERIALS BROUGHT TO THE SITE.
 - THE CONTRACTOR IS REQUIRED TO PROVIDE TEMPORARY AND/OR PERMANENT SHORING WHERE REQUIRED DURING EXCAVATION ACTIVITIES INCLUDING BUT NOT LIMITED TO UTILITY TRENCHES TO ENSURE THE STRUCTURAL INTEGRITY OF NEARBY STRUCTURES AND STABILITY OF THE SURROUNDING SOILS.
 - PROPOSED TOP OF CURB ELEVATIONS ARE GENERALLY 4 INCHES TO 7 INCHES ABOVE EXISTING GRADES UNLESS OTHERWISE NOTED. THE CONTRACTOR WILL SUPPLY ALL STAKEOUT CURB GRADE SHEETS TO STONEFIELD ENGINEERING & DESIGN, LLC. FOR REVIEW AND APPROVAL PRIOR TO POURING CURBS.
 - THE CONTRACTOR IS RESPONSIBLE TO SET ALL PROPOSED UTILITY COVERS AND RESET ALL EXISTING UTILITY COVERS WITHIN THE PROJECT LIMITS TO PROPOSED GRADE IN ACCORDANCE WITH ANY APPLICABLE MUNICIPAL COUNTY, STATE AND/OR UTILITY AUTHORITY REGULATIONS.
 - MINIMUM SLOPE REQUIREMENTS TO PREVENT PONDING SHALL BE AS FOLLOWS:
 - CURB GUTTER: 0.50%
 - CONCRETE SURFACES: 1.00%
 - ASPHALT SURFACES: 1.00%
 - A MINIMUM SLOPE OF 1:100 SHALL BE PROVIDED AWAY FROM ALL BUILDINGS. THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE FROM THE BUILDING IS ACHIEVED AND SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IF THIS CONDITION CANNOT BE MET. FOR PROJECTS WHERE BASEMENTS ARE PROPOSED, THE DEVELOPER IS RESPONSIBLE TO DETERMINE THE DEPTH TO GROUNDWATER AT THE LOCATION OF THE PROPOSED STRUCTURE. IF GROUNDWATER IS ENCOUNTERED WITHIN THE BASEMENT AREA, SPECIAL CONSTRUCTION METHODS SHALL BE UTILIZED AND REVIEWED/APPROVED BY THE CONSTRUCTION CODE OFFICIAL. IF SUMP PUMPS ARE UTILIZED, ALL DISCHARGES SHALL BE CONNECTED DIRECTLY TO THE PUBLIC STORM SEWER SYSTEM WITH APPROVAL FROM THE GOVERNING STORM SEWER SYSTEM AUTHORITY.
- ### ADA NOTES
- THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION WITHIN THE ADA PARKING SPACES AND ACCESS AISLES.
 - THE CONTRACTOR SHALL PROVIDE COMPLIANT SIGNAGE AT ALL ADA PARKING AREAS IN ACCORDANCE WITH STATE GUIDELINES.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 5.00% RUNNING SLOPE AND A MAXIMUM OF 2.00% CROSS SLOPE ALONG WALKWAYS WITHIN THE ACCESSIBLE PATH OF TRAVEL (SEE THE SITE PLAN FOR THE LOCATION OF THE ACCESSIBLE PATH). THE CONTRACTOR IS RESPONSIBLE TO ENSURE THE ACCESSIBLE PATH OF TRAVEL IS 36 INCHES WIDE OR GREATER UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION AT ALL LANDINGS. LANDINGS INCLUDE, BUT ARE NOT LIMITED TO, THE TOP AND BOTTOM OF AN ACCESSIBLE RAMP. AT ACCESSIBLE BUILDING ENTRANCES, AT AN AREA IN FRONT OF A WALK-UP ATM, AND AT TURNING SPACES ALONG THE ACCESSIBLE PATH OF TRAVEL, THE LANDING AREA SHALL HAVE A MINIMUM CLEAR AREA OF 60 INCHES BY 60 INCHES UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 8.33% RUNNING SLOPE AND A MAXIMUM 2.00% CROSS SLOPE ON ANY CURB RAMPS ALONG THE ACCESSIBLE PATH OF TRAVEL. WHERE PROVIDED, CURB RAMP FLARES SHALL NOT HAVE A SLOPE GREATER THAN 10.00%. IF A LANDING AREA IS PROVIDED AT THE TOP OF THE RAMP, FOR ALTERATIONS, A CURB RAMP FLARE SHALL NOT HAVE A SLOPE GREATER THAN 8.33% IF A LANDING AREA IS NOT PROVIDED AT THE TOP OF THE RAMP. CURBS RAMPS SHALL NOT RISE MORE THAN 6 INCHES IN ELEVATION WITHOUT A HANDRAIL. THE CLEAR WIDTH OF A CURB RAMP SHALL BE NO LESS THAN 36 INCHES WIDE.
 - ACCESSIBLE RAMPS WITH A RISE GREATER THAN 6 INCHES SHALL CONTAIN COMPLIANT HANDRAILS ON BOTH SIDES OF THE RAMP AND SHALL NOT RISE MORE THAN 30" IN ELEVATION WITHOUT A LANDING AREA IN BETWEEN RAMP RUNS. LANDING AREAS SHALL ALSO BE PROVIDED AT THE TOP AND BOTTOM OF THE RAMP.
 - A SLIP RESISTANT SURFACE SHALL BE CONSTRUCTED ALONG THE ACCESSIBLE PATH AND WITHIN ADA PARKING AREAS.
 - THE CONTRACTOR SHALL ENSURE A MAXIMUM OF 1/4" INCHES VERTICAL CHANGE IN LEVEL ALONG THE ACCESSIBLE PATH. WHERE A CHANGE IN LEVEL BETWEEN 1/4" INCHES AND 1/2" INCHES EXISTS, CONTRACTOR SHALL ENSURE THAT THE TOP 1/4" INCH CHANGE IN LEVEL IS BEVELED WITH A SLOPE NOT STEEPER THAN 1 UNIT VERTICAL AND 2 UNITS HORIZONTAL (2:1 SLOPE).
 - THE CONTRACTOR SHALL ENSURE THAT ANY OPENINGS (GAPS OR HORIZONTAL SEPARATION) ALONG THE ACCESSIBLE PATH SHALL NOT ALLOW PASSAGE OF A SPHERE GREATER THAN 1/4" INCH.

FOR R/C/O: PLANNING APPROVAL	KTH	DATE	BY	DESCRIPTION
FOR ENGINEERING APPROVAL	KTH			
FOR SITE PLAN APPROVAL	KTH			
FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION	KTH			
FOR CITY SUBMISSION	RAC			
ISSUE				

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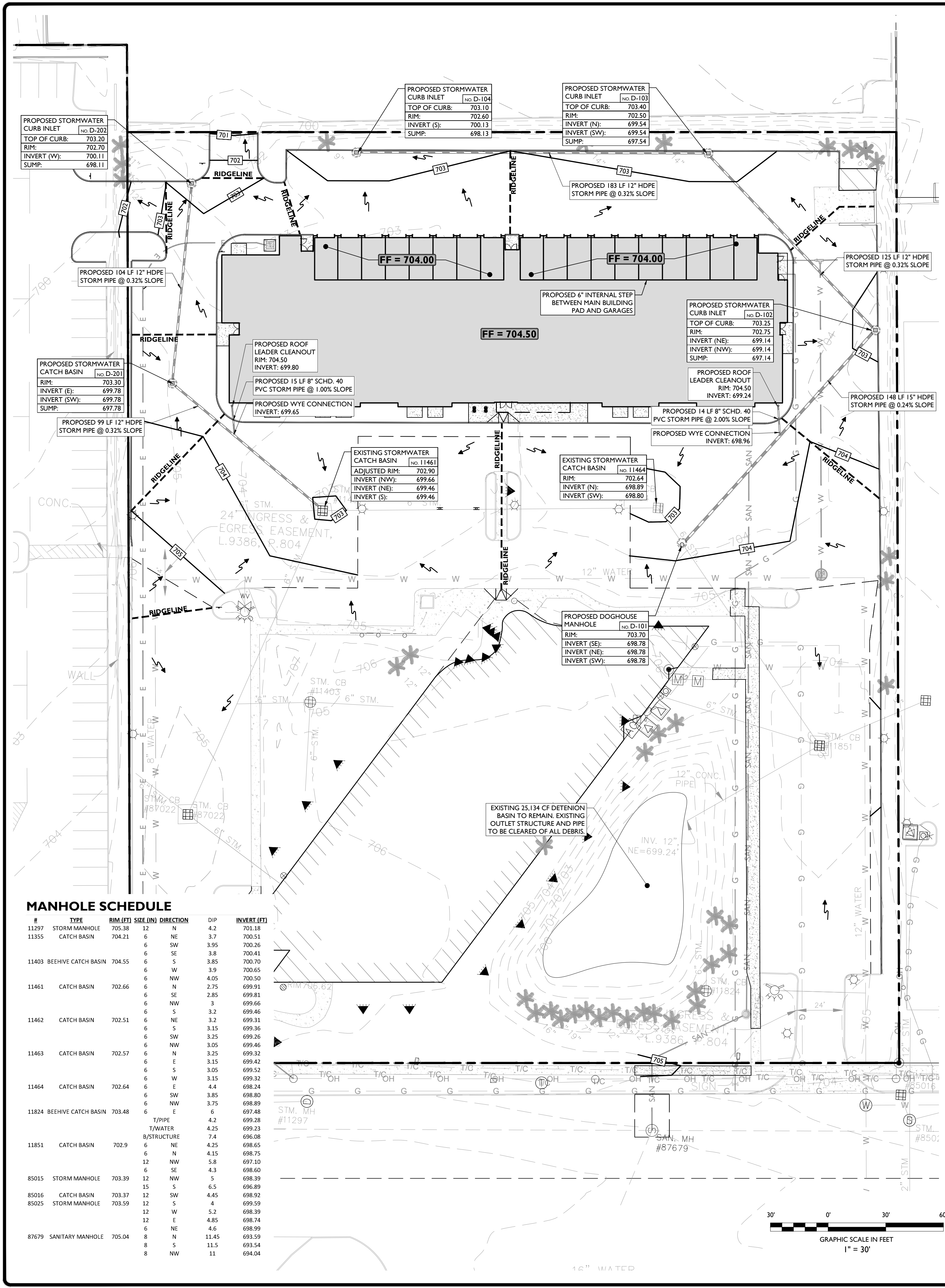
20-28-101-003
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

STONEFIELD
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SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE: GRADING PLAN

DRAWING: C-5



2022-06-03 Existing Pond Volume

Prepared by Stonefield Engineering & Design
HydroCAD® 10.00-22 s/n 10626 © 2018 HydroCAD Software Solutions LLC

Volume #1	Invert	Avail. Storage	Storage Description
700.00'	37,337.000 af	Custom Stage Data (Prismatic) listed below (Recalc)	
Elevation (feet)	Surf. Area (acres)	Inc. Store (acre-feet)	Cum. Store (acre-feet)
700.00	5,845.000	0.000	0.000 (BOTTOM OF BASIN)
701.00	7,449.000	6,647.000	6,647.000
702.00	9,205.000	8,327.000	14,974.000
703.00	11,115.000	10,160.000	25,134.000 (TOP OF BASIN)
704.00	13,291.000	12,203.000	37,337.000 (FREEBOARD)

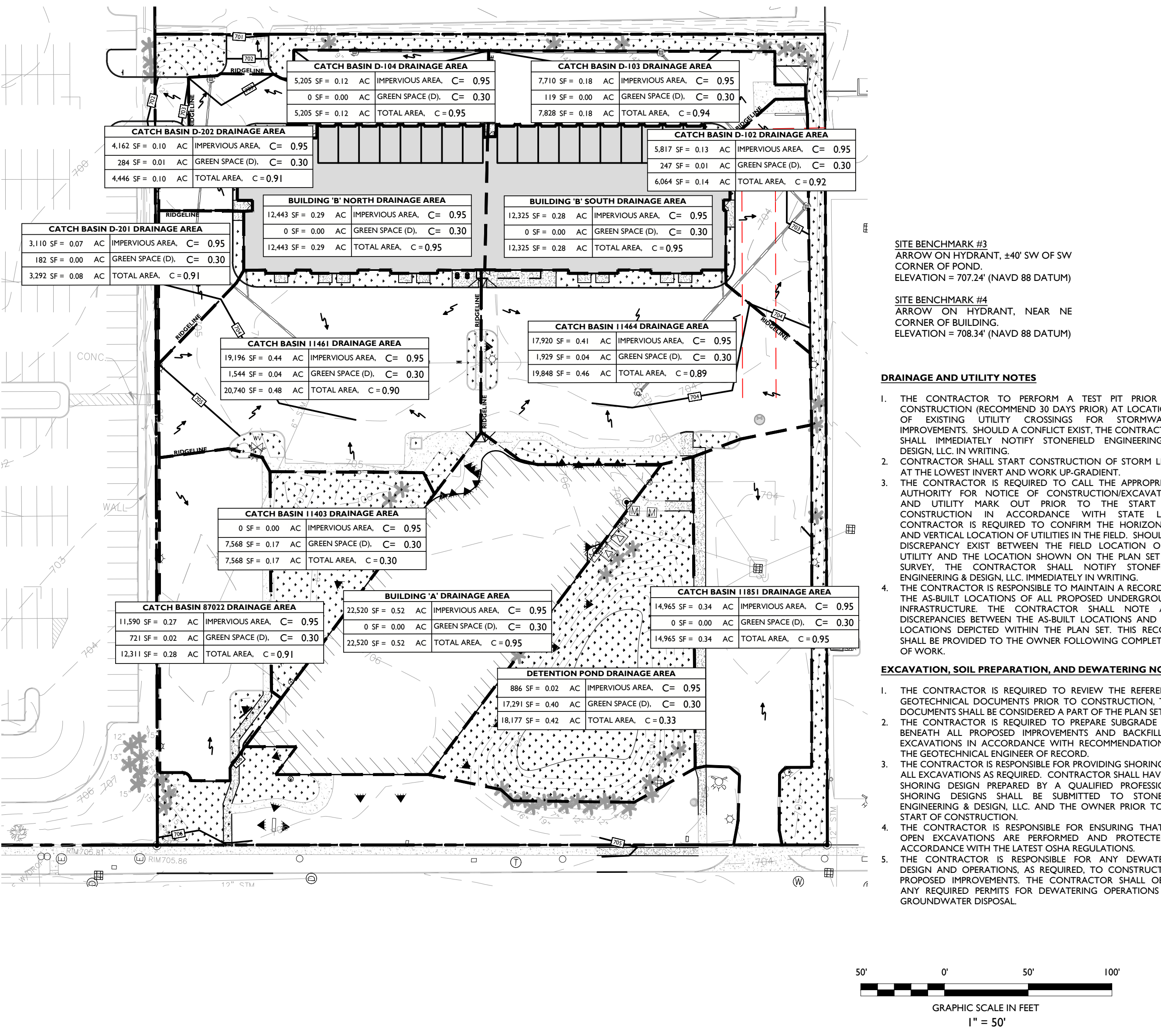
'PRE vs POST' STORMWATER ANALYSIS

EXISTING CONDITIONS			PROPOSED CONDITIONS		
SURFACE TYPE	C VALUE	WEIGHTED AREA (SF)	SURFACE TYPE	C VALUE	WEIGHTED AREA (SF)
IMPERVIOUS / ROOF	0.95	140,643	IMPERVIOUS / ROOF	0.95	139,750
PERVIOUS (HSG 'D')	0.30	52,956	PERVIOUS (HSG 'D')	0.30	53,849
TOTAL:		193,599	TOTAL:		193,599
EXISTING COMPOSITE 'C' VALUE =		0.772	PROPOSED COMPOSITE 'C' VALUE =		0.769
			NET RUNOFF VALUE IMPROVEMENT:		0.003

NOTE: STORMWATER RUNOFF VALUES ARE PROVIDED BY THE 'OAKLAND COUNTY STORMWATER STANDARDS, SECTION III, PART 'A'

10-YEAR STORM EVENT CONVEYANCE CALCULATIONS

Line No.	Line ID	Grnd/Rim Elev Dn (ft)	Grnd/Rim Elev Up (ft)	Invert Dn (ft)	Invert Up (ft)	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Capacity Full (cfs)	Vel Down (ft/s)	HGL Down (ft)	HGL Up (ft)	Drainage Area (ac)	Runoff Coeff (C)	Tc (min)	iSys (in/hr)
1	D102-D101	703.70	702.75	698.78	699.14	15	148	0.24	2.30	3.18	1.87	700.03	700.20	0.14	0.92	19.5	3.39
2	D103-D102	702.75	702.50	699.14	699.54	12	125	0.32	1.00	2.01	1.28	700.31	700.40	0.18	0.94	17.9	3.55
3	D104-D103	702.50	702.60	699.54	700.13	12	183	0.32	0.45	2.02	0.60	700.44	700.54	0.12	0.95	15.0	3.91
4	BLDG(S)-WYE	702.75	704.50	699.25	699.53	8	14	2.00	1.04	1.71	2.98	700.31	700.42	0.28	0.95	15.0	3.91
6	D201-11461	702.90	703.30	699.46	699.78	12	99	0.32	1.55	2.02	1.97	700.46	700.63	0.08	0.91	18.1	3.53
7	D202-D201	703.30	702.70	699.78	700.10	12	104	0.31	0.36	1.98	0.46	700.74	700.75	0.10	0.91	15.0	3.91
7	BLDG(N)-D201	703.30	704.50	699.65	699.80	8	15	1.00	1.08	1.21	3.08	700.74	700.86	0.29	0.95	15.0	3.91



FOR RCOC / PLANNING APPROVAL
 FOR ENGINEERING APPROVAL
 FOR SITE PLAN APPROVAL
 FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION
 FOR CITY SUBMISSION

ISSUE	DATE	BY	DESCRIPTION
5	10/11/2022	KTH	
4	07/11/2022	KTH	
3	05/11/2022	KTH	
2	02/14/2022	KTH	
1	02/09/2021	RAC	

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2690 CROOKS ROAD

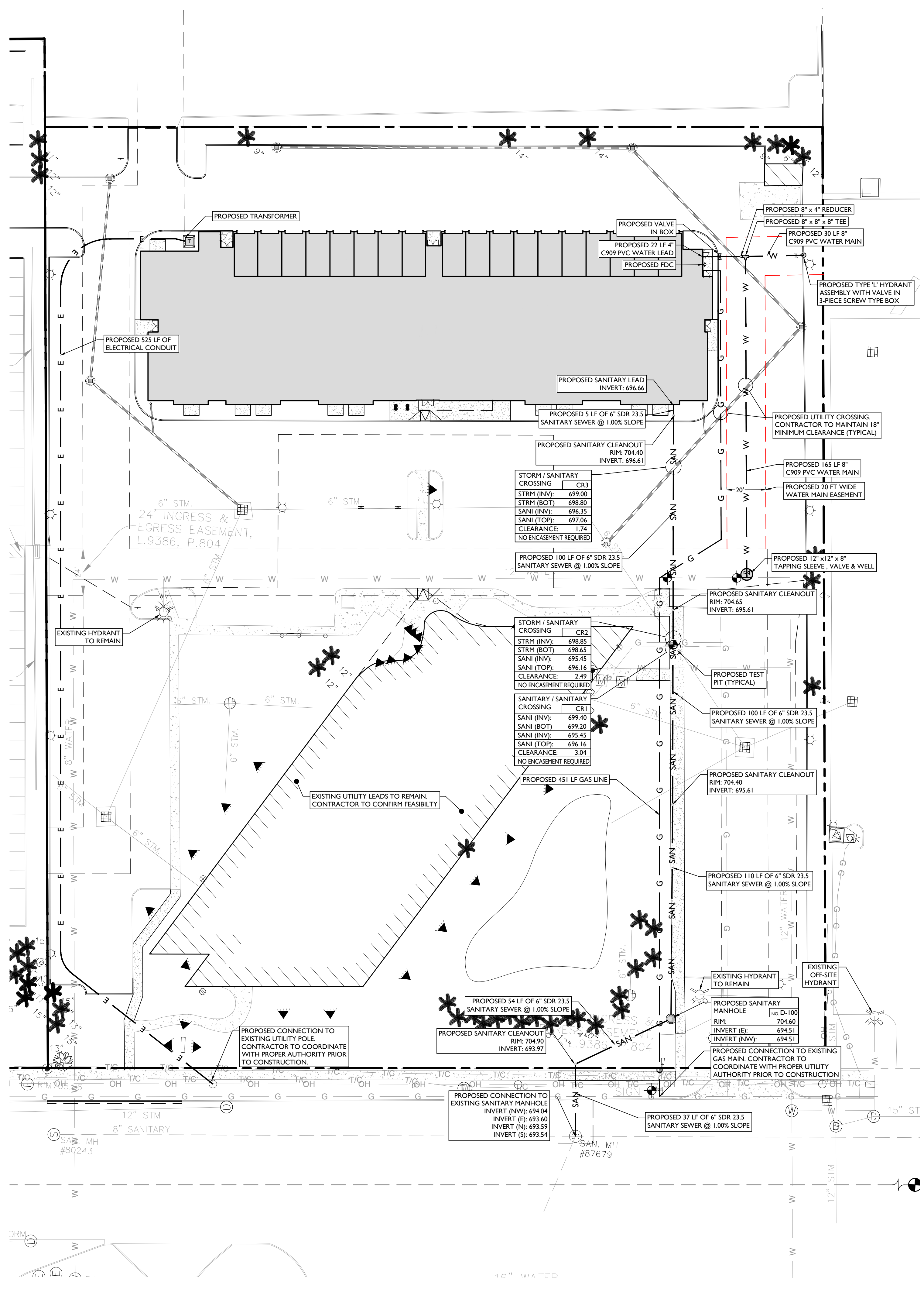
EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

SCALE: AS SHOWN PROJECT ID: M-19301.01

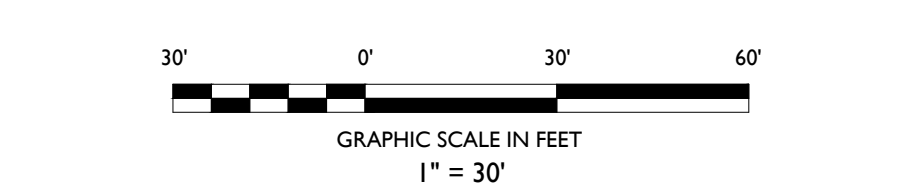
TITLE: STORMWATER MANAGEMENT PLAN

DRAWING: C-6



SYMBOL	DESCRIPTION
---	PROPERTY LINE
---	PROPOSED SANITARY LATERAL
---	PROPOSED DOMESTIC WATER SERVICE
---	PROPOSED ELECTRIC CONDUITS
---	PROPOSED GAS LINE
⊗	PROPOSED VALVE
⊕	PROPOSED WATER TEE / BEND
⊙	PROPOSED FIRE HYDRANT
⊕	PROPOSED FIRE DEPARTMENT CONNECTION (FDC)
⊙	PROPOSED SANITARY MANHOLE / CLEANOUT
⊕	PROPOSED TRANSFORMER ON CONCRETE PAD WITH BOLLARDS
⊙	PROPOSED TEST PIT
---	PROPOSED EASEMENT

- DRAINAGE AND UTILITY NOTES**
- THE CONTRACTOR IS REQUIRED TO CALL THE APPROPRIATE AUTHORITY FOR NOTICE OF CONSTRUCTION/EXCAVATION AND UTILITY MARK OUT PRIOR TO THE START OF CONSTRUCTION IN ACCORDANCE WITH STATE LAW. CONTRACTOR IS REQUIRED TO CONFIRM THE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES IN THE FIELD. SHOULD A DISCREPANCY EXIST BETWEEN THE FIELD LOCATION OF A UTILITY AND THE LOCATION SHOWN ON THE PLAN SET OR SURVEY, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IMMEDIATELY IN WRITING.
 - THE CONTRACTOR IS RESPONSIBLE TO PROTECT AND MAINTAIN IN OPERATION ALL UTILITIES NOT DESIGNATED TO BE REMOVED.
 - THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE TO ANY EXISTING UTILITY IDENTIFIED TO REMAIN WITHIN THE LIMITS OF THE PROPOSED WORK DURING CONSTRUCTION.
 - A MINIMUM HORIZONTAL SEPARATION OF 10 FEET IS REQUIRED BETWEEN ANY SANITARY SEWER SERVICE AND ANY WATER LINES. IF THIS SEPARATION CANNOT BE PROVIDED, A CONCRETE ENCASMENT SHALL BE UTILIZED FOR THE SANITARY SEWER SERVICE AS APPROVED BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - ALL WATER LINES SHALL BE VERTICALLY SEPARATED ABOVE SANITARY SEWER LINES BY A MINIMUM DISTANCE OF 18 INCHES. IF THIS SEPARATION CANNOT BE PROVIDED, A CONCRETE ENCASMENT SHALL BE UTILIZED FOR THE SANITARY SEWER SERVICE AS APPROVED BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR TO PERFORM A TEST PIT PRIOR TO CONSTRUCTION (RECOMMEND 30 DAYS PRIOR) AT LOCATIONS OF EXISTING UTILITY CROSSINGS FOR WATER AND SANITARY SEWER CONNECTION IMPROVEMENTS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IN WRITING.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING GAS, ELECTRIC AND TELECOMMUNICATION CONNECTIONS WITH THE APPROPRIATE GOVERNING AUTHORITY.
 - CONTRACTOR SHALL START CONSTRUCTION OF ANY GRAVITY SEWER AT THE LOWEST INVERT AND WORK UP-GRADE.
 - THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD SET OF PLANS REFLECTING THE LOCATION OF EXISTING UTILITIES THAT HAVE BEEN CAPPED, ABANDONED, OR RELOCATED BASED ON THE DEMOLITION/REMOVAL ACTIVITIES REQUIRED IN THIS PLAN SET. THIS DOCUMENT SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.
 - THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD OF THE AS-BUILT LOCATIONS OF ALL PROPOSED UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR SHALL NOTE ANY DISCREPANCIES BETWEEN THE AS-BUILT LOCATIONS AND THE LOCATIONS DEPICTED WITHIN THE PLAN SET. THIS RECORD SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.



FOR RCOC / PLANNING APPROVAL	KTH	BY
FOR ENGINEERING APPROVAL <td>07/11/2022</td> <td></td>	07/11/2022	
FOR SITE PLAN APPROVAL <td>05/31/2022</td> <td></td>	05/31/2022	
FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION <td>02/14/2022</td> <td></td>	02/14/2022	
FOR CITY SUBMISSION <td>02/09/2021</td> <td></td>	02/09/2021	

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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

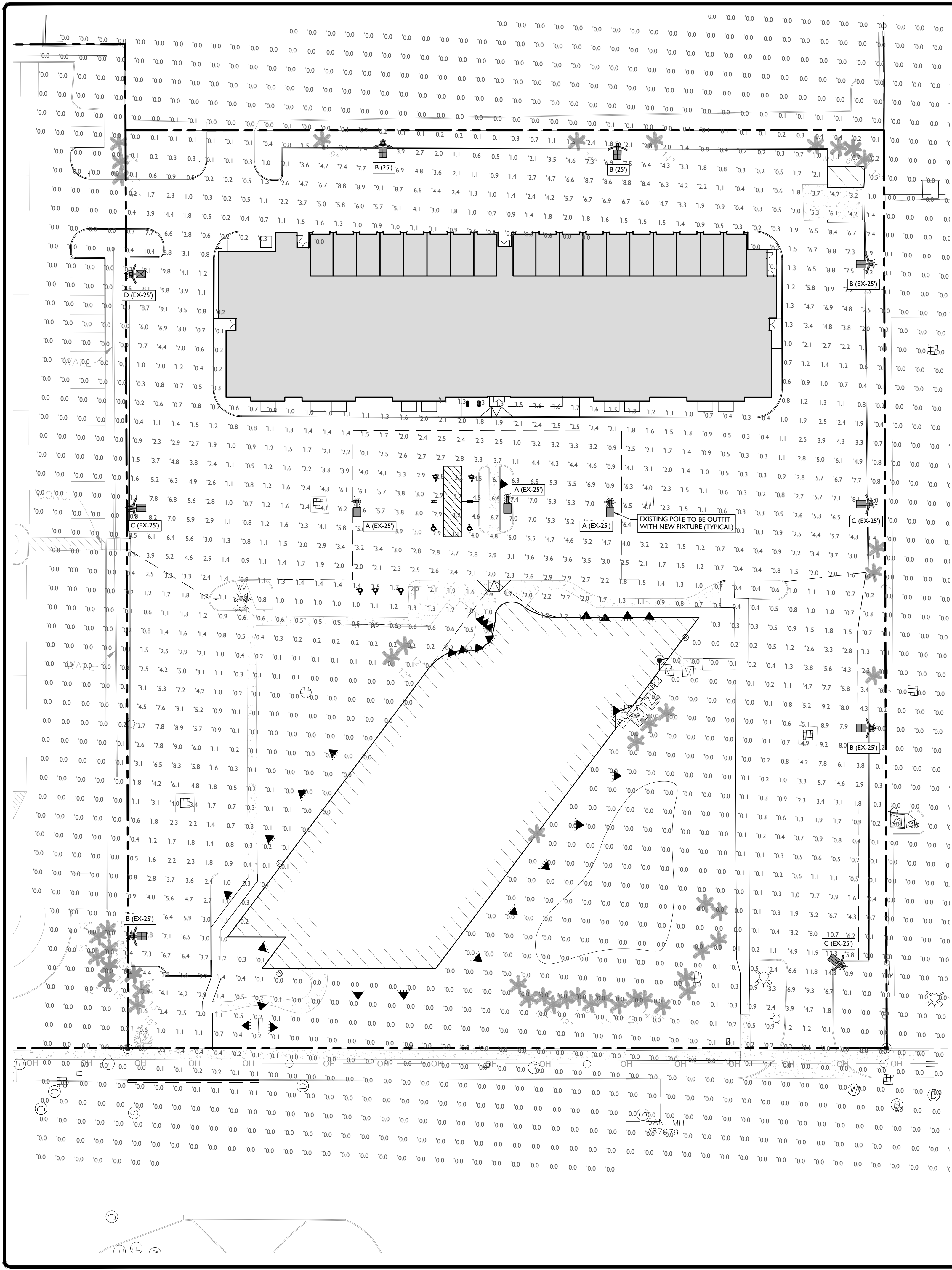
20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

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SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE: **UTILITY PLAN**

DRAWING: **C-7**



PROPOSED LUMINAIRE SCHEDULE						
SYMBOL	LABEL	QUANTITY	SECURITY LIGHTING	DISTRIBUTION	LLF	MANUFACTURER
	A	3	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE	V	0.90	LSI INDUSTRIES
	B	5	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE WITH HOUSE-SIDE SHIELD	III	0.90	LSI INDUSTRIES
	C	4	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE WITH HOUSE-SIDE SHIELD	FT	0.90	LSI INDUSTRIES
	D	1	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE WITH HOUSE-SIDE SHIELD	II	0.90	LSI INDUSTRIES

SYMBOL	DESCRIPTION
A (XX')	PROPOSED LIGHTING FIXTURE (MOUNTING HEIGHT)
XX	PROPOSED LIGHTING INTENSITY (FOOT-CANDLES)
	PROPOSED AREA LIGHT

**Mirada Medium - MRM
Outdoor LED Area Light**

The Mirada's sleek design makes it perfectly suited for architectural & commercial applications, while its cost-effective die-cast aluminum housing makes its installation cost very competitive. The Mirada offers high performance factory-rotatable silicone optics, 5-star-rated CCTs, 2200+ delivered lumens, and is available with integral Airstar™ Wireless Controls.

Features & Specifications

Optics System

- State-of-the-art one-piece silicone optic sheet delivers industry leading optical control with an improved gasket to provide 99% sealed optical chamber in 1 component.
- Proprietary silicone refractive optics provide exceptional coverage and uniformity in IES Types 2, 3, 5K, FT and FTA.
- Silicone optic material does not yellow or crack with age and provides a typical light transmittance of 92%.
- Zero sight.
- Available in 3000K, 4000K, 5000K, and 5700K color temperatures per ANSI C18.27. Also Available in Phosor Converter Amber with Peak Intensity of 650nm.
- Minimum CRI of 72.
- Integrated sensor (S) option available for improved back-light control without sacrificing street side performance. See page 5 for more details.

Electrical

- High performance driver features over-voltage, under-voltage, short-circuit and over temperature protection.
- 5-20V dimming (10%-100%) standard.
- Standard Universal Voltage (120-277 VAC) Input 50/60 Hz or optional High Voltage (240-480 VAC).
- L80 Calculated Life >100k Hours (See Lumen Maintenance on Page 2)
- Star terminals, die-cast, 20%.
- Operating temperature: -40°C to +60°C (-40°F to +122°F), 40L lumen package rated to +40°C.
- Power factor > 0.95.
- Input power stays constant over life.
- Field-replaceable surge protection device meets a minimum Category C Low operation per ANSI/IEEE C82.41.2.
- High efficiency LEDs mounted to heat-conductive circuit board to maximize heat dissipation.
- Components are fully enclosed in potting material for moisture resistance. Driver complies with FCC standards. Driver and key electronic components are easily accessible.

Product Dimensions

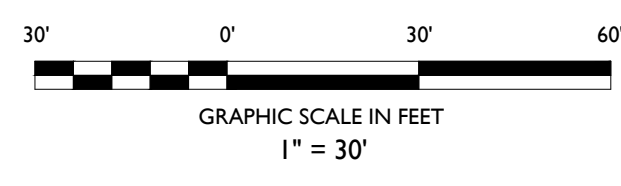
83 Pole Drill Pattern

LIGHTING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 13.05.C.1.A	FIXTURE SHIELDING: ALL PROPOSED FIXTURES ARE TO BE FULLY SHIELDED FROM ADJACENT PROPERTIES AND RIGHTS-OF-WAY	PROVIDED
§ 13.05.C.2.A-C	FREESTANDING POLE LIGHTING: MAXIMUM 20 FC DURING BUSINESS HOURS (10 FC AFTER HOURS) MAXIMUM 1.0 FC AT NON-RESIDENTIAL PROPERTY LINES MAXIMUM 0.1 FC AT ABUTTING RESIDENTIAL PROPERTY LINES	14.3 FC 0.8 FC N/A
§ 13.05.C.3	MAXIMUM FIXTURE HEIGHT OF 25'	25.0 FT

NOTE: ALL LIGHTING IS TO BE MEASURED AT 40' ABOVE GRADE

AREA LIGHTS 'A', 'B' & 'C'

- GENERAL LIGHTING NOTES**
- THE LIGHTING LEVELS DEPICTED WITHIN THE PLAN SET ARE CALCULATED UTILIZING DATA OBTAINED FROM THE LISTED MANUFACTURER. ACTUAL ILLUMINATION LEVELS AND PERFORMANCE OF ANY PROPOSED LIGHTING FIXTURE MAY VARY DUE TO UNCONTROLLABLE VARIABLES SUCH AS WEATHER, VOLTAGE SUPPLY, LAMP TOLERANCE, EQUIPMENT SERVICE LIFE AND OTHER VARIABLE FIELD CONDITIONS.
 - WHERE APPLICABLE, THE EXISTING LIGHT LEVELS DEPICTED WITHIN THE PLAN SET SHALL BE CONSIDERED APPROXIMATE. THE EXISTING LIGHT LEVELS ARE BASED ON FIELD OBSERVATIONS AND THE MANUFACTURER'S DATA OF THE ASSUMED OR MOST SIMILAR LIGHTING FIXTURE MODEL.
 - UNLESS NOTED ELSEWHERE WITHIN THIS PLAN SET, THE LIGHT LOSS FACTORS USED IN THE LIGHTING ANALYSIS ARE AS FOLLOWS:
 - LIGHT EMITTING DIODES (LED): 0.90
 - HIGH PRESSURE SODIUM: 0.72
 - METAL HALIDE: 0.72
 - THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IN WRITING, PRIOR TO THE START OF CONSTRUCTION, OF ANY PROPOSED LIGHTING LOCATIONS THAT CONFLICT WITH EXISTING/PROPOSED DRAINAGE, UTILITY, OR OTHER IMPROVEMENTS.
 - THE CONTRACTOR IS RESPONSIBLE TO PREPARE A WIRING PLAN AND PROVIDE ELECTRIC SERVICE TO ALL PROPOSED LIGHTING FIXTURES. THE CONTRACTOR IS REQUIRED TO PREPARE AN AS-BUILT PLAN OF WIRING AND PROVIDE COPIES TO THE OWNER AND STONEFIELD ENGINEERING & DESIGN, LLC.



FOR RCC/PLANNING APPROVAL
FOR ENGINEERING APPROVAL
FOR SITE PLAN REVIEW
FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION
FOR CITY SUBMISSION

5 10/11/2022 KTH
4 07/11/2022 KTH
3 05/31/2022 KTH
2 02/14/2022 KTH
1 02/09/2021 RAC

ISSUE DATE BY

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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION &
PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

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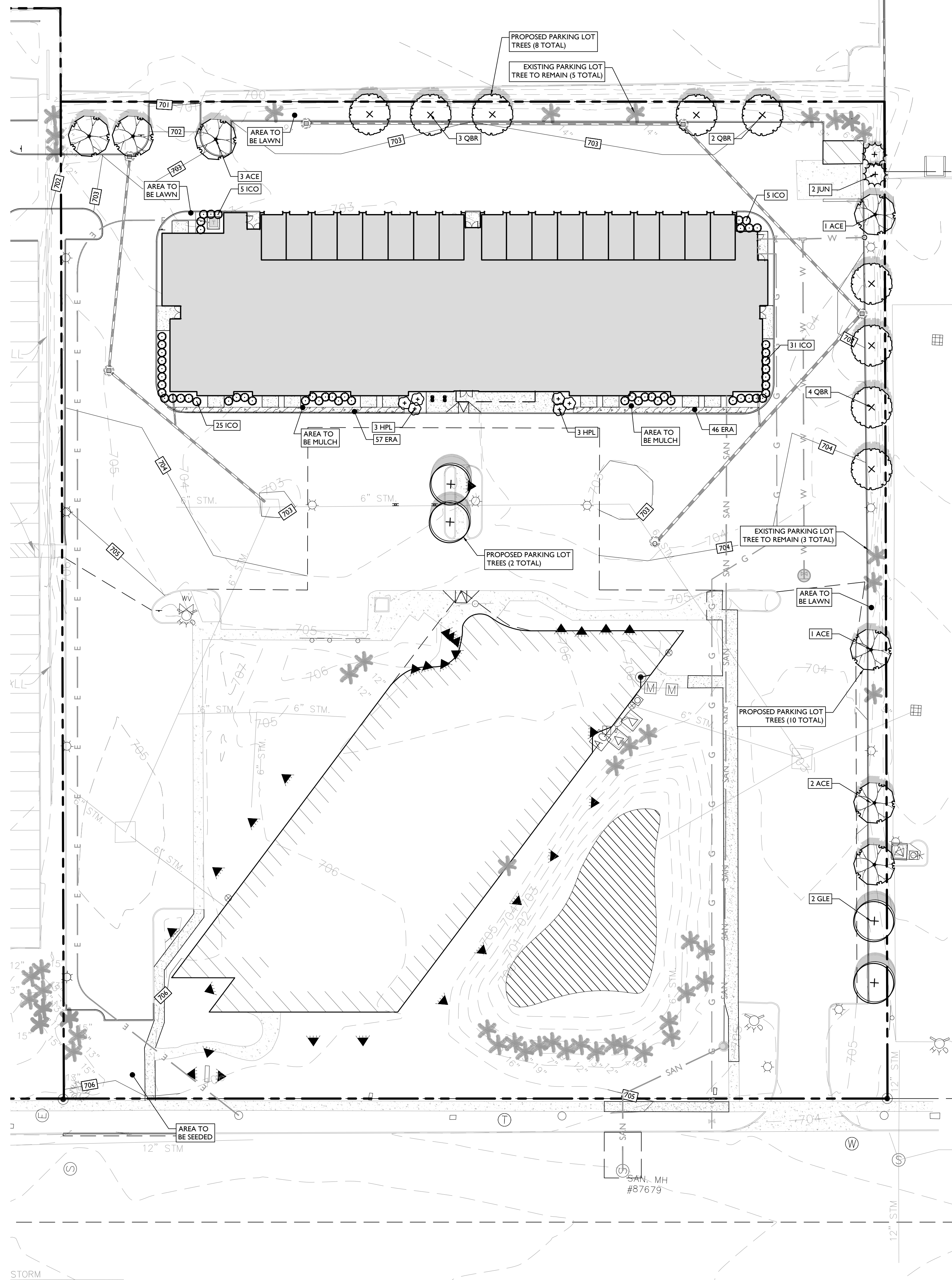
SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE:

LIGHTING PLAN

DRAWING:

C-8

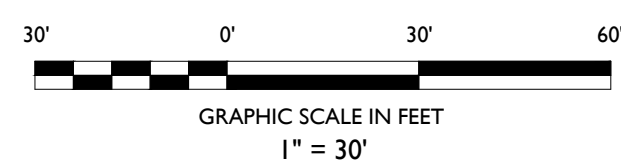
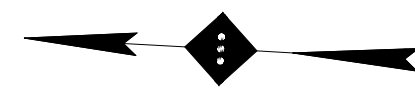


LANDSCAPING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 13.02.C-2	PARKING LOT LANDSCAPING: CURBED ISLANDS SHALL BE A MINIMUM OF 200 SF 1 TREE PER EVERY 8 PARKING SPACES (206 SURFACE SPACES) (1 TREE / 8 SPACES) = 26 TREES	COMPLIES 28 TREES
§ 13.02.D-2	ROW GREENBELT: MINIMUM WIDTH: 10 FT 1 DECIDUOUS TREE PER 30 LF (369 LF) (1 TREE / 30 LF) = 13 TREES	37.70 FT 13 EXISTING TREES
§ 13.02.E-1	SITE LANDSCAPING: (**) 15% OF THE SITE AREA SHALL BE LANDSCAPED (193,599 SF)(0.15) = 29,040 SF	27.8% (53,849 SF)
§ 13.03.B	TRASH ENCLOSURE SCREENING: MINIMUM HEIGHT 6 FT CANNOT BE LOCATED IN A FRONT YARD SETBACK	PROPOSED COMPLIES

(*) DECIDUOUS TREES WITHIN GREENBELT SHALL BE A MINIMUM CALIPER OF TWO AND A HALF (2 1/2) INCHES OR GREATER
 (***) UP TO 35% OF THE REQUIRED LANDSCAPE AREA MAY BE BRICK, STONE, PAVERS, OR OTHER PUBLIC PLAZA ELEMENTS

PLANT SCHEDULE							
DECIDUOUS TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	ACE	7	ACER SACCHARUM	SUGAR MAPLE	2.5" - 3" CAL	B&B	AS SHOWN
	GLE	4	GLEDITSIA TRIACANTHOS	HONEY LOCUST	2.5" - 3" CAL	B&B	AS SHOWN
	QBR	9	QUERCUS BOREALIS	NORTHERN RED OAK	2.5" - 3" CAL	B&B	AS SHOWN
EVERGREEN TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	JUN	2	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	6' - 7' HT	B&B	AS SHOWN
SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	HPL	6	HYDRANGEA PANICULATA 'LIMELIGHT'	LIME LIGHT PANICLE HYDRANGEA	24" - 30"	POT	AS SHOWN
EVERGREEN SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	ICO	55	ILEX GLABRA 'COMPACTA'	COMPACT INKBERRY	18" - 24"	POT	AS SHOWN
GRASSES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	ERA	93	ERAGROSTIS SPECTABILIS	PURPLE LOVE GRASS	1 GAL.	POT	30' o.c.

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN ON THE LANDSCAPE PLAN AND WITHIN THE PLANT LIST, THE PLAN SHALL DICTATE.



ISSUE	DATE	BY	DESCRIPTION
5	10/11/2022	KTH	FOR RCOC / PLANNING APPROVAL
4	07/11/2022	KTH	FOR ENGINEERING APPROVAL
3	05/11/2022	KTH	FOR SITE PLAN APPROVAL
2	02/14/2022	KTH	FOR SITE PLAN REVIEW & SPECIAL LAND USE SUBMISSION
1	02/09/2021	RAC	FOR CITY SUBMISSION

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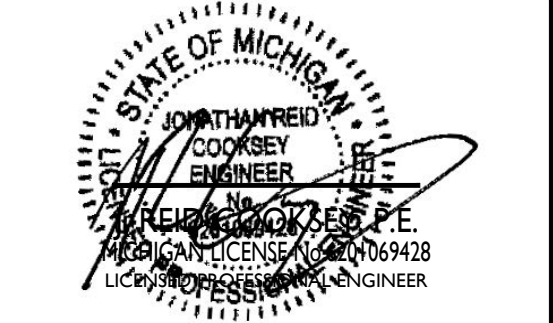
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 Phone 248.247.1115

SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
 2690 CROOKS ROAD
 CITY OF TROY
 OAKLAND COUNTY, MICHIGAN



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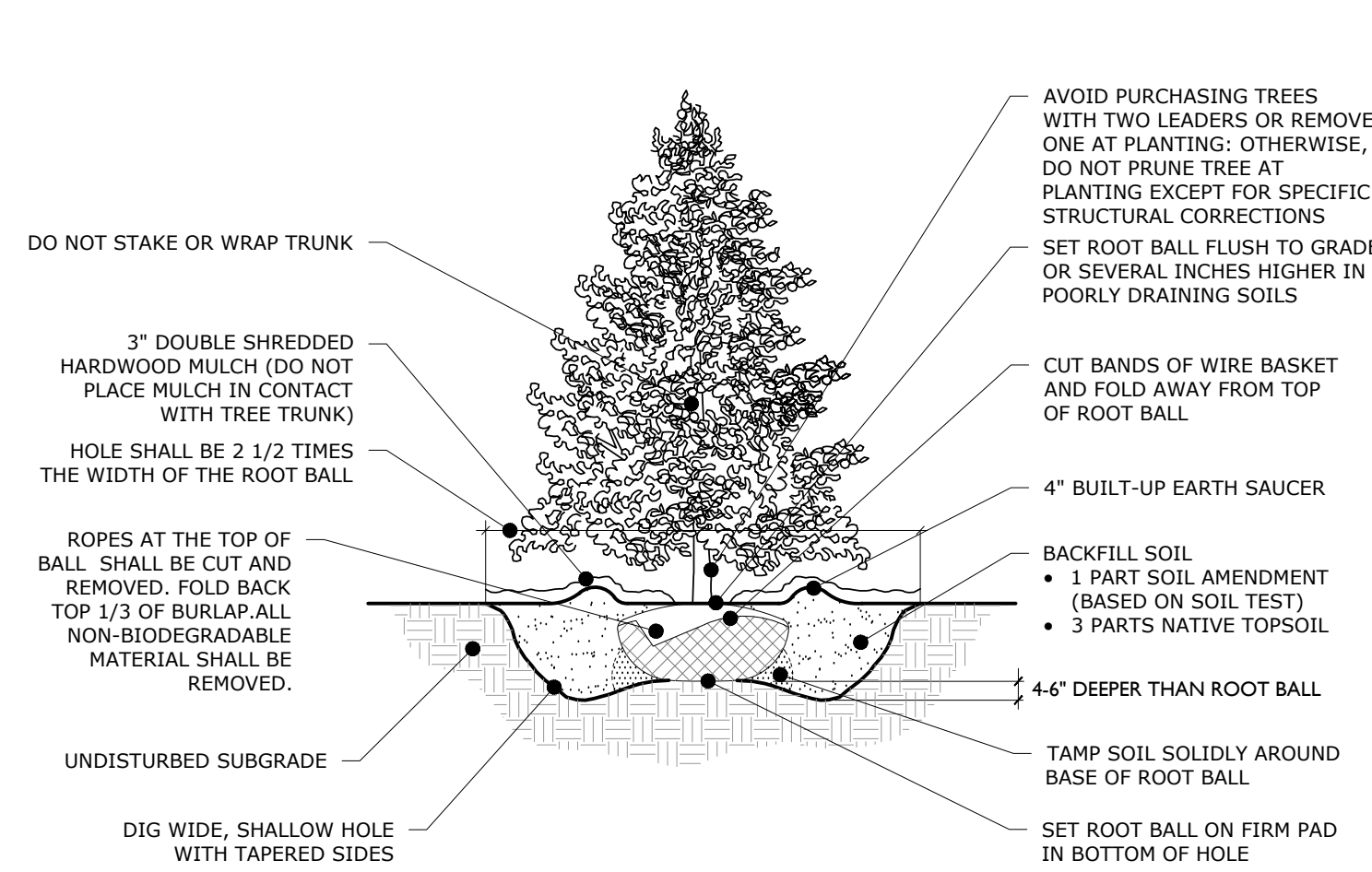
SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE:
LANDSCAPING PLAN

DRAWING:
C-9

NOTES:

- 1. FOR CONTAINER-GROWN TREES, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS...

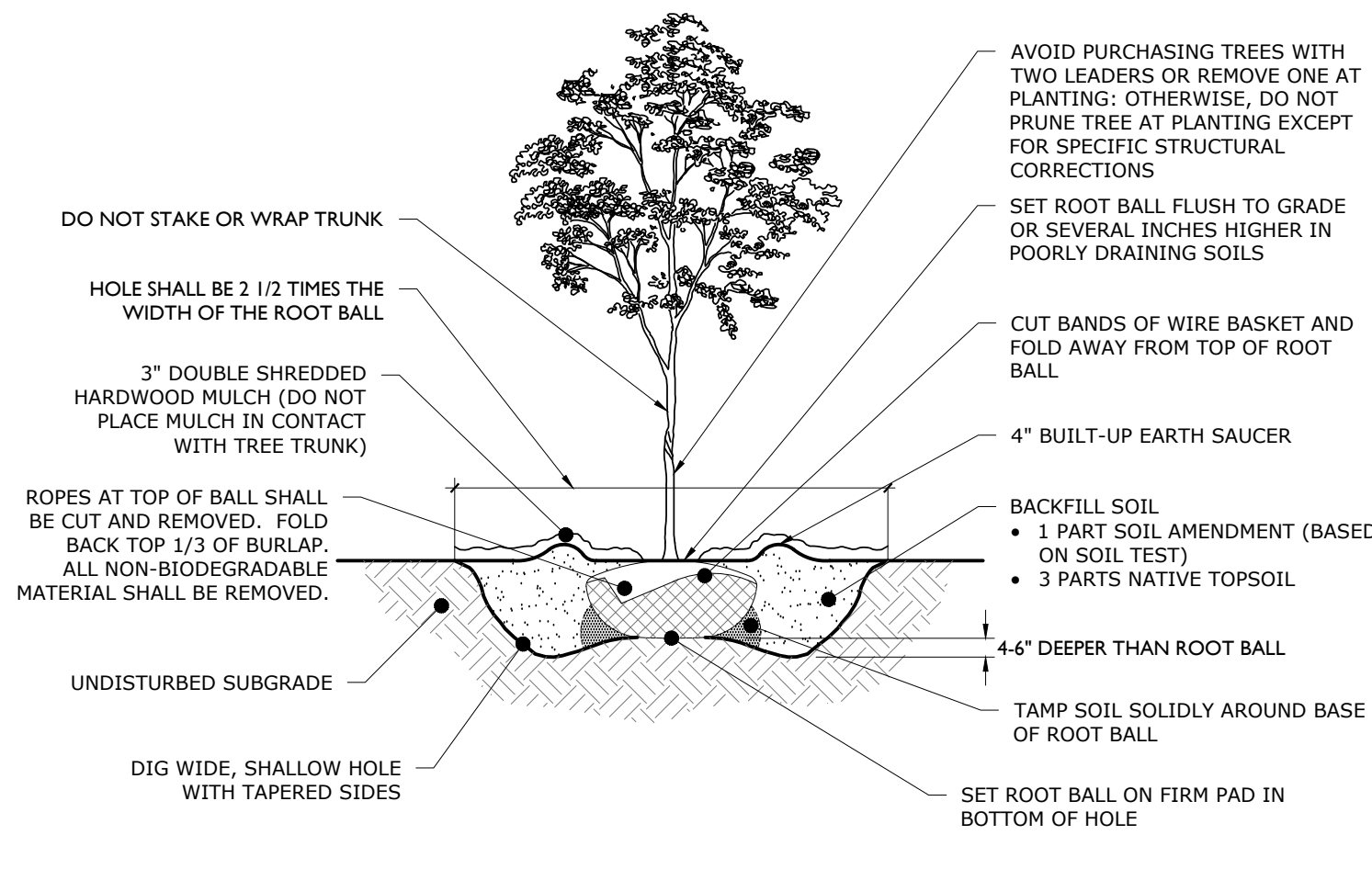


EVERGREEN TREE PLANTING DETAIL

NOT TO SCALE

NOTES:

- 1. FOR CONTAINER-GROWN TREES, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS...



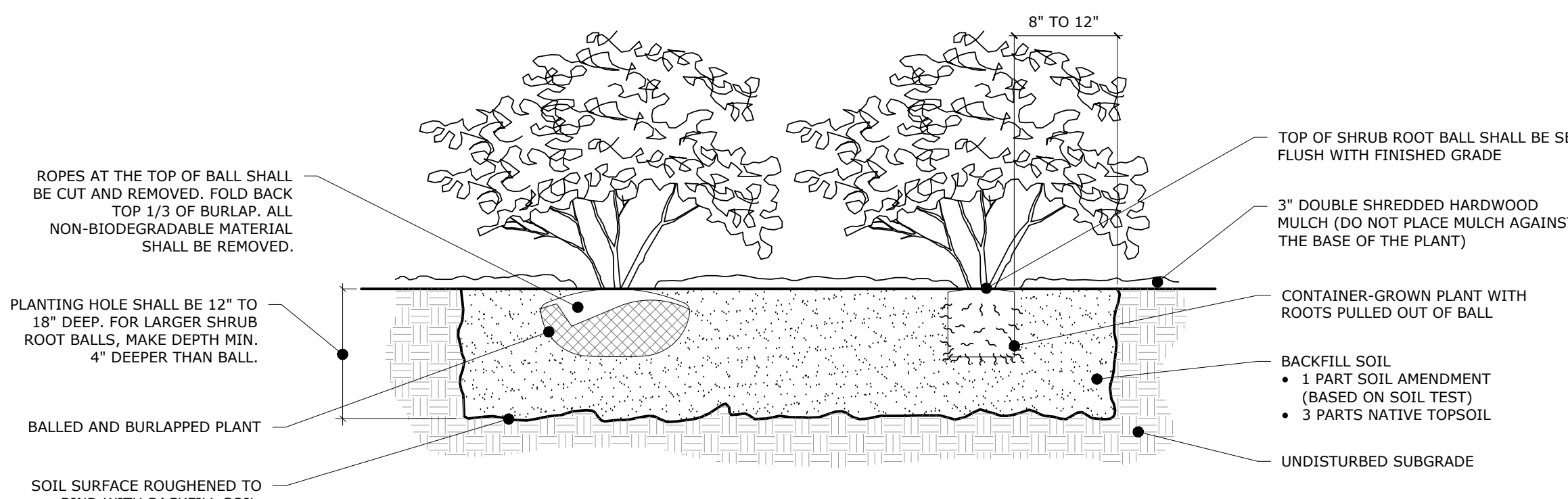
DECIDUOUS TREE PLANTING DETAIL

NOT TO SCALE

2

NOTES:

- 1. FOR THE CONTAINER-GROWN SHRUBS, USE FINGERS OR SMALL HAND TOOL TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS...



DECIDUOUS AND EVERGREEN SHRUB PLANTING DETAIL

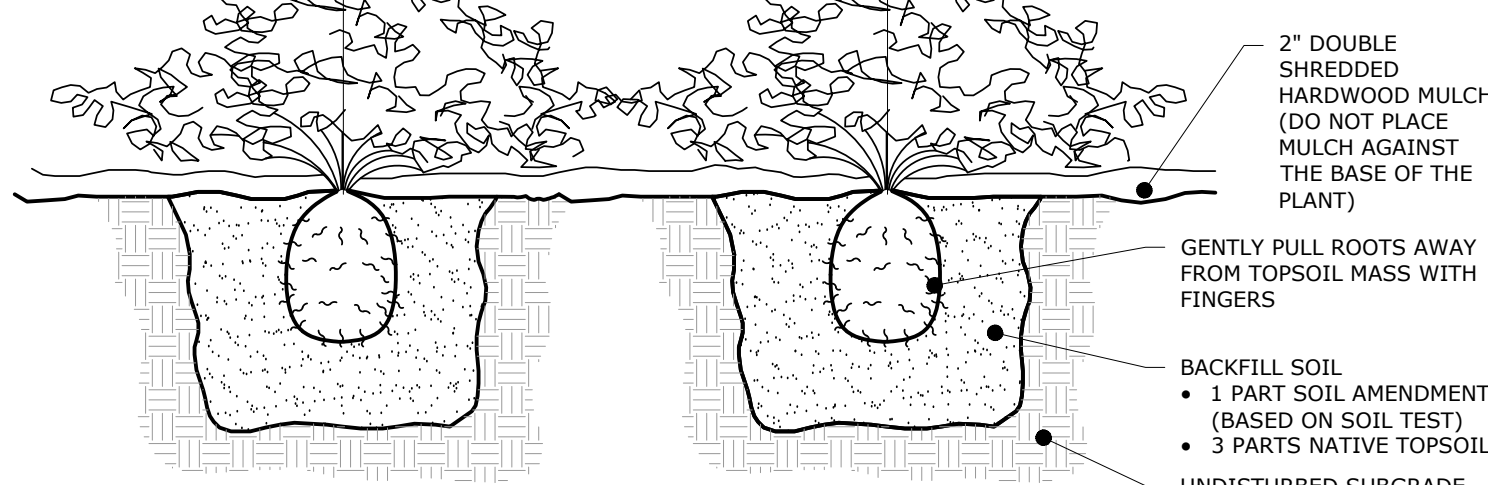
NOT TO SCALE

3

NOTES:

- 1. THOROUGHLY SOAK THE GROUND COVER ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.

Table with 2 columns: SPACING 'D', ROW 'A'. Lists spacing options from 6" to 36" and corresponding row lengths.



GROUND COVER/PERENNIAL/ANNUAL PLANTING DETAIL

NOT TO SCALE

4

GENERAL LANDSCAPING NOTES:

- 1. THE LANDSCAPE CONTRACTOR SHALL FURNISH ALL MATERIALS AND PERFORM ALL WORK IN ACCORDANCE WITH THESE SPECIFICATIONS, APPROVED OR FINAL DRAWINGS, AND INSTRUCTIONS PROVIDED BY THE PROJECT LANDSCAPE DESIGNER...

PROTECTION OF EXISTING VEGETATION NOTES:

- 1. BEFORE COMMENCING WORK, ALL EXISTING VEGETATION WHICH COULD BE IMPACTED AS A RESULT OF THE PROPOSED CONSTRUCTION ACTIVITIES MUST BE PROTECTED FROM DAMAGE BY THE INSTALLATION OF TREE PROTECTION FENCING...

SOIL PREPARATION AND MULCH NOTES:

- 1. LANDSCAPE CONTRACTOR SHALL OBTAIN A SOIL TEST OF THE INSTITU TOPSOIL BY A CERTIFIED SOIL LABORATORY PRIOR TO PLANTING. LANDSCAPE CONTRACTOR SHALL ALLOW FOR A TWO WEEK TURNAROUND TIME FROM SUBMITTAL OF SAMPLE TO NOTIFICATION OF RESULTS...

PLANT QUALITY AND HANDLING NOTES:

- 1. ALL PLANT MATERIAL SHALL CONFORM TO THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z601-2004) OR LATEST REVISION AS PUBLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION.

- 10. LANDSCAPE CONTRACTOR SHALL MAKE BEST EFFORT TO INSTALL PLANTINGS ON THE SAME DAY AS DELIVERY. IF PLANTS ARE NOT PLANTED IMMEDIATELY ON SITE, PROPER CARE SHALL BE TAKEN TO PLACE THE PLANTINGS IN PARTIAL SHADE...

- 17. IF A PROPOSED PLANT IS UNAVAILABLE OR ON THE FALL DIGGING HAZARD LIST, AN EQUIVALENT SPECIES OF THE SAME SIZE MAY BE REQUESTED FOR SUBSTITUTION OF THE ORIGINAL PLANT. ALL SUBSTITUTIONS SHALL BE APPROVED BY THE PROJECT LANDSCAPE DESIGNER OR MUNICIPAL OFFICIAL PRIOR TO ORDERING AND INSTALLATION.

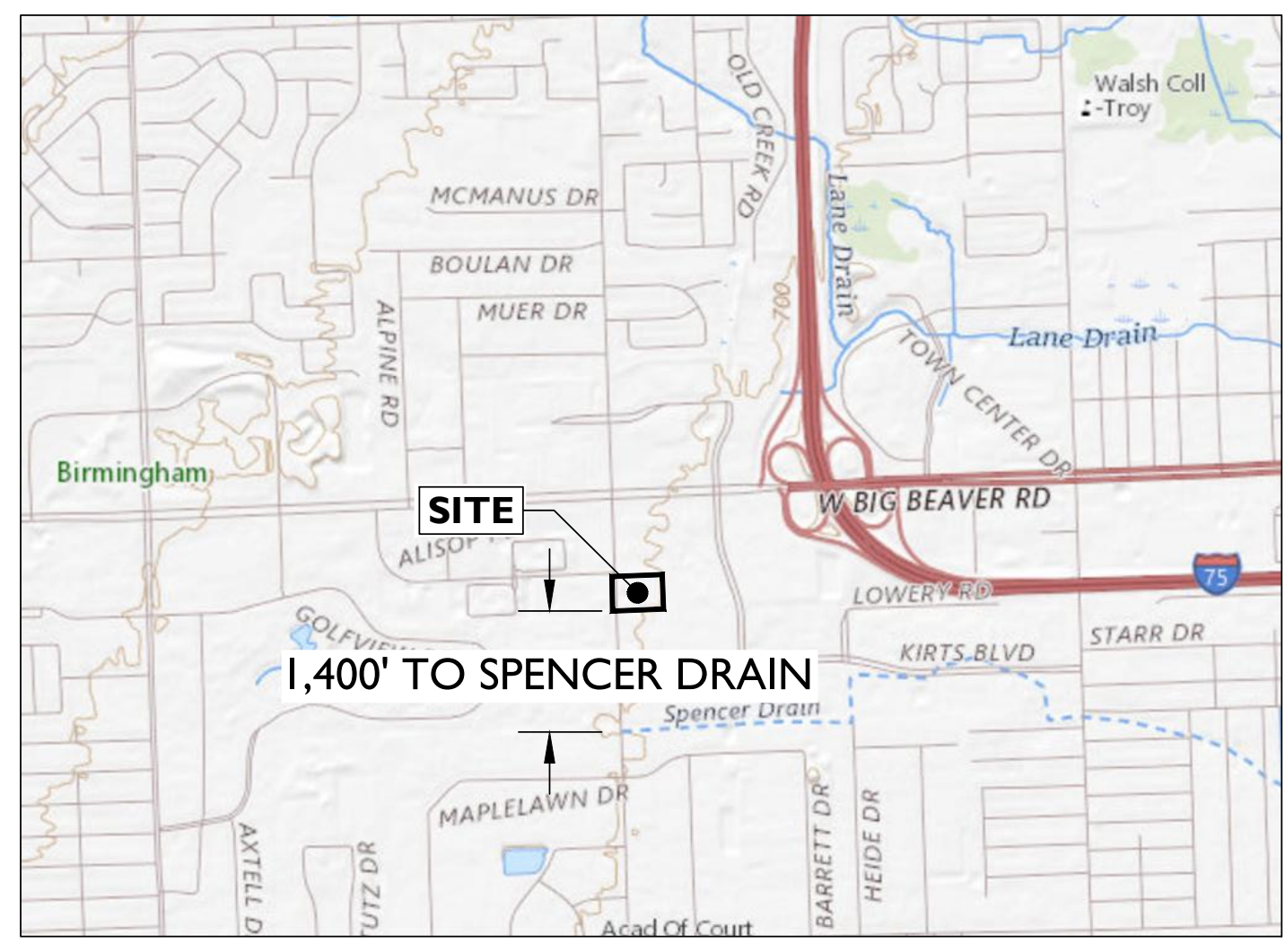
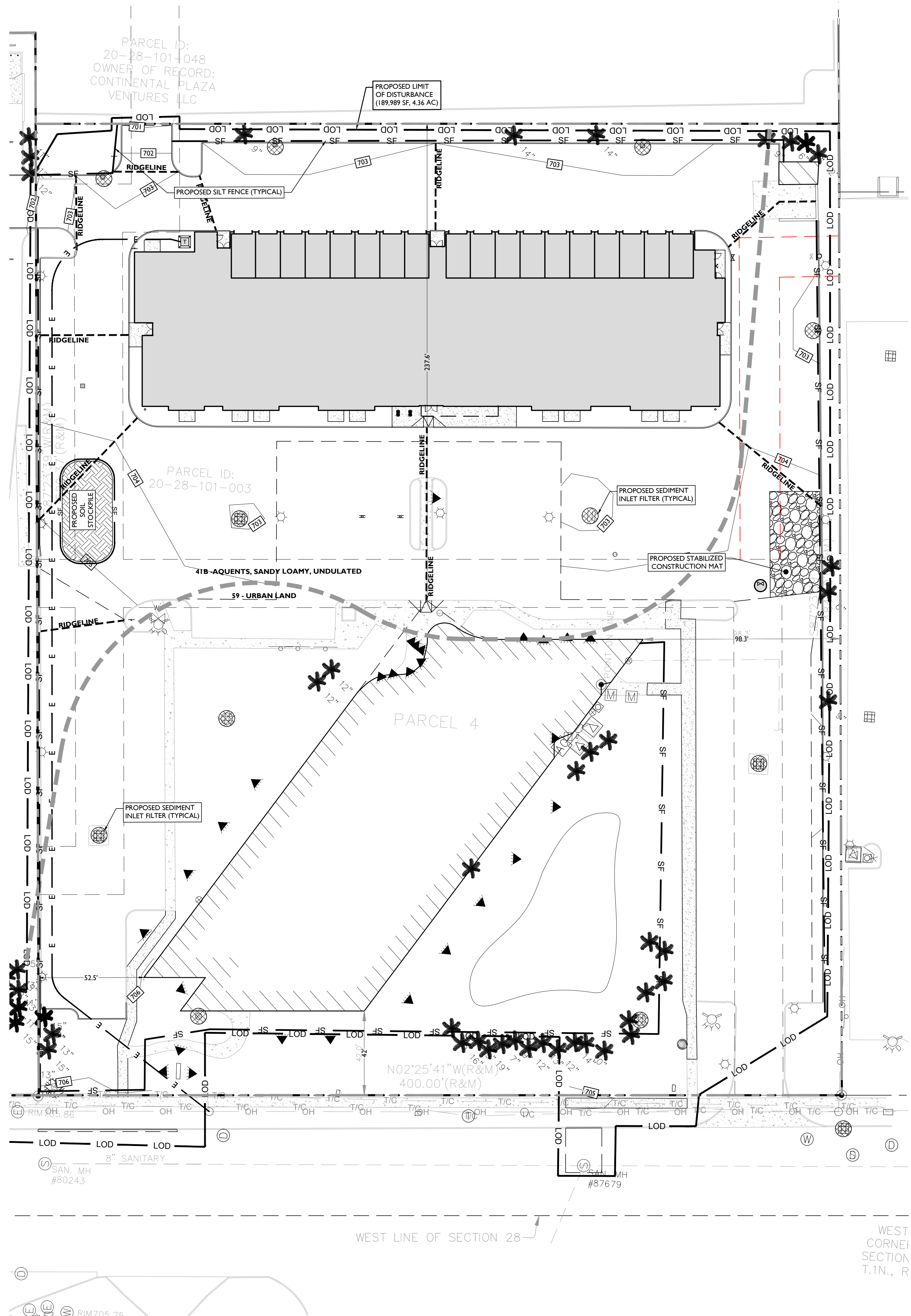
PLANT MATERIAL GUARANTEE NOTES:

- 1. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE YEAR (1 YR.) FROM APPROVAL OF LANDSCAPE INSTALLATION BY THE PROJECT LANDSCAPE DESIGNER, MUNICIPAL OFFICIAL, OR OWNER/OWNER'S REPRESENTATIVE.

LAWN (SEED OR SOD) NOTES:

- 1. SEED MIXTURE SHALL BE FRESH, CLEAN, NEW CROP SEED. SOD SHALL BE STRONGLY ROOTED, UNIFORM IN THICKNESS, AND FREE OF WEEDS, DISEASE, AND PESTS.

Project information block including Stonefield engineering & design logo, address (2690 Crooks Road), phone number, and a table with project milestones and dates.



PROPERTY DESCRIPTION

THE LAND SITUATED IN THE TROY, COUNTY OF OAKLAND, STATE OF MICHIGAN, IS DESCRIBED AS FOLLOWS:

PARCEL 4:
THE EAST 484 FEET OF THE WEST 544 FEET OF THE SOUTH 400 FEET OF THE NORTH 1/2 OF THE NORTHWEST 1/4 CORNER OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN.

SYMBOL	DESCRIPTION
---	PROPERTY BOUNDARY
- - - -	ADJACENT PROPERTY BOUNDARY
---	LOD
---	PROPOSED SILT FENCE
[Symbol]	PROPOSED STOCKPILE & EQUIPMENT STORAGE
[Symbol]	PROPOSED STABILIZED CONSTRUCTION ENTRANCE
[Symbol]	PROPOSED INLET PROTECTION FILTER

- SOIL EROSION AND SEDIMENT CONTROL NOTES**
1. THE CONTRACTOR IS RESPONSIBLE FOR SOIL EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
 2. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL AIR QUALITY STANDARDS.
 3. THE CONTRACTOR IS RESPONSIBLE TO INSPECT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES WEEKLY AND AFTER A PRECIPITATION EVENT GREATER THAN 1 INCH. THE CONTRACTOR SHALL MAINTAIN AN INSPECTION LOG ON SITE AND DOCUMENT CORRECTIVE ACTION TAKEN THROUGHOUT THE COURSE OF CONSTRUCTION AS REQUIRED.

- ENVIRONMENTAL NOTES:**
1. THERE ARE NO RIPARIAN ZONES ON SITE
 2. NO PORTION OF THIS SITE LIES WITHIN A FLOOD HAZARD AREA
 3. THERE ARE NO WETLANDS ON SITE
 4. ALL ELEVATIONS SHOWN ARE BASED ON NAVD 1988 DATUM

SITE BENCHMARK #3
ARROW ON HYDRANT, ±40' SW OF SW CORNER OF POND.
ELEVATION = 707.24' (NAVD 88 DATUM)

SITE BENCHMARK #4
ARROW ON HYDRANT, NEAR NE CORNER OF BUILDING.
ELEVATION = 708.34' (NAVD 88 DATUM)

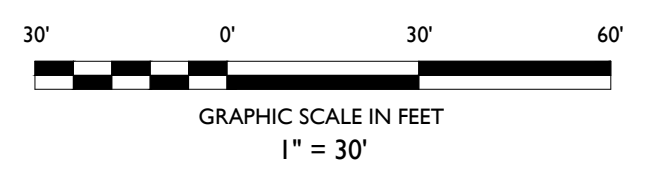
- SEQUENCE OF CONSTRUCTION**
1. INSTALL SILT FENCE AND CONSTRUCTION ENTRANCE (2 DAYS).
 2. SITE DEMOLITION (20 DAYS).
 3. ROUGH GRADING AND TEMPORARY SEEDING (20 DAYS).
 4. EXCAVATE AND INSTALL DRAINAGE PIPING, AND INLETS (10 DAYS).
 5. INSTALL INLET FILTERS (1 DAY).
 6. BUILDING CONSTRUCTION AND SITE IMPROVEMENTS (100 DAYS).
 7. LANDSCAPING IMPROVEMENTS AND FINAL SEEDING (10 DAYS).
 8. REMOVE SOIL EROSION MEASURES (2 DAYS).
- NOTE: TIME DURATIONS ARE APPROXIMATE AND ARE INTENDED TO ACT AS A GENERAL GUIDE TO THE CONSTRUCTION TIMELINE. ALL DURATIONS ARE SUBJECT TO CHANGE BY CONTRACTOR. CONTRACTOR SHALL SUBMIT CONSTRUCTION SCHEDULE TO TOWNSHIP AND ENGINEER. CONTRACTOR SHALL PHASE CONSTRUCTION ACCORDINGLY.

SOIL CHARACTERISTICS CHART

TYPE OF SOIL	59 - URBAN LAND
PERCENT OF SITE COVERAGE	47.3%
HYDROLOGIC SOIL GROUP	D
DEPTH TO RESTRICTIVE LAYER	> 80 INCHES
SOIL PERMEABILITY	0.00 TO 0.00 IN / HR
DEPTH TO WATER TABLE	> 80 INCHES

SOIL CHARACTERISTICS CHART

TYPE OF SOIL	418 - AQUENTS, SANDY LOAMY, UNDLATED
PERCENT OF SITE COVERAGE	52.6%
HYDROLOGIC SOIL GROUP	A/D
DEPTH TO RESTRICTIVE LAYER	> 80 INCHES
SOIL PERMEABILITY	5.95 TO 19.98 IN
DEPTH TO WATER TABLE	ABOUT 0 INCHES



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1	02/09/2021	RAC	FOR CITY SUBMISSION

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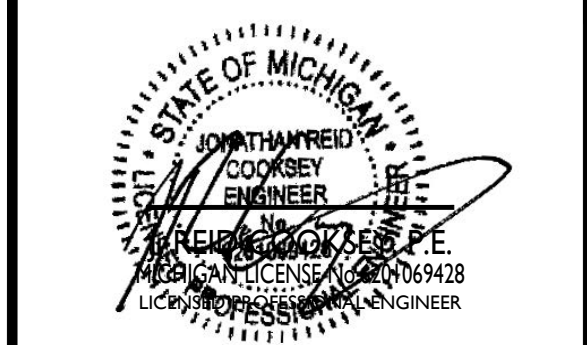
607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

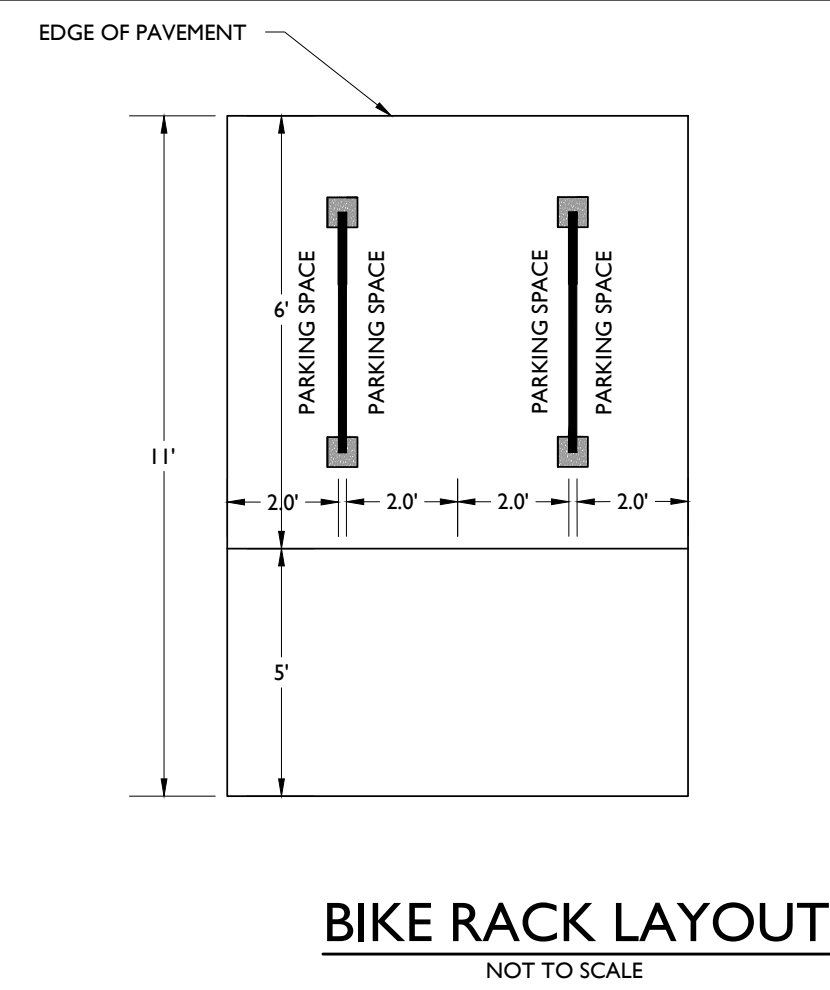
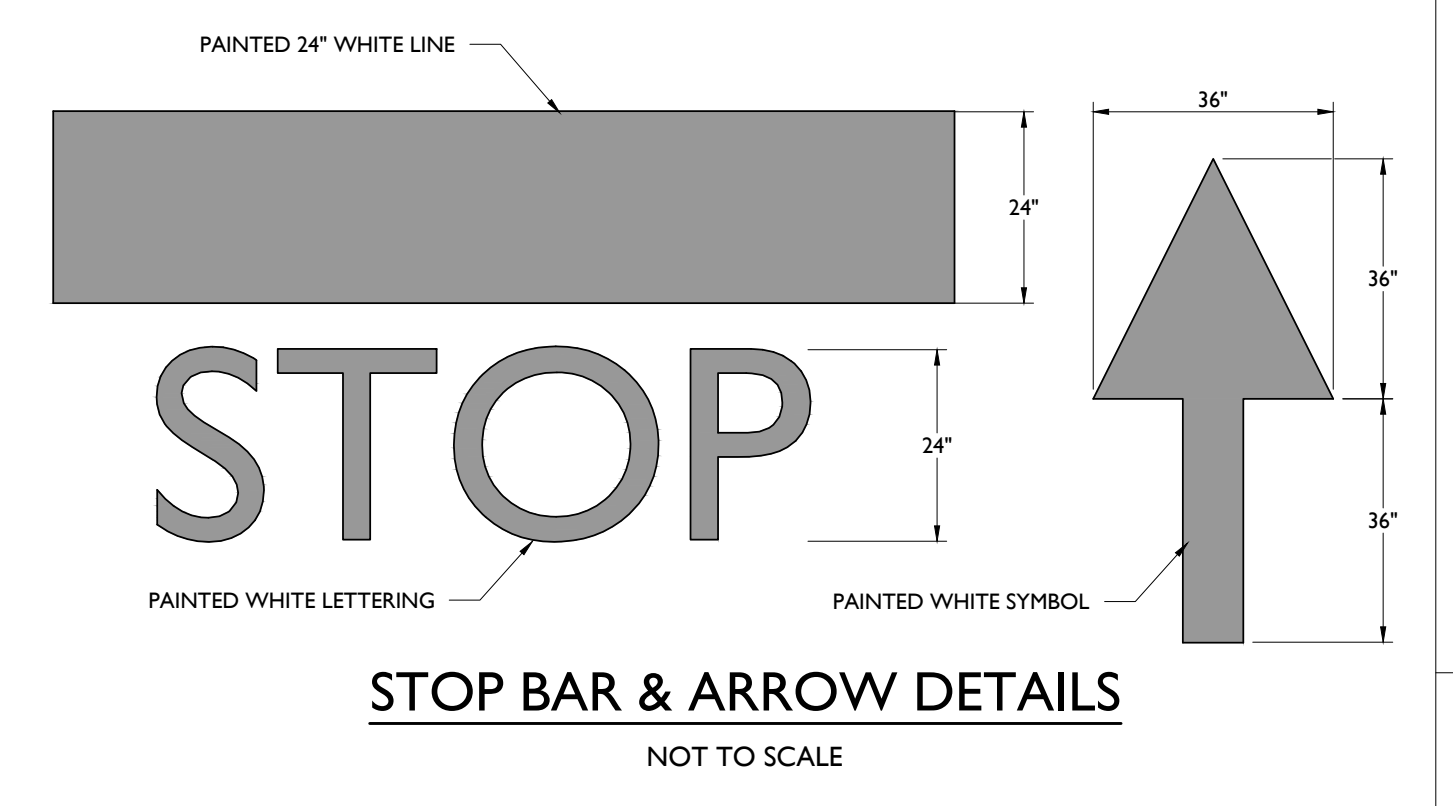
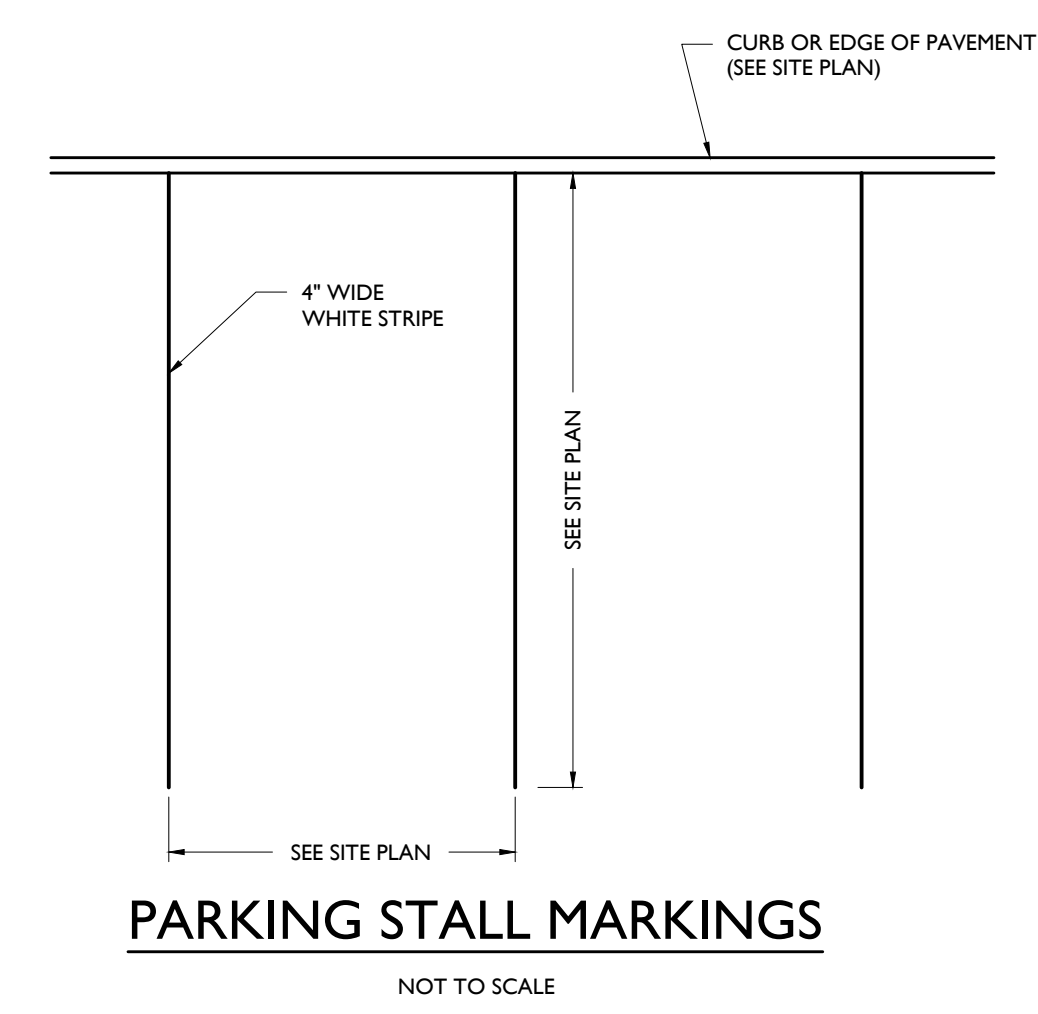
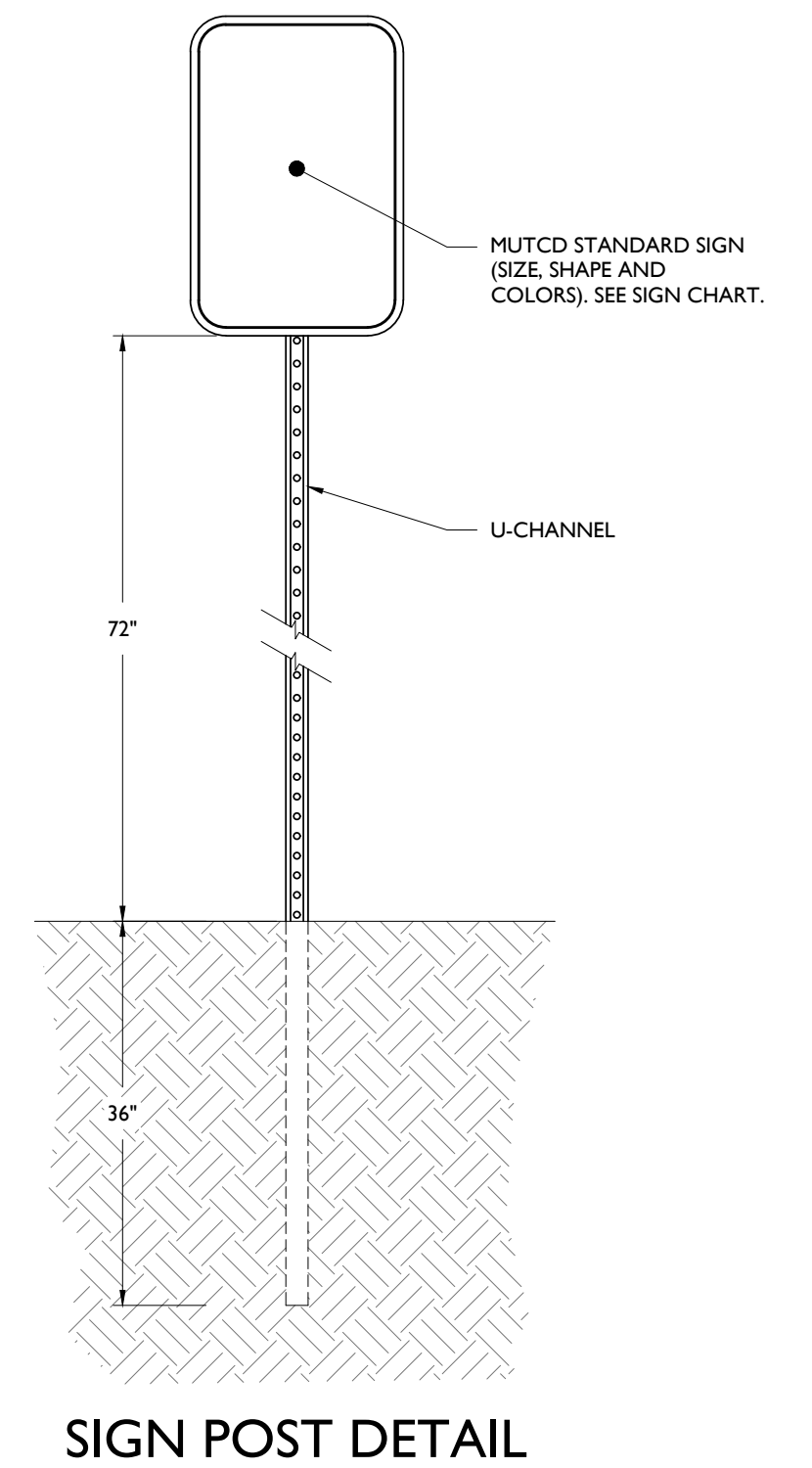
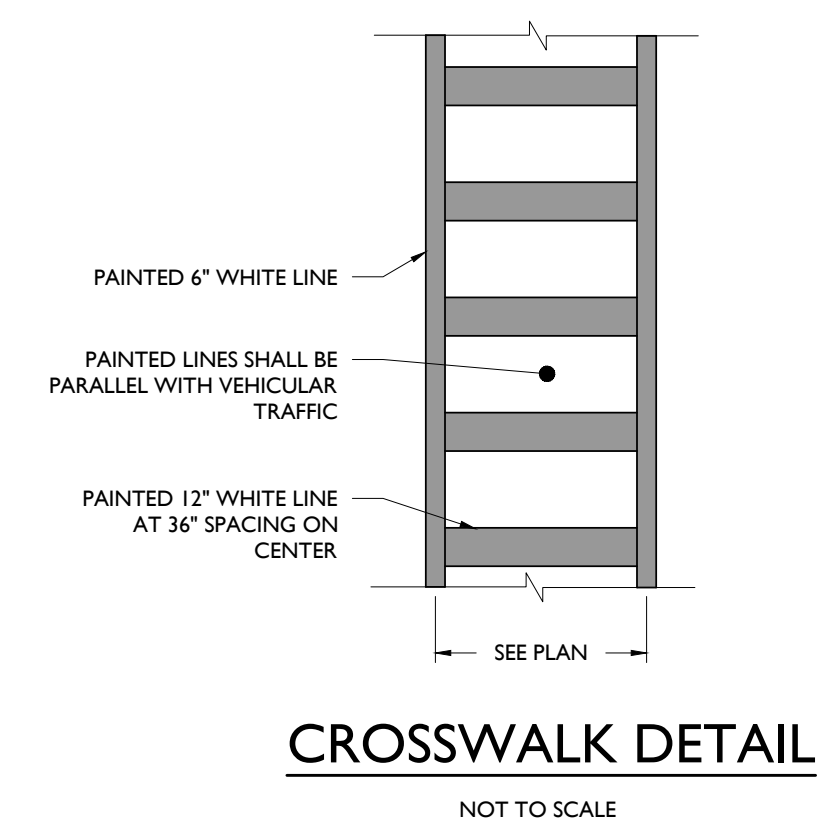
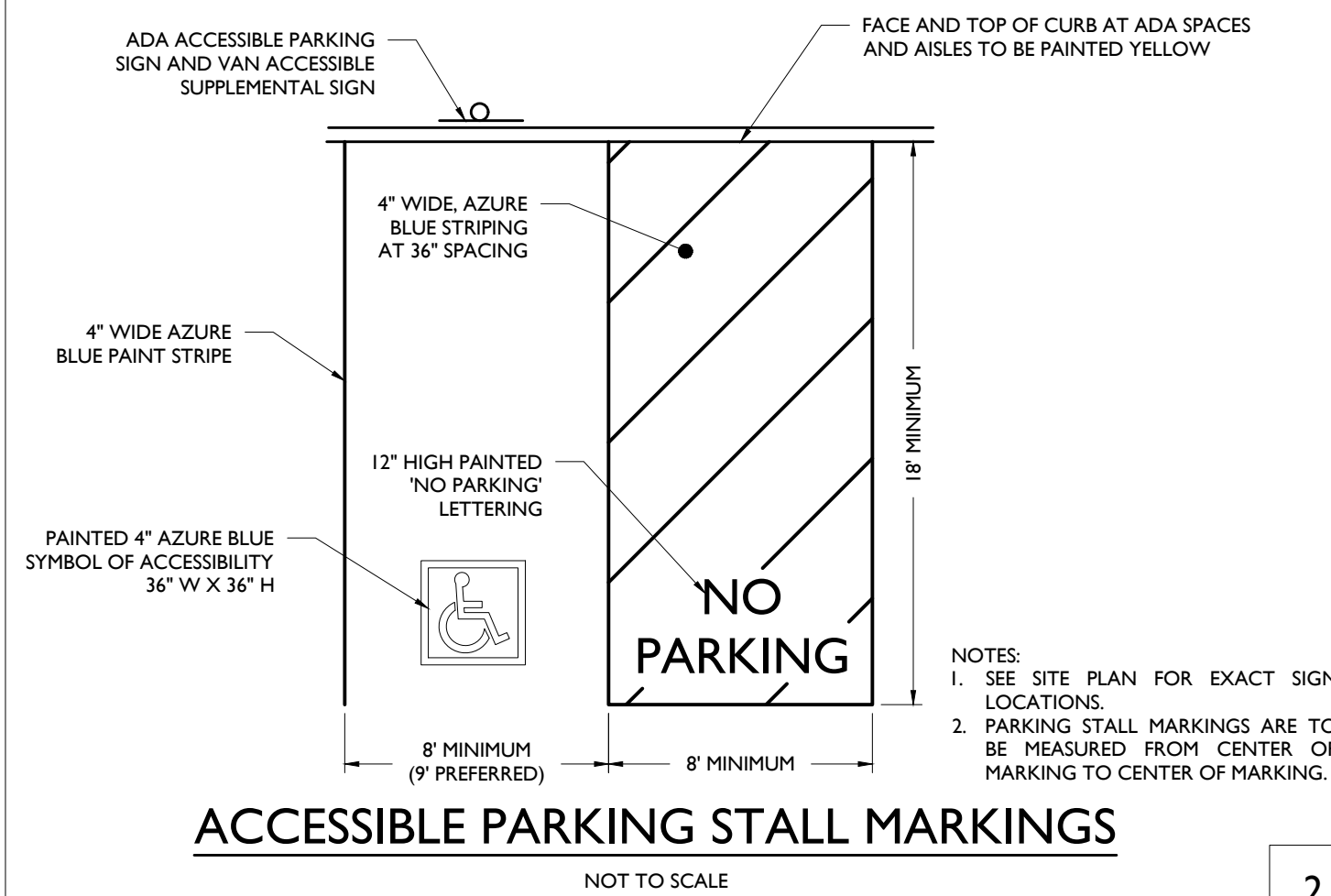
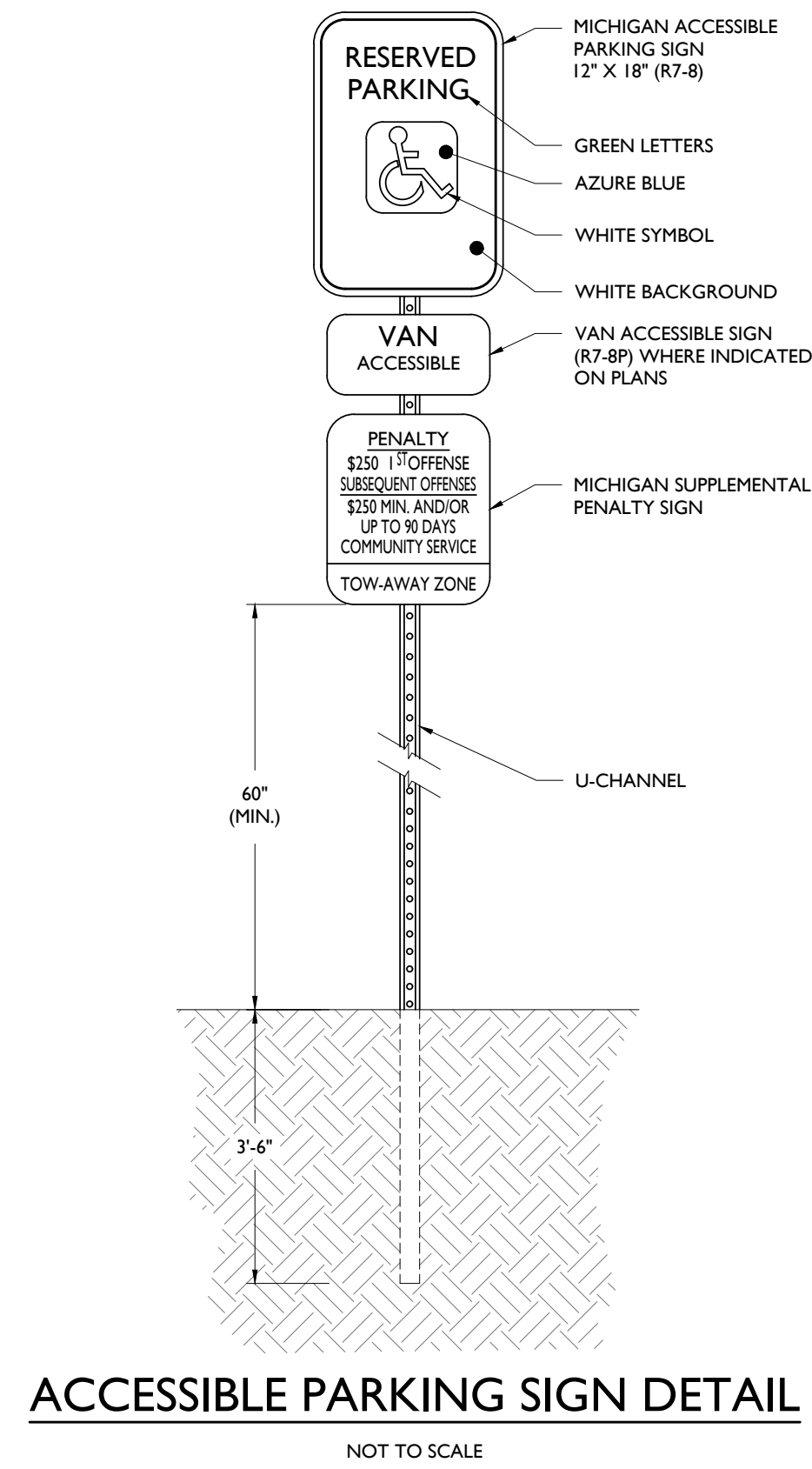


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SCALE: 1" = 30' PROJECT ID: M-19301.01

TITLE:
SOIL EROSION & SEDIMENT CONTROL PLAN

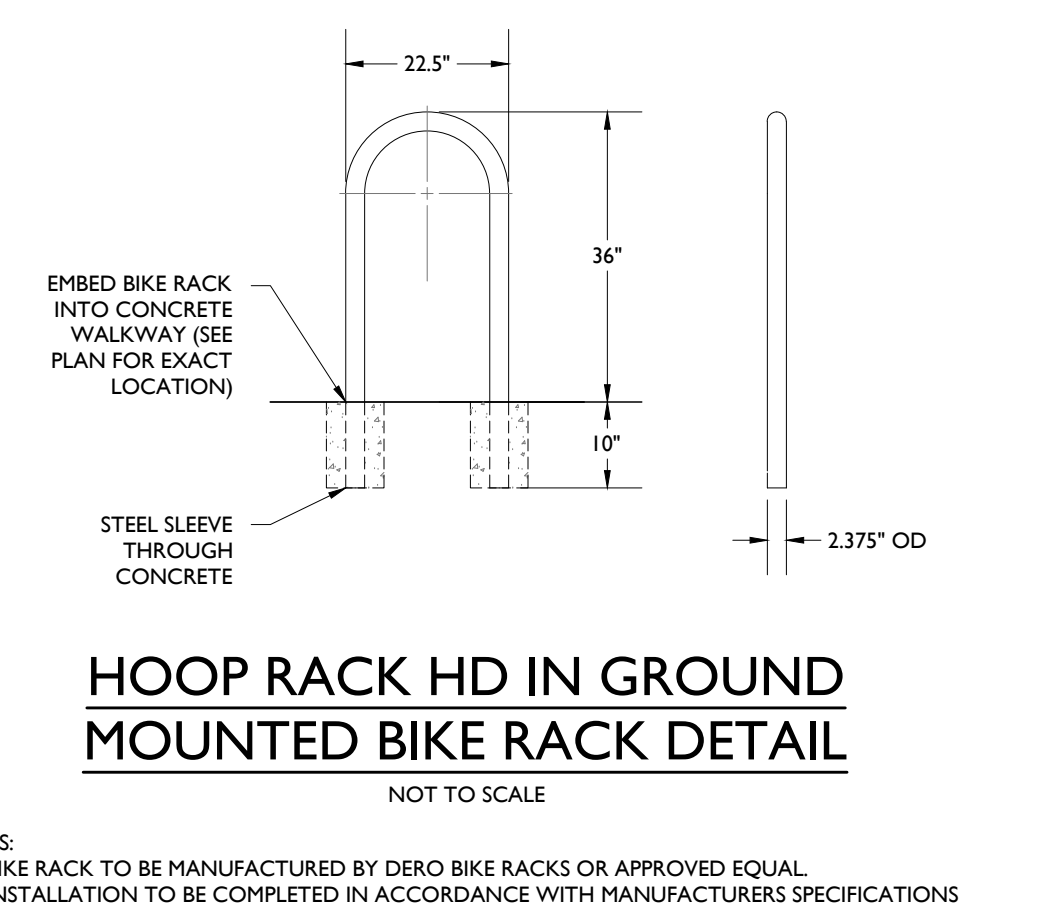
DRAWING:
C-11



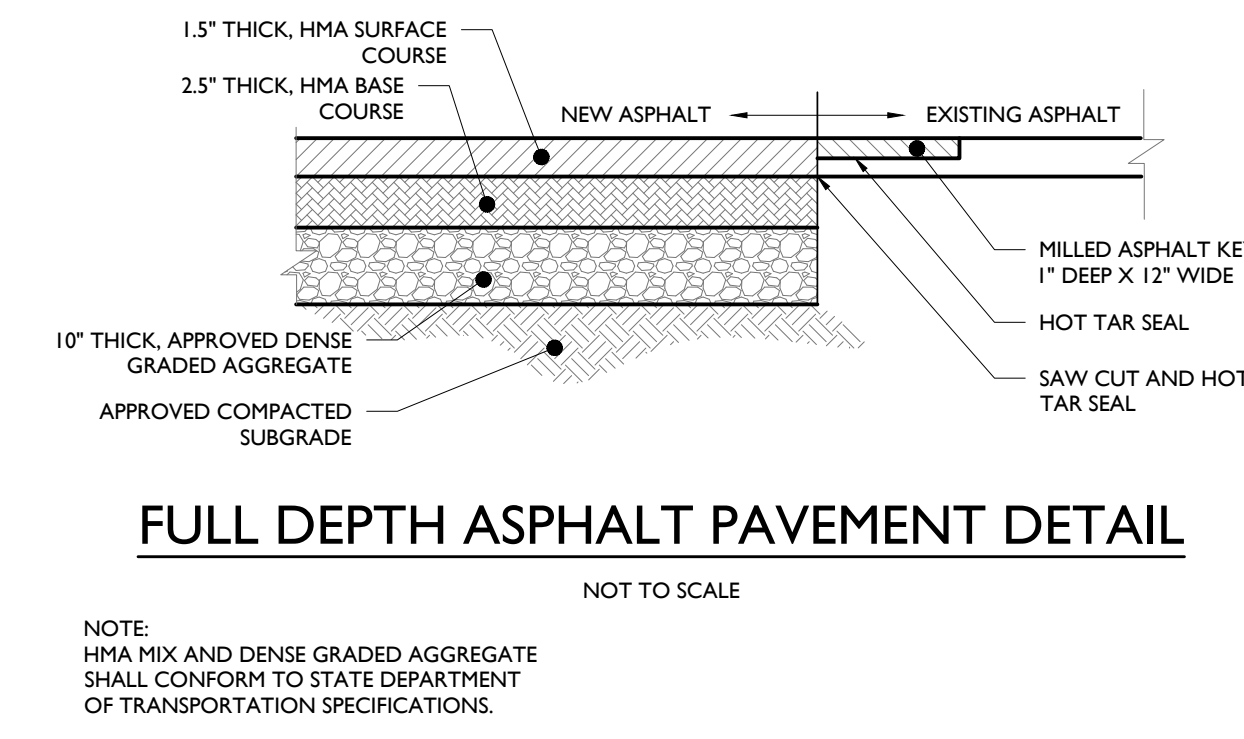
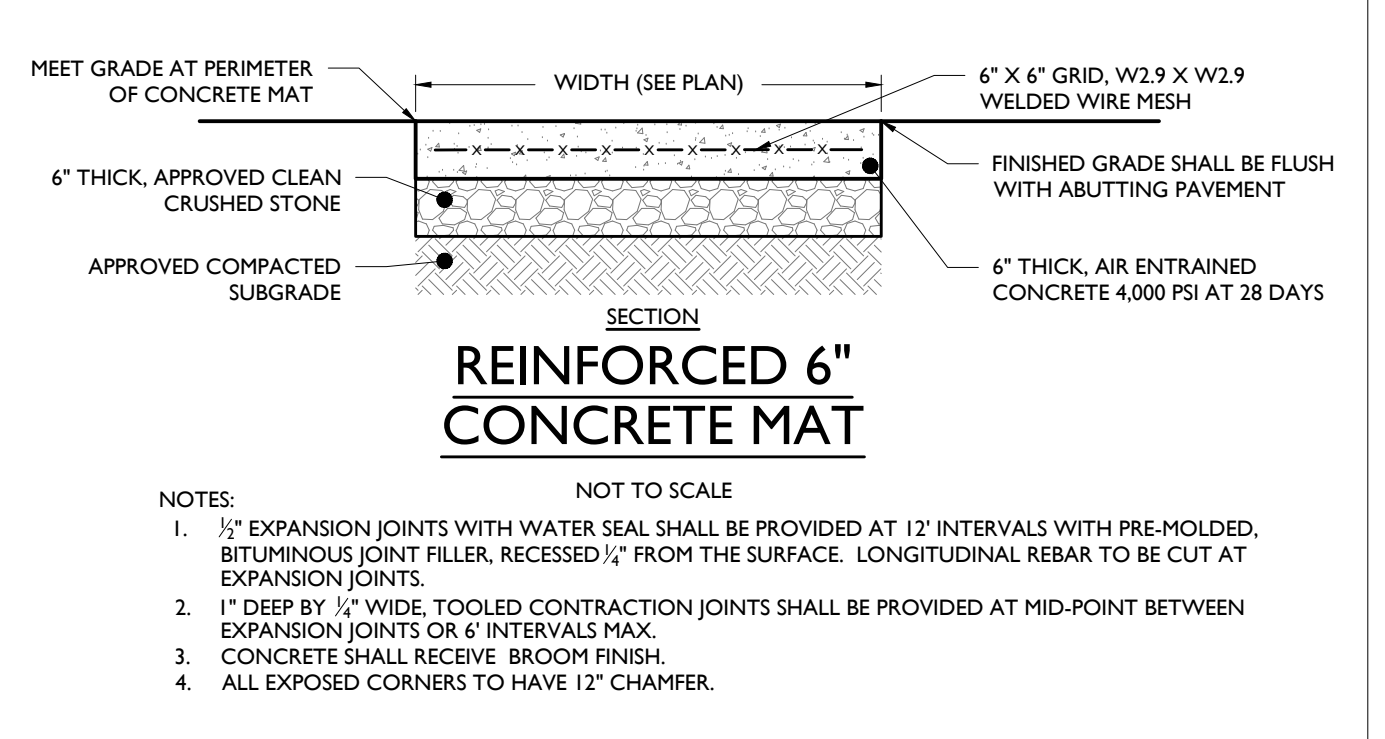
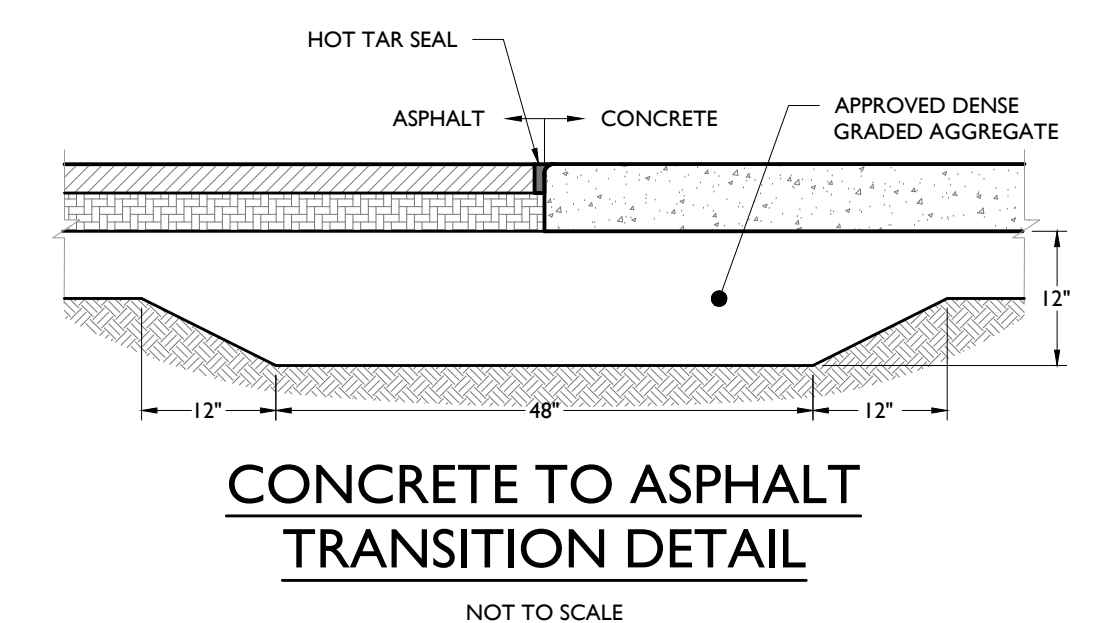
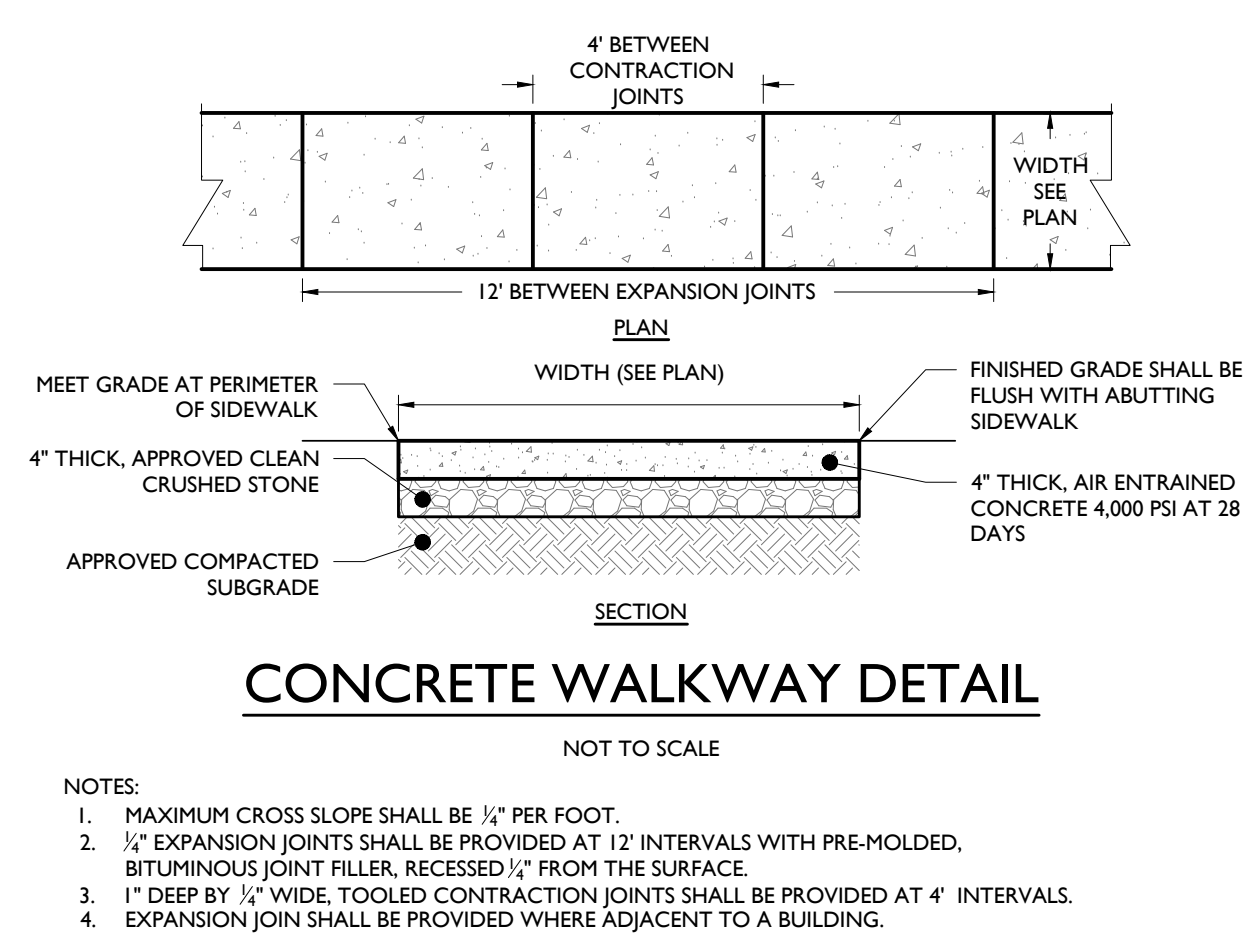
M.U.T.C.D. NUMBER	TEXT	COLOR		SIZE OF SIGN (WIDTH X HEIGHT)	TYPE OF MOUNT
		LEGEND	BACKGROUND		
STOP SIGN (R1-1)		WHITE	RED	36"x36"	GROUND
NO OUTLET - DEAD END (K2-0540)		TEXT: BLACK	YELLOW	24"x24"	GROUND

SIGN DATA TABLE
NOT TO SCALE

NOTE:
1. ALL SIGNS SHALL BE IN ACCORDANCE WITH THE FEDERAL HIGHWAY ADMINISTRATION (FHWA) MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), EXCEPT AS NOTED.
2. ALL SIGNS SHALL BE MOUNTED AS TO NOT OBSTRUCT THE SHAPE OF "STOP" (R1-1) AND "YIELD" (R1-2) SIGNS.



- PAVEMENT STRIPING & MARKINGS NOTES:**
- ALL SIGNING AND STRIPING IN EXISTING CONDITION IN CONFLICT WITH THE PROPOSED DESIGN PLAN SHALL BE REMOVED.
 - ALL PROPOSED SIGNING AND STRIPING SHALL CONFORM TO THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION.
 - PAVEMENT STRIPING AND MARKINGS SHALL BE INSTALLED IN CONFORMANCE WITH ALL APPLICABLE LOCAL, COUNTY AND STATE REQUIREMENTS.
 - UNLESS OTHERWISE SPECIFIED, ALL STRIPING AND MARKINGS IN THE PUBLIC RIGHT-OF-WAY SHALL BE OF THERMOPLASTIC PAINT OR PREFORMED THERMOPLASTIC MARKINGS.
 - UNLESS OTHERWISE SPECIFIED, ON SITE PARKING STALL STRIPING, FIRE LANE STRIPING AND DIRECTIONAL ARROWS SHALL BE EPOXY PAINT. ON SITE STOP BARS, "DO NOT ENTER" BARS, AND ASSOCIATED LETTERING SHALL BE THERMOPLASTIC PAINT OR PREFORMED THERMOPLASTIC MARKINGS.



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1	02/09/2021		RAC	FOR CITY SUBMISSION

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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

EXISTING BUILDING RENOVATION & PROPOSED MULTI-FAMILY APARTMENTS

20-28-101-003
2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

STATE OF MICHIGAN
MICHIGAN PROFESSIONAL ENGINEER
MICHAEL J. COONEY, P.E.
LICENSE NO. 0069428
LICENSE EXPIRES 12/31/2024

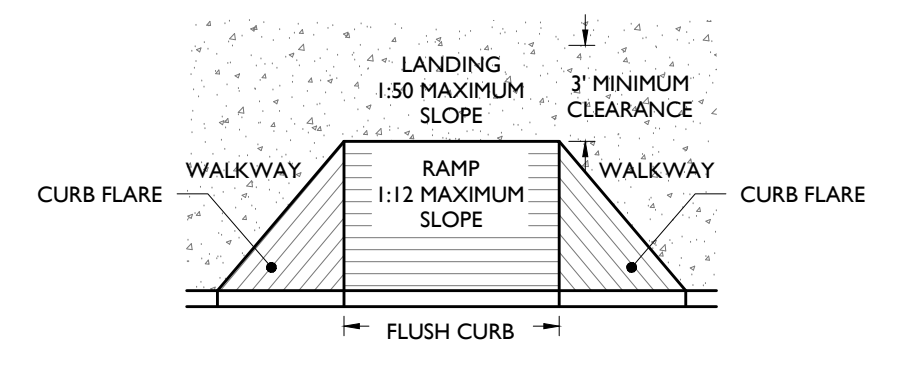
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SCALE: AS SHOWN PROJECT ID: M-19301.01

TITLE:
CONSTRUCTION DETAILS

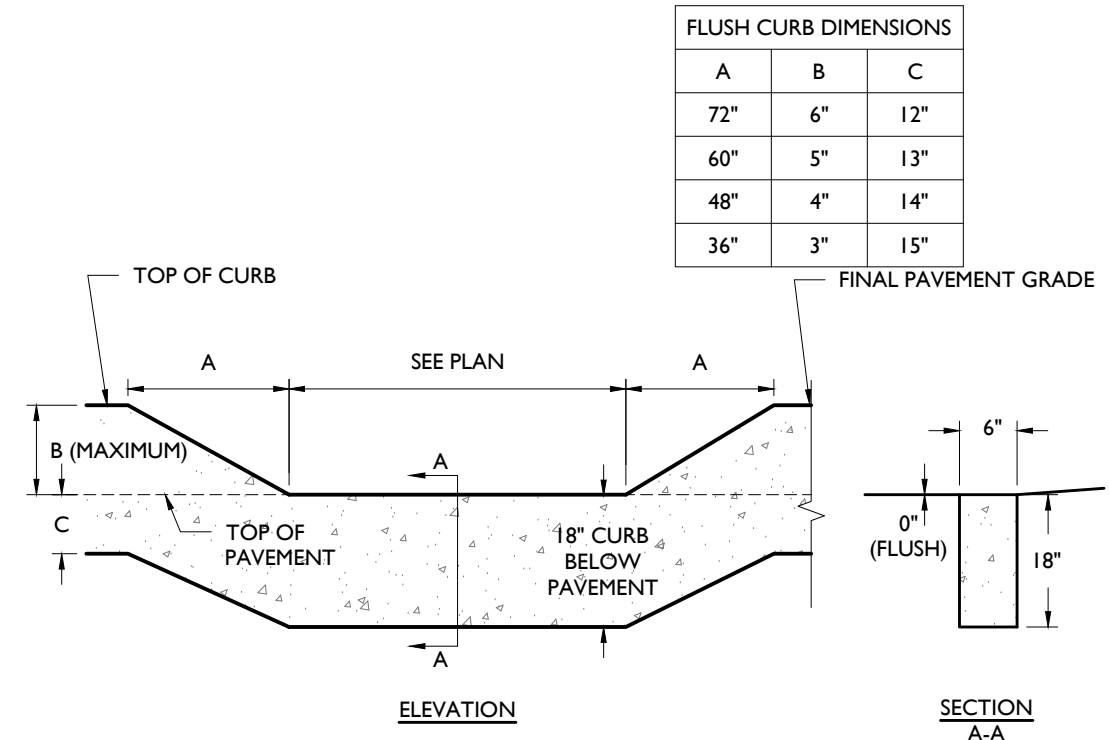
DRAWING:
C-12

W:\P\2019\101-003\2690 CROOKS ROAD - 2020\PROJ\DWG\20-28-101-003-11-12-1.DWG

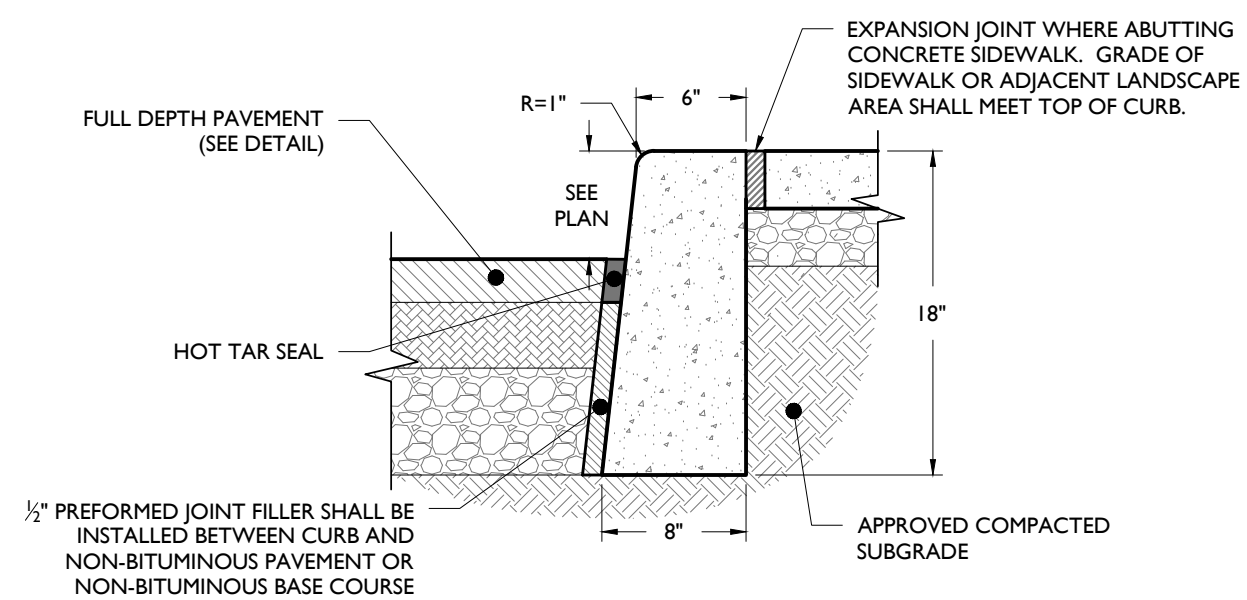


CURB RAMP WITH FLARES DETAIL
NOT TO SCALE

- NOTES:
- CROSS SLOPE ON RAMP SHALL NOT EXCEED 1:50 SLOPE.
 - WHERE A 60" X 60" LANDING EXISTS AT THE TOP OF RAMP, RAMP FLARE SHALL NOT EXCEED 1:10 SLOPE. WHERE LANDING IS NOT PROVIDED RAMP FLARE SHALL NOT EXCEED 1:12 SLOPE.
 - A FLUSH CURB SHALL HAVE A MINIMUM WIDTH OF 36". SEE PLAN FOR EXACT WIDTH.
 - RAMP SHALL HAVE A MAXIMUM RISE OF 6" WITHOUT A HANDRAIL.

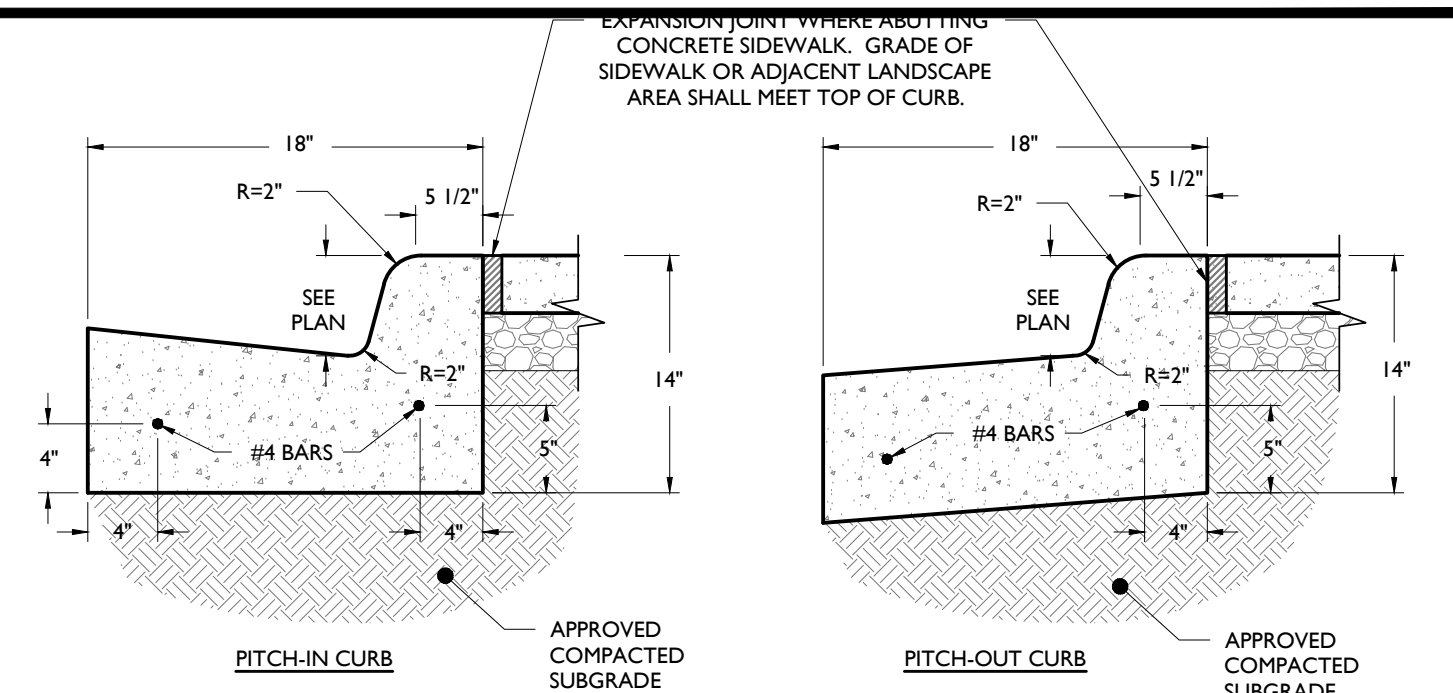


FLUSH CURB DETAIL
NOT TO SCALE



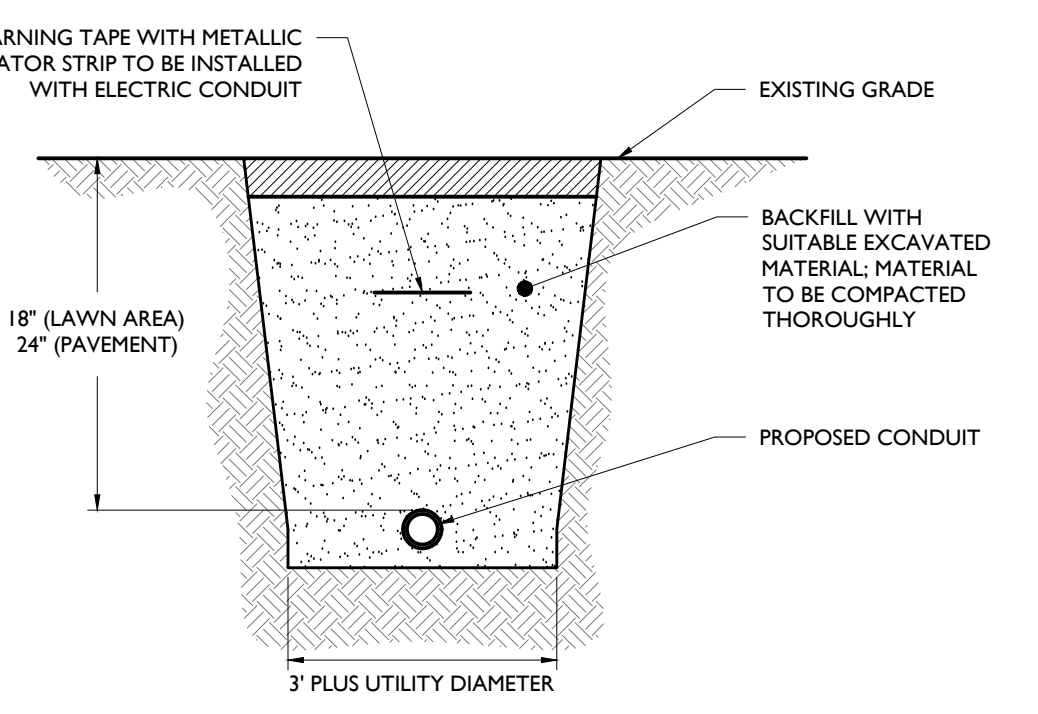
CONCRETE CURB DETAIL
NOT TO SCALE

- NOTES:
- CONCRETE SHALL BE 3500 PSI AT 28 DAYS, AIR-ENTRAINED.
 - TRANSVERSE EXPANSION JOINTS SHALL BE PROVIDED AT 20 FOOT INTERVALS WITH PRE-MOLDED, BITUMINOUS JOINT FILLER, RECESSED 1/2" FROM SURFACE.
 - HALF DEPTH CONTRACTION JOINTS SHALL BE PROVIDED AT 10 FOOT INTERVALS.
 - 18" CURB DEPTH SHALL BE MAINTAINED AT DEPRESSED OR FLUSH CURBED AREAS.



CONCRETE CURB AND GUTTER DETAIL
NOT TO SCALE

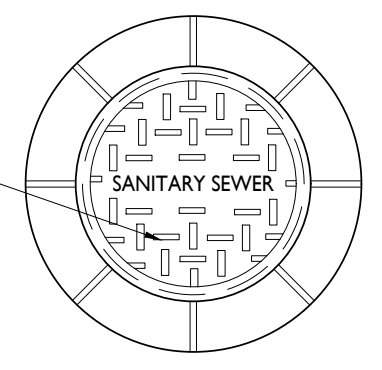
- NOTES:
- CONCRETE SHALL BE 3500 PSI AT 28 DAYS, AIR-ENTRAINED.
 - TRANSVERSE EXPANSION JOINTS SHALL BE PROVIDED AT 20 FOOT INTERVALS WITH PRE-MOLDED, BITUMINOUS JOINT FILLER, RECESSED 1/2" FROM SURFACE.
 - HALF DEPTH CONTRACTION JOINTS SHALL BE PROVIDED AT 10 FOOT INTERVALS.
 - 14" CURB DEPTH SHALL BE MAINTAINED AT DEPRESSED OR FLUSH CURBED AREAS.



ELECTRICAL CONDUIT TRENCH DETAIL
NOT TO SCALE

- NOTES:
- FRAME AND COVER TO BE CAST-IRON AND SUPPORT MINIMUM H-25 LOADING.
 - ALL JOINTS TO BE WATER-TIGHT.
 - FRAME AND COVER TO BE E.I.J.V. 1040 OR APPROVED EQUIVALENT.

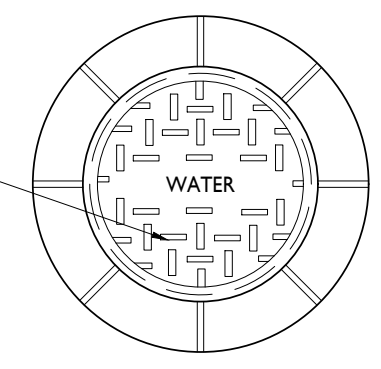
MANHOLE COVER TO BE LABELED / DEFINED PER LOCAL COMMUNITY STANDARDS AND REGULATIONS. PRIVATE MANHOLES SHALL NOT CONTAIN ANY REFERENCE TO THE CITY OF TROY.



PRIVATE SANITARY MANHOLE COVERS
NOT TO SCALE

- NOTES:
- FRAME AND COVER TO BE CAST-IRON AND SUPPORT MINIMUM H-25 LOADING.
 - ALL JOINTS TO BE WATER-TIGHT.
 - FRAME AND COVER TO BE E.I.J.V. 1040 OR APPROVED EQUIVALENT.

MANHOLE COVER TO BE LABELED / DEFINED PER LOCAL COMMUNITY STANDARDS AND REGULATIONS. PRIVATE MANHOLES SHALL NOT CONTAIN ANY REFERENCE TO THE CITY OF TROY.



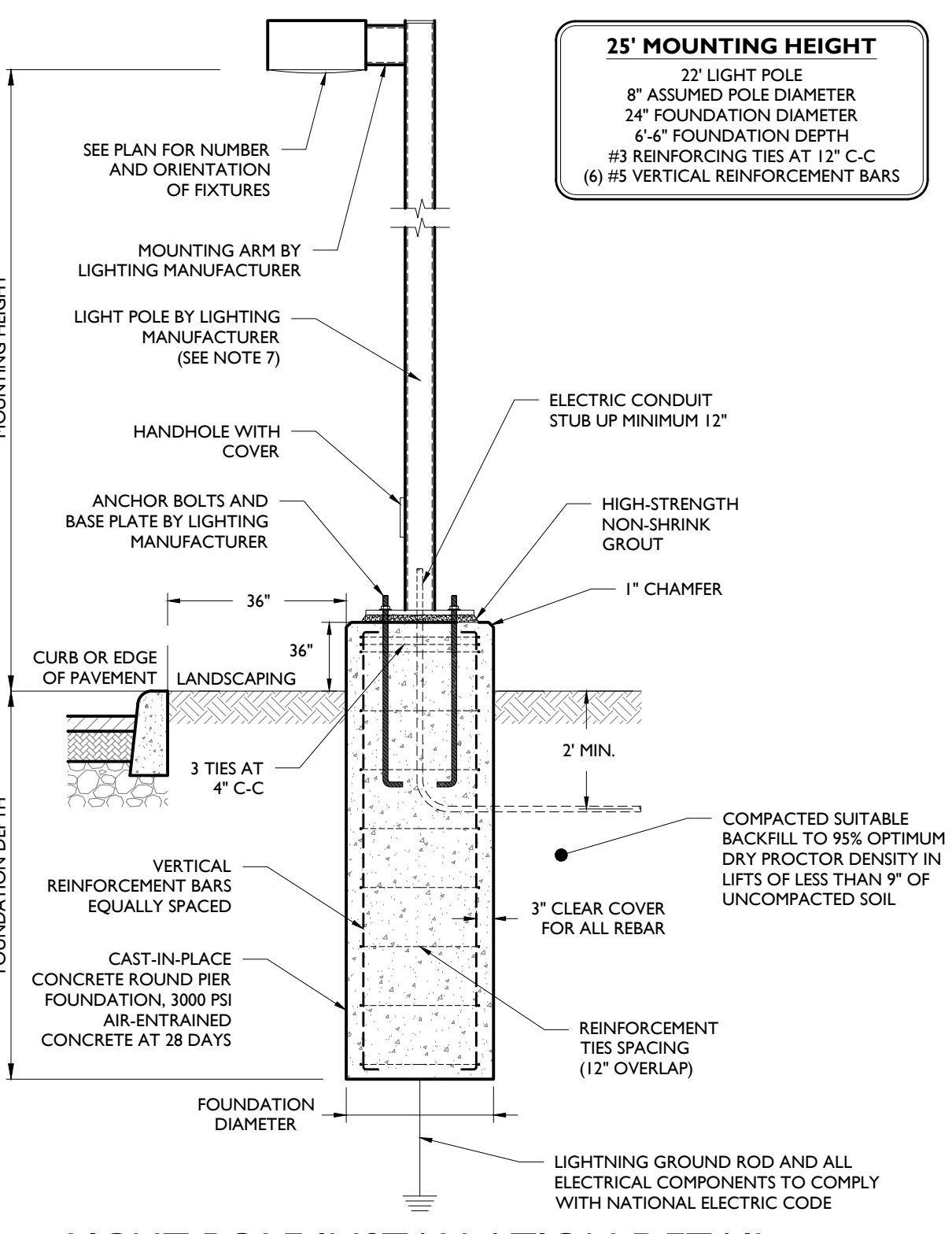
PRIVATE WATER MANHOLE COVERS
NOT TO SCALE



The above sign is approved "No Parking Fire Lane" sign must be installed and maintained in compliance with the criteria set forth in the Michigan Manual of Uniform Traffic Control Devices. Some of the criteria is as follows: (Troy City Code Chapter: 105)

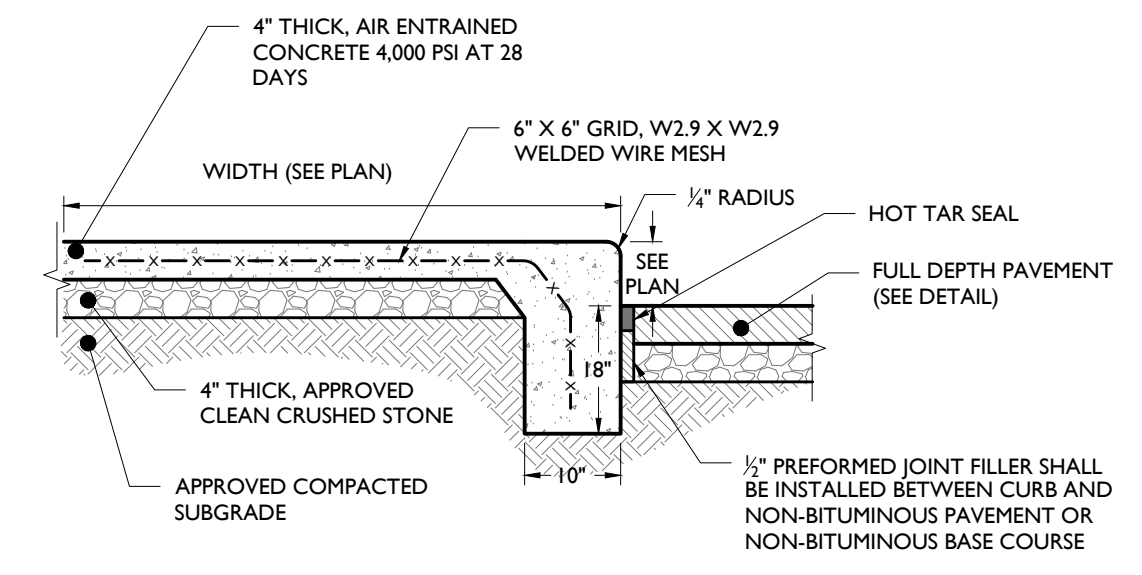
- Sign shall be red lettering on white background and shall read: "FIRE LANE, NO PARKING, NO STOPPING, NO STANDING, TOW AWAY ZONE".
- Signs shall be spaced no further than 100 feet apart.
- Signs shall be installed at a right angle or 90° to curb.
- Sign shall be seven (7) feet from the bottom of sign to grade.
- Signs shall be double faced where the possibility exists for left wheel to curb parking.
- Signs shall be 12 inches in width and 15 inches in height.

CITY OF TROY FIRE LANE SIGN DETAIL
NOT TO SCALE



LIGHT POLE INSTALLATION DETAIL
NOT TO SCALE

- NOTES:
- MINIMUM SOIL BEARING PRESSURE OF 1500 PSF, SOIL FRICTION ANGLE OF 30 DEGREES, AND SOIL DRY UNIT WEIGHT OF 120 PCF SHALL BE CONFIRMED IN THE FIELD BY A QUALIFIED PROFESSIONAL.
 - CAST-IN-PLACE CONCRETE SHALL BE CONSOLIDATED USING VIBRATOR.
 - ALL REBAR TO BE NEW GRADE 60 STEEL.
 - PRE-CAST PIERS ACCEPTABLE UPON WRITTEN APPROVAL OF SHOP DRAWING BY ENGINEER.
 - CONCRETE TO BE INSTALLED A MINIMUM OF 7 DAYS PRIOR TO INSTALLING LIGHT POLE. POURED CONCRETE MIX REQUIRED TO OBTAIN 90% OF DESIGN STRENGTH PRIOR TO INSTALLING LIGHT POLE.
 - CONCRETE SHALL HAVE A MAXIMUM SLUMP OF 4" (WITHIN 1" TOLERANCE).
 - POLE SHALL BE RATED FOR 10 MPH HIGHER THAN MAXIMUM WIND SPEED 33FT ABOVE GROUND FOR THE AREA BASED ON ANSI/ASCE 7-93.
 - POUR TO BE TERMINATED AT A FORM.
 - WORK SHALL CONFORM TO ACI BEST PRACTICES FOR APPROPRIATE TEMPERATURE AND WEATHER CONDITIONS.
 - CONTRACTOR TO TEMPORARILY SUPPORT ADJACENT SOIL AND STRUCTURES DURING EXCAVATION IF REQUIRED.



MONOLITHIC CONCRETE CURB DETAIL
NOT TO SCALE

- NOTES:
- MAXIMUM CROSS SLOPE SHALL BE 1/4" PER FOOT.
 - 1/2" EXPANSION JOINTS SHALL BE PROVIDED AT 12' INTERVALS WITH PRE-MOLDED, BITUMINOUS JOINT FILLER, RECESSED 1/2" FROM THE SURFACE.
 - 1" DEEP BY 1/2" WIDE, TOOLED CONTRACTION JOINTS SHALL BE PROVIDED AT 4' INTERVALS.

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SITE DEVELOPMENT PLANS

2690 CROOKS ROAD

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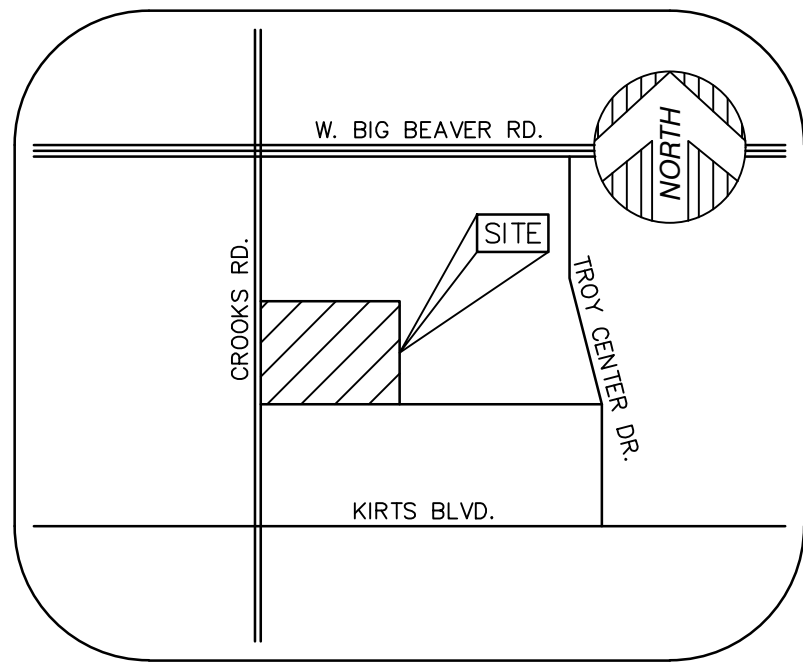
STATE OF MICHIGAN
NORTH WOOD
COONEY
ENGINEER
PROFESSIONAL LICENSE NO. 069428
LICENSE EXPIRES 12/31/2024

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SCALE: AS SHOWN PROJECT ID: M-19301.01

TITLE:
CONSTRUCTION DETAILS

DRAWING:
C-13



VICINITY MAP
(NOT TO SCALE)

LEGEND

- FOUND MONUMENT (AS NOTED)
- FOUND SECTION CORNER (AS NOTED)
- RECORD AND MEASURED DIMENSION
- RECORD DIMENSION
- MEASURED DIMENSION
- ELECTRIC MANHOLE
- ELECTRIC PANEL
- TRANSFORMER
- UTILITY POLE
- GAS METER
- GAS VALVE
- TELEPHONE MANHOLE
- ELECTRIC OUTLET
- CABLE TV RISER
- TRAFFIC SIGNAL
- CROSSWALK SIGNAL
- CLEANOUT
- SANITARY MANHOLE
- ROUND CATCH BASIN
- SQUARE CATCH BASIN
- DRAIN
- STORM DRAIN MANHOLE
- FIRE HYDRANT
- FIRE DEPARTMENT CONNECTION
- WATER GATE MANHOLE
- WATER VALVE
- AIR CONDITIONING UNIT
- BOLLARD
- FLAGPOLE
- FLOOD LIGHT
- LIGHTPOST/LAMP POST
- MAIL BOX
- SINGLE POST SIGN
- DOUBLE POST SIGN
- HANDICAP PARKING
- PARCEL BOUNDARY LINE
- ADJOINER PARCEL LINE
- SECTION LINE
- EASEMENT (AS NOTED)
- BUILDING
- BUILDING OVERHANG
- ASPHALT CURB
- CONCRETE CURB
- RAISED CONCRETE
- PARKING
- EDGE OF CONCRETE (CONC.)
- EDGE OF ASPHALT (ASPH.)
- EDGE OF GRAVEL
- FENCE (AS NOTED)
- WALL (AS NOTED)
- LANDSCAPING (AS NOTED)
- OVERHEAD UTILITY LINE
- UNDERGROUND PIPE (AS NOTED)
- BUILDING AREA
- ASPHALT
- CONCRETE

PARKING

HANDICAP PARKING = 8 STALLS
STANDARD PARKING = 328 STALLS

PARCEL AREA

PARCEL 4:
193,599± SQUARE FEET = 4.444± ACRES

BENCHMARK

SITE BENCHMARK #3
ARROW ON HYDRANT, ±40' SW OF SW CORNER OF POND.
ELEVATION = 707.24' (NAVD 88 DATUM)

SITE BENCHMARK #4

ARROW ON HYDRANT, NEAR NE CORNER OF BUILDING.
ELEVATION = 708.34' (NAVD 88 DATUM)

SURVEYOR'S NOTE

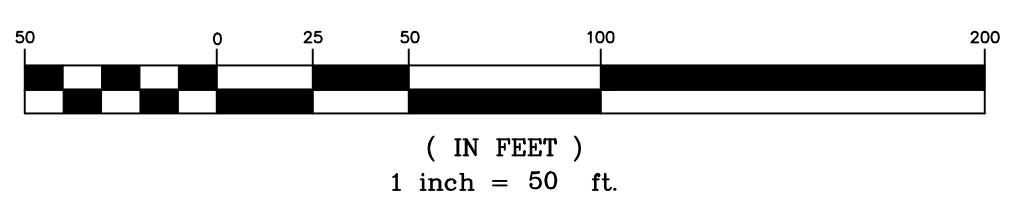
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES OTHER THAN THE STRUCTURE INVENTORY SHOWN HEREON.

BASIS OF BEARING

SOUTH 02°25'41" EAST, BEING THE WEST LINE OF SECTION 28, AS SHOWN.



GRAPHIC SCALE



PROPERTY DESCRIPTION

THE LAND SITUATED IN THE TROY, COUNTY OF OAKLAND, STATE OF MICHIGAN, IS DESCRIBED AS FOLLOWS:

PARCEL 4:
THE EAST 484 FEET OF THE WEST 544 FEET OF THE SOUTH 400 FEET OF THE NORTH 1/2 OF THE NORTHWEST 1/4 CORNER OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN.

TITLE REPORT NOTE

ONLY THOSE EXCEPTIONS CONTAINED WITHIN THE STEWART TITLE GUARANTY COMPANY FILE NO. 63-19650824-SCM, REVISION 4, DATED SEPTEMBER 03, 2019, AND RELISTED BELOW WERE CONSIDERED FOR THIS SURVEY. NO OTHER RECORDS RESEARCH WAS PERFORMED BY THE CERTIFYING SURVEYOR.

27. TERMS AND PROVISIONS CONTAINED WITHIN, AND EASEMENTS CREATED BY CROSS-ACCESS OR JOINT-DRIVE EASEMENT RECORDED IN LIBER 9386, PAGE 804, OAKLAND COUNTY RECORDS (AFFECTS PARCELS 4). (AS SHOWN)

28. TERMS AND PROVISIONS CONTAINED WITHIN, AND EASEMENTS CREATED BY CROSS-ACCESS OR JOINT-DRIVE EASEMENT RECORDED IN LIBER 9630, PAGE 559, OAKLAND COUNTY RECORDS (AFFECTS PARCELS 4). (AS SHOWN)

MANHOLE SCHEDULE

#	TYPE	RIM (FT)	SIZE (IN)	DIRECTION	DIP	INVERT (FT)
11297	STORM MANHOLE	705.38	12	N	4.2	701.18
11355	CATCH BASIN	704.21	6	NE	3.7	700.51
			6	SW	3.95	700.26
			6	SE	3.8	700.41
11403	BEEHIVE CATCH BASIN	704.55	6	S	3.85	700.70
			6	W	3.9	700.65
11461	CATCH BASIN	702.66	6	NW	4.05	700.50
			6	N	2.75	699.91
			6	SE	2.85	699.81
			6	NW	3	699.66
			6	S	3.2	699.46
11462	CATCH BASIN	702.51	6	NE	3.2	699.31
			6	S	3.15	699.36
			6	SW	3.25	699.26
			6	NW	3.05	699.46
11463	CATCH BASIN	702.57	6	N	3.25	699.32
			6	E	3.15	699.42
			6	S	3.05	699.52
			6	W	3.15	699.32
11464	CATCH BASIN	702.64	6	E	4.4	698.24
			6	SW	3.85	698.80
			6	NW	3.75	698.89
11824	BEEHIVE CATCH BASIN	703.48	6	E	6	697.48
				T/PIPE	4.2	699.28
				T/WATER	4.25	699.23
				B/STRUCTURE	7.4	696.08
11851	CATCH BASIN	702.9	6	NE	4.25	698.65
			6	N	4.15	698.75
			12	NW	5.8	697.10
			6	SE	4.3	698.60
85015	STORM MANHOLE	703.39	12	NW	5	698.39
			15	S	6.5	696.89
85016	CATCH BASIN	703.37	12	SW	4.45	698.92
85025	STORM MANHOLE	703.59	12	S	4	699.59
			12	W	5.2	698.39
			12	E	4.85	698.74
			6	NE	4.6	698.99
87679	SANITARY MANHOLE	705.04	8	N	11.45	693.59
			8	S	11.5	693.54
			8	NW	11	694.04

SURVEYOR'S CERTIFICATION

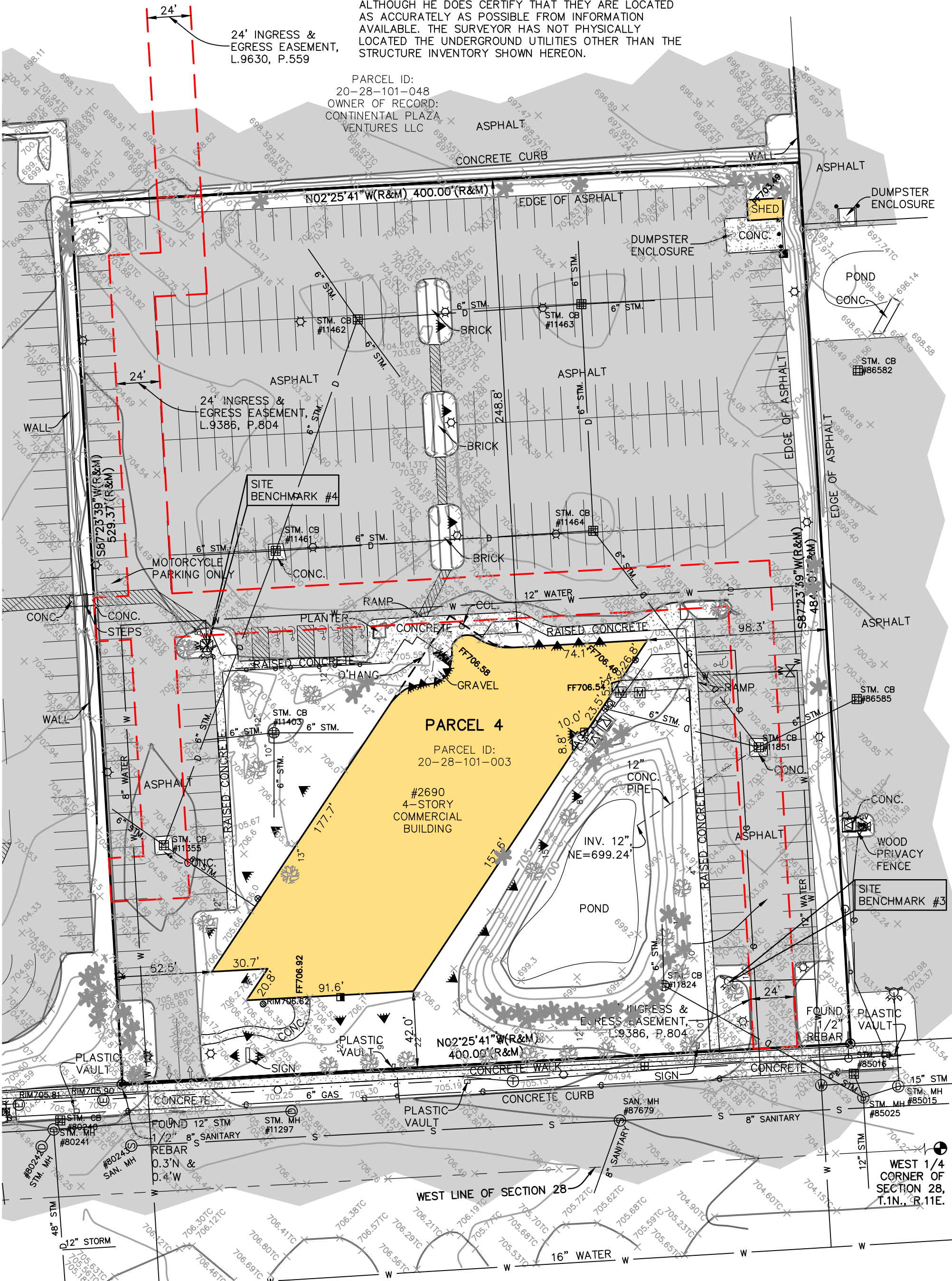
TO A.F. JONNA; CIBC BANK USA, AN ILLINOIS CHARTERED BANK, ITS SUCCESSORS AND/OR ASSIGNS; STEWART TITLE GUARANTY COMPANY; AND ATA NATIONAL TITLE GROUP, LLC:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDED ITEMS 2, 4, 7A, 8, AND 9 OF TABLE A, THEREOF. THE FIELD WORK WAS COMPLETED ON DECEMBER 05, 2019.

DATE OF PLAT OR MAP: DECEMBER 10, 2019

DRAFT

ANTHONY T. SYCKO, JR., P.S.
PROFESSIONAL SURVEYOR
MICHIGAN LICENSE NO. 47976
22556 GRATIOT AVE., EASTPOINTE, MI 48021
Tsycko@kemtec-survey.com



ALTA / NSPS LAND TITLE SURVEY
PREPARED FOR: A.F. JONNA
991 & 999 W. BIG BEAVER RD. & 2690 CROOKS RD.,
TROY, MICHIGAN,
PART OF SECTION 28,
TOWN 2 NORTH, RANGE 11 EAST

PROFESSIONAL ENGINEERING,
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FAX: (866) 772-4048 FAX: (566) 772-4048 FAX: (734) 984-0667 FAX: (810) 684-9855
www.kemtecgroupprofessionals.com

DRAWN BY:	JDM	12/12/19
CHECKED BY:	ATS	12/12/19
DATE:	DECEMBER 12, 2019	
PROJECT NO.:	19-03620	SCALE: 1" = 50'

STONEFIELD

November 16, 2022

R. Brent Savidant, AICP
Community Development Director
City of Troy
500 W. Big Beaver Road
Troy, MI 48084

**RE: Preliminary Site Plan & Special Use Review
Proposed Multi-Family Apartments
Parcel ID: 20-28-101-003
2690 Crooks Road
City of Troy, Oakland County, Michigan**

Brent:

Our office is submitting documents on behalf of the Applicant to address the outstanding conditions contained within Carlisle Wortman's review letter, dated November 7, 2022. Please find the following items enclosed:

ITEM DESCRIPTION	DATED	COPIES	PREPARED BY
Site Development Plans	11-16-2022	2	Stonefield Engineering & Design
Architectural Plans Building A	10-11-2022	2	Biddison Architecture
Architectural Plans Building B	10-11-2022	2	Biddison Architecture
Response to Traffic Comments	11-16-2022	1	Stonefield Engineering & Design
Architectural Design Narrative		2	Biddison Architecture
Parking Study	11-16-2022	2	Fleis & Vandenbrink

The following is an itemized response to the comments contained within the Preliminary Site Plan and Special Use Review Letter dated November 7, 2022. For the sake of brevity, any comments that are statements of fact or have been previously addressed are not included in the response below:

1. Increase drive-aisle width to at least 26-feet

The drive-aisle widths have been widened to accommodate fire access on Sheet C-3 of the Site Development Plans.

2. Review and revise circulation based on OHMs comments.

Noted.

3. Confirm existing screening of trash enclosure.

The existing trash enclosure screening shall remain as-is. The plans have noted a new gate will be added on Sheet C-3 of the Site Development Plans.

4. Confirm building lighting.

There are no proposed building mounted light fixtures.

5. Provide a 3-D model of the buildings and site context.

The 3D model will be submitted under separate cover.

6. Description of architectural intent and how materials and architecture relate to other buildings in area.

The design narrative has been included in this submission.

7. Transparency calculations.

The new building does not abut the public roadway and is residential in nature, transparency requirements should not be applicable to this building.

8. Verify unit numbers.

The number of units has been confirmed to be 156 units on Sheet C-3 of the Site Development Plans.

9. Provide a shared parking agreement to the satisfaction of the City Attorney.

The properties are owned by the same parent entity, no shared parking agreement should be necessary.

Should you have any questions regarding the submission items or responses above please do not hesitate to contact our office.

Best regards,



Eric Williams, PE
ewilliams@stonefieldeng.com
Stonefield Engineering and Design, LLC



Kevin Heffernan, PE
kheffernan@stonefieldeng.com
Stonefield Engineering and Design, LLC

Design Impact:

- a. *Foster a lasting impact on the community through the provision of high-quality design, construction, and detailing.*

Response #1. *We feel the development will have a lasting positive impact on the Troy community, by taking an vacant 4 story office building and vast parking lot into a vibrant residential community. The overall, scale, high quality of design, materials, construction, will bring a balanced composition to the development, which will enhance and compliment the overall surrounding area both in its compatible uses, aesthetics and connection to the community at large.*

- b. *Provide high quality, durable materials, such as but not limited to stone, brick, glass, and metal. E.I.F.S. or material equivalent shall only be used as an accent material.*

Response #2. *The design, materials and detailing will be complimentary throughout the development with colors and detail materials added to the existing office building again used on the new structure to create a campus environment. Metal canopies, vertical and horizontal metal details designate the building entries and accent the design aesthetic. The second building will use brick and masonry materials along with metal accents and balcony elements common to both buildings.*

- c. *Develop buildings with creativity that includes balanced compositions and forms.*

Response #3. *The design of the two buildings while different will blend together through the use of common materials and design features.*

- d. *Design roofs that are appropriate to the architectural style of the building and create an appropriate visual exterior mass of the building given the context of the site.*

Response #4. *The design of the existing office building roof is flat and the second building will be flat as well at a slightly higher level with the 5th floor. This will be consistent with the surrounding sites and the proposed Kelly development to the north.*

- e. *For commercial buildings, incorporate clearly defined, highly visible customer entrances using features such as canopies, porticos, arcades, arches, wing walls, ground plane elements, and/or landscape planters.*

Response #5. *The design of the existing office building two story entry will remain The building entry for the second building will incorporate a long horizontal metal canopy attached to a larger vertical building element, both appropriate to the context, activity and scale of each building.*

- f. *Include community amenities that add value to the development such as patio/seating areas, water features, artwork or sculpture, clock towers, pedestrian plazas with park benches or other features located in areas accessible to the public.*

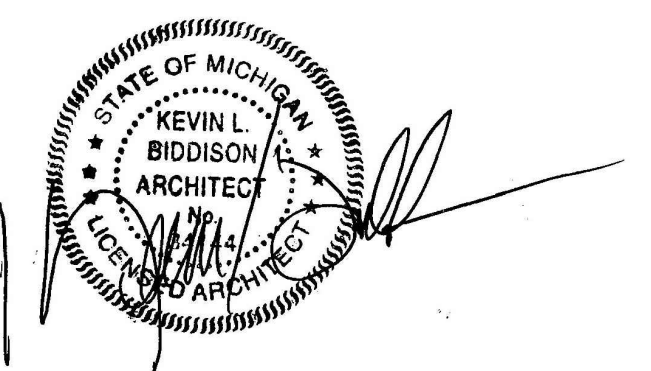
Response #6. *Both buildings will have outdoor patio seating and possibilities for artwork, sculpture and benches. The existing office building has extensive green space surrounding it providing the potential for many outdoor activities for the new residential occupants.*

PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

SITE PLAN 10.11.22

**Building A
1st FLOOR PLAN**



2068.20

A.101

NOTE: ALL APPLIANCES TO BE PROVIDED TO COMPLY WITH ADA REQUIREMENTS. DISHWASHERS MUST FIT UNDER A 34" HIGH (32-1/4" CLEAR UNDER) COUNTERTOP. FULL HT. REFRIGERATORS MUST BE A SIDE-BY-SIDE OR BOTTOM FREEZER UNIT, AND ALL MICROWAVE CONTROLS TO BE NO HIGHER THAN 48" A.F.F. TO MEET OBSTRUCTED HIGH SIDE REACH REQUIREMENTS.

NOTE: ALL ENTRANCE AND EXIT DOORS HAVE BARRIER FREE ACCESSIBILITY.

NOTE: ALL GYP. BD. AT WET WALL LOCATIONS AND TOILET ROOM INTERIORS SHALL BE GREEN BOARD

NOTE: SAFETY GLAZING MUST HAVE PERMANENT IDENTIFICATION IN ACCORDANCE WITH SECTION 2406.1.1 OF THE 2015 MICHIGAN BUILDING CODE.

NOTE: INTERIOR FINISHES IN EXIT ACCESS CORRIDORS, OTHER EXITWAYS, ROOMS, AND ENCLOSED SPACES IN USE GROUPS "B" AND "S" IN SPRINKLED BUILDINGS ARE REQUIRED TO HAVE AT LEAST A CLASS C, FLAME SPREAD 75-200; SMOKE DEVELOPED 0-450; RATING AS LISTED IN TABLE 803.4 OF THE 2015 MICHIGAN BUILDING CODE.

NOTE:
■ DENOTES FIRE EXTINGUISHER

NOTE: ALL SILLS TO BE CLEAR ANNO. BREAKMETAL ALUM. PROVIDE

NOTE: CONFIRM SIZES OF ALL APPLIANCES WITH TENANT AND/OR OWNER PRIOR TO ORDERING CABINETS.

NOTE: ALL INTERIOR PARTITION WALLS TO BE PAINTED GYP. BD. ON STUD FRAMING / FURRING

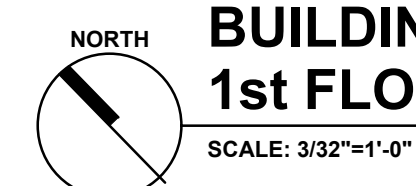
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FIRE EXTINGUISHER NOTE:
TYPE 2A FIRE EXTINGUISHERS SHALL BE PROVIDED AND SPACED A MAX. OF 75' APART PER SECTION 906.1 OF THE 2015 INTERNATIONAL FIRE CODE AND / OR BY THE DIRECTION OF THE FIRE MARSHAL.



(5) 1 BEDROOM UNITS

(7) 2 BEDROOM UNITS



**BUILDING A
1st FLOOR PLAN**

SCALE: 3/32"=1'-0"

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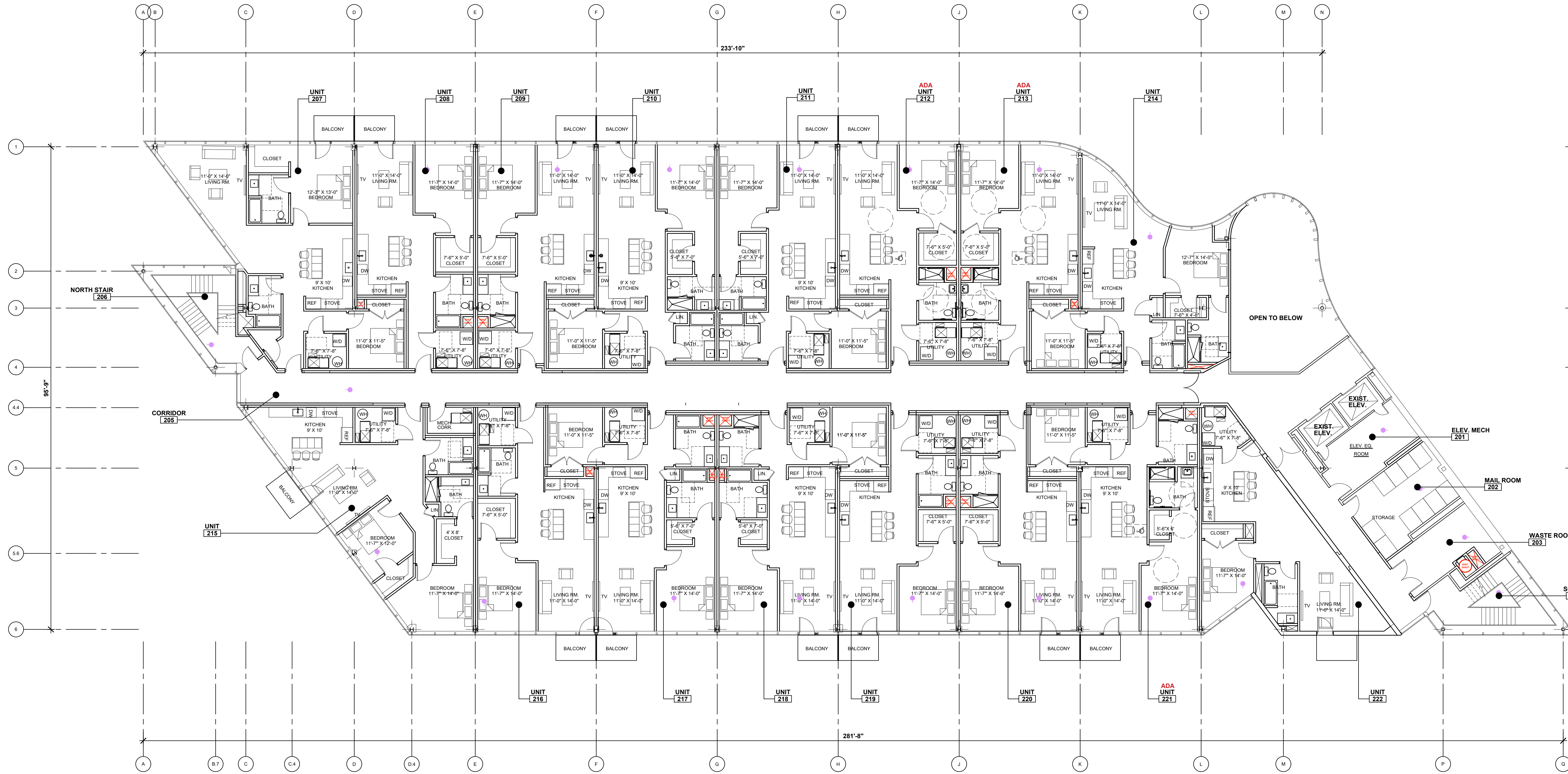
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Project title

PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

Issued dr/ch

SITE PLAN 10.11.22

Sheet title

**Building A
2nd FLOOR PLAN**

Project no.

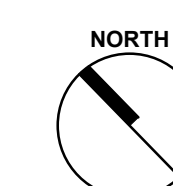
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Sheet no.

A.102

(8) 1 BEDROOM UNITS

(8) 2 BEDROOM UNITS



**BUILDING A
2nd FLOOR PLAN**

SCALE: 3/32"=1'-0"

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NOTE:
■ DENOTES FIRE EXTINGUISHER

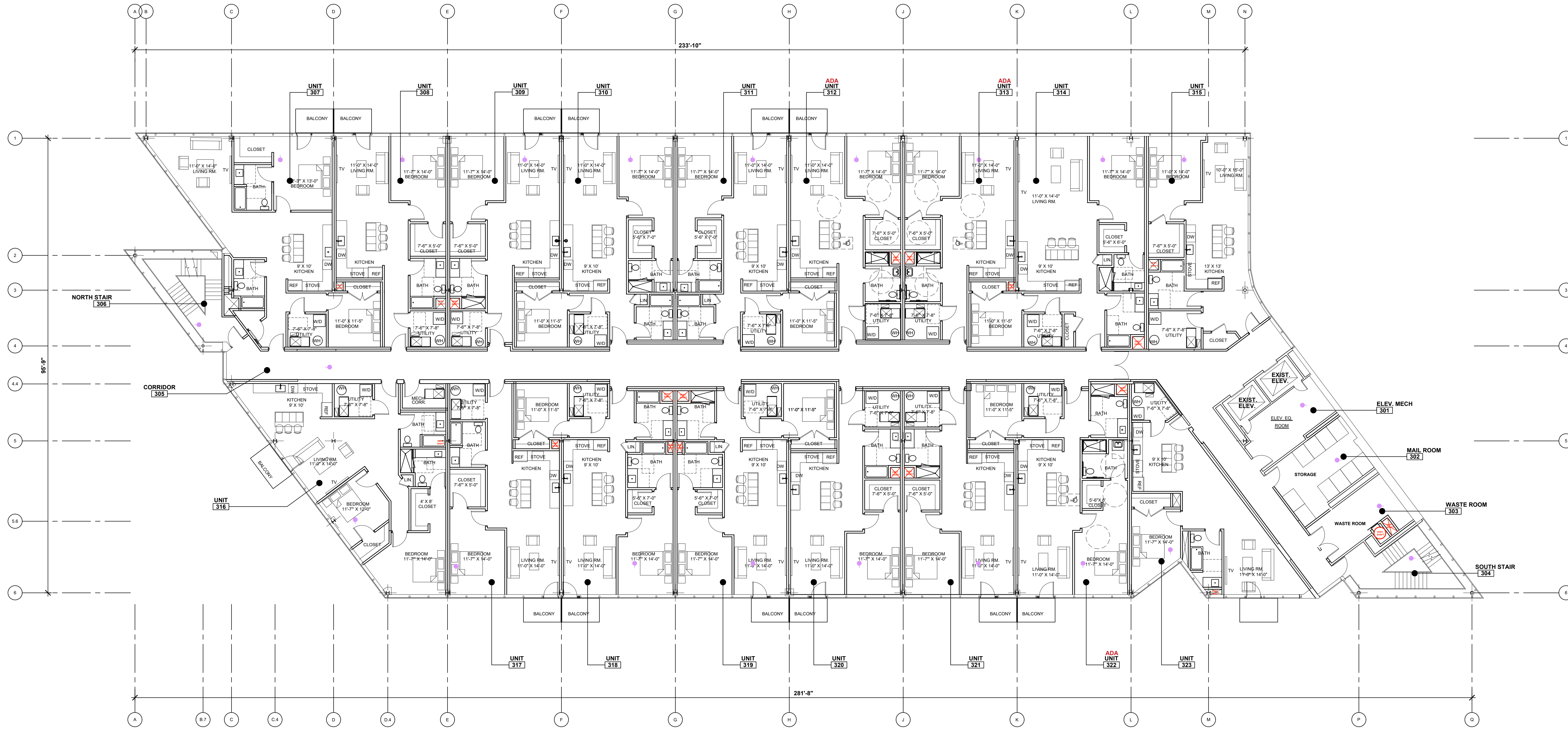
ALL SILLS TO BE CLEAR ANNO. BREAKMETAL ALUM. DR/AVD/IE

CONFIRM SIZES OF ALL APPLIANCES WITH TENANT AND/OR OWNER PRIOR TO ORDERING CABINETS.

ALL INTERIOR PARTITION WALLS TO BE PAINTED GYP. BD. ON STUD FRAMING / FURRING

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PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

SITE PLAN 10.11.22

**Building A
3rd FLOOR PLAN**

2068.20

A.103

(9) 1 BEDROOM UNITS

(8) 2 BEDROOM UNITS

**BUILDING A
3rd FLOOR PLAN**
SCALE: 3/32"=1'-0"

NOTE:
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NOTE:
■ DENOTES FIRE EXTINGUISHER

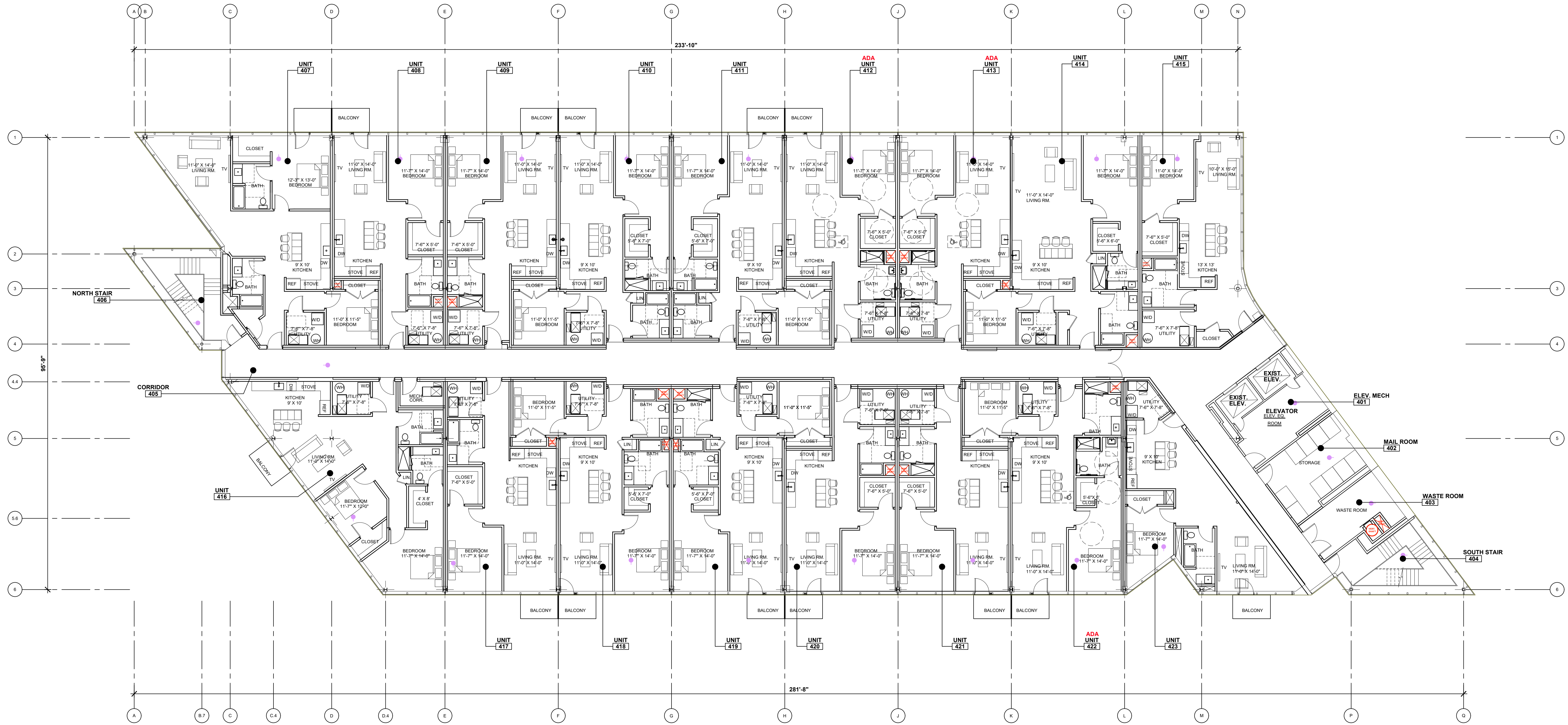
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Project title

PROPOSED REDEVELOPMENT FOR:
**Lindsey Centre
Redevelopment**

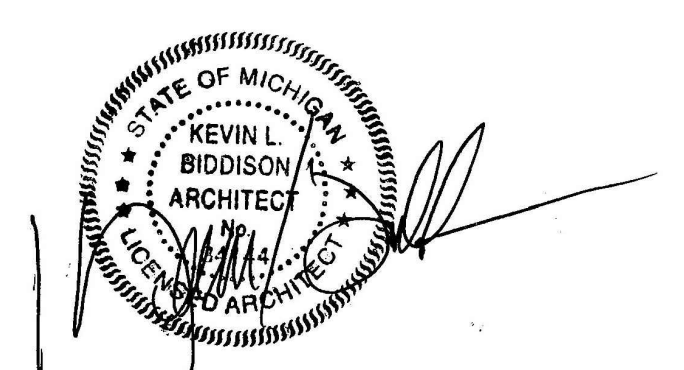
2690 Crooks Road
Troy, Michigan

Issued dr/ch

SITE PLAN 10.11.22

Sheet title

**Building A
4th FLOOR PLAN**



Project no.

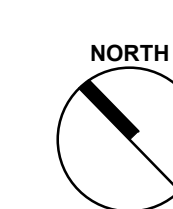
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Sheet no.

A.104

(9) 1 BEDROOM UNITS

(8) 2 BEDROOM UNITS



**BUILDING A
4th FLOOR PLAN**

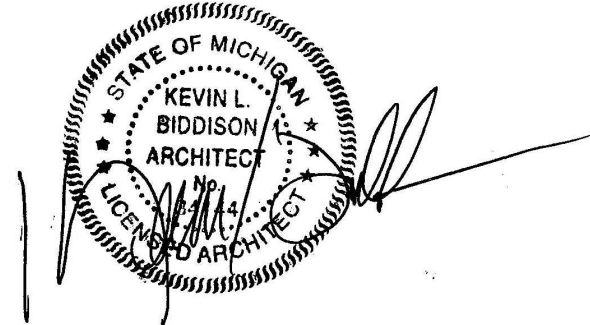
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PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

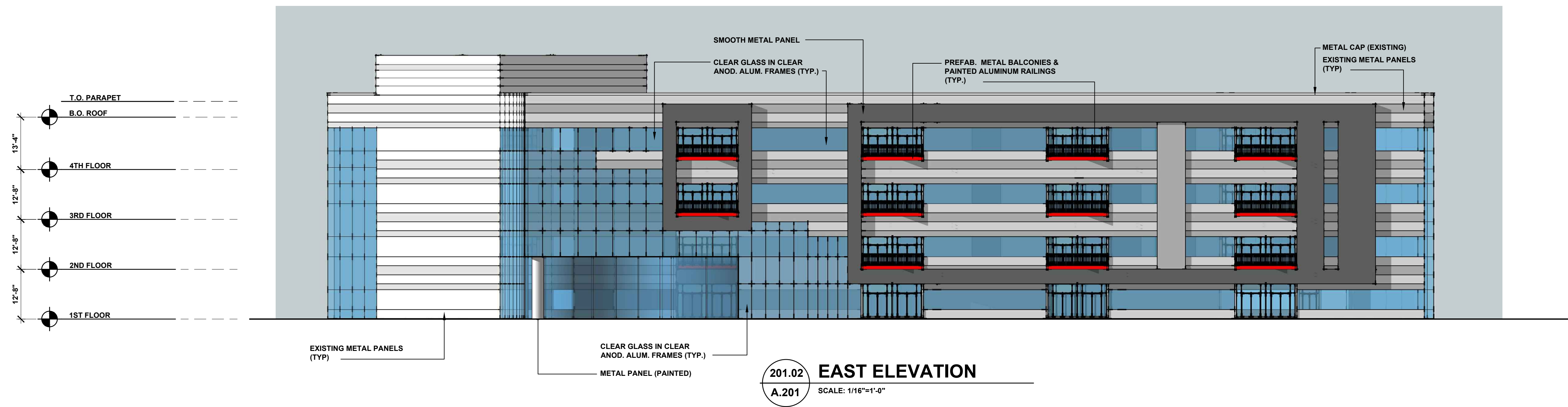
SITE PLAN 10.11.22

**Building A
EXTERIOR
ELEVATIONS**



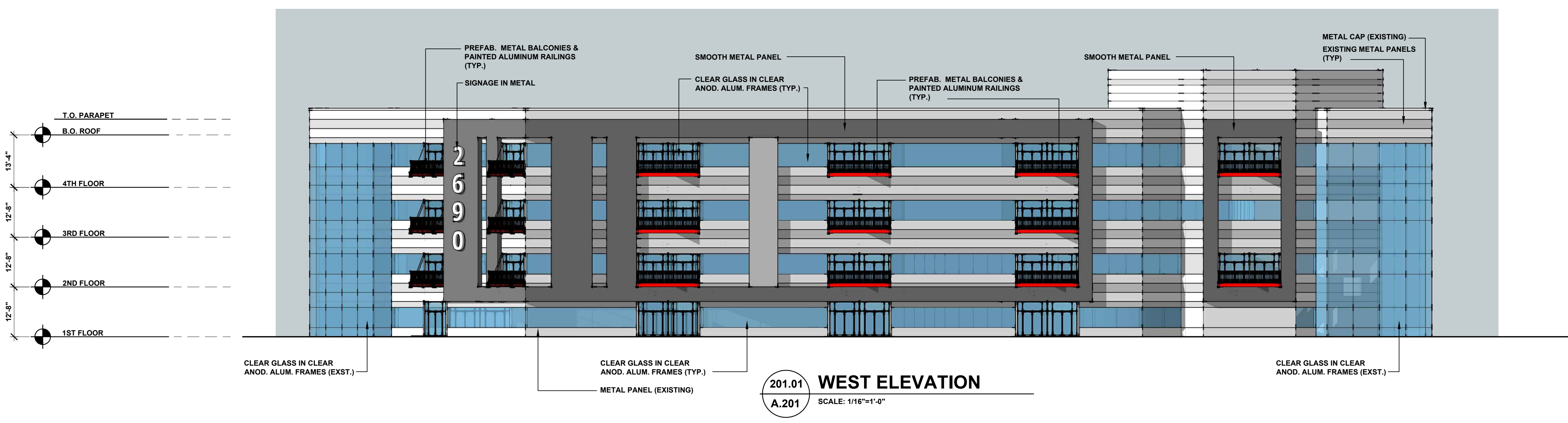
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A.201



GENERAL PROJECT NOTES:

- 1) EXISTING METAL PANEL AND GLASS TO REMAIN EXTERIOR SKIN
- 2) NEW METAL WRAP AND BALCONIES TO BE ADDED TO EXTERIOR SKIN
- 3) EXTERIOR METAL AND GLASS TO BE REMOVED FOR NEW BALCONY DOORS AND WINDOWS
- 4) OTHER ELEMENTS OF CURRENT FACADE TO REMAIN AS EXISTING

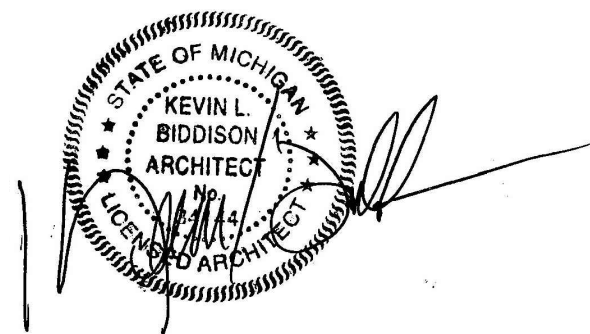


PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

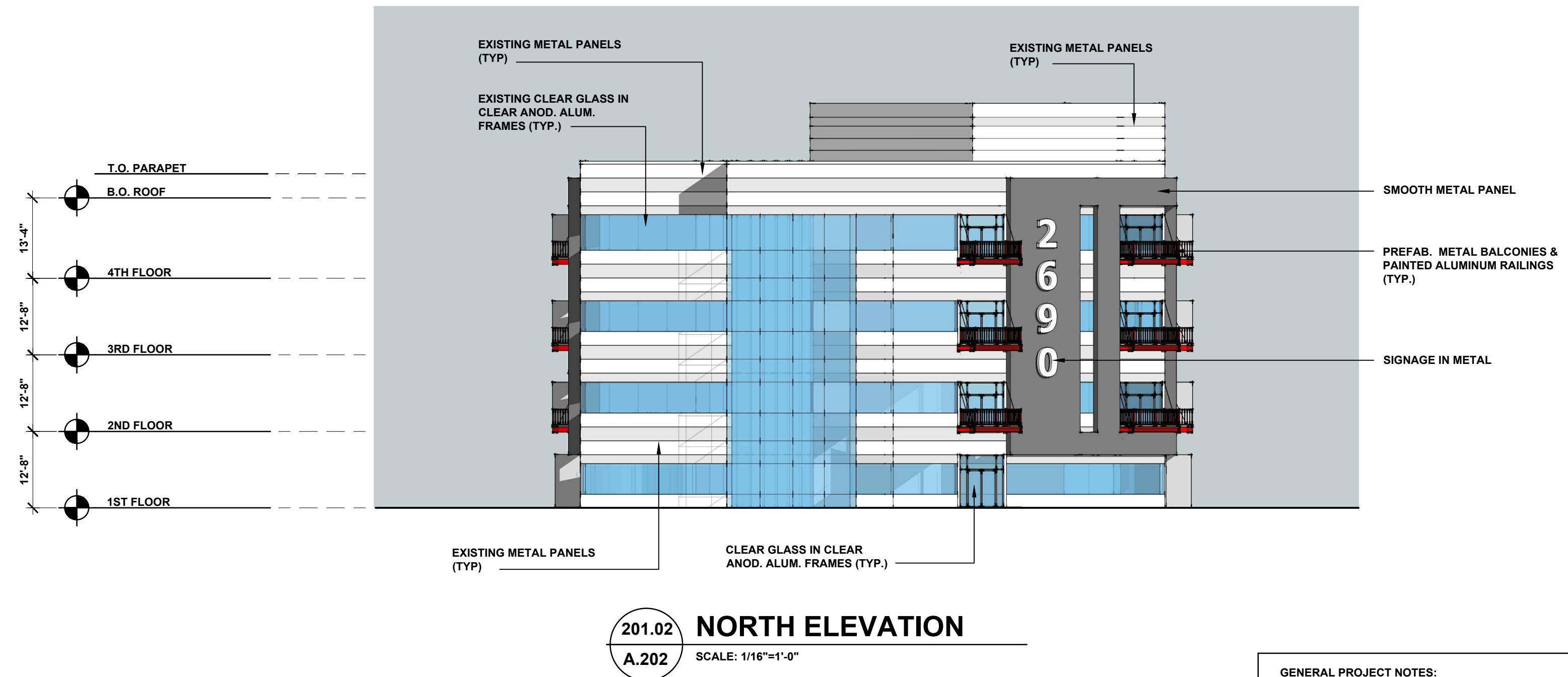
SITE PLAN 10.11.22

**Building A
EXTERIOR
ELEVATIONS**

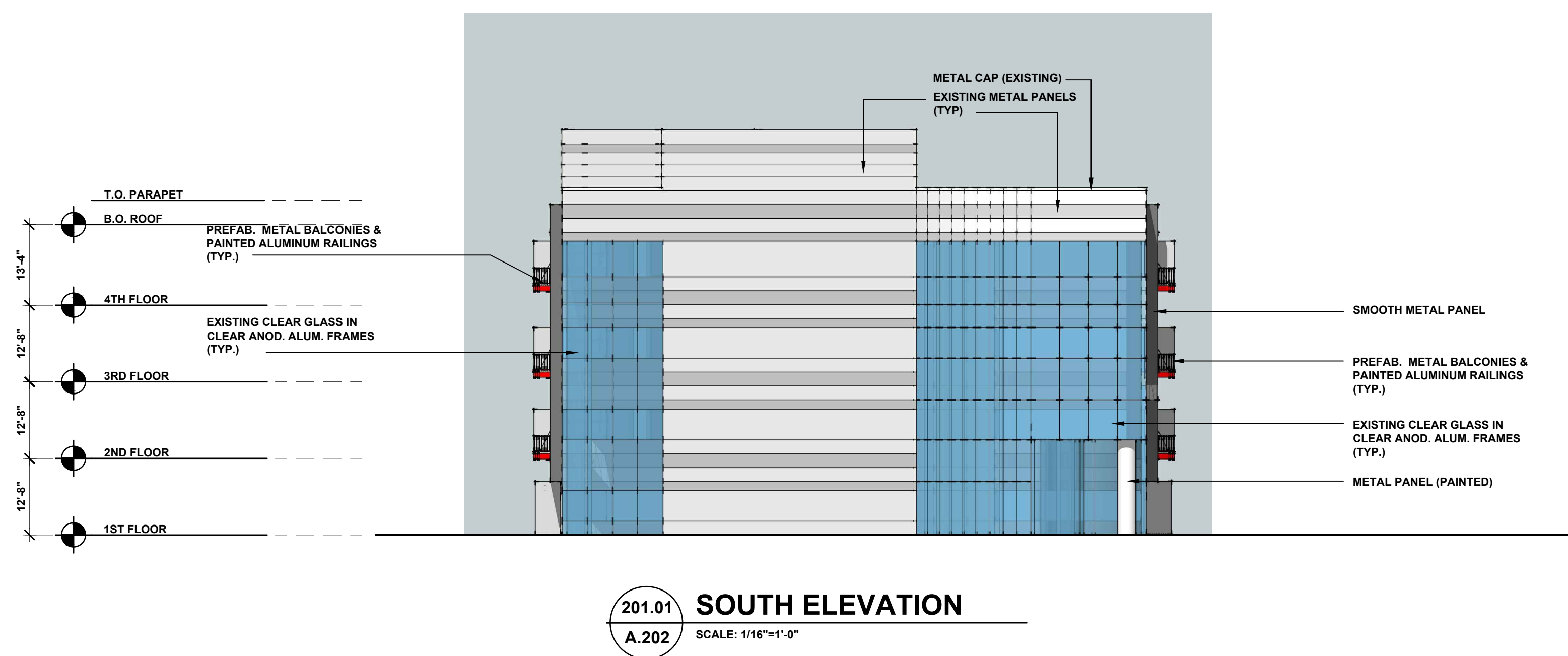


2068.20

A.202



GENERAL PROJECT NOTES:
1) EXISTING METAL PANEL AND GLASS TO REMAIN
2) NEW METAL WRAP AND BALCONIES TO BE ADDED TO EXTERIOR SKIN
3) EXTERIOR METAL AND GLASS TO BE REMOVED FOR NEW BALCONY DOORS AND WINDOWS
4) OTHER ELEMENTS OF CURRENT FACADE TO REMAIN AS EXISTING

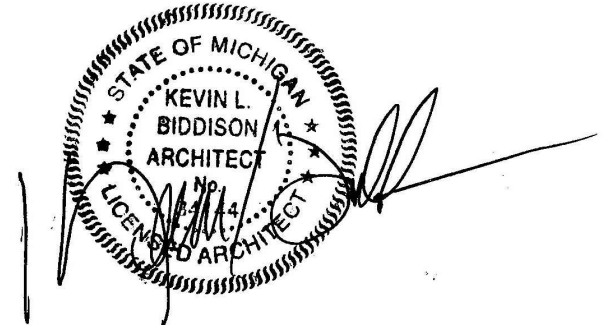


PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

SITE PLAN 10.11.22

**Building A
EXTERIOR
IMAGES**



2068.20

A.203



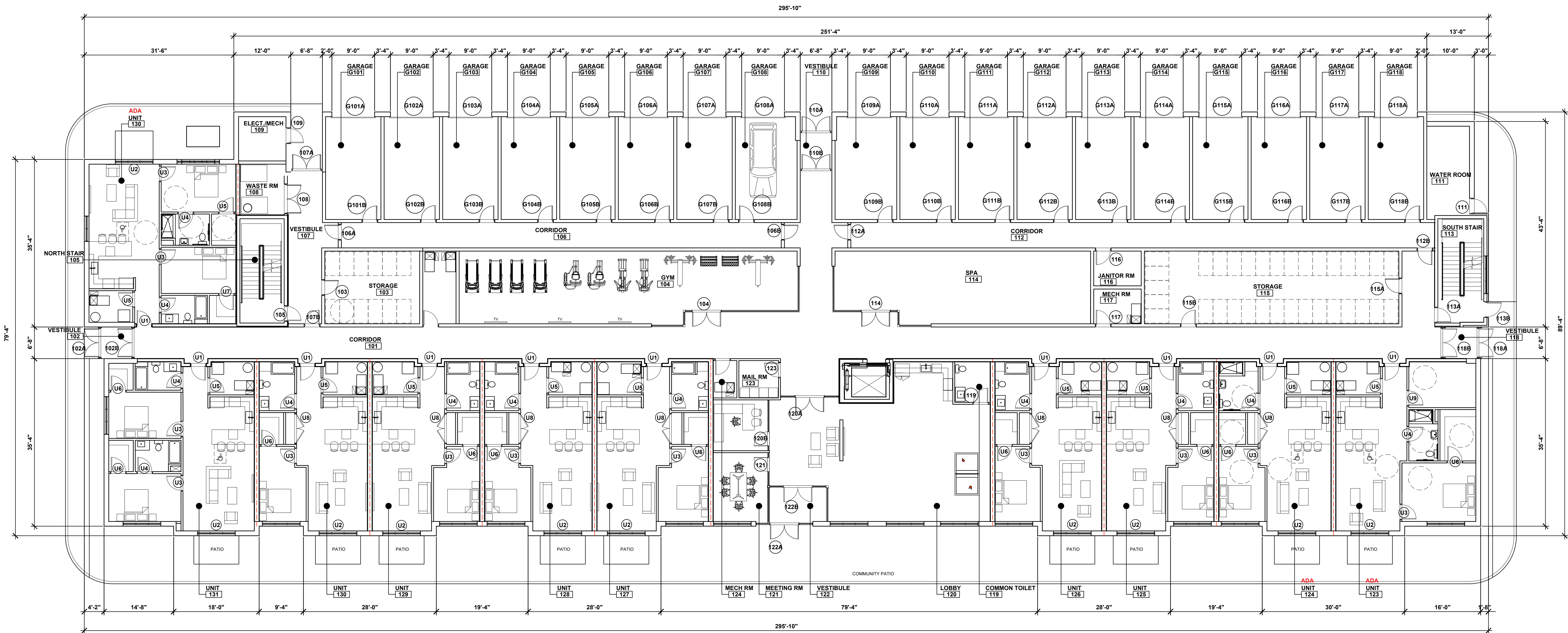
SOUTHWEST FACADE



SOUTHWEST FACADE



NORTHEAST FACADE



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

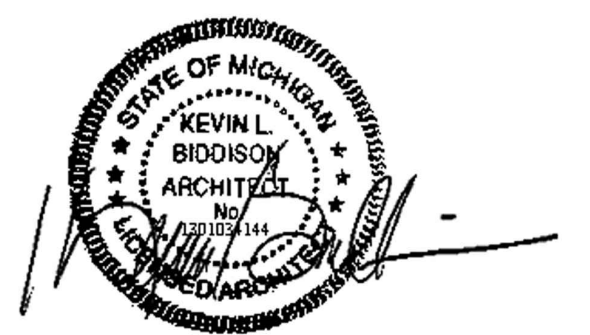
2690 CROOKS RD
TROY, MICHIGAN

Issued dr/ch

SITE PLAN 10.11.22

Sheet title

**Building B
1st FLOOR PLAN**



Project no.

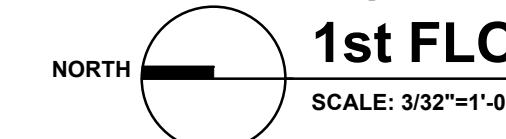
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Sheet no.

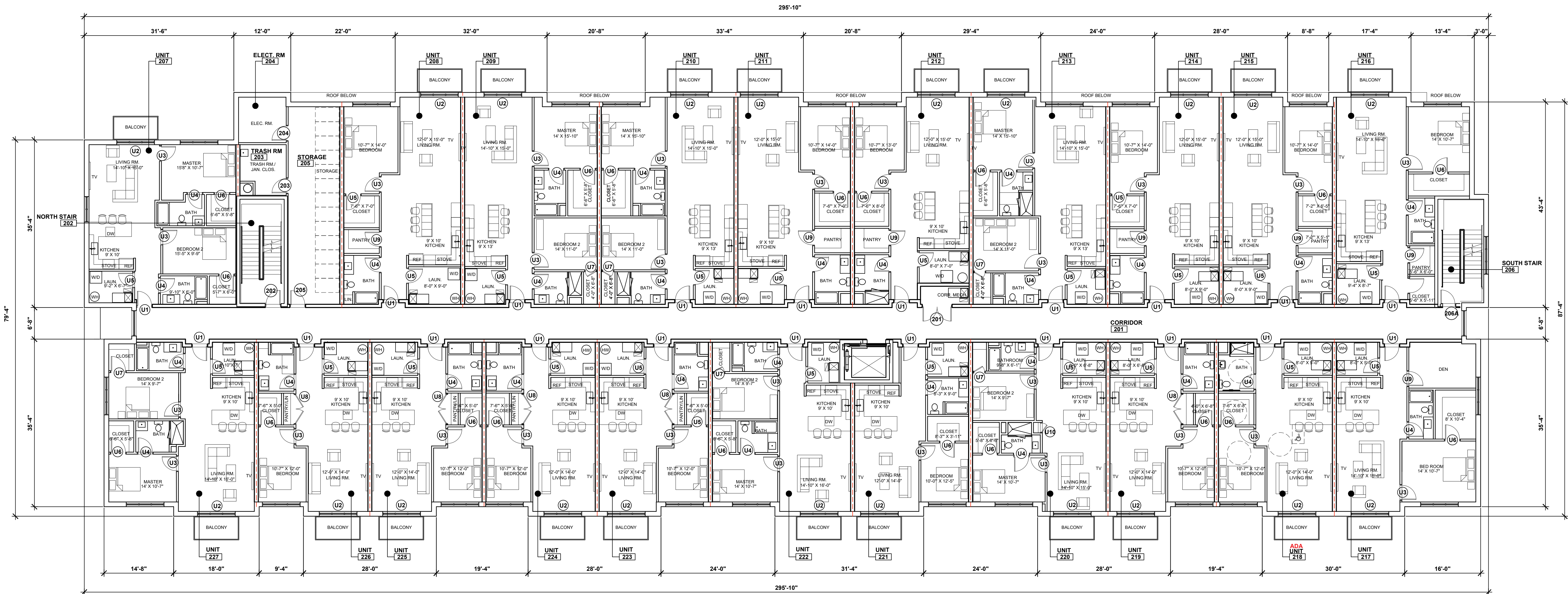
A.101

**1BR - 07 UNITS
2BR - 03 UNITS**

**BUILDING B OVERALL
1st FLOOR PLAN**



SCALE: 3/32"=1'-0"



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

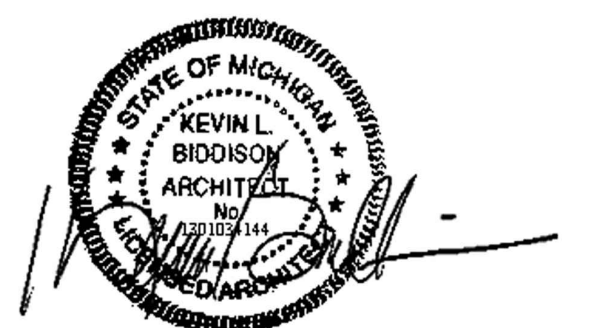
2690 CROOKS RD
TROY, MICHIGAN

Issued dr/chn

SITE PLAN 10.11.22

Sheet title

**Building B
2nd FLOOR PLAN**

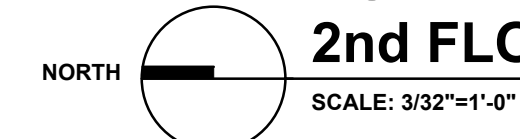


Project no.

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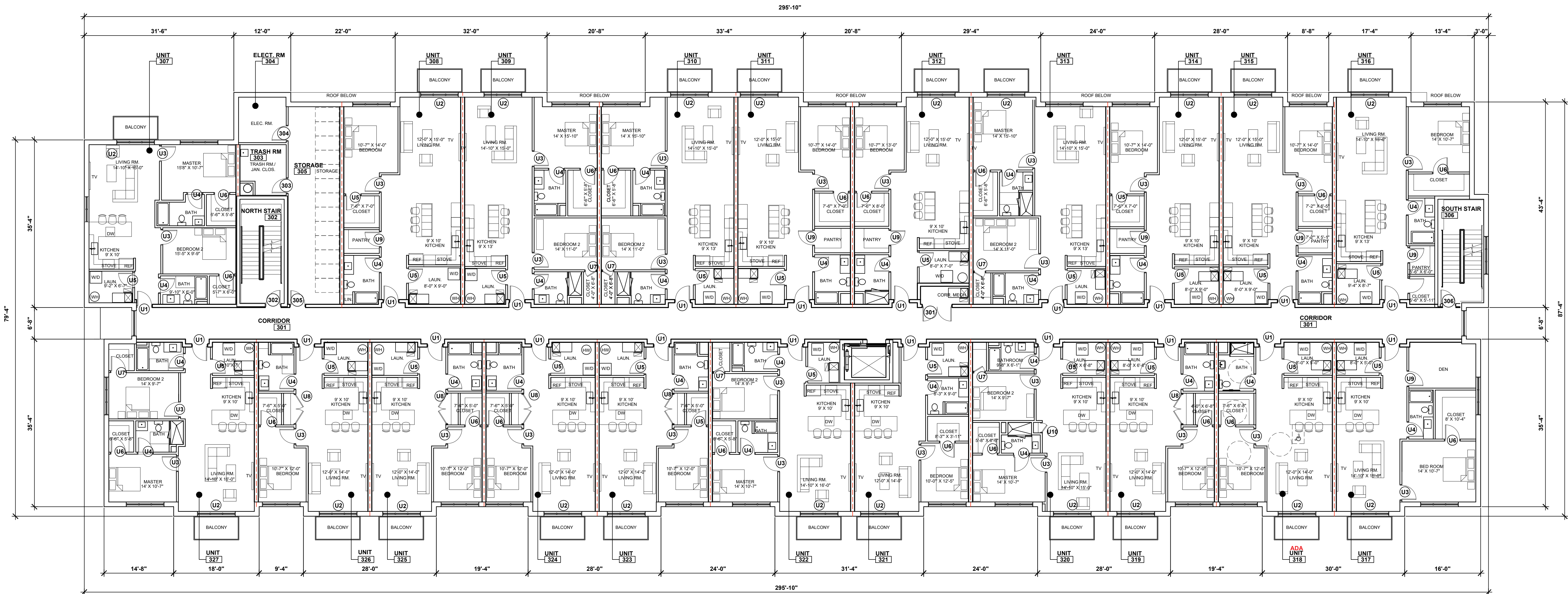
**1BR - 13 UNITS
2BR - 08 UNITS**

**BUILDING B OVERALL
2nd FLOOR PLAN**



Sheet no.

A.102



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

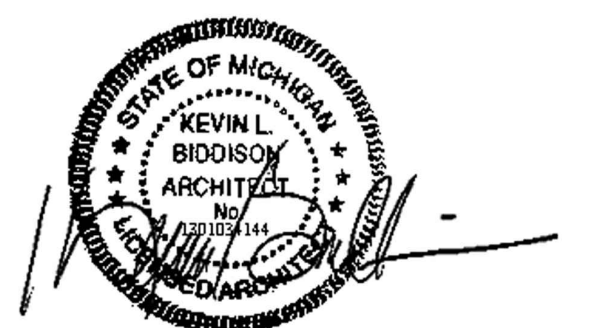
2690 CROOKS RD
TROY, MICHIGAN

Issued dr/chn

SITE PLAN 10.11.22

Sheet title

**Building B
3rd FLOOR PLAN**



Project no.

2068.20

Sheet no.

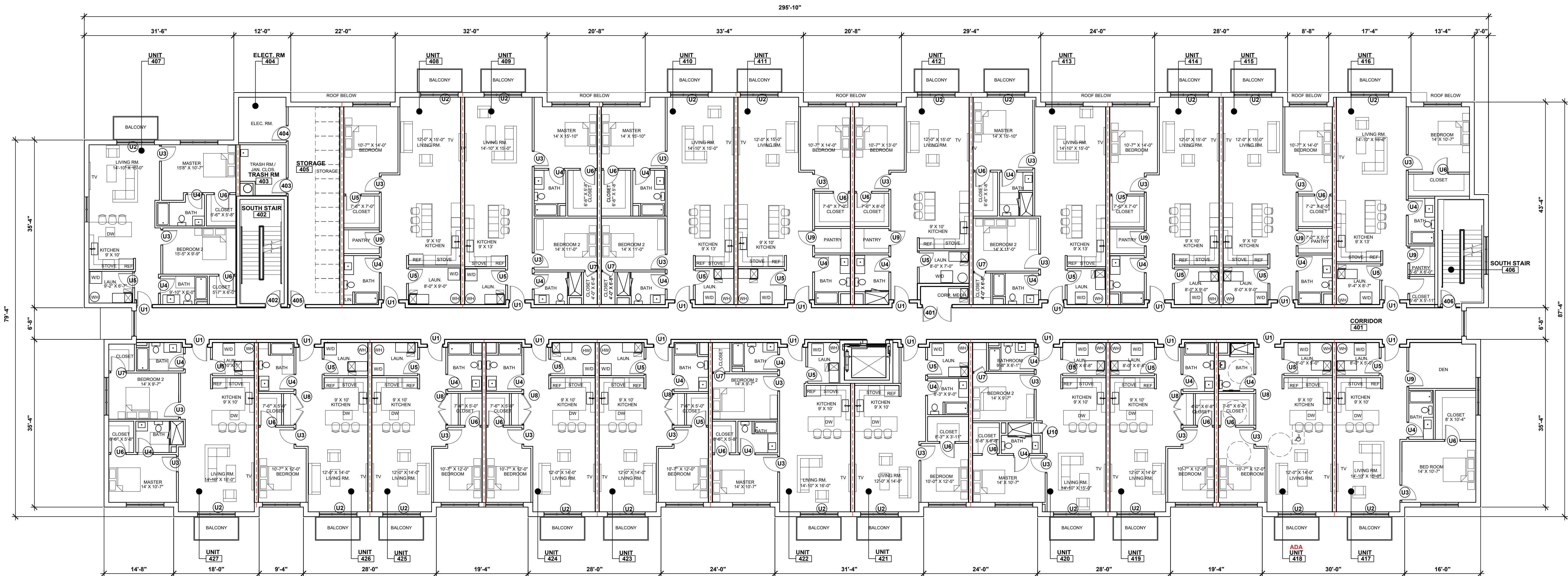
A.103

**1BR - 13 UNITS
2BR - 08 UNITS**

**BUILDING B OVERALL
3rd FLOOR PLANS**



SCALE: 3/32"=1'-0"



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

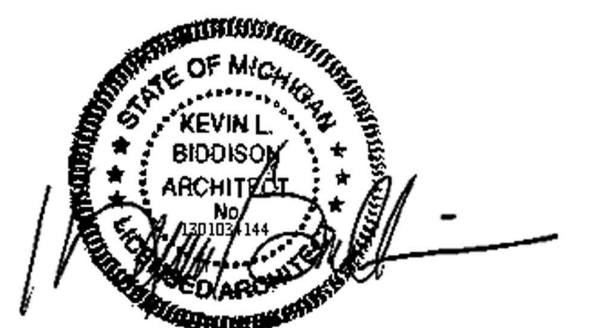
2690 CROOKS RD
TROY, MICHIGAN

Issued dr/ch

SITE PLAN 10.11.22

Sheet title

**Building B
4th FLOOR PLAN**



Project no.

2068.20

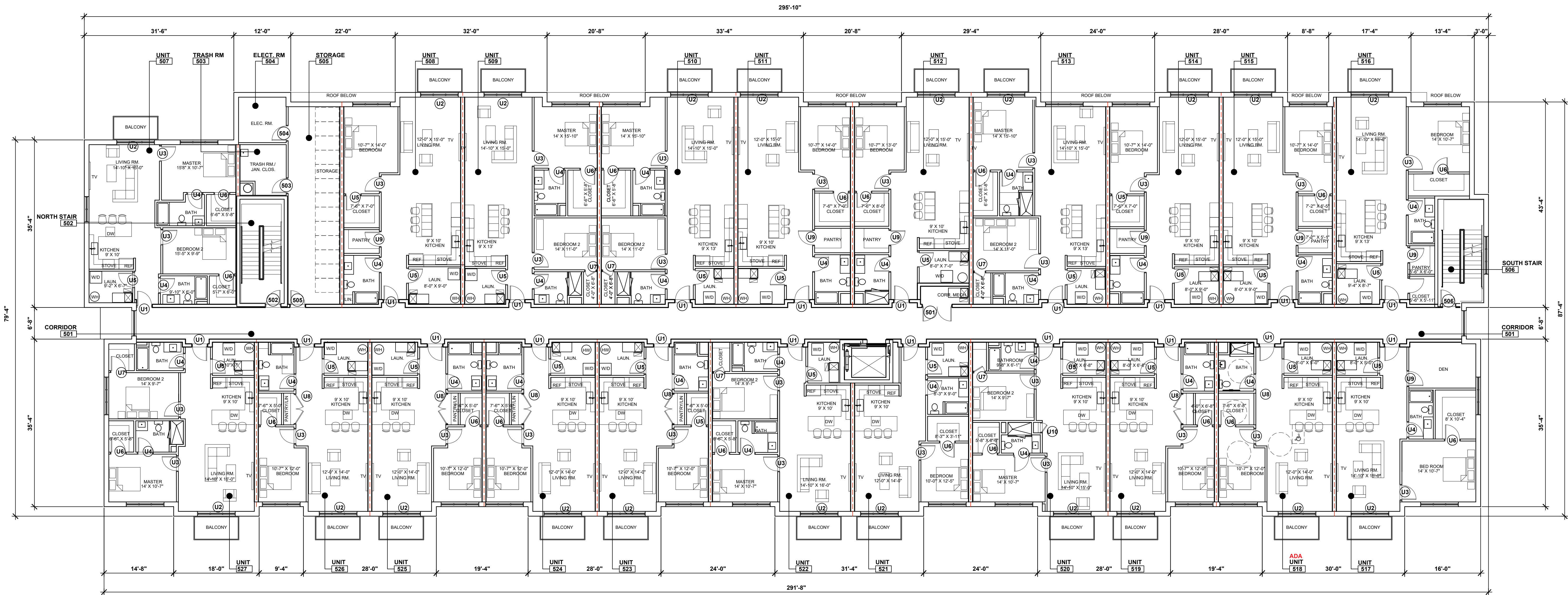
Sheet no.

A.104

**1BR - 13 UNITS
2BR - 08 UNITS**

**BUILDING B OVERALL
4TH FLOOR PLANS**

NORTH SCALE: 3/32"=1'-0"



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

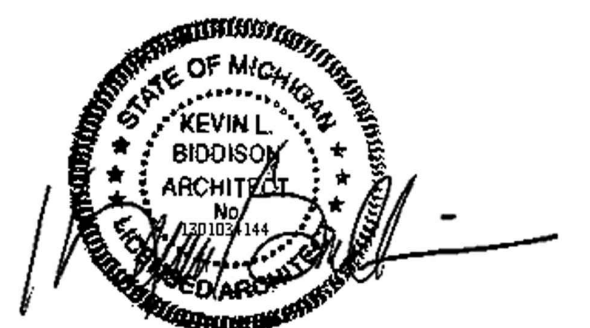
2690 CROOKS RD
TROY, MICHIGAN

Issued dr/chn

SITE PLAN 10.11.22

Sheet title

**Building B
5TH FLOOR PLAN**



Project no.

2068.20

Sheet no.

A.105

**BUILDING B OVERALL
5TH FLOOR PLANS**

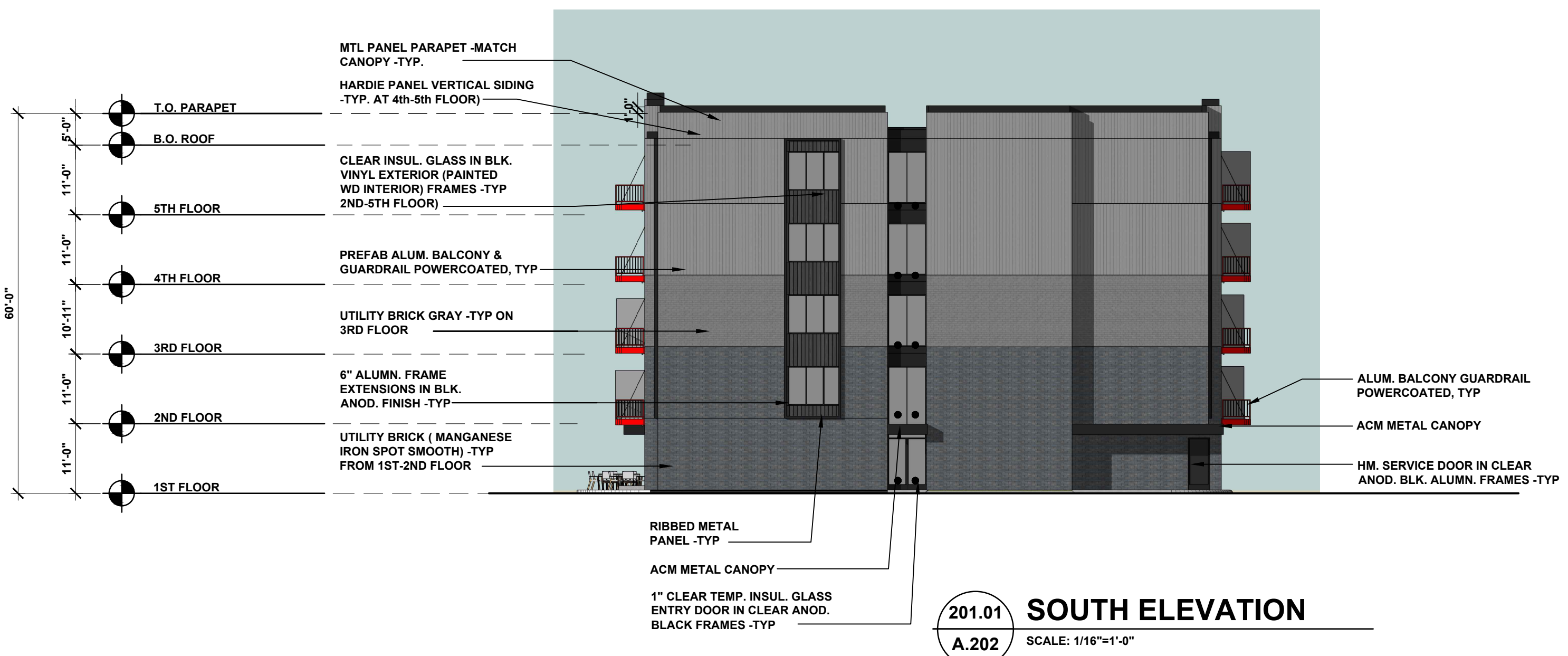
NORTH
SCALE: 3/32"=1'-0"



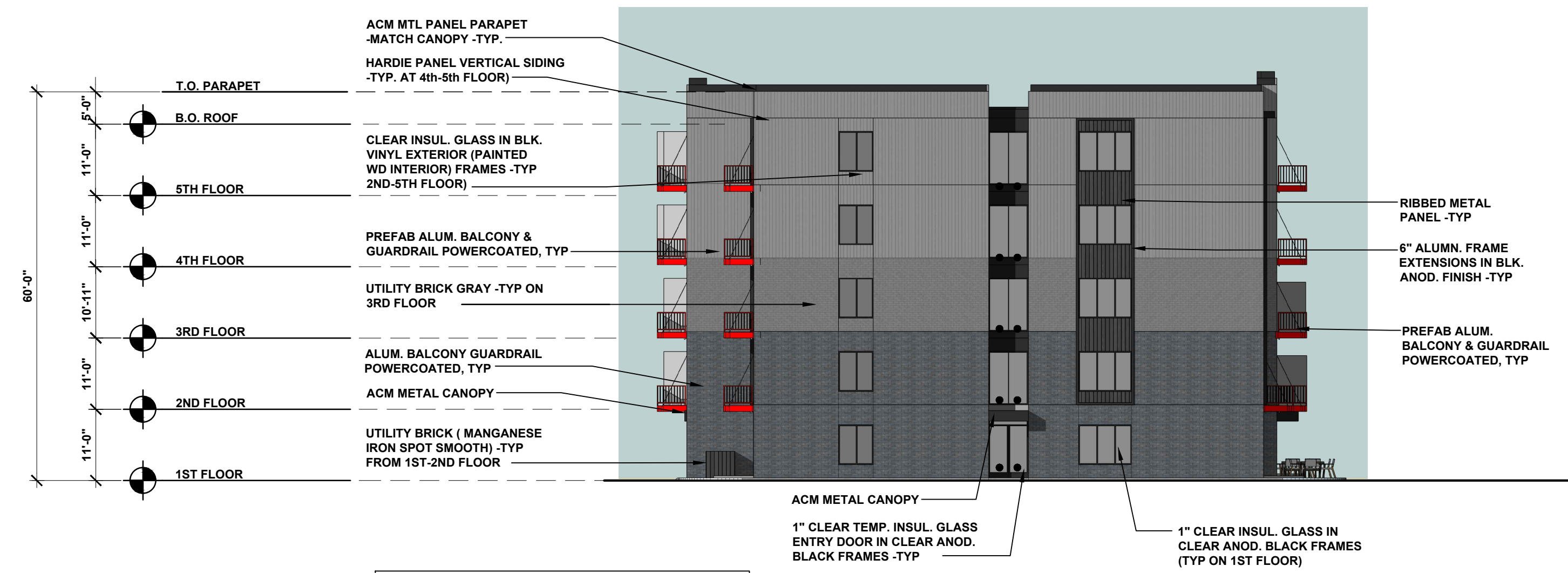
201.01 WEST ELEVATION
A.201 SCALE: 1/16"=1'-0"



201.02 EAST ELEVATION
A.201 SCALE: 1/16"=1'-0"



201.01 SOUTH ELEVATION
A.202 SCALE: 1/16"=1'-0"



201.02 NORTH ELEVATION
A.202 SCALE: 1/16"=1'-0"

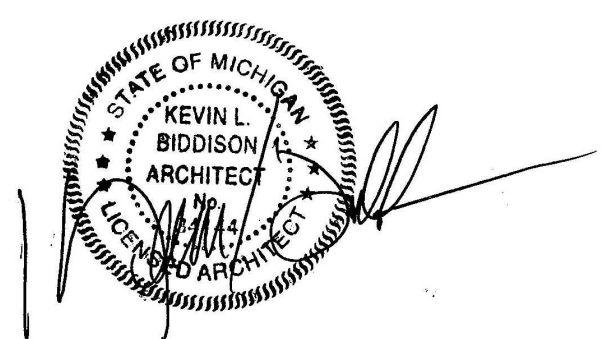
KEY
● DESIGNATES TEMPERED GLASS

PROPOSED BUILDING FOR:
**Lindsey Centre
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

SITE PLAN 10.11.22

**BUILDING B
ELEVATIONS**



2068.21

A.201



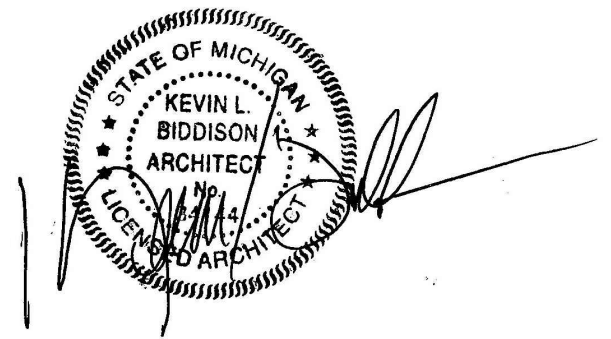
WEST FACADE

PROPOSED RENOVATION FOR:
**Lindsey Centre
Redevelopment**

2690 Crooks Road
Troy, Michigan

SITE PLAN 10.11.22

**Building B
EXTERIOR
IMAGES**



2068.20

A.202



WEST FACADE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE

Consultants

Project title

PROPOSED BUILDING FOR
**CROOK & BIG BEAVER
MIXED USE
REDEVELOPMENT**

2690 CROOKS ROAD,
TROY, MI

Issued dr/ch

SITE PLAN APPROVAL 12.06.22

Sheet title

SITE PERSPECTIVES

Project no.

2068-20

Sheet no.

A.301



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE

Consultants

Project title

PROPOSED BUILDING FOR
CROOK & BIG BEAVER
MIXED USE
REDEVELOPMENT

2690 CROOKS ROAD,
TROY, MI

Issued dr/ch

SITE PLAN APPROVAL 12.06.22

Sheet title

SITE PERSPECTIVES

Project no.

2068-20

Sheet no.

A.303



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE



PERSPECTIVE IMAGE
N.T.S. FOR REFERENCE

ITEM #7

DATE: January 5, 2023

TO: Planning Commission

FROM: R. Brent Savidant, Community Development Director

SUBJECT: PUBLIC HEARING - SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 911 & 999 W. Big Beaver Mixed Use Development, Southeast corner of Big Beaver and Crooks (PIN 88-20-28-101-032, -034 and -047), Section 28, Currently Zoned BB (Big Beaver) District.

The petitioner Tower Construction, LLC submitted the above referenced Special Use Approval and Preliminary Site Plan Approval application for a mixed-use development. Proposed improvements include 5-story apartment building, 4-story parking deck, clubhouse building, two new commercial buildings including financial institution drive-thru, and site amenities. The drive-thru and first floor apartments require Special Use Approval. The applicant proposes to demolish the 5-story building but retain the existing 15-story building.

The owner of this property is the same owner as 2690 Crooks, the other development project on the January 10, 2023 agenda.

The attached report prepared by Carlisle/Wortman Associates, Inc. (CWA), the City's Planning Consultant, summarizes the application. CWA prepared the report with input from various City departments including Planning, Engineering, Public Works and Fire. City Management supports the findings of fact contained in the report and recommends approval of the project, as noted.

Attachments:

1. Maps
2. Report prepared by Carlisle/Wortman Associates, Inc.
3. Memo from Road Commission for Oakland County (RCOC), dated November 8, 2022.
4. Memo from City Traffic Consultant OHM, dated December 22, 2022.
5. Site Plan.
6. Traffic Study from Fleis & Vandenbrink, dated December 7, 2022.

G:\SPECIAL USE\SU JPLN2022-0005 911 & 999 W BIG BEAVER\PC Memo 01 10 2023.docx

PROPOSED RESOLUTION

PUBLIC HEARING - SPECIAL USE APPROVAL AND PRELIMINARY SITE PLAN REVIEW (File Number SU JPLN2022-0004) – Proposed 911 & 999 W. Big Beaver Mixed Use Development, Southeast corner of Big Beaver and Crooks (PIN 88-20-28-101-032, -034 and -047), Section 28, Currently Zoned BB (Big Beaver) District.

Resolution # PC-2023-01-

Moved by:

Seconded by:

RESOLVED, The Planning Commission hereby approves shared parking between 911 & 999 W. Big Beaver Road and 2690 Crooks Road; and,

RESOLVED, That Special Use Approval and Preliminary Site Plan Approval for the proposed 911 & 999 W. Big Beaver Mixed Use Development, southeast corner of Big Beaver and Crooks (PIN 88-20-28-101-032, -034 and -047), Section 28, Currently Zoned BB (Big Beaver) District, be (granted, subject to the following conditions)

1. Review and revise site plan based on OHMs comments.
2. Flip the parking for Building E to be adjacent to the building.
3. Address OHM and Road Commission comments.
4. Show drive-through stacking spaces and provide dimensions
5. For Building E, replace use of first floor residential along eastern elevation (Crooks)
6. Provide one (1) additional green belt tree
7. Applicant shall either increase overall landscaping or seek a variance from the Zoning Board of Appeals.
8. Provide transparency calculations.
9. Provide a shared parking agreement to the satisfaction of the City Attorney.

_____) or
 (denied, for the following reasons: _____) or
 (postponed, for the following reasons: _____)

Yes:
 No:
 Absent:

MOTION CARRIED / FAILED



Carlisle | Wortman
ASSOCIATES, INC.

117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

Date: January 5, 2023

Preliminary Site Plan and Special Use For City of Troy, Michigan

Applicant:	Jordan Jonna
Project Name:	911 and 999 W. Big Beaver Mixed Use Development
Location:	911 and 999 W. Big Beaver
Plan Date:	December 2, 2022
Zoning:	BB, Big Beaver
Action Requested:	Preliminary Site Plan and Special Use

SITE DESCRIPTION

An application has been submitted to convert the existing Kelly Services site into a mixed-use development. Proposed improvements include:

- New Building (Building A): 8,000 sq/ft commercial retail building, with financial institution drive-thru, that fronts on Big Beaver
- New Building (B): 14,400 sq/ft commercial retail building that fronts on Big Beaver
- New 4-story, 552 space parking garage located to the rear of the Kelly Services Building
- New Building (C): 4,200 sq/ft office/community center attached to new parking garage
- New Building (D): 3,200 sq/ft clubhouse for new residential uses on site
- New Building (E): 5-story, 156-unit multiple family building
- Improved landscaping, lighting, and other site amenities

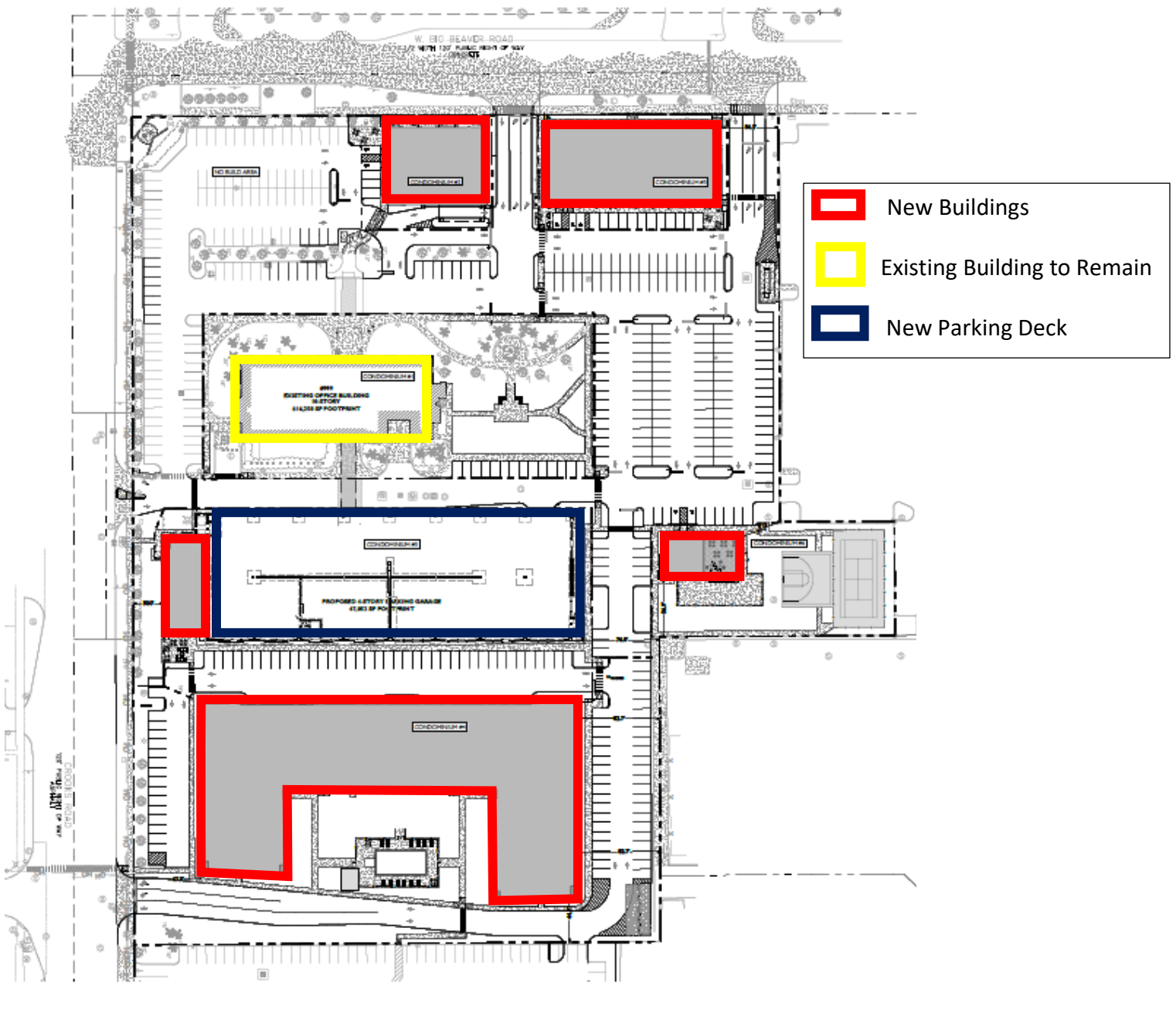
They propose to demolish the existing 5 story (911 Big Beaver) but keep the existing 15-story Kelly Service building (999 Big Beaver) as an office building.

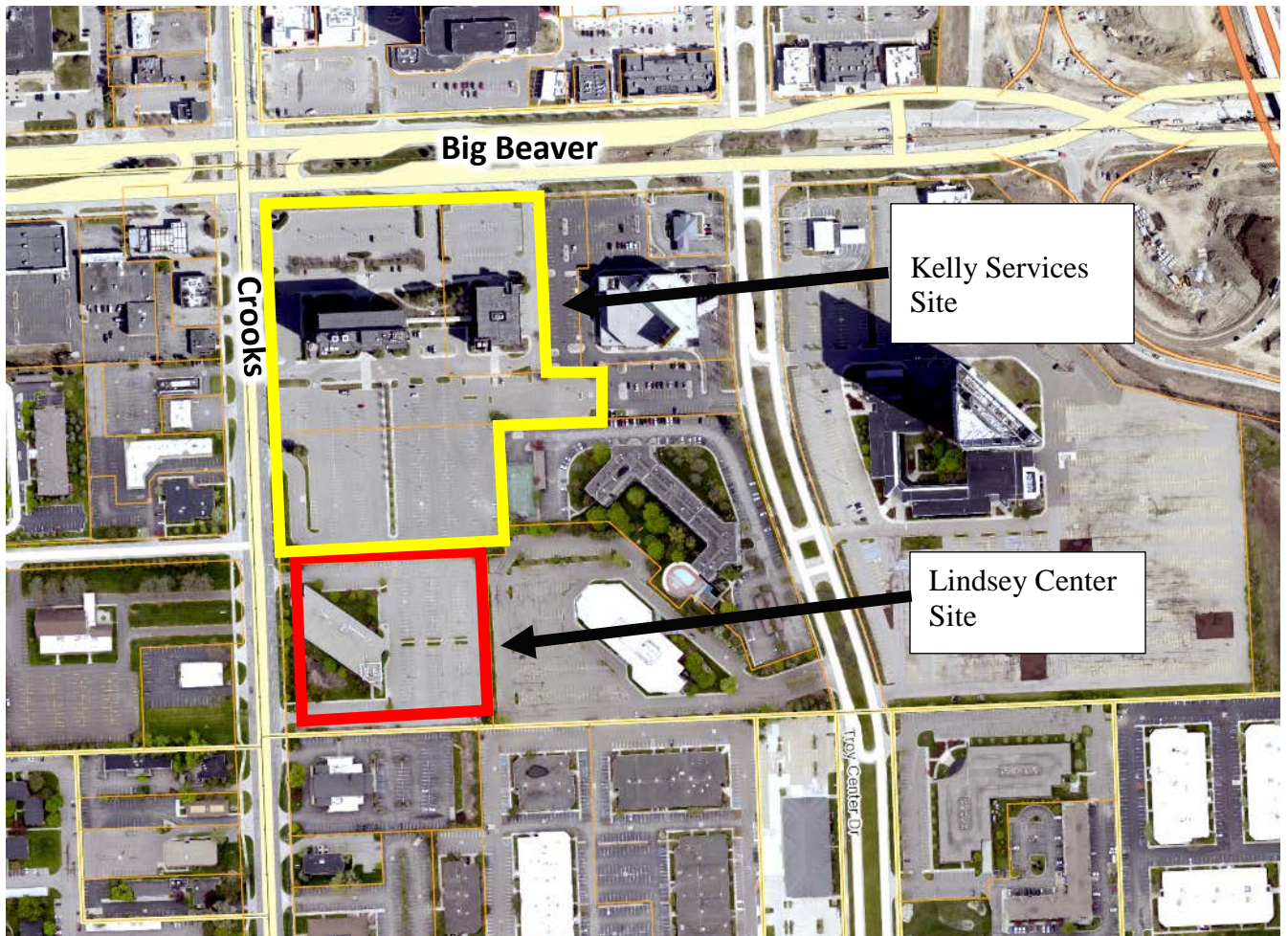
Overall site parking will be shared with the 2960 Crooks (Lindsey Center site). Both sites are under the same ownership.

Applicant is seeking the following approvals:

1. Preliminary site plan approval
2. Special Use approval
 - a. Financial Institution Drive-thru
 - b. Residential use on first floor of area not facing right of way
3. Waivers (as noted in review)

Summary of Improvements:





Proposed Uses of Subject Parcel:

Convert the existing Kelly Services site into a mixed-use development.

Current Zoning:

The property is currently zoned BB, Big Beaver Form Based District

Surrounding Property Details:

Direction	Zoning	Use
North	BB, Big Beaver	Big Beaver Road, Mixed Use
South	BB, Big Beaver	Lindsey Center
East	BB, Big Beaver and UR, Urban Residential	Office and Commercial
West	BB, Big Beaver, CB, Commercial, O, Office	Mix of Commercial Uses

NATURAL FEATURES

The site has been graded and improved for an office building and an associated parking lot.

Items to be addressed: None.

SITE ARRANGEMENT

Access will be provided via two points on Big Beaver, two on Crooks, and cross-access to the 2690 Crooks (Lindsey Center site). The applicant is proposing shared parking for both buildings at Lindsey Center site and the Kelly Services site.

Two new small commercial buildings will be placed fronting on Big Beaver. The new five (5) story parking deck and five (5) story multiple family building is placed behind the existing Kelly Services office tower. The residential clubhouse building will be placed interior to the rear of the site.

OHM has reviewed site circulation and notes the following comments:

1. *We note that adjacent site, 2690 Crooks, proposes to utilize shared parking and requires a pedestrian sidewalk connection between the sites. This pedestrian route must be ADA-accessible.*
2. *As a part of Building E, the four parking stalls adjacent to the common area should be hatched out since it is impossible for a vehicle to exit this area if all of the parking spaces are occupied.*
3. *For the parking provided within Building E, an active parking management sign displaying the number of available spaces should be provided for both parking areas. This will alert drivers if these lots are full. There is not an easy way for vehicles to exit these areas if they are full.*

The applicant should review and revised based on OHMs comments.

Items to be addressed: Review and revise site plan based on OHMs comments.

AREA, WIDTH, HEIGHT, SETBACKS

The applicant does not propose any changes to the footprint of the existing building. The Kelly Services building is an existing non-conforming structure. By placing the new buildings on Big Beaver and the small office/community building (Building C) that fronts on Crooks, the applicant is making the site more conforming.

	Required	Provided	Compliance
Front (Big Beaver)	10-foot build-to-line	10.8-feet (building A)	Complies with Planning Commission approval

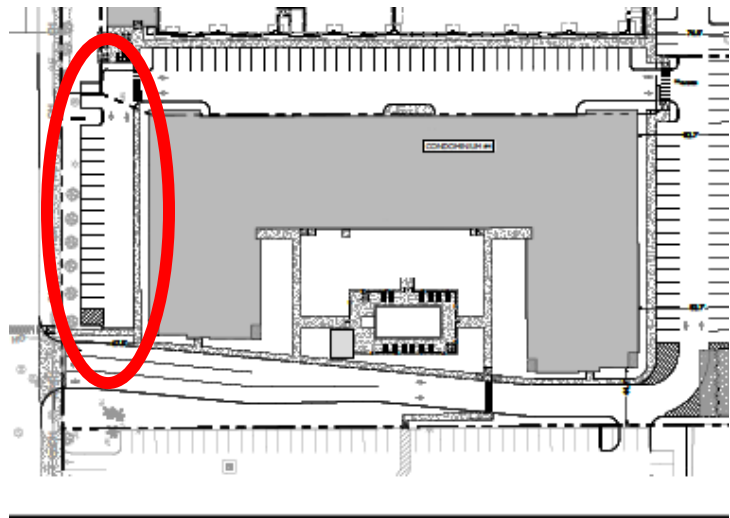
Front (Crooks)	10-foot build-to-line	30 feet (building C)	Complies with Planning Commission approval.
Side (east)	N/A, building may be placed up to property line	56-feet	Complies
Rear (South)	30-foot minimum setback	44-feet	Complies
Building Height	6 stories, 72 feet	5 stories, 62 feet	Complies
Open Space	20%	22%	Complies
Parking Location	Cannot be located in front yard	Parking area located in front yard for Building E	Does not comply

The applicant is seeking the following waivers from the Planning Commission:

- Building A build-to-line: 10.8' when 10.0' is required
- Building C build-to-line: 30' when 10.0' is required

Building E:

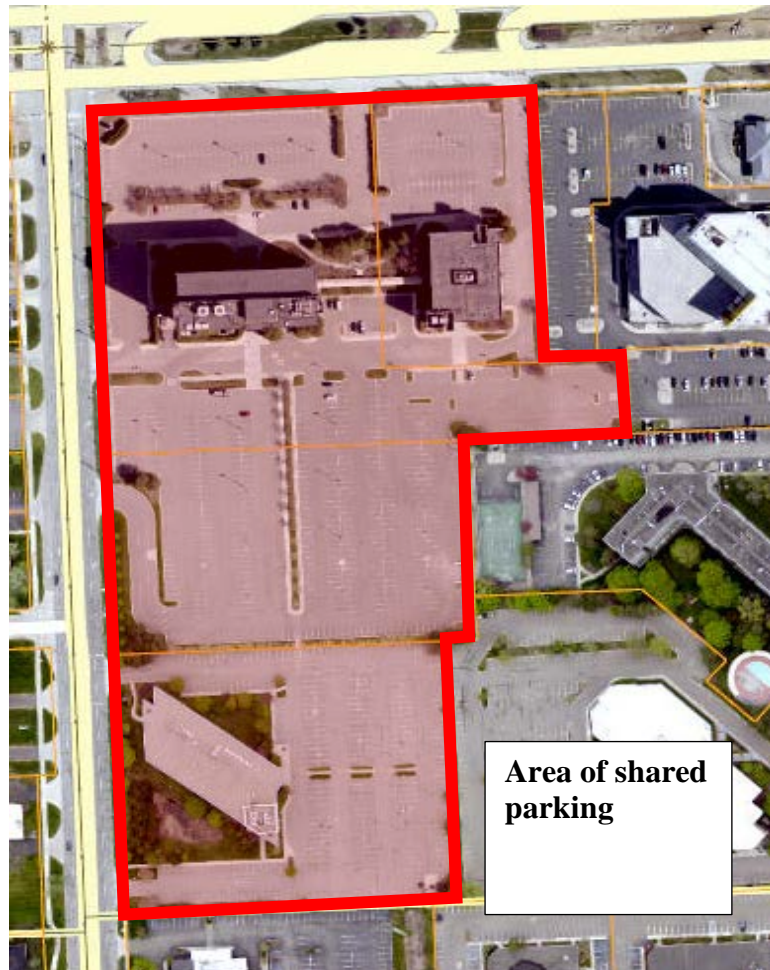
Building E is a multiple story building, which permits one (1) row of parking between the building and Crooks Road. However, the parking has to be adjacent to the building. In order to comply, the applicant shall flip the parking for Building E so that the parking is adjacent to the building.



Items to be addressed: 1). Planning Commission to consider the two request waivers; and 2). Flip the parking for Building E to be adjacent to the building.

PARKING

The applicant proposes shared parking for both buildings with the Kelly service buildings and parking areas.



OHM has reviewed the shared parking and shares the following comments for Planning Commission consideration:

999 Big Beaver alone is sufficient on parking. Some minor comments (see our 12/22/22 review) that may affect the total parking space count slightly (a handful of spaces).

However, 2690 Crooks requires the use of shared parking (with 999 Big Beaver), as it alone would have a deficit.

The big question on parking is how will shared parking function in the future, given the unknowns with timing/phasing of both sites (including the site drives and new Butterfield traffic signal)?

- *If the developer sells one of the parcels, they're no longer under common ownership- then what (does 300' apply, what if it's already built out)?*
- *This is a multi-phase development, so what happens if 999 Big Beaver the parking structure construction is delayed but construction on the second building at 2690 has already begun?*
- *Is there enough parking if construction activities on both sites are concurrent? How do pedestrians from 2690 Crooks safely walk to the shared parking area when the south residential building and new driveway at Butterfield are built?*
- *If 2690 proceeds and 999 Big Beaver begins with only the Phase 1 retail, it leaves a large sea of old pavement for an indefinite time (with uncertainty over when the Butterfield reconfiguration would occur, potentially opening the door to needing a new "interim" traffic impact study and/or concerns from RCOC along Crooks Rd).*

A representative from OHM will attend the meeting to discuss shared parking and other issues.

Items to be Addressed: *Planning Commission to consider shared parking.*

TRAFFIC

The applicant submitted a traffic study that was reviewed by both OHM and the Oakland County Road Commission. OHM reviewed the traffic study and concludes:

At this time, OHM does not object to the conclusions of the TIS and note a few minor items that are not likely to impact the study findings. OHM recommends conditional approval of the site plan, subject to the items noted below being addressed.

OHM's comments are as follows:

Traffic Impact Study:

1. *Table 3 shows 312 dwelling units for the multi-family housing; however, the site plan shows 156 units. These documents need to match. It appears that the 2690 Crooks development is proposed to include an additional 156 dwelling units. If so, add a footnote to Table 3 to add clarity.*
2. *OHM notes a level of service F with a delay of 73.1 seconds for NBR vehicles at Big Beaver Road and W. Site Drive during the PM peak hour. Traffic congestion and backups may occur within the site. It is expected that many of these vehicles will instead utilize one of the signalized driveways to exit the site.*
3. *The plans provide a parking phasing plan that show available parking for each phase of development (during construction, when large portions of the existing surface lots are unavailable and/or before the proposed parking structure is*

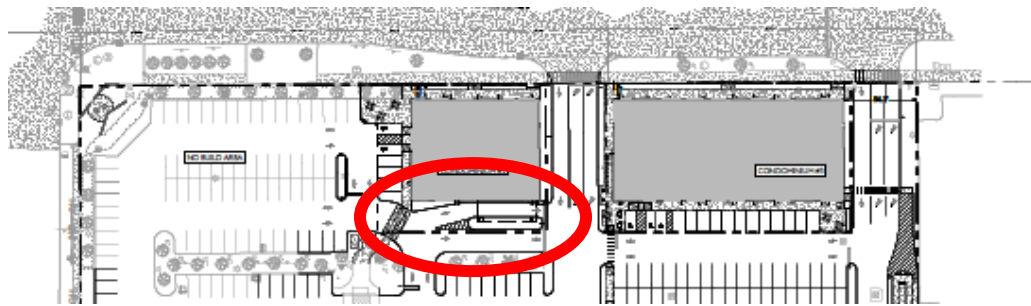
constructed). As each phase of development proceeds, there must be sufficient parking to satisfy parking demand. Interim parking calculations should be reviewed with engineering plans for each phase of development on the 999 Big Beaver and 2690 Crooks sites. It is unclear when 2690 Crooks development will occur relative to the proposed phased construction for 999 Big Beaver.

Please see OHMs and Road Commission review for detailed comments.

Items to be addressed: Applicant to address OHM and Road Commission comments.

SPECIAL USE: FINANCIAL INSTITUTION DRIVE-THROUGH

The applicant is proposing a financial institution drive-through located on the rear side of Building A. A financial institution drive-through is permitted as a special use in the Big Beaver district.



Drive-Through Standards (15.05.E.5.d):

- i. *A drive-through and associated structure cannot be a primary use or principal building.*

CWA Comment: The drive-through is an accessory use to the principal use of the building.

- ii. *Ingress and egress to drive-through facilities shall be part of the internal circulation of the site and integrated with the overall site design. Clear identification and delineation between the drive-through facility and the parking lot shall be provided. Drive-through facilities shall be designed in a manner which promotes pedestrian and vehicular safety.*

CWA Comment: Through the use of curbing, landscaping islands, and striping, the applicant has clearly delineated the drive-through use.

- iii. *Drive-throughs must be located behind façade opposite Big Beaver Road or detached from principal structure and shall be located in a manner that will be the least visible from a public thoroughfare.*

- a. *If detached, the point-to-point tube transport system (pneumatic tubes) must be located underground to serve the drive-through kiosk or canopy.*
- b. *Canopy design shall be compatible with the design of the principal building and incorporate similar materials and architectural elements.*

CWA Comment: The drive-through is located on the opposite façade of Big Beaver. The applicant shows a canopy with a stone column and metal covering that matches the primary building.

- iv. *Each drive-through facility shall provide stacking space meeting the following standards:*
 - a. *Each stacking lane shall be one-way, and each stacking lane space shall be a minimum of ten (10) feet in width and twenty (20) feet in length.*
 - b. *If proposed, an escape lane shall be a minimum of twelve (12) feet in width to allow other vehicles to pass those waiting to be served.*
 - c. *Four (4) stacking spaces per drive-through lane.*
 - d. *All stacking lanes must be clearly delineated through the use of striping, landscaping, curbs, or signage.*

CWA Comment: The applicant did not dimension or show stacking spaces.

- v. *A drive-through aisle shall not be directly accessed from or exit onto Big Beaver Road.*

CWA Comment: The drive-through is not directly access from or exits to Big Beaver Road.

Items to be Addressed: 1). Show stacking spaces and provide dimensions; and 2). Planning Commission to consider Special Use

SPECIAL USE: FIRST FLOOR RESIDENTIAL

In the fall of 2021, a text amendment was adopted which permitted residential uses on the first floor as a Special Use for the section of the building that does not front on a public right-of-way. New Building E has first floor residential uses along the eastern (Crooks) and western property line. The residential uses on the western property line is permitted via Special Use; however the residential uses on the first floor is not permitted and the use must be converted to a non-residential use.

Items to be Addressed: 1). For Building E, replace use of first floor residential along eastern elevation (Crooks); and 2). Planning Commission to consider Special Use.

LANDSCAPING

A landscaping plan has been provided on Sheet L101. The following table discusses the development’s compliance with the landscape requirements set forth in Section 13.02.

	Required:	Provided:	Compliance:
Greenbelt Planting			
Crooks and Big Beaver: 1 tree every 30 feet	1,483 / 30 = 50 trees	49	Does not comply
Parking Lot Landscaping			
1 tree per every 8 parking spaces	419 spaces / 8 = 53 trees	107	Complies, with Planning Commission approval
Overall			
<u>Site landscaping:</u> A minimum of fifteen percent (15%) of the site area shall be comprised of landscape material. Up to twenty-five percent (25%) of the required landscape area may be brick, stone, pavers, or other public plaza elements, but shall not include any parking area or required sidewalks.	15% = 106,623 sq/ft	14% (101,503 sq.ft)	Does not comply

The applicant is providing double the amount of required parking lot landscaping, however most is on the perimeter of the parking lot and there are long stretches of parking without landscaping. The Planning Commission may allow alternative location of parking lot trees.

The applicant is deficient in greenbelt trees and total landscaping area. They shall add one additional greenbelt tree and increase overall landscaping or seek a variance from the Zoning Board of Appeals.

Transformer / Trash Enclosure:

The applicant has indicated they propose to screen the trash enclosure with a masonry block.

Items to be Addressed: 1). Applicant to provide one (1) additional green belt tree; 2). Planning Commission to discuss parking lot tree location; and 3). Applicant shall either increase overall landscaping or seek a variance from the Zoning Board of Appeals.

PHOTOMETRICS

The applicant is proposing twenty (20) new parking lot lights, fourteen (14) wall scones, and fifteen (15) lighted bollards. There is existing lights that will remain on site. The lighting fixture and photometrics meet ordinance requirements.

Items to be Addressed: None

FLOOR PLAN AND ELEVATIONS

Existing Kelly Services Building:

The building will remain as is.

New Buildings (A and B) Commercial:

Brown and tan tone color scheme, with brick, glass, and limestone veneer. Please note that the labeling on the elevations are different than the building labeling on the site plan set. Building A is building B on the site plan and vice-versa.

New Parking Structure

Proposed brick and masonry block. The color scheme is gray and black, with a brown brick elevator tower.

New Buildings (C) Office/Community Space:

Proposed brick and glass material use. Color scheme is browns and tans.

New Buildings (D) Clubhouse:

Proposed burnished block and glass material use. Color scheme is greys.

New Buildings (E) Multiple Family:

Proposed brick, masonry block, and metal panels. and glass material use. Color scheme is greys.

For all buildings, the applicant should provide transparency calculations.

Items to be Addressed: Provide transparency calculations

DESIGN STANDARDS AND SITE PLAN REVIEW STANDARDS

The Big Beaver Node design standards as well as Site Plan review standards provide the Planning Commission with direction when reviewing the proposed site plan and design features of this development.

Section 5.04.E. outlines Design Standards:

1. *Building Orientation and Entrance*
2. *Ground Story Activation*
3. *Transitional Features*
4. *Site Access, Parking, and Loading*

Please see Section 5.04.E for standard details.

Section 8.06 outlines Site Plan Review Design Standards.

1. *Development shall ensure compatibility to existing commercial districts and provide a transition between land uses.*
 - a. *Building design shall enhance the character of the surrounding area in relation to building and parking placement, landscape and streetscape features, and architectural design.*
 - b. *Street fronts shall provide a variety of architectural expression that is appropriate in its context and prevents monotony.*
 - c. *Building design shall achieve a compatible transition between areas with different height, massing, scale, and architectural style.*
2. *Development shall incorporate the recognized best architectural building design practices.*
 - a. *Foster a lasting impact on the community through the provision of high quality design, construction, and detailing.*
 - b. *Provide high quality, durable materials, such as but not limited to stone, brick, glass, and metal. E.I.F.S. or material equivalent shall only be used as an accent material.*
 - c. *Develop buildings with creativity that includes balanced compositions and forms.*
 - d. *Design roofs that are appropriate to the architectural style of the building and create an appropriate visual exterior mass of the building given the context of the site.*
 - e. *For commercial buildings, incorporate clearly defined, highly visible customer entrances using features such as canopies, porticos, arcades, arches, wing walls, ground plane elements, and/or landscape planters.*
 - f. *Include community amenities that add value to the development such as patio/seating areas, water features, art work or sculpture, clock towers, pedestrian plazas with park benches or other features located in areas accessible to the public.*

3. *Enhance the character, environment and safety for pedestrians and motorists.*
 - a. *Provide elements that define the street and the pedestrian realm.*
 - b. *Create a connection between the public right of way and ground floor activities.*
 - c. *Create a safe environment by employing design features to reduce vehicular and pedestrian conflict, while not sacrificing design excellence.*
 - d. *Enhance the pedestrian realm by framing the sidewalk area with trees, awnings, and other features.*
 - e. *Improve safety for pedestrians through site design measures.*

SPECIAL USE STANDARDS

The applicant is seeking two special uses:

1. Financial Institution Drive-thru
2. Residential use on first floor of area not facing right of way.

For any special use, according to Section 9.02.D, the Planning Commission shall “...review the request, supplementary materials either in support or opposition thereto, as well as the Planning Department’s report, at a Public Hearing established for that purpose, and shall either grant or deny the request, table action on the request, or grant the request subject to specific conditions.”

Section 9.03 states that before approving any requests for Special Use Approval, the Planning Commission shall consider:

1. *Compatibility with Adjacent Uses.*
2. *Compatibility with the Master Plan.*
3. *Traffic Impact.*
4. *Impact on Public Services.*
5. *Compliance with Zoning Ordinance Standards.*
6. *Impact on the Overall Environment.*
7. *Special Use Approval Specific Requirements.*

SUMMARY

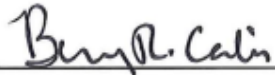
As part of the deliberation, the Planning Commission and the applicant shall discuss:

- a. Two (2) building placement waiver requests
- b. Compliance with Section 5.04.E Big Beaver Design Standards
- c. Compliance with Section 8.06 Site Plan Review Standards
- d. Compliance with 9.02.D Special Use Standards
- e. Architecture and material use
- f. Parking lot tree location
- g. Shared parking

If Planning Commission approves preliminary site plan and special use, the following conditions shall as part of final site plan submittal:

1. Review and revise site plan based on OHMs comments.
2. Flip the parking for Building E to be adjacent to the building.
3. Address OHM and Road Commission comments.
4. Show drive-through stacking spaces and provide dimensions
5. For Building E, replace use of first floor residential along eastern elevation (Crooks)
6. Provide one (1) additional green belt tree
7. Applicant shall either increase overall landscaping or seek a variance from the Zoning Board of Appeals.
8. Provide transparency calculations.
9. Provide a shared parking agreement to the satisfaction of the City Attorney.

Sincerely,



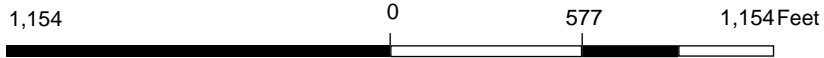
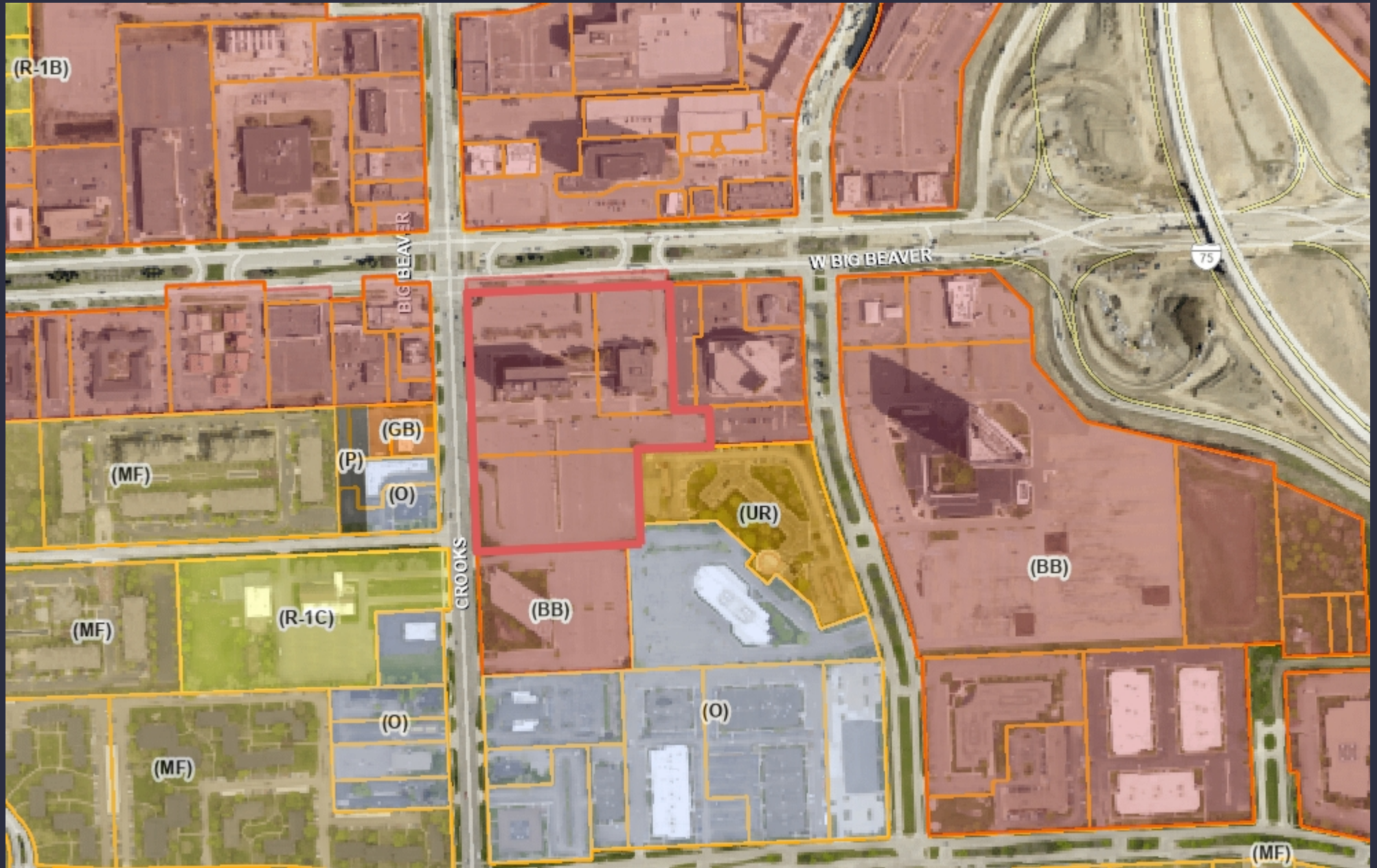
CARLISLE/WORTMAN ASSOC., INC.
Benjamin R. Carlisle, LEED AP, AICP



1,154 0 577 1,154 Feet



Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.



Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.



November 8, 2022

Jason Gekiere
314 Lakeside Drive
White Lake, MI 48386

RE: 999 BIG BEAVER ROAD TRAFFIC IMPACT DISCUSSION

Dear Mr. Gekiere:

Thank you for taking the time to meet with the City of Troy and the Road Commission for Oakland County (RCOC) to discuss this matter. In light of that meeting, and after discussing this matter internally, RCOC is willing to approve this development in concept, under the following conditions:

- A) The existing traffic signal heads facing outbound traffic from the easterly driveway should be relocated to the north side of eastbound Big Beaver Road and modernized. In lieu of that, RCOC is also willing to accept relocation of the stop bar for outbound traffic, with prohibition of right turns on red.
- B) The westerly driveway and access can remain as existing, with right-in ingress and dual right turn lane egress.
- C) Outbound left turns will be prohibited from the northerly driveway to Crooks Road. All other ingress and egress will continue to be allowed.

These conditions are required for conceptual approval. A detailed field and engineering review of the final plans will be conducted during the permit application process.

If you have any questions or require additional information, please feel free to contact me at 248-858-4835.

Respectfully,

Scott Sintkowski, P.E.
Permit Engineer
Department of Customer Services

Copied via e-mail:
Mark Soma – Tower Construction
Paula Arwady – Tower Construction
Julie M. Kroll, PE, PTOE – Fleis & Vandenbrink
Eric Williams, PE – Stonefied Engineering
Jordan Jonna – A.F. Jonna
Dennis Cowan – Plunkett Cooney
Bill Huotari, PE, City Engineer – City of Troy
Brent Savidant, AICP, Community Development Director – City of Troy
Gary Piotrowicz, PE, PTOE, Deputy Managing Director – RCOC
Dave Czerniakowski, Director of Customer Services – RCOC
Danielle Deneau, PE, Director of Traffic and Safety – RCOC
Alex Rucinski, PE, Traffic Engineer - RCOC

Board of Road Commissioners

Ronald J. Fowkes
Commissioner

Andrea LaLonde
Commissioner

Nancy Quarles
Commissioner

Dennis G. Kolar, P.E.
Managing Director

Gary Piotrowicz, P.E., P.T.O.E.
Deputy Managing Director
County Highway Engineer

Department of
Customer Services
Permits

2420 Pontiac Lake Road
Waterford, MI 48328

248-858-4835

FAX
248-858-4773

TDD
248-858-8005

www.rcocweb.org



memorandum

Date: December 22, 2022

To: Scott Finlay, PE

From: Stephen Dearing, PE, PTOE & Lauren Hull, EIT

CC: Sara Merrill, PE, PTOE

Re: Multi-Family/ Mixed Use at Crooks Rd & Big Beaver Rd
(a.k.a. 911/999 Big Beaver, Kelly Properties, Lindsey Center PUD)
JPLN2022-0006

We have reviewed the Traffic Impact Study (TIS) for the planned development, which also includes the proposed 2690 Crooks Multi-Family development. Phase 1 of the mixed-use development at the southeast corner of Crooks Road & Big Beaver Road proposes to redevelop a portion of the site, demolishing the existing 4-story commercial building at 911 Big Beaver Road and constructing two commercial/retail buildings totaling 22,008 SFT and surface parking. Future phases of this development will retain an existing 10-story office building, and will also construct a 4,277 SFT office building, a 156-unit 5-story multi-family building, a clubhouse, and a 4-story parking structure. The site plans were prepared by Stonefield Engineering, Inc., and dated December 2, 2022.

The previously submitted Traffic Impact Assessment was prepared by ROWE Professional Services Company and dated February 15, 2022. The revised TIS has been prepared by Fleis & Vanderblink, Inc and is dated December 7, 2022.

At this time, OHM does not object to the conclusions of the TIS and note a few minor items that are not likely to impact the study findings. OHM recommends conditional approval of the site plan, subject to the items noted below being addressed.

OHM's comments are as follows:

Traffic Impact Study:

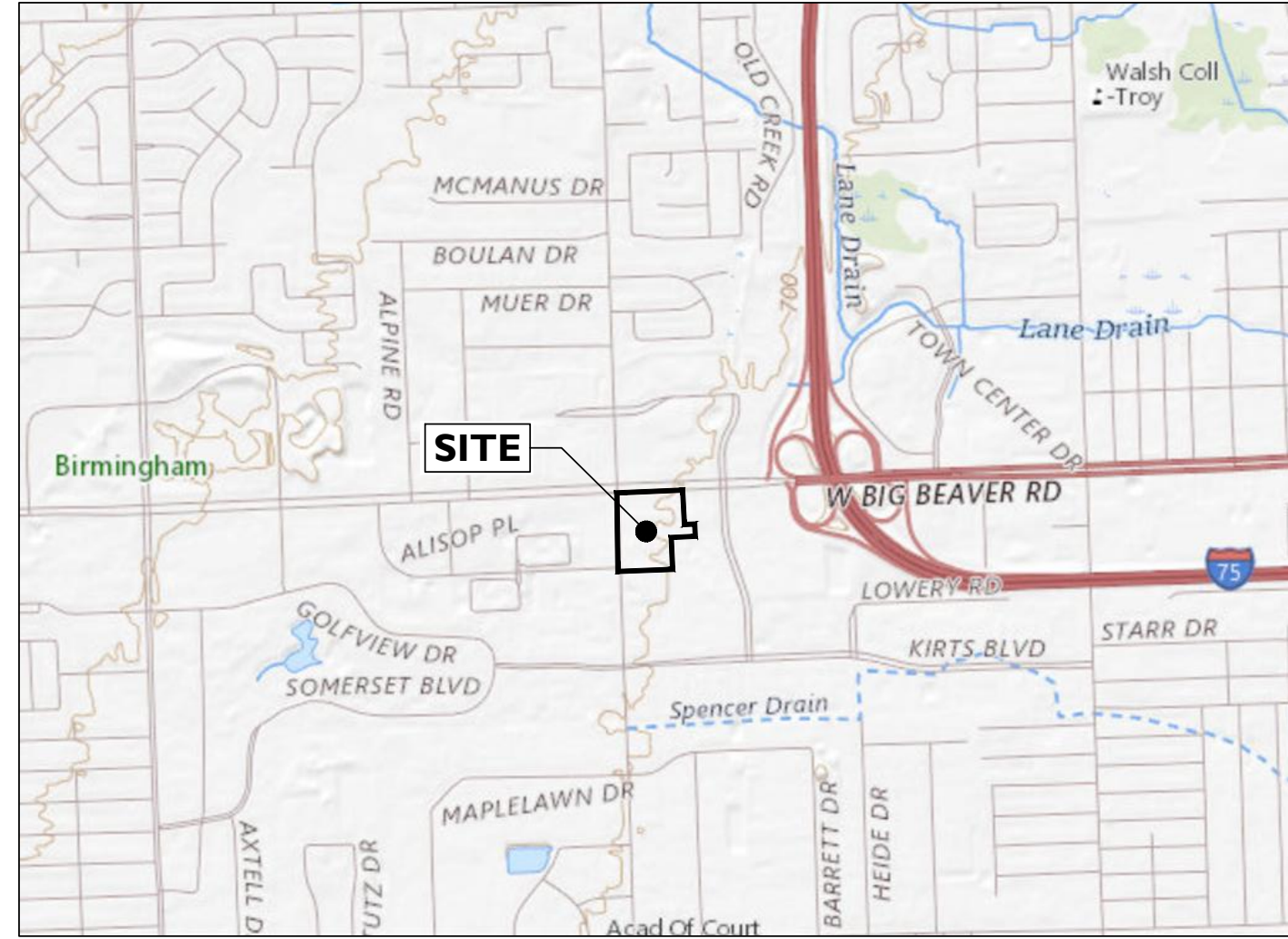
1. Table 3 shows 312 dwelling units for the multi-family housing; however, the site plan shows 156 units. These documents need to match. It appears that the 2690 Crooks development is proposed to include an additional 156 dwelling units. If so, add a footnote to Table 3 to add clarity.
2. OHM notes a level of service F with a delay of 73.1 seconds for NBR vehicles at Big Beaver Road and W. Site Drive during the PM peak hour. Traffic congestion and backups may occur within the site. It is expected that many of these vehicles will instead utilize one of the signalized driveways to exit the site.
3. The plans provide a parking phasing plan that show available parking for each phase of development (during construction, when large portions of the existing surface lots are unavailable and/or before the proposed parking structure is constructed). As each phase of development proceeds, there must be sufficient parking to satisfy parking demand. Interim parking calculations should be reviewed with



engineering plans for each phase of development on the 999 Big Beaver and 2690 Crooks sites. It is unclear when 2690 Crooks development will occur relative to the proposed phased construction for 999 Big Beaver.

Site Plan:

1. We note that adjacent site, 2690 Crooks, proposes to utilize shared parking and requires a pedestrian sidewalk connection between the sites. This pedestrian route must be ADA-accessible.
2. As a part of Building E, the four parking stalls adjacent to the common area should be hatched out since it is impossible for a vehicle to exit this area if all of the parking spaces are occupied.
3. For the parking provided within Building E, an active parking management sign displaying the number of available spaces should be provided for both parking areas. This will alert drivers if these lots are full. There is not an easy way for vehicles to exit these areas if they are full.



SOURCE: USGS MAPS

LOCATION MAP

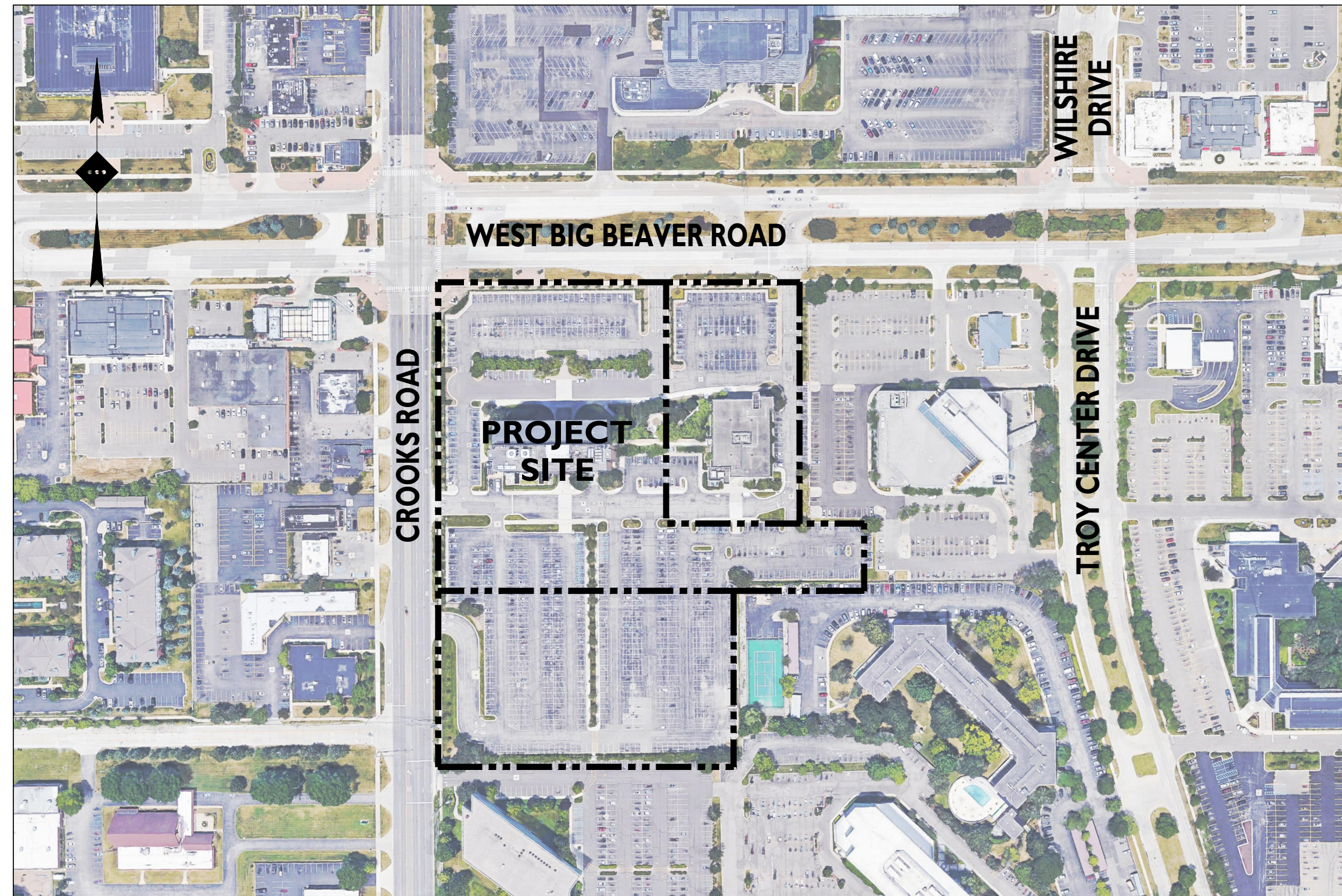
SCALE: 1" = 2,000'±

SITE DEVELOPMENT PLANS FOR CROOKS & BIG BEAVER PROPOSED MIXED USE REDEVELOPMENT

PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, & 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY, OAKLAND COUNTY, MICHIGAN

APPLICANT

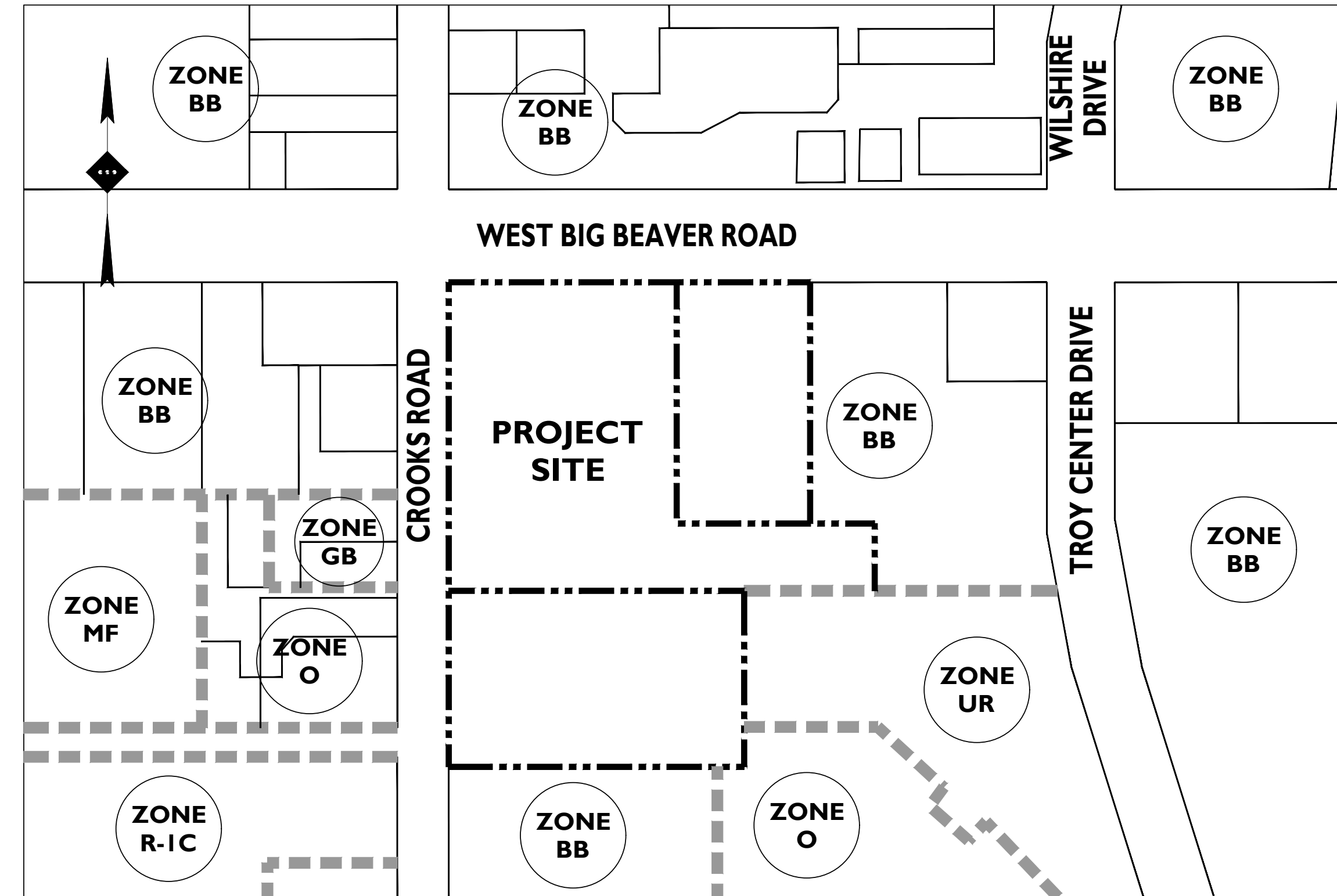
AF JONNA DEVELOPMENT
4036 TELEGRAPH ROAD, SUITE 201
BLOOMFIELD HILLS, MI 48302



SOURCE: GOOGLE EARTH PRO

AERIAL MAP

SCALE: 1" = 200'±



SOURCE: OAKLAND COUNTY PROPERTY GATEWAY & CITY OF TROY ZONING MAP

ZONING MAP

SCALE: 1" = 200'±

PLAN REFERENCE MATERIALS:

- THIS PLAN SET REFERENCES THE FOLLOWING DOCUMENTS INCLUDING, BUT NOT LIMITED TO:
 - ALTA/TOPOGRAPHIC SURVEY PREPARED BY KEM-TEC SURVEY DATED 02/21/20, REVISED 06/12/2020
 - ARCHITECTURAL PLANS PREPARED BY BIDDISON ARCHITECTURE DATED 02/11/2022
 - GEO TECHNICAL REPORT
 - TENANT WORK LETTERS
 - AERIAL MAP OBTAINED FROM GOOGLE EARTH PRO
 - LOCATION MAP OBTAINED FROM USGS ONLINE
 - ZONING INFORMATION OBTAINED FROM CITY OF TROY ZONING MAP
- ALL REFERENCE MATERIAL LISTED ABOVE SHALL BE CONSIDERED A PART OF THIS PLAN SET AND ALL INFORMATION CONTAINED WITHIN THESE MATERIALS SHALL BE UTILIZED IN CONJUNCTION WITH THIS PLAN SET. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN A COPY OF EACH REFERENCE AND REVIEW IT THOROUGHLY PRIOR TO THE START OF CONSTRUCTION.



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PLANS PREPARED BY:



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Phone 248.247.1115

SHEET INDEX

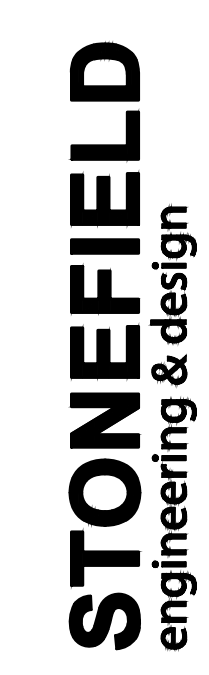
DRAWING TITLE	SHEET #
COVER SHEET	C-1
SITE PLAN	C-2
PHASING PLAN	C-3
CONDOMINIUM PLAN	C-4
OVERALL SITE PLAN	C-5
GRADING & STORMWATER MANAGEMENT PLAN	C-6
UTILITY PLAN	C-7
LIGHTING PLAN	C-8
LANDSCAPING PLAN	C-9

ADDITIONAL SHEETS

DRAWING TITLE	SHEET #
ALTA / TOPOGRAPHIC SURVEY	1 OF 1
LEVEL 1 STRIPING + SIGNAGE PLAN	A-2.1
LEVEL 2 STRIPING + SIGNAGE PLAN	A-2.2
LEVEL 3 STRIPING + SIGNAGE PLAN	A-2.3

ADDITIONAL SHEETS

DRAWING TITLE	SHEET #
LEVEL 4 (ROOF) STRIPING + SIGNAGE PLAN	A-2.4
PARKING GARAGE PHOTOMETRICS	1 OF 1
FLOOR PLAN - RETAIL BUILDING A	A.101A
FLOOR PLAN - RETAIL BUILDING B	A.101B
FLOOR PLAN - BUILDING C, COMMUNITY HOUSE	A.101C
FLOOR PLAN - BUILDING D, RECREATION CENTER	A.101D
FLOOR PLAN - RESIDENTIAL BUILDING E, 1ST FLOOR	A.101E
FLOOR PLAN - RESIDENTIAL BUILDING E, 2ND - 5TH FLOORS	A.102E
ELEVATIONS - RETAIL BUILDING A	A.201A
ELEVATIONS - RETAIL BUILDING B	A.201B & A.202B
ELEVATIONS - PARKING / COMMUNITY	A.201C
ELEVATIONS - BUILDING C, COMMUNITY HOUSE	A.202C
ELEVATIONS - BUILDING D, RECREATION CENTER	A.201D
ELEVATIONS - RESIDENTIAL BUILDING E	A.201E & A.201F
3D PERSPECTIVE VIEWS	A.301 - A.309

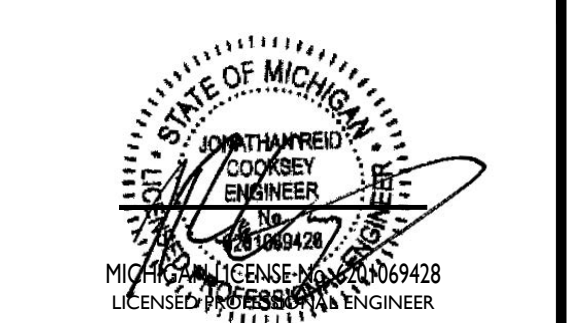


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**SITE DEVELOPMENT PLANS
CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT**

PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY, OAKLAND COUNTY, MICHIGAN



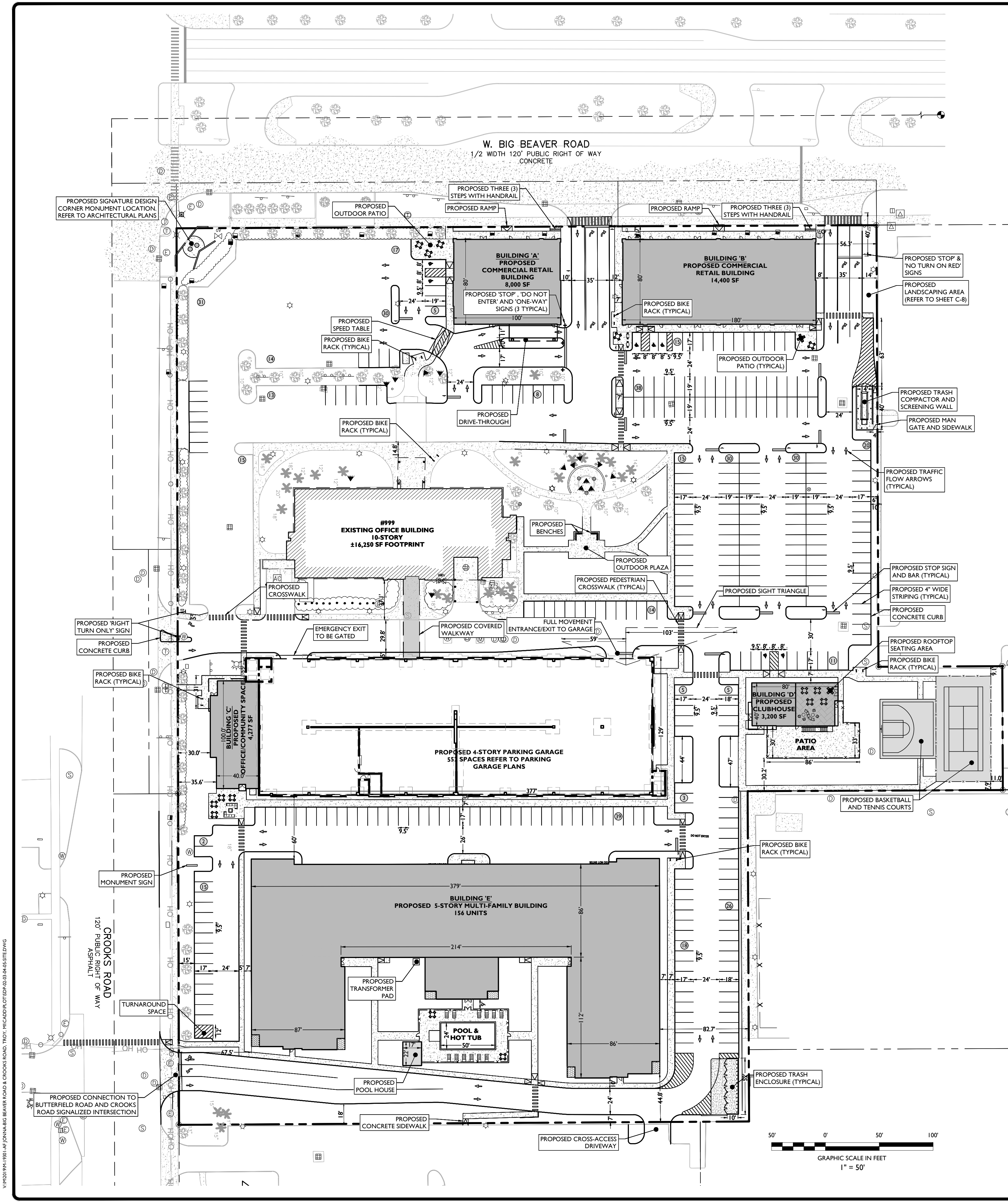
SCALE: AS SHOWN PROJECT ID: M-19301

TITLE:
COVER SHEET

DRAWING:
C-1

NOT APPROVED FOR CONSTRUCTION

ISSUE	DATE	BY	DESCRIPTION
11	12/02/2022	ERN	FOR SITE PLAN APPROVAL
10	06/01/2022	KTH	FOR SITE PLAN APPROVAL
9	02/15/2022	KTH	RESUBMISSION FOR SPA APPROVAL
8	12/08/2021	KTH	RESUBMISSION FOR SPA APPROVAL
7	02/08/2021	KTH	RESUBMISSION FOR SPA APPROVAL
6	10/14/2020	KTH	RESUBMISSION FOR PUD APPROVAL
5	10/08/2020	KTH	FOR CLIENT REVIEW
4	10/02/2020	KTH	FOR CLIENT REVIEW
3	07/02/2020	KTH	RESUBMISSION FOR PUD APPROVAL
2	05/02/2020	KTH	RESUBMISSION FOR PUD APPROVAL



OFF-STREET PARKING REQUIREMENTS

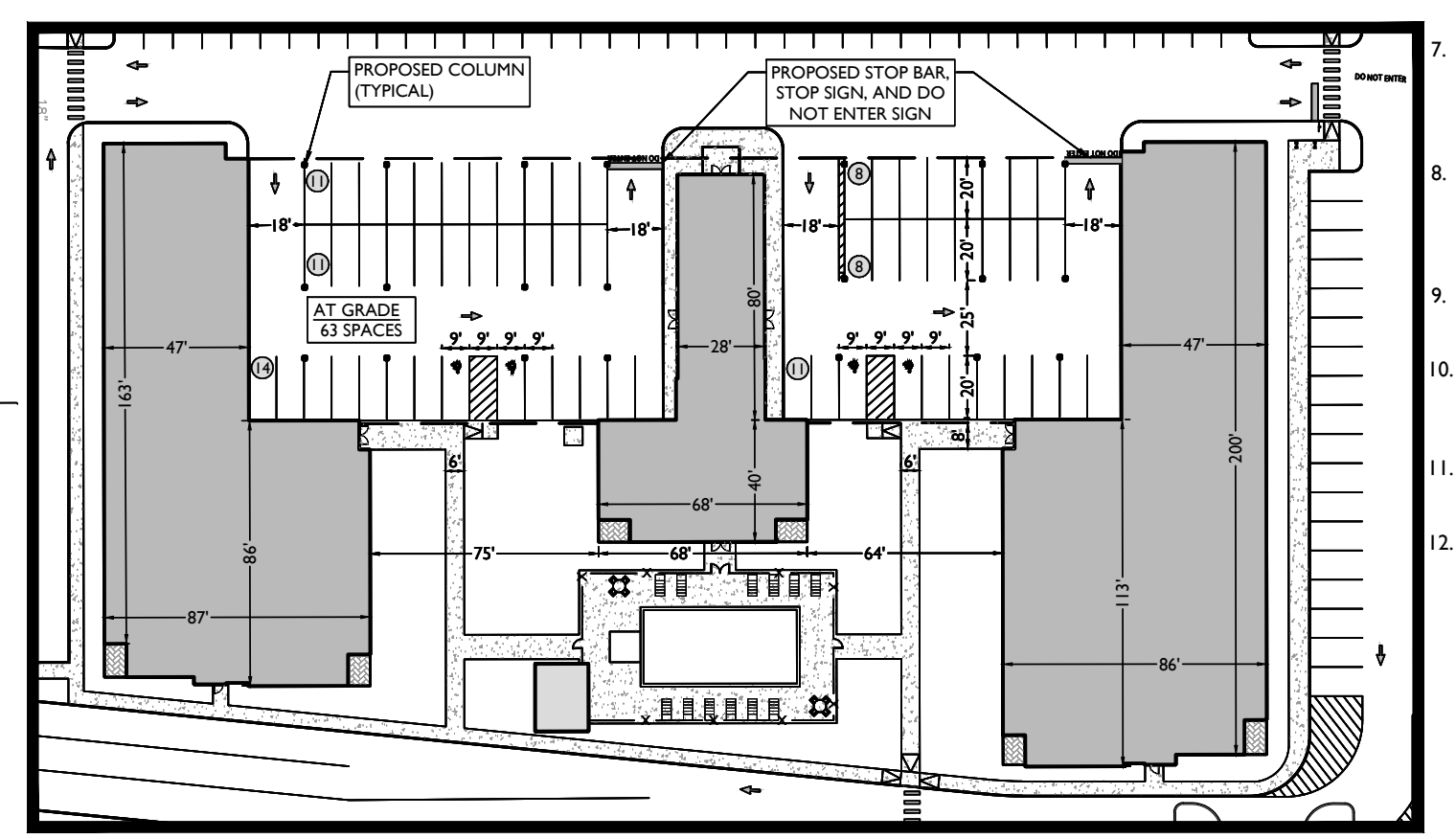
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1/300 NFA) = 449 SPACES	419 SURFACE SPACES 552 GARAGE SPACES 63 PODIUM SPACES 1,034 TOTAL SPACES
§ TABLE 13.06-A	COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1/250 GFA) = 37 SPACES	
§ TABLE 13.06-A	BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1/200 GFA) = 10 SPACES	
§ TABLE 6.10	4 STACKING SPACES PER LANE	4 SPACES PER LANE
§ TABLE 13.06-A	RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (300 SEATS)/(1/2 SEATS) = 150 SPACES	
§ TABLE 13.06-A	RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (*) (2,560 SF NFA)/(1/70 SF NFA) = 37 SPACES	
§ 13.06.1	BARRIER FREE PARKING (1,000+ SPACES): 20 SPACES + 1 SPACE PER EVERY 100 OVER 1,000 20 SPACES + (177/100) = 21 SPACES	22 ADA SPACES
§ 13.11.C.4	BICYCLE PARKING: 2 SPACES PER BUILDING (6 BUILDINGS)/(2 SPACES/BUILDING) = 12 SPACES	PROVIDED
§ 13.06.F.3	MAXIMUM PARKING 120% OF REQUIRED PARKING (1,200)/(995 SPACES) = 1,194 SPACES	1,034 SPACES

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
 (168,200 SF)/(0.8) = 134,560 SF
 (3,200 SF)/(0.8) = 2,560 SF

SYMBOL DESCRIPTION

[Symbol]	CONDOMINIUM LINE
[Symbol]	PROPOSED CURB
[Symbol]	PROPOSED FLUSH CURB
[Symbol]	PROPOSED SIGNS / BOLLARDS
[Symbol]	PROPOSED BUILDING
[Symbol]	EXISTING BUILDING
[Symbol]	PROPOSED CONCRETE
[Symbol]	PROPOSED PLANTER AREA
[Symbol]	PROPOSED FENCE
[Symbol]	PROPOSED BIKE RACK
[Symbol]	PROPOSED RAILING

- ### GENERAL NOTES
- THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 - ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 - THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
 - THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
 - THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTOR'S EXPENSE.
 - CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
 - THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 - THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 - THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
 - SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.



PROPOSED APARTMENT BUILDING - 1ST FLOOR

FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	DESCRIPTION												
ERW	12/22/2022	10	06/07/2022	9	02/15/2022	8	12/08/2021	7	02/08/2021	6	10/14/2020	5	10/08/2020	4	10/02/2020	3	07/02/2020	2	05/20/2020	1	05/20/2020	BY	DATE	ISSUE

NOT APPROVED FOR CONSTRUCTION

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SITE DEVELOPMENT PLANS

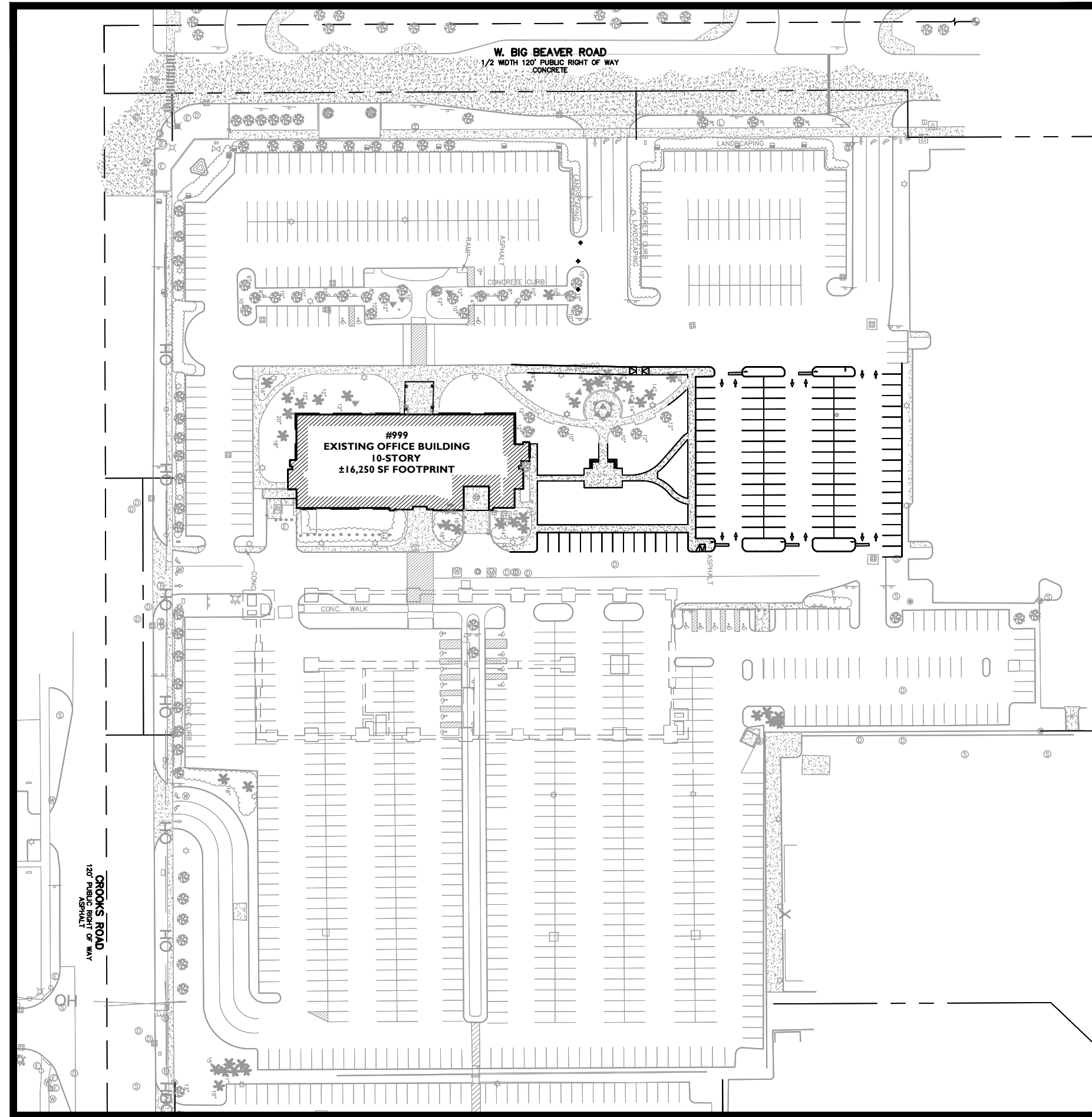
CROOKS & BIG BEAVER

PROPOSED MIXED USE REDEVELOPMENT

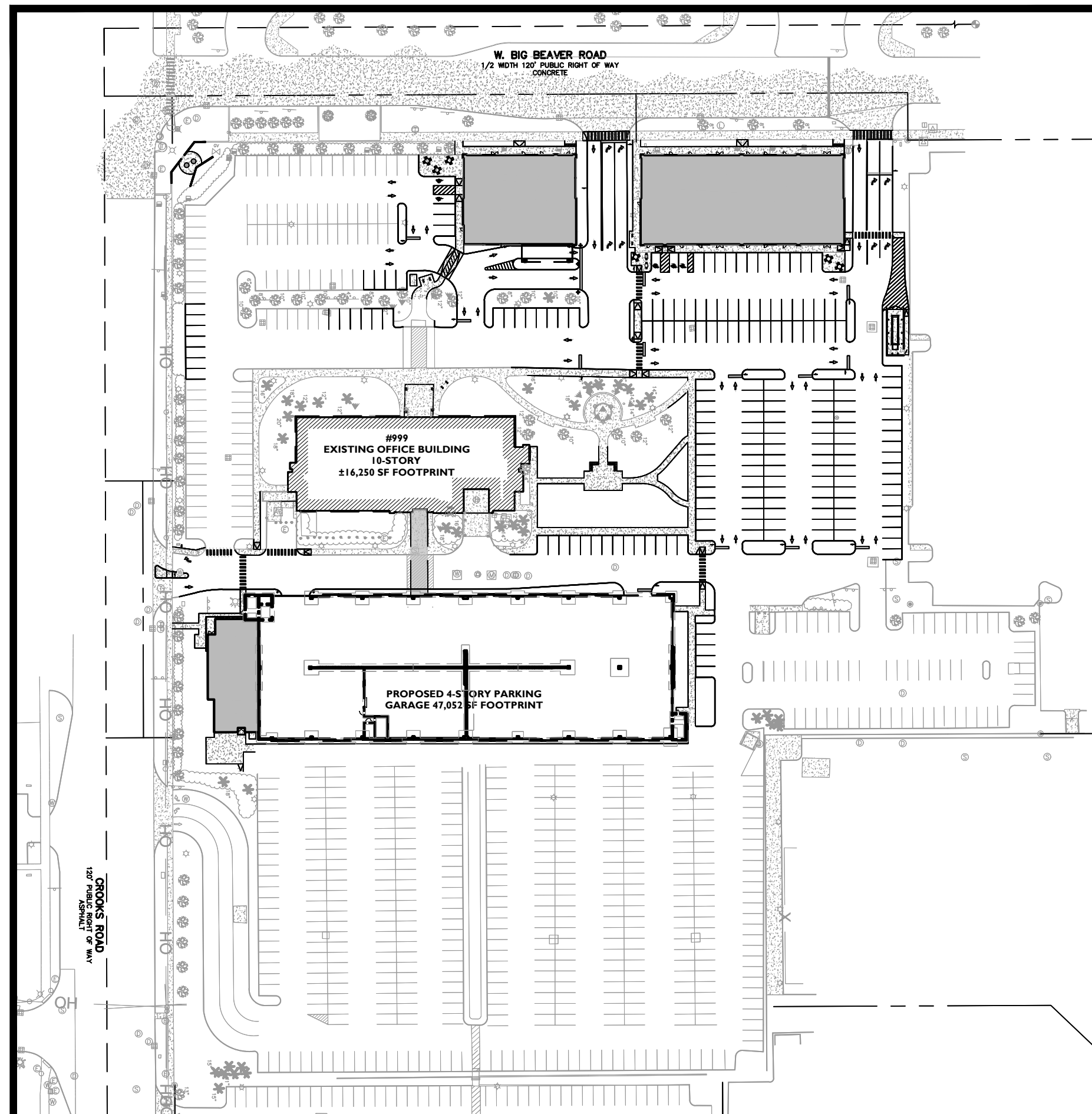
PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
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STONEFIELD
engineering & design

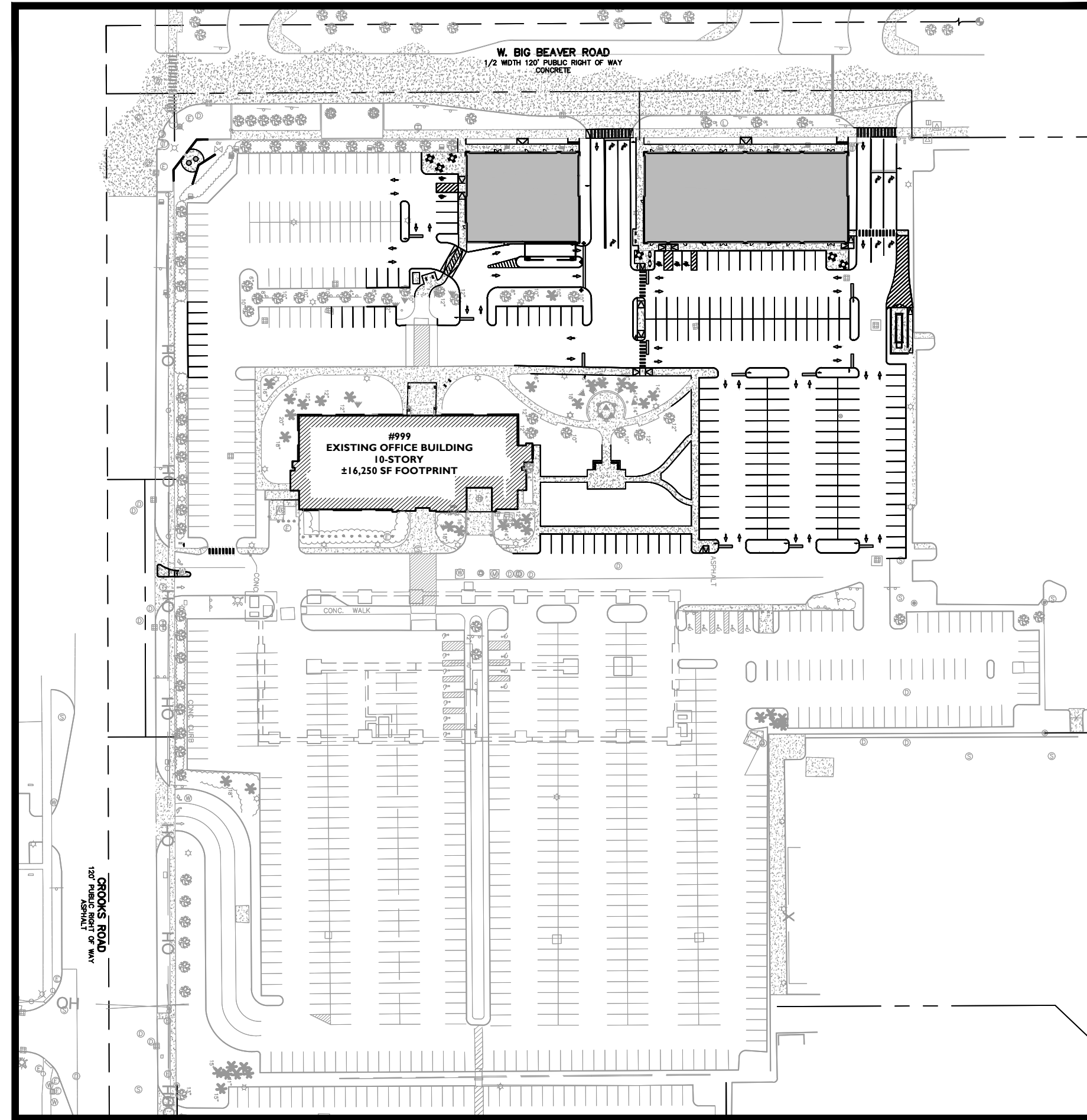
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TITLE: SITE PLAN
DRAWING: C-2



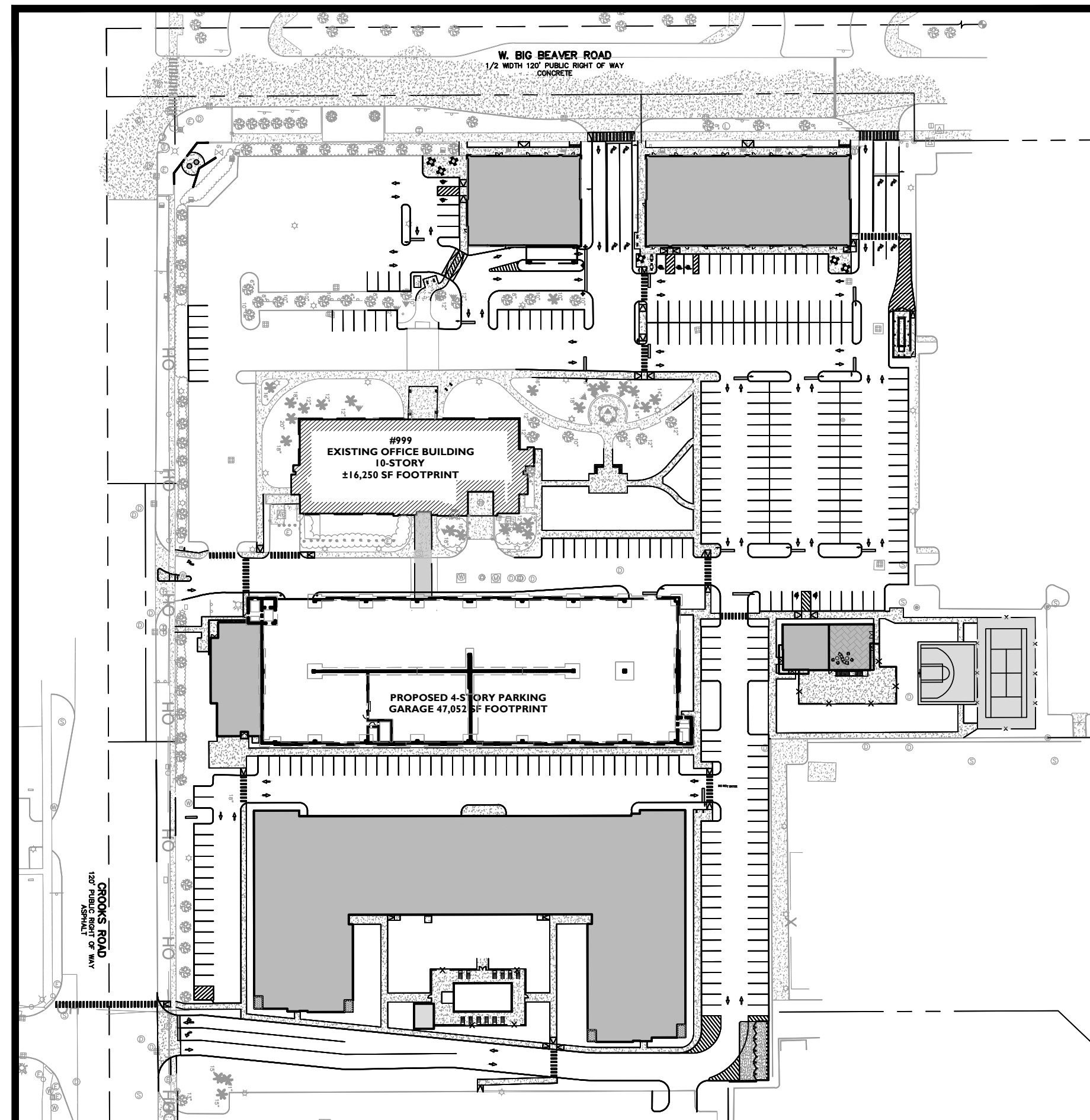
PHASE 1 SITE PLAN: DEMOLITION OF 911 W BIG BEAVER, PROPOSED PARKING LOT, ENHANCED LANDSCAPING AND PEDESTRIAN PLAZA



PHASE 3 SITE PLAN: PROPOSED 4-STORY PARKING GARAGE, 4,277 SF OFFICE FRONTING CROOKS ROAD



PHASE 2 SITE PLAN: TWO PROPOSED COMMERCIAL BUILDINGS FRONTING BIG BEAVER ROAD WITH ASSOCIATED SITE IMPROVEMENTS



PHASE 4 SITE PLAN: PROPOSED 5-STORY APARTMENT BUILDING WITH PODIUM PARKING, CLUBHOUSE WITH OUTDOOR AMENITIES AND CONNECTION TO CROOKS AND BUTTERFIELD ROAD INTERSECTION

PARKING REQUIREMENTS - PHASE 1			
CODE SECTION	REQUIRED (POST-CONSTRUCTION)	PROPOSED POST-CONSTRUCTION	PROPOSED UNDER-CONSTRUCTION
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1,300 NFA) = 449 SPACES TOTAL: 449 SPACES	961 SPACES	851 SPACES (449 REQUIRED)

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)(0.8) = 134,560 SF

PARKING REQUIREMENTS - PHASE 2			
CODE SECTION	REQUIRED (POST-CONSTRUCTION)	PROPOSED POST-CONSTRUCTION	PROPOSED UNDER-CONSTRUCTION
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1,300 NFA) = 449 SPACES BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1,200 GFA) = 10 SPACES COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1,250 GFA) = 37 SPACES RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (300 SEATS)/(1/2 SEATS) = 150 SPACES RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (2,560 SF NFA)/(1,170 SF NFA) = 37 SPACES TOTAL: 449+10+37+150+37 = 683 SPACES	901 SPACES	811 SPACES (449 REQUIRED)

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)(0.8) = 134,560 SF

(3,200 SF GFA)(0.8) = 2,560 SF

PARKING REQUIREMENTS - PHASE 3			
CODE SECTION	REQUIRED (POST-CONSTRUCTION)	PROPOSED POST-CONSTRUCTION	PROPOSED UNDER-CONSTRUCTION
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1,300 NFA) = 449 SPACES BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1,200 GFA) = 10 SPACES COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1,250 GFA) = 37 SPACES RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (270 SEATS)/(1/2 SEATS) = 135 SPACES RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (2,560 SF NFA)/(1,170 SF NFA) = 37 SPACES TOTAL: 449+10+37+150+37 = 683 SPACES	750 SURFACE SPACES 552 GARAGE SPACES 1,302 TOTAL SPACES	745 SURFACE SPACES (683 REQUIRED)

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)(0.8) = 134,560 SF

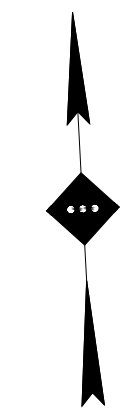
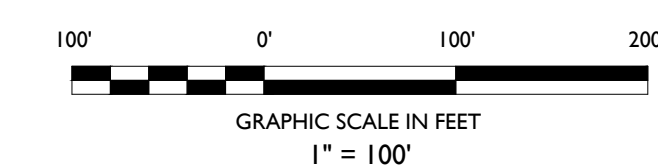
(3,200 SF GFA)(0.8) = 2,560 SF

NOTE: DURING CONSTRUCTION OF THE PROPOSED PARKING GARAGE, CONSTRUCTION FENCING WITH SIGNAGE WILL BE PROVIDED TO ENSURE SAFE PEDESTRIAN CIRCULATION

PARKING REQUIREMENTS - PHASE 4			
CODE SECTION	REQUIRED (POST-CONSTRUCTION)	PROPOSED POST-CONSTRUCTION	PROPOSED UNDER-CONSTRUCTION
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1,300 NFA) = 449 SPACES BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1,200 GFA) = 10 SPACES COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1,250 GFA) = 37 SPACES RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (300 SEATS)/(1/2 SEATS) = 150 SPACES RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (2,560 SF NFA)/(1,170 SF NFA) = 37 SPACES MULTI-FAMILY RESIDENTIAL: 2 SPACES PER DWELLING UNIT (156 UNITS)/(2/1 UNITS) = 312 SPACES TOTAL: 449+37+10+150+37+312 = 995 SPACES	419 SURFACE SPACES 552 GARAGE SPACES 63 BELOW APARTMENT 1,034 TOTAL SPACES	316 SURFACE SPACES 552 GARAGE SPACES 868 TOTAL SPACES (683 REQUIRED)

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)(0.8) = 134,560 SF

(3,200 SF GFA)(0.8) = 2,560 SF



REV	DATE	ISSUE	BY	DESCRIPTION
11	12/02/2022			
10	06/01/2022			FOR SITE PLAN APPROVAL
9	02/15/2022			RESUBMISSION FOR SPA APPROVAL
8	12/08/2021			RESUBMISSION FOR SPA APPROVAL
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6	10/14/2020			RESUBMISSION FOR SPA APPROVAL
5	10/08/2020			FOR CLIENT REVIEW
4	10/02/2020			FOR CLIENT REVIEW
3	07/02/2020			RESUBMISSION FOR PUD APPROVAL
2	05/02/2020			RESUBMISSION FOR PUD APPROVAL

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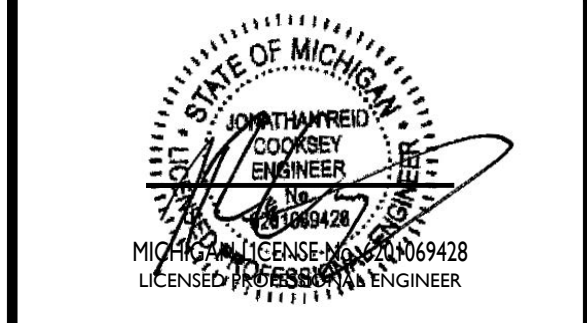
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SITE DEVELOPMENT PLANS

CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT

PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN



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SCALE: 1" = 100' PROJECT ID: M-19301

TITLE: PHASING PLAN

DRAWING: C-3

M:\Projects\191101 - 911 W Big Beaver, Crooks & Crooks Road, Troy, Michigan\LOT\SPR\2022\04-10-2022.DWG

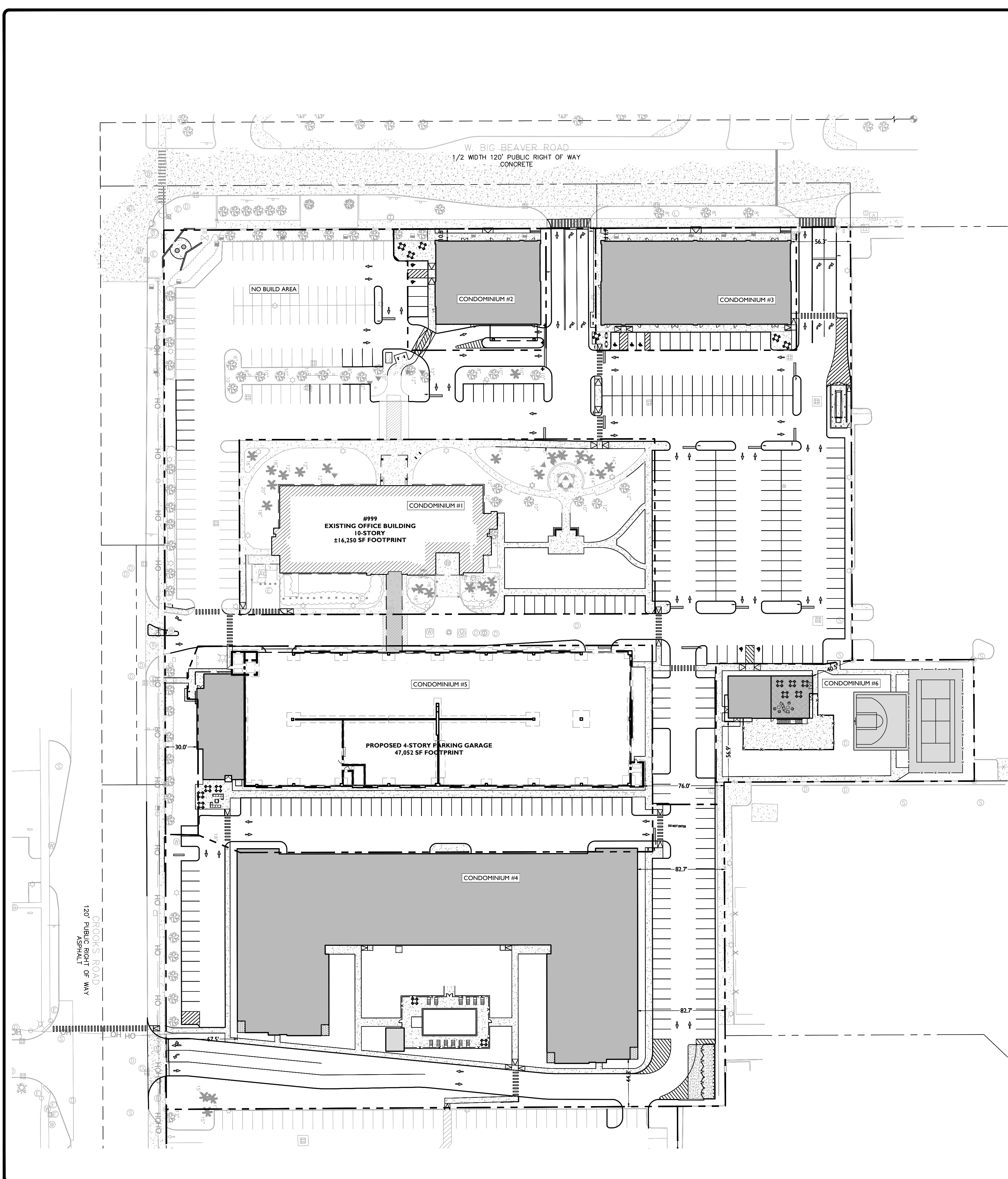


TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-21-351-015
 BIG BEAVER ROAD (BB) - (STREET TYPE: A, BUILDING FORM-A)

PROPOSED USE	PERMITTED USE	
COMMERCIAL RETAIL/RESTAURANT/ SERVICE (BUILDING 'A')		
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	15,445 SF (0.35 AC)
MINIMUM BUILDING HEIGHT	14 FT (1 STORY)	30.0 FT (1 STORY)
MAXIMUM BUILDING HEIGHT	45 FT (3 STORIES)	30.0 FT (1 STORY)
REQUIRED FRONT BUILDING LINE	10 FT	10.8 FT (W)
MINIMUM SIDE YARD SETBACK	0 FT	293.5 FT
MINIMUM REAR YARD SETBACK	30 FT	740.8 FT

(W) WAIVER

TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-21-351-015
 BIG BEAVER ROAD (BB) - (STREET TYPE: A, BUILDING FORM-A)

PROPOSED USE	PERMITTED USE	
COMMERCIAL RETAIL/RESTAURANT/ SERVICE (BUILDING 'B')		
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	22,029 SF (0.51 AC)
MINIMUM BUILDING HEIGHT	14 FT (1 STORIES)	30.0 FT (1 STORY)
MAXIMUM BUILDING HEIGHT	45 FT (3 STORIES)	30.0 FT (1 STORY)
REQUIRED FRONT BUILDING LINE	10 FT	11.7 FT (W)
MINIMUM SIDE YARD SETBACK	0 FT	56.3 FT
MINIMUM REAR YARD SETBACK	30 FT	740.2 FT

(W) WAIVER

TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-21-351-015
 BIG BEAVER ROAD (BB) - (STREET TYPE: B, BUILDING FORM-A)

PROPOSED USE	PERMITTED USE	
OFFICE (BUILDING 'C')		
PARKING GARAGE	ACCESSORY USE	
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	84,115 SF (1.93 AC)
MINIMUM BUILDING HEIGHT	14 FT (1 STORY)	20.0 FT (1 STORY)
MAXIMUM BUILDING HEIGHT	45 FT (3 STORIES)	45.0 FT (4 STORIES)
REQUIRED FRONT BUILDING LINE	10 FT	30.0 FT (W)
MINIMUM SIDE YARD SETBACK	0 FT	244.2 FT
MINIMUM REAR YARD SETBACK	30 FT	74.9 FT

(W) WAIVER

TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-21-351-015
 BIG BEAVER ROAD (BB) - (STREET TYPE: A, BUILDING FORM-A)

PROPOSED USE	PERMITTED USE	
CLUB HOUSE (BUILDING 'D')		
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	27,734 SF (0.64 AC)
MINIMUM BUILDING HEIGHT	14 FT (1 STORY)	20.0 FT (1 STORY)
MAXIMUM BUILDING HEIGHT	45 FT (3 STORIES)	20.0 FT (1 STORY)
REQUIRED FRONT BUILDING LINE	10 FT	424.5 (W)
MINIMUM SIDE YARD SETBACK	0 FT	56.9 FT
MINIMUM REAR YARD SETBACK	30 FT	40.5 FT

(W) WAIVER

TABLE OF LAND USE AND ZONING
 PARCEL ID: 20-21-351-015
 BIG BEAVER ROAD (BB) - (STREET TYPE: B, BUILDING FORM-D)

PROPOSED USE	PERMITTED USE	
MULTI-FAMILY (BUILDING 'E')	SPECIAL LAND USE	
GROUND FLOOR UNITS (BUILDING 'E')		
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	N/A	131,971 SF (3.03 AC)
MINIMUM BUILDING HEIGHT	55 FT (5 STORIES)	85.0 FT (6 STORIES)
MAXIMUM BUILDING HEIGHT	N/A	85.0 FT (6 STORIES)
REQUIRED FRONT BUILDING LINE	10 FT	67.5 FT (W)
MINIMUM SIDE YARD SETBACK	0 FT	57.1 FT
MINIMUM REAR YARD SETBACK	40 FT	82.7 FT

(W) WAIVER

SYMBOL DESCRIPTION

--- --	CONDOMINIUM LINE
— — — —	PROPOSED CURB
— — — — — —	PROPOSED FLUSH CURB
○ ○ ○	PROPOSED SIGNS / BOLLARDS
█	PROPOSED BUILDING
▨	PROPOSED PEDESTRIAN SKYWALK
▩	PROPOSED CONCRETE
- X - X -	PROPOSED CHAINLINK FENCE

FOR SITE PLAN APPROVAL	FOR CLIENT REVIEW	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	FOR PUD APPROVAL	
ERW	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH
12/02/2022	06/01/2022	02/15/2022	12/08/2021	02/08/2021	10/14/2020	10/08/2020	10/02/2020	07/02/2020	05/20/2020										
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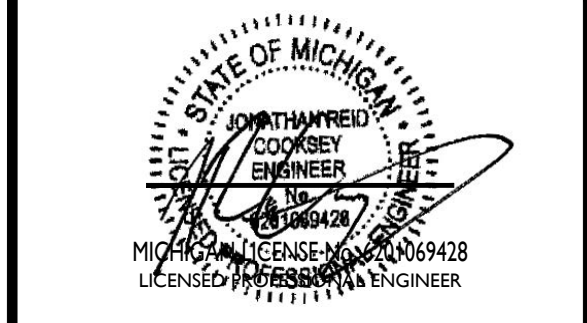
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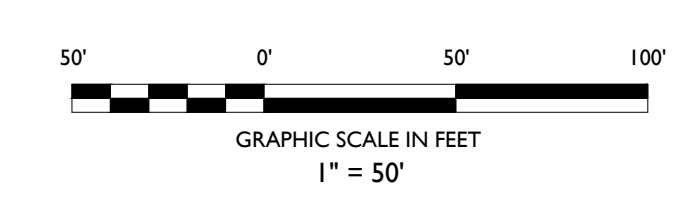


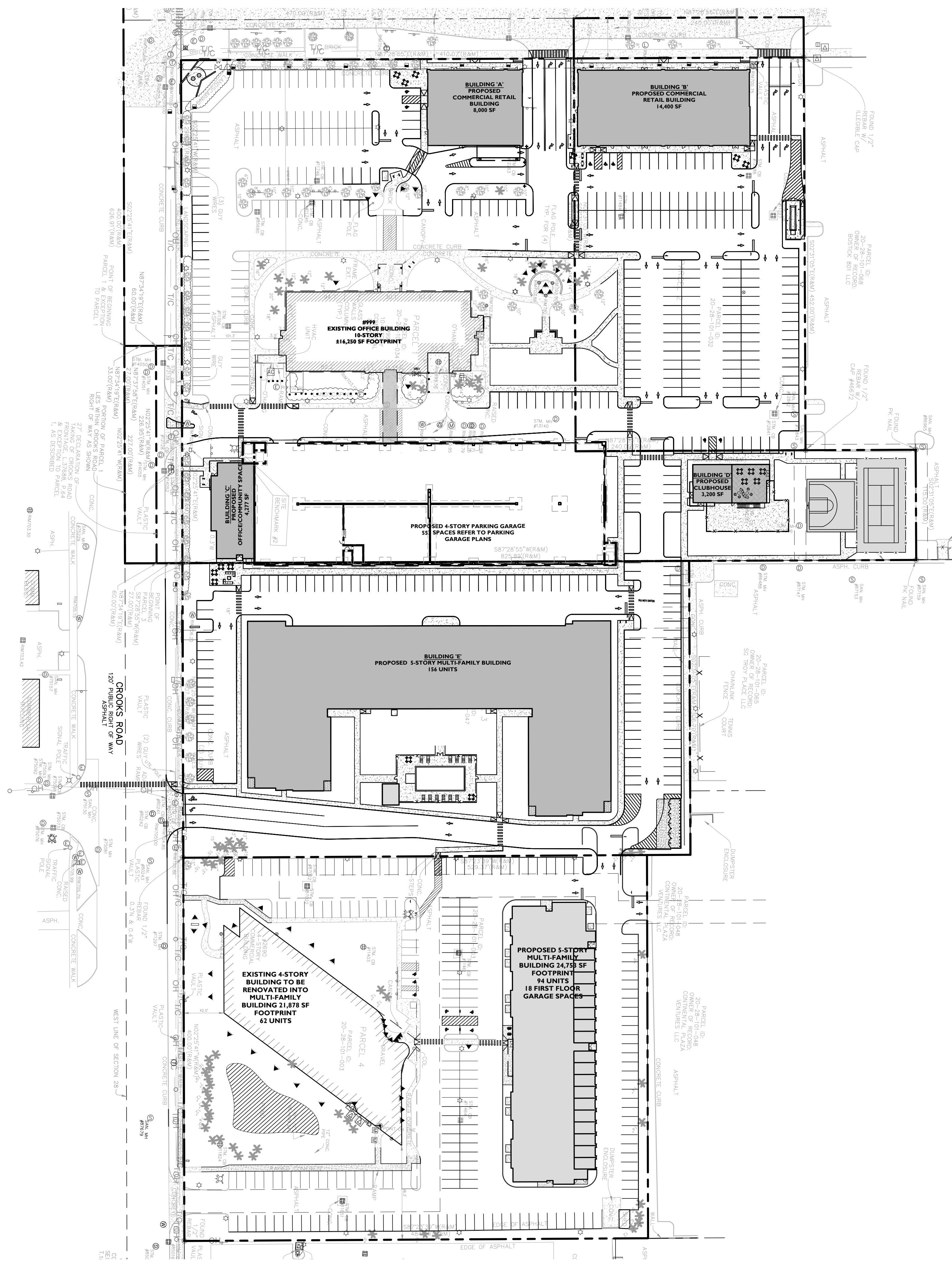
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SCALE: 1" = 50' PROJECT ID: M-19301

TITLE:
CONDOMINIUM PLAN

DRAWING:
C-4





OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1300 NFA) = 449 SPACES	419 SURFACE SPACES 552 GARAGE SPACES 63 PODIUM SPACES 1,034 TOTAL SPACES
§ TABLE 13.06-A	COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1/250 GFA) = 37 SPACES	
§ TABLE 13.06-A	BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1/200 GFA) = 10 SPACES	
§ TABLE 6.10	4 STACKING SPACES PER LANE	4 SPACES PER LANE
§ TABLE 13.06-A	RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (300 SEATS)/(1/2 SEATS) = 150 SPACES	
§ TABLE 13.06-A	RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (*) (2,560 SF NFA)/(1/70 SF NFA) = 37 SPACES	
	MULTI-FAMILY RESIDENTIAL: 2 SPACES PER DWELLING UNIT (156 UNITS)/(2/1 UNITS) = 312 SPACES	
	TOTAL: 449+37+10+150+37+312 = 995 SPACES	

(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)/(0.8) = 134,560 SF
(3,200 SF)/(0.8) = 2,560 SF

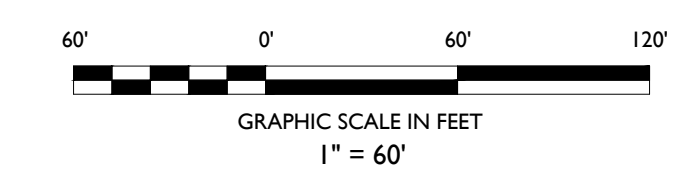
OFF-STREET PARKING REQUIREMENTS - LINDSEY CENTRE		
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	MULTI-FAMILY DWELLING: 2 SPACES PER DWELLING UNIT (156 UNITS)/(2 SPACES PER UNIT) = 312 SPACES	224 SPACES (V)

(V) VARIANCE

OFF-STREET PARKING REQUIREMENTS - COMBINED		
PARCEL	REQUIRED	PROPOSED
KELLY PARCEL	995 SPACES	1,034 SPACES
LINDSEY CENTRE	312 SPACES	224 SPACES
	TOTAL: 995 + 284 = 1,279 SPACES	TOTAL: 1,258 SPACES

SYMBOL DESCRIPTION

- CONDOMINIUM LINE
- PROPOSED CURB
- PROPOSED FLUSH CURB
- PROPOSED SIGNS / BOLLARDS
- PROPOSED BUILDING
- ▨ EXISTING BUILDING
- ▧ PROPOSED CONCRETE
- ▩ PROPOSED PLANTER AREA
- X-X- PROPOSED FENCE
- ⊕ PROPOSED BIKE RACK
- ⊖ PROPOSED RAILING



I.I.	REV	FOR SITE PLAN APPROVAL		DATE	BY	DESCRIPTION
		FOR SITE PLAN APPROVAL	FOR PUD APPROVAL			
11	12/02/2022	KTH	KTH	06/01/2022		
10	06/01/2022	KTH	KTH	02/15/2022		
9	02/15/2022	KTH	KTH	12/08/2021		
8	12/08/2021	KTH	KTH	02/08/2021		
7	02/08/2021	KTH	KTH	10/14/2020		
6	10/14/2020	KTH	KTH	10/08/2020		
5	10/08/2020	KTH	KTH	07/02/2020		
4	07/02/2020	KTH	KTH	07/02/2020		
3	07/02/2020	KTH	KTH	05/05/2020		
2	05/05/2020	KTH	KTH			

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SITE DEVELOPMENT PLANS

CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT

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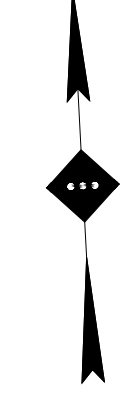
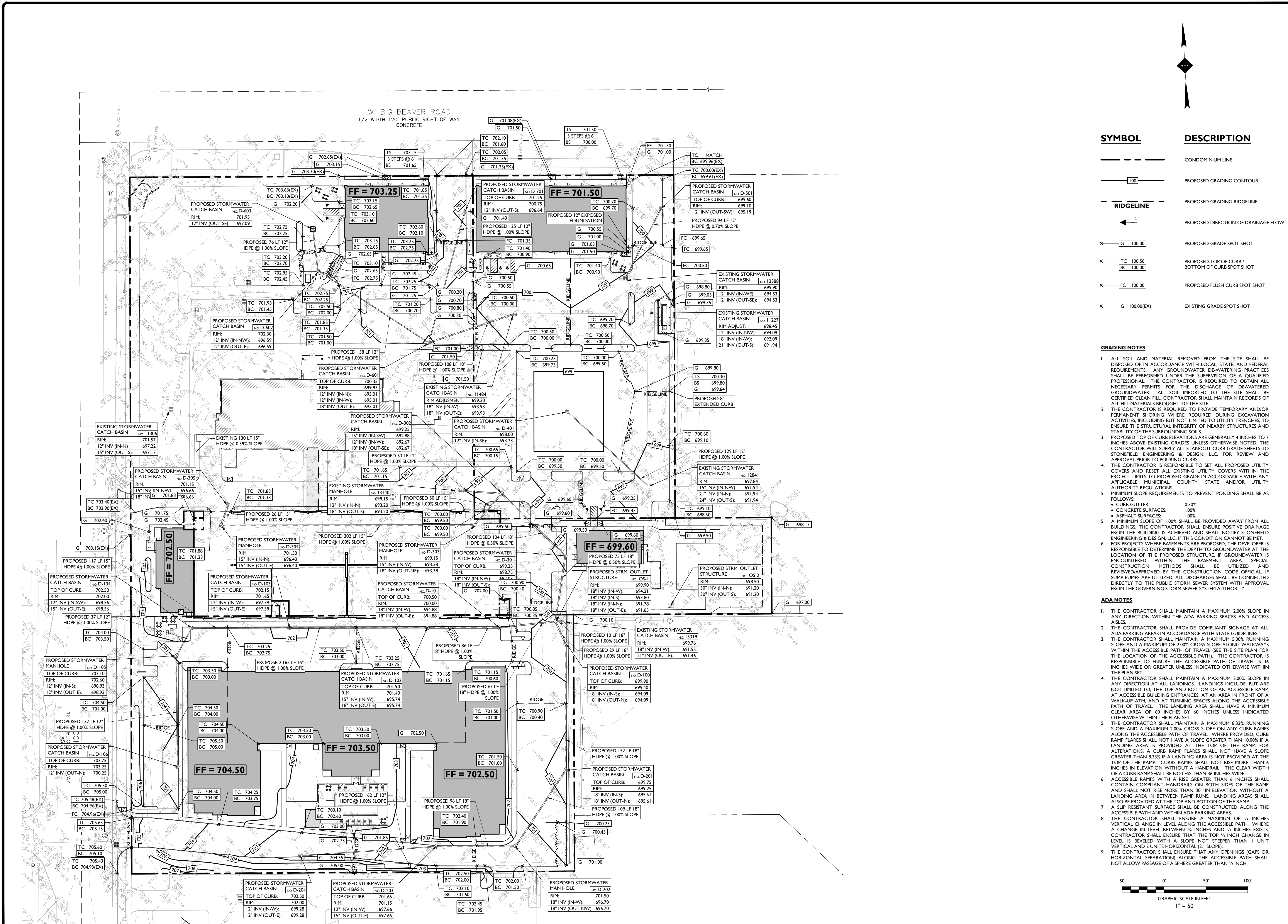
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SCALE: 1" = 60' PROJECT ID: M-19301

TITLE:
OVERALL SITE PLAN

DRAWING:
C-5

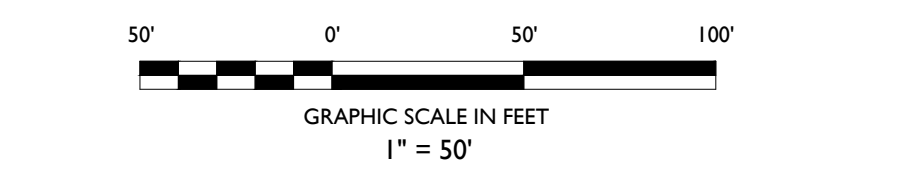
W. BIG BEAVER ROAD & CROOKS ROAD, TC01 - H:\CADD\2024\28-101-047\28-101-047-GRD-STRIP.DWG



SYMBOL	DESCRIPTION
---	CONDOMINIUM LINE
---	PROPOSED GRADING CONTOUR
---	PROPOSED GRADING RIDGELINE
---	PROPOSED DIRECTION OF DRAINAGE FLOW
X G 100.00	PROPOSED GRADE SPOT SHOT
X TC 100.50 BC 100.00	PROPOSED TOP OF CURB / BOTTOM OF CURB SPOT SHOT
X FC 100.00	PROPOSED FLUSH CURB SPOT SHOT
X G 100.00(EX)	EXISTING GRADE SPOT SHOT

- GRADING NOTES**
- ALL SOIL AND MATERIAL REMOVED FROM THE SITE SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS. ANY GROUNDWATER DEWATERING PRACTICES SHALL BE PERFORMED UNDER THE SUPERVISION OF A QUALIFIED PROFESSIONAL. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL NECESSARY PERMITS FOR THE DISCHARGE OF DEWATERED GROUNDWATER. ALL SOIL IMPORTED TO THE SITE SHALL BE CERTIFIED CLEAN FILL. CONTRACTOR SHALL MAINTAIN RECORDS OF ALL FILL MATERIALS BROUGHT TO THE SITE.
 - THE CONTRACTOR IS REQUIRED TO PROVIDE TEMPORARY AND/OR PERMANENT SHORING WHERE REQUIRED DURING EXCAVATION ACTIVITIES INCLUDING BUT NOT LIMITED TO UTILITY TRENCHES TO ENSURE THE STRUCTURAL INTEGRITY OF NEARBY STRUCTURES AND STABILITY OF THE SURROUNDING SOILS.
 - PROPOSED TOP OF CURB ELEVATIONS ARE GENERALLY 4 INCHES TO 7 INCHES ABOVE EXISTING GRADES UNLESS OTHERWISE NOTED. THE CONTRACTOR WILL SUPPLY ALL STAKEOUT CURB GRADE SHEETS TO STONEFIELD ENGINEERING & DESIGN, LLC. FOR REVIEW AND APPROVAL PRIOR.
 - THE CONTRACTOR IS RESPONSIBLE TO SET ALL PROPOSED UTILITY COVERS AND RESET ALL EXISTING UTILITY COVERS WITHIN THE PROJECT LIMITS TO PROPOSED GRADE IN ACCORDANCE WITH ANY APPLICABLE MUNICIPAL, COUNTY, STATE AND/OR UTILITY AUTHORITY REGULATIONS.
 - MINIMUM SLOPE REQUIREMENTS TO PREVENT PONDING SHALL BE AS FOLLOWS:
 - CURB GUTTER: 0.50%
 - CONCRETE SURFACES: 1.00%
 - ASPHALT SURFACES: 1.00%
 - A MINIMUM SLOPE OF 1.00% SHALL BE PROVIDED AWAY FROM ALL BUILDINGS. THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE FROM THE BUILDING IS ACHIEVED AND SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IF THE CONDITION CANNOT BE MET. FOR PROJECTS WHERE BASEMENTS ARE PROPOSED, THE DEVELOPER IS RESPONSIBLE TO DETERMINE THE DEPTH TO GROUNDWATER AT THE LOCATION OF THE PROPOSED STRUCTURE. IF GROUNDWATER IS ENCOUNTERED WITHIN THE BASEMENT AREA, SPECIAL CONSTRUCTION METHODS SHALL BE UTILIZED AND REVIEWED/APPROVED BY THE CONSTRUCTION CODE OFFICIAL. IF SUMP PUMPS ARE UTILIZED, ALL DISCHARGES SHALL BE CONNECTED DIRECTLY TO THE PUBLIC STORM SEWER SYSTEM WITH APPROVAL FROM THE GOVERNING STORM SEWER SYSTEM AUTHORITY.

- ADA NOTES**
- THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION WITHIN THE ADA PARKING SPACES AND ACCESS AISLES.
 - THE CONTRACTOR SHALL PROVIDE COMPLIANT SIGNAGE AT ALL ADA PARKING AREAS IN ACCORDANCE WITH STATE GUIDELINES.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 5.00% RUNNING SLOPE AND A MAXIMUM OF 2.00% CROSS SLOPE ALONG WALKWAYS WITHIN THE ACCESSIBLE PATH OF TRAVEL (SEE THE SITE PLAN FOR THE LOCATION OF THE ACCESSIBLE PATH). THE CONTRACTOR IS RESPONSIBLE TO ENSURE THE ACCESSIBLE PATH OF TRAVEL IS 36 INCHES WIDE OR GREATER UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 2.00% SLOPE IN ANY DIRECTION AT ALL LANDINGS. LANDINGS INCLUDE, BUT ARE NOT LIMITED TO, THE TOP AND BOTTOM OF AN ACCESSIBLE RAMP. AT ACCESSIBLE BUILDING ENTRANCES, AT AN AREA IN FRONT OF A WALK-UP LIFT, AND AT TURNING SPACES ALONG THE ACCESSIBLE PATH OF TRAVEL, THE LANDING AREA SHALL HAVE A MINIMUM CLEAR AREA OF 60 INCHES BY 60 INCHES UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
 - THE CONTRACTOR SHALL MAINTAIN A MAXIMUM 8.33% RUNNING SLOPE AND A MAXIMUM 2.00% CROSS SLOPE ON ANY CURB RAMPS ALONG THE ACCESSIBLE PATH OF TRAVEL. WHERE PROVIDED, CURB RAMP FLARES SHALL NOT HAVE A SLOPE GREATER THAN 10.00%. IF A LANDING AREA IS PROVIDED AT THE TOP OF THE RAMP, FOR ALTERATIONS, A CURB RAMP FLARE SHALL NOT HAVE A SLOPE GREATER THAN 8.33% IF A LANDING AREA IS NOT PROVIDED AT THE TOP OF THE RAMP. CURB RAMPS SHALL NOT RISE MORE THAN 6 INCHES IN ELEVATION WITHOUT A HANDRAIL. THE CLEAR WIDTH OF A CURB RAMP SHALL BE NO LESS THAN 36 INCHES WIDE.
 - ACCESSIBLE RAMPS WITH A RISE GREATER THAN 6 INCHES SHALL CONTAIN COMPLIANT HANDRAILS ON BOTH SIDES OF THE RAMP AND SHALL NOT RISE MORE THAN 30" IN ELEVATION WITHOUT A LANDING AREA IN BETWEEN RAMP RUNS. LANDING AREAS SHALL ALSO BE PROVIDED AT THE TOP AND BOTTOM OF THE RAMP.
 - A SLIP RESISTANT SURFACE SHALL BE CONSTRUCTED ALONG THE ACCESSIBLE PATH AND WITHIN ADA PARKING AREAS.
 - THE CONTRACTOR SHALL ENSURE A MAXIMUM OF 1/4 INCHES VERTICAL CHANGE IN LEVEL ALONG THE ACCESSIBLE PATH. WHERE A CHANGE IN LEVEL BETWEEN 1/4 INCHES AND 1/2 INCHES EXISTS, CONTRACTOR SHALL ENSURE THAT THE TOP 1/4 INCH CHANGE IN LEVEL IS BEVELED WITH A SLOPE NOT STEEPER THAN 1 UNIT VERTICAL AND 2 UNITS HORIZONTAL (2:1 SLOPE).
 - THE CONTRACTOR SHALL ENSURE THAT ANY OPENINGS (GAPS OR HORIZONTAL SEPARATION) ALONG THE ACCESSIBLE PATH SHALL NOT ALLOW PASSAGE OF A SPHERE GREATER THAN 1/4 INCH.



REV	DATE	DESCRIPTION
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2	05/20/2020	RESUBMISSION FOR PUD APPROVAL

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CROOKS & BIG BEAVER
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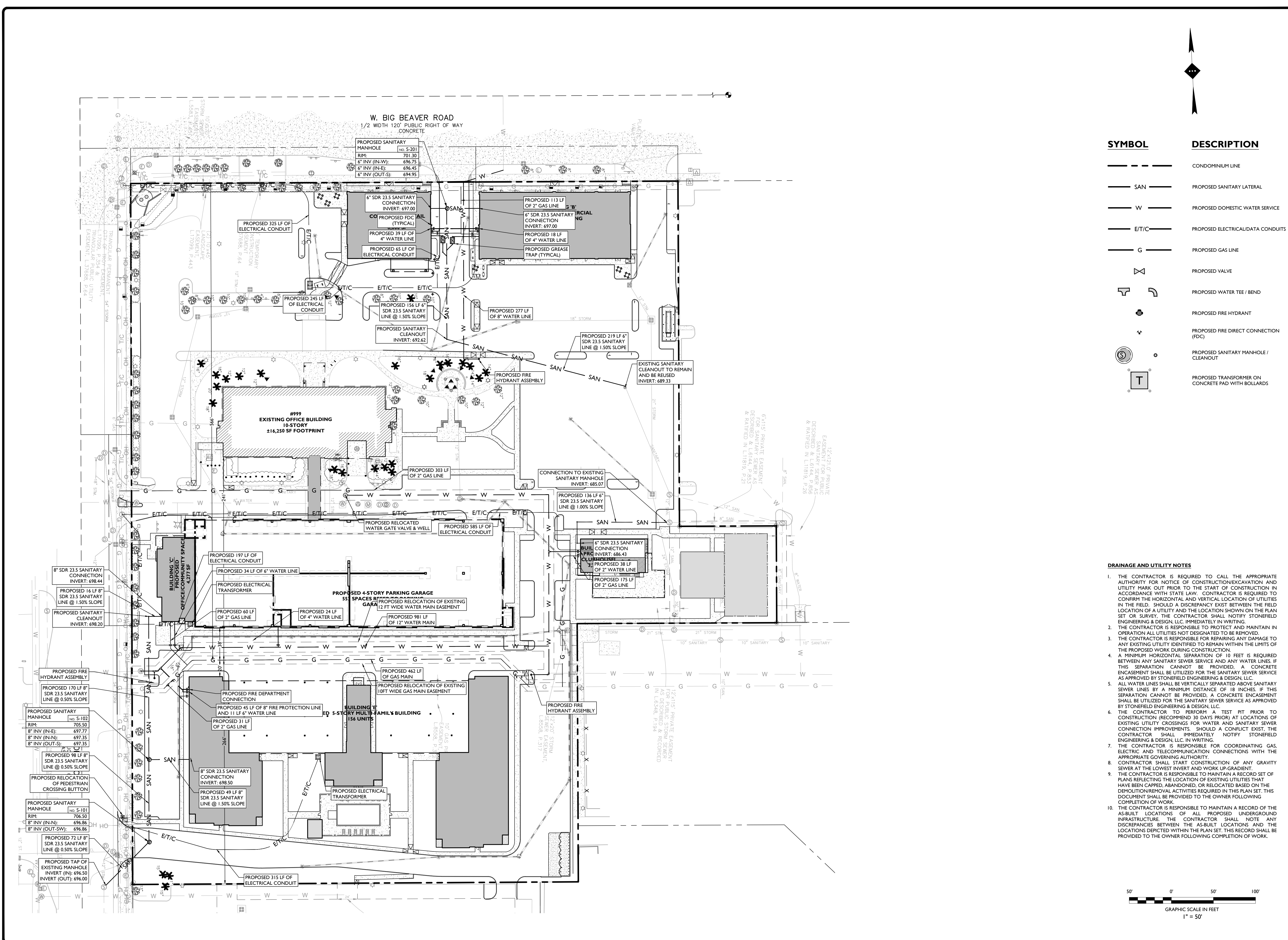


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SCALE: 1" = 50' PROJECT ID: M-19301

TITLE: **GRADING & STORMWATER MANAGEMENT PLAN**

DRAWING: **C-6**



SYMBOL	DESCRIPTION
---	CONDOMINIUM LINE
SAN	PROPOSED SANITARY LATERAL
W	PROPOSED DOMESTIC WATER SERVICE
E/T/C	PROPOSED ELECTRICAL/DATA CONDUITS
G	PROPOSED GAS LINE
⊗	PROPOSED VALVE
⊕	PROPOSED WATER TEE / BEND
⊙	PROPOSED FIRE HYDRANT
⊛	PROPOSED FIRE DIRECT CONNECTION (FDC)
⊚	PROPOSED SANITARY MANHOLE / CLEANOUT
⊚	PROPOSED TRANSFORMER ON CONCRETE PAD WITH BOLLARDS

- DRAINAGE AND UTILITY NOTES**
- THE CONTRACTOR IS REQUIRED TO CALL THE APPROPRIATE AUTHORITY FOR NOTICE OF CONSTRUCTION EXCAVATION AND UTILITY MARK OUT PRIOR TO THE START OF CONSTRUCTION IN ACCORDANCE WITH STATE LAW. CONTRACTOR IS REQUIRED TO CONFIRM THE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES IN THE FIELD. SHOULD A DISCREPANCY EXIST BETWEEN THE FIELD LOCATION OF A UTILITY AND THE LOCATION SHOWN ON THE PLAN SET OR SURVEY, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IMMEDIATELY IN WRITING.
 - THE CONTRACTOR IS RESPONSIBLE TO PROTECT AND MAINTAIN IN OPERATION ALL UTILITIES NOT DESIGNATED TO BE REMOVED.
 - THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE TO ANY EXISTING UTILITY IDENTIFIED TO REMAIN WITHIN THE LIMITS OF THE PROPOSED WORK DURING CONSTRUCTION.
 - A MINIMUM HORIZONTAL SEPARATION OF 10 FEET IS REQUIRED BETWEEN ANY SANITARY SEWER SERVICE AND ANY WATER LINES. IF THIS SEPARATION CANNOT BE PROVIDED, A CONCRETE ENCASMENT SHALL BE UTILIZED FOR THE SANITARY SEWER SERVICE AS APPROVED BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - ALL WATER LINES SHALL BE VERTICALLY SEPARATED ABOVE SANITARY SEWER LINES BY A MINIMUM DISTANCE OF 18 INCHES. IF THIS SEPARATION CANNOT BE PROVIDED, A CONCRETE ENCASMENT SHALL BE UTILIZED FOR THE SANITARY SEWER SERVICE AS APPROVED BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR TO PERFORM A TEST PIT PRIOR TO CONSTRUCTION (RECOMMEND 30 DAYS PRIOR) AT LOCATIONS OF EXISTING UTILITY CROSSINGS FOR WATER AND SANITARY SEWER CONNECTION IMPROVEMENTS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IN WRITING.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING GAS, ELECTRIC AND TELECOMMUNICATION CONNECTIONS WITH THE APPROPRIATE GOVERNING AUTHORITY.
 - CONTRACTOR SHALL START CONSTRUCTION OF ANY GRAVITY SEWER AT THE LOWEST INVERT AND WORK UP-GRADE.
 - THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD SET OF PLANS REFLECTING THE LOCATION OF EXISTING UTILITIES THAT HAVE BEEN CAPPED, ABANDONED, OR RELOCATED BASED ON THE DEMOLITION/REMOVAL ACTIVITIES REQUIRED IN THIS PLAN SET. THIS DOCUMENT SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.
 - THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD OF THE AS-BUILT LOCATIONS OF ALL PROPOSED UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR SHALL NOTE ANY DISCREPANCIES BETWEEN THE AS-BUILT LOCATIONS AND THE LOCATIONS DEPICTED WITHIN THE PLAN SET. THIS RECORD SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.

FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL	FOR SITE PLAN APPROVAL
DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
12/27/2022	06/07/2022	02/15/2022	12/08/2021	02/08/2021	10/14/2020	10/08/2020	07/02/2020	05/20/2020	
BY	KTH	KTH	KTH	KTH	KTH	KTH	KTH	KTH	BY
ISSUE									DATE
									DESCRIPTION

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REDEVELOPMENT

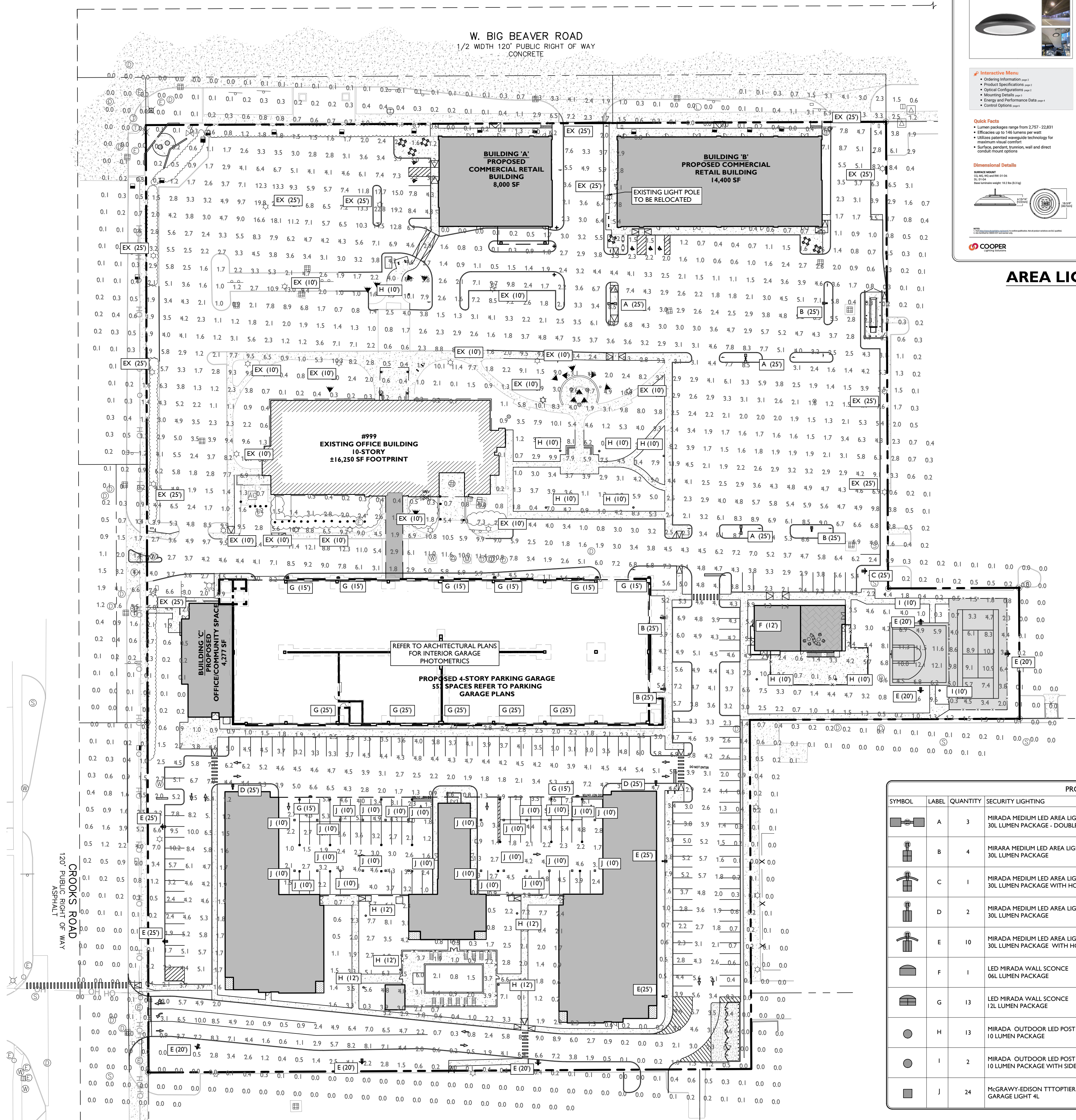
PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

STONEFIELD
engineering & design

SCALE: 1" = 50' PROJECT ID: M-19301

TITLE: **UTILITY PLAN**

DRAWING: **C-7**



Mirada Medium - MRM Outdoor LED Area Light

McGraw-Edison
TT TopTier
Parking Garage Luminaire

Product Features

- Ordering Information
- Product Specifications
- Optical Configuration
- Mounting Details
- Energy and Performance Data
- Control Options

Product Certifications

Connected Systems

- Wireless LxL
- Sprinkler

Quick Facts

- Luminaire package range from 2.787' - 22.831'
- Efficiency up to 168 lumens per watt
- Utilizes patented waveguide technology for maximum light efficiency
- Surface treatment, corrosion, wall and direct contact mount options

Dimensional Details

COOPER INDUSTRIES

AREA LIGHTS 'J'

Mirada Medium - MRM Outdoor LED Area Light

Optical System

Product Dimensions

Features & Specifications

- High performance 3000, 3500K, and 5000K color temperatures per ANSI C137.1. Also available in Programmable Color Select with Tunable White.
- High performance 170° - 180° beam spread
- 5-10' mounting height (200' max) for 5000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3500K or as specified (40' - 400' max)
- High performance 170° - 180° beam spread
- 5-10' mounting height (200' max) for 5000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3000K or as specified (40' - 400' max)
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COOPER INDUSTRIES

AREA LIGHTS 'A', 'B', 'C', 'D' & 'E'

Mirada Post Top - MPP Outdoor LED Post Top

Optical System

Product Dimensions

Features & Specifications

- High performance 3000, 3500K, and 5000K color temperatures per ANSI C137.1. Also available in Programmable Color Select with Tunable White.
- High performance 170° - 180° beam spread
- 5-10' mounting height (200' max) for 5000K or as specified (40' - 400' max)
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- 4-10' mounting height (200' max) for 3500K or as specified (40' - 400' max)

COOPER INDUSTRIES

AREA LIGHTS 'H' & 'I'

Mirada Wall Sconce - XWM Outdoor LED Wall Sconce

Optical System

Product Dimensions

Features & Specifications

- High performance 3000, 3500K, and 5000K color temperatures per ANSI C137.1. Also available in Programmable Color Select with Tunable White.
- High performance 170° - 180° beam spread
- 5-10' mounting height (200' max) for 5000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3500K or as specified (40' - 400' max)
- High performance 170° - 180° beam spread
- 5-10' mounting height (200' max) for 5000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3000K or as specified (40' - 400' max)
- 4-10' mounting height (200' max) for 3500K or as specified (40' - 400' max)

COOPER INDUSTRIES

WALL LIGHTS 'F' & 'G'

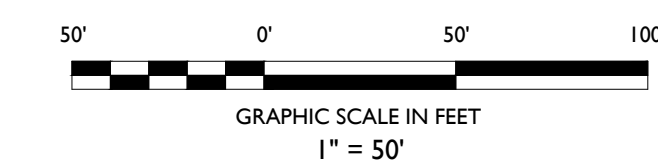
PROPOSED LUMINAIRE SCHEDULE						
SYMBOL	LABEL	QUANTITY	SECURITY LIGHTING	DISTRIBUTION	LLF	MANUFACTURER / IES FILE
A	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE - DOUBLE 180°	3		V	0.90	LSI INDUSTRIES / MRM-SW-LED-30L-40
B	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE	4		FT	0.90	LSI INDUSTRIES / MRM-FT-LED-30L-40
C	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE WITH HOUSE-SIDE SHIELD	1		FT	0.90	LSI INDUSTRIES / MRM-FT-LED-30L-40-IL
D	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE	2		III	0.90	LSI INDUSTRIES / MRM-3-LED-30L-40
E	MIRADA MEDIUM LED AREA LIGHT 30L LUMEN PACKAGE WITH HOUSE-SIDE SHIELD	10		III	0.90	LSI INDUSTRIES / MRM-3-LED-30L-40
F	LED MIRADA WALL SCONCE 06L LUMEN PACKAGE	1		III	0.90	LSI INDUSTRIES / XWM-3-LED-06L-40
G	LED MIRADA WALL SCONCE 12L LUMEN PACKAGE	13		III	0.90	LSI INDUSTRIES / XWM-3-LED-12L-40
H	MIRADA OUTDOOR LED POST TOP 10 LUMEN PACKAGE	13		SW	0.90	LSI INDUSTRIES / MPP-LED-10L-SL-SW-40-70CRJ
I	MIRADA OUTDOOR LED POST TOP 10 LUMEN PACKAGE WITH SIDE SHIELD	2		III	0.90	LSI INDUSTRIES / MPP-LED-10L-SL-3-40-70CRJL
J	McGraw-Edison TTTOPTier LED PARKING GARAGE LIGHT 4L	24		V	0.90	COOPER INDUSTRIES / TT-D1-740J-MQ

LIGHTING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 13.05.C.1.A	FIXTURE SHIELDING: ALL PROPOSED FIXTURES ARE TO BE FULLY SHIELDED FROM ADJACENT PROPERTIES AND RIGHTS-OF-WAY	PROVIDED
§ 13.05.C.2.A-C	FREESTANDING POLE LIGHTING: MAXIMUM 20 FC DURING BUSINESS HOURS (10 FC AFTER HOURS) MAXIMUM 1.0 FC AT NON-RESIDENTIAL PROPERTY LINES MAXIMUM 0.1 FC AT ABUTTING RESIDENTIAL PROPERTY LINES	12.3 FC 8.4 (EN) 0.1 FC
§ 13.05.C.3	BUILDING MOUNTED LIGHTS: MAXIMUM 20 FC DURING BUSINESS HOURS (10 FC AFTER HOURS) MAXIMUM 1.0 FC AT NON-RESIDENTIAL PROPERTY LINES MAXIMUM 0.1 FC AT ABUTTING RESIDENTIAL PROPERTY LINES	12.3 FC 8.4 (EN) 0.1 FC
§ 13.05.D.1-3		

NOTE: ALL LIGHTING IS TO BE MEASURED AT 8' ABOVE GRADE

(EN) EXISTING NON-COMFORMITY

- GENERAL LIGHTING NOTES**
- THE LIGHTING LEVELS DEPICTED WITHIN THE PLAN SET ARE CALCULATED UTILIZING DATA OBTAINED FROM THE LISTED MANUFACTURER. ACTUAL ILLUMINATION LEVELS AND PERFORMANCE OF ANY PROPOSED LIGHTING FIXTURE MAY VARY DUE TO UNCONTROLLABLE VARIABLES SUCH AS WEATHER, VOLTAGE SUPPLY, LAMP TOLERANCE, EQUIPMENT SERVICE LIFE AND OTHER VARIABLE FIELD CONDITIONS.
 - WHERE APPLICABLE, THE EXISTING LIGHT LEVELS DEPICTED WITHIN THE PLAN SET SHALL BE CONSIDERED APPROXIMATE. THE EXISTING LIGHT LEVELS ARE BASED ON FIELD OBSERVATIONS AND THE MANUFACTURER'S DATA OF THE ASSUMED OR MOST SIMILAR LIGHTING FIXTURE MODEL.
 - UNLESS NOTED ELSEWHERE WITHIN THIS PLAN SET, THE LIGHT LOSS FACTORS USED IN THE LIGHTING ANALYSIS ARE AS FOLLOWS:
 - LIGHT EMITTING DIODES (LED): 0.70
 - HIGH PRESSURE SODIUM: 0.72
 - METAL HALIDE: 0.72
 - THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC IN WRITING, PRIOR TO THE START OF CONSTRUCTION, OF ANY PROPOSED LIGHTING LOCATIONS THAT CONFLICT WITH EXISTING/PROPOSED DRAINAGE, UTILITY, OR OTHER IMPROVEMENTS.
 - THE CONTRACTOR IS RESPONSIBLE TO PREPARE A WIRING PLAN AND PROVIDE ELECTRICAL SERVICE TO ALL PROPOSED LIGHTING FIXTURES. THE CONTRACTOR IS REQUIRED TO PREPARE AN AS-BUILT PLAN OF WIRING AND PROVIDE COPIES TO THE OWNER AND STONEFIELD ENGINEERING & DESIGN, LLC.



REV	DATE	ISSUE	BY	DESCRIPTION
11	12/02/2022			
10	06/07/2022			
9	02/15/2022			
8	12/08/2021			
7	02/08/2021			
6	10/14/2020			
5	10/08/2020			
4	10/02/2020			
3	07/02/2020			
2	05/20/2020			
1				

NOT APPROVED FOR CONSTRUCTION

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CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT

PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

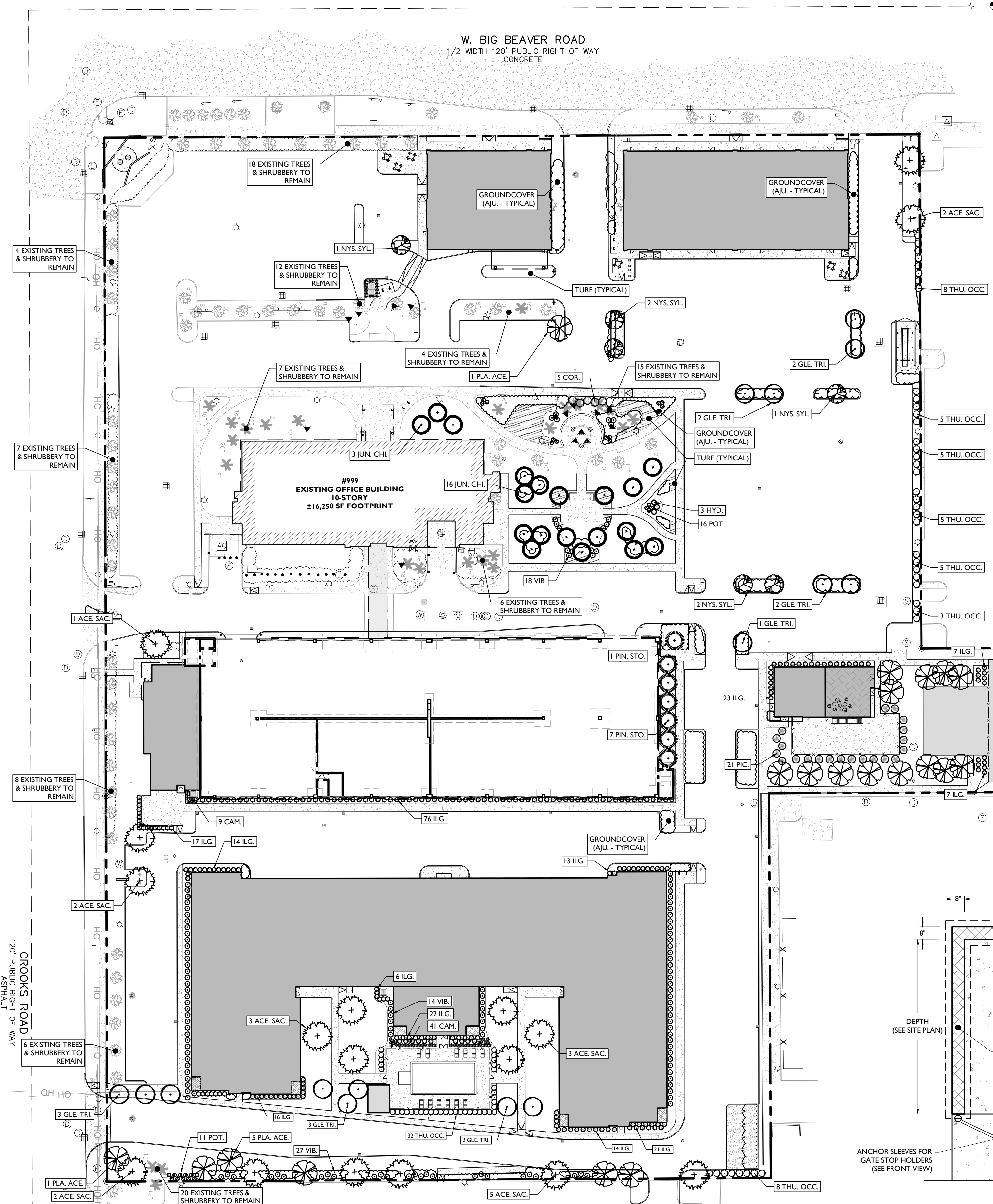
STATE OF MICHIGAN
MICHAEL J. STONEFIELD
LICENSED PROFESSIONAL ENGINEER
0695428

STONEFIELD
engineering & design

SCALE: 1" = 50' PROJECT ID: M-19301

TITLE:
LIGHTING PLAN

DRAWING:
C-8



LANDSCAPING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 13.02.C-2	PARKING LOT LANDSCAPING: CURBED ISLANDS SHALL BE A MINIMUM OF 200 SF 1 TREE PER EVERY 8 PARKING SPACES (419 SURFACE SPACES) (1 TREE / 8 SPACES) = 52 TREES	PROVIDED 60 PROPOSED TREES 47 EXISTING TREES TOTAL: 107 TREES
§ 13.02.D-2	ROW GREENBELT: MINIMUM WIDTH: 10 FT 1 DECIDUOUS TREE PER 30 LF (1,483 LF) (1 TREE / 30 LF) = 49 TREES	PROVIDED 6 PROPOSED TREES 43 EXISTING TREES TOTAL: 49 TREES
§ 13.02.E-1	SITE OPEN SPACE: 15% OF THE SITE AREA SHALL BE PRESERVED AS OPEN SPACE (710,825 SF) (0.15) = 106,624 SF	156,145 SF 22.0%
§ 13.02.E-1	SITE LANDSCAPING: (*) 15% OF THE SITE AREA SHALL BE LANDSCAPED (710,825 SF) (0.15) = 106,624 SF	101,503 SF 14.3% (W)
§ 13.03.B	TRASH ENCLOSURE SCREENING: MINIMUM HEIGHT 6 FT CANNOT BE LOCATED IN A FRONT YARD SETBACK	6 FT NOT IN SETBACK

(*) DECIDUOUS TREES WITHIN GREENBELT SHALL BE A MINIMUM CALIPER OF TWO AND A HALF (2 1/2) INCHES OR GREATER

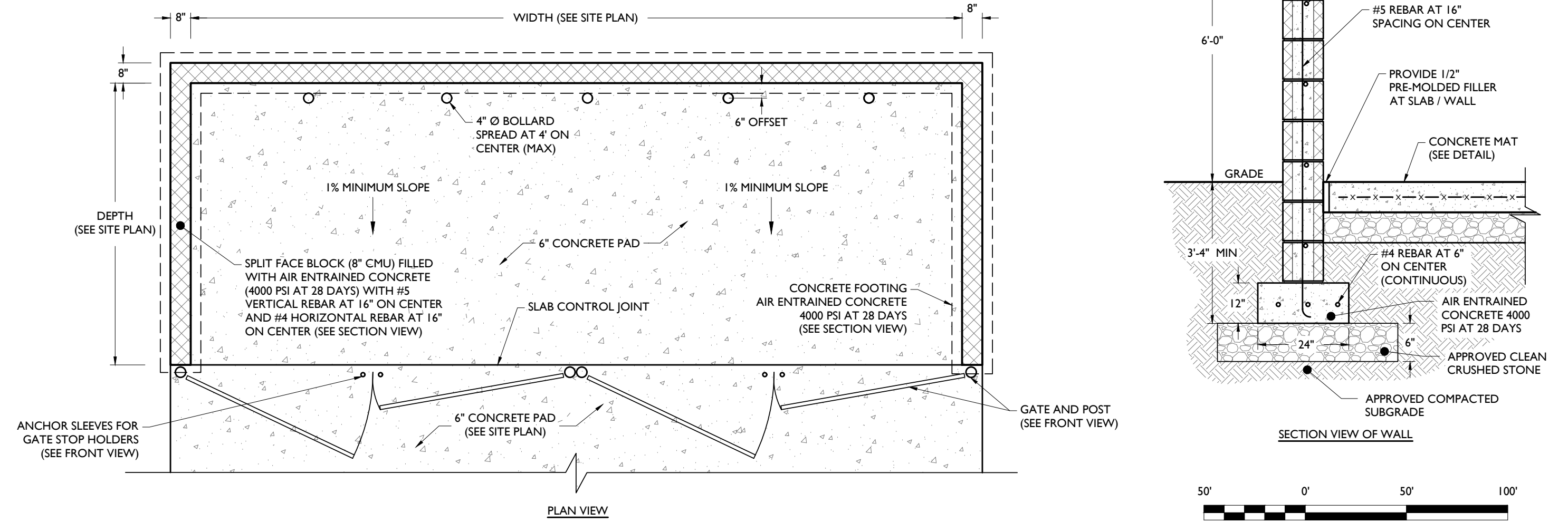
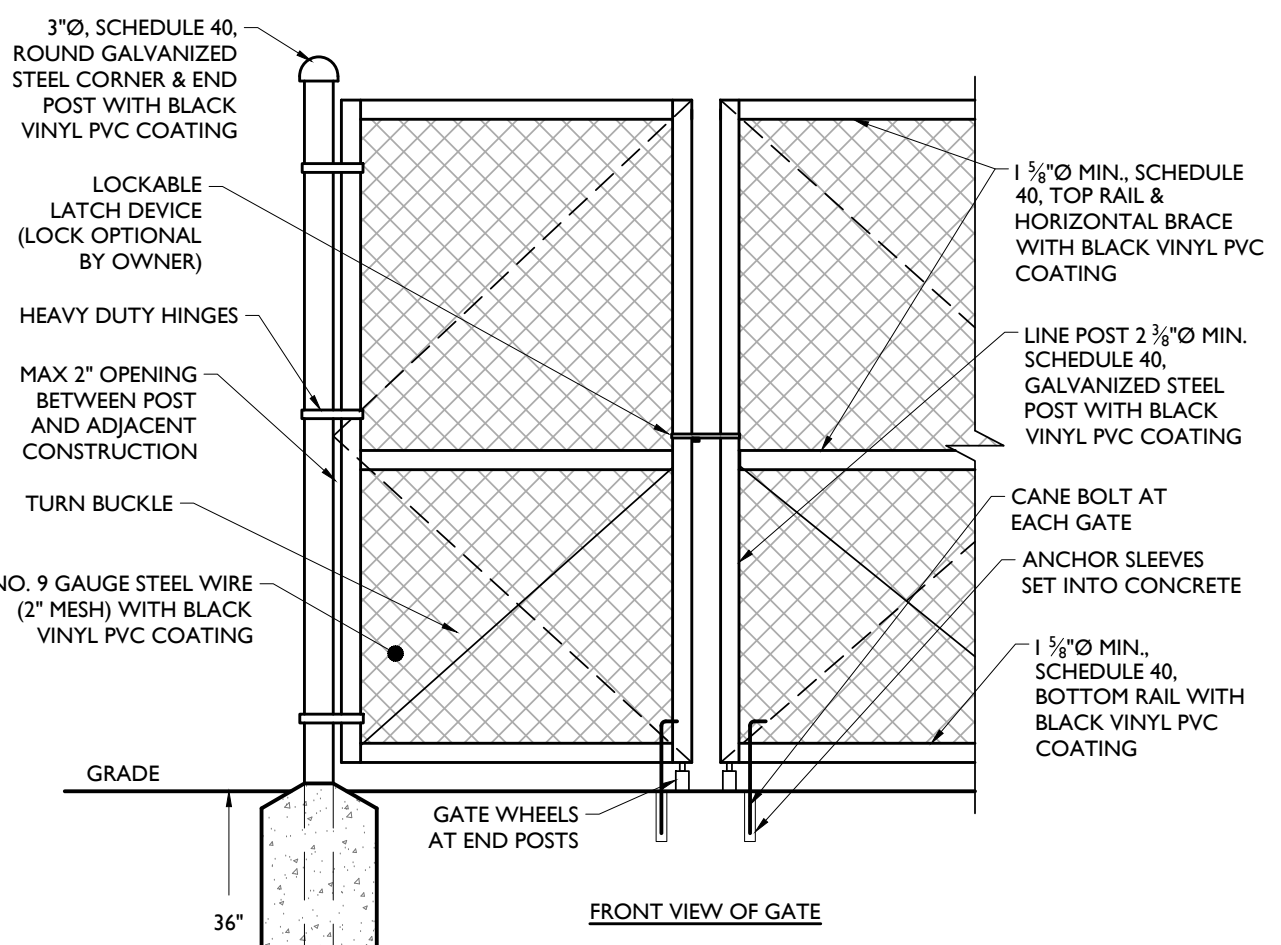
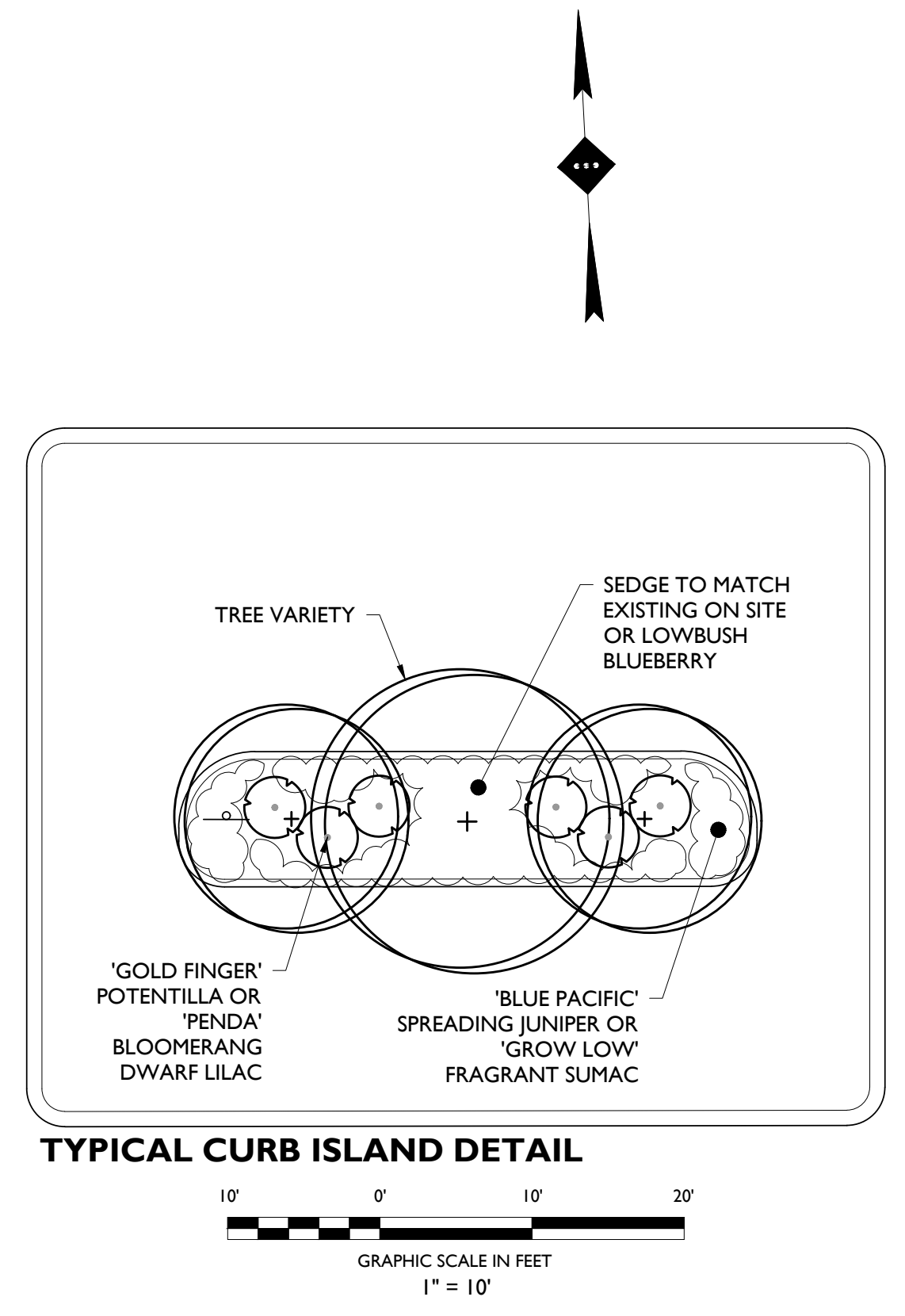
(**) UP TO 25% OF THE REQUIRED LANDSCAPE AREA MAY BE BRINK, STONE, PAVERS, OR OTHER PUBLIC PLAZA ELEMENTS (0.25)(39,132 SF) = 9,783 SF

(90,141 SF) + (9,783 SF) = 99,924 SF TOTAL LANDSCAPE AREA

(***) WAIVER

ANTICIPATED TREE KEY		
PLANT KEY	COMMON NAME	BOTANICAL NAME
DECIDUOUS TREES		
	SUGAR MAPLE	ACER SACCHARUM (ACE. SAC.)
	LONDON PLANE	PLATANUS X ACERIFOLIA (PLA. ACE.)
	BLACK GUM	NYSSA SYLVATICA (NYS. SYL.)
	HONEY LOCUST	GLEDISIA TRICANTHOS (GLE. TRI.)
EVERGREEN TREES		
	WHITE PINE	PINUS STROBUS (PIN. STO.)
	SPARTAN JUNIPER	JUNIPERUS CHINENSIS (JUN. CHI.)
	EMERALD GREEN ARBORVITAE	THUJA OCCIDENTALIS 'SMARAGD'

ANTICIPATED SHRUB KEY		
PLANT KEY	COMMON NAME	BOTANICAL NAME
	RED OSIER DOGWOOD	CORNUS SERICEA (COR.)
	ARROWWOOD VIBURNUM	VIBURNUM DENTATUM (VIB.)
	GOLD FINGER POTENTILLA	POTENTILLA FRUTICOSA (POT.)
	COMMON BUGLE	AJUGA REPTANS (AJU.)
	FAT ALBERT SPRUCE	PICEA PUNGENS (PIC.)
	LIMELIGHT	HYDRANGEA PANICULATA (HYD.)
	DEGROOT SPIRE	THUJA OCCIDENTALIS (THJ.)
	INKBERRY HOLLY	ILEX GLABRA (ILG.)
	CREEPING JENNY	LYSIMACHIA NUMMULARIA (LYS.)
	FEATHER REED GRASS	CAMAGROSTIS X ACUTIFLORA (CAM.)



NOTE: BLOCK COLOR TO MATCH BUILDING OR AS SPECIFIED BY OWNER

DOUBLE TRASH / RECYCLE ENCLOSURE DETAILS
NOT TO SCALE

REV	DATE	DESCRIPTION
11	12/02/2022	FOR SITE PLAN APPROVAL
10	06/01/2022	FOR SITE PLAN APPROVAL
9	02/15/2022	RESUBMISSION FOR SPA APPROVAL
8	12/08/2021	RESUBMISSION FOR SPA APPROVAL
7	02/08/2021	RESUBMISSION FOR SPA APPROVAL
6	10/14/2020	RESUBMISSION FOR PUD APPROVAL
5	10/08/2020	FOR CLIENT REVIEW
4	10/02/2020	FOR CLIENT REVIEW
3	07/02/2020	RESUBMISSION FOR PUD APPROVAL
2	05/20/2020	RESUBMISSION FOR PUD APPROVAL
1		

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CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT

PARCEL ID: 88-20-28-101-032, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

STATE OF MICHIGAN
MICHIGAN REGISTERED PROFESSIONAL ENGINEER
MICHAEL J. STONEFIELD
LICENSE NO. 0006428
EXPIRES 12/31/2024

STONEFIELD
engineering & design

SCALE: 1" = 50' PROJECT ID: M-19301
TITLE: LANDSCAPING PLAN
DRAWING: C-9

PROPERTY DESCRIPTION

THE LAND SITUATED IN THE TROY, COUNTY OF OAKLAND, STATE OF MICHIGAN, IS DESCRIBED AS FOLLOWS:

PARCEL 1: PART OF THE NORTHWEST 1/4, SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN, BEGINNING AT POINT DISTANT SOUTH 02 DEGREES 21 MINUTES 41 SECONDS EAST 400 FEET FROM NORTHWEST SECTION CORNER...

PARCEL 2: PART OF THE NORTHWEST 1/4 OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT A POINT DISTANT SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 60 FEET AND NORTH 87 DEGREES 28 MINUTES 55 SECONDS EAST 470 FEET FROM THE NORTHWEST CORNER OF SECTION 28...

PARCEL 3: PART OF THE NORTHWEST 1/4 OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT A POINT DISTANT SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 60 FEET AND NORTH 87 DEGREES 28 MINUTES 55 SECONDS EAST 470 FEET FROM THE NORTHWEST CORNER OF SECTION 28...

SURVEYOR'S NOTE: THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA...

LEGEND

- FOUND MONUMENT (AS NOTED)
FOUND SECTION CORNER (AS NOTED)
RECORD AND MEASURED DIMENSION
RECORD DIMENSION
MEASURED DIMENSION
ELECTRIC MANHOLE
ELECTRIC PANEL
TRANSFORMER
UTILITY POLE
GAS METER
GAS VALVE
TELEPHONE MANHOLE
ELECTRIC OUTLET
CABLE TV RISER
TRAFFIC SIGNAL
CROSSWALK SIGNAL
TRAFFIC SIGNAL
CLEANOUT
SANITARY MANHOLE
ROUND CATCH BASIN
SQUARE CATCH BASIN
DRAIN
STORM DRAIN MANHOLE
FIRE HYDRANT
FIRE DEPARTMENT CONNECTION
WATER GATE MANHOLE
WATER VALVE
AIR CONDITIONING UNIT
BOLLARD
FLAGPOLE
FLOOD LIGHT
LIGHTPOST/LAMP POST
MAIL BOX
SINGLE POST SIGN
DOUBLE POST SIGN
HANDICAP PARKING
PARCEL BOUNDARY LINE
ADJOINER PARCEL LINE
SECTION LINE
EASEMENT (AS NOTED)
BUILDING
BUILDING OVERHANG
ASPHALT CURB
CONCRETE CURB
RAISED CONCRETE
PARKING
EDGE OF CONCRETE (CONC.)
EDGE OF ASPHALT (ASPH.)
EDGE OF GRAVEL
FENCE (AS NOTED)
WALL (AS NOTED)
LANDSCAPING (AS NOTED)
OVERHEAD UTILITY LINE
GAS LINE
WATER LINE
STORM LINE
SANITARY LINE
UNDERGROUND PIPE (AS NOTED)
BUILDING AREA
ASPHALT
CONCRETE

TOGETHER WITH THE FOLLOWING EASEMENTS:

A SIX (6) FOOT PRIVATE EASEMENT FOR SANITARY SEWER, BEING A PART OF THE NORTHWEST 1/4 OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN, BEING MORE PARTICULARLY DESCRIBED AS: BEGINNING AT A POINT DISTANT SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 60.00 FEET, NORTH 87 DEGREES 28 MINUTES 55 SECONDS EAST 470 FEET AND SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 445.00 FEET FROM THE NORTHWEST CORNER OF SAID SECTION 28...

AND A TWELVE (12) FOOT PRIVATE EASEMENT FOR PUBLIC SANITARY SEWER, BEING A PART OF THE NORTHWEST 1/4 OF SECTION 28, TOWN 2 NORTH, RANGE 11 EAST, CITY OF TROY, OAKLAND COUNTY, MICHIGAN, BEING MORE PARTICULARLY DESCRIBED AS: BEGINNING AT A POINT DISTANT SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 60.00 FEET, SOUTH 02 DEGREES 28 MINUTES 55 SECONDS EAST 446.00 FEET AND NORTH 87 DEGREES 28 MINUTES 55 SECONDS EAST 115.00 FEET FROM THE NORTHWEST CORNER OF SAID SECTION 28...

PARKING

HANDICAP PARKING = 19 STALLS
STANDARD PARKING = 810 STALLS

BASIS OF BEARING

SOUTH 02°25'41" EAST, BEING THE WEST LINE OF SECTION 28, AS SHOWN.

TITLE REPORT NOTE

ONLY THOSE EXCEPTIONS CONTAINED WITHIN THE STEWART TITLE GUARANTY COMPANY FILE NO. 63-1965024-SOM, REVISION 4, DATED SEPTEMBER 03, 2019, AND LISTED BELOW WERE PARTICULARLY DESCRIBED AS: BEGINNING AT A POINT DISTANT SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 60 FEET AND NORTH 87 DEGREES 28 MINUTES 55 SECONDS EAST 470 FEET AND SOUTH 02 DEGREES 25 MINUTES 41 SECONDS EAST 445.00 FEET FROM THE NORTHWEST CORNER OF SAID SECTION 28...

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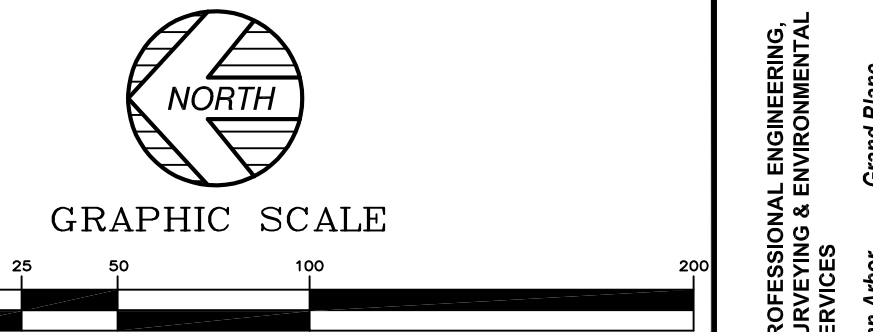
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PARKING

HANDICAP PARKING = 19 STALLS
STANDARD PARKING = 810 STALLS

BASIS OF BEARING

SOUTH 02°25'41" EAST, BEING THE WEST LINE OF SECTION 28, AS SHOWN.



MANHOLE SCHEDULE

Table with 2 columns: Manhole ID (e.g., STORM CATCH BASIN #12227) and Location/Coordinates (e.g., INV. 12' N=694.31').

MANHOLE SCHEDULE CONT.

Continuation of Manhole Schedule table with entries like STORM CATCH BASIN #75073 and SANITARY MANHOLE #75076.

SURVEYOR'S CERTIFICATION

TO A.F. JONNA; STEWART TITLE GUARANTY COMPANY; AND ATA NATIONAL TITLE GROUP, LLC. THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS...

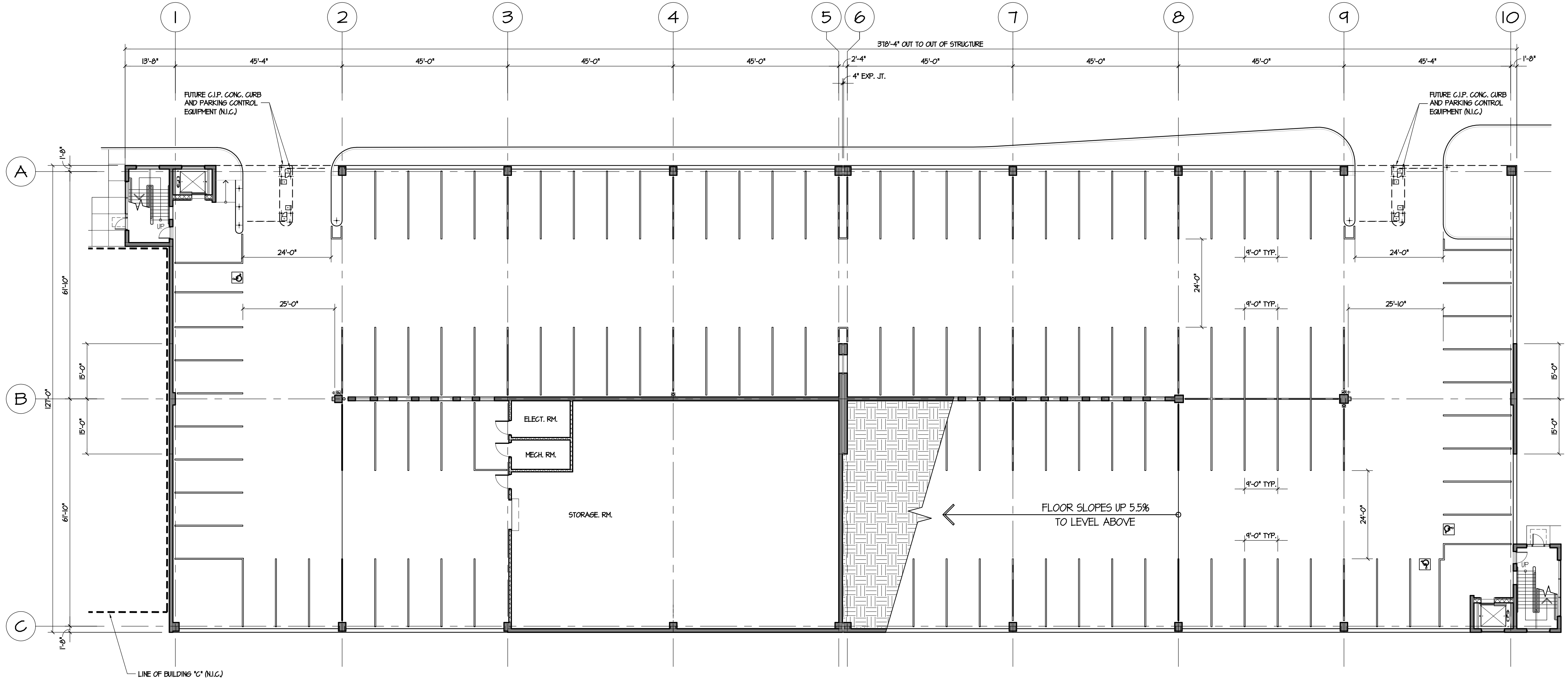
DRAFT

ANTHONY T. SYCKO, JR., P.S. PROFESSIONAL SURVEYOR MICHIGAN LICENSE NO. 47976 22556 GRATIOT AVE., EASTPOINTE, MI 48021 Tsycko@kentec-survey.com

Vertical sidebar containing logos for KEM-TEC, ALTA/NSPS LAND TITLE SURVEY, and a revision table with columns for DATE, REVISION, and DESCRIPTION.

KELLY PARKING STRUCTURE

RICH & ASSOCIATES
 PARKING CONSULTANTS
 ARCHITECTS - ENGINEERS - PLANNERS
 26677 NORTHWESTERN HWY.
 SUITE 208
 SOUTHFIELD, MI 48033
 (248) 353-5050 (813) 949-9860
 WWW.RICHASSOC.COM



LEVEL I STRIPING & SIGNAGE PLAN
 SCALE: 1/16" = 1'-0"

CAR COUNT SUMMARY			
LEVEL	STANDARD	BARRIER FREE	TOTAL
1	120	3	123
2	146	4	150
3	146	4	150
4	127	2	129
TOTAL	539	13	552

Date	ISSUED FOR:	By
04-19-2022	100% SCHEMATIC DESIGN	

Sheet Title:
LEVEL 1 STRIPING + SIGNAGE PLAN

Drawn By	RTM	Detail Number Detail Sheet
Checked By	RJK	
File Name	2225A-2_1	
Plot Date		

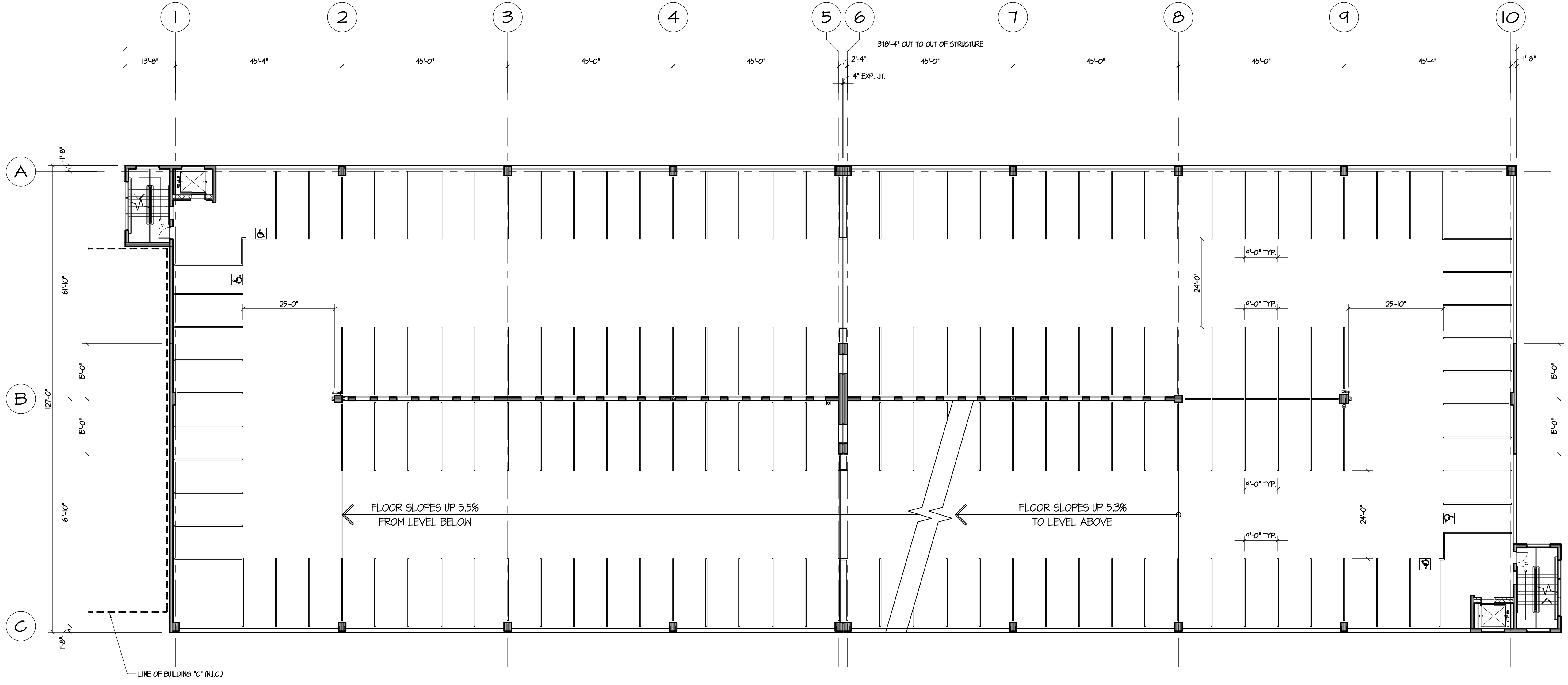
All matter contained herein, including drawings, written matter, notes or computations, are the creation of Rich and Associates, Inc. for the specific project and shall remain the property of Rich and Associates, Inc. No disclosure thereof to any third party shall be made to any person, firm, corporation, agency or organization, including news media without the written consent of Rich and Associates, Inc. except as required for the general completion of the specific project.

File No	2225	NORTH
Date		
Scale	AS NOTED	
Last Rev.		

Sheet Number:
A - 2.1

KELLY PARKING STRUCTURE

RICH & ASSOCIATES
 PARKING CONSULTANTS
 ARCHITECTS - ENGINEERS - PLANNERS
 26677 NORTHWESTERN HWY.
 SUITE 208
 SOUTHFIELD, MI 48033
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LEVEL 2 STRIPING & SIGNAGE PLAN
 SCALE: 1/16" = 1'-0"

CAR COUNT SUMMARY			
LEVEL	STANDARD	BARRIER FREE	TOTAL
1	120	3	123
2	146	4	150
3	146	4	150
4	127	2	129
TOTAL	539	13	552

Date	ISSUED FOR:	By
04-19-2022	100% SCHEMATIC DESIGN	

Sheet Title:
LEVEL 2 STRIPING + SIGNAGE PLAN

Drawn By	RTM	Detail Number Detail Sheet
Checked By	RJK	
File Name	2225A-2_2	
Plot Date		

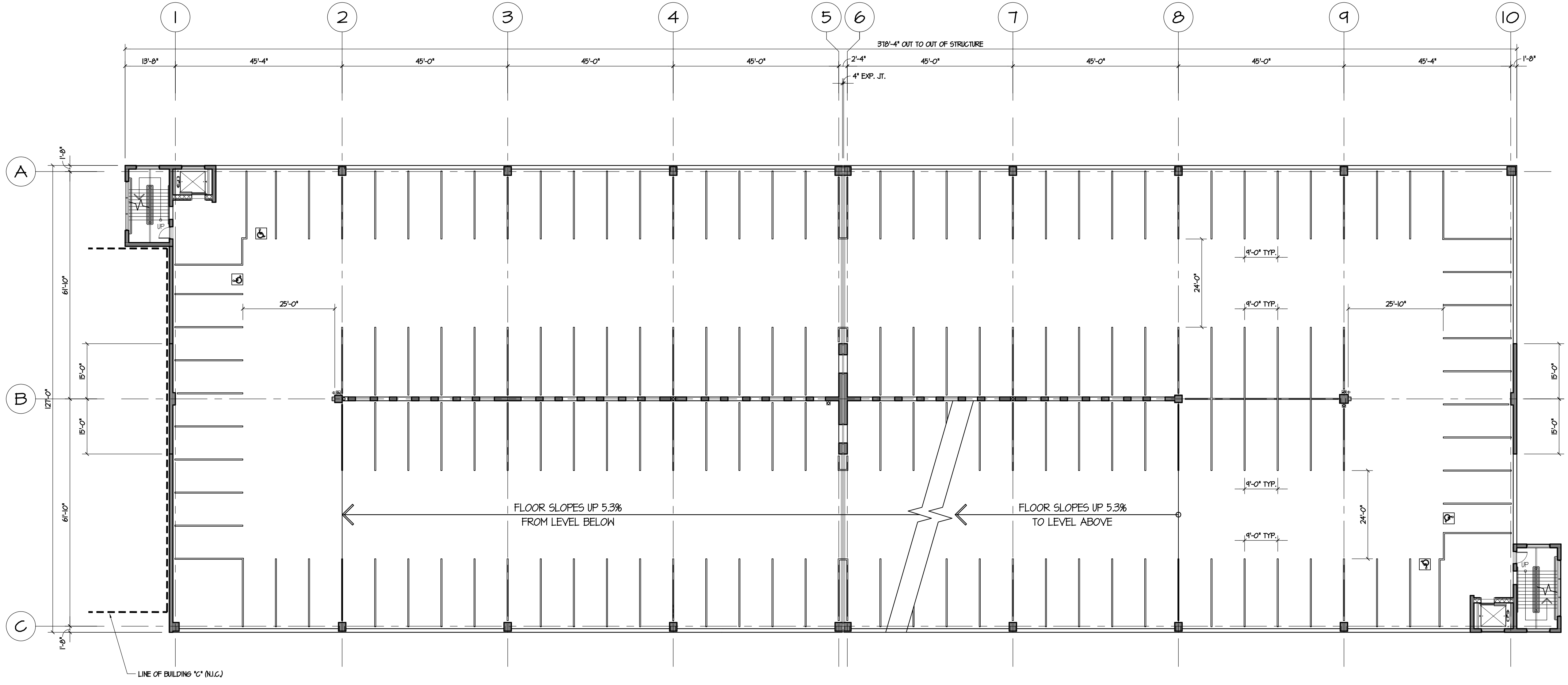
All matter contained herein, including drawings, written matter, notes or computations, are the creation of Rich and Associates, Inc. for the specific project and shall remain the property of Rich and Associates, Inc. No disclosure thereof to any third party shall be made to any person, firm, corporation, agency or organization, including news media, without the written consent of Rich and Associates, Inc. except as required for the specific completion of the specific project.

File No	2225	NORTH
Date		
Scale	AS NOTED	
Last Rev.		

Sheet Number:
A - 2.2

KELLY PARKING STRUCTURE

RICH & ASSOCIATES
 PARKING CONSULTANTS
 ARCHITECTS - ENGINEERS - PLANNERS
 26677 NORTHWESTERN HWY.
 SUITE 208
 SOUTHFIELD, MI 48033
 (248) 353-5050 (813) 949-9860
 WWW.RICHASSOC.COM



LEVEL 3 STRIPING & SIGNAGE PLAN
 SCALE: 1/16" = 1'-0"

CAR COUNT SUMMARY			
LEVEL	STANDARD	BARRIER FREE	TOTAL
1	120	3	123
2	146	4	150
3	146	4	150
4	127	2	129
TOTAL	539	13	552

Date	ISSUED FOR:	By
04-19-2022	100% SCHEMATIC DESIGN	

Sheet Title:

LEVEL 3 STRIPING + SIGNAGE PLAN

Drawn By	RTM	Detail Number Detail Sheet
Checked By	RJK	
File Name	2225A-2_3	
Plot Date		

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File No	2225	NORTH
Date		
Scale	AS NOTED	
Last Rev.		

Sheet Number:
A - 23

KELLY PARKING STRUCTURE

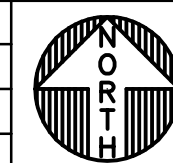
RICH & ASSOCIATES
 PARKING CONSULTANTS
 ARCHITECTS - ENGINEERS - PLANNERS
 26677 NORTHWESTERN HWY.
 SUITE 208
 SOUTHFIELD, MI 48033
 SOUTHFIELD, MI, LUTZ, FL
 (248) 353-5050 (813) 949-9860
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Date	ISSUED FOR:	By
04-19-2022	100% SCHEMATIC DESIGN	

Sheet Title:
**LEVEL 4 (ROOF)
 STRIPING +
 SIGNAGE PLAN**

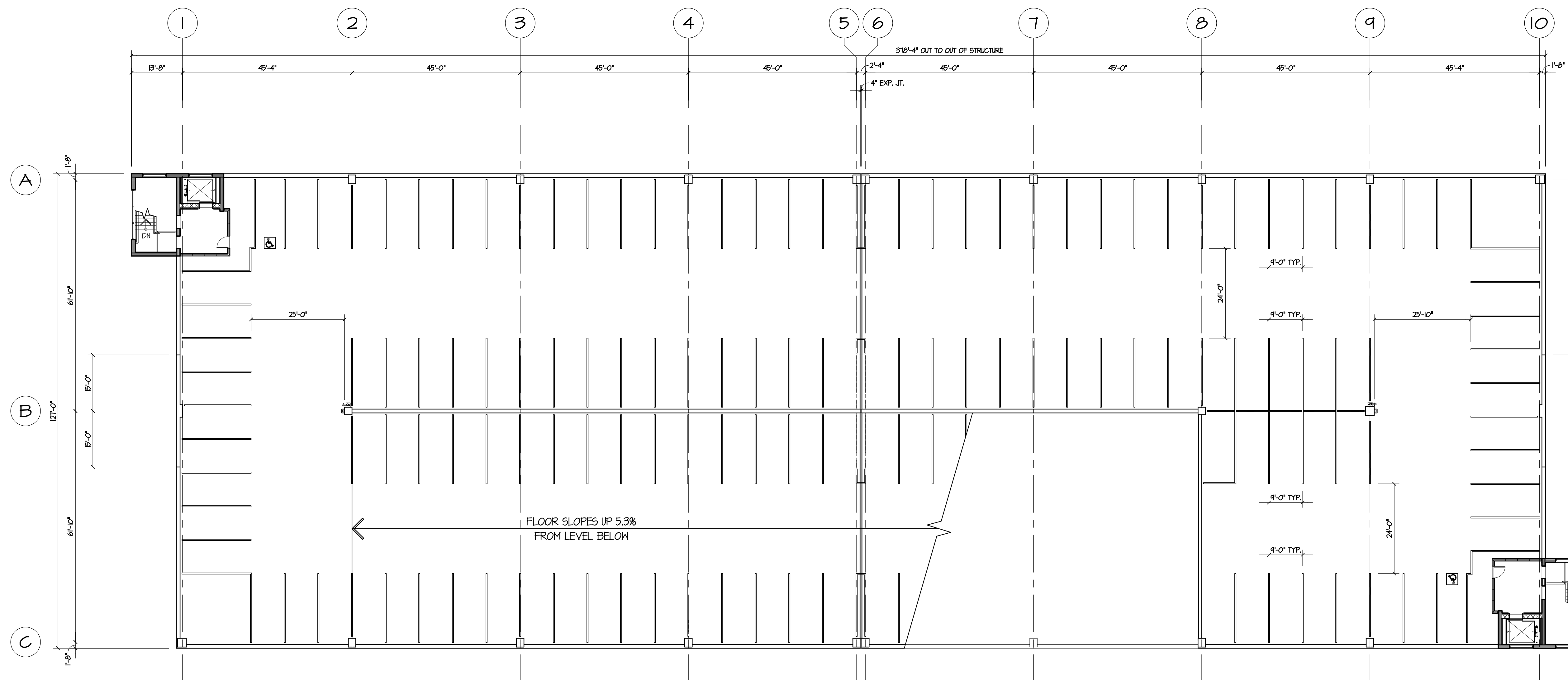
Drawn By	RTM	Detail Number Detail Sheet
Checked By	RJK	
File Name	2225A-2_4	
Plot Date		

All matter contained herein, including drawings, written matter, notes or computations, are the creation of Rich and Associates, Inc. for the specific project and shall remain the property of Rich and Associates, Inc. No disclosure thereof in any form whatsoever shall be made to any person, firm, corporation, agency or organization, including news media without the written consent of Rich and Associates, Inc. except as required for the special completion of the specific project.

File No	2225	
Date		
Scale	AS NOTED	
Last Rev.		

Sheet Number:

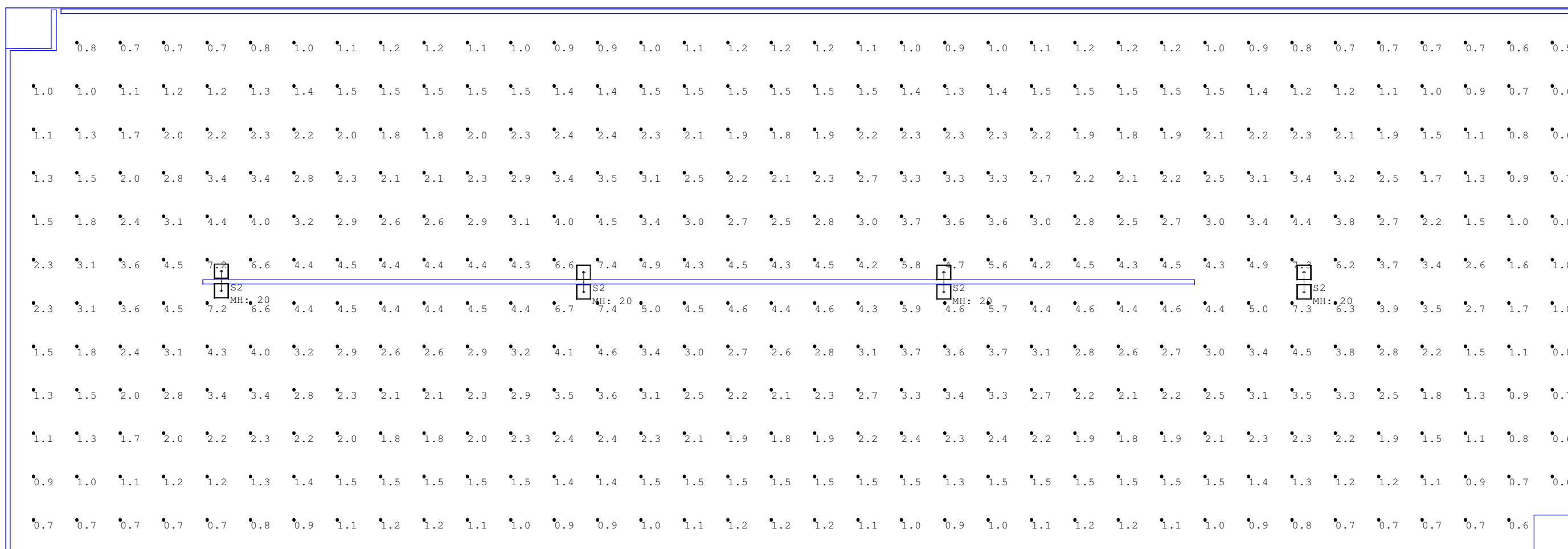
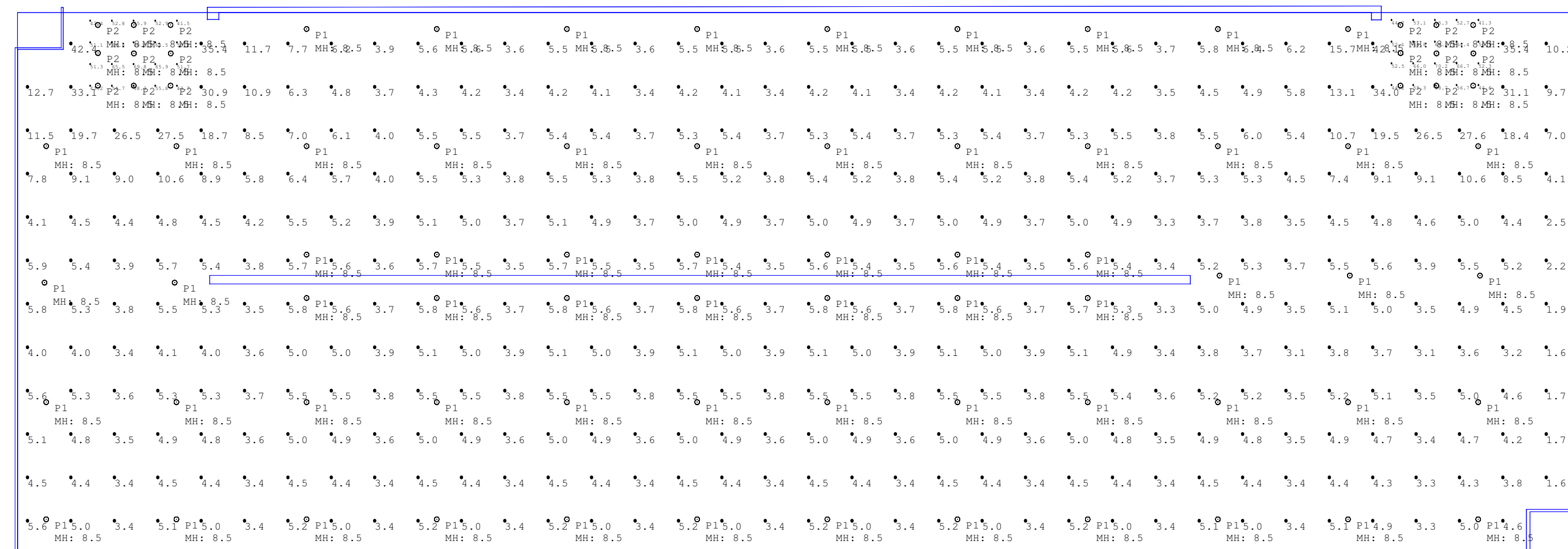
A - 2.4



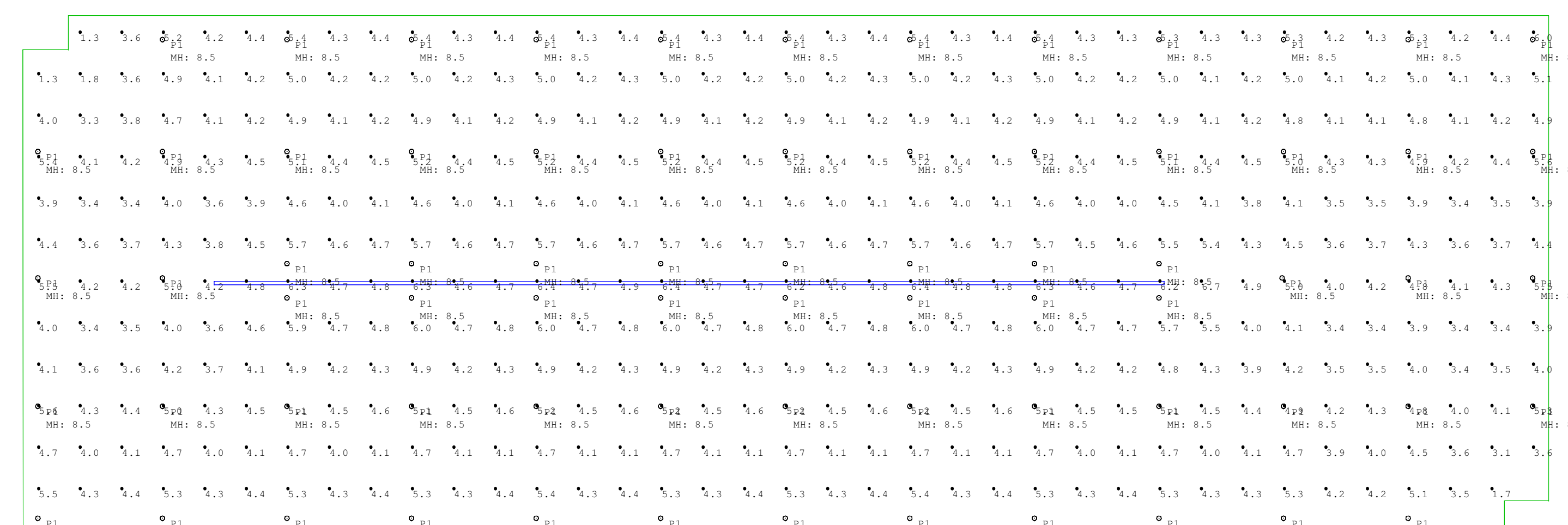
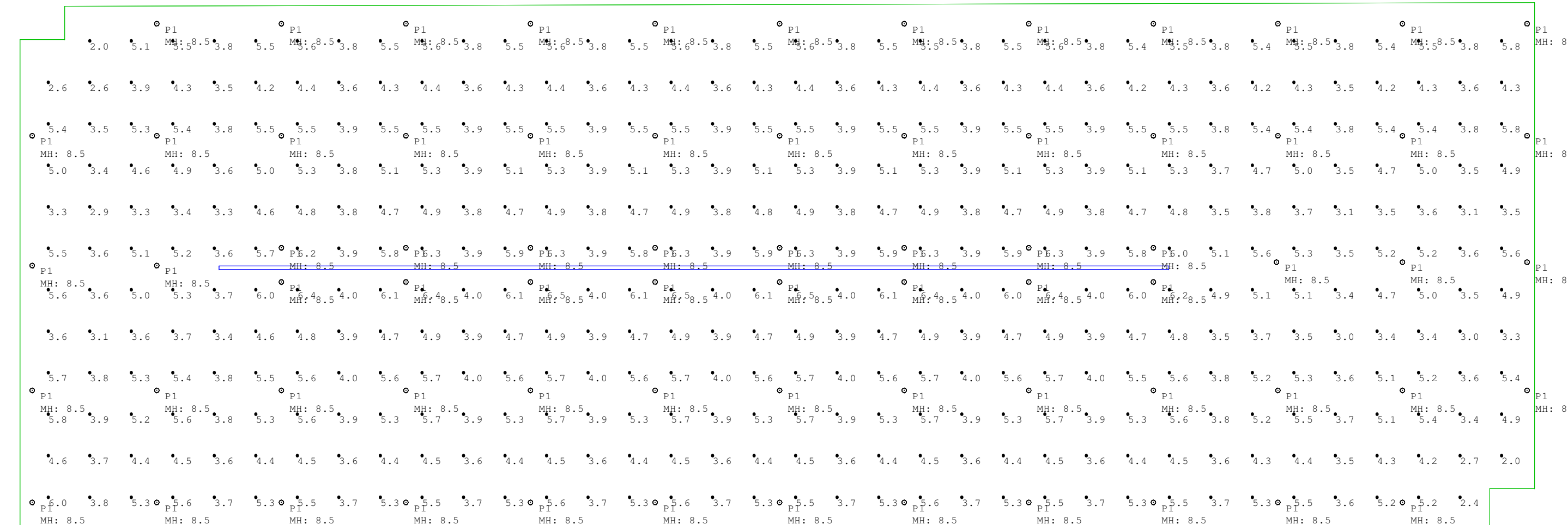
LEVEL 4 (ROOF) STRIPING & SIGNAGE PLAN
 SCALE: 1/16" = 1'-0"

CAR COUNT SUMMARY			
LEVEL	STANDARD	BARRIER FREE	TOTAL
1	120	3	123
2	146	4	150
3	146	4	150
4	127	2	129
TOTAL	539	13	552

FIRST FLOOR



SECOND FLOOR



FOURTH FLOOR/ROOF

THIRD FLOOR

Luminaire Schedule					
Symbol	Qty	Label	LLF	Description	Lum. Watts
⊙	206	P1	0.920	COOPER MCGRAW-EDISON# TT-D1-740-U-WQ	28
⊙	18	P2	0.920	COOPER MCGRAW-EDISON# TT-D5-740-U-WQ	74.7
⊕	4	S2	0.920	COOPER LUMARK# PRV-PA2A-740-U-T4W (TWIN ASSEMBLY)	112

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
1st Floor - At Grade	Illuminance	Fc	5.79	42.4	1.6	3.62
1st Floor Entrance & Exit A	Illuminance	Fc	55.72	70.2	41.3	1.35
1st Floor Entrance & Exit B	Illuminance	Fc	55.21	69.8	41.5	1.68
2nd Floor - At Grade	Illuminance	Fc	4.64	6.5	2.0	2.32
3rd Floor - At Grade	Illuminance	Fc	4.50	6.7	1.3	3.46
4th Floor - At Grade	Illuminance	Fc	2.37	7.4	0.5	4.74



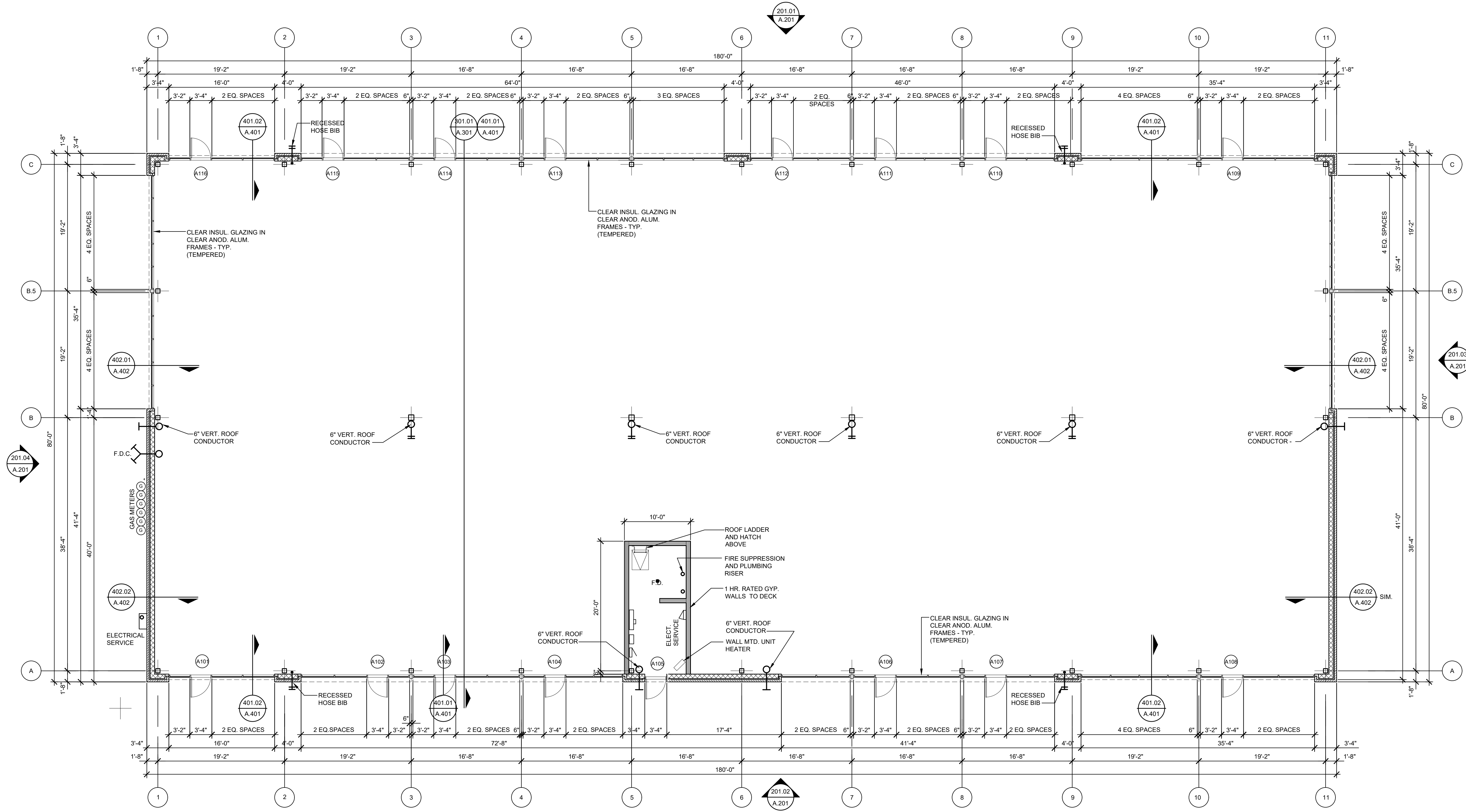
#	Date	Comments

Revisions

Drawn By: ACM
 Checked By:
 Date: 10/27/2020

Scale: NOT TO SCALE

CROOKS & BIG BEAVER
 MIXED USED SITE
 4 STORY PARKING STRUCTURE



NOTE:
FUTURE FINAL LOCATION OF
DEMISING WALL TO BE DETERMINED

NORTH
RETAIL BUILDING A - FLOOR PLAN
SCALE: 1/8"=1'-0"

Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

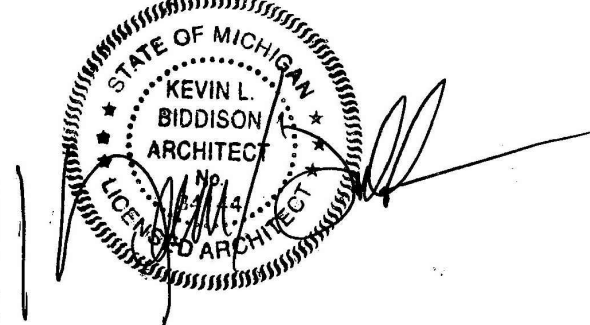
BIG BEAVER
TROY, MICHIGAN

Issued dr/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
BIDS	02.22.22
OWNER REVISIONS	03.24.22
PERMITS	05.11.22
SITE PLAN APPROVAL	05.31.22

Sheet title

**RETAIL BUILDING A
FLOOR PLAN**



Project no

2058.20

Sheet no

A.101a

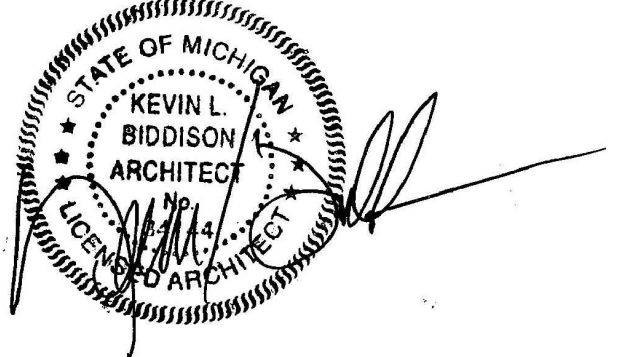
PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

BIG BEAVER
TROY, MICHIGAN

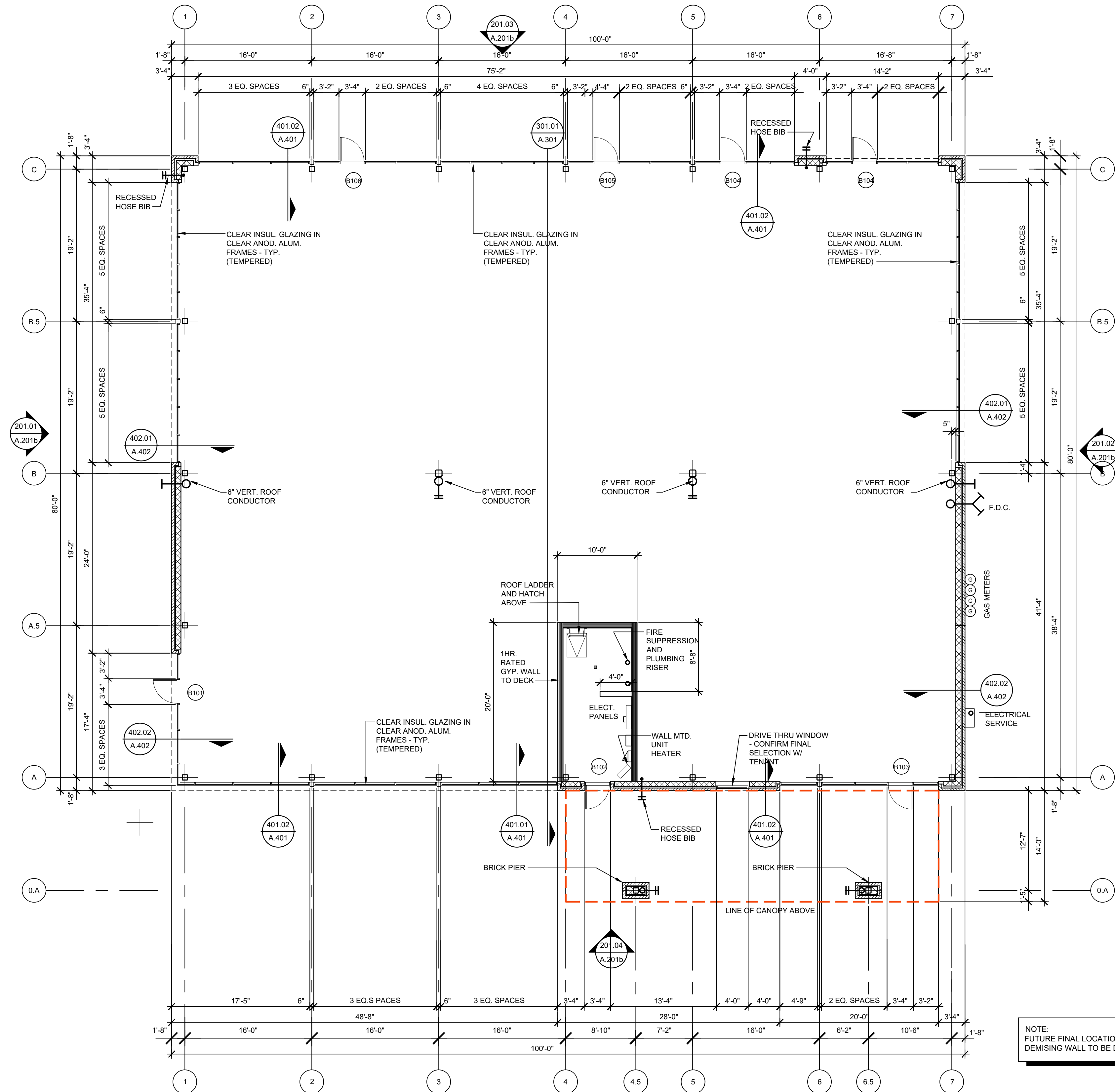
PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
REVIEW	02.17.22
BIDS	02.22.22
OWNER REVISIONS	03.25.22
PERMITS	05.11.22
SITE PLAN APPROVAL	05.31.22

**RETAIL
BUILDING B
FLOOR PLAN**



2058.20

A.101b



BUILDING B - FLOOR PLAN
SCALE: 1/8"=1'-0"

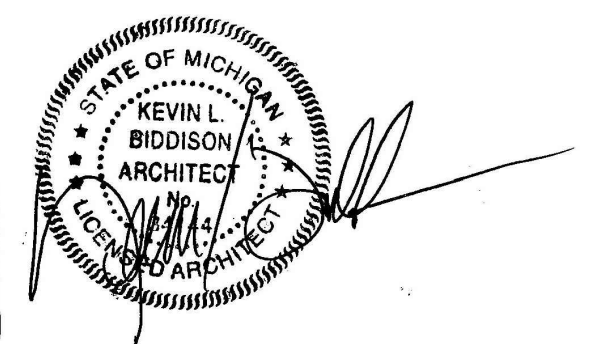
PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

BIG BEAVER
TROY, MICHIGAN

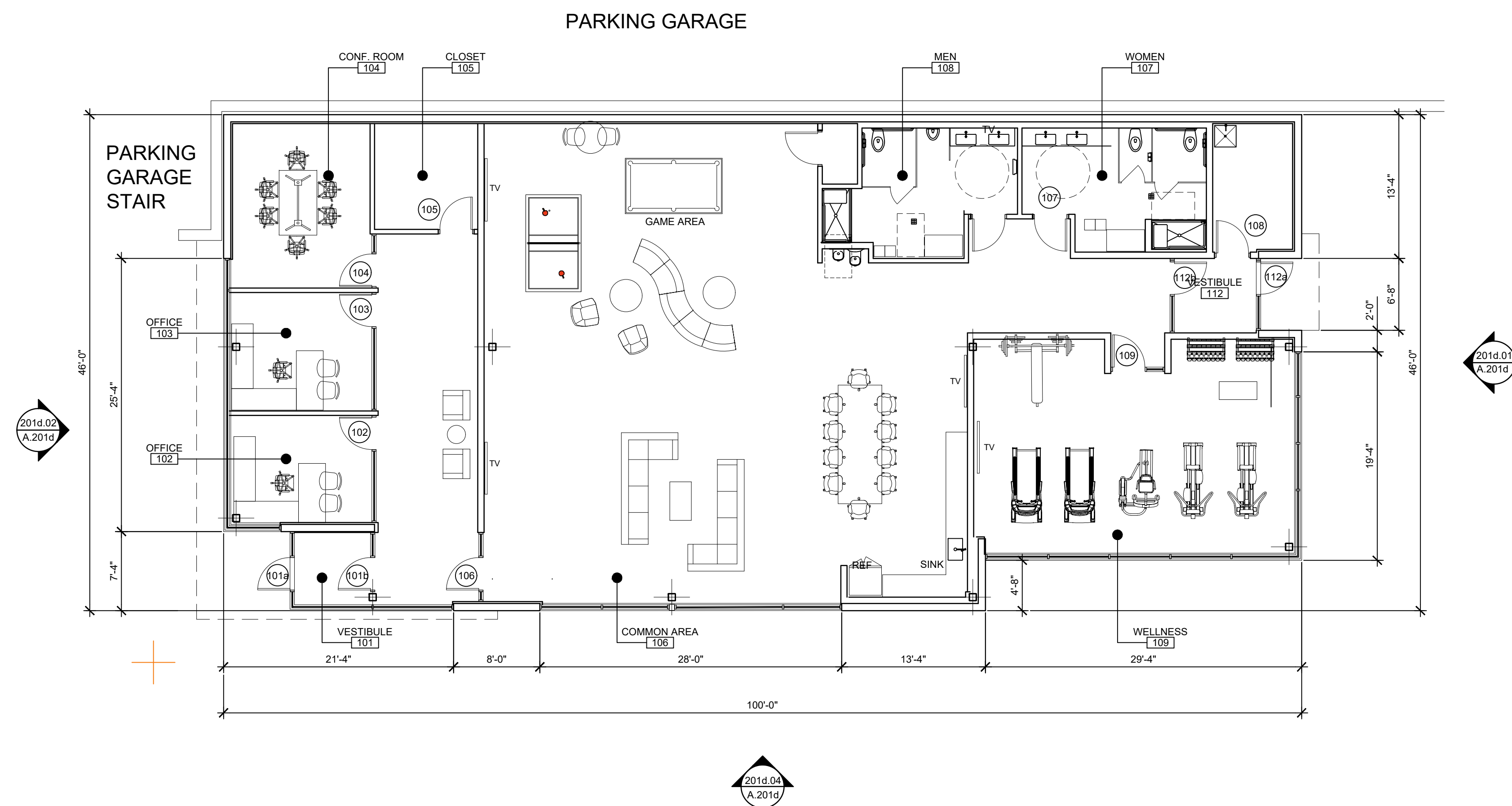
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

**BUILDING C
COMMUNITY HOUSE
PLANS**



2058.20

A.101c



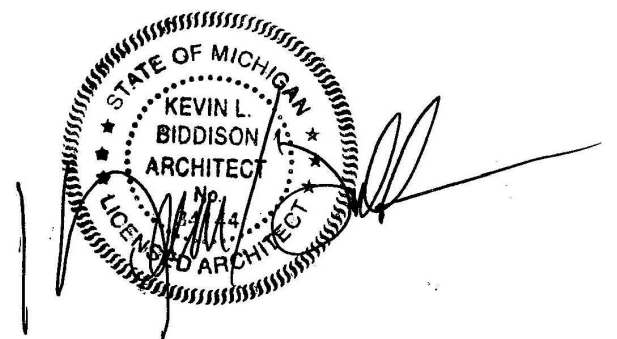
**BUILDING C -
COMMUNITY CENTER FLOOR PLAN**
SCALE: 1/8"=1'-0"

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
 Mixed Use
 Redevelopment**

BIG BEAVER
 TROY, MICHIGAN

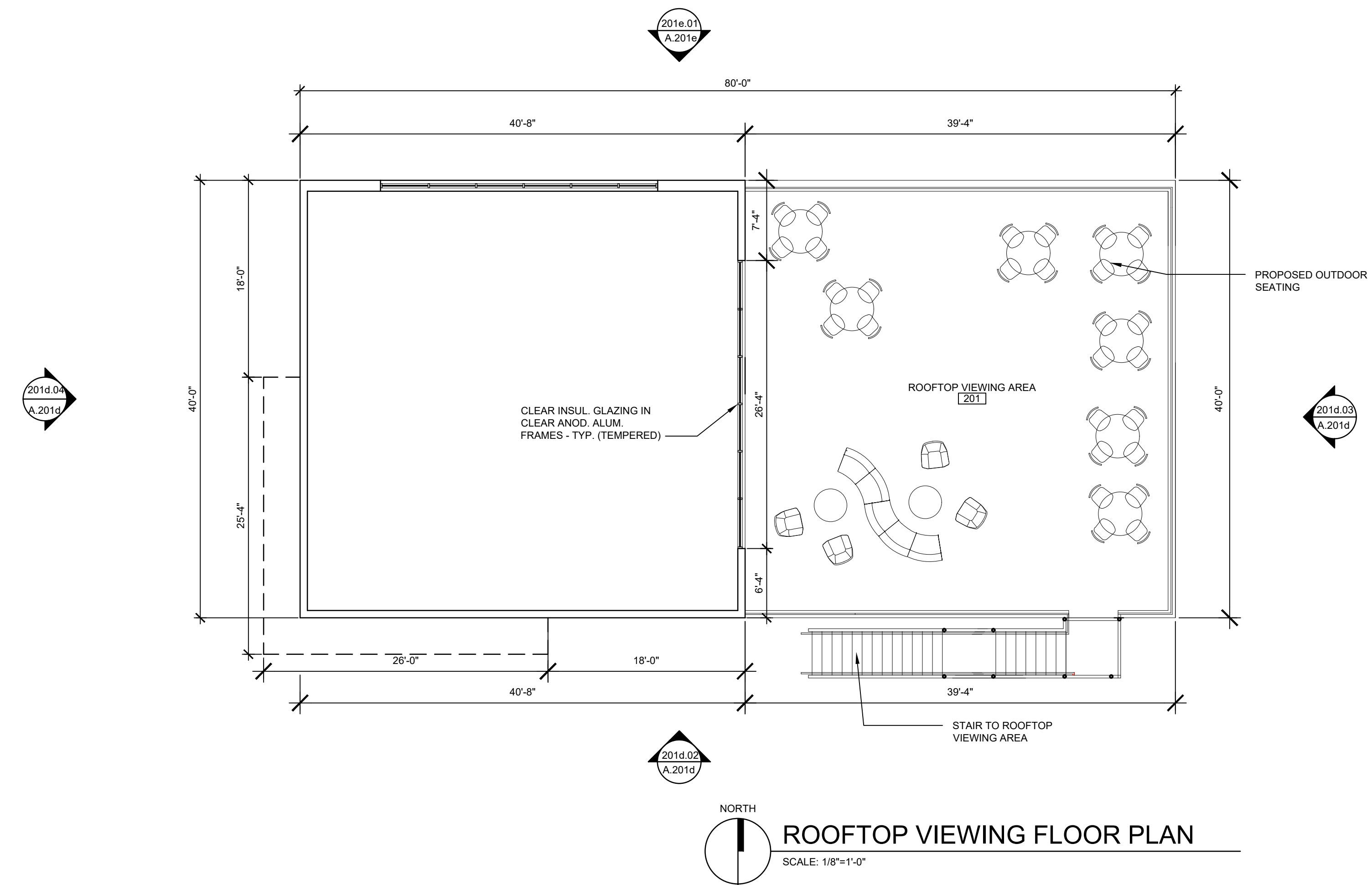
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SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

**BUILDING D
 RECREATION CNTR.
 PLANS**

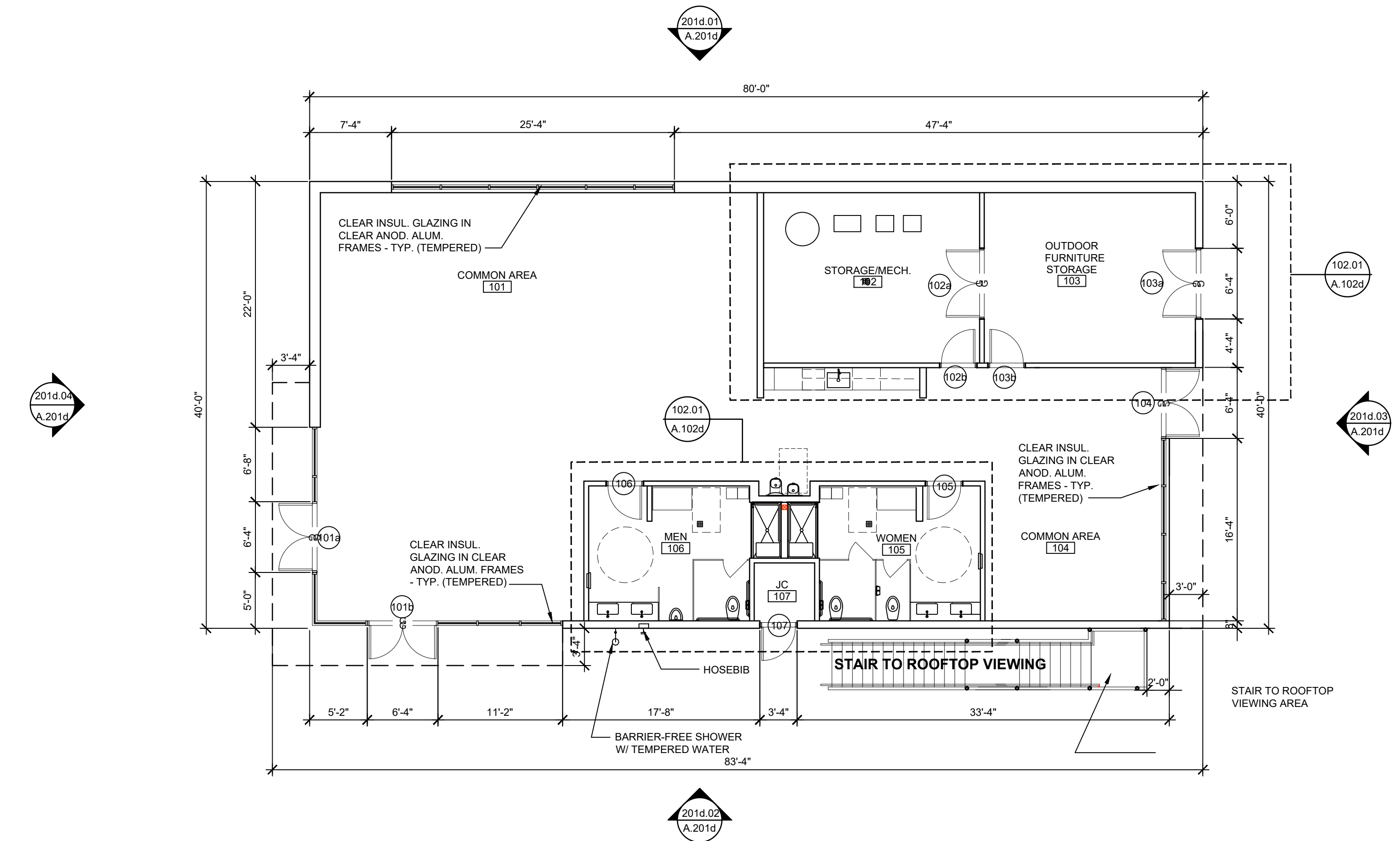


2058.20

A.101d

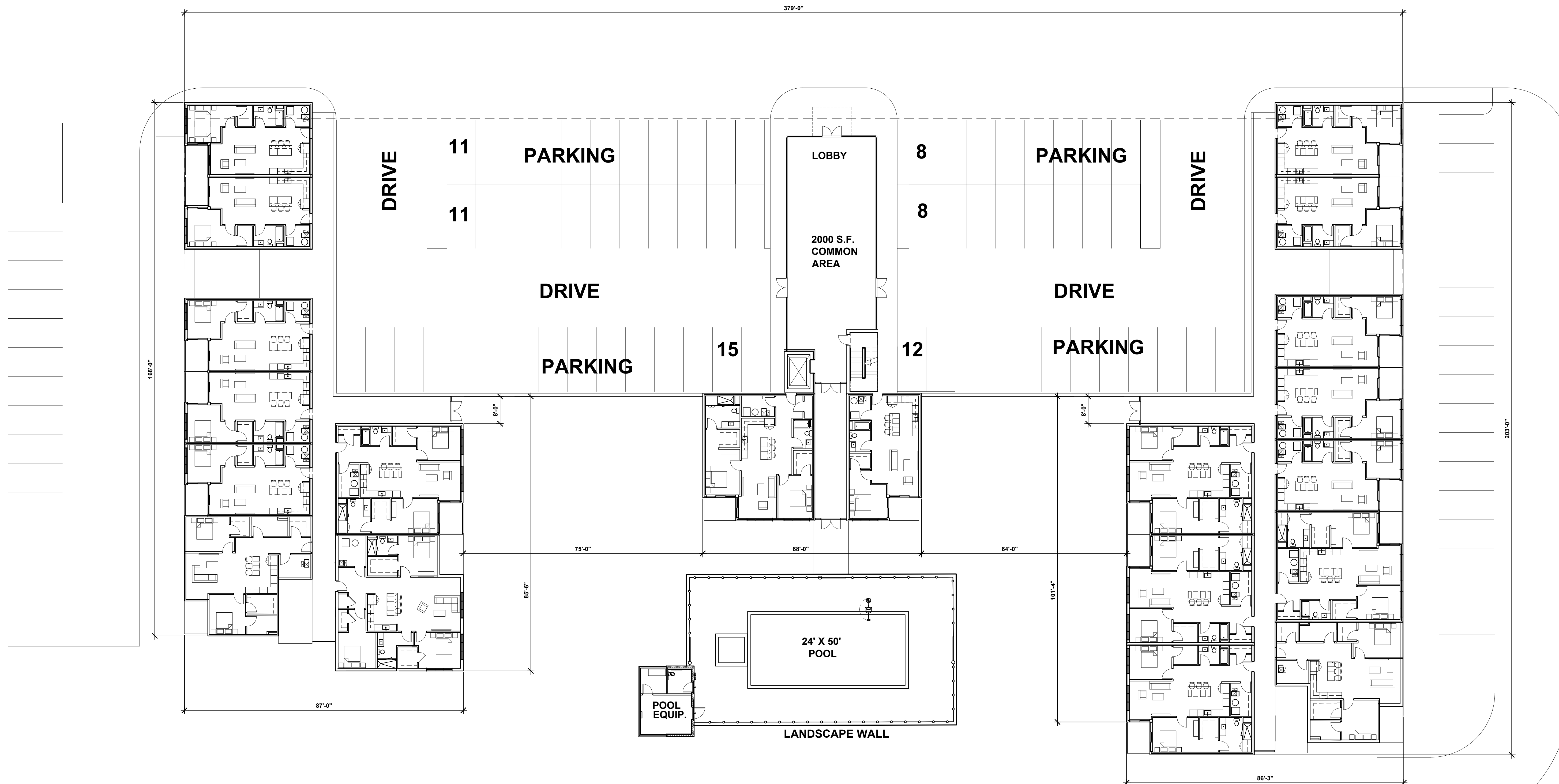


NORTH
ROOFTOP VIEWING FLOOR PLAN
 SCALE: 1/8"=1'-0"



NORTH
RECREATION CENTER/CLUBHOUSE FLOOR PLAN
 SCALE: 1/8"=1'-0"

PARKING STRUCTURE



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

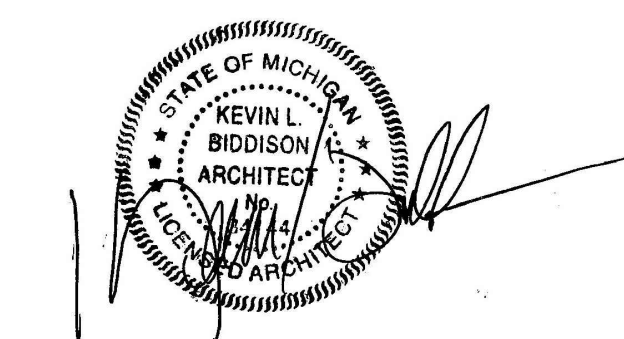
2690 CROOKS RD
TROY, MICHIGAN

Issued d/r/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

Sheet title

**RESIDENTIAL
FIRST FLOOR PLAN**

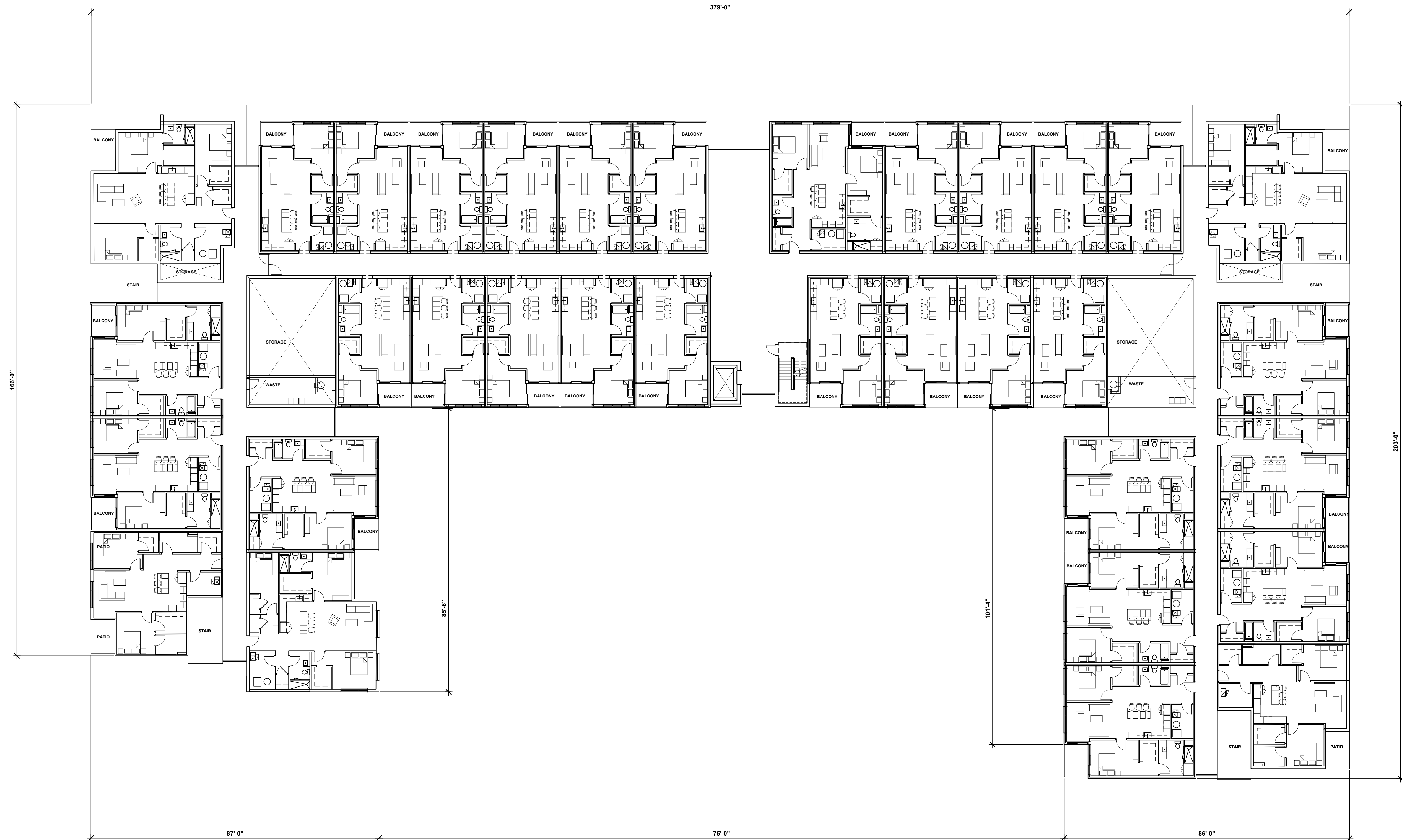


Project no

2058.20

Sheet no

A.101e



Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

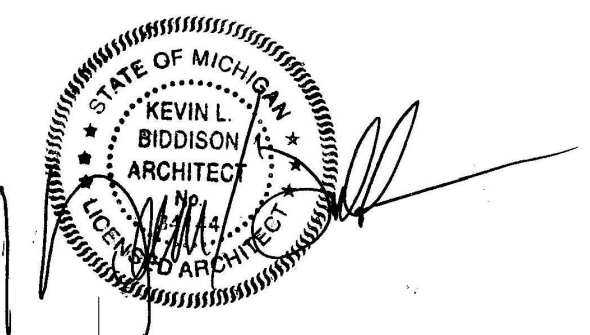
2690 CROOKS RD
TROY, MICHIGAN

Issued d/r/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

Sheet title

**RESIDENTIAL
2ND-5TH FLOOR PL**

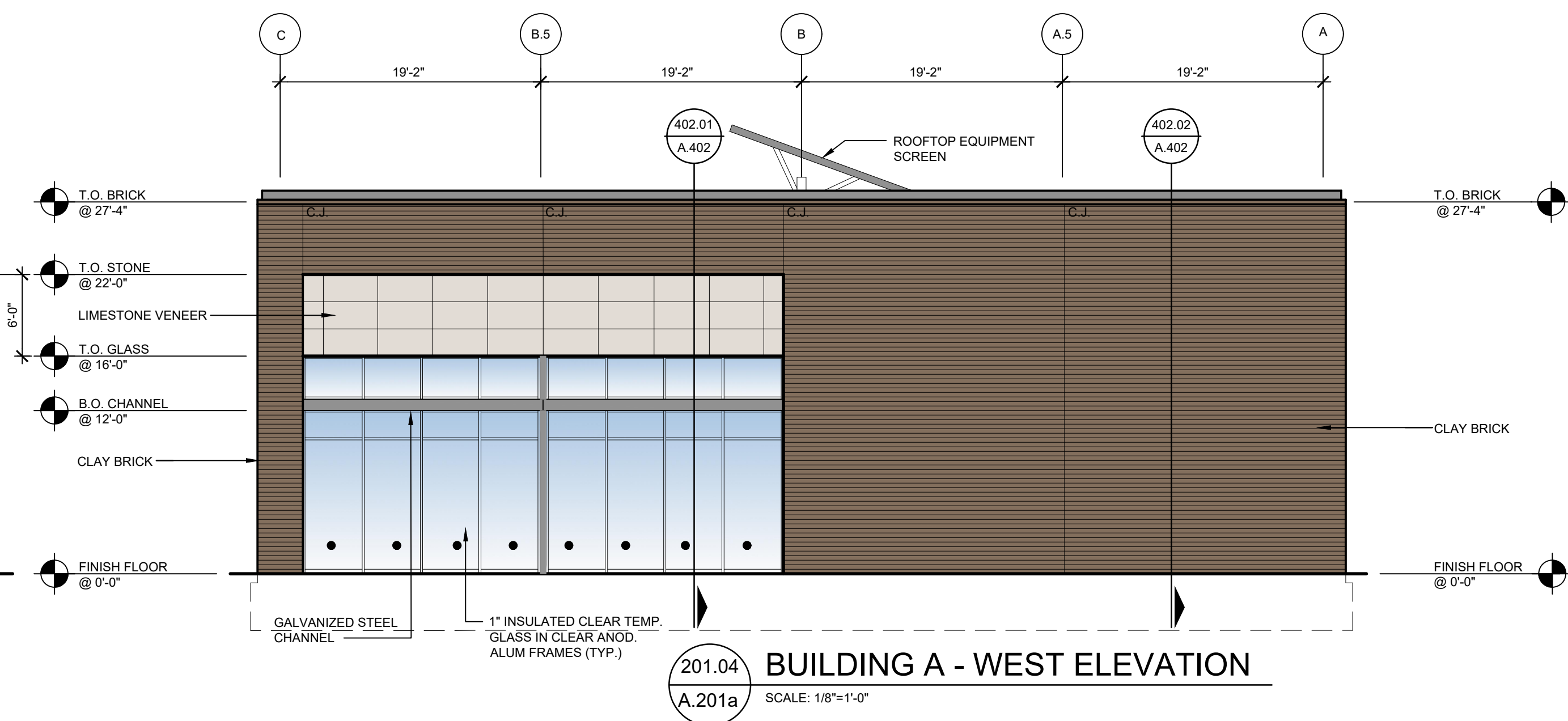
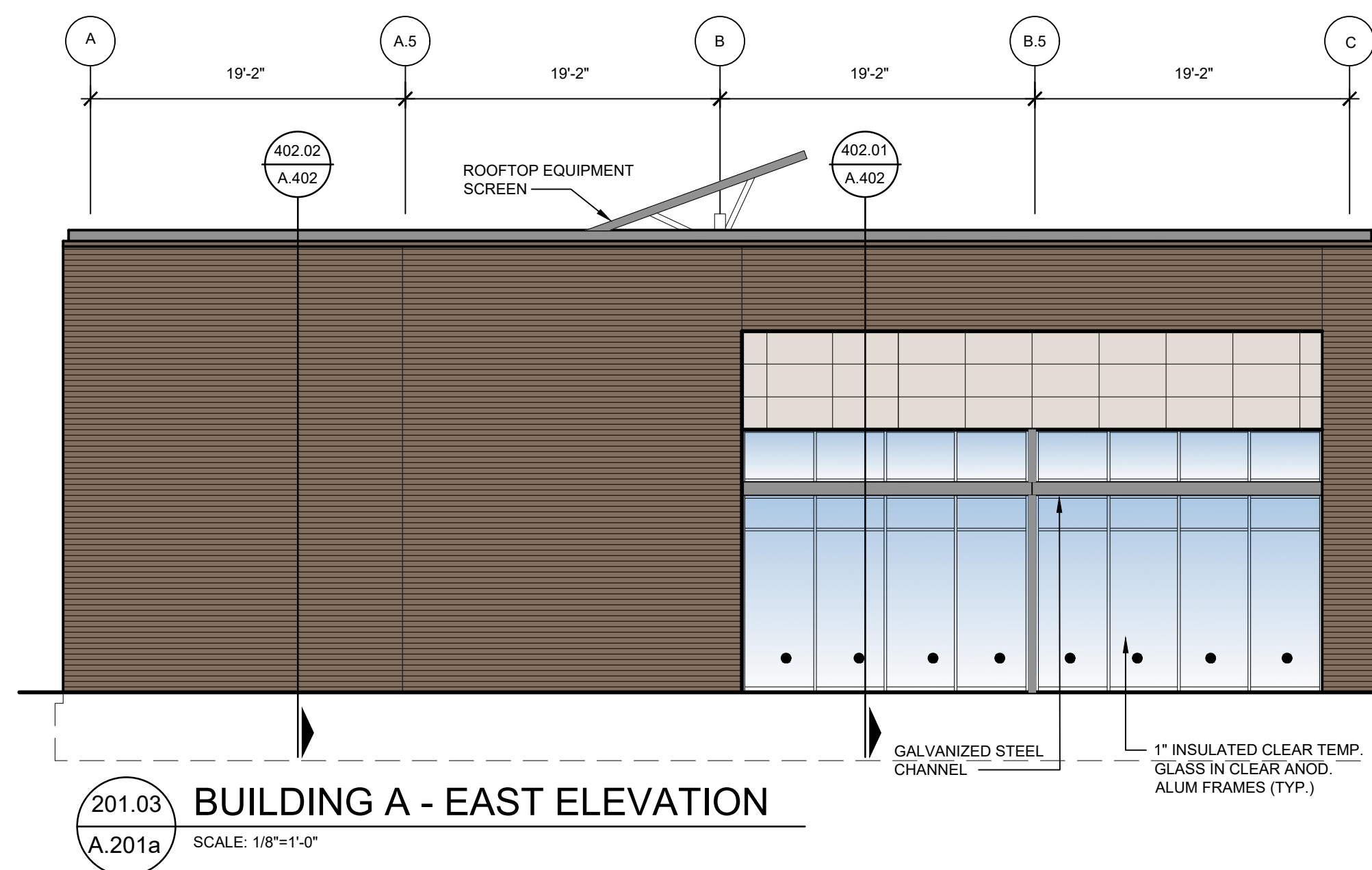
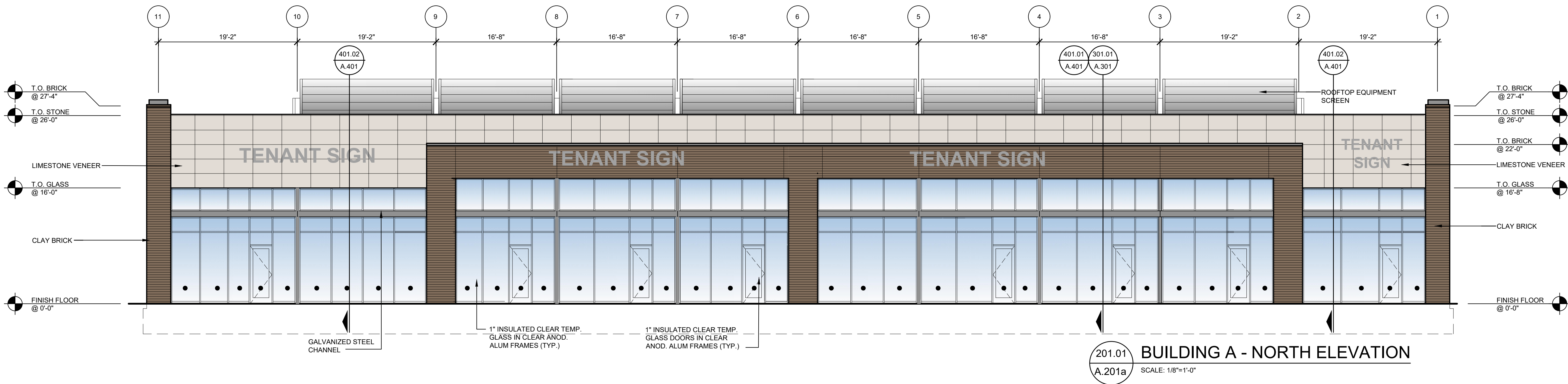
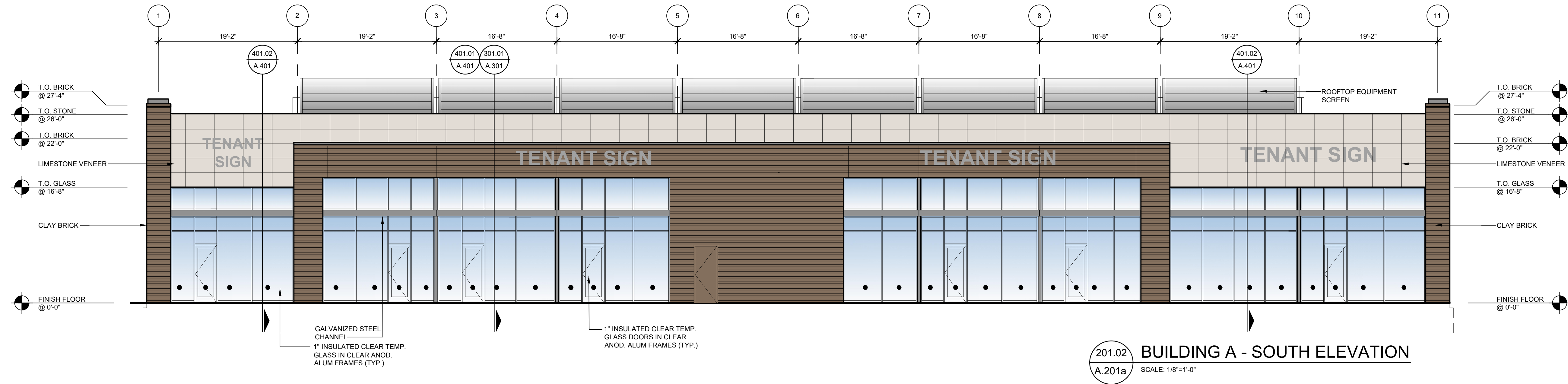


Project no

2058.20

Sheet no

A.102e



● DENOTES CLEAR TEMPERED GLASS

Project title

PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

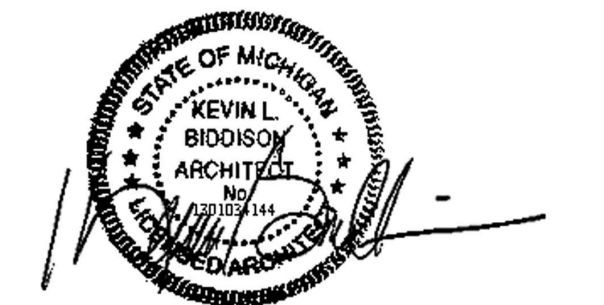
BIG BEAVER
TROY, MICHIGAN

Issued drc/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL REVIEW	02.11.22
BIDS	02.22.22
OWNER REVISIONS	03.24.22
PERMITS	05.11.22
SITE PLAN APPROVAL	05.31.22

Sheet title

**RETAIL
BUILDING A
ELEVATIONS**



Project no

2058.20

Sheet no

A.201A

● DENOTES CLEAR
TEMPERED GLASS

Project title

PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

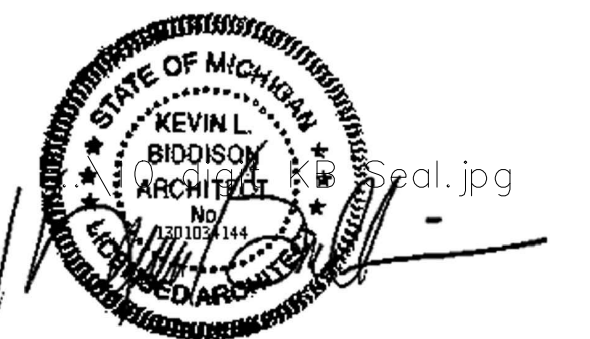
BIG BEAVER
TROY, MICHIGAN

Issued dr/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL REVIEW	02.11.22
BIDS	02.17.22
OWNER REVISIONS	02.22.22
PERMITS	03.24.22
SITE PLAN APPROVAL	05.11.22
	05.31.22

Sheet title

**RETAIL
BUILDING B
ELEVATIONS**

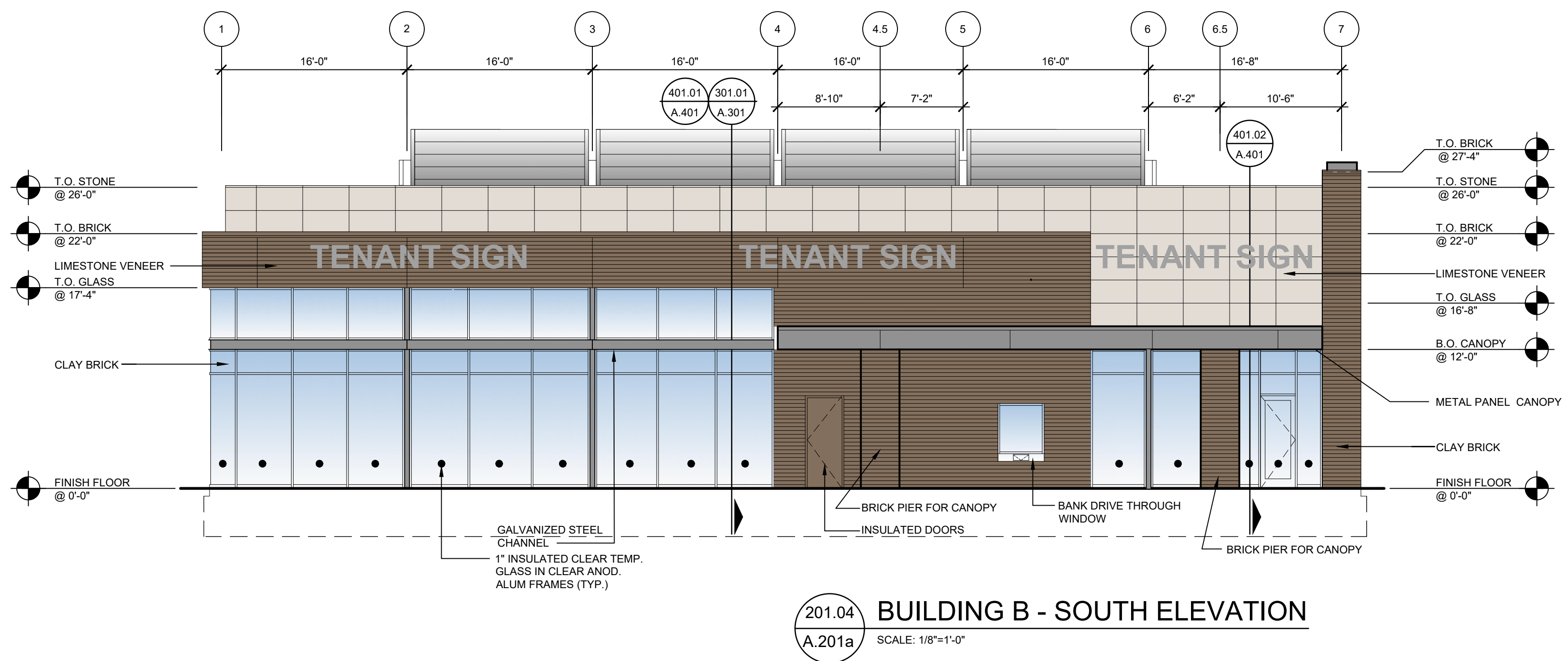


Project no

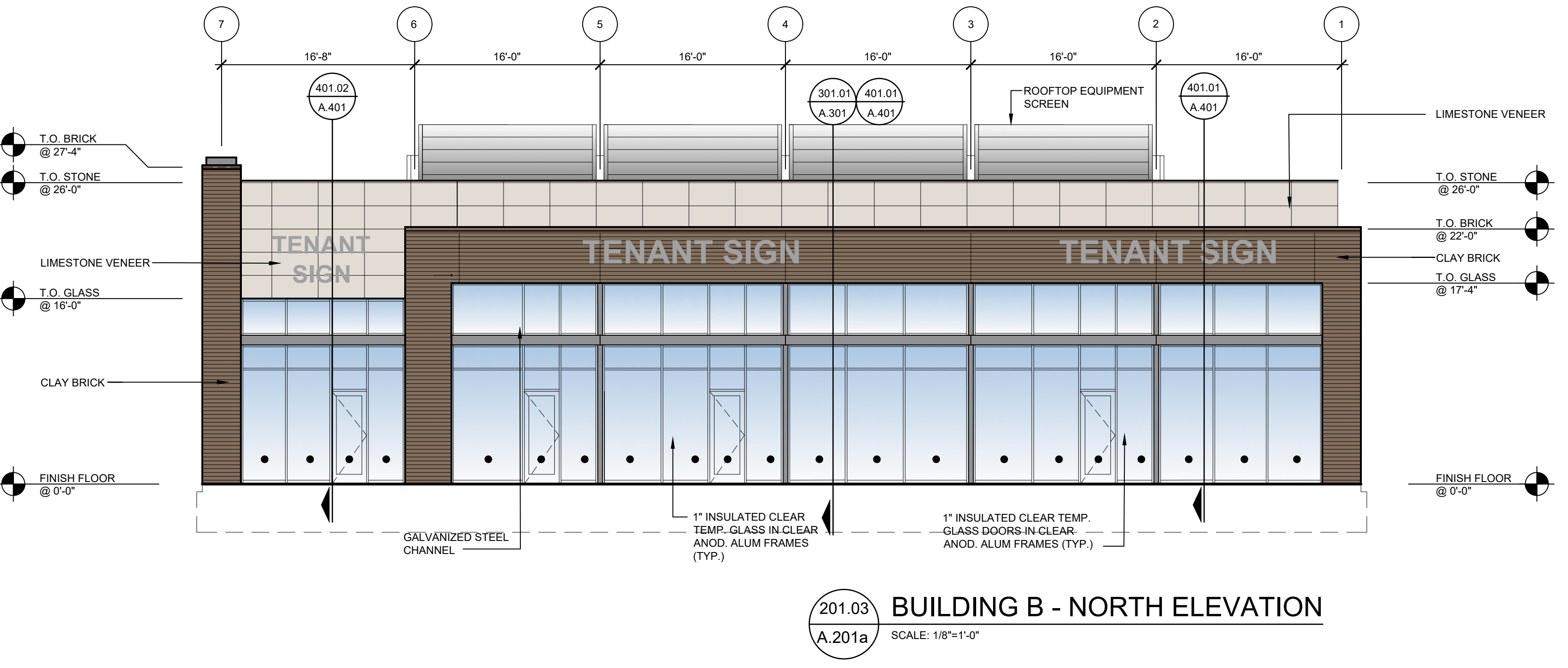
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Sheet no

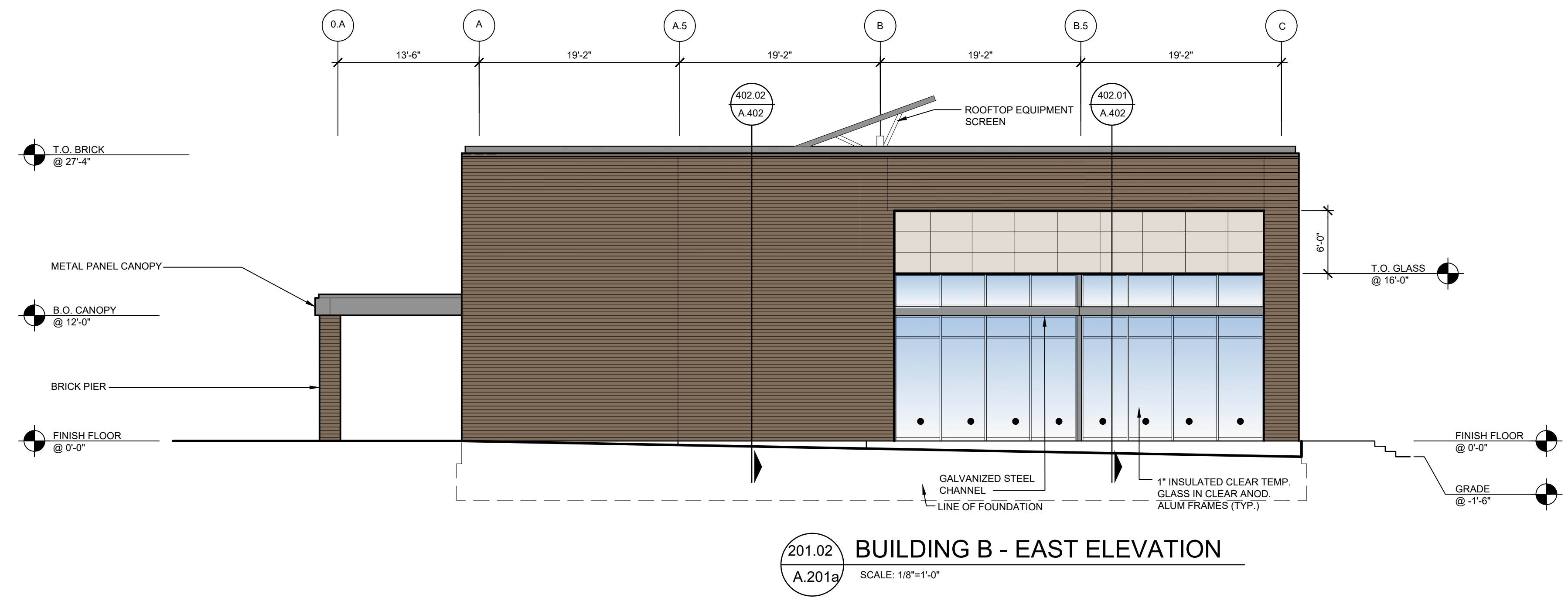
A.201b



201.04 BUILDING B - SOUTH ELEVATION
A.201a SCALE: 1/8"=1'-0"



201.03 BUILDING B - NORTH ELEVATION
A.201a SCALE: 1/8"=1'-0"



● DENOTES CLEAR TEMPERED GLASS

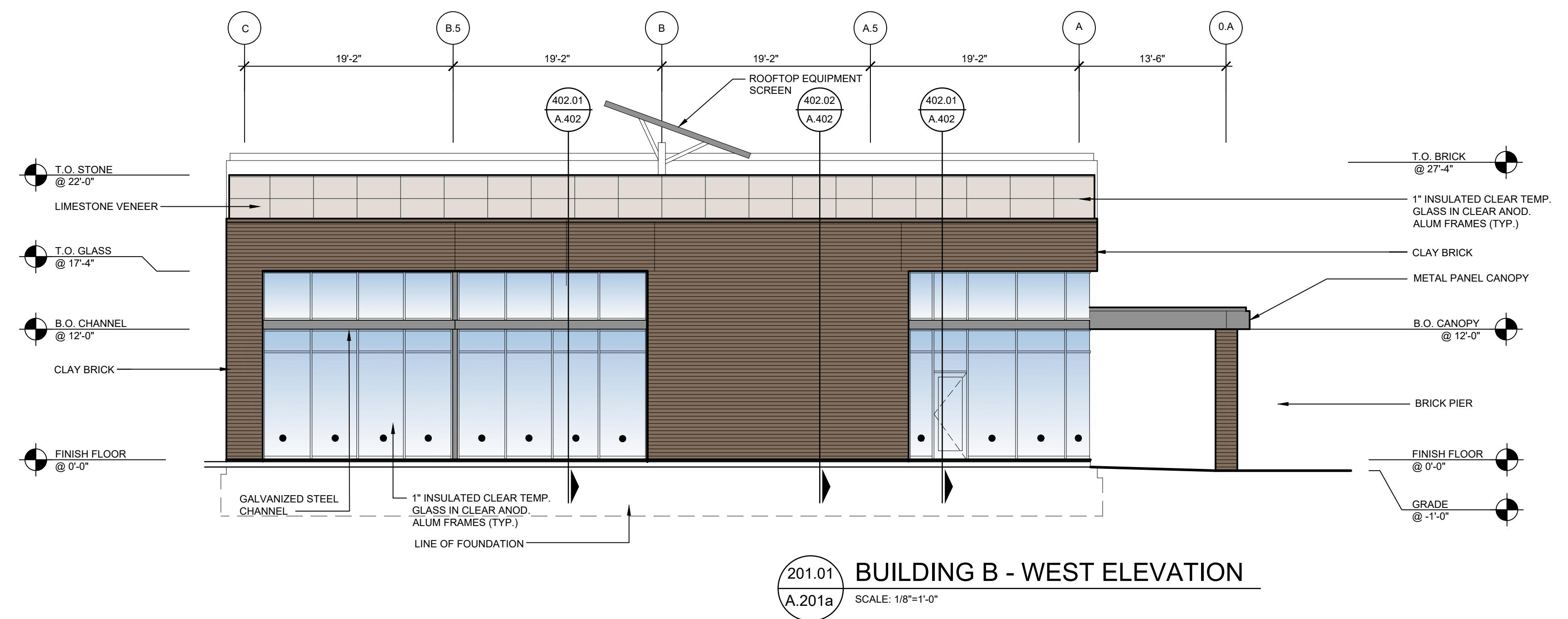
Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

BIG BEAVER
TROY, MICHIGAN

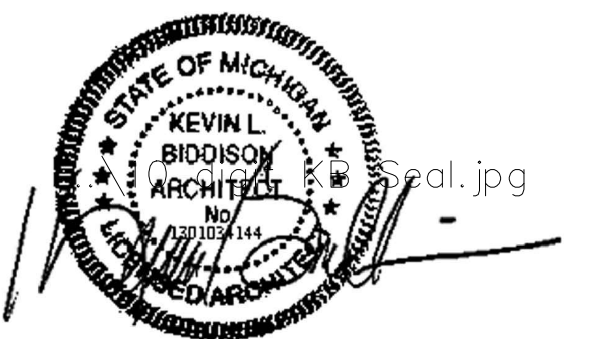
Issued dr/c

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN APPROVAL	07.02.20
REVIEW	02.11.22
BIDS	02.17.22
OWNER REVISIONS	02.22.22
PERMITS	03.24.22
SITE PLAN APPROVAL	05.11.22
	05.31.22



Sheet title

**RETAIL
BUILDING B
ELEVATIONS**

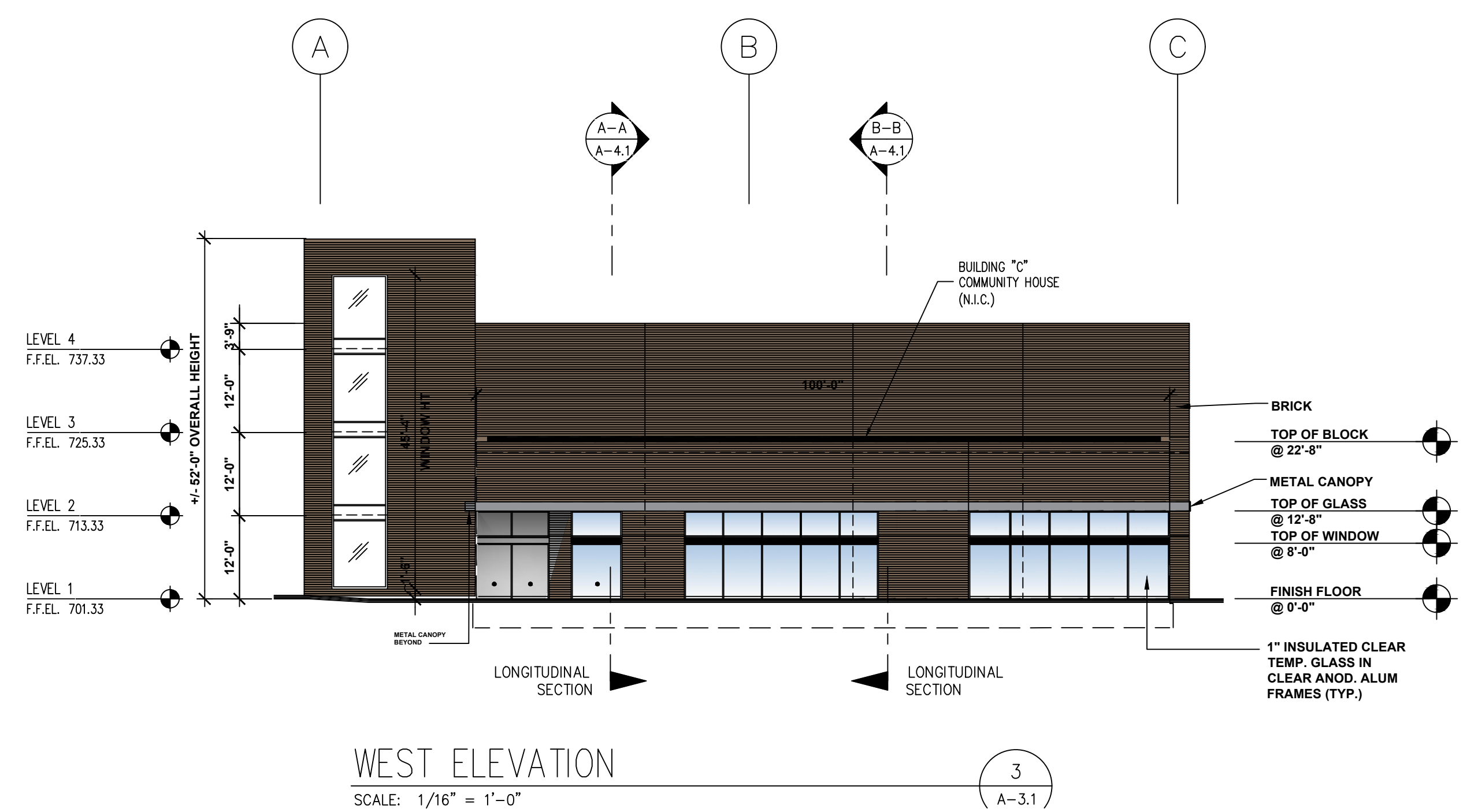
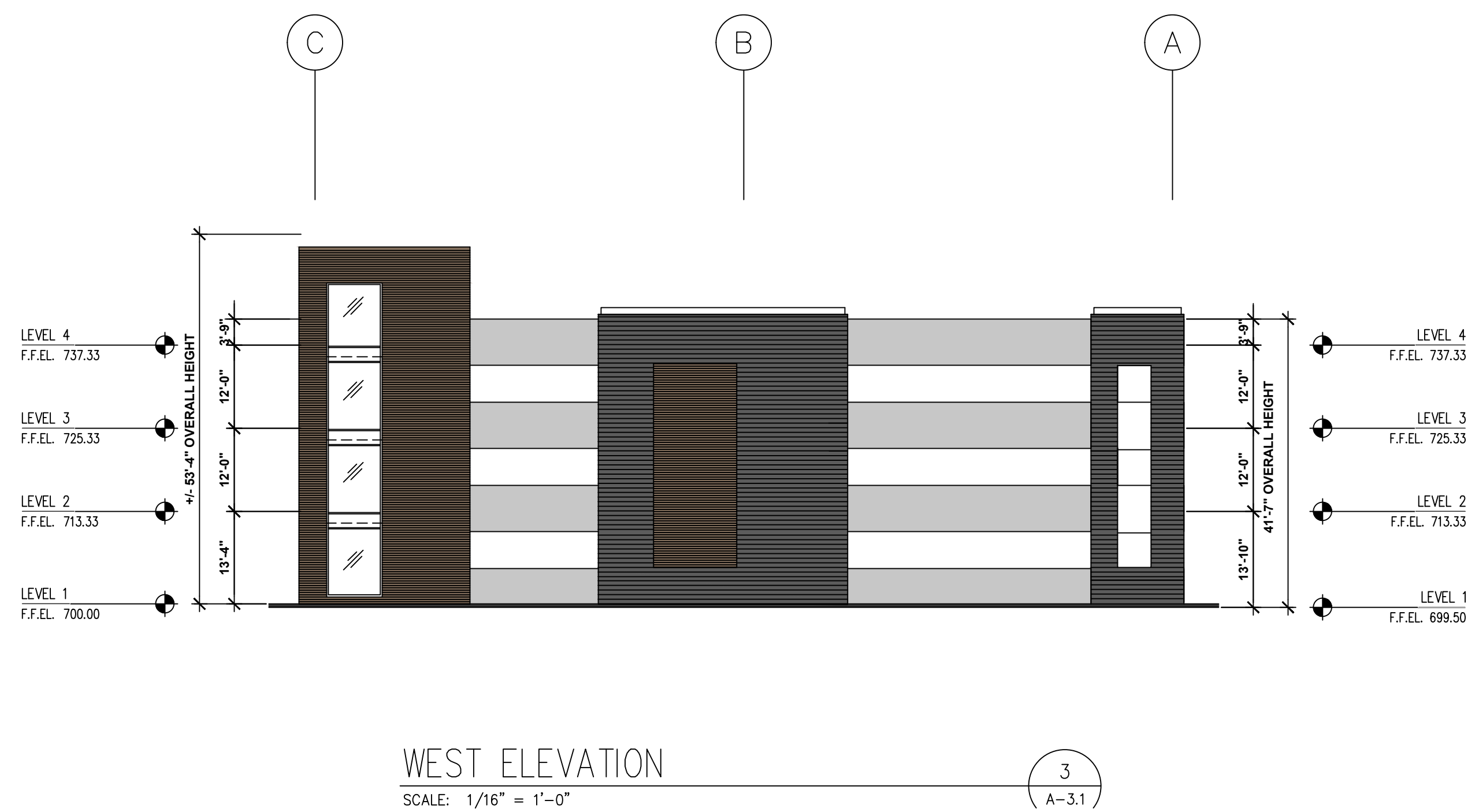
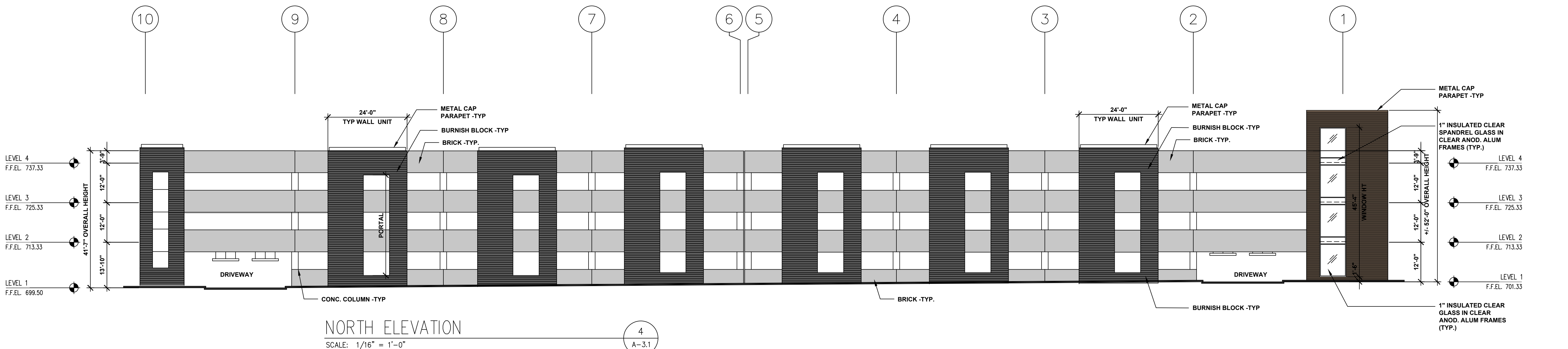
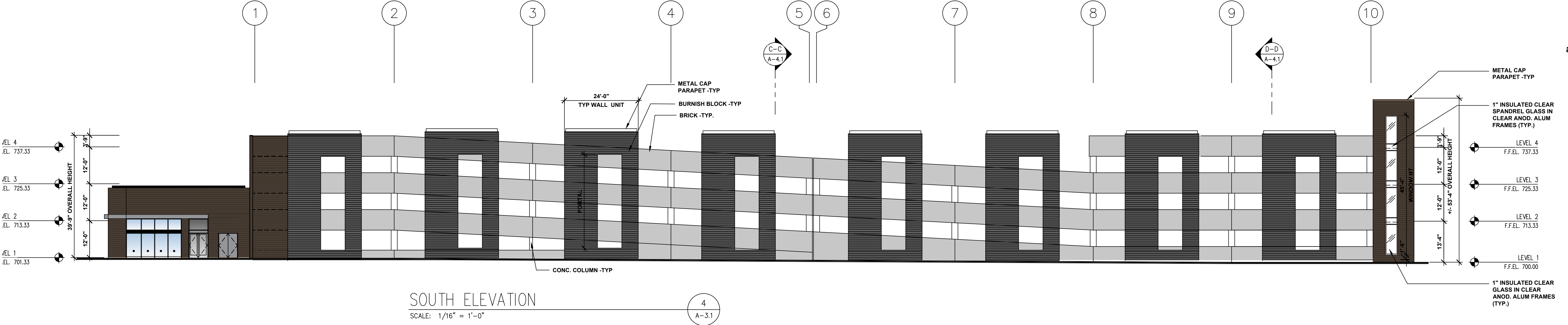


Project no

2058.20

Sheet no

A.202b



PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

BIG BEAVER
TROY, MICHIGAN

● DENOTES CLEAR
TEMPERED GLASS

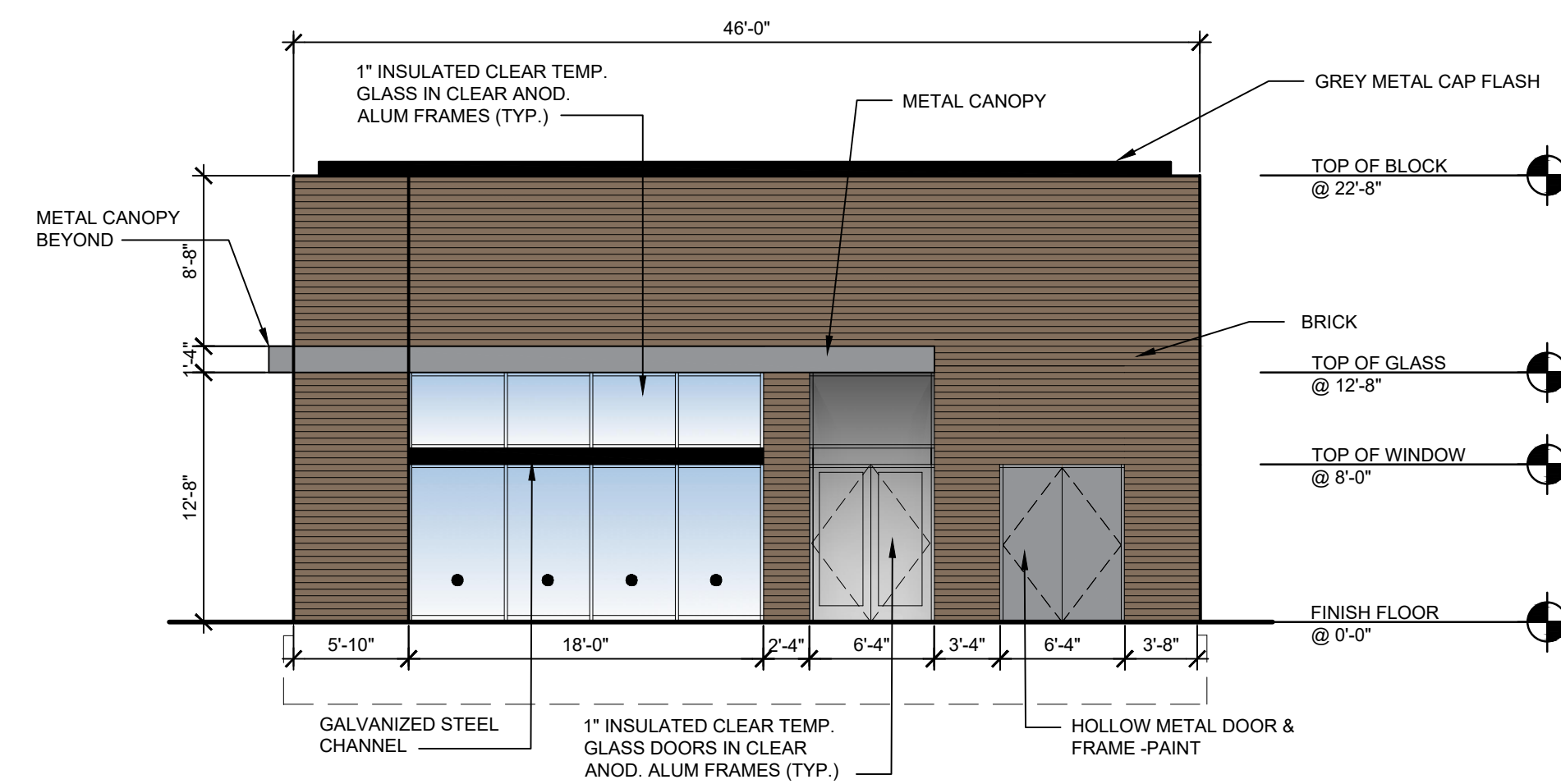
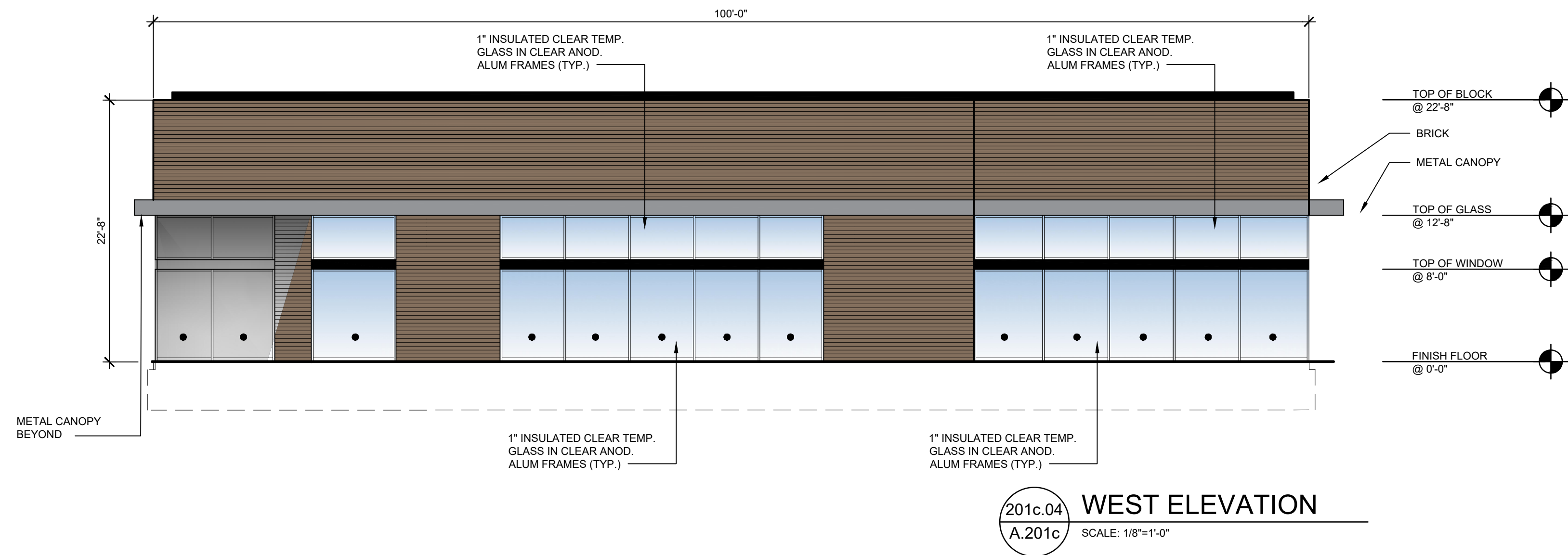
SITE PLAN REVIEW 04.10.20
SITE PLAN APPROVAL 02.11.22
SITE PLAN APPROVAL 05.31.22

**BUILDING C
COMMUNITY HOUSE
ELEVATIONS**

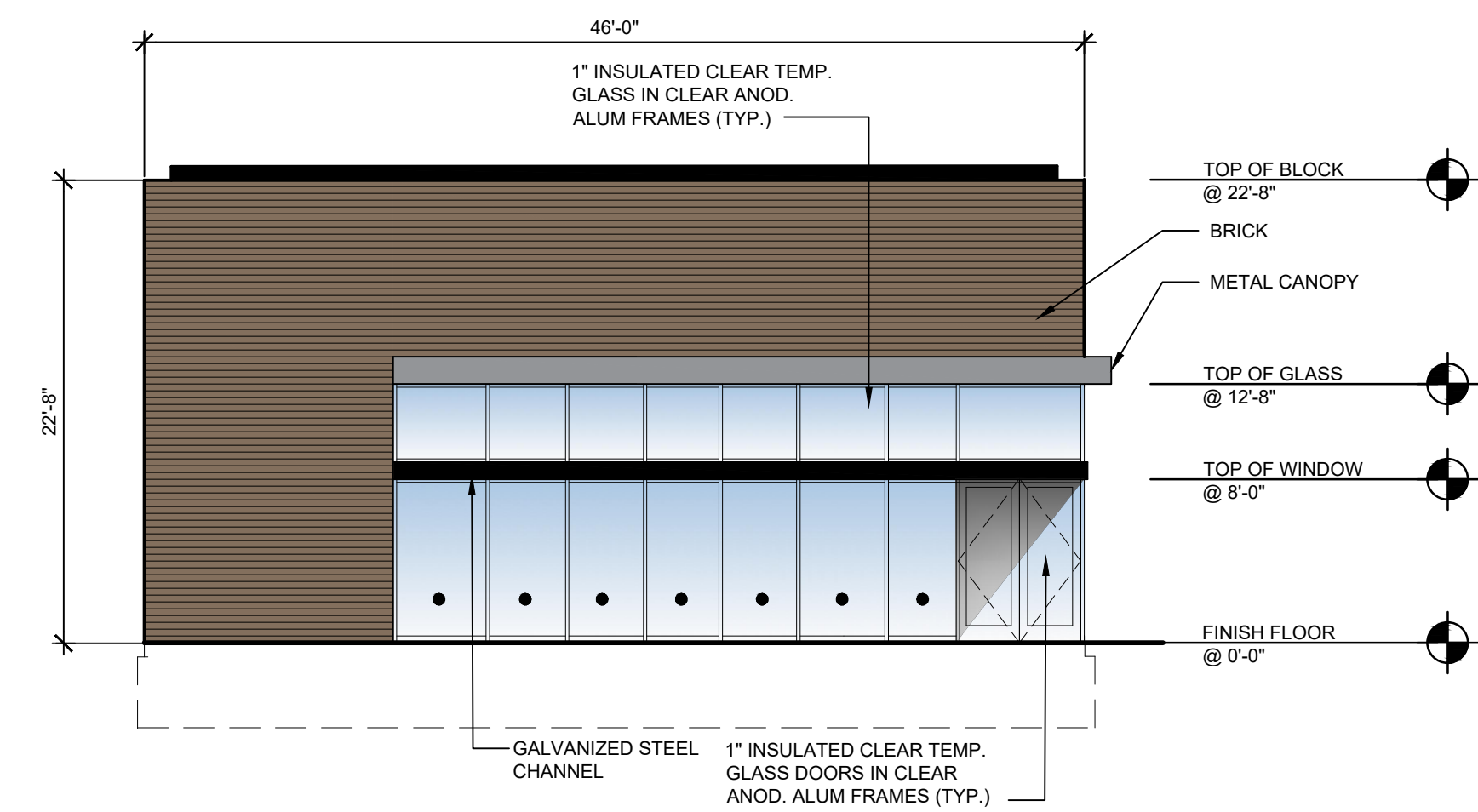


2058.20

A.202c



201c.01
A.201c SCALE: 1/8"=1'-0"



201c.02
A.201c SCALE: 1/8"=1'-0"

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

BIG BEAVER
TROY, MICHIGAN

• DENOTES CLEAR
TEMPERED GLASS

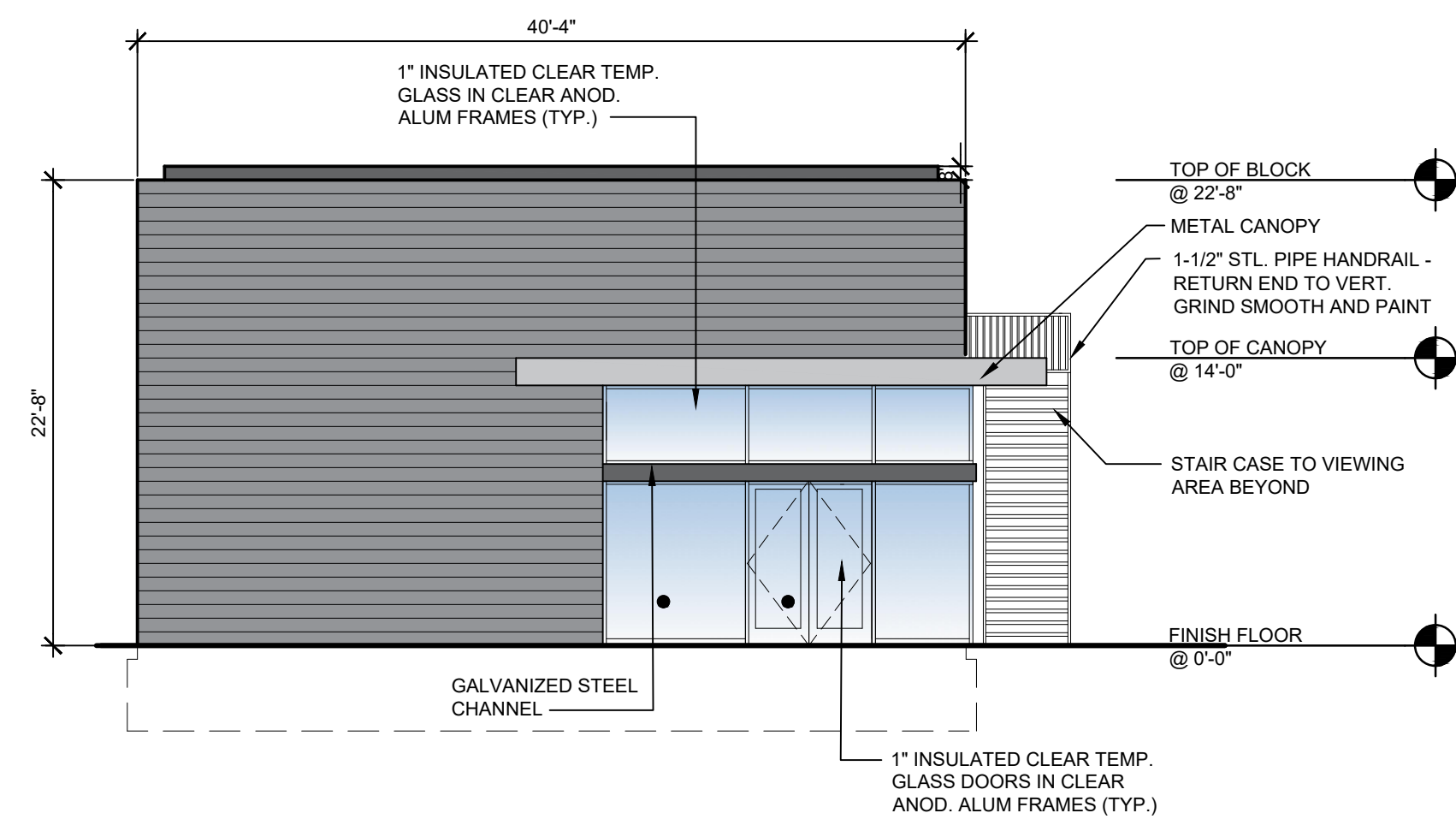
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

**BUILDING D
RECREATION BLDG.
ELEVATIONS**

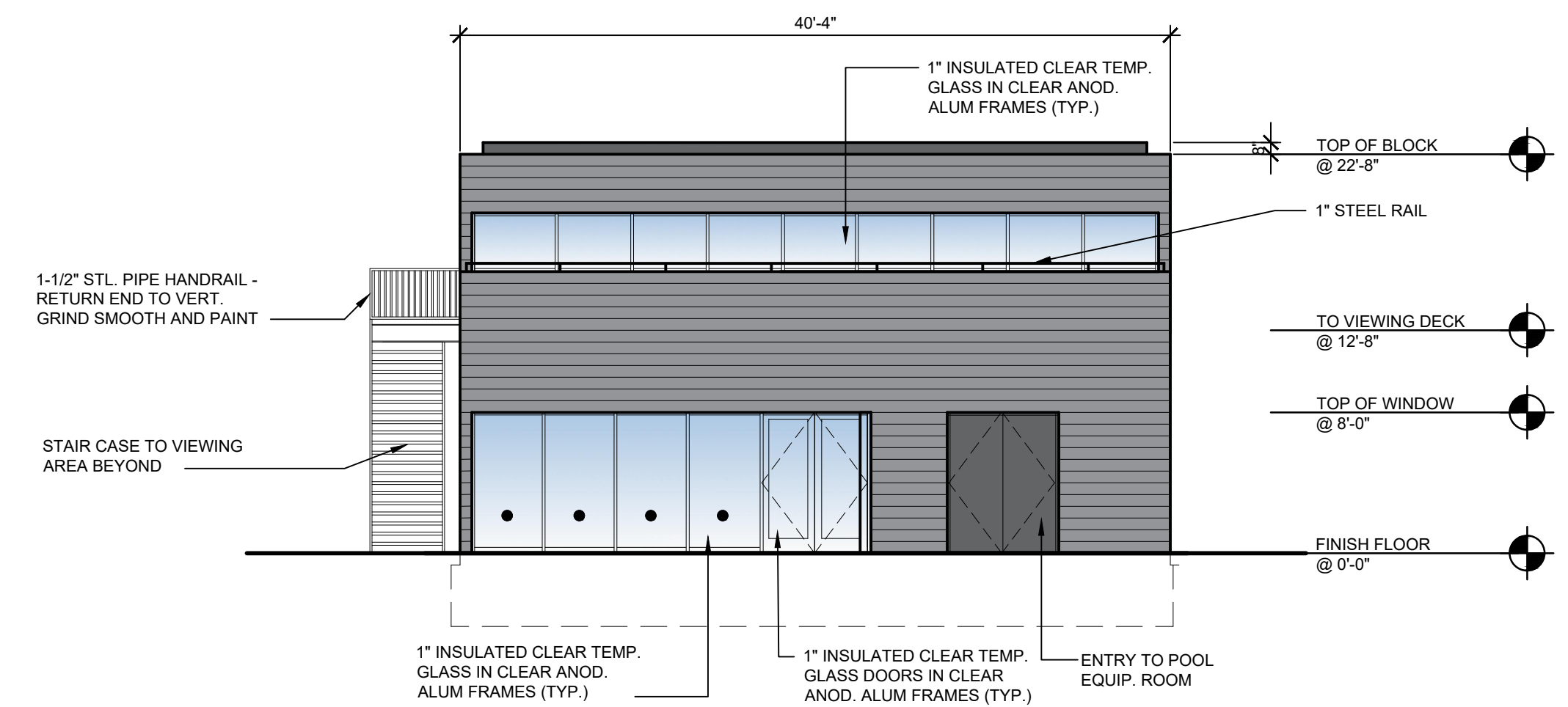


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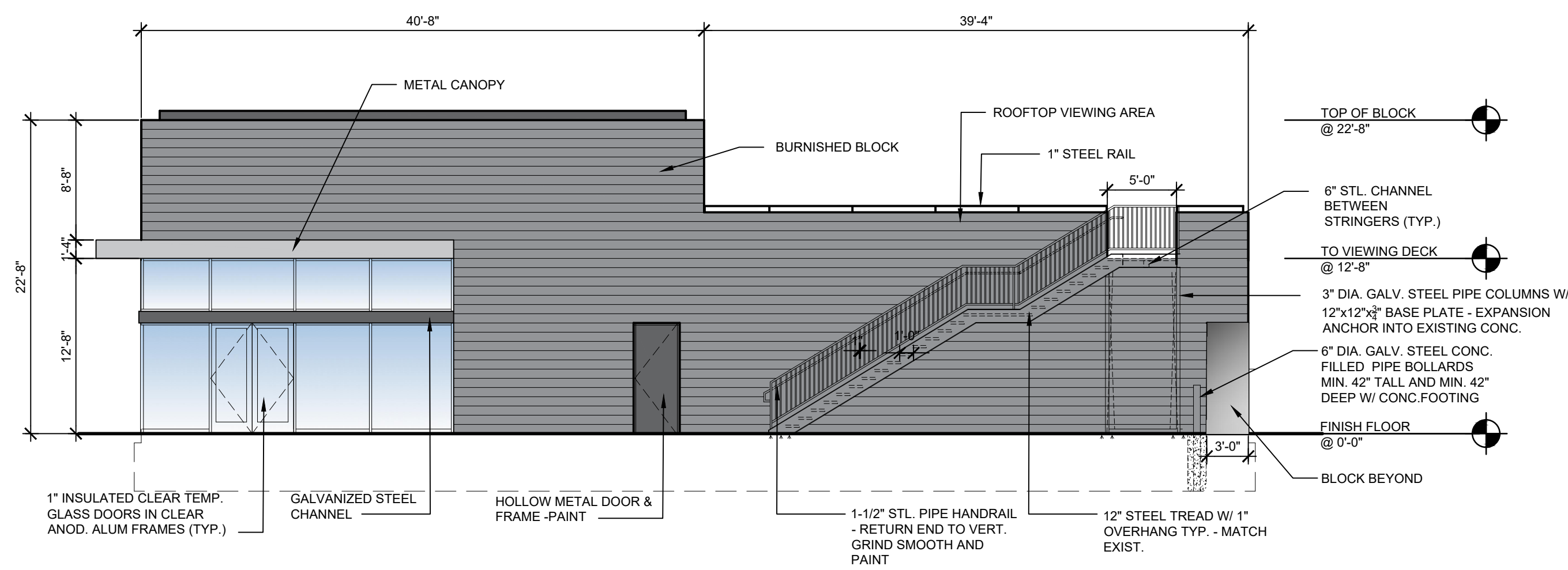
A.201d



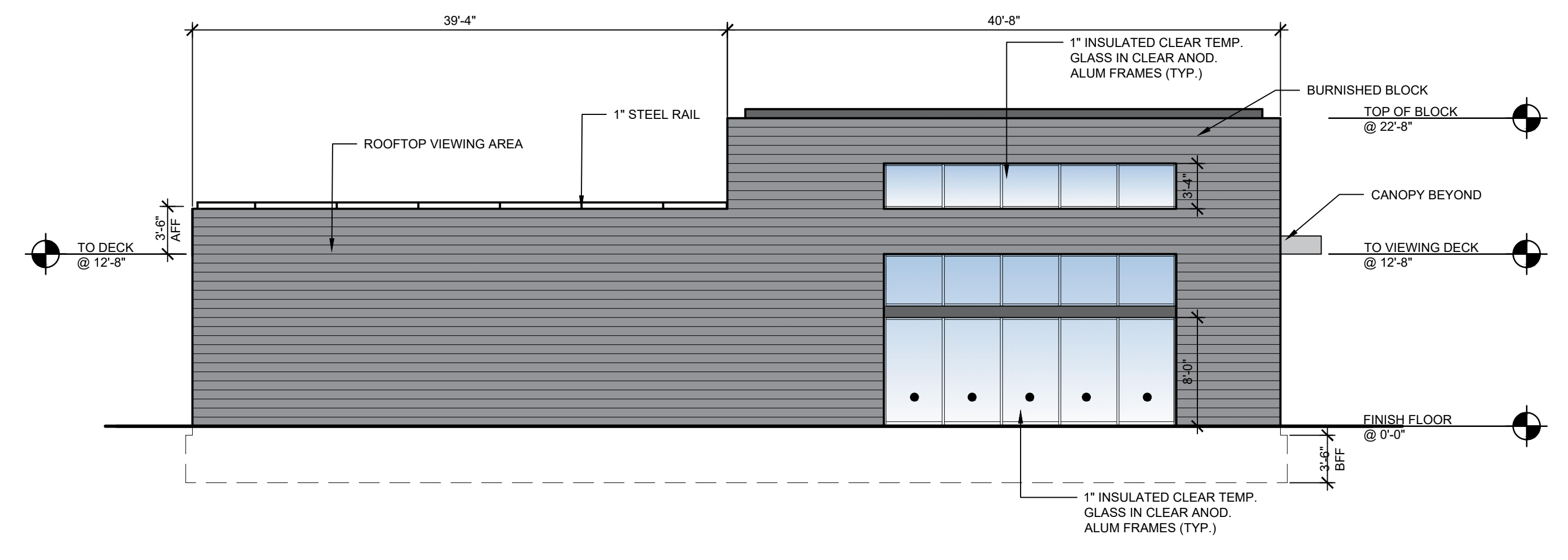
201d.04 WEST ELEVATION
A.201d SCALE: 1/8"=1'-0"



201d.03 EAST ELEVATION
A.201d SCALE: 1/8"=1'-0"



201d.02 SOUTH ELEVATION
A.201d SCALE: 1/8"=1'-0"



201d.01 NORTH ELEVATION
A.201d SCALE: 1/8"=1'-0"

PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

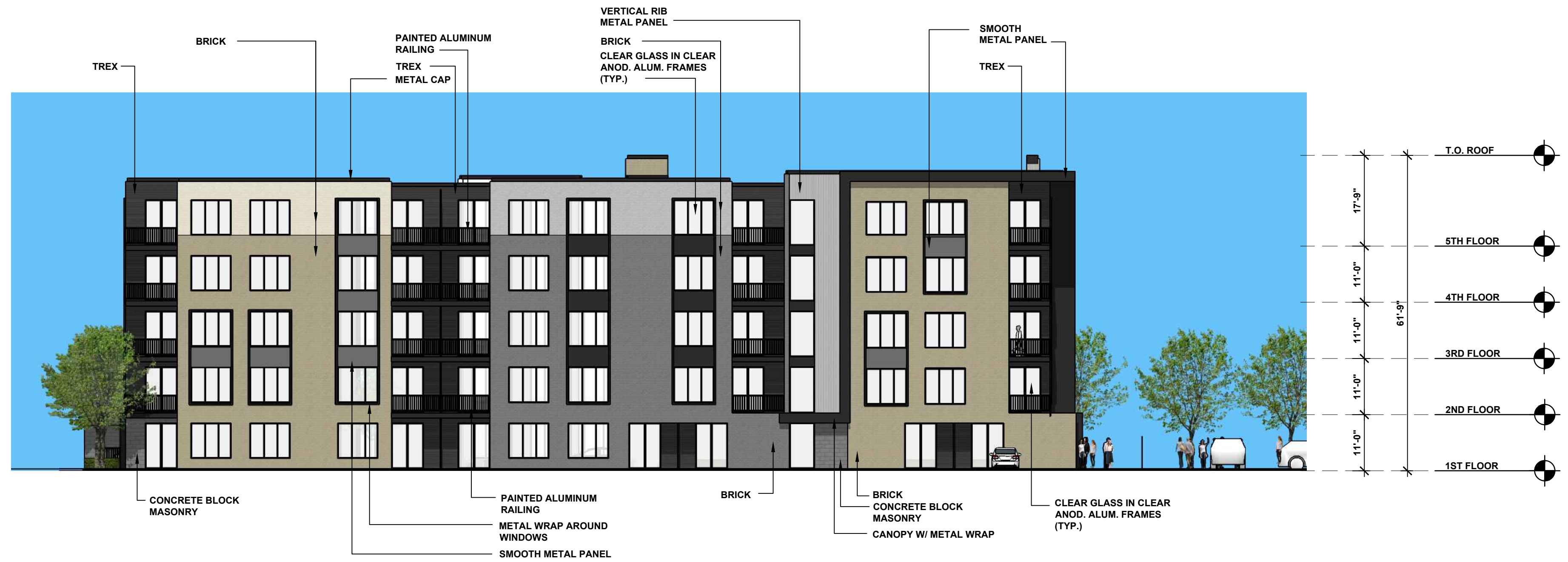
2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN APPROVAL	02.11.22
SITE PLAN APPROVAL	05.31.22

**RESIDENTIAL
ELEVATIONS
BUILDING E**

2058.20

A.201f



201f.02 **EAST ELEVATION**
A.201f SCALE: 1/16"=1'-0"



201f.01 **WEST ELEVATION**
A.201f SCALE: 1/16"=1'-0"



PERSPECTIVE IMAGE

FOR REFERENCE



PERSPECTIVE IMAGE

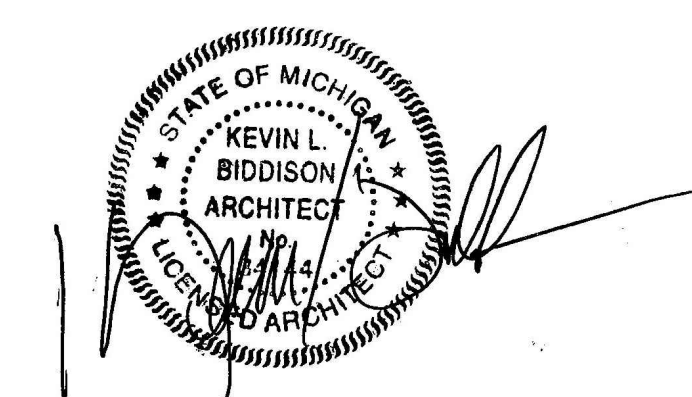
FOR REFERENCE

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.301



PERSPECTIVE IMAGE

FOR REFERENCE

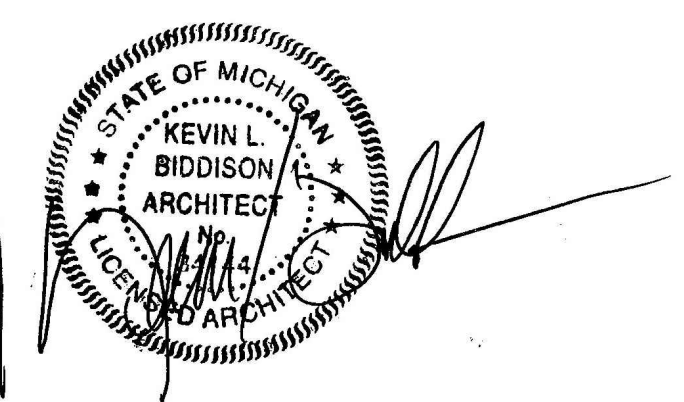
PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.302



PERSPECTIVE IMAGE

FOR REFERENCE



PERSPECTIVE IMAGE
FOR REFERENCE



PERSPECTIVE IMAGE
FOR REFERENCE

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.303



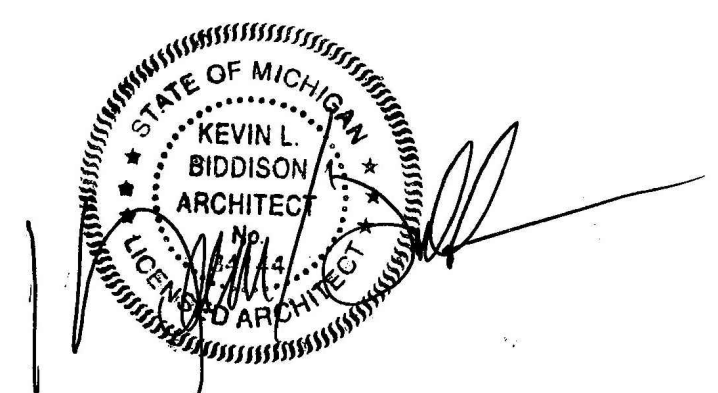
PERSPECTIVE IMAGE
FOR REFERENCE

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.304



PERSPECTIVE IMAGE
FOR REFERENCE



PERSPECTIVE IMAGE
FOR REFERENCE

Consultants

Project title

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

Issued dr/ch

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

Sheet title

SITE PERSPECTIVES



Project no.

2058.20

PERSPECTIVE IMAGE
FOR REFERENCE

Sheet no.

A.305





PERSPECTIVE IMAGE
FOR REFERENCE



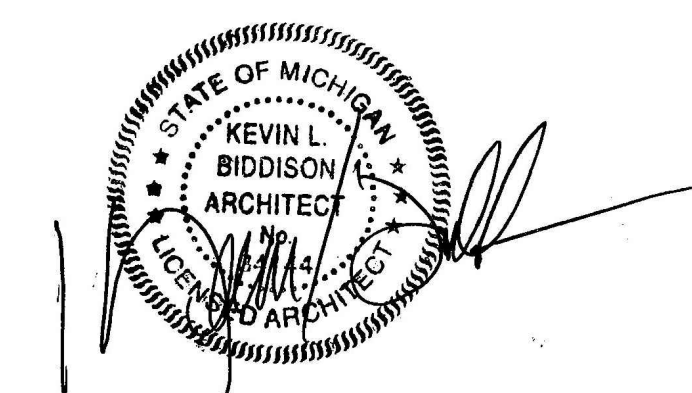
PERSPECTIVE IMAGE

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.306

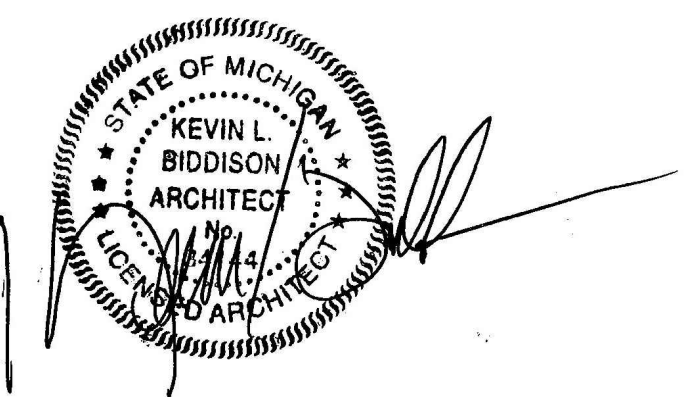
PROPOSED BUILDING FOR:

**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.307



PERSPECTIVE IMAGE

FOR REFERENCE



PERSPECTIVE IMAGE

FOR REFERENCE

PROPOSED BUILDING FOR:

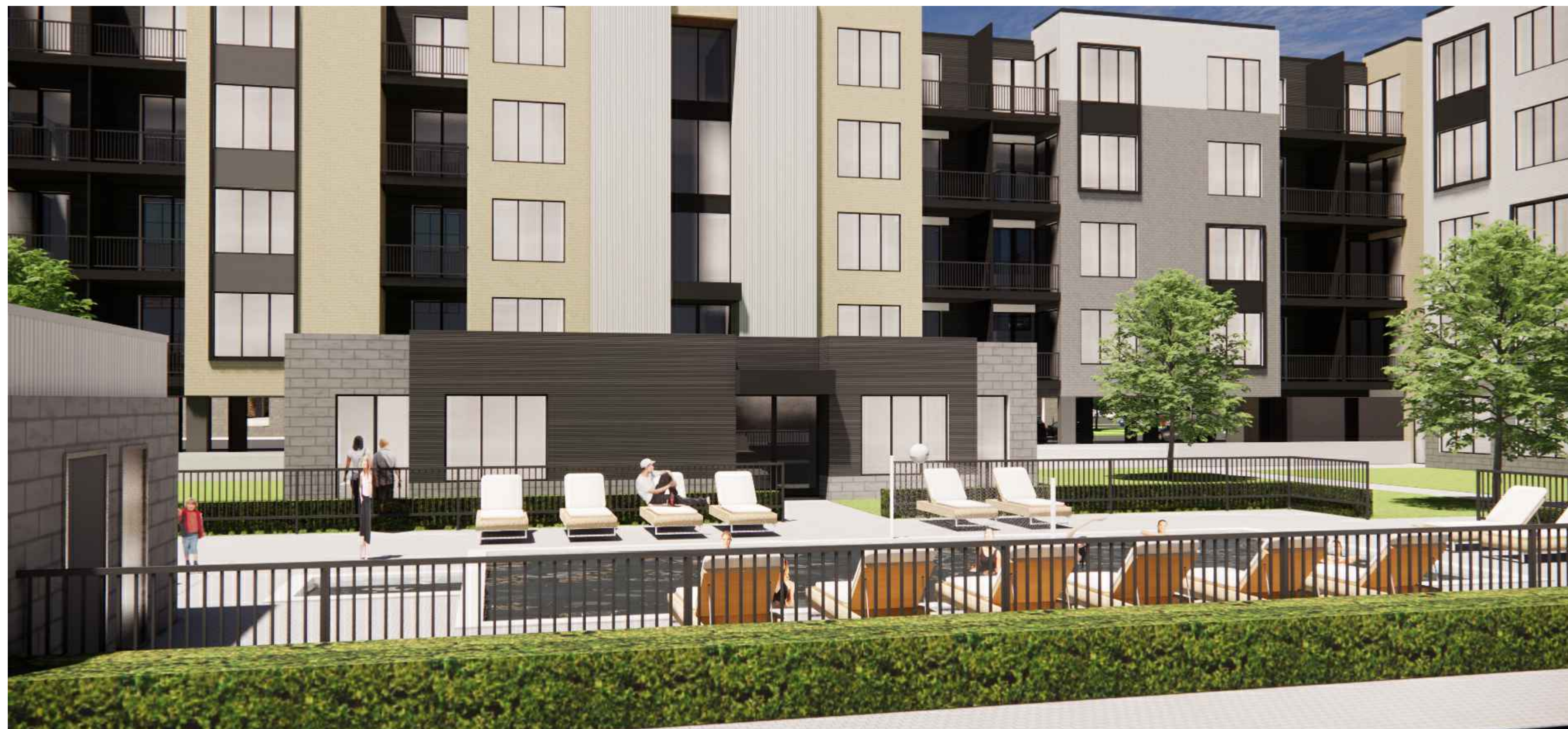
**Crooks & Big Beaver
Mixed Use
Redevelopment**

2690 CROOKS RD
TROY, MICHIGAN



PERSPECTIVE IMAGE

FOR REFERENCE



PERSPECTIVE IMAGE

FOR REFERENCE

PUD APPROVAL	03.06.20
SITE PLAN REVIEW	04.10.20
SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.308



PERSPECTIVE IMAGE
FOR REFERENCE



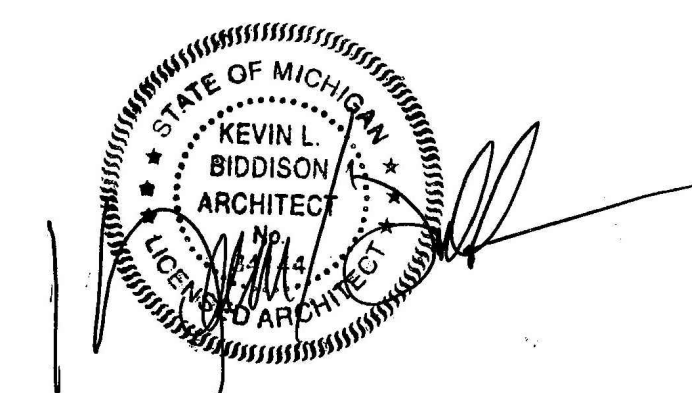
PERSPECTIVE IMAGE
FOR REFERENCE

PROPOSED BUILDING FOR:
**Crooks & Big Beaver
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2690 CROOKS RD
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PUD APPROVAL	03.06.20
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SITE PLAN REVIEW	07.02.20
SITE PLAN REVIEW	02.11.22
SITE PLAN REVIEW	05.31.22

SITE PERSPECTIVES



2058.20

A.309

STONEFIELD

December 8, 2022

R. Brent Savidant, AICP
Community Development Director
City of Troy
500 W Big Beaver Rd, Troy, MI 48084

RE: Engineering Plan Review
Proposed Mixed Use Redevelopment
Parcel ID: 88-20-28-101-034, 88-20-28-101-032, & 88-20-28-101-047
911 & 999 West Big Beaver Road & 2690 Crook Road
City of Troy, Oakland County, Michigan

Scott:

Our office is submitting documents on behalf of the Applicant to address the outstanding conditions of the Board's Resolution including comments contained within the latest Board Professional's review letter. Please find the following items enclosed:

ITEM DESCRIPTION	DATED	COPIES	PREPARED BY
Site Development Plans	12-02-2022	2	Stonefield Engineering & Design
Traffic Impact Study	12-07-2022	1	Fleis & VandenBrink
TIS Response Letter	12-07-2022	1	Fleis & VandenBrink
Traffic Analysis – Synchro Model	12-07-2022	1	Fleis & VandenBrink

The following is an itemized response to the comments contained within the Engineering Plan Review Letter dated June 8, 2022. For the sake of brevity, any comments that are statements of fact or have been previously addressed are not included in the response below:

Site Plan Comments:

1. The existing signal at Kelly Drive/East Site Drive is configured with "near side" heads for traffic exiting the site drive. OHM defers to RCOC on site access but notes that this signal likely will need to be modernized to provide adequate separation between signal heads and the stop bar. At a minimum, the stop bar must be placed sufficiently far back as to provide at least 40 feet between the signal face and the stop line as required by the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

The site plan has been revised to include a stop bar placed 40' from the signal as requested. Refer to Sheet C-2 of the Site Development Plans.

2. Modify proposed sidewalks for improved pedestrian accessibility:
 - a. Either widen sidewalk through parking lot islands to 7 feet (where adjacent to parked vehicles) or center walks in the island. In the current configuration, the curb will need to be flush with the pavement to provide ADA-accessible walks, which may result in vehicles that mispark at a skew and partially obstruct the sidewalk ramps.

Proposed sidewalks located within parking islands have been widened to 7' as requested. Refer to Sheet C-2 of the Site Development Plans.

STONEFIELDENG.COM

607 SHELBY STREET, SUITE 200, DETROIT, MI 48226 248.247.1115 T. 201.340.4472 F.

- b. Widen the sidewalk along the west side of Building A to 7 feet in width. This sidewalk represents the main entrance into the site for pedestrians coming from the east.

The sidewalk abutting Building 'A's west side has been widened to 7'. Refer to Sheet C-2 of the Site Development Plans.

- c. Pedestrian sidewalks must be ADA-accessible. We note that there are stairs near the northeast corner of both Building A and Building B, connecting to the public sidewalk along Big Beaver Road. Stairs should be eliminated or supplemented with ramps to improve accessibility and minimize the adverse travel distance for pedestrians traveling between buildings and along the corridor.

Note the proposed stairs are necessary to meet the sloping grade along the Big Beaver right-of-way. Supplemental ramps have been added where feasible to improve accessibility to Buildings 'A' & 'B'. Refer to Sheet C-2 of the Site Development Plans.

- 3. Provide ONE WAY signs exiting the drive-thru lane south of Building A. The ONE-WAY signs should be oriented parallel to the drive-thru aisle, with the sign faces perpendicular and visible to the north/south drive traffic. Additionally, add a DO NOT ENTER sign in the center island of the drive-thru exit.

'One-way' signs have been added to the drive-through lane of Building 'A'. Refer to Sheet C-2 of the Site Development Plans.

- 4. Extend concrete sidewalk (with sidewalk jointing and maximum 2% cross-slopes grades) through the driveway approaches at site driveways that are not under traffic signal control, as per the City's Engineering and Development Standards.

All driveway approaches have been revised to extend the concrete pavement through the sidewalk crossings. Refer to Sheet C-2 of the Site Development Plans.

- 5. Add crosswalk pavement markings for the crossing near the southwest corner of Building B (near the entrance into the drive-thru area).

All pedestrian crossings have been marked with crosswalk pavement markings. The proposed speed table crossing has been marked to match the existing speed table at the north entrance of the Kelly Services Tower for site continuity. Refer to Sheet C-2 of the Site Development Plans.

Should you have any questions regarding the submission items or responses above please do not hesitate to contact our office.

Regards,



Eric Williams, PE
Stonefield Engineering and Design, LLC



Kevin Heffernan, PE
Stonefield Engineering and Design, LLC

December 7, 2022

VIA EMAIL mark@tower-construction.com

Mark Soma
Tower Construction
2093 Orchard Lake Road
Sylvan Lake, MI 48320

**RE: Multi-Family/ Mixed Use at Crooks Rd & Big Beaver Rd
(a.k.a. 911/999 Big Beaver, Kelly Properties, Lindsey Center PUD)
Engineering Review, JPLN2022-0006**

Dear Mr. Soma:

Fleis & VandenBrink (F&V) staff has completed this letter in response to comments provided by OHM Advisors in a review letter dated September 14, 2022. The comments were provided in reference to a Traffic Impact Study (TIS) prepare by Fleis & VandenBrink dated August 28, 2022. The comments and corresponding responses to the OHM review letter are summarized herein.

OHM Comment #1: *The TIS references a new development label, the Lindsey Center PUD. Need to better identify what property is being evaluated. Use addresses or refer also to previously submitted development names. Does this TIS include 2690 Crooks or just 911 / 999 Big Beaver?*

F&V Response: Noted. The TIS has been updated accordingly to better identify the property included within the proposed development project site.

OHM Comment #2: *In the description of Crooks Rd, the TIS indicated that the City of Troy has jurisdiction over this highway. Jurisdiction is actually with the Road Commission for Oakland County.*

F&V Response: Noted. The TIS has been updated accordingly.

OHM Comment #3: *Section 2.2: The previous study used 2017 counts as those in 2020 were showing a large reduction due to COVID. This study is saying that there is a new normal with Big Beaver Rd volumes lower, so there is no need for any COVID adjustments. Need to better support this affirmation. OK to provide the details and analysis as an Appendix.*

F&V Response: Noted. Additional information from RITIS probe data has been provided in the revised TIS.

OHM Comment #4: *Section 5: Regarding the strip retail plaza, need to justify why using the ITE land use code 822 instead of 820. Need to also account for the possibility that some proportion of the retail use may be restaurant.*

F&V Response: The TIS has been updated to include the various potential land uses as shown on the proposed development site plan.

OHM Comment #5: *Building A has a drive thru. Is some part of the building a restaurant or bank? Must account for this use in the trip generation calculations. As a separate site plan issue, is there adequate queuing provided for this drive thru facility?*

F&V Response: The proposed drive-through facility will be a bank facility. The trip generation has been updated accordingly.

OHM Comment #6: *Comparing Figures 3 (Existing Traffic) and 4 (Background), we note that the volume for the NB left turn for the EB to WB crossover east of Crooks on Big Beaver appears to have a precipitous drop for the p.m. period from 777 to 329. Need to verify the correct values.*

F&V Response: Noted. This is a typo, "777" is utilized in F&V's CAD templates and is intended to be updated. The revised figures have the corrected values.

OHM Comment #7: *One of the data sheets in the Appendix indicates that it is the data for the WB to EB crossover on Big Beaver located west of Rochester Rd. Is this mislabeled or has the wrong set of data been used. Some of the values appears to have been used in the Synchro analysis, but not all as noted below:*

- a. *The a.m. peak hour total is shown to be 953. But the value of 949 is used in the Synchro model.*
- b. *The p.m. peak hour total is shown to be 1653. But the value of 1651 is used in the Synchro model.*

These discrepancies were the result of just spot checking a small number of calculations. Need to verify that all calculations are correct.

F&V Response: The traffic volume data referenced in the Attachments was utilized in the analysis. The discrepancies between the 4 AM trips and 2 PM trips at the study intersection identified above were a result of the existing volumes generated by the site. These volumes were reduced at the site drive (Kelly Drive), then balanced downward through the network, in order to account for the volume of traffic that will be eliminated from the study roadways with the redevelopment of the site.

OHM Comment #8: We has previously noted that the existing signal at Kelly Drive/East Site Drive is configured with "near side" heads for traffic exiting the site drive, and suggested that this signal likely will need to be modernized to provide far side signal head placement. F&V has suggested that it would be possible to just position the stop bar a minimum of 40' back from the near side signal heads and then post the driveway as NO TURN ON RED. Their Synchro model is still showing the stop bar location as too close to intersection and TURN ON RED is allowed. This point is moot. In email dated 6/24/22 RCOC confirmed that this signal must be modernized for far side heads.

F&V Response: RCOC provided comments in a letter dated November 8, 2022 (attached), which stated that RCOC would permit the relocation of the stop-bar and the prohibition of right-turns on red. The TIS models and analyses have been updated to reflect the proposed operations.

OHM Comment #9: The West Site Drive (on Big Beaver Road) is located approximately 100' west of the EB crossover to WB Big Beaver. The traffic study indicates that the majority of the site generated trips using this driveway will exit out and weave across to use this crossover. We have a safety concern regarding the heavy queuing in the crossover as outbound site traffic may proceed to "force" their way in mid-queue, potentially obstructing the adjacent through lane. We note that though there are various ways to mitigate this issue, the easiest is to limit this drive to entry only traffic. In email dated 6/24/22 RCOC confirms that this driveway be entry only or removed altogether. The change made to the site plan for the driveway will impact the volumes to be shown at the east driveway (Kelly Drive) and the resultant analysis for that location.

F&V Response: RCOC provided comments in a letter dated November 8, 2022 (attached), which stated that RCOC would permit the West Site Driveway to remain as existing, with right-turn ingress and dual right-turn lane egress.

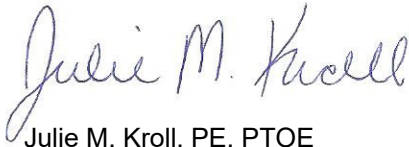
OHM Comment #10: As noted in a prior review, OHM recommended the North Site Drive (on Crooks Rd, north of Building C) should be right-in/right-out only. The previous traffic study concluded that this location experiences large delays and were enmeshed in long vehicle queues for NB Crooks Rd backing up from Big Beaver. The current SimTraffic simulation continues to show NB Crooks queuing to and beyond this driveway. In email dated 6/24/22 RCOC confirmed that this driveway shall be configured for right in/out only. The relocation of this left turning traffic will need to be reflected in the remaining site driveways and their analyses.

F&V Response: RCOC provided comments in a letter dated November 8, 2022 (attached), which stated that outbound left-turns will be prohibited from the North Site Drive and all other ingress and egress movements will continue to be allowed. The TIS models and analyses have been updated to reflect the proposed operations.

If you have any questions or concerns, please contact our office.

Sincerely,

FLEIS & VANDENBRINK ENGINEERING, INC.



Julie M. Kroll, PE, PTOE
Traffic Services Manager

MEMO

VIA EMAIL mark@tower-construct.com

To: Mr. Mark Soma
Tower Construction

From: Traffic Services Group
Fleis & VandenBrink

Date: Revised December 7, 2022

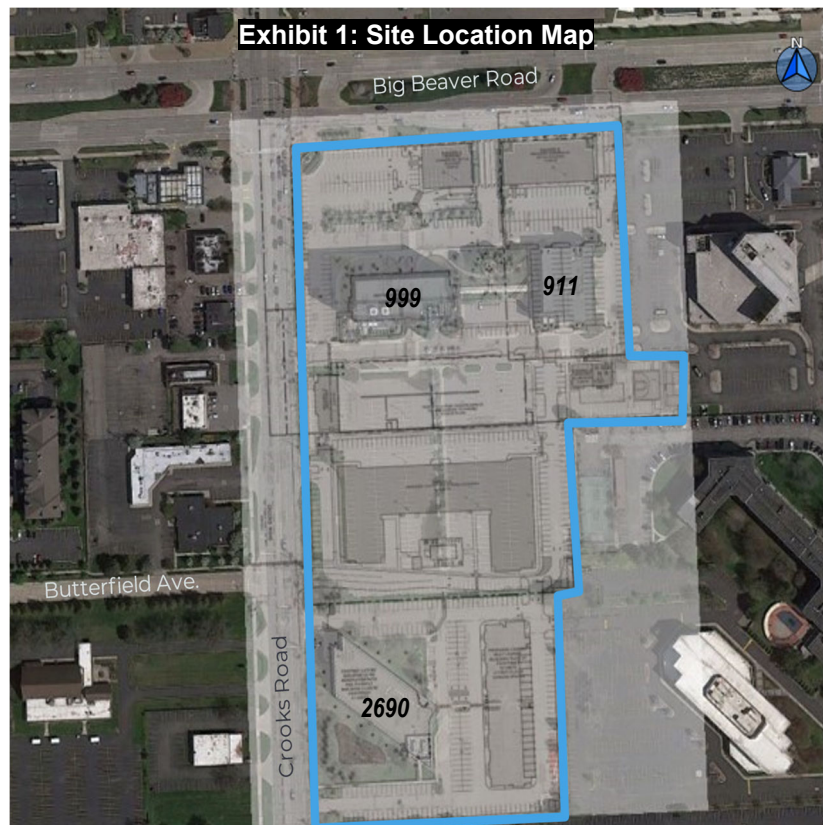
Re: Crooks & Big Beaver Mixed Use Redevelopment
City of Troy, Michigan
Traffic Impact Study

1 INTRODUCTION

This memorandum presents the results of the Traffic Impact Study (TIS) for the proposed Crooks & Big Beaver Mixed Use Redevelopment in the City of Troy, Michigan. The project site includes 911 & 999 West Big Beaver Road and 2690 Crooks Road and is located generally in the southeast quadrant of the Big Beaver Road and Crooks Road intersection, as shown on **Exhibit 1** and on the attached **Figure 1**.

The proposed project includes a mixed-use development with commercial, office, and multi-family residential land uses. Site access is proposed via three (3) driveways on Crooks Road and via two (2) driveways on Big Beaver Road. The study sections of Crooks Road and Big Beaver Road are both under the jurisdiction of the Road Commission for Oakland County (RCOC).

The scope of this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, our understanding of the development program, accepted traffic engineering practice, and information published by the Institute of Transportation Engineers (ITE). Additionally, F&V received feedback on the scope of work from RCOC and the City of Troy. Sources of data for this study include F&V subconsultant Gewalt Hamilton Associates, Inc. (GHA), RCOC, ITE, and the Southeast Michigan Council of Governments (SEMCOG).



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2 BACKGROUND

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided via Big Beaver Road and Crooks Road. F&V collected an inventory of existing lane use and traffic control at the study intersections, as shown on the attached **Figure 2**; the study roadways are further described below. F&V also obtained existing traffic signal timing information from RCOC. For the purposes of this study, all minor streets and site driveways are assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted.

Big Beaver Road generally runs in the east and west directions adjacent to the north side of the project site. Big Beaver Road has a posted speed limit of 45 mph, is under the jurisdiction of RCOC, and is classified as an *Other Principal Arterial*. Big Beaver Road is a six-lane, boulevard divided roadway, with three (3) lanes in each direction and has an Average Annual Daily Traffic (AADT) volume of approximately 53,500 vehicles per day (SEMCOG 2016). Big Beaver Road widens to provide exclusive right-turn lanes in each direction at the Crooks Road intersection and to provide left-turn lanes at the median crossover intersections.

Crooks Road generally runs in the north and south directions adjacent to the west side of the project site. Crooks Road has a posted speed limit of 45 mph, is under the jurisdiction of RCOC, and is classified as an *Other Principal Arterial*. Crooks Road has an AADT volume of approximately 31,200 vehicles per day (SEMCOG 2016). The study section of Crooks Road has a typical five-lane cross section, with two (2) lanes in each direction with a center two-way left-turn lane (TWLTL). Crooks Road widens at the intersection with Big Beaver Road to provide exclusive right-turn lanes in both directions. The northbound right-turn lane extends through the Butterfield Avenue intersection, where an exclusive southbound right-turn lane is provided.

Butterfield Avenue generally runs in the east and west directions, is classified as a *Local Road*, is under the jurisdiction of the City of Troy, and has a posted speed limit of 25 mph. The study section of Butterfield Avenue is a three-lane roadway, with one (1) lane in each direction and a center TWLTL. The intersection with Crooks Road is signalized, with exclusive eastbound left- and right-turn lanes provided.

Wilshire Drive runs generally in the north and south directions, is classified as a *Local Road*, is under the jurisdiction of the City of Troy, and has a posted speed limit of 25 mph. The study section of Wilshire Drive has a divided four-lane cross-section, providing two (2) lanes in each direction.

Troy Center Drive runs generally in the north and south directions and is classified as a *Local Road* under the jurisdiction of the City of Troy, with a posted speed limit of 25 mph. The study section of Troy Center Drive has a divided four-lane cross-section, providing two lanes in each direction. At the signalized intersection with EB Big Beaver Road, Troy Center Road provides three (3) exclusive right-turn lanes.

2.2 EXISTING TRAFFIC VOLUMES

F&V collected existing turning movement count (TMC) data from SCATS on Wednesday July 13, 2022, during the AM and PM peak hours at the following study intersections:

- Big Beaver Road & Crooks Road
- Crooks Road & Butterfield Avenue
- WB Big Beaver Road & EB-to-WB X/O, E. of Crooks
- WB Big Beaver Road & Wilshire Drive
- EB Big Beaver Road & Troy Center Drive

Additionally, F&V staff collected TMC data between Tuesday July 26, 2022, through Thursday July 28, 2022, during the AM and PM peak hours at the following study intersections:

- EB Big Beaver Road & WB-to-EB X/O, W. of Crooks Road
- WB Big Beaver Road & EB-to-WB X/O at Kelly Drive

Through the review of existing 2022 traffic volumes, historical traffic volumes (during I-75 construction and pre/post-COVID), it was concluded that over the past 2+years Big Beaver Road has leveled out to a steady state. This was confirmed with RITIS probe data, which showed how the travel speeds have migrated over time from a typical AM, MD, PM peaking characteristic to a steady volume throughout the day from about 11AM to 7PM. Historical traffic volumes and RITIS probe data are attached.

As new developments progress, such as the proposed PUD, the existing 2022 traffic volumes were used as a baseline to determine the impacts of developments on the roadway network; since office buildings are being repurposed and new office uses are being considered in new ways, in a post-COVID world. Therefore, for purposes of this analysis, the existing traffic volumes collected were used as a baseline to determine the traffic impact of the proposed development on the adjacent roadway network.

An annual background growth rate of **0.5%** was previously approved by the City of Troy and was applied to the existing 2022 traffic volumes, to determine the background 2025 traffic volumes. During collection of the turning movement counts, Peak Hour Factors (PHFs) were recorded and used in the traffic analysis. The AM and PM peak hours of existing network traffic were identified to generally occur between 8:00 AM to 9:00 AM and 4:30 PM to 5:30 PM, respectively. Additionally, F&V obtained the current signal timing permits from RCOC for use in this analysis. The existing peak hour traffic volumes used in the analysis are shown on the attached **Figure 3**. All applicable background data referenced in this memorandum are attached.

3 EXISTING (2022) CONDITIONS

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro/SimTraffic (Version 11) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached **Figure 2** and the existing peak hour traffic volumes shown on the attached **Figure 3**. Descriptions of LOS “A” through “F” as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay and LOS F indicating failing conditions.

The lane use and traffic control at several of the study intersections includes non-NEMA phasing and clustered intersections, which are not supported by the methodologies presented in the Highway Capacity Manual, 6th Edition (HCM6); therefore, HCM2000 was determined to be more appropriate for use at those study intersections. Additionally, the study intersection of EB Big Beaver Road & West Site Drive has a stop-controlled approach with dual (2) right-turn lanes, which is not supported by either HCM6 or HCM2000 methodologies; therefore, SimTraffic delay reports were utilized at this study intersection. The study intersections analyses methodologies are summarized below.

HCM 6 th Intersections
#3 – Crooks Road & Butterfield Avenue / Middle Site Drive
#8 – Crooks Road & N. Site Drive
#10 – Crooks Road & S. Site Drive
HCM2000 Intersections
#1 – EB Big Beaver Road & WB-to-EB X/O, West of Crooks Road
#2 – Big Beaver Road & Crooks Road
#4 – WB Big Beaver Road & EB-to-WB X/O, East of Crooks Road
#5 – EB Big Beaver Road & Kelly Drive / WB-to-EB X/O
#6 – WB Big Beaver Road & Wilshire Drive
#7 – WB Big Beaver Road & Troy Center Drive
SimTraffic Delay Intersections
#9 – EB Big Beaver Road & W. Site Drive

Additionally, all of the signalized study intersections within the roadway network operate the Sydney Coordinated Adaptive Traffic System (SCATS); as a result, the signals will perform real time optimizations to accommodate the traffic volumes observed by the approach lane detectors. Therefore, the base timings were input for the signalized intersections and the study network was optimized for each scenario, in order to reflect true signal operations. The existing conditions results are attached and summarized in **Table 1**.

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better during both peak periods. Additionally, review of SimTraffic network simulations for the study roadway network indicates generally acceptable operations during both peak periods. Microsimulation observations indicate that vehicles are not expected to experience significant delays or excessive vehicle queueing at any of the study intersections.

Table 1: Existing Intersection Operations

	Intersection	Control	Approach	Existing Conditions			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	EB Big Beaver Road & WB-to-EB X/O, W. of Crooks Road	Signalized	EBT	4.3	A	5.3	A
			SBL	1.4	A	1.4	A
			Overall	3.3	A	4.4	A
2	Big Beaver Road & Crooks Road	Signalized	EBT	17.2	B	37.9	D
			EBR	23.6	C	25.1	C
			WBT	18.6	B	29.8	C
			WBR	28.2	C	34.8	C
			NBT	20.5	C	33.1	C
			NBR	20.3	C	48.5	D
			SBT	30.7	C	30.4	C
			SBR	21.6	C	26.3	C
Overall	21.1	C	29.5	C			
3	Crooks Road & Butterfield Avenue	Signalized	EBL	46.8	D	48.8	D
			EBR	47.0	D	48.5	D
			NBL	9.7	A	5.6	A
			NBT	1.9	A	2.6	A
			SBT	0.9	A	2.9	A
			SBR	0.0	A	1.8	A
			Overall	2.6	A	4.7	A
4	WB Big Beaver Road & EB-to-WB X/O, E. of Crooks Road	Signalized	WBT	3.4	A	3.8	A
			NBL	1.5	A	1.6	A
			Overall	3.2	A	3.5	A
5	EB Big Beaver Road & Kelly Drive / WB-to-EB X/O	Signalized	EBT	3.1	A	1.6	A
			EBR	0.0*	A	0.0*	A
			NBR	0.0*	A	0.0*	A
			SBTL	22.8	C	41.9	D
			Overall	7.0	A	5.7	A
6	WB Big Beaver Road & Wilshire Drive	Signalized	WBTR	5.0	A	6.0	A
			SBR	24.6	C	21.8	C
			Overall	5.3	A	7.1	A
7	EB Big Beaver Road & Troy Center Drive	Signalized	EBTR	2.6	A	2.8	A
			NBR	22.9	C	43.7	D
			Overall	3.3	A	5.5	A

* Indicates no vehicle volume present

4 BACKGROUND (2025) CONDITIONS

Population and economic growth profile data was obtained for the City of Troy from the Southeast Michigan Council of Governments (SEMCOG) to calculate a background growth rate for the 2022 traffic volumes in order to reflect the 2025 buildout year traffic volumes. In addition to background traffic growth, it is important to account for traffic that will be generated by approved development(s) within the vicinity of the study area that have yet to be constructed or are currently under construction; no background developments were identified within the vicinity of the study area. Therefore, a conservative background growth rate of **0.5%** per year was applied to the existing 2022 peak hour traffic volumes to forecast the background 2025 traffic volume, **without the proposed development**, as shown on the attached **Figure 4**.

Background peak hour vehicle delays and LOS were calculated based on the existing lane use and traffic control shown on the attached **Figure 2**, the background peak hour traffic volumes shown on the attached **Figure 4**, and the methodologies presented in the HCM. The results of the analysis of background conditions are attached and summarized in **Table 2**.

Table 2: Background Intersection Operations

Intersection	Control	Approach	Existing Conditions				Background Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 EB Big Beaver Road & WB-to-EB X/O, W. of Crooks Road	Signal	EBT	4.3	A	5.3	A	4.3	A	5.3	A	0.0	-	0.0	-
		SBL	1.4	A	1.4	A	1.4	A	1.4	A	0.0	-	0.0	-
		Overall	3.3	A	4.4	A	3.3	A	4.5	A	0.0	-	0.1	-
2 Big Beaver Road & Crooks Road	Signal	EBT	17.2	B	37.9	D	17.3	B	39.0	D	0.1	-	1.1	-
		EBR	23.6	C	25.1	C	24.1	C	25.2	C	0.5	-	0.1	-
		WBT	18.6	B	29.8	C	18.7	B	30.1	C	0.1	-	0.3	-
		WBR	28.2	C	34.8	C	29.7	C	35.3	C	1.5	-	0.5	-
		NBT	20.5	C	33.1	C	20.5	C	33.4	C	0.0	-	0.3	-
		NBR	20.3	C	48.5	D	20.4	C	50.5	D	0.1	-	2.0	-
		SBT	30.7	C	30.4	C	31.4	C	31.0	C	0.7	-	0.6	-
		SBR	21.6	C	26.3	C	21.6	C	26.6	C	0.0	-	0.3	-
Overall	21.1	C	29.5	C	21.6	C	30.3	C	0.5	-	0.8	-		
3 Crooks Road & Butterfield Avenue	Signal	EBL	46.8	D	48.8	D	46.8	D	48.8	D	0.0	-	0.0	-
		EBR	47.0	D	48.5	D	47.0	D	48.8	D	0.0	-	0.3	-
		NBL	9.7	A	5.6	A	10.5	A	5.8	A	0.8	-	0.2	-
		NBT	1.9	A	2.6	A	1.9	A	2.6	A	0.0	-	0.0	-
		SBT	0.9	A	2.9	A	1.0	A	3.0	A	0.1	-	0.1	-
		SBR	0.0	A	1.8	A	0.0	A	1.8	A	0.0	-	0.0	-
		Overall	2.6	A	4.7	A	2.7	A	4.8	A	0.1	-	0.1	-
4 WB Big Beaver Road & EB-to-WB X/O, E. of Crooks Road	Signal	WBT	3.4	A	3.8	A	3.4	A	3.8	A	0.0	-	0.0	-
		NBL	1.5	A	1.6	A	1.5	A	1.6	A	0.0	-	0.0	-
		Overall	3.2	A	3.5	A	3.2	A	3.5	A	0.0	-	0.0	-
5 EB Big Beaver Road & Kelly Drive / WB-to-EB X/O	Signal	EBT	3.1	A	1.6	A	3.1	A	1.6	A	0.0	-	0.0	-
		EBR	0.0*	A	0.0*	A	0.0*	A	0.0*	A	N/A			
		NBR	0.0*	A	0.0*	A	0.0*	A	0.0*	A	N/A			
		SBTL	22.8	C	41.9	D	22.3	C	41.9	D	-0.5	-	0.0	-
		Overall	7.0	A	5.7	A	6.9	A	5.7	A	-0.1	-	0.0	-
6 WB Big Beaver Road & Wilshire Drive	Signal	WBTR	5.0	A	6.0	A	5.1	A	6.1	A	0.1	-	0.1	-
		SBR	24.6	C	21.8	C	24.7	C	21.9	C	0.1	-	0.1	-
		Overall	5.3	A	7.1	A	5.4	A	7.2	A	0.1	-	0.1	-
7 EB Big Beaver Road & Troy Center Drive	Signal	EBTR	2.6	A	2.8	A	2.6	A	2.8	A	0.0	-	0.0	-
		NBR	22.9	C	43.7	D	22.9	C	43.7	D	0.0	-	0.0	-
		Overall	3.3	A	5.5	A	3.3	A	5.5	A	0.0	-	0.0	-

* Indicates no vehicle volume present

The results of the background conditions analysis indicates that all approaches and movements at the study intersections will continue to operate acceptably, at LOS D or better during both peak periods, in a manner similar to the existing conditions analysis. Additionally, a review of SimTraffic network simulations for the remaining study roadway network intersections indicates generally acceptable operations during both peak periods. Microsimulation observations indicate that vehicles are not expected to experience significant delays or excessive vehicle queuing at all study intersections.

5 SITE TRIP GENERATION

The proposed Lindsey Center PUD is a mixed-use development, that includes retail, office, and multi-family residential housing. The existing Kelly Services office building will be re-utilized as an office building; however, the existing office building located on the south side of the project site will be renovated to provide multi-family housing. Review of the existing TMC data showed that the existing office building is generating minimal traffic volumes; therefore, no reduction for the existing use was applied, providing a conservative analysis for the future roadway network traffic volumes. The number of weekday peak hour (AM and PM) and daily vehicle trips that would be generated by the proposed development were calculated using the rates and equations published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 11th Edition*. The site trip generation forecast is summarized in **Table 3**.

Table 3: Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total
Multi-Family Housing (Mid-Rise)	221	312	D.U.	1,442	29	97	126	77	45	122
General Office Building	710	134,560	SF	1,502	190	26	216	36	176	212
Strip Retail Plaza (<40k SF)	822	9,200	SF	618	13	9	22	37	36	73
<i>Pass-By (40% PM)</i>				124	0	0	0	15	15	30
<i>New Trips</i>				494	13	9	22	22	21	43
Drive-in Bank	912	2	Lane	271	10	7	17	26	28	54
<i>Pass-By (35% PM)</i>				47	0	0	0	9	9	18
<i>New Trips</i>				224	10	7	17	17	19	36
Fast Casual Restaurant	930	3,200	SF	311	11	7	18	22	18	40
<i>Pass-By (43% PM)</i>				67	0	0	0	9	9	18
<i>New Trips</i>				244	11	7	18	13	9	22
High Turnover (Sit-down) Restaurant	932	8,000	SF	858	42	35	77	44	28	72
<i>Pass-By (43% PM)</i>				184	0	0	0	15	15	30
<i>New Trips</i>				674	42	35	77	29	13	42
Total Trips				5,002	295	181	476	242	331	573
<i>Total Pass-By</i>				422	0	0	0	48	48	96
Total New Trips				4,580	295	181	476	194	283	477

As is typical of commercial developments, a portion of the trips generated are from vehicles on the adjacent roadway, that will pass the site on their way from an origin to their ultimate destination. Therefore, not all traffic at the site driveways is necessarily new traffic added to the street system. This percentage of the trips generated by the development are considered “pass-by” and “diverted link” trips, which are already present on the adjacent roadway network. Diverted link trips are pass-by trips for vehicles on the opposite side of the median area; these vehicles will therefore have to utilize multiple crossovers in order to enter and exit the site. The percentage of pass-by trips used in this analysis was determined based on the rates published by ITE in the *Trip Generation Manual, 11th Edition*. Notes on the pass-by trips utilized in this analysis:

- There are no ITE calculations for AM pass-by trips associated with the restaurant and retail land uses. There are pass-by trip calculations for the bank; however, in order to provide a conservative analysis, these pass-by trips were not reduced from the calculations during the AM peak hour.
- The pass-by trips were applied as diverted-link trips for westbound Big Beaver Road and for southbound egress movements at the Crooks Road site driveway.

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roads based on the proposed site access plan and driveway configurations, the existing peak hour traffic patterns in the adjacent roadway network, and the methodologies published by ITE. To determine the trip distribution, the vehicles were assumed to be home-to-work trips during the AM peak hour and work-to-home trips during the PM peak hour. This was used to determine where vehicles generated by the residential land uses were destined to and from where the office trips were arriving. The ITE trip distribution methodology assumes that new trips will enter the network, then return to their direction of origin, whereas “pass-by” trips will access the development and return to their original direction of travel. The site trip distributions are summarized in **Table 4**.

Table 4: Site Trip Distribution

		Residential		Office		Commercial		
To/From	Via	AM	PM	AM	PM	AM	PM	Pass-by
East	Big Beaver Road	22%	32%	40%	37%	40%	32%	35% (EB)
West	Big Beaver Road	23%	25%	17%	22%	17%	25%	26% (WB)
North	Crooks Road	22%	20%	27%	23%	27%	20%	22% (NB)
South	Crooks Road	33%	23%	16%	18%	16%	23%	17% (SB)
Total		100%	100%	100%	100%	100%	100%	100%

The vehicular traffic volumes shown in **Table 3** were distributed to the roadway network according to the distribution shown in **Table 4**. The site-generated trips shown on the attached **Figure 5** were added to the background peak hour traffic volumes shown on the attached **Figure 4**, in order to calculate the future peak hour traffic volumes with the addition of the proposed development. Future peak hour traffic volumes are shown on the attached **Figure 6**.

7 FUTURE (2025) CONDITIONS

Future peak hour vehicle delays and LOS, *with the proposed development*, were calculated based on the future lane use and traffic control shown on the attached **Figure 2**, the future peak hour traffic volumes shown on the attached **Figure 6**, and the methodologies presented in the HCM.

Additionally, the existing signal at EB Big Beaver Road & Kelly Drive / East Site Drive is currently configured with “near side” signal heads for traffic exiting the project site via Kelly drive. RCOC provided comments in a letter dated November 8, 2022 (attached), which stated that RCOC would permit the relocation of the stop-bar and the prohibition of right-turns on red. Therefore, the future conditions analysis includes the implementation of these proposed operations.

The results of the future conditions analysis are attached and summarized in **Table 5**. The results indicate that, with the addition of the site generated traffic volumes from the proposed development, the study intersections are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to background conditions, with the following exceptions:

EB Big Beaver Road & West Site Drive

- During PM peak hour: The northbound right-turn movement is expected to operate at LOS F.

Although the SimTraffic delay projections indicate poor operations, review of the SimTraffic microsimulations indicates a 95th percentile queue length of approximately 149-feet (5-6 vehicles) or less, for the northbound right-turn movement. Additionally, SimTraffic network simulation observations indicates that egress vehicles were observed to find adequate gaps within the through traffic along EB Big Beaver Road, without experiencing significant delays or excessive vehicle queueing. The signalized intersection of Big Beaver Road & Crooks Road was observed to create gaps within the traffic stream, providing additional opportunities for egress traffic at the stop-control site driveways along Big Beaver Road and along Crooks Road.

Table 5: Future Intersection Operations

Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 EB Big Beaver Road & WB-to-EB X/O, W. of Crooks Road	Signal	EBT	4.3	A	5.3	A	4.4	A	5.4	A	0.1	-	0.1	-
		SBL	1.4	A	1.4	A	1.4	A	1.4	A	0.0	-	0.0	-
		Overall	3.3	A	4.5	A	3.4	A	4.6	A	0.1	-	0.1	-
2 Big Beaver Road & Crooks Road	Signal	EBT	17.3	B	39.0	D	17.4	B	27.6	C	0.1	-	-11.4	D→C
		EBR	24.1	C	25.2	C	25.6	C	15.3	B	1.5	-	-9.9	C→B
		WBT	18.7	B	30.1	C	19.1	B	17.8	B	0.4	-	-12.3	C→B
		WBR	29.7	C	35.3	C	32.1	C	20.9	C	2.4	-	-14.4	-
		NBT	20.5	C	33.4	C	20.5	C	28.3	C	0.0	-	-5.1	-
		NBR	20.4	C	50.5	D	20.6	C	51.4	D	0.2	-	0.9	-
		SBT	31.4	C	31.0	C	35.6	D	32.6	C	4.2	C→D	1.6	-
		SBR	21.6	C	26.6	C	21.6	C	26.6	C	0.0	-	0.0	-
Overall	21.6	C	30.3	C	23.2	C	24.2	C	1.6	-	-6.1	-		
3 Crooks Road & Butterfield Avenue / Middle Site Drive	Signal	EBL	46.8	D	48.8	D	47.9	D	44.4	D	1.1	-	-4.4	-
		EBR [EBTR]	47.0	D	48.8	D	45.5	D	43.0	D	-1.5	-	-5.8	-
		[WBL]	N/A				47.5	D	47.1	D	N/A			
		[WBTR]	N/A				46.3	D	41.0	D	N/A			
		NBL	10.5	A	5.8	A	11.1	B	3.8	A	0.6	A→B	-2.0	-
		NBT [NBTR]	1.9	A	2.6	A	2.3	A	4.1	A	0.4	-	1.5	-
		[SBL]	1.0	A	3.0	A	0.2	A	1.4	A	-0.8	-	-1.6	-
		SBTR	0.0	A	1.8	A	1.0	A	0.5	A	1.0	-	-1.3	-
Overall	2.7	A	4.8	A	3.9	A	5.1	A	1.2	-	0.3	-		
4 WB Big Beaver Road & EB-to-WB X/O, E. of Crooks Road	Signal	WBT	3.4	A	3.8	A	3.4	A	3.9	A	0.0	-	0.1	-
		NBL	1.5	A	1.6	A	1.6	A	1.7	A	0.1	-	0.1	-
		Overall	3.2	A	3.5	A	3.2	A	3.5	A	0.0	-	0.0	-
5 EB Big Beaver Road & Kelly Drive / WB-to-EB X/O	Signal	EBT	3.1	A	1.6	A	8.0	A	6.5	A	4.9	-	4.9	-
		EBR	0.0*	0.0*	0.0*	0.0*	8.7	A	9.2	A	N/A			
		NBR	0.0*	0.0*	0.0*	0.0*	24.3	C	52.7	D	N/A			
		SBTL	22.3	C	41.9	D	22.2	C	43.3	D	-0.1	-	1.4	-
		Overall	6.9	A	5.7	A	12.4	B	13.5	B	5.5	A→B	7.8	A→B
6 WB Big Beaver Road & Wilshire Drive	Signal	WBTR	5.1	A	6.1	A	5.4	A	6.3	A	0.3	-	0.2	-
		SBR	24.7	C	21.9	C	25.0	C	22.0	C	0.3	-	0.1	-
		Overall	5.4	A	7.2	A	5.8	A	7.3	A	0.4	-	0.1	-
7 EB Big Beaver Road & Troy Center Drive	Signal	EBTR	2.6	A	2.8	A	1.0	A	1.6	A	-1.6	-	-1.2	-
		NBR	22.9	C	43.7	D	22.9	C	43.8	D	0.0	-	0.1	-
		Overall	3.3	A	5.5	A	1.7	A	4.3	A	-1.6	-	-1.2	-

Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
8 Crooks Road & N. Site Drive	Stop	WBR	N/A				10.1	B	12.2	B	N/A			
		NB					Free							
		SBL					10.5	B	11.7	B				
9 EB Big Beaver Road & W. Site Drive	Stop	EB	N/A				Free				N/A			
		NBR					8.7	A	73.1	F				
10 Crooks Road & S. Site Drive	Stop	WB	N/A				22.4	C	31.8	D	N/A			
		NB					Free							
		SBL					15.1	C	26.4	D				

* Indicates no vehicle volume present

8 AUXILIARY TURN LANE EVALUATION

The study section of Big Beaver Road is a boulevard style roadway and there is an existing center two-way left turn lane (TWLTL) present on Crooks Road; therefore, the auxiliary left-turn lane warrants were not evaluated at the proposed site driveway locations. Additionally, all of the site driveways are proposed in locations that currently provide existing right-turn deceleration lanes; therefore, the auxiliary right-turn lane warrants were not evaluated at the proposed site driveway locations. The results of the auxiliary turn lane evaluation indicate that left- and right-turn treatments are not recommended at the proposed site driveways.

9 CONCLUSIONS

The conclusions of this TIS are as follows:

1. Existing (2022) Conditions

- All study intersection approaches and movements are currently operating acceptably, at a LOS D or better, during both peak periods. Additionally, review of SimTraffic network simulations indicates generally acceptable operations, without excessive vehicle queuing or significant delays.

2. Background Growth

- An annual background traffic growth rate of **0.5%** per year was previously approved by the City of Troy and was utilized to project the existing 2022 traffic volumes to the buildout year of 2025.

3. Background (2025) Conditions

- The results of the background conditions analysis indicate that all approaches and movements at the study intersections are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to existing conditions. Review of SimTraffic microsimulations also indicates acceptable operations, similar to those observed under the existing conditions analysis.

4. Future (2025) Conditions

- With the addition of the site-generated traffic, all study intersection approaches and movements will continue to operate acceptably, at LOS D or better during both peak periods, in a manner similar to background conditions, with the exception of the following:
 - EB Big Beaver Road & W. Site Drive: The northbound right-turn movement is expected to operate at LOS F during the PM peak hour. Although the SimTraffic delay projections indicate poor operations, review of SimTraffic network simulations indicates that egress vehicles were observed to find adequate gaps within the through traffic along EB Big Beaver Road, without experiencing significant delays or excessive vehicle queuing.

5. Access Management

- There is an existing TWLTL on Crooks Road and left-turns on Big Beaver Road are facilitated by median crossovers; therefore, no left-turn lanes are warranted or recommended.
- Right-turn lanes are currently provided at all of the site driveways; therefore, no additional right-turn lanes are warranted or recommended.

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

Attached: Figures 1-6
Proposed Site Plan
Traffic Volume Data
RITIS Data
Signal Timing Permits
Synchro / SimTraffic Results

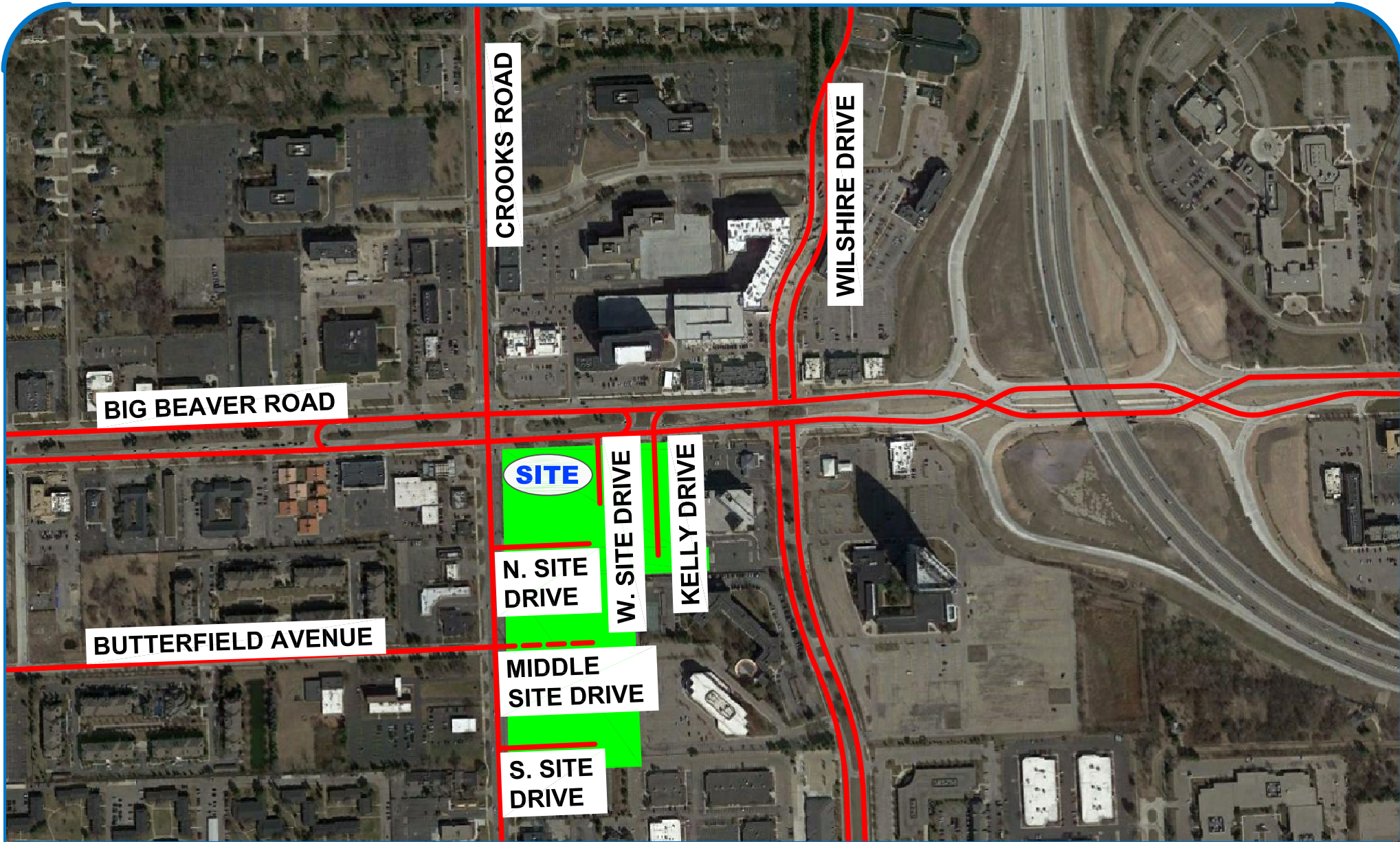


FIGURE 1
SITE LOCATION

LINDSEY CENTER PUD - TROY, MI

LEGEND

 SITE LOCATION



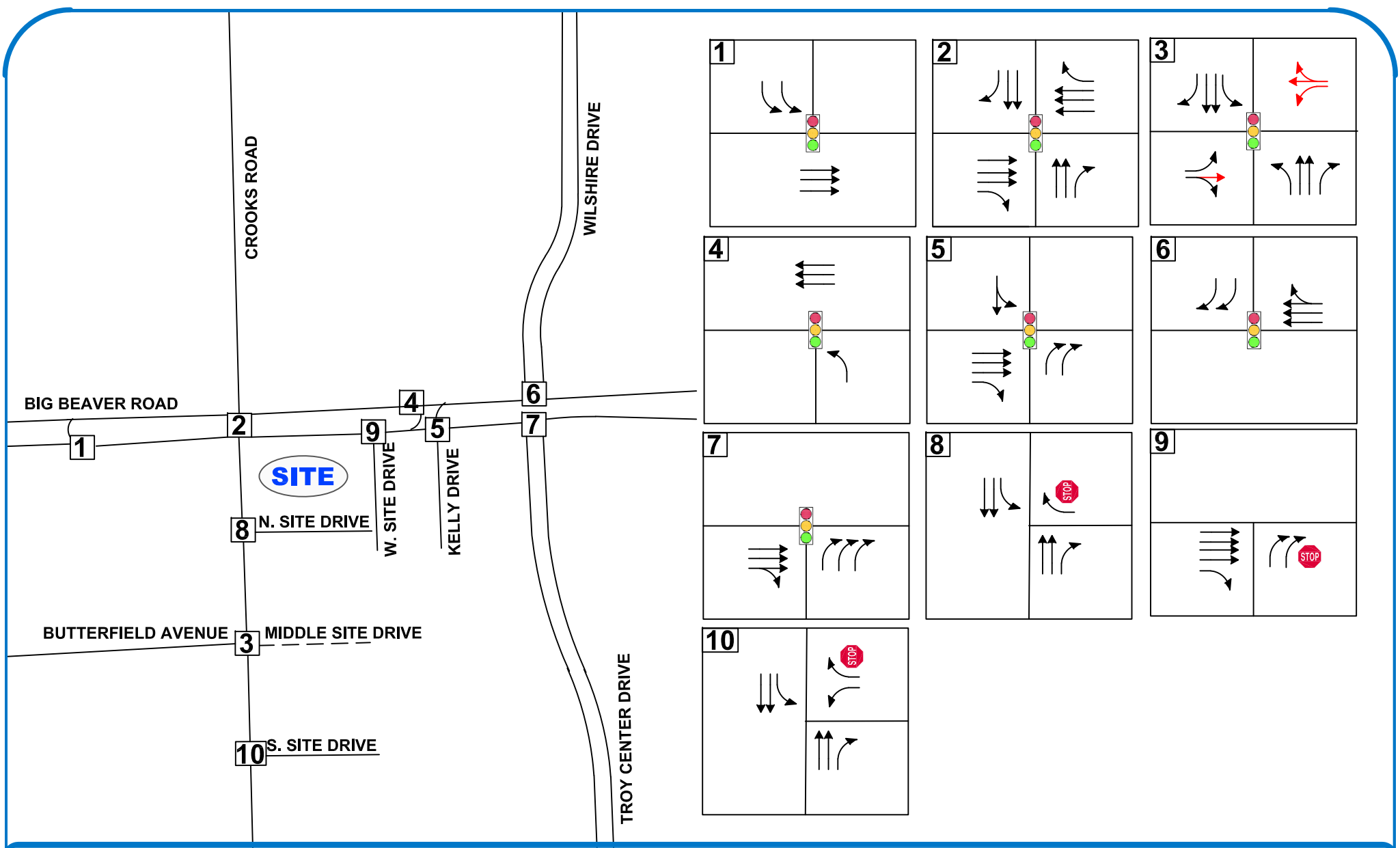


FIGURE 2

LANE USE AND TRAFFIC CONTROL

LINDSEY CENTER PUD - TROY, MI



LEGEND

- ROADS
- PROPOSED ROADS
- LANE USE
- PROPOSED LANE USE
- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- NORTH
- SCALE: NOT TO SCALE

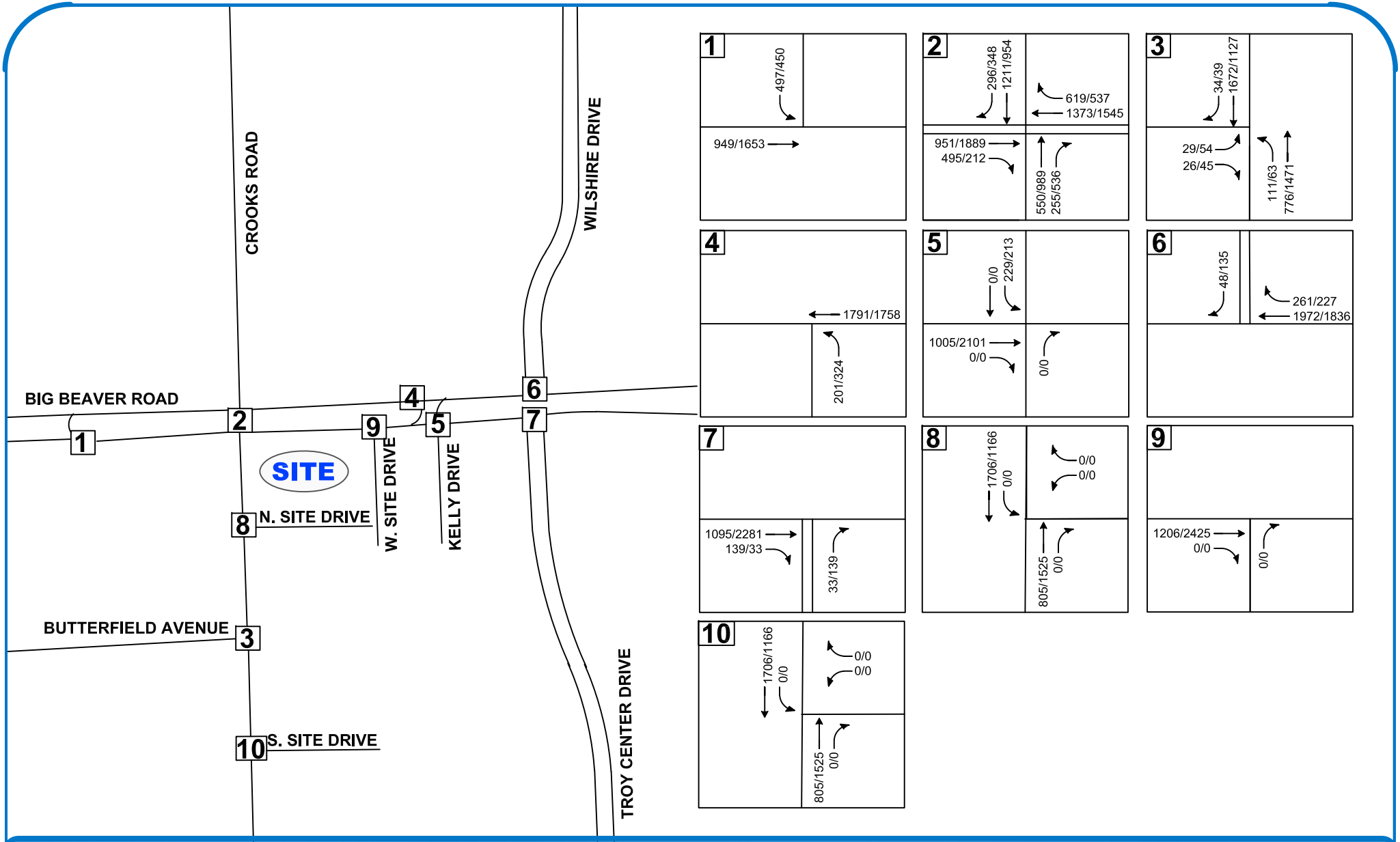


FIGURE 3 EXISTING TRAFFIC VOLUMES

LINDSEY CENTER PUD - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)



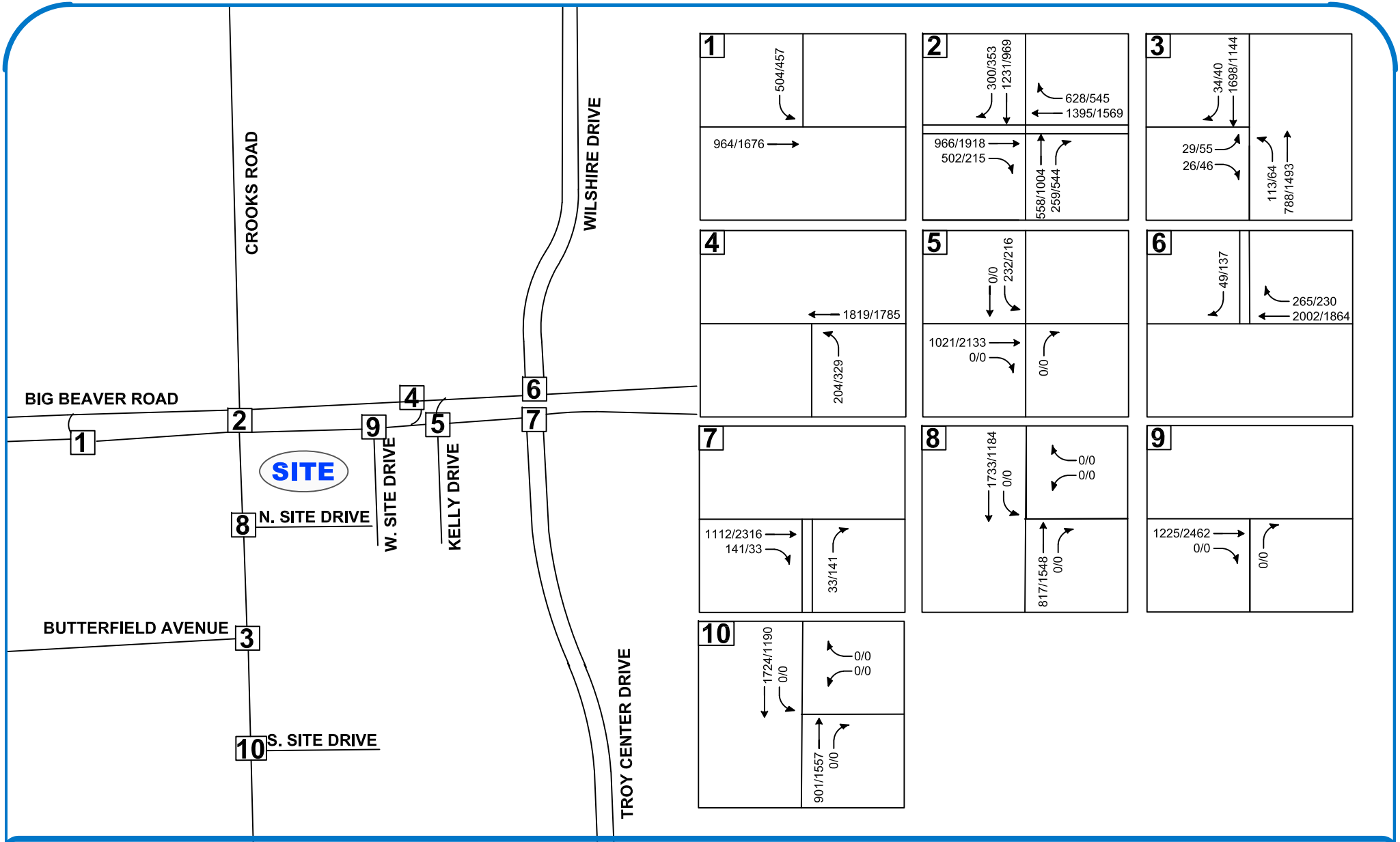


FIGURE 4 BACKGROUND TRAFFIC VOLUMES

LINDSEY CENTER PUD - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)



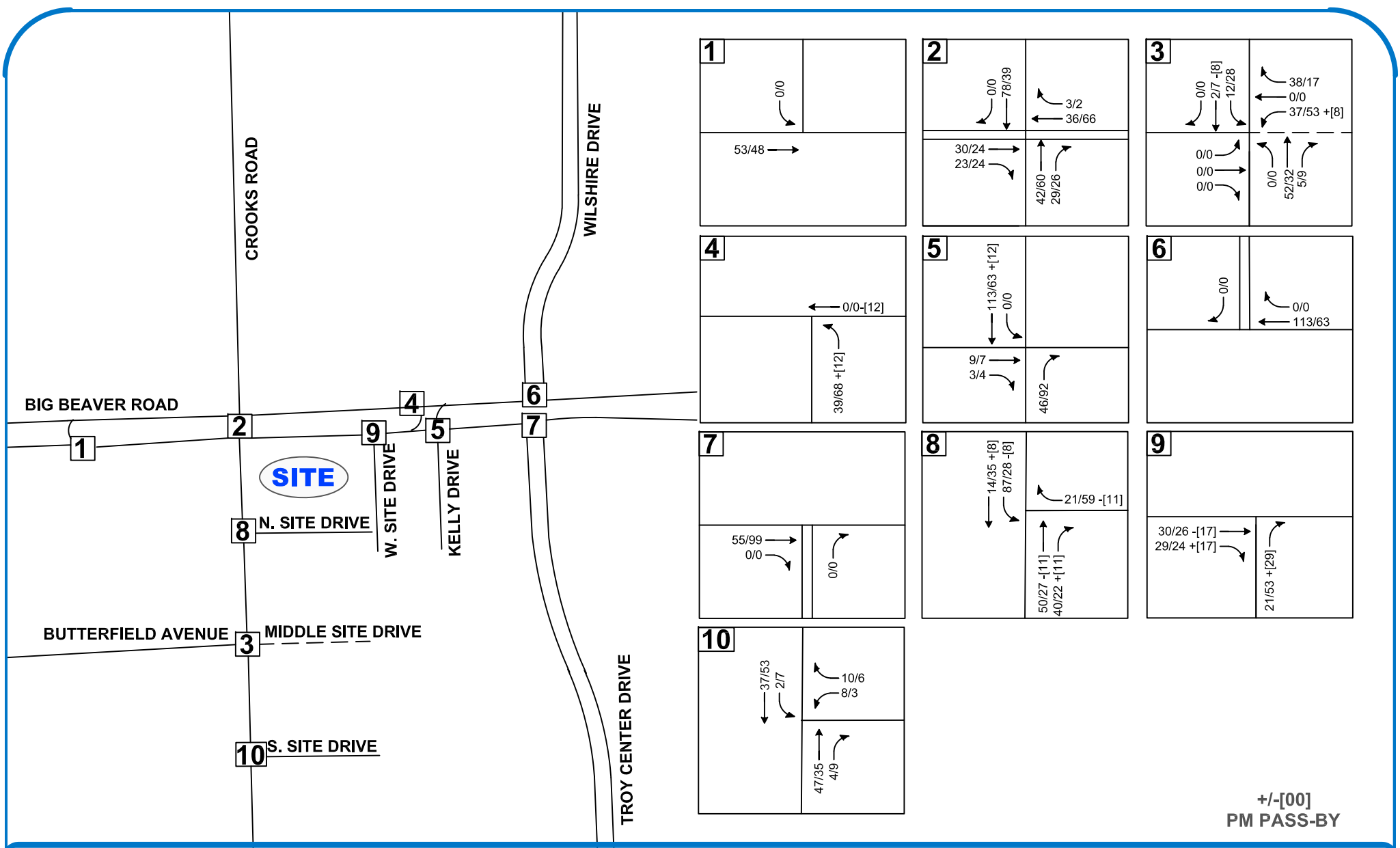


FIGURE 5
SITE-GENERATED TRAFFIC VOLUMES

LINDSEY CENTER PUD - TROY, MI

LEGEND

- ROADS
- - - PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)



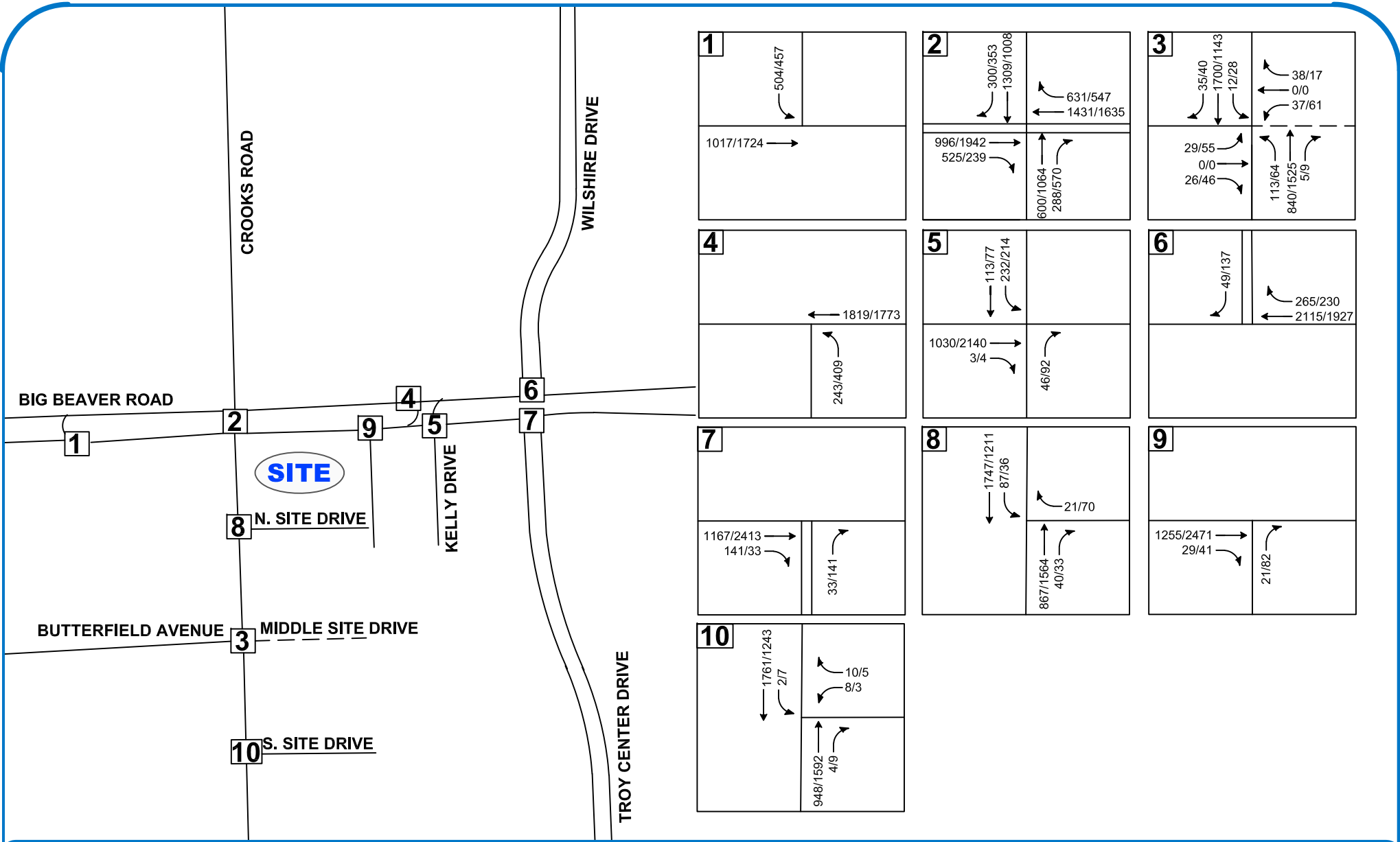


FIGURE 6
FUTURE TRAFFIC VOLUMES

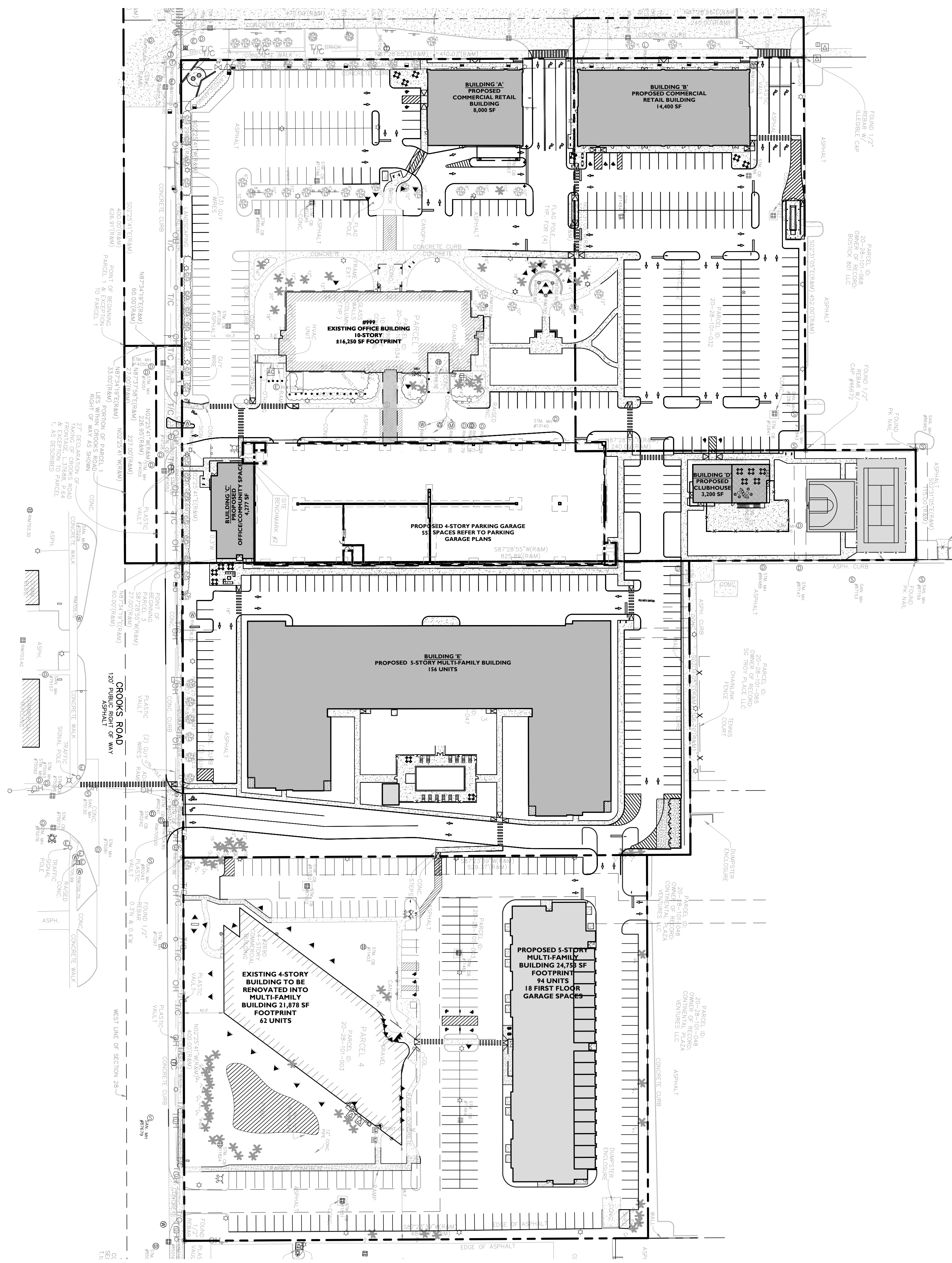
LINDSEY CENTER PUD - TROY, MI

LEGEND

- ROADS
- - - PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)



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OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	PROFESSIONAL OFFICE: 1 SPACE PER 300 NFA (134,560 NFA)/(1300 NFA) = 449 SPACES	419 SURFACE SPACES 552 GARAGE SPACES 63 PODIUM SPACES 1,034 TOTAL SPACES
§ TABLE 13.06-A	COMMERCIAL / RETAIL: 1 SPACE PER 250 GFA (9,200 GFA)/(1/250 GFA) = 37 SPACES	
§ TABLE 13.06-A	BANK: 1 SPACE PER 200 GFA (2,000 GFA)/(1/200 GFA) = 10 SPACES	
§ TABLE 6.10	4 STACKING SPACES PER LANE	4 SPACES PER LANE
§ TABLE 13.06-A	RESTAURANT (STANDARD): 1 SPACE PER 2 SEATS AT MAXIMUM CAPACITY (300 SEATS)/(1/2 SEATS) = 150 SPACES	
§ TABLE 13.06-A	RESTAURANT (FAST FOOD): 1 SPACE PER 70 SF NET FLOOR AREA (*) (2,560 SF NFA)/(1/70 SF NFA) = 37 SPACES	
	MULTI-FAMILY RESIDENTIAL: 2 SPACES PER DWELLING UNIT (156 UNITS)/(2 UNITS) = 312 SPACES	
	TOTAL: 449+37+10+150+37+312 = 995 SPACES	

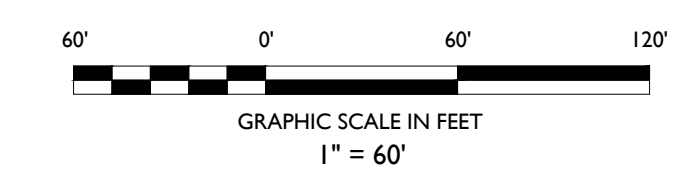
(*) NET FLOOR AREA IS ASSUMED TO BE 80% GROSS FLOOR AREA
(168,200 SF)/(0.8) = 134,560 SF
(3,200 SF)/(0.8) = 2,560 SF

OFF-STREET PARKING REQUIREMENTS - LINDSEY CENTRE		
CODE SECTION	REQUIRED	PROPOSED
§ TABLE 13.06-A	MULTI-FAMILY DWELLING: 2 SPACES PER DWELLING UNIT (156 UNITS)/(2 SPACES PER UNIT) = 312 SPACES	224 SPACES (V)

(V) VARIANCE

OFF-STREET PARKING REQUIREMENTS - COMBINED		
PARCEL	REQUIRED	PROPOSED
KELLY PARCEL	995 SPACES	1,034 SPACES
LINDSEY CENTRE	312 SPACES	224 SPACES
	TOTAL: 995 + 284 = 1,279 SPACES	TOTAL: 1,258 SPACES

SYMBOL	DESCRIPTION
---	CONDOMINIUM LINE
---	PROPOSED CURB
---	PROPOSED FLUSH CURB
○	PROPOSED SIGNS / BOLLARDS
■	PROPOSED BUILDING
▨	EXISTING BUILDING
▨	PROPOSED CONCRETE
▨	PROPOSED PLANTER AREA
---	PROPOSED FENCE
⊕	PROPOSED BIKE RACK
○	PROPOSED RAILING



NO.	DATE	ISSUE	BY	DESCRIPTION
11	12/02/2022			
10	06/01/2022	KTH		FOR SITE PLAN APPROVAL
9	02/15/2022	KTH		RESUBMISSION FOR SPA APPROVAL
8	12/08/2021	KTH		RESUBMISSION FOR SPA APPROVAL
7	02/08/2021	KTH		RESUBMISSION FOR SPA APPROVAL
6	10/14/2020	KTH		RESUBMISSION FOR PUD APPROVAL
5	10/08/2020	KTH		FOR CLIENT REVIEW
4	10/02/2020	KTH		RESUBMISSION FOR PUD APPROVAL
3	07/02/2020	KTH		RESUBMISSION FOR PUD APPROVAL
2	05/02/2020	KTH		RESUBMISSION FOR PUD APPROVAL

NOT APPROVED FOR CONSTRUCTION

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SITE DEVELOPMENT PLANS

CROOKS & BIG BEAVER
PROPOSED MIXED USE
REDEVELOPMENT

PARCEL ID: 88-20-28-101-034, 88-20-28-101-032, 88-20-28-101-047
911 & 999 WEST BIG BEAVER ROAD & 2690 CROOKS ROAD
CITY OF TROY
OAKLAND COUNTY, MICHIGAN

MICHIGAN LICENSE No. 6201069428
LICENSED PROFESSIONAL ENGINEER

STONEFIELD
engineering & design

SCALE: 1" = 60' PROJECT ID: M-19301

TITLE:
OVERALL SITE PLAN

DRAWING:

C-5

Start Time	Big Beaver Road Eastbound			Kelly Drive Northbound		WB-to-EB XO Southbound			Total
	Thru	Right	Trucks	Right	Trucks	Left	Thru	Trucks	
7:00 AM	140	0	11	0	0	17	4	2	161
7:15 AM	187	0	9	0	0	28	6	1	221
7:30 AM	196	0	9	0	0	44	2	0	242
7:45 AM	247	0	8	1	0	43	5	1	296
8:00 AM	234	1	6	0	0	60	4	0	299
8:15 AM	278	2	16	0	0	47	3	0	330
8:30 AM	241	0	12	1	0	53	2	0	297
8:45 AM	252	1	4	0	0	69	4	3	326

EB-to-WB XO, E. of Crooks
NBL

27
16
30
48
36
55
56
54

Peak hour

Total	1005	4	1	229	13	1252
PHF		0.90	0.25		0.83	
HV %		3.8%	0.0%		1.2%	

920
1058
1167
1222
1252

4:00 PM	484	0	10	2	0	43	0	2	529
4:15 PM	496	1	9	2	0	54	1	1	554
4:30 PM	484	0	9	4	0	39	1	1	528
4:45 PM	586	1	17	0	0	66	0	0	653
5:00 PM	535	0	7	2	0	52	0	2	589
5:15 PM	475	1	8	4	0	52	1	0	533
5:30 PM	454	0	2	3	0	56	1	1	514
5:45 PM	454	1	2	1	0	51	0	0	507

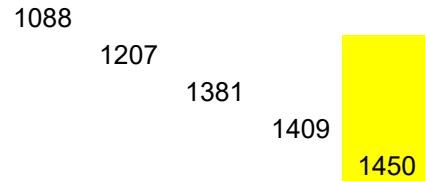
83
78
87
79
66
92
66
66

Peak hour

Total	2101	2	8	211	2	2324
PHF		0.90	0.50		0.81	
HV %		2.0%	0.0%		1.9%	

2264
2324
2303
2289
2143

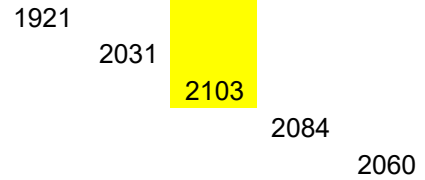
	Big Beaver Road (Eastbound)		WB-to-EB XO, W. of Rochester (Southbound)		
Start Time	Thru	Trucks	Left	Trucks	Total
7:00 AM	111	1	88	3	199
7:15 AM	137	0	93	2	230
7:30 AM	174	5	129	1	303
7:45 AM	222	8	134	1	356
8:00 AM	212	4	106	1	318
8:15 AM	266	1	138	4	404
8:30 AM	215	0	116	1	331
8:45 AM	260	5	137	0	397



Peak hour

Total	953	497	1450
PHF	0.90	0.90	
HV %	1.0%	1.2%	

4:00 PM	405	5	97	1	502
4:15 PM	368	1	88	2	456
4:30 PM	356	4	116	0	472
4:45 PM	386	2	105	0	491
5:00 PM	480	0	132	0	612
5:15 PM	431	0	97	0	528
5:30 PM	356	1	97	1	453
5:45 PM	363	0	104	1	467



Peak hour

Total	1653	450	2103
PHF	0.86	0.85	
HV %	0.4%	0.0%	



Traffic Count Database System
(TCDS)

Volume Count Report

LOCATION INFO	
Location ID	76_3_NB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
SOUTH OF	BIG BEAVER
Direction	3
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	76
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	10	3	6	4	23
1:00-2:00	3	2	4	6	15
2:00-3:00	6	6	1	5	18
3:00-4:00	2	5	4	4	15
4:00-5:00	0	4	8	9	21
5:00-6:00	11	17	26	23	77
6:00-7:00	24	30	27	39	120
7:00-8:00	33	61	67	68	229
8:00-9:00	51	78	66	60	255
9:00-10:00	71	66	60	75	272
10:00-11:00	84	69	76	58	287
11:00-12:00	104	78	86	105	373
12:00-13:00	100	104	73	91	368
13:00-14:00	104	110	93	66	373
14:00-15:00	100	97	104	88	389
15:00-16:00	95	84	110	97	386
16:00-17:00	155	118	137	123	533
17:00-18:00	161	115	126	93	495
18:00-19:00	123	122	71	75	391
19:00-20:00	67	57	55	68	247
20:00-21:00	47	39	47	58	191
21:00-22:00	30	37	40	33	140
22:00-23:00	48	34	21	22	125
23:00-24:00	17	21	13	11	62
Total					5,405
AADT					
AM Peak					11:30-12:30 395
PM Peak					16:15-17:15 539



Traffic Count Database System
(TCDS)

Volume Count Report

LOCATION INFO	
Location ID	76_NB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
SOUTH OF	BIG BEAVER
Direction	NB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	NB
Notes	
Station	76
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	22	14	15	13	64
1:00-2:00	9	9	9	9	36
2:00-3:00	14	10	3	9	36
3:00-4:00	6	9	8	6	29
4:00-5:00	16	11	22	19	68
5:00-6:00	16	25	59	60	160
6:00-7:00	73	71	97	102	343
7:00-8:00	118	165	171	196	650
8:00-9:00	171	228	181	193	773
9:00-10:00	196	195	158	178	727
10:00-11:00	202	194	181	168	745
11:00-12:00	241	208	224	260	933
12:00-13:00	245	258	220	229	952
13:00-14:00	250	269	222	204	945
14:00-15:00	250	224	241	246	961
15:00-16:00	274	226	280	270	1,050
16:00-17:00	391	319	397	335	1,442
17:00-18:00	434	359	349	311	1,453
18:00-19:00	387	320	223	216	1,146
19:00-20:00	178	180	201	175	734
20:00-21:00	165	131	163	155	614
21:00-22:00	107	105	101	88	401
22:00-23:00	121	78	51	68	318
23:00-24:00	41	50	36	29	156
Total					14,736
AADT					
AM Peak					11:30-12:30 987
PM Peak					16:30-17:30 1,525


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**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	76_3_SB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
NORTH OF	BIG BEAVER
Direction	3
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	76
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	1	3	5	2	11
1:00-2:00	1	0	0	1	2
2:00-3:00	0	0	3	1	4
3:00-4:00	0	1	2	1	4
4:00-5:00	1	0	2	2	5
5:00-6:00	7	6	11	8	32
6:00-7:00	14	30	18	30	92
7:00-8:00	32	44	51	69	196
8:00-9:00	72	73	84	67	296
9:00-10:00	63	56	62	72	253
10:00-11:00	62	50	61	53	226
11:00-12:00	45	69	76	86	276
12:00-13:00	87	91	72	68	318
13:00-14:00	77	71	78	69	295
14:00-15:00	58	68	70	60	256
15:00-16:00	59	63	68	64	254
16:00-17:00	72	59	76	75	282
17:00-18:00	117	80	72	75	344
18:00-19:00	51	51	55	53	210
19:00-20:00	42	47	49	40	178
20:00-21:00	40	59	34	28	161
21:00-22:00	23	24	18	21	86
22:00-23:00	15	12	17	7	51
23:00-24:00	10	13	5	7	35
Total					3,867
AADT					
AM Peak					11:30-12:30 340
PM Peak					16:30-17:30 348



Traffic Count Database System
(TCDS)

Volume Count Report

LOCATION INFO	
Location ID	76_SB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
NORTH OF	BIG BEAVER
Direction	SB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	SB
Notes	
Station	76
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	42	35	16	14	107
1:00-2:00	65	11	13	21	110
2:00-3:00	74	23	85	31	213
3:00-4:00	38	30	37	48	153
4:00-5:00	52	26	36	32	146
5:00-6:00	54	55	111	107	327
6:00-7:00	95	164	226	282	767
7:00-8:00	223	329	307	387	1,246
8:00-9:00	377	393	359	378	1,507
9:00-10:00	336	250	218	262	1,066
10:00-11:00	267	230	243	272	1,012
11:00-12:00	239	276	290	302	1,107
12:00-13:00	286	269	254	253	1,062
13:00-14:00	263	240	257	266	1,026
14:00-15:00	240	233	272	263	1,008
15:00-16:00	251	175	248	255	929
16:00-17:00	268	223	290	287	1,068
17:00-18:00	397	328	263	273	1,261
18:00-19:00	237	246	237	265	985
19:00-20:00	203	185	251	196	835
20:00-21:00	202	238	147	154	741
21:00-22:00	144	138	139	157	578
22:00-23:00	86	83	78	69	316
23:00-24:00	65	102	86	42	295
Total					17,865
AADT					
AM Peak					07:45-08:45 1,516
PM Peak					16:30-17:30 1,302


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**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	595_WB
Type	SPOT
Funct'l Class	-
Located On	BIG BEAVER
EAST OF	X-OVER EAST OF CROOK
Direction	WB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	WB
Notes	
Station	595
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	31	28	22	13	94
1:00-2:00	15	16	17	7	55
2:00-3:00	3	10	5	6	24
3:00-4:00	10	11	16	12	49
4:00-5:00	19	10	21	26	76
5:00-6:00	29	48	69	110	256
6:00-7:00	94	109	144	230	577
7:00-8:00	215	251	327	414	1,207
8:00-9:00	429	428	421	513	1,791
9:00-10:00	392	362	324	400	1,478
10:00-11:00	268	263	325	296	1,152
11:00-12:00	288	339	333	408	1,368
12:00-13:00	389	414	373	444	1,620
13:00-14:00	378	369	421	369	1,537
14:00-15:00	350	321	338	347	1,356
15:00-16:00	341	376	382	398	1,497
16:00-17:00	375	441	340	450	1,606
17:00-18:00	454	450	404	407	1,715
18:00-19:00	432	390	420	378	1,620
19:00-20:00	308	286	247	254	1,095
20:00-21:00	198	172	166	171	707
21:00-22:00	154	150	145	134	583
22:00-23:00	114	92	91	51	348
23:00-24:00	69	48	33	44	194
Total					22,005
AADT					
AM Peak					08:00-09:00 1,791
PM Peak					16:45-17:45 1,758



Traffic Count Database System
(TCDS)

Volume Count Report

LOCATION INFO	
Location ID	76_5_WB
Type	SPOT
Funct'l Class	-
Located On	BIG BEAVER
EAST OF	CROOKS
Direction	5
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Tue 7/9/2019
End Date	Wed 7/10/2019
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	76
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	14	12	7	15	48
1:00-2:00	5	4	9	5	23
2:00-3:00	5	4	1	7	17
3:00-4:00	2	3	11	1	17
4:00-5:00	9	10	12	15	46
5:00-6:00	21	24	42	51	138
6:00-7:00	47	64	84	117	312
7:00-8:00	122	156	173	145	596
8:00-9:00	145	117	119	96	477
9:00-10:00	108	106	103	104	421
10:00-11:00	87	87	97	84	355
11:00-12:00	109	116	108	123	456
12:00-13:00	145	136	122	142	545
13:00-14:00	134	130	117	100	481
14:00-15:00	113	115	114	109	451
15:00-16:00	113	110	122	132	477
16:00-17:00	153	118	134	132	537
17:00-18:00	129	125	117	160	531
18:00-19:00	123	109	147	124	503
19:00-20:00	121	111	110	93	435
20:00-21:00	88	109	95	83	375
21:00-22:00	74	73	65	48	260
22:00-23:00	37	55	48	33	173
23:00-24:00	35	20	14	21	90
Total					7,764
AADT					
AM Peak					07:15-08:15 619
PM Peak					12:00-13:00 545


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**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	1161_1_EB
Type	SPOT
Funct'l Class	-
Located On	BUTTERFIELD
WEST OF	CROOKS
Direction	1
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	0	0	0	0	0
1:00-2:00	0	0	0	0	0
2:00-3:00	0	0	0	0	0
3:00-4:00	0	3	0	1	4
4:00-5:00	0	2	1	1	4
5:00-6:00	0	2	2	0	4
6:00-7:00	0	1	4	3	8
7:00-8:00	3	7	4	8	22
8:00-9:00	6	8	7	2	23
9:00-10:00	10	7	1	4	22
10:00-11:00	11	7	3	6	27
11:00-12:00	5	6	5	8	24
12:00-13:00	10	6	9	7	32
13:00-14:00	8	9	3	8	28
14:00-15:00	6	9	7	3	25
15:00-16:00	8	6	6	7	27
16:00-17:00	13	10	14	9	46
17:00-18:00	18	13	3	10	44
18:00-19:00	7	4	5	3	19
19:00-20:00	3	2	4	3	12
20:00-21:00	5	2	3	4	14
21:00-22:00	1	0	2	3	6
22:00-23:00	2	2	4	3	11
23:00-24:00	0	3	0	0	3
Total					405
AADT					
AM Peak					11:45-12:45 33
PM Peak					16:30-17:30 54



Volume Count Report

LOCATION INFO	
Location ID	1161_2_EB
Type	SPOT
Funct'l Class	-
Located On	BUTTERFIELD
WEST OF	CROOKS
Direction	2
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	2	1	1	0	4
1:00-2:00	0	1	0	0	1
2:00-3:00	1	0	1	0	2
3:00-4:00	2	0	1	0	3
4:00-5:00	1	0	0	0	1
5:00-6:00	2	1	1	1	5
6:00-7:00	0	5	2	4	11
7:00-8:00	4	5	13	3	25
8:00-9:00	5	9	9	7	30
9:00-10:00	11	6	5	7	29
10:00-11:00	10	5	10	9	34
11:00-12:00	8	7	12	10	37
12:00-13:00	8	16	9	14	47
13:00-14:00	15	12	12	8	47
14:00-15:00	15	13	6	9	43
15:00-16:00	8	9	14	9	40
16:00-17:00	16	12	7	14	49
17:00-18:00	14	10	8	11	43
18:00-19:00	11	7	8	5	31
19:00-20:00	1	5	5	4	15
20:00-21:00	6	3	5	2	16
21:00-22:00	3	5	2	2	12
22:00-23:00	3	5	2	3	13
23:00-24:00	1	3	0	0	4
Total					542
AADT					
AM Peak					11:30-12:30 46
PM Peak					12:15-13:15 54


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	1161_1_NB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
SOUTH OF	BUTTERFIELD
Direction	1
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	9	5	5	5	24
1:00-2:00	3	2	2	2	9
2:00-3:00	3	3	2	1	9
3:00-4:00	2	1	1	0	4
4:00-5:00	4	1	7	2	14
5:00-6:00	2	6	11	9	28
6:00-7:00	16	11	14	13	54
7:00-8:00	26	25	11	49	111
8:00-9:00	21	23	18	19	81
9:00-10:00	10	13	9	12	44
10:00-11:00	17	14	3	13	47
11:00-12:00	9	14	19	24	66
12:00-13:00	41	25	26	28	120
13:00-14:00	32	21	20	19	92
14:00-15:00	14	21	20	4	59
15:00-16:00	15	14	16	9	54
16:00-17:00	9	11	15	19	54
17:00-18:00	16	13	9	14	52
18:00-19:00	19	6	19	9	53
19:00-20:00	8	6	7	5	26
20:00-21:00	5	10	7	10	32
21:00-22:00	11	14	17	12	54
22:00-23:00	22	19	16	11	68
23:00-24:00	12	10	4	5	31
Total					1,186
AADT					
AM Peak					11:45-12:45 116
PM Peak					12:00-13:00 120


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	1161_NB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
SOUTH OF	BUTTERFIELD
Direction	NB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	NB
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	31	17	20	19	87
1:00-2:00	14	10	11	14	49
2:00-3:00	18	14	7	12	51
3:00-4:00	9	7	11	5	32
4:00-5:00	22	15	29	19	85
5:00-6:00	21	40	70	42	173
6:00-7:00	101	83	111	115	410
7:00-8:00	147	186	189	242	764
8:00-9:00	197	252	196	211	856
9:00-10:00	203	203	180	191	777
10:00-11:00	215	203	176	184	778
11:00-12:00	238	229	238	282	987
12:00-13:00	274	274	249	264	1,061
13:00-14:00	270	276	246	215	1,007
14:00-15:00	252	235	275	258	1,020
15:00-16:00	278	248	292	319	1,137
16:00-17:00	368	293	388	363	1,412
17:00-18:00	399	349	350	318	1,416
18:00-19:00	417	280	251	207	1,155
19:00-20:00	191	190	190	178	749
20:00-21:00	160	131	170	165	626
21:00-22:00	117	122	106	89	434
22:00-23:00	136	94	60	69	359
23:00-24:00	57	61	39	32	189
Total					15,614
AADT					
AM Peak					11:45-12:45 1,079
PM Peak					16:30-17:30 1,499


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	1161_3_SB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
NORTH OF	BUTTERFIELD
Direction	3
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	0	0	0	0	0
1:00-2:00	0	0	0	0	0
2:00-3:00	0	0	0	1	1
3:00-4:00	0	1	0	0	1
4:00-5:00	0	0	0	0	0
5:00-6:00	1	1	1	1	4
6:00-7:00	0	1	3	5	9
7:00-8:00	12	5	9	8	34
8:00-9:00	9	6	11	11	37
9:00-10:00	9	7	16	6	38
10:00-11:00	4	11	9	5	29
11:00-12:00	4	4	5	10	23
12:00-13:00	10	8	8	6	32
13:00-14:00	7	5	2	8	22
14:00-15:00	6	5	5	7	23
15:00-16:00	3	6	11	6	26
16:00-17:00	6	6	9	3	24
17:00-18:00	9	18	9	9	45
18:00-19:00	7	4	6	7	24
19:00-20:00	5	4	5	5	19
20:00-21:00	7	4	3	4	18
21:00-22:00	3	1	3	1	8
22:00-23:00	2	1	0	1	4
23:00-24:00	2	2	0	1	5
Total					426
AADT					
AM Peak					08:45-09:45 43
PM Peak					17:00-18:00 45


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	1161_SB
Type	SPOT
Funct'l Class	-
Located On	CROOKS
NORTH OF	BUTTERFIELD
Direction	SB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	SB
Notes	
Station	1161
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	28	30	15	17	90
1:00-2:00	12	7	13	6	38
2:00-3:00	8	13	8	7	36
3:00-4:00	8	12	12	24	56
4:00-5:00	13	18	32	30	93
5:00-6:00	35	62	115	96	308
6:00-7:00	132	173	182	274	761
7:00-8:00	217	271	311	394	1,193
8:00-9:00	342	318	337	392	1,389
9:00-10:00	300	245	238	205	988
10:00-11:00	237	216	201	234	888
11:00-12:00	222	223	288	321	1,054
12:00-13:00	337	310	297	301	1,245
13:00-14:00	307	271	295	323	1,196
14:00-15:00	264	259	264	291	1,078
15:00-16:00	300	261	285	247	1,093
16:00-17:00	275	280	293	252	1,100
17:00-18:00	321	277	246	251	1,095
18:00-19:00	255	231	196	181	863
19:00-20:00	173	164	168	153	658
20:00-21:00	157	157	123	147	584
21:00-22:00	137	144	145	116	542
22:00-23:00	119	91	60	52	322
23:00-24:00	45	72	37	37	191
Total					16,861
AADT					
AM Peak					07:45-08:45 1,391
PM Peak					12:00-13:00 1,245


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	480_SB
Type	SPOT
Funct'l Class	-
Located On	TROY CENTER
NORTH OF	BIG BEAVER
Direction	SB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	SB
Notes	
Station	480
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	7	11	8	2	28
1:00-2:00	0	3	2	2	7
2:00-3:00	0	0	0	0	0
3:00-4:00	4	0	0	3	7
4:00-5:00	2	1	1	0	4
5:00-6:00	2	5	3	3	13
6:00-7:00	2	3	6	5	16
7:00-8:00	10	11	10	7	38
8:00-9:00	12	13	13	10	48
9:00-10:00	7	9	11	9	36
10:00-11:00	13	11	10	17	51
11:00-12:00	17	13	18	25	73
12:00-13:00	26	35	36	39	136
13:00-14:00	34	37	33	28	132
14:00-15:00	26	29	24	26	105
15:00-16:00	31	34	33	27	125
16:00-17:00	24	23	39	38	124
17:00-18:00	34	24	28	20	106
18:00-19:00	25	31	28	38	122
19:00-20:00	51	36	27	45	159
20:00-21:00	35	30	34	26	125
21:00-22:00	30	35	25	42	132
22:00-23:00	39	47	33	21	140
23:00-24:00	24	17	10	21	72
Total					1,799
AADT					
AM Peak					11:45-12:45 122
PM Peak					21:45-22:45 161


SEMCOG

**Traffic Count Database System
(TCDS)**

Volume Count Report

LOCATION INFO	
Location ID	597_NB
Type	SPOT
Funct'l Class	-
Located On	TROY CENTER
SOUTH OF	EB BIG BEAVER
Direction	NB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Wed 7/13/2022
End Date	Thu 7/14/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	NB
Notes	
Station	597
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	1	1	0	1	3
1:00-2:00	0	0	1	0	1
2:00-3:00	1	0	2	0	3
3:00-4:00	0	0	0	0	0
4:00-5:00	1	0	0	2	3
5:00-6:00	2	1	5	3	11
6:00-7:00	6	1	3	8	18
7:00-8:00	8	7	7	7	29
8:00-9:00	6	13	4	4	27
9:00-10:00	8	7	11	13	39
10:00-11:00	22	7	6	6	41
11:00-12:00	16	12	14	12	54
12:00-13:00	15	16	17	13	61
13:00-14:00	18	21	22	13	74
14:00-15:00	16	12	10	21	59
15:00-16:00	18	27	21	21	87
16:00-17:00	30	29	35	23	117
17:00-18:00	46	34	24	35	139
18:00-19:00	30	14	12	15	71
19:00-20:00	18	16	15	15	64
20:00-21:00	19	23	19	0	61
21:00-22:00	0	20	15	10	45
22:00-23:00	10	6	7	3	26
23:00-24:00	5	2	3	1	11
Total					1,044
AADT					
AM Peak					11:45-12:45 60
PM Peak					17:00-18:00 139

Crash and Road Data

Road Segment Report

Crooks Rd, (PR Number 659810)

From:	Kirts Blvd 4.325 BMP
To:	Big Beaver Rd W 4.694 EMP
Jurisdiction:	County
FALINK ID:	2266
Community:	City of Troy
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	0.369 miles
Number of Lanes:	5
Posted Speed:	45 (source: TCO)
Route Classification:	I-696 / M-5 Connector
Annual Crash Average 2017-2021:	<u>23</u>
Traffic Volume (2016)*:	31,200 (Observed AADT)
Pavement Type (2021):	Asphalt
Pavement Rating (2021):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**

Street View



Crash and Road Data

Road Segment Report

Big Beaver Rd W, (PR Number 4408243)

From:	Crooks Rd 1.483 BMP
To:	S I 75/W Big Beaver Ramp 1.800 EMP
Jurisdiction:	County
FALINK ID:	18142
Community:	City of Troy
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	0.317 miles
Number of Lanes:	3
Posted Speed:	45 (source: TCO)
Route Classification:	Not a route
Annual Crash Average 2017-2021:	<u>30</u>
Traffic Volume (2016)*:	27,000 (Observed AADT)
Pavement Type (2021):	Concrete
Pavement Rating (2021):	Fair
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**



Crash and Road Data

Road Segment Report

Big Beaver Rd W, (PR Number 607204)

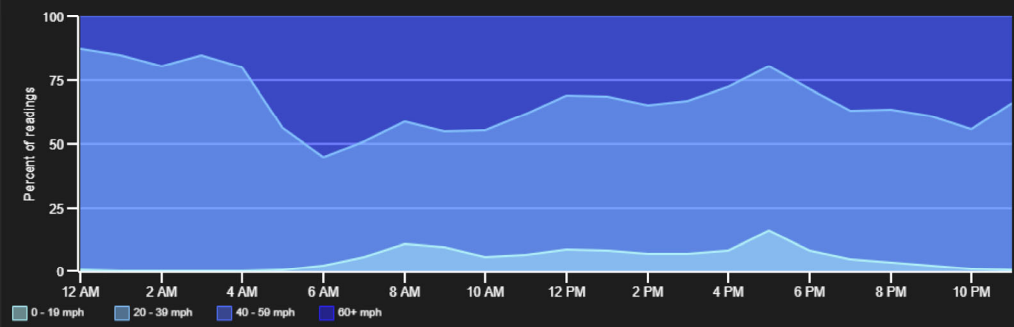
From:	Crooks Rd 2.005 BMP
To:	E Big Beaver/S I 75 Ramp 2.358 EMP
Jurisdiction:	County
FALINK ID:	44
Community:	City of Troy
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	0.353 miles
Number of Lanes:	3
Posted Speed:	45 (source: TCO)
Route Classification:	Not a route
Annual Crash Average 2017-2021:	<u>31</u>
Traffic Volume (2016)*:	26,500 (Observed AADT)
Pavement Type (2021):	Concrete
Pavement Rating (2021):	Fair
Short Range (TIP) Projects:	(11988) Rehabilitate Roadway
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**

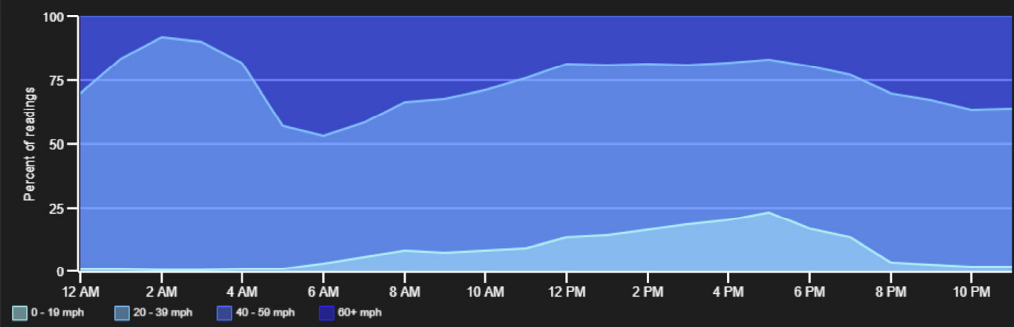


Michigan (13 XD segments) Speed Trend Map for 2018 (Every Tuesday, Wednesday, and Thursday) and 2020 (Every Tuesday, Wednesday, and Thursday) and 2021 (Every Tuesday, Wednesday, and Thursday) and January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)

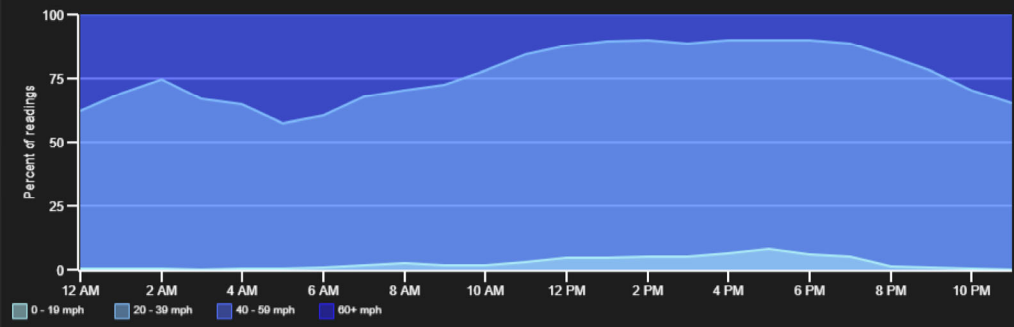
12:00 AM - 2018 (Every Tuesday, Wednesday, and Thursday)



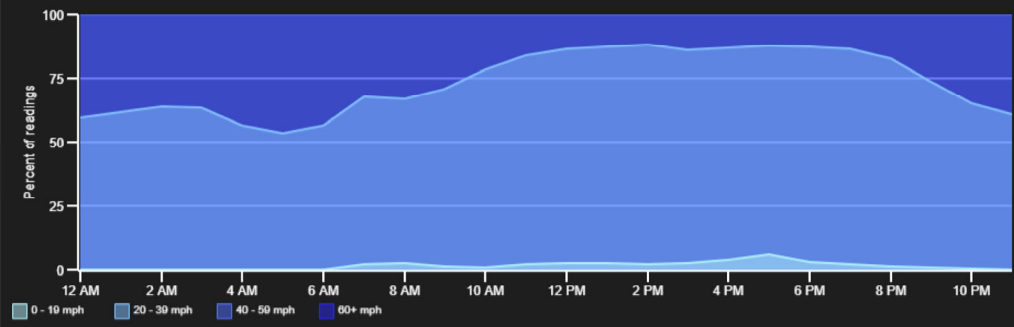
12:00 AM - 2020 (Every Tuesday, Wednesday, and Thursday)



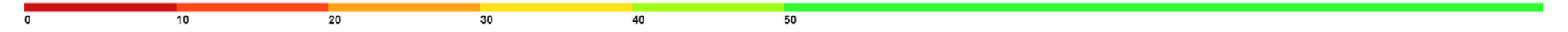
12:00 AM - 2021 (Every Tuesday, Wednesday, and Thursday)



12:00 AM - January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)

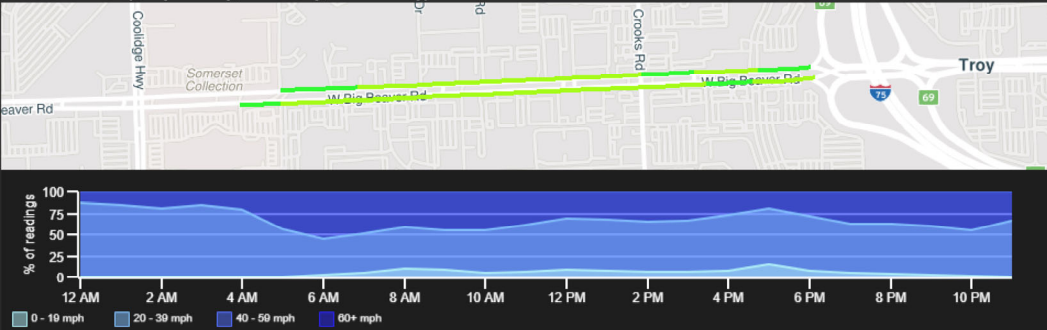


Speed (mph)



13 XD segments) Travel time index Trend Map for 2018 (Every Tuesday, Wednesday, and Thursday) and 2020 (Every Tuesday, Wednesday, and Thursday) and 2021 (Every Tuesday, Wednesday, and Thursday) and January 2022 through November 2022 (

12:00 AM - 2018 (Every Tuesday, Wednesday, and Thursday)



12:00 AM - 2020 (Every Tuesday, Wednesday, and Thursday)



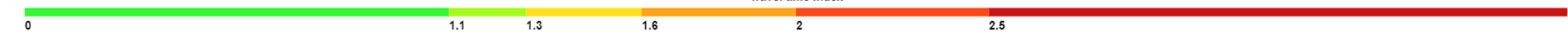
12:00 AM - 2021 (Every Tuesday, Wednesday, and Thursday)



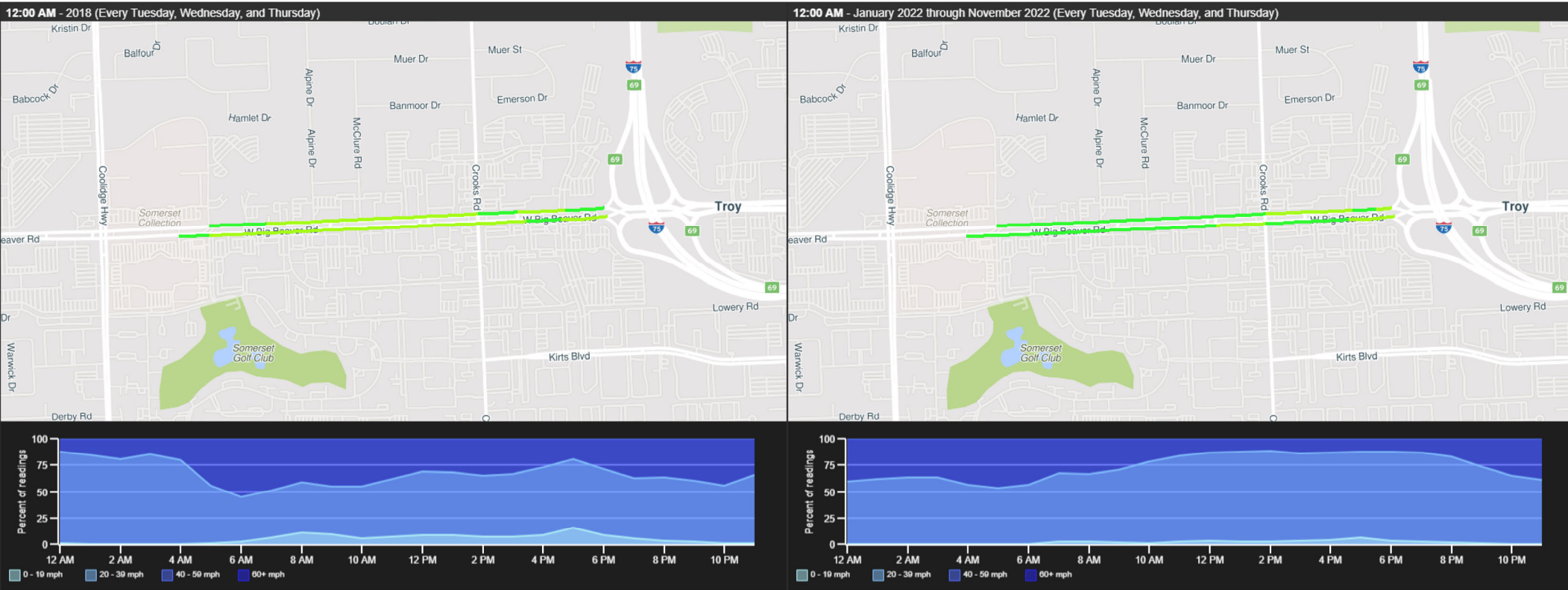
12:00 AM - January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)



Travel time index



Road class 2 in 48084 in Oakland, Michigan (13 XD segments) Travel time index Trend Map for 2018 (Every Tuesday, Wednesday, and Thursday) and January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)

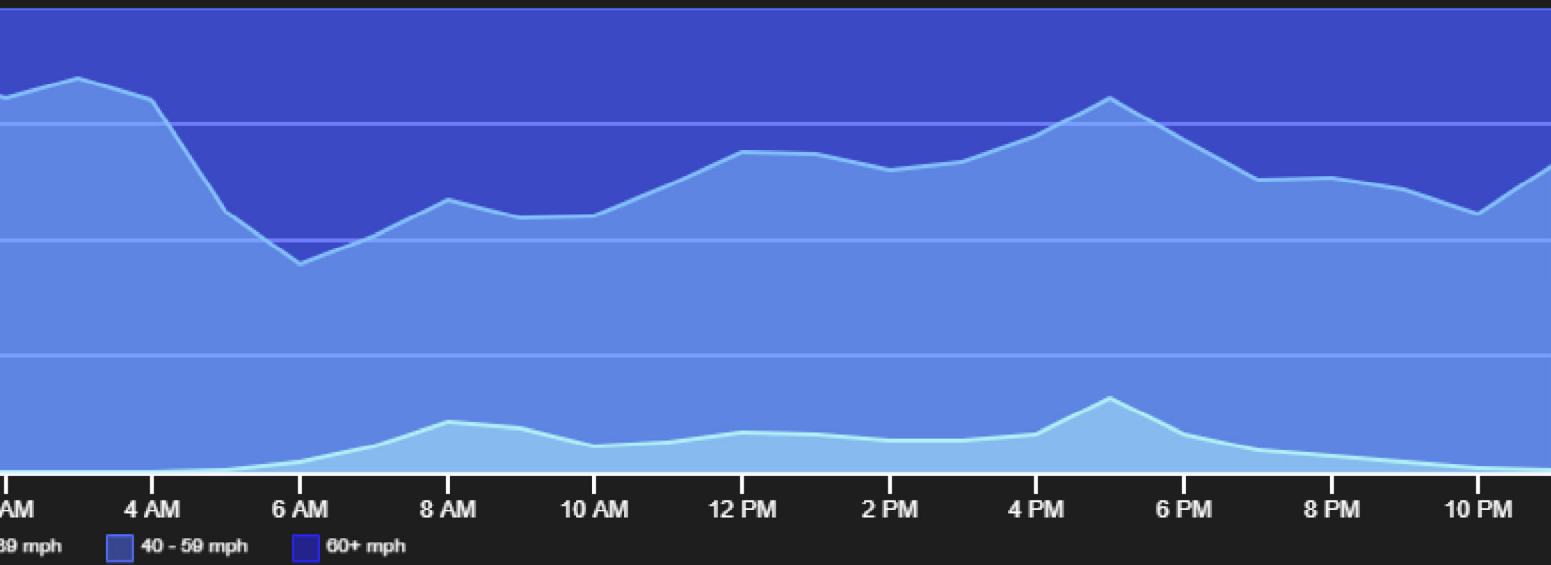


Travel time index

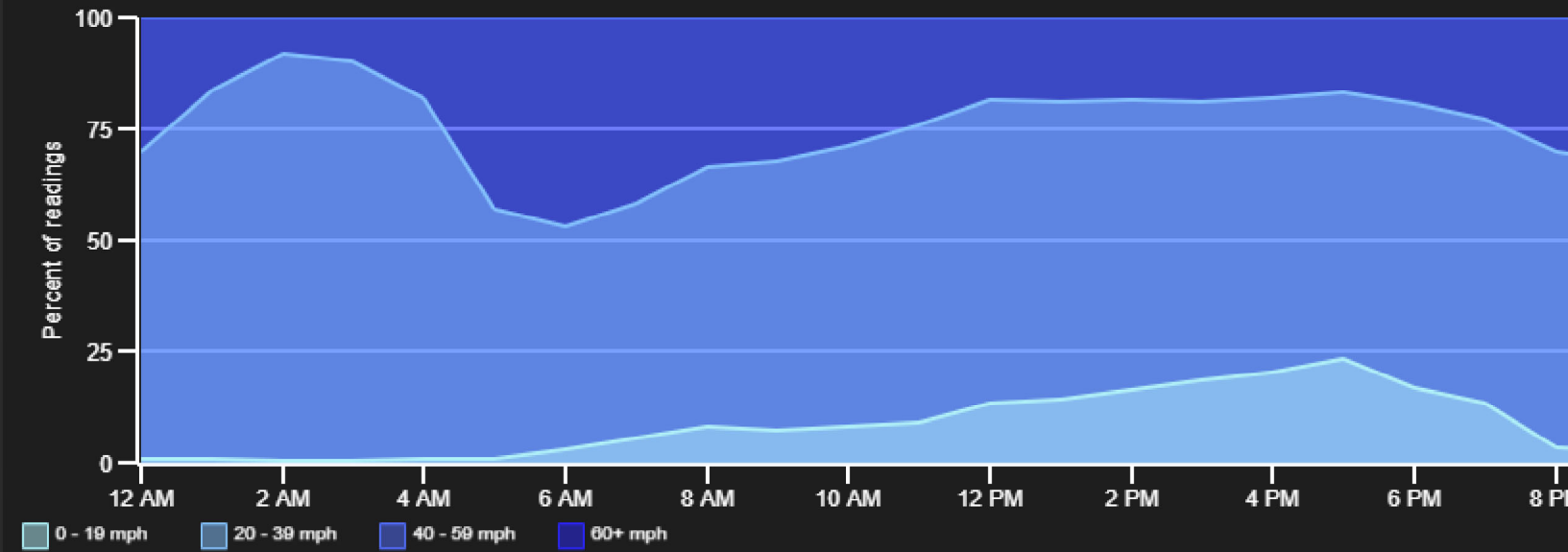


Speed Trend Map for 2018 (Every Tuesday, Wednesday, and Thursday) and 2020 (Every Tuesday, Wednesday, and Thursday) and 2021 (Every Tuesday, Wednesday, and Thursday) and January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)

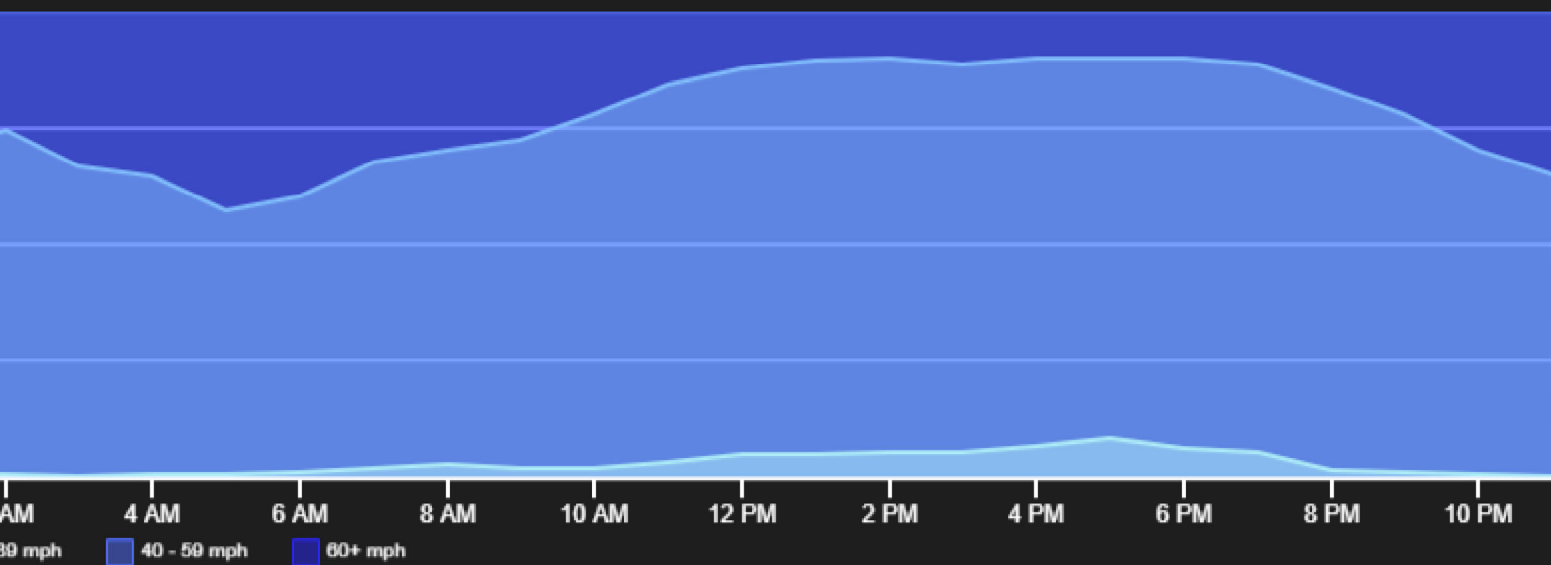
Every Tuesday, Wednesday, and Thursday



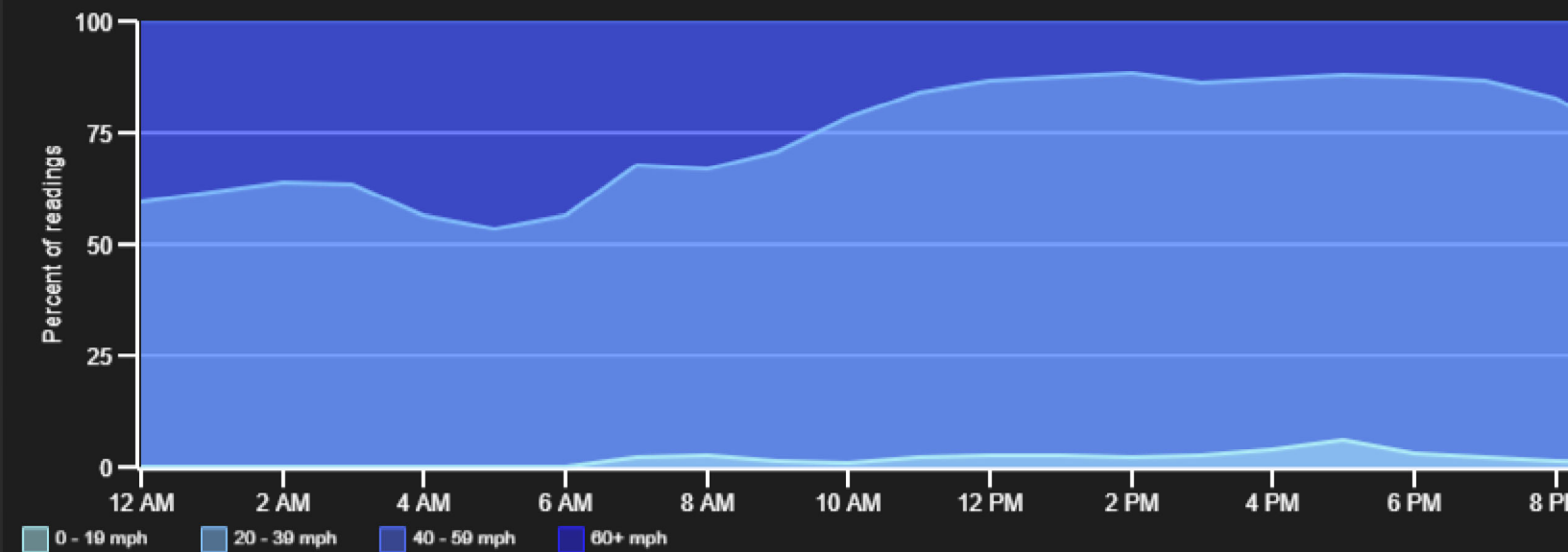
12:00 AM - 2020 (Every Tuesday, Wednesday, and Thursday)



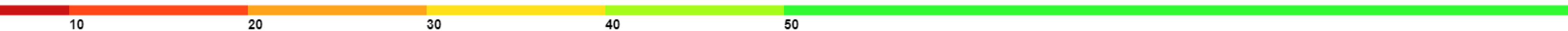
Every Tuesday, Wednesday, and Thursday



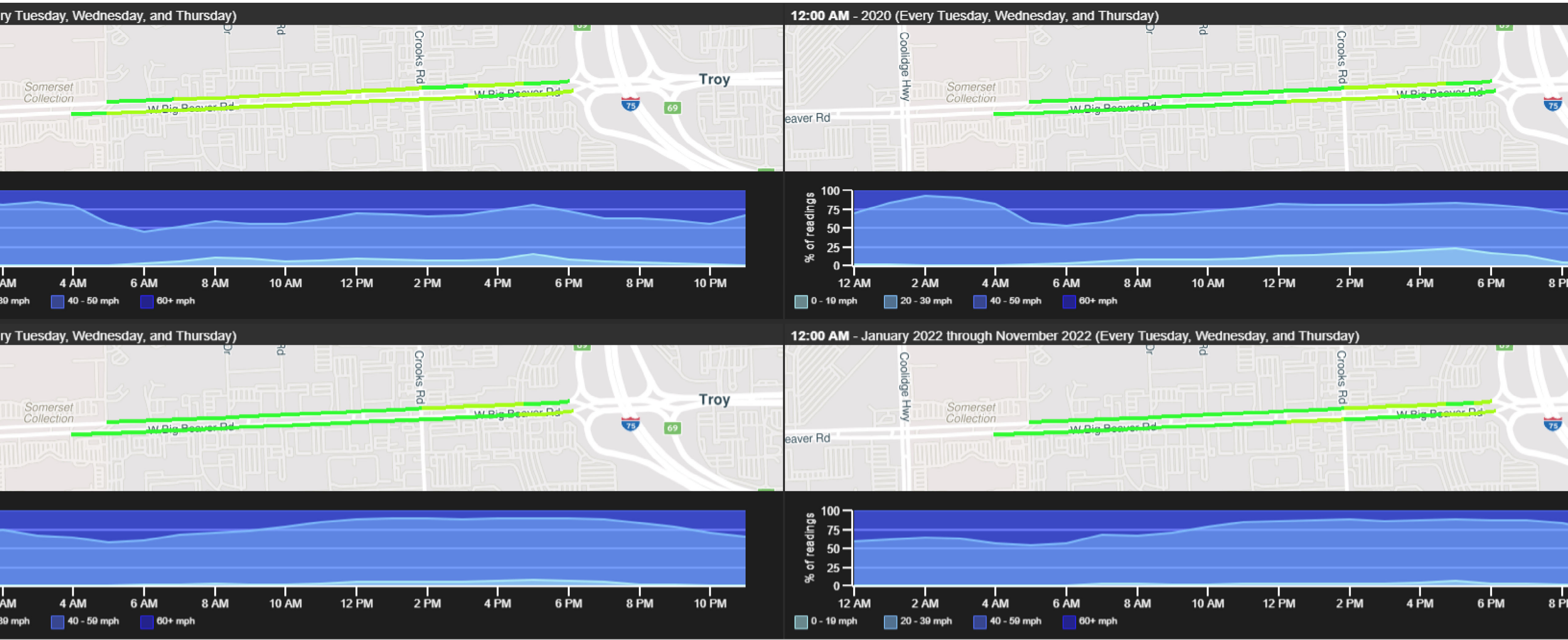
12:00 AM - January 2022 through November 2022 (Every Tuesday, Wednesday, and Thursday)



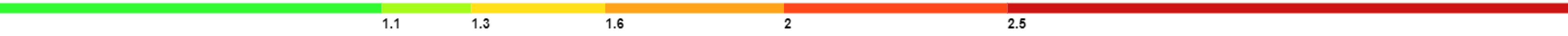
Speed (mph)



Travel time index Trend Map for 2018 (Every Tuesday, Wednesday, and Thursday) and 2020 (Every Tuesday, Wednesday, and Thursday) and 2021 (Every Tuesday, Wednesday, and Thursday) and January 2022 through



Travel time index



OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Big Beaver & Crooks DATE: 1/24/18

CITY/TOWNSHIP: Troy BY: Dawn Bierlein

COUNTY#: 76 STATE#: _____ CHARGES: 78 00076 0

PLEASE PERFORM THE FOLLOWING:

____ ELECTRICAL DEVICE: ____ INSTALL ____ MODERNIZE ____ MAINTENANCE

____ UNDERGROUND: _____

____ EDISON OK: ____ YES ____ NO JOB#: _____

JAN 31 2018

____ COORDINATE W/DISTRICT 7: _____

TRAFFIC OPERATIONS

	DIAL..								3				4			
	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
____ CHANGE TIMING.....																
____ CHANGE OFFSET.....																
____ CHANGE CYCLE LENGTH.....																
____ ADD DIAL/SPLIT.....																

____ CHANGE BREAKOUT OR EPROM: _____

____ CHANGE HOURS OF OPERATION: _____

OLD: _____

NEW: _____

____ REPROGRAM TBC

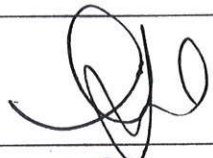
____ INSTALL INTERCONNECT: ____ TBC ____ MINITROL ____ TONE

____ MBT OK: ____ YES ____ NO

____ NO CHANGE - RECORD CORRECTION

X OTHER: Build and install TS1 P44-12 cabinet with Mod 52 SCATS with loop rack, opticom & GPS Opticom & hook up per paperwork. Please call TOC to test. Requires a checksum change.

(REV 2)

APPROVED BY:  DATE: 1/24/18

DATE INSTALLED: 1-27-18

INSTALLED BY: OBRIEN GONG SAHAW

INTERSECTION :- 76 BIG BEAVER & CROOKS
 DESCRIPTION PROMS :- X00076 / F2403
 CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
 SOFTWARE TYPE :- MOD 52 SCATS
 INPUTS :-

- | | | |
|-----|-----------------------|-----------------------------------|
| 1. | WB BIG BEAVER L (LK) | 15. |
| 2. | WB BIG BEAVER C (LK) | 16. |
| 3. | WB BIG BEAVER R (LK) | 17. |
| 4. | WB BIG BEAVER RT (NL) | 18. |
| 5. | SB CROOKS L (LK) | 19. |
| 6. | SB CROOKS R (LK) | 20. |
| 7. | EB BIG BEAVER L (LK) | 21. |
| 8. | EB BIG BEAVER C (LK) | 22. |
| 9. | EB BIG BEAVER R (LK) | 23. Opticom 2 (VD7 Backpanel 167) |
| 10. | EB BIG BEAVER RT (NL) | 24. Opticom 1 (VD8 Backpanel 175) |
| 11. | NB CROOKS L (LK) | |
| 12. | NB CROOKS R (LK) | PED 2 - BIG BEAVER PED P.B. (W1) |
| 13. | NB CROOKS RT (NL) | |
| 14. | SB CROOKS RT (NL) | PED 4 - CROOKS PED P.B. (W2) |

APPROACHES :-

A APP 1 : WB BIG BEAVER L,C,R,RT	APP 2 : EB BIG BEAVER L,C,R,RT
B APP 1 : NB CROOKS L,R,RT	APP 2 : SB CROOKS L,R,RT

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-

1. NO PED 1
2. BIG BEAVER PED (P+)
3. NO PED 3
4. CROOKS PED (P-)

SPECIAL FEATURES :-

Personality revision is 2 (=B).
 Pedestrians have automatic introduction using SCATS Y-.
 OPTICOM 1 CALLS A STAGE. OPTICOM 2 CALL B STAGE.
 CROOKS NEAR has early cut-off operation in B stage.
 Ped BIG BEAVER PED introduction is suppressed when OPTICOM is active.
 Ped CROOKS PED introduction is suppressed when OPTICOM is active.
 A stage has a permanent demand.
 Demand for B stage in flexi and isol - set zneg to disable.

BACKPANEL :- SIZE P44-12 CABINET

LOAD SWITCH	2: BIG BEAVER	A	FLR
LOAD SWITCH	4: CROOKS NEAR	B	FLR
LOAD SWITCH	5: CROOKS FAR (OLA)	C	FLR
LOAD SWITCH	9: BIG BEAVER PED	W1	
LOAD SWITCH	10: CROOKS PED	W2	

JUMPERS :-

195-196, 197-198, 199-200, 201-202, 207-208, 217-218, 219-220, 221-222, 223-224,
 229-230, 233-234, 235-236, 237-238, 298-302, 321-PB1, 325-326, 327-328, 329-PB1,
 334-335, 343-PB1, 347-348, 349-350, 351-PB1, 356-357, 365-366, 367-368, 369-PB1,
 373-PB1, 387-PB1, 391-PB1, 395-PB1.

SIGNAL MONITOR :- 4-5.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 4, 5.
 MINIMUM FLASH = 4+2+1.

 * CONTROLLER INFORMATION SHEET *
 * FOR SITE NO. 76 *
 * DAWN BIERLEIN *
 * 24-JAN-2018 *

CHECKSUMS
 TIMES: DF/337
 PERS: C9/311
 TOTAL: 16/026

FLEXILINK PLAN DATA

Intersection # 76 **State #** _____ **Date:** 01/24/18 **Prepared By:** Dawn Bierlein
Intersection: Big Beaver & Crooks **City:** Troy
Hours of Operation: 7 Days: 24 Hours **Approved By:** Rachel Jones
Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		45	75	75					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		79	102	24					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	Big Beaver	10.0	45.0		4.3	2.2	3.0	1.2	10.0
B	Crooks	10.0	45.0	3.0	4.3	1.7	3.5	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
Big Beaver Ped	7.0	9.7	4.3
Crooks Ped	7.0	7.7	4.3

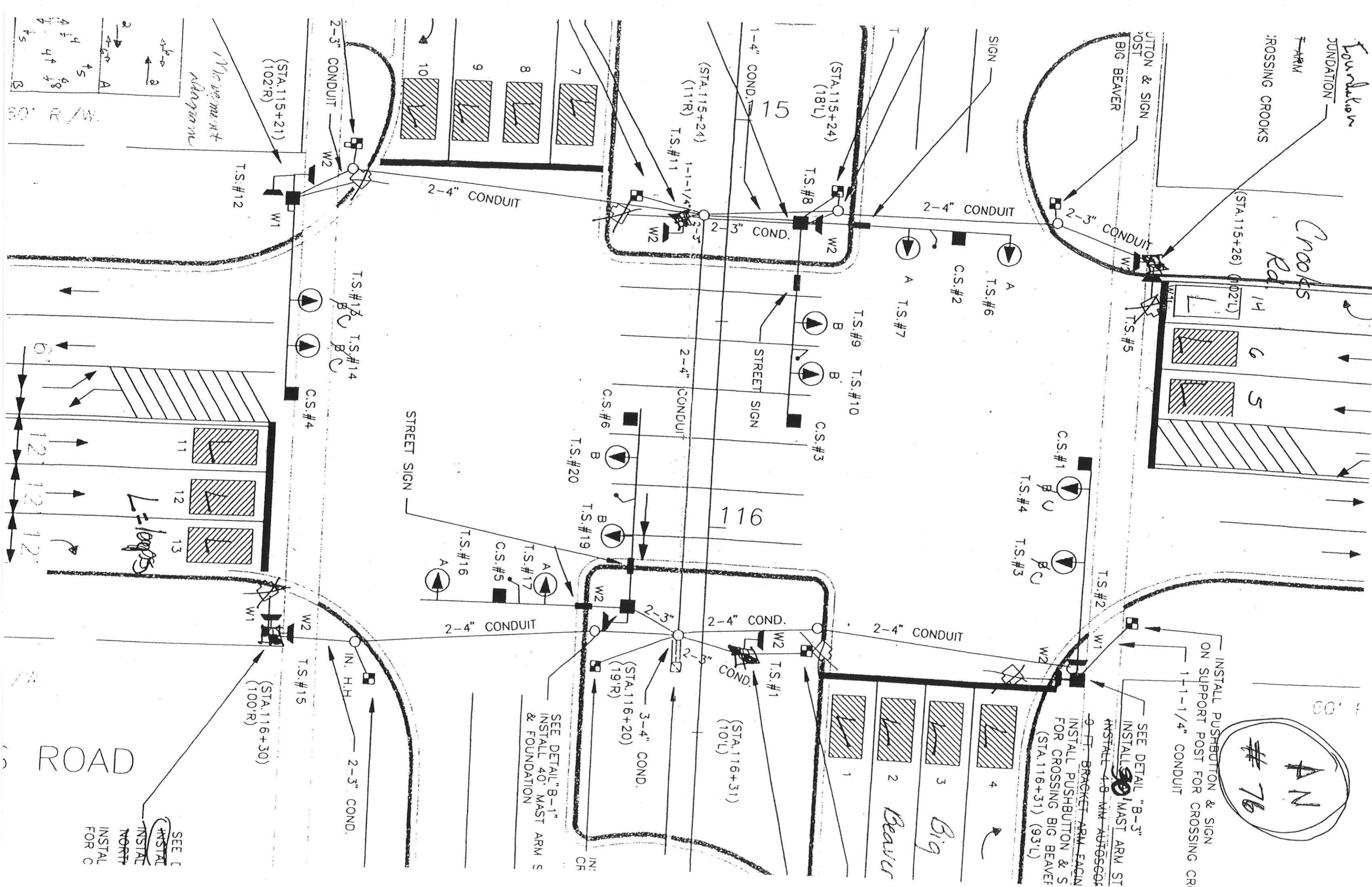
TSM 15 = OPTICOM 2 ALARM TIME = 200
 TSM 16 = OPTICOM 1 ALARM TIME = 200

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER



76 AN

INSTALL PUSHBUTTON & SIGN ON SUPPORT POST FOR CROSSING CROOKS

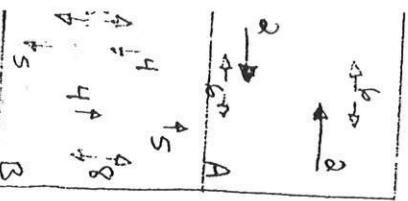
SEE DETAIL "B-3" INSTALL 4.8" MAST ARM SIGN

9-FT. BRACKET ARM FACIN INSTALL PUSHBUTTON & SIGN FOR CROSSING BIG BEAVER (STA. 116+31) (93'L)

SEE DETAIL "B-1" INSTALL 40" MAST ARM SIGN & FOUNDATION

ROAD

SEE C INSTALL NORTH



OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Big Beaver WB + Troy Center SB DATE: 11/02/18
 CITY/TOWNSHIP: Troy BY: C. MARKEL
 COUNTY#: 480 STATE#: — CHARGES: 78004800

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

NOVEMBER 14 2018
OAKLAND COUNTY

UNDERGROUND: _____

EDISON OK: YES NO JOB#: NOV 13 2018

COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
<input type="checkbox"/> CHANGE TIMING.....																			
<input type="checkbox"/> CHANGE OFFSET.....																			
<input type="checkbox"/> CHANGE CYCLE LENGTH.....																			
<input type="checkbox"/> ADD DIAL/SPLIT.....																			

CHANGE BREAKOUT OR EPROM: _____

CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

REPROGRAM TBC

INSTALL INTERCONNECT: TBC MINITROL TONE

MBT OK: YES NO

NO CHANGE - RECORD CORRECTION

OTHER: PLEASE INSTALL AS TAP I/O HARNESS. PROGRAM IP ADDRESSES & UPDATE AS SOFTWARE (IF NEEDED). CALL TOC FOR COMMS & CAMERA (VIDEO AT TOC)

CHECK. Remove det 4,5 calls from controller.

APPROVED BY:  DATE: 11 / 5 / 18

DATE INSTALLED: 11/9/18

INSTALLED BY: JAMES PRATHN

INTERSECTION :- 480 WB BIG BEAVER & TROY CENTER DRIVE
DESCRIPTION PROMS :- X00480 / F2402
CONTROLLER TYPE :- STANDARD PERSONALITY
SOFTWARE TYPE :- MOD 52 SCATS S30

INPUTS :-

- 1. WB BIG BEAVER L (LK) 15. -
- 2. WB BIG BEAVER C (LK) 16. Opticom 1 (D-CONNECTOR PIN 16)
- 3. WB BIG BEAVER R (LK)
- 4. SB TROY CENTER RT L (NL) NOTE :- DETECTORS 1-3 ARE LOOPS.
- 5. SB TROY CENTER RT R (NL) DETECTORS 4 & 5 ARE RACKVISION
- 6. - (AIS-IV CAMERA).
- 7. -
- 8. -
- 9. -
- 10. -
- 11. -
- 12. - PED 2 - BIG BEAVER PED WFG (P1)
- 13. -
- 14. - PED 4 - TROY CENTER PED P.B. (P2)

APPROACHES :-

A APP 1 : WB BIG BEAVER L,C,R
B APP 1 : SB TROY CENTER RT L,RT R

FLEXIDATA :-

SEQUENCE A,B A,B
AUTO REL
R- REL A A
R+ REL B B
Q- REL
Q+ REL

PEDESTRIANS :-

- 1. NO PED 1
- 2. BIG BEAVER PED
- 3. NO PED 3
- 4. TROY CENTER PED (P-P+)

SPECIAL FEATURES :-

Personality revision is 1 (=A).
A Stage has a permanent demand.
Demand for B Stage in flexi and isol, set ZNEG to disable.
Pedestrians have automatic introduction using SCATS Y-.
Opticom 1 calls A stage.
Ped BIG BEAVER PED is walk for green in A stage and is secret under masterlink.
Ped BIG BEAVER PED has automatic introduction in A stage.
Ped BIG BEAVER PED introduction is suppressed when OPTICOM is active.
Ped TROY CENTER PED introduction is suppressed when OPTICOM is active.

BACKPANEL :- SIZE M CABINET

LOAD SWITCH 2: WB BIG BEAVER A FLA
LOAD SWITCH 4: SB TROY CENTER B FLR
LOAD SWITCH 6: BIG BEAVER PED P1
LOAD SWITCH 8: TROY CENTER PED P2

JUMPERS :-

121-213,151-152,153-154,155-156,173-174,175-176,177-178,179-180,185-186,
223-224,229-230,233-PB1,237-PB1,241-PB1,255-256,257-258,259-260,261-262
263-PB1,268-269,273-274.

SIGNAL MONITOR :- NONE.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 4.
MINIMUM FLASH = 4+2+1.

* CONTROLLER INFORMATION SHEET *
* FOR SITE NO. 480 *
* CARISSA MARKEL *
* Wed, 28-May-2008 10:45:20 *

CHECKSUMS
TIMES: B7/267
PERS: F9/371
TOTAL: 4E/116

FLEXILINK PLAN DATA

Intersection # 480 State # _____ Date: 05/28/08 Prepared By: Carissa Markel

Intersection: WB Big Beaver & Troy Center City: Troy

Hours of Operation: Mon-Fri: 6am - 8pm Approved By: Rachel Jones

Hours of Flashing: Mon-Fri: 8pm - 6am; Sat&Sun: 24 Hours

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120	120				
1	A		0	0	0	0				
2	B		57	93	83	93				
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		66	90	12	12				
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	WB Big Beaver	10.0	50.0	3.7	4.3	2.5	3.0	1.2	10.0
B	Troy Center	5.0	20.0		3.5	1.9	3.0	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	4
SC4	8	17:00	3
SC5	8	19:00	1
SC6	8	20:00	0
SC7	14	0:00	0
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
Big Beaver Ped	7.0	3.7	4.3
Troy Center Ped	7.0	6.0	3.5

TSM16: Opticom Alarm Time (200 Seconds)

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

AutoScope Detection Camera - IP Port Worksheet

Site: Big Beaver WB & Troy Center

AutoScope Property Editor // Communications Tab

	Camera #1	Camera #2	Camera #3	Camera #4
Network Address:	10.32.52.68	10.32.52.69	10.32.52.70	10.32.52.71
Subnet Mask:	255.255.255.240	255.255.255.240	255.255.255.240	255.255.255.240
Default Gateway:	10.32.52.65	10.32.52.65	10.32.52.65	10.32.52.65

AutoScope Property Editor // Advanced Comm Tab

Supervisor IP Port (54321):	56011	56021	56031	56041
Detector IP Port (54322):	56012	56022	56032	56042
Video Streaming IP Port (554):	56013	56023	56033	56043
Web IP Port (80):	56014	56024	56034	56044
Traffic Data IP Port (54323):	56015	56025	56035	56045

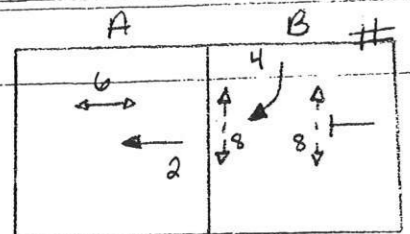
AutoScope Property Editor // Communications Tab

	Camera #5	Camera #6	Camera #7	Camera #8
Network Address:	10.32.52.72	10.32.52.73	10.32.52.74	10.32.52.75
Subnet Mask:	255.255.255.240	255.255.255.240	255.255.255.240	255.255.255.240
Default Gateway:	10.32.52.65	10.32.52.65	10.32.52.65	10.32.52.65

AutoScope Property Editor // Advanced Comm Tab

Supervisor IP Port (54321):	56051	56061	56071	56081
Detector IP Port (54322):	56052	56062	56072	56082
Video Streaming IP Port (554):	56053	56063	56073	56083
Web IP Port (80):	56054	56064	56074	56084
Traffic Data IP Port (54323):	56055	56065	56075	56085

BIG BEAVER ROAD



480

PB for NS

w2 (WB)

w1 (WB)

1-4" CONDUIT

w1 (WB)

w1 (WB)

IN. H.H.

w1 (WB)

w2 (WB)

PB for NS

INSTALL
SENSOR II
CAMERA &
18' BRACKET
ARM ON
STEEL POLE

STREET SIGN
T.S.#4 T.S.#3

C.S.#1

2-3" CONDUIT

1-3" CONDUIT

IN. 30' MAST ARM STD. & FOUNDATION
IN. 2-50' MAST ARMS
(127+70)(19'L)

3-4" CONDUIT
INSTALL SCATS NEMA COMPATIBLE TRAFFIC SIGNAL
CONTROLLER IN BASE MOUNTED CABINET ON NEW FOUNDATION

2-PB for NS

w2 (WB)

w2 (EB)

3-4" CONDUIT

2-4" conduit

2-3" CONDUIT
IN. 30' MAST ARM STD. & FOUNDATION
IN. 2-50' MAST ARMS
(127+77)(19'R)

2-PB for NS

w2 (WB)

w2 (EB)

1-3" CONDUIT

C.S.#1

T.S.#3

T.S.#4

1-4" CONDUIT

T.S.#1

STREET SIGN

T.S.#2

1-4" CONDUIT

1-3" CONDUIT

w1 (EB)

w1 (EB)

1-3" w2 (EB)

PB for NS

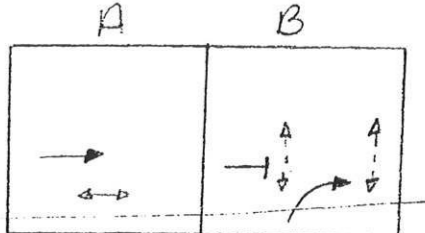
597

PB for NS

w2 (EB)

w1 (EB)

w1 (EB)



VLS

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Big Beaver & X10 E/o Crooks DATE: 8/5/10

CITY/TOWNSHIP: Troy BY: E Labiano

COUNTY#: 595 STATE#: _____ CHARGES: _____

PLEASE PERFORM THE FOLLOWING:

_____ ELECTRICAL DEVICE: _____ INSTALL _____ MODERNIZE _____ MAINTENANCE

_____ UNDERGROUND: _____

_____ EDISON OK: _____ YES _____ NO JOB#: _____

_____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CHANGE TIMING.....																
CHANGE OFFSET.....																
CHANGE CYCLE LENGTH.....																
ADD DIAL/SPLIT.....																

CHANGE BREAKOUT OR EPROM: Rev 2 opticon input

_____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

_____ REPROGRAM TBC

_____ INSTALL INTERCONNECT: _____ TBC _____ MINITROL _____ TONE

_____ MBT OK: _____ YES _____ NO

_____ NO CHANGE - RECORD CORRECTION

OTHER: Requires a checksum change

APPROVED BY: [Signature] DATE: 8, 5, 10

DATE INSTALLED: 8-9-10

INSTALLED BY: Reich

INTERSECTION :- 595 BIG BEAVER (WB) & X/O E/O CROOKS
DESCRIPTION PROMS :- X00595 / F2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS

INPUTS :-

- | | | | |
|-----|-----------------------|-----|--------------------------------|
| 1. | X/O E/O CROOKS L (NL) | 13. | NOTE: ALL DETECTORS ARE LOOPS. |
| 2. | X/O E/O CROOKS C (NL) | 14. | - |
| 3. | X/O E/O CROOKS R (NL) | 15. | - |
| 4. | WB BIG BEAVER L (LK) | 16. | Opticom 1 (D-CONNECTOR PIN 16) |
| 5. | WB BIG BEAVER C (LK) | 17. | - |
| 6. | WB BIG BEAVER R (LK) | 18. | - |
| 7. | - | 19. | - |
| 8. | - | 20. | - |
| 9. | - | 21. | - |
| 10. | - | 22. | - |
| 11. | - | 23. | - |
| 12. | - | 24. | - |

APPROACHES :-

A APP 1 : WB BIG BEAVER L,C,R
B APP 1 : X/O E/O CROOKS L,C,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-

SPECIAL FEATURES :-

Personality revision is 2 (=B).
Opticom 1 calls A stage.
A stage has a permanent demand.
Demand for B stage flexi and isol - set zneg to disable.

BACKPANEL :- SIZE M CABINET

LOAD SWITCH	2: BIG BEAVER WB	A	FLA
LOAD SWITCH	4: X/O E/O CROOKS	B	FLR

JUMPERS :-

121-213,151-152,153-154,155-156,173-174,175-176,177-178,233-PB1,
237-PB1,241-PB1,255-256,257-258,259-260,261-262,263-PB1.

SIGNAL MONITOR :- NONE.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 4.
MINIMUM FLASH = 4+2+1.

* CONTROLLER INFORMATION SHEET *
* FOR SITE NO. 595 *
* E LABIANO *
* Fri, 5-AUG-2010 08:55:44 *

TI : 8E/216
Pcvs : 92/222
Total: 1C/1034 ✓

FLEXILINK PLAN DATA

Intersection # 595 State # _____ Date: 08/05/10 Prepared By: E LABIANO

Intersection: Big Beaver (WB) & X/O E/O Crooks City: Troy

Hours of Operation: 7 Days: 24 Hours Approved By: Rachel Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		56	85	75					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		74	98	20					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	Big Beaver (WB)	10.0	50.0		4.3	1.6	3.0	1.2	10.0
B	X/O E/O Crooks	5.0	20.0		3.5	1.9	4.0	2.0	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

TSM16: Opticom Alarm Time (200 Seconds)

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

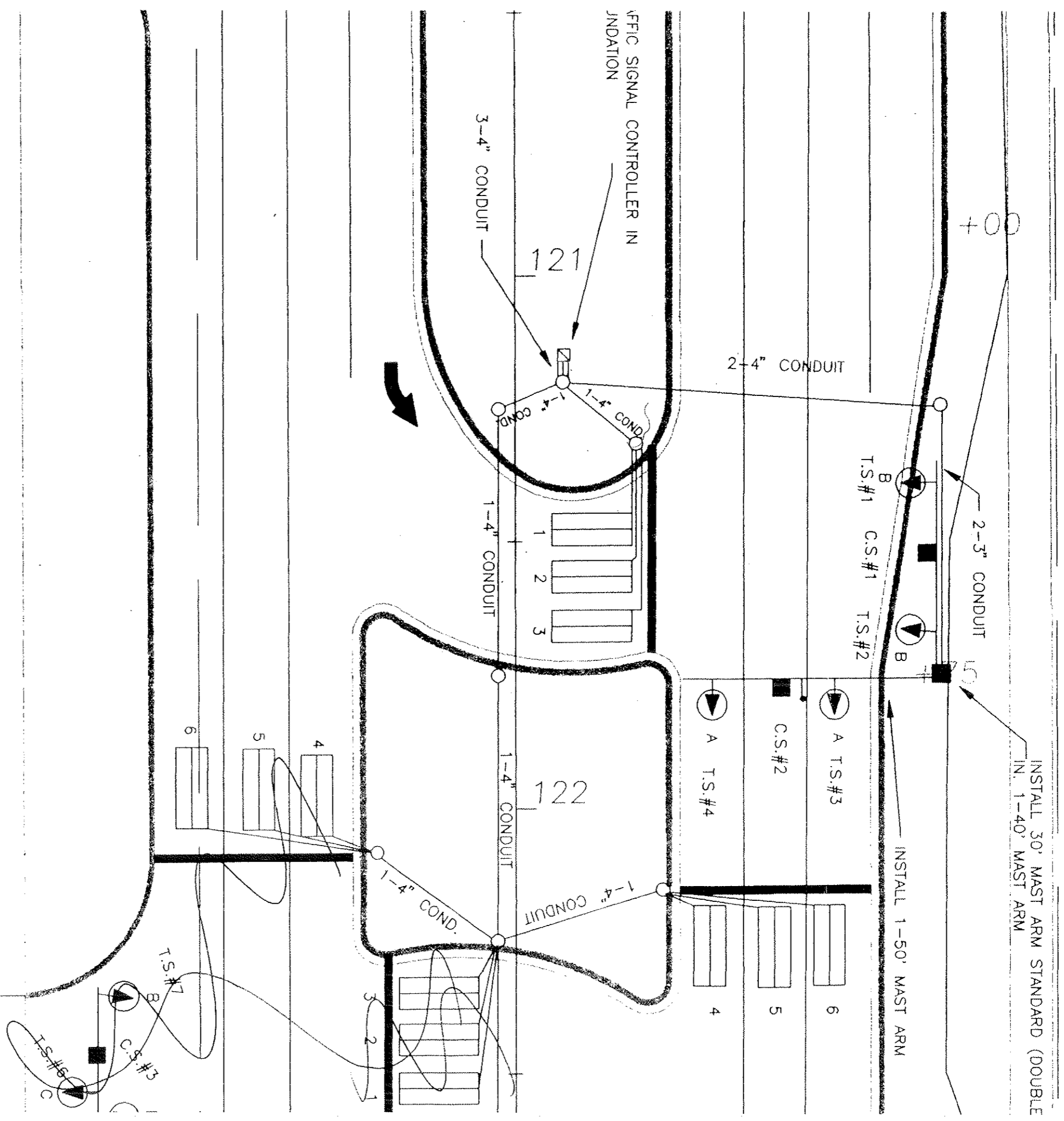
DAY OF WEEK CODE NUMBER

	End of Schedule						
0		4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

FN

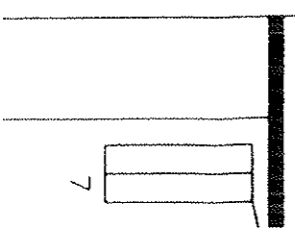
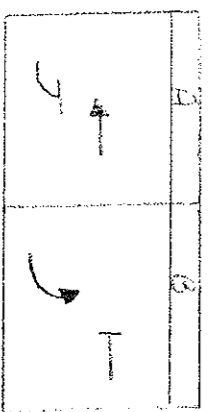
WESTBOUND *Big Beaver* 102' R./W.

(STA. 121+75) (80'L)



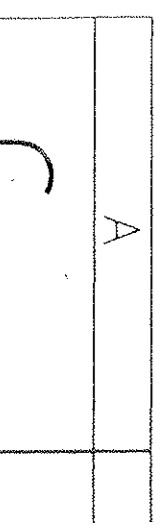
/O CROOKS ROAD
(STA. 121+50)
(WESTBOUND)

Movement Diagram



MOV

F



OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Big Beaver & X/O W/O Crooks DATE: 8/5/10
 CITY/TOWNSHIP: Troy BY: E Labiano
 COUNTY#: 596 STATE#: - CHARGES: 78 00 5960

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

UNDERGROUND: _____

EDISON OK: YES NO JOB#: _____

COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CHANGE TIMING.....																
CHANGE OFFSET.....																
CHANGE CYCLE LENGTH.....																
ADD DIAL/SPLIT.....																

CHANGE BREAKOUT OR EPROM: Rev 2 (opticom input)

CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

REPROGRAM TBC

INSTALL INTERCONNECT: TBC MINITROL TONE

MBT OK: YES NO

NO CHANGE - RECORD CORRECTION

OTHER: Requires a checksum change

APPROVED BY: [Signature] DATE: 8/6/10

DATE INSTALLED: _____

INSTALLED BY: _____

INTERSECTION :- 596 BIG BEAVER & X/O W/O CROOKS
DESCRIPTION PROMS :- X00596 / F2002
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS

INPUTS :-

- | | | | |
|-----|-----------------------|-----|--------------------------------|
| 1. | X/O W/O CROOKS L (NL) | 13. | NOTE: ALL DETECTORS ARE LOOPS. |
| 2. | X/O W/O CROOKS C (NL) | 14. | - |
| 3. | X/O W/O CROOKS R (NL) | 15. | - |
| 4. | EB BIG BEAVER L (LK) | 16. | Opticom 1 (D-CONNECTOR PIN 16) |
| 5. | EB BIG BEAVER CL (LK) | 17. | - |
| 6. | EB BIG BEAVER CR (LK) | 18. | - |
| 7. | EB BIG BEAVER R (LK) | 19. | - |
| 8. | - | 20. | - |
| 9. | - | 21. | - |
| 10. | - | 22. | - |
| 11. | - | 23. | - |
| 12. | - | 24. | - |

APPROACHES :-

A APP 1 : EB BIG BEAVER L,CL,CR,R
B APP 1 : X/O W/O CROOKS L,C,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-

SPECIAL FEATURES :-

Personality revision is 2 (=B).
Opticom 1 calls A stage.
A stage has a permanent demand.
Demand for B stage flexi and isol - set zneg to disable.

BACKPANEL :- SIZE M CABINET

LOAD SWITCH	2:	EB BIG BEAVER	A	FLA
LOAD SWITCH	4:	X/O W/O CROOKS	B	FLR

JUMPERS :-

121-213,151-152,153-154,155-156,173-174,175-176,177-178,233-PB1,
237-PB1,241-PB1,255-256,257-258,259-260,261-262,263-PB1.

SIGNAL MONITOR :- NONE.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 4.
MINIMUM FLASH = 4+2+1.

```
*****
* CONTROLLER INFORMATION SHEET *
*   FOR SITE NO. 596           *
*           E LABIANO         *
*   DATE: 5-AUG-2010         *
*****
```

Checksum

<i>Times</i>	<i>3A / 72</i>
<i>Pers</i>	<i>FA / 372</i>
<i>Total</i>	<i>CO / 300 ✓</i>

FLEXILINK PLAN DATA

Intersection # 596 State # _____ Date: 08/05/10 Prepared By: E LABIANO

Intersection: Big Beaver & X/O W/O Crooks City: Troy

Hours of Operation: 7 Days: 24 Hours Approved By: D DENEAU

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		56	85	75					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		74	98	20					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED

BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17

254 FOR ENTRIES #8 - #15

'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	EB Big Beaver	10.0	50.0		4.3	1.1	3.0	1.2	10.0
B	Crossover	5.0	20.0		3.5	1.9	3.5	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	14	0:00	1
SC2	8	6:00	2
SC3	8	9:00	1
SC4	8	15:00	3
SC5	8	19:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

TSM16: Opticom Alarm Time (200 Seconds)

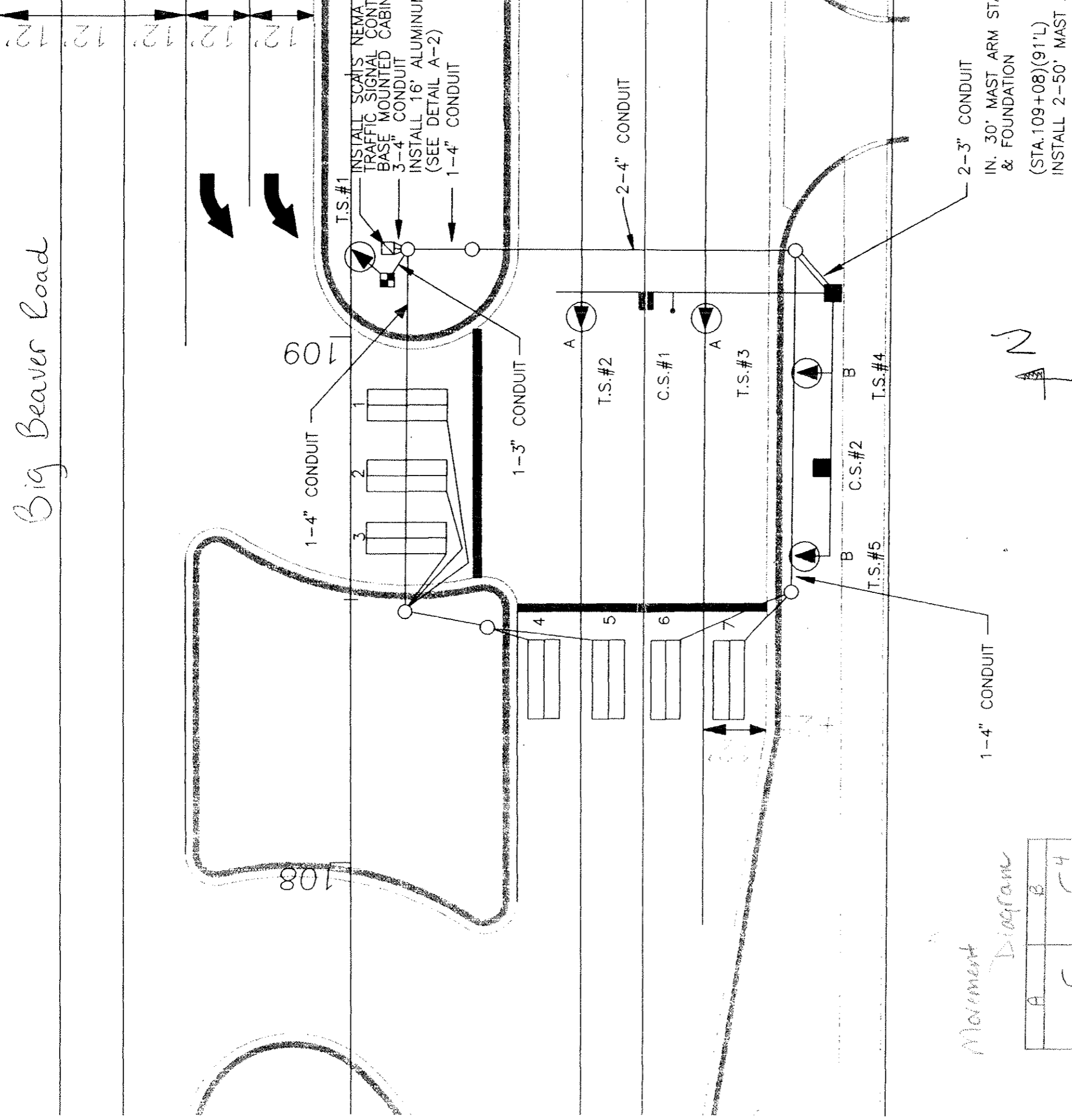
Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

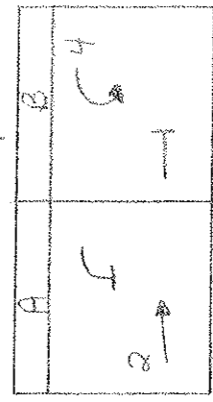
DAY OF WEEK CODE NUMBER

Code	End of Schedule	Day	Code	Day	Code	Day	
0		4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

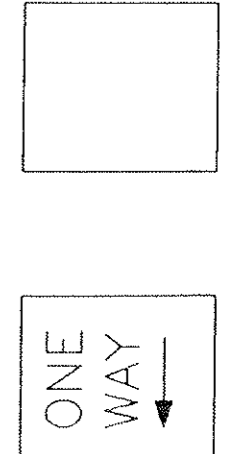
Big Beaver Road



Movement Diagram



GN LEGEND



C.S.#2
C.S.#1

X-OVER W/O CROOKS ROAD

LEGEND

NEW SIGNAL 12"
NEW SIGNAL 8"
SIGNAL TO REMAIN

INSTALL SCATS NEMA TRAFFIC SIGNAL CONT. BASE MOUNTED CABINETS
3-4" CONDUIT
INSTALL 16' ALUMINUM (SEE DETAIL A-2)
1-4" CONDUIT

2-3" CONDUIT
IN. 30' MAST ARM ST. & FOUNDATION
(STA. 109+08)(91'L)
INSTALL 2-50' MAST

12' 12' 12' 12' 12'

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: EB Big Beaver + Troy Center Drive (NB) DATE: 5/28/08

CITY/TOWNSHIP: Troy BY: C. Markel

COUNTY#: 597 STATE#: - CHARGES: 7800 ~~570~~ ⁹⁹⁹

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

UNDERGROUND: _____

EDISON OK: YES NO JOB#: _____

COORDINATE W/DISTRICT 7: _____

	DIAL..															
	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<input type="checkbox"/>																
<input type="checkbox"/>																
<input type="checkbox"/>																
<input type="checkbox"/>																

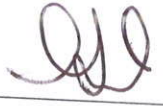
CHANGE TIMING.....
 CHANGE OFFSET.....
 CHANGE CYCLE LENGTH.....
 ADD DIAL/SPLIT.....

CHANGE BREAKOUT OR EPROM: Change Personality -> Rev#1

CHANGE HOURS OF OPERATION:
 OLD: _____
 NEW: _____

REPROGRAM TBC
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION

OTHER: Requires a checksum change. Swap out existing controller with Mod 52 Scats controller. Swap out existing AWA d-connector with Mod 52 d-connector; wire d-connector per paperwork. See attached for cabinet changes. Remove all AT&T comms equipment. Install and hook up wireless comms equipment.

APPROVED BY:  DATE: 5/16/08
 DATE INSTALLED: _____
 INSTALLED BY: _____

CO# 597 – CABINET CHANGES

LOAD SWITCHES –

REMOVE: LS 1, 7

ADD: LS 4, 6

BACKPANEL JUMPERS –

REMOVE: 145-146,147-148,149-150,157-224,163-230,167-168,169-170,
171-172,179-202,185-208,233-234,235-236,247-273,251-269
259-PB1.

ADD: 179-180,185-186,223-224,229-230,233-PB1,259-260,261-262,
268-269,273-274.

SIGNAL MONITOR SWITCHES –

REMOVE: SSM 1

ADD: SSM 4

FIELD WIRING, FLASH PROGRAM, & OPTICOM –
WIRE PER CONTROLLER INFORMATION SHEET

LOOPS/D-CONNECTOR –
WIRE PER LOOP SHEET

INTERSECTION :- 597 EB BIG BEAVER & TROY CENTER DRIVE

DESCRIPTION PROMS :- X00597 / F2402

CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER

SOFTWARE TYPE :- MOD 52 SCATS

INPUTS :-

- | | | | |
|-----|-----------------------|-----|-----------------------------------|
| 1. | EB BIG BEAVER L (LK) | 15. | NOTE: ALL DETECTORS ARE LOOPS. |
| 2. | EB BIG BEAVER C (LK) | 16. | Opticom 1 (D-CONNECTOR PIN 16) |
| 3. | EB BIG BEAVER R (LK) | 17. | - |
| 4. | NB TROY CENTER L (NL) | 18. | - |
| 5. | NB TROY CENTER C (NL) | 19. | - |
| 6. | NB TROY CENTER R (NL) | 20. | - |
| 7. | - | 21. | - |
| 8. | - | 22. | - |
| 9. | - | 23. | - |
| 10. | - | 24. | - |
| 11. | - | | |
| 12. | - | | PED 2 - BIG BEAVER PED WFG (W1) |
| 13. | - | | |
| 14. | - | | PED 4 - TROY CENTER PED P.B. (W2) |

APPROACHES :-

A APP 1 : EB BIG BEAVER L,C,R

B APP 1 : NB TROY CENTER L,C,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-

1. NO PED 1
2. BIG BEAVER PED
3. NO PED 3
4. TROY CENTER PED (P-P+)

SPECIAL FEATURES :-

Personality revision is 1 (=A).
 A Stage has permanent demand.
 Demand for B Stage in flexi and isol, set ZNEG to disable.
 Pedestrians have automatic introduction using SCATS Y-.
 Opticom 1 calls A stage.
 Ped BIG BEAVER PED is walk for green in A stage and is secret under masterlink.
 Ped BIG BEAVER PED has automatic introduction in A stage.
 Ped BIG BEAVER PED introduction is suppressed when OPTICOM is active.
 Ped TROY CENTER PED introduction is suppressed when OPTICOM is active.

BACKPANEL :- SIZE M CABINET

LOAD SWITCH	2:	EB BIG BEAVER	A	FLA
LOAD SWITCH	4:	NB TROY CENTER	B	FLR
LOAD SWITCH	6:	BIG BEAVER PED	W1	
LOAD SWITCH	8:	TROY CENTER PED	W2	

JUMPERS :-

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 179-180, 185-186,
 223-224, 229-230, 233-PB1, 237-PB1, 241-PB1, 255-256, 257-258, 259-260, 261-262,
 263-PB1, 268-269, 273-274.

SIGNAL MONITOR :- NONE.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 4.
 MINIMUM FLASH = 4+2+1.

 * CONTROLLER INFORMATION SHEET *
 * FOR SITE NO. 597 *
 * CARISSA MARKEL *
 * Wed, 28-May-2008 09:31:12 *

Checksums

Times: EC/354

Pers: 27/047

Total: CB/313 ✓

FLEXILINK PLAN DATA

Intersection # 597 State # _____ Date: 05/28/08 Prepared By: Carissa Markel

Intersection: EB Big Beaver and Troy Center City: Troy

Hours of Operation: Mon-Fri: 6am - 8pm Approved By: Rachel Jones

Hours of Flashing: Mon-Fri: 8pm - 6am; Sat&Sun: 24 Hours

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		57	94	84					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		2	4	46					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	EB Big Beaver	10.0	53.0	3.7	4.3	2.5	3.0	1.2	10.0
B	Troy Center	5.0	15.0		3.5	1.9	3.0	1.2	9.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	8	20:00	0
SC6	14	0:00	0
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
Big Beaver Ped	7.0	3.7	4.3
Troy Center Ped	7.0	6.0	3.5

TSM16: Opticom Alarm Time (200 Seconds)

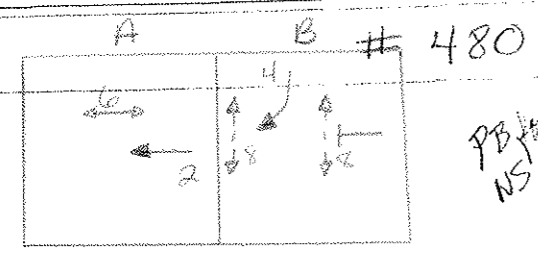
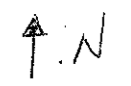
Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

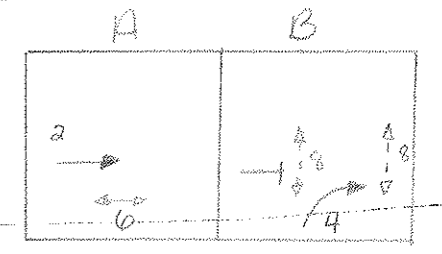
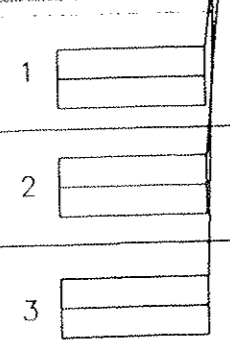
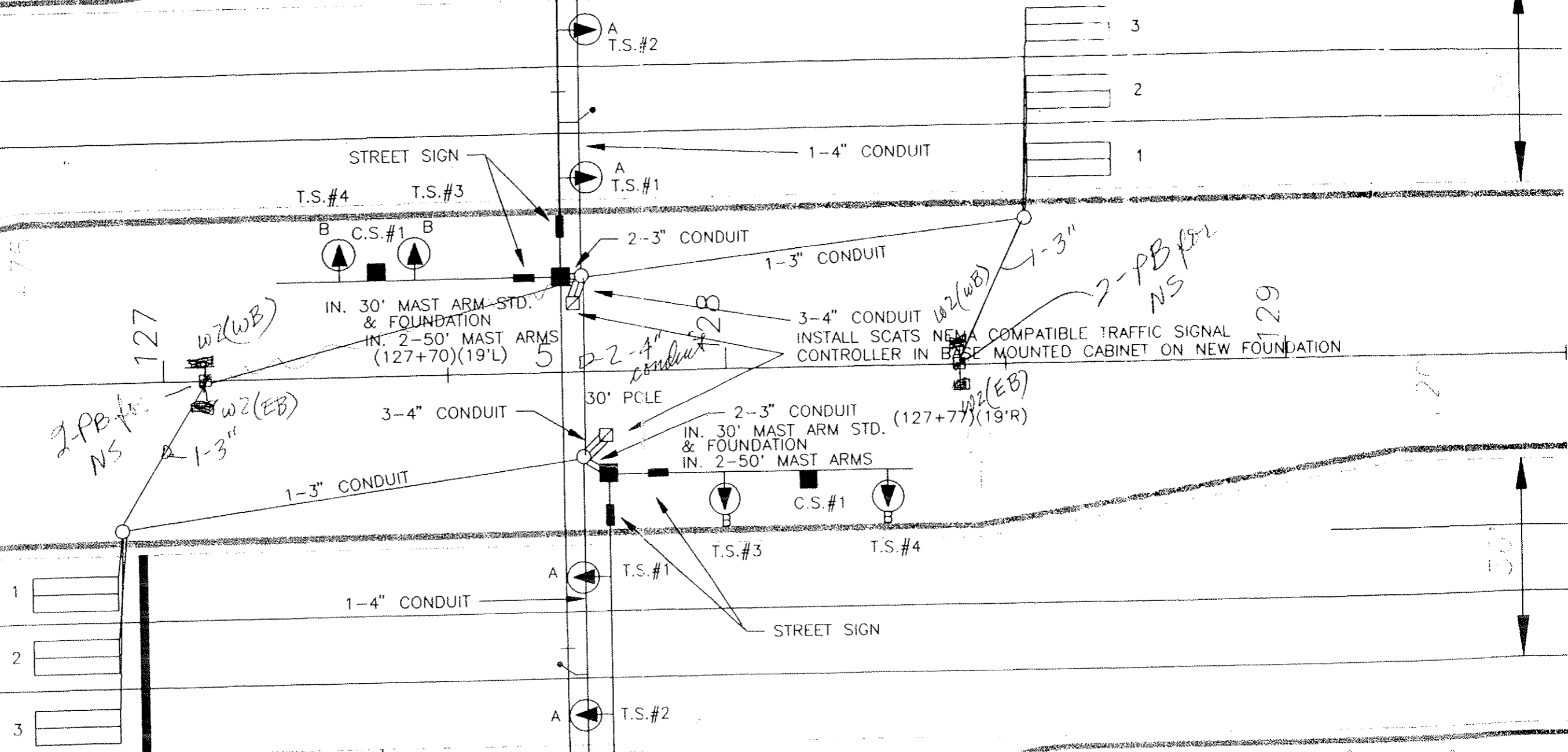
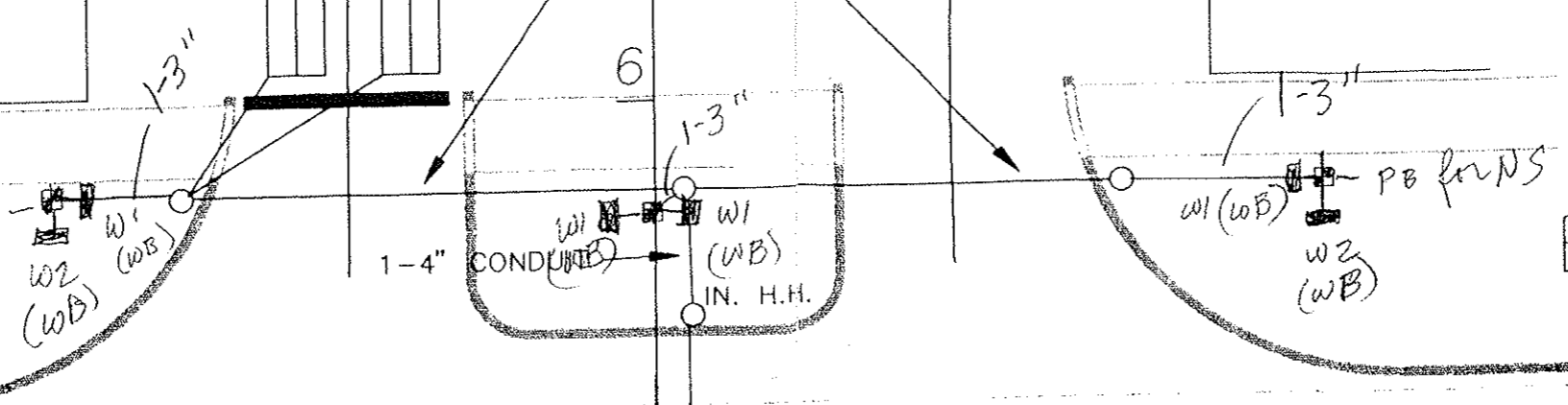
DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

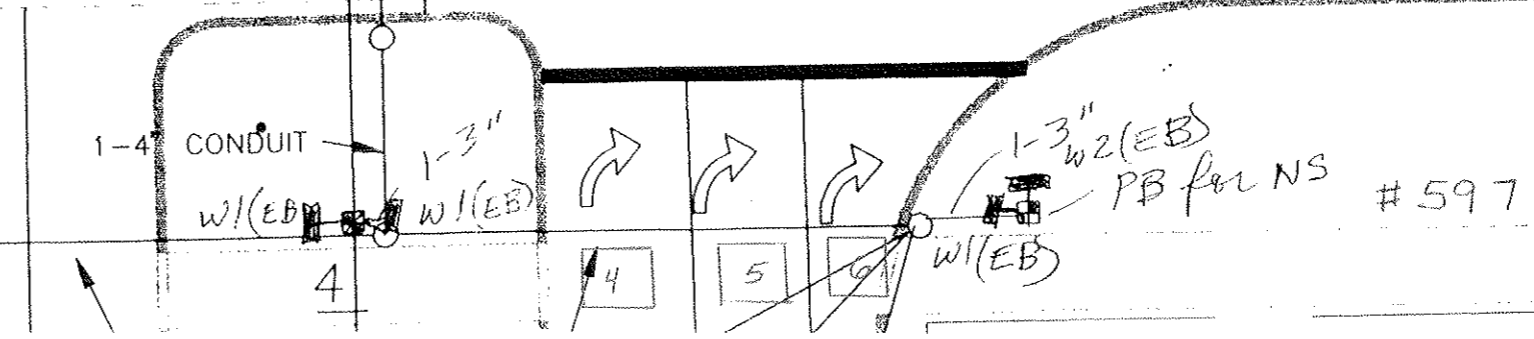
BIG BEAVER ROAD



PB for NS



PB for NS



#597

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Big Beaver + X/O w/o Troy Center/Kelly DATE: 12/5/16

CITY/TOWNSHIP: Troy BY: C. Markel

COUNTY#: 812 STATE#: — CHARGES: 78008120

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

UNDERGROUND: _____

EDISON OK: YES NO JOB#: NOV 22 2017

COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<input type="checkbox"/> CHANGE TIMING.....																
<input type="checkbox"/> CHANGE OFFSET.....																
<input type="checkbox"/> CHANGE CYCLE LENGTH.....																
<input type="checkbox"/> ADD DIAL/SPLIT.....																

CHANGE BREAKOUT OR EPROM: _____

CHANGE HOURS OF OPERATION:
 OLD: _____
 NEW: _____

REPROGRAM TBC

INSTALL INTERCONNECT: TBC MINITROL TONE

MBT OK: YES NO

NO CHANGE - RECORD CORRECTION

OTHER: Please install wireless vehicle detection, SPP radio, and pucks per print. Hook up pucks per paperwork. (Note: No change w/ personality / data key).

APPROVED BY: [Signature] DATE: 12/6/16

DATE INSTALLED: 11/20/17

INSTALLED BY: Jordan, French

INTERSECTION :- 812 BIG BEAVER & X/O W/ O TROY CENTER/KELLY DRIVE
DESCRIPTION PROMS :- X00812 / F3003
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS

INPUTS :-

1. X/O W/O TROY CENTER L (5 SEC)	13. NOTE: DETECTORS 1-7 ARE LOOPS.
2. X/O W/O TROY CENTER C (5 SEC)	14. DETECTORS 8-9 ARE PUCKS.
3. X/O W/O TROY CENTER R (5 SEC)	15. -
4. WB BIG BEAVER L (LK)	16. Opticom 1 (D-CONNECTOR PIN 16)
5. WB BIG BEAVER C (LK)	17. -
6. WB BIG BEAVER R (LK)	18. -
7. WB BIG BEAVER RT (LK)	19. -
8. NB KELLY DRIVE L (NL)	20. -
9. NB KELLY DRIVE R (NL)	21. -
10. -	22. -
11. -	23. -
12. -	24. -

APPROACHES :-

A APP 1 : WB BIG BEAVER L,CL,CR,R
B APP 1 : X/O W/O TROY CENTER L,C,R
C APP 1 : NB KELLY DRIVE L,R

FLEXIDATA :-

SEQUENCE	A,B,C	A,B,C
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL	C	C
Q+ REL		

PEDESTRIANS :-

SPECIAL FEATURES :-

Personality revision is 2 (=B).
A Stage has a permanent demand.
Demand for B & C Stages in flexi and isol, set ZNEG to disable.
Personality has Emergency Service Table type 1.
Opticom 1 calls A Stage.

BACKPANEL :- SIZE M CABINET

LOAD SWITCH	2: BIG BEAVER	A	FLA
LOAD SWITCH	3: KELLY DRIVE	C	FLR
LOAD SWITCH	4: X/O W/O TROY CENTER	B	FLR

JUMPERS :-

121-213,151-152,153-154,155-156,167-168,169-170,171-172,173-174,
175-176,177-178,233-PB1,237-238,239-240,241-PB1,255-256,257-258,
259-260,261-262,263-PB1.

SIGNAL MONITOR :- NONE.

ALL SWITCHES OFF EXCEPT: DUAL SELECT A&B; G&Y ENABLE; SSM 2, 3, 4.
MINIMUM FLASH = 4+2+1.

* CONTROLLER INFORMATION SHEET *
* FOR SITE NO. 812 *
* CARISSA MARKEL *
* 15-Oct-2010 *

CHECKSUMS
TIMES: DF/337
PERS: OC/014
TOTAL: D3/323

FLEXILINK PLAN DATA

Intersection # 812 **State #** _____ **Date:** 10/15/10 **Prepared By:** Carissa Markel
Intersection: Big Beaver & X/O W/O Troy Center/Kelly Drive **City:** Troy
Hours of Operation: Mon-Fri: 6:30am - 8pm **Approved By:** Rachel Jones
Hours of Flashing: Mon-Fri: 8pm - 6:30am; Sat & Sun: 24 hours

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		50	65	80					
3	C		65	105	100					
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Y-		78	0	42					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16										
17										

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINUOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	EB Big Beaver	10.0	40.0		4.3	1.1	3.0	1.2	10.0
B	X/O W/O Troy Center	5.0	20.0		3.5	1.9	3.0	1.2	10.0
C	Kelly Drive	5.0	20.0		3.5	1.9	3.0	1.2	10.0
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:30	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	8	20:00	0
SC6	14	0:00	0
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

TSM16: Opticom Alarm Time (200 Seconds)

Normal Operating Mode

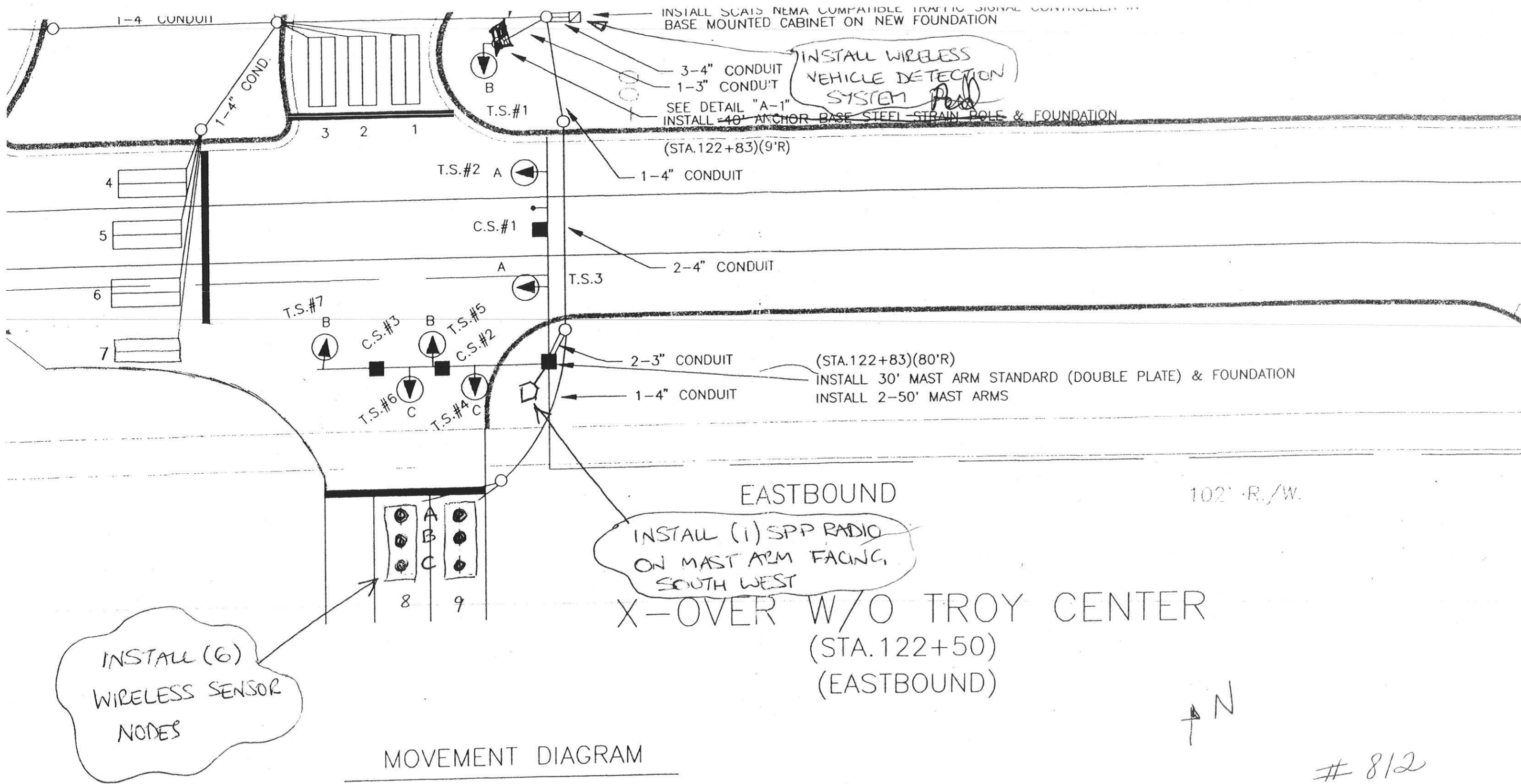
Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

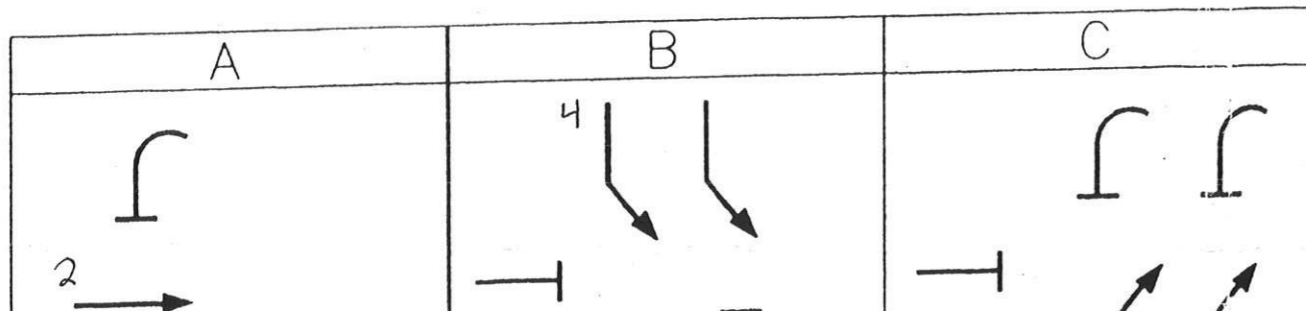
0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

SENSYS DETECTORS

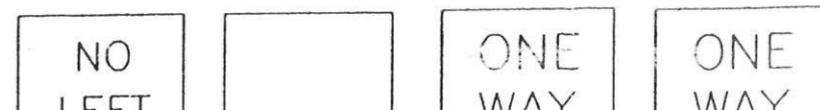
Detector # on Print	Description	D-Connector		Phase
		Terminal #	Description	
1		1	Det 9	
2		2	Det 10	
3		3	Det 11	
4		4	Det 12	
5		5	Det 13	
6		6	Det 14	
7		7	Det 15	
8	NB Kelly Dr L	8	Det 16	3
9	NB Kelly Dr R	9	Det 17	3
10		10	Det 18	
11		11	Det 19	
12		12	Det 20	
13		13	Det 21	
14		14	Det 22	
15		15	Det 23	
16		16	Det 24	
17		Backpanel VD1		
18		Backpanel VD2		
19		Backpanel VD3		
20		Backpanel VD4		
21		Backpanel VD5		
22		Backpanel VD6		
23		Backpanel VD7		
24		Backpanel VD8		



MOVEMENT DIAGRAM



CASE SIGN LEGEND



LEGEND



812

4
AR

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Crooks & Butterfield DATE 8/13/13

CITY/TOWNSHIP: Troy BY: Dawn Bierlein

COUNTY#: 1161 STATE#: _____ CHARGES: 51671-0981

LABOR:
MATERIALS: 88 51671 1

PLEASE PERFORM THE FOLLOWING:

___ ELECTRICAL DEVICE: ___ INSTALL ___ MODERNIZE ___ MAINTENANCE

___ UNDERGROUND: _____

___ EDISON OK: ___ YES ___ NO JOB#: _____

___ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
___ CHANGE TIMING.....																			
___ CHANGE OFFSET.....																			
___ CHANGE CYCLE LENGTH.....																			
___ ADD DIAL/SPLIT.....																			

___ CHANGE BREAKOUT OR EPROM: _____

___ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

___ REPROGRAM TBC

___ INSTALL INTERCONNECT: ___ TBC ___ MINITROL ___ TONE

___ MBT OK: ___ YES ___ NO

___ NO CHANGE - RECORD CORRECTION

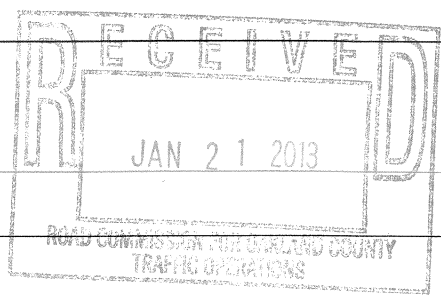
X OTHER: Build cabinet for contractor with Mod 52 SCATS controller, modem, phone jack, and

autoscope (Terra Rackvision w/ FLIR cameras). AND OPTICOM.

APPROVED BY: [Signature] DATE: 10/16/13

DATE INSTALLED: 12-12-13

INSTALLED BY: Petere / TOC



INTERSECTION :- 1161 Crooks & Butterfield
DESCRIPTION PROMS :- X01161 / F2803
SOFTWARE TYPE:- 2070 SCATS S30

INPUTS :-

1. NB Crooks LT (LK) All detectors are Autoscope
2. NB Crooks Thru L (LK) (Terra Rackvision W/Flir Cameras)
3. NB Crooks Thru R (LK)
4. NB Crooks RT (LK)
5. SB Crooks Thru L (LK)
6. SB Crooks Thru R (LK)
7. SB Crooks RT (LK)
8. EB Butterfield LT (LK)
9. EB Butterfield RT (NL)
24. Opticom 1

Ped 4: Butterfield Ped (North Leg) P.B.
Ped 6: SB Crooks Ped (West Leg) W.F.G.

APPROACHES :-

A APP 1 : NB Crooks LT,Thru L,R, RT A APP 2 : SB Crooks Thru L,R,RT
B APP 1 : EB Butterfield LT & RT

FLEXIDATA :-

PEDESTRIANS :-

SEQUENCE	A,B	A,B	4. Butterfield Ped (North Leg)
AUTO REL			6. SB Crooks Ped (West Leg)
R- REL	A	A	
R+ REL	B	B	
Q- REL			
Q+ REL			

SPECIAL FEATURES :-

Personality revision is 1 (=A).
A Stage has permanent demand.
Demand for B stage in Flexi and Isol, set ZNEG to Disable.
Pedestrians have automatic introduction using SCATS Y-.
Ped SB Crooks Ped (West Leg) has automatic introduction in A stage.

Opticom 1 calls A stage.

BACK PANEL :- P44-16 CABINET
LOAD SWITCH 2: NB CROOKS A
LOAD SWITCH 6: SB CROOKS B
LOAD SWITCH 8: EB BUTTERFIELD C
LOAD SWITCH 10: BUTTERFIELD PED (NORTH LEG) WB
LOAD SWITCH 11: SB CROOKS PED (WEST LEG) WC

FLA
FLA
FLR

MMU 2: (MENU : SET/VIEW CONFIG)

Field Check Enable: Channel 2: G, Y, R
Channel 6: G, Y, R
Channel 8: G, Y, R

Dual Indication Enable: R+G: 2, 6, 8, 10, 11,
R+Y: 2, 6, 8
G+Y: 2, 6, 8

Red Fail Enable: Enable Channel 2, 6, 8

Unit Options: All OFF except:
Recurrent pulse
Program Memory Card

Y & R Clearance Disable: Channel 2, 6, 8 Enabled

Flashing Yellow Arrow: None

Program Card: Compatible Channels:
2-6, 2-11, 6-11, 8-10
Min Flash Time: 4+2+1
Min Yellow Change Disable: 10, 11,
Voltage Monitor Latch: NONE

* CONTROLLER INFORMATION SHEET *
* FOR SITE NO. 1161 *
* Dawn Bierlein *
* 27-Sep-2013 *

CHECKSUM
TIME: B9 / 271
PERS: 0E / 016
TOTAL: B7 / 267

FLEXILINK PLAN DATA

Intersection # 1161 State # _____ Date: 08/08/13 Prepared By: Dawn Bierlein

Intersection: Crooks & Butterfield City: Troy

Flash: M-F: 9pm - 6am; Sat & Sun: 24 Hours Approved By: Rachel Jones

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		53	88	88					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		29	42	94					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
 BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
 254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINOUS = 255

Phase	Direction	Min	Max	ECO	Amber	All Red	Timers		
							Gap	Hdwy	Waste
A	Crooks	10.0	35.0	8.0	4.3	1.2	3.0	1.2	10.0
B	Butterfield	7.0	15.0		3.5	2.5	3.0	1.2	10.0
C									
D									
E									
F									
G									

TSM 16 = Opticom alarm time = 200

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	8	21:00	0
SC6	14	0:00	0
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
Butterfield Ped (North Leg) (Ped 4)	8.0	21.0	3.0
SB Crooks Ped (West Leg) (Ped 6)	7.0	8.0	2.5

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

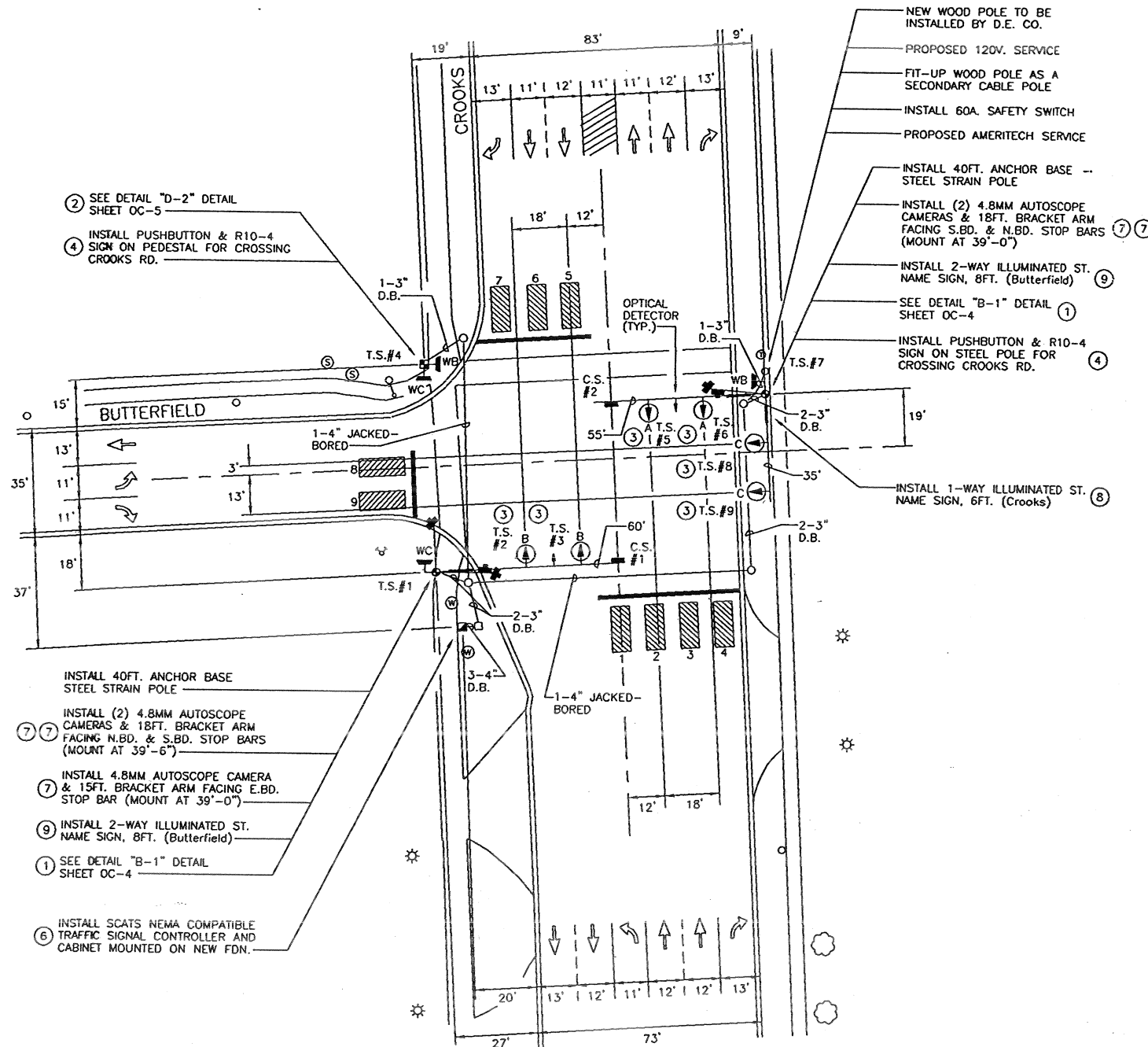
DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

TS2 Terra Rackvision Det Rack BIU #1

CO# 1161

Camera / Card #	Description	Detector No. on Print	Input Description (LS Red)	Rack Output
1	NB Crooks LT	1	LS 2 Red	1
2	NB Crooks Thru L	2	LS 2 Red	2
2	NB Crooks Thru R	3	LS 2 Red	3
2	NB Crooks RT	4	LS 2 Red	4
3	SB Crooks Thru L	5	LS 6 Red	5
3	SB Crooks Thru R	6	LS 6 Red	6
4	SB Crooks RT	7	LS 6 Red	7
5	EB Butterfield LT	8	LS 8 Red	8
5	EB Butterfield RT	9	LS 8 Red	9
				10
				11
				12
				13
				14
				15
				16

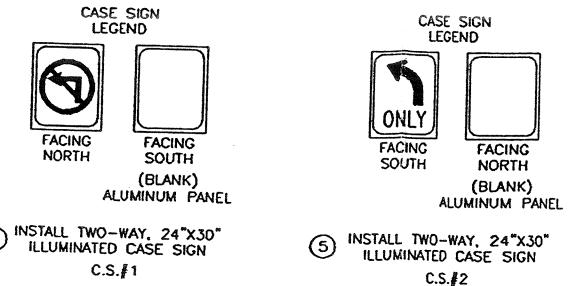
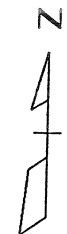


PLAN
SCALE: 1"=20'

ALL MAST ARMS, STEEL POLES, PEDESTALS (INCLUDING BASES), SIGNAL MOUNTING HARDWARE, T.S. CONTROLLER CABINET, STREET NAME SIGNS, CLAMP-ON BRACKET ARMS, AND ALL ASSOCIATED HARDWARE SHALL BE PAINTED TO MATCH VALMONT'S DARK BRONZE (PAINT CODE 333). ALL MATERIALS SHALL BE PAINTED USING THE POWDER COAT PROCESS WHERE POSSIBLE. (SEE POWDER COATING SPECIFICATION.) (PAYMENT FOR PAINTING AND POWDER COATING SHALL BE INCLUDED IN THE AFFECTED PAY ITEMS.)

LOAD	AMPS	WATTS	
SIGNALS	0	0	
CASE SIGNS	0	0	
			DATE
			REVISIONS

- NEW WOOD POLE TO BE INSTALLED BY D.E. CO.
- PROPOSED 120V. SERVICE
- FIT-UP WOOD POLE AS A SECONDARY CABLE POLE
- INSTALL 60A. SAFETY SWITCH
- PROPOSED AMERITECH SERVICE
- INSTALL 40FT. ANCHOR BASE -- STEEL STRAIN POLE
- INSTALL (2) 4.8MM AUTOSCOPE CAMERAS & 18FT. BRACKET ARM FACING S.BD. & N.BD. STOP BARS (MOUNT AT 39'-0") (7) (7)
- INSTALL 2-WAY ILLUMINATED ST. NAME SIGN, 8FT. (Butterfield) (9)
- SEE DETAIL "B-1" DETAIL SHEET OC-4 (1)
- INSTALL PUSHBUTTON & R10-4 SIGN ON STEEL POLE FOR CROSSING CROOKS RD. (4)
- INSTALL 1-WAY ILLUMINATED ST. NAME SIGN, 6FT. (Crooks) (8)

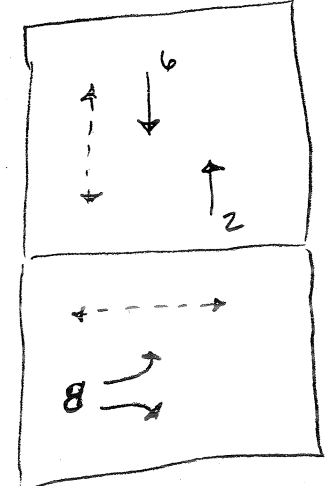


CONTACT MR. BOB JONES, D.E. CO. (1-248-594-7132) PRIOR TO INSTALLATION OF TRAFFIC SIGNALS. CONTACT D.E. CO. FOR DETAILED CHARGES.

ROAD COMMISSION FOR OAKLAND COUNTY FORCE ACCOUNT CHARGES (ESTIMATED) WILL BE \$77,000.00 CONTACT R.C.O.C. FOR DETAILED COSTS.

LIST OF MATERIALS			
NO.	ITEM	QUANTITIES	CODE NO.
①	1-WAY BRACKET ARM MOUNTED PEDESTRIAN T.S. (LED)	2 EACH	6917050
②	2-WAY PEDESTAL MOUNTED PEDESTRIAN TRAFFIC SIGNAL (LED)	1 EACH	6917050
③	1-WAY MAST ARM MOUNTED TRAFFIC SIGNAL (LED)	6 EACH	6917050
④	PUSHBUTTON & SIGN	2 EACH	6910287
⑤	TWO-WAY CASE SIGN, 24"x30"	2 EACH	6910304
⑥	SOLID STATE ACTUATED CONTROLLER & CABINET	1 EACH	6910337
⑦	AUTOSCOPE CAMERA	2 EACH	6917050
⑧	1-WAY ILLUMINATED STREET NAME SIGN, 6FT.	1 EACH	6917050
⑨	2-WAY ILLUMINATED STREET NAME SIGN, 8FT.	2 EACH	6917050
	DIRECT BURIAL CONDUIT, 1-3"	30 LIN. FT.	6917001
	DIRECT BURIAL CONDUIT, 2-3"	90 LIN. FT.	6917001
	DIRECT BURIAL CONDUIT, 3-4"	5 LIN. FT.	6917001
	JACKED-BORED CONDUIT	175 LIN. FT.	6910368
	HANDHOLE (ROUND)	4 EACH	6910369
	HANDHOLE (SQUARE)	1 EACH	6910370
*	MAST ARM	3 EACH	6910417
	ANCHOR BASE STEEL STRAIN POLE, 40FT.	2 EACH	6910395
	ANCHOR BASE STEEL STRAIN POLE FOUNDATION	2 EACH	6910426
	BASE MOUNT CONTROLLER FOUNDATION	1 EACH	6910427
	ALUMINUM PEDESTAL	1 EACH	6910428
	PEDESTAL FOUNDATION	1 EACH	6910430
	CLAMP-ON BRACKET ARM, 15FT.	1 EACH	6917050
	CLAMP-ON BRACKET ARM, 18FT.	2 EACH	6917050
	FIT-UP WOOD POLE AS A SECONDARY CABLE POLE	1 EACH	6917050
	SAFETY SWITCH	1 EACH	6910458
	60V., 1-2/C#4 SECONDARY CABLE	225 LIN. FT.	6910470
	OPTICAL PRIORITY CONTROL UNIT	1 LS	6917050

* ALL MAST ARMS SHALL BE MODEL "SM-46 (CALIFORNIA STYLE)"



CO. CROOKS RD. & BUTTERFIELD ATS

MANSELL ASSOCIATES INC.
ENGINEERING CONSULTANTS
33608 Grand River Farmington, MI. 48335 (248) 473-7070

CITY OF TROY
DIVISION OF ENGINEERING

TRAFFIC-SAFETY DEPARTMENT

DATE: 5-8-02 DRAWN BY: MAI APPROVED: M3587 JOB NO.: PROJECT NAME: NEW T.S. INSTALLATION SHEET NO.: 3 OF 4

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle. The criteria are given in Exhibit 19-8. Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

LOS A describes operations with a control delay of 10 s/veh or less. This level is typically assigned when the volume-to-capacity ratio is low and either progression is extremely favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during a green indication and travel through the intersection without stopping.

LOS B describes operations with control delay between 10 and 20 s/veh. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

Exhibit 19.8. Level-of-Service Criteria for Signalized Intersections (Motorized Vehicles)

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (SEC)
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

1. If the v/c ratio for a lane group exceeds 1.0, a LOS F is assigned to the individual lane group. LOS for approach-based and intersection-wide assessments are determined solely by the control delay.

LOS C describes operations with control delay between 20 and 35 s/veh. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e. one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicle stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D describes operations with control delay between 35 and 55 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E describes operations with control delay between 55 and 80 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level, considered to be unacceptable to most drivers, often occurs with over-saturation, that is, when arrival flow rates exceed the capacity of the intersection. This level is typically assigned when the volume-to-capacity ratio is high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Existing Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	949	0	0	497	0
Future Volume (vph)	0	949	0	0	497	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3650	
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.90	0.90
Adj. Flow (vph)	0	1054	0	0	552	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1054	0	0	552	0
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		31.9			39.2	
Effective Green, g (s)		31.9			39.2	
Actuated g/C Ratio		0.64			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3449			3650	
v/s Ratio Prot		c0.19			c0.02	
v/s Ratio Perm					0.13	
v/c Ratio		0.31			0.15	
Uniform Delay, d1		4.1			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.2			0.0	
Delay (s)		4.3			1.4	
Level of Service		A			A	
Approach Delay (s)		4.3	0.0		1.4	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Crooks Rd & WB Big Beaver Rd













Existing Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1373	619	0	550	0	0	1211	296	
Future Volume (vph)	0	0	0	0	1373	619	0	550	0	0	1211	296	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	0	1560	703	0	647	0	0	1275	312	
RTOR Reduction (vph)	0	0	0	0	0	89	0	0	0	0	0	22	
Lane Group Flow (vph)	0	0	0	0	1560	614	0	647	0	0	1275	290	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					43.5	43.5		44.0			41.0	41.0	
Effective Green, g (s)					43.5	43.5		44.0			41.0	41.0	
Actuated g/C Ratio					0.44	0.44		0.44			0.41	0.41	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2328	725		1639			1527	683	
v/s Ratio Prot					0.29			0.17			c0.34		
v/s Ratio Perm						c0.37						0.17	
v/c Ratio					0.67	0.85		0.39			0.83	0.42	
Uniform Delay, d1					22.5	25.3		19.0			26.5	21.1	
Progression Factor					0.77	0.71		0.00			1.00	1.00	
Incremental Delay, d2					1.3	10.2		0.2			4.2	0.5	
Delay (s)					18.6	28.2		0.2			30.7	21.6	
Level of Service					B	C		A			C	C	
Approach Delay (s)		0.0			21.6			0.2			28.9		
Approach LOS		A			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			21.1		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.84										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)						15.5		
Intersection Capacity Utilization			71.3%		ICU Level of Service						C		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

21: Crooks Rd & EB Big Beaver Rd

Existing Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑					↑↑	↑		↑↑	
Traffic Volume (vph)	0	951	495	0	0	0	0	550	255	0	1211	0
Future Volume (vph)	0	951	495	0	0	0	0	550	255	0	1211	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0	
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					3725	1667		3725	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					3725	1667		3725	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95
Adj. Flow (vph)	0	1057	550	0	0	0	0	647	300	0	1275	0
RTOR Reduction (vph)	0	0	37	0	0	0	0	0	24	0	0	0
Lane Group Flow (vph)	0	1057	513	0	0	0	0	647	276	0	1275	0
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		6						4			8	
Permitted Phases			6						4			
Actuated Green, G (s)		43.5	43.5					41.0	41.0		44.0	
Effective Green, g (s)		43.5	43.5					41.0	41.0		44.0	
Actuated g/C Ratio		0.44	0.44					0.41	0.41		0.44	
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0	
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5	
Lane Grp Cap (vph)		2328	725					1527	683		1639	
v/s Ratio Prot		0.20						0.17			c0.34	
v/s Ratio Perm			c0.31						0.17			
v/c Ratio		0.45	0.71					0.42	0.40		0.78	
Uniform Delay, d1		19.9	23.1					21.1	20.9		23.8	
Progression Factor		0.83	0.78					0.96	0.95		0.00	
Incremental Delay, d2		0.6	5.7					0.2	0.5		1.3	
Delay (s)		17.2	23.6					20.5	20.3		1.4	
Level of Service		B	C					C	C		A	
Approach Delay (s)		19.4			0.0			20.4			1.4	
Approach LOS		B			A			C			A	
Intersection Summary												
HCM 2000 Control Delay			13.6					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		15.5		
Intersection Capacity Utilization			71.3%					ICU Level of Service		C		
Analysis Period (min)			15									

c Critical Lane Group

HCM 6th Signalized Intersection Summary
30: Crooks Rd & Butterfield Ave

Existing Conditions
AM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	26	111	776	1672	34
Future Volume (veh/h)	29	26	111	776	1672	34
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	36	32	126	882	1900	39
Peak Hour Factor	0.81	0.81	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	111	99	261	4437	3088	1377
Arrive On Green	0.06	0.06	0.83	0.83	1.00	1.00
Sat Flow, veh/h	1875	1668	229	5552	3839	1668
Grp Volume(v), veh/h	36	32	126	882	1900	39
Grp Sat Flow(s),veh/h/ln	1875	1668	229	1792	1870	1668
Q Serve(g_s), s	1.8	1.8	21.4	3.4	0.0	0.0
Cycle Q Clear(g_c), s	1.8	1.8	21.4	3.4	0.0	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	111	99	261	4437	3088	1377
V/C Ratio(X)	0.32	0.32	0.48	0.20	0.62	0.03
Avail Cap(c_a), veh/h	131	117	261	4437	3088	1377
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	45.1	3.4	1.8	0.0	0.0
Incr Delay (d2), s/veh	1.7	1.9	6.3	0.1	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.8	0.8	0.5	0.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.8	47.0	9.7	1.9	0.9	0.0
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	68			1008	1939	
Approach Delay, s/veh	46.9			2.9	0.9	
Approach LOS	D			A	A	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		88.1		11.9		88.1
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5
Max Green Setting (Gmax), s		* 82		7.0		* 82
Max Q Clear Time (g_c+I1), s		23.4		3.8		2.0
Green Ext Time (p_c), s		14.1		0.0		28.3
Intersection Summary						
HCM 6th Ctrl Delay			2.6			
HCM 6th LOS			A			

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Existing Conditions
 AM Peak Hour















Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1791	201	0
Future Volume (vph)	0	0	0	1791	201	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.90	0.90
Adj. Flow (vph)	0	0	0	2059	223	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	2059	223	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				33.1	38.7	
Effective Green, g (s)				33.1	38.7	
Actuated g/C Ratio				0.66	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3543	1643	
v/s Ratio Prot				c0.38	c0.02	
v/s Ratio Perm					0.10	
v/c Ratio				0.58	0.14	
Uniform Delay, d1				4.6	1.5	
Progression Factor				0.60	1.00	
Incremental Delay, d2				0.6	0.0	
Delay (s)				3.4	1.5	
Level of Service				A	A	
Approach Delay (s)	0.0			3.4	1.5	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis Existing Conditions
 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	1005	0	0	0	0	0	0	0	229	0	0
Future Volume (vph)	0	1005	0	0	0	0	0	0	0	229	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4									5.4	
Lane Util. Factor		0.91									1.00	
Frt		1.00									1.00	
Flt Protected		1.00									0.95	
Satd. Flow (prot)		5250									1881	
Flt Permitted		1.00									0.95	
Satd. Flow (perm)		5250									1881	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.83	0.83	0.83
Adj. Flow (vph)	0	1117	0	0	0	0	0	0	0	276	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	218	0
Lane Group Flow (vph)	0	1117	0	0	0	0	0	0	0	0	58	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm							Prot	custom	NA
Protected Phases		2!								4		3
Permitted Phases			2							3 2!		
Actuated Green, G (s)		31.8									7.4	
Effective Green, g (s)		31.8									7.4	
Actuated g/C Ratio		0.64									0.15	
Clearance Time (s)		5.4									5.4	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		3339									278	
v/s Ratio Prot		c0.21										
v/s Ratio Perm											0.03	
v/c Ratio		0.33									0.21	
Uniform Delay, d1		4.2									18.7	
Progression Factor		0.68									1.20	
Incremental Delay, d2		0.2									0.3	
Delay (s)		3.1									22.8	
Level of Service		A									C	
Approach Delay (s)		3.1			0.0			0.0			22.8	
Approach LOS		A			A			A			C	
Intersection Summary												
HCM 2000 Control Delay		7.0			HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio		0.36										
Actuated Cycle Length (s)		50.0			Sum of lost time (s)				16.2			
Intersection Capacity Utilization		39.5%			ICU Level of Service				A			
Analysis Period (min)		15										
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

Existing Conditions
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	1972	261	0	48
Future Volume (vph)	0	0	1972	261	0	48
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5259			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5259			2933
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.92	0.92
Adj. Flow (vph)	0	0	2267	300	0	52
RTOR Reduction (vph)	0	0	28	0	0	15
Lane Group Flow (vph)	0	0	2539	0	0	37
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			35.7			2.1
Effective Green, g (s)			35.7			2.1
Actuated g/C Ratio			0.71			0.04
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3754			123
v/s Ratio Prot			c0.48			c0.01
v/s Ratio Perm						
v/c Ratio			0.68			0.30
Uniform Delay, d1			4.0			23.2
Progression Factor			1.00			1.00
Incremental Delay, d2			1.0			1.4
Delay (s)			5.0			24.6
Level of Service			A			C
Approach Delay (s)		0.0	5.0		24.6	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
70: Troy Center Drive & EB Big Beaver Rd

Existing Conditions
AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	1095	139	0	0	0	33
Future Volume (vph)	1095	139	0	0	0	33
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	0.98					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5263					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5263					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.64	0.64
Adj. Flow (vph)	1217	154	0	0	0	52
RTOR Reduction (vph)	23	0	0	0	0	50
Lane Group Flow (vph)	1348	0	0	0	0	2
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	35.6					2.2
Effective Green, g (s)	35.6					2.2
Actuated g/C Ratio	0.71					0.04
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	3747					167
v/s Ratio Prot	c0.26					c0.00
v/s Ratio Perm						
v/c Ratio	0.36					0.01
Uniform Delay, d1	2.8					22.9
Progression Factor	0.84					1.00
Incremental Delay, d2	0.3					0.0
Delay (s)	2.6					22.9
Level of Service	A					C
Approach Delay (s)	2.6			0.0	22.9	
Approach LOS	A			A	C	

Intersection Summary

HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Existing Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	1651	0	0	450	0
Future Volume (vph)	0	1651	0	0	450	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5460			3686	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5460			3686	
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.85	0.85
Adj. Flow (vph)	0	1920	0	0	529	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1920	0	0	529	0
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		32.6			39.2	
Effective Green, g (s)		32.6			39.2	
Actuated g/C Ratio		0.65			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3559			3686	
v/s Ratio Prot		c0.35			c0.02	
v/s Ratio Perm					0.12	
v/c Ratio		0.54			0.14	
Uniform Delay, d1		4.7			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.6			0.0	
Delay (s)		5.3			1.4	
Level of Service		A			A	
Approach Delay (s)		5.3	0.0		1.4	
Approach LOS		A	A		A	













Intersection Summary			
HCM 2000 Control Delay	4.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group













HCM Signalized Intersection Capacity Analysis
20: Crooks Rd & WB Big Beaver Rd

Existing Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1545	537	0	989	0	0	954	348	
Future Volume (vph)	0	0	0	0	1545	537	0	989	0	0	954	348	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.82	0.82	0.82	
Adj. Flow (vph)	0	0	0	0	1661	577	0	1124	0	0	1163	424	
RTOR Reduction (vph)	0	0	0	0	0	35	0	0	0	0	0	23	
Lane Group Flow (vph)	0	0	0	0	1661	542	0	1124	0	0	1163	401	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					45.5	45.5		42.0			39.0	39.0	
Effective Green, g (s)					45.5	45.5		42.0			39.0	39.0	
Actuated g/C Ratio					0.46	0.46		0.42			0.39	0.39	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2435	758		1564			1452	650	
v/s Ratio Prot					0.31			0.30			c0.31		
v/s Ratio Perm						c0.32						0.24	
v/c Ratio					0.68	0.71		0.72			0.80	0.62	
Uniform Delay, d1					21.5	22.0		24.1			27.1	24.5	
Progression Factor					1.32	1.35		0.00			1.00	1.00	
Incremental Delay, d2					1.4	5.1		1.0			3.4	1.8	
Delay (s)					29.8	34.8		1.0			30.4	26.3	
Level of Service					C	C		A			C	C	
Approach Delay (s)		0.0			31.1			1.0			29.3		
Approach LOS		A			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			23.7		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.75										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					15.5			
Intersection Capacity Utilization			79.1%		ICU Level of Service					D			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
 21: Crooks Rd & EB Big Beaver Rd

Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑					↑↑	↑		↑↑	
Traffic Volume (vph)	0	1889	212	0	0	0	0	989	536	0	954	0
Future Volume (vph)	0	1889	212	0	0	0	0	989	536	0	954	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0	
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					3725	1667		3725	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					3725	1667		3725	
Peak-hour factor, PHF	0.86	0.86	0.86	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82
Adj. Flow (vph)	0	2197	247	0	0	0	0	1124	609	0	1163	0
RTOR Reduction (vph)	0	0	35	0	0	0	0	0	23	0	0	0
Lane Group Flow (vph)	0	2197	212	0	0	0	0	1124	586	0	1163	0
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		6						4			8	
Permitted Phases			6						4			
Actuated Green, G (s)		45.5	45.5					39.0	39.0		42.0	
Effective Green, g (s)		45.5	45.5					39.0	39.0		42.0	
Actuated g/C Ratio		0.46	0.46					0.39	0.39		0.42	
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0	
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5	
Lane Grp Cap (vph)		2435	758					1452	650		1564	
v/s Ratio Prot		c0.41						0.30			0.31	
v/s Ratio Perm			0.13						c0.35			
v/c Ratio		0.90	0.28					0.77	0.90		0.74	
Uniform Delay, d1		25.2	17.0					26.7	28.7		24.5	
Progression Factor		1.29	1.43					1.14	1.15		0.00	
Incremental Delay, d2		5.5	0.8					2.6	15.5		1.2	
Delay (s)		37.9	25.1					33.1	48.5		1.2	
Level of Service		D	C					C	D		A	
Approach Delay (s)		36.6			0.0			38.5			1.2	
Approach LOS		D			A			D			A	
Intersection Summary												
HCM 2000 Control Delay			29.5					HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		15.5		
Intersection Capacity Utilization			79.1%					ICU Level of Service		D		
Analysis Period (min)			15									

c Critical Lane Group

HCM 6th Signalized Intersection Summary
30: Crooks Rd & Butterfield Ave

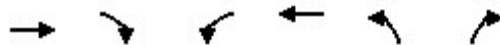
Existing Conditions
PM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	45	63	1471	1127	39
Future Volume (veh/h)	54	45	63	1471	1127	39
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	70	58	67	1565	1266	44
Peak Hour Factor	0.77	0.77	0.94	0.94	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	128	113	376	4391	3056	1363
Arrive On Green	0.07	0.07	0.82	0.82	0.82	0.82
Sat Flow, veh/h	1875	1668	420	5552	3839	1668
Grp Volume(v), veh/h	70	58	67	1565	1266	44
Grp Sat Flow(s),veh/h/ln	1875	1668	420	1792	1870	1668
Q Serve(g_s), s	3.6	3.4	5.3	7.5	9.4	0.5
Cycle Q Clear(g_c), s	3.6	3.4	14.6	7.5	9.4	0.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	128	113	376	4391	3056	1363
V/C Ratio(X)	0.55	0.51	0.18	0.36	0.41	0.03
Avail Cap(c_a), veh/h	375	334	376	4391	3056	1363
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	45.0	4.6	2.4	2.5	1.7
Incr Delay (d2), s/veh	3.6	3.5	1.0	0.2	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	1.5	0.4	1.2	1.6	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	48.8	48.5	5.6	2.6	2.9	1.8
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h				1632	1310	
Approach Delay, s/veh	48.7			2.7	2.9	
Approach LOS	D			A	A	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.2		12.8		87.2
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5
Max Green Setting (Gmax), s		* 69		20.0		* 69
Max Q Clear Time (g_c+I1), s		16.6		5.6		11.4
Green Ext Time (p_c), s		18.0		0.3		12.0
Intersection Summary						
HCM 6th Ctrl Delay			4.7			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Existing Conditions
 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1758	324	0
Future Volume (vph)	0	0	0	1758	324	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.93	0.93
Adj. Flow (vph)	0	0	0	1851	348	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1851	348	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				31.3	38.7	
Effective Green, g (s)				31.3	38.7	
Actuated g/C Ratio				0.63	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3350	1643	
v/s Ratio Prot				c0.35	c0.03	
v/s Ratio Perm					0.16	
v/c Ratio				0.55	0.21	
Uniform Delay, d1				5.3	1.6	
Progression Factor				0.61	1.00	
Incremental Delay, d2				0.6	0.0	
Delay (s)				3.8	1.6	
Level of Service				A	A	
Approach Delay (s)	0.0			3.8	1.6	
Approach LOS	A			A	A	

Intersection Summary

HCM 2000 Control Delay	3.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis Existing Conditions
 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd PM Peak Hour



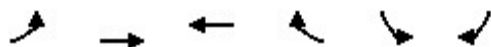
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	2101	0	0	0	0	0	0	0	213	0	0
Future Volume (vph)	0	2101	0	0	0	0	0	0	0	213	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4									5.4	
Lane Util. Factor		0.91									1.00	
Frt		1.00									1.00	
Flt Protected		1.00									0.95	
Satd. Flow (prot)		5353									1863	
Flt Permitted		1.00									0.95	
Satd. Flow (perm)		5353									1863	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.81	0.81	0.81
Adj. Flow (vph)	0	2334	0	0	0	0	0	0	0	263	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	104	0
Lane Group Flow (vph)	0	2334	0	0	0	0	0	0	0	0	159	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA	Perm							Prot	custom	NA
Protected Phases		2!								4		3
Permitted Phases			2								3 2!	
Actuated Green, G (s)		75.7									13.5	
Effective Green, g (s)		75.7									13.5	
Actuated g/C Ratio		0.76									0.14	
Clearance Time (s)		5.4									5.4	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		4052									251	
v/s Ratio Prot		c0.44										
v/s Ratio Perm											0.09	
v/c Ratio		0.58									0.63	
Uniform Delay, d1		5.2									40.9	
Progression Factor		0.27									0.92	
Incremental Delay, d2		0.2									4.3	
Delay (s)		1.6									41.9	
Level of Service		A									D	
Approach Delay (s)		1.6			0.0			0.0			41.9	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

Existing Conditions
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	1836	227	0	135
Future Volume (vph)	0	0	1836	227	0	135
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5265			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5265			2933
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.87	0.87
Adj. Flow (vph)	0	0	1933	239	0	155
RTOR Reduction (vph)	0	0	29	0	0	25
Lane Group Flow (vph)	0	0	2143	0	0	130
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			32.5			5.3
Effective Green, g (s)			32.5			5.3
Actuated g/C Ratio			0.65			0.11
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3422			310
v/s Ratio Prot			c0.41			c0.04
v/s Ratio Perm						
v/c Ratio			0.63			0.42
Uniform Delay, d1			5.2			20.9
Progression Factor			1.00			1.00
Incremental Delay, d2			0.9			0.9
Delay (s)			6.0			21.8
Level of Service			A			C
Approach Delay (s)		0.0	6.0		21.8	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay			7.1		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.60			
Actuated Cycle Length (s)			50.0		Sum of lost time (s)	12.2
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
70: Troy Center Drive & EB Big Beaver Rd

Existing Conditions
PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	2281	33	0	0	0	139
Future Volume (vph)	2281	33	0	0	0	139
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	1.00					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5341					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5341					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.76	0.76
Adj. Flow (vph)	2534	37	0	0	0	183
RTOR Reduction (vph)	1	0	0	0	0	24
Lane Group Flow (vph)	2570	0	0	0	0	159
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	78.4					9.4
Effective Green, g (s)	78.4					9.4
Actuated g/C Ratio	0.78					0.09
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	4187					357
v/s Ratio Prot	c0.48					c0.04
v/s Ratio Perm						
v/c Ratio	0.61					0.45
Uniform Delay, d1	4.5					42.8
Progression Factor	0.50					1.00
Incremental Delay, d2	0.6					0.9
Delay (s)	2.8					43.7
Level of Service	A					D
Approach Delay (s)	2.8			0.0	43.7	
Approach LOS	A			A	D	

Intersection Summary

HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	100	78	114	61	48
Average Queue (ft)	44	17	39	43	33
95th Queue (ft)	89	53	92	67	43
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				13	26
Queuing Penalty (veh)				34	65
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	91	137
Average Queue (ft)	30	69
95th Queue (ft)	75	113
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	320	264	240	318	4	15	432	408	272
Average Queue (ft)	216	182	140	150	0	1	274	237	98
95th Queue (ft)	286	254	213	263	3	13	399	363	240
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					0	1			
Queuing Penalty (veh)					0	2			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)								5	
Queuing Penalty (veh)								14	

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R	T	T
Maximum Queue (ft)	255	215	184	319	186	198	140	42	52
Average Queue (ft)	163	139	108	190	105	93	49	10	4
95th Queue (ft)	224	198	169	291	164	159	108	36	29
Link Distance (ft)	602	602	602	602	334	334	334	37	37
Upstream Blk Time (%)								12	3
Queuing Penalty (veh)								72	20
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 30: Crooks Rd & Butterfield Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (ft)	71	60	169	76	64	71	212	209	105
Average Queue (ft)	23	15	76	21	11	15	91	93	5
95th Queue (ft)	58	41	142	59	41	52	208	211	39
Link Distance (ft)		1022		336	336	336	333	333	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	500		500						150
Storage Blk Time (%)								2	
Queuing Penalty (veh)								1	

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	68	52	58	87
Average Queue (ft)	38	26	36	64
95th Queue (ft)	71	58	68	86
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	10	5	8	24
Queuing Penalty (veh)	63	34	52	49
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	120	13	80	59
Average Queue (ft)	29	1	3	3
95th Queue (ft)	84	8	29	27
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	1		0	0
Queuing Penalty (veh)	2		0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	SB
Directions Served	T	T	T	LT
Maximum Queue (ft)	74	92	84	79
Average Queue (ft)	13	16	16	38
95th Queue (ft)	52	61	60	74
Link Distance (ft)	52	52	52	36
Upstream Blk Time (%)	1	2	1	8
Queuing Penalty (veh)	2	4	4	18
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	42	86	57	92
Average Queue (ft)	3	18	5	19
95th Queue (ft)	17	59	29	64
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	149	85	219	66	37
Average Queue (ft)	61	25	76	26	11
95th Queue (ft)	131	71	178	59	35
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	83	108	95	60	18
Average Queue (ft)	15	21	24	22	1
95th Queue (ft)	56	71	74	54	8
Link Distance (ft)	409	409	409	590	590
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 80: Crooks Rd & N. Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	5	11
Average Queue (ft)	0	0
95th Queue (ft)	4	8
Link Distance (ft)	350	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	40	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: Crooks Rd & S. Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 435

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	143	118	102	56	56
Average Queue (ft)	68	43	31	54	35
95th Queue (ft)	124	91	78	64	49
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				40	49
Queuing Penalty (veh)				93	111
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	176	174
Average Queue (ft)	82	92
95th Queue (ft)	149	157
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	313	290	278	316	40	45	363	326	283
Average Queue (ft)	215	194	171	172	3	4	231	183	105
95th Queue (ft)	294	264	251	276	19	24	326	286	210
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					2	3			
Queuing Penalty (veh)					11	14			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)								1	0
Queuing Penalty (veh)								4	1

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R	T	T
Maximum Queue (ft)	499	491	430	142	345	329	356	32	34
Average Queue (ft)	289	273	243	68	228	212	222	2	3
95th Queue (ft)	443	430	394	121	327	311	342	17	16
Link Distance (ft)	602	602	602	602	334	334	334	37	37
Upstream Blk Time (%)		0			0	0	1	2	1
Queuing Penalty (veh)		0			3	1	5	10	8
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 30: Crooks Rd & Butterfield Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (ft)	107	56	98	104	123	120	215	210	39
Average Queue (ft)	38	17	34	42	31	36	88	99	9
95th Queue (ft)	80	42	79	95	85	96	185	197	32
Link Distance (ft)		1022		336	336	336	333	333	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	500		500						150
Storage Blk Time (%)								1	
Queuing Penalty (veh)								0	

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	61	71	73	99
Average Queue (ft)	48	42	44	69
95th Queue (ft)	68	71	73	89
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	17	10	12	40
Queuing Penalty (veh)	98	59	68	131
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	166	50	82	99
Average Queue (ft)	68	3	11	13
95th Queue (ft)	150	25	56	63
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	5		0	0
Queuing Penalty (veh)	24		0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	SB
Directions Served	T	T	T	LT
Maximum Queue (ft)	78	84	87	75
Average Queue (ft)	15	24	30	50
95th Queue (ft)	58	80	88	85
Link Distance (ft)	52	52	52	36
Upstream Blk Time (%)	2	3	4	20
Queuing Penalty (veh)	10	15	21	42
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	143	139	77	117
Average Queue (ft)	18	42	20	32
95th Queue (ft)	73	99	60	89
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	162	144	224	111	56
Average Queue (ft)	86	44	91	53	25
95th Queue (ft)	148	98	176	95	54
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	TR	R	R	R
Maximum Queue (ft)	145	185	189	150	116	12
Average Queue (ft)	42	79	93	85	24	0
95th Queue (ft)	106	145	158	137	78	6
Link Distance (ft)	409	409	409	590	590	590
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 80: Crooks Rd & N. Site Drive

Movement	NB	NB
Directions Served	T	TR
Maximum Queue (ft)	28	37
Average Queue (ft)	1	2
95th Queue (ft)	14	26
Link Distance (ft)	333	333
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB	EB	EB
Directions Served	T	T	T
Maximum Queue (ft)	64	22	15
Average Queue (ft)	4	1	1
95th Queue (ft)	32	18	8
Link Distance (ft)		350	350
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	40		
Storage Blk Time (%)	1	0	0
Queuing Penalty (veh)	6	0	0

Intersection: 100: Crooks Rd & S. Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 737

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Background Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	964	0	0	504	0
Future Volume (vph)	0	964	0	0	504	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3650	
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.90	0.90
Adj. Flow (vph)	0	1071	0	0	560	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1071	0	0	560	0
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		31.9			39.2	
Effective Green, g (s)		31.9			39.2	
Actuated g/C Ratio		0.64			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3449			3650	
v/s Ratio Prot		c0.20			c0.02	
v/s Ratio Perm					0.13	
v/c Ratio		0.31			0.15	
Uniform Delay, d1		4.1			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.2			0.0	
Delay (s)		4.3			1.4	
Level of Service		A			A	
Approach Delay (s)		4.3	0.0		1.4	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Crooks Rd & WB Big Beaver Rd













Background Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1395	628	0	558	0	0	1231	300	
Future Volume (vph)	0	0	0	0	1395	628	0	558	0	0	1231	300	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	0	1585	714	0	656	0	0	1296	316	
RTOR Reduction (vph)	0	0	0	0	0	86	0	0	0	0	0	22	
Lane Group Flow (vph)	0	0	0	0	1585	628	0	656	0	0	1296	294	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					43.5	43.5		44.0			41.0	41.0	
Effective Green, g (s)					43.5	43.5		44.0			41.0	41.0	
Actuated g/C Ratio					0.44	0.44		0.44			0.41	0.41	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2328	725		1639			1527	683	
v/s Ratio Prot					0.30			0.18			c0.35		
v/s Ratio Perm						c0.38						0.18	
v/c Ratio					0.68	0.87		0.40			0.85	0.43	
Uniform Delay, d1					22.7	25.6		19.0			26.7	21.1	
Progression Factor					0.77	0.71		0.00			1.00	1.00	
Incremental Delay, d2					1.4	11.4		0.2			4.7	0.5	
Delay (s)					18.7	29.7		0.2			31.4	21.6	
Level of Service					B	C		A			C	C	
Approach Delay (s)		0.0			22.1			0.2			29.5		
Approach LOS		A			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			21.6		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.86										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					15.5			
Intersection Capacity Utilization			72.3%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

21: Crooks Rd & EB Big Beaver Rd

Background Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑↑	↗					↑↑	↗		↑↑		
Traffic Volume (vph)	0	966	502	0	0	0	0	558	259	0	1231	0	
Future Volume (vph)	0	966	502	0	0	0	0	558	259	0	1231	0	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0		
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		5353	1667					3725	1667		3725		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		5353	1667					3725	1667		3725		
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	0	1073	558	0	0	0	0	656	305	0	1296	0	
RTOR Reduction (vph)	0	0	37	0	0	0	0	0	23	0	0	0	
Lane Group Flow (vph)	0	1073	521	0	0	0	0	656	282	0	1296	0	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		6						4			8		
Permitted Phases			6						4				
Actuated Green, G (s)		43.5	43.5					41.0	41.0		44.0		
Effective Green, g (s)		43.5	43.5					41.0	41.0		44.0		
Actuated g/C Ratio		0.44	0.44					0.41	0.41		0.44		
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0		
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5		
Lane Grp Cap (vph)		2328	725					1527	683		1639		
v/s Ratio Prot		0.20						0.18			c0.35		
v/s Ratio Perm			c0.31						0.17				
v/c Ratio		0.46	0.72					0.43	0.41		0.79		
Uniform Delay, d1		20.0	23.2					21.1	21.0		24.0		
Progression Factor		0.83	0.78					0.96	0.95		0.01		
Incremental Delay, d2		0.6	5.9					0.2	0.5		1.4		
Delay (s)		17.3	24.1					20.5	20.4		1.6		
Level of Service		B	C					C	C		A		
Approach Delay (s)		19.6			0.0			20.5			1.6		
Approach LOS		B			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			13.8									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.78										
Actuated Cycle Length (s)			100.0									Sum of lost time (s)	15.5
Intersection Capacity Utilization			72.3%									ICU Level of Service	C
Analysis Period (min)			15										

c Critical Lane Group

HCM 6th Signalized Intersection Summary
30: Crooks Rd & Butterfield Ave

Background Conditions
AM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	26	113	788	1698	35
Future Volume (veh/h)	29	26	113	788	1698	35
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	36	32	128	895	1930	40
Peak Hour Factor	0.81	0.81	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	111	99	255	4437	3088	1377
Arrive On Green	0.06	0.06	0.83	0.83	1.00	1.00
Sat Flow, veh/h	1875	1668	222	5552	3839	1668
Grp Volume(v), veh/h	36	32	128	895	1930	40
Grp Sat Flow(s),veh/h/ln	1875	1668	222	1792	1870	1668
Q Serve(g_s), s	1.8	1.8	23.8	3.5	0.0	0.0
Cycle Q Clear(g_c), s	1.8	1.8	23.8	3.5	0.0	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	111	99	255	4437	3088	1377
V/C Ratio(X)	0.32	0.32	0.50	0.20	0.62	0.03
Avail Cap(c_a), veh/h	131	117	255	4437	3088	1377
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	45.1	3.6	1.8	0.0	0.0
Incr Delay (d2), s/veh	1.7	1.9	6.9	0.1	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.8	0.9	0.5	0.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.8	47.0	10.5	1.9	1.0	0.0
LnGrp LOS	D	D	B	A	A	A
Approach Vol, veh/h	68			1023	1970	
Approach Delay, s/veh	46.9			3.0	0.9	
Approach LOS	D			A	A	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		88.1		11.9		88.1
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5
Max Green Setting (Gmax), s		* 82		7.0		* 82
Max Q Clear Time (g_c+I1), s		25.8		3.8		2.0
Green Ext Time (p_c), s		14.7		0.0		29.3
Intersection Summary						
HCM 6th Ctrl Delay			2.7			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Background Conditions
 AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1819	204	0
Future Volume (vph)	0	0	0	1819	204	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.90	0.90
Adj. Flow (vph)	0	0	0	2091	227	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	2091	227	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				33.1	38.7	
Effective Green, g (s)				33.1	38.7	
Actuated g/C Ratio				0.66	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3543	1643	
v/s Ratio Prot				c0.39	c0.02	
v/s Ratio Perm					0.11	
v/c Ratio				0.59	0.14	
Uniform Delay, d1				4.7	1.5	
Progression Factor				0.60	1.00	
Incremental Delay, d2				0.6	0.0	
Delay (s)				3.4	1.5	
Level of Service				A	A	
Approach Delay (s)	0.0			3.4	1.5	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

Background Conditions

50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	1021	0	0	0	0	0	0	0	232	0	0
Future Volume (vph)	0	1021	0	0	0	0	0	0	0	232	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4									5.4	
Lane Util. Factor		0.91									1.00	
Frt		1.00									1.00	
Flt Protected		1.00									0.95	
Satd. Flow (prot)		5250									1881	
Flt Permitted		1.00									0.95	
Satd. Flow (perm)		5250									1881	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.83	0.83	0.83
Adj. Flow (vph)	0	1134	0	0	0	0	0	0	0	280	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	217	0
Lane Group Flow (vph)	0	1134	0	0	0	0	0	0	0	0	63	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm							Prot	custom	NA
Protected Phases		2!								4		3
Permitted Phases			2								3 2!	
Actuated Green, G (s)		31.8									7.4	
Effective Green, g (s)		31.8									7.4	
Actuated g/C Ratio		0.64									0.15	
Clearance Time (s)		5.4									5.4	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		3339									278	
v/s Ratio Prot		c0.22										
v/s Ratio Perm											0.03	
v/c Ratio		0.34									0.23	
Uniform Delay, d1		4.2									18.8	
Progression Factor		0.68									1.17	
Incremental Delay, d2		0.3									0.3	
Delay (s)		3.1									22.3	
Level of Service		A									C	
Approach Delay (s)		3.1			0.0			0.0			22.3	
Approach LOS		A			A			A			C	

Intersection Summary

HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

Background Conditions
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	2002	265	0	49
Future Volume (vph)	0	0	2002	265	0	49
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5259			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5259			2933
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.92	0.92
Adj. Flow (vph)	0	0	2301	305	0	53
RTOR Reduction (vph)	0	0	28	0	0	14
Lane Group Flow (vph)	0	0	2578	0	0	39
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			35.7			2.1
Effective Green, g (s)			35.7			2.1
Actuated g/C Ratio			0.71			0.04
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3754			123
v/s Ratio Prot			c0.49			c0.01
v/s Ratio Perm						
v/c Ratio			0.69			0.31
Uniform Delay, d1			4.0			23.3
Progression Factor			1.00			1.00
Incremental Delay, d2			1.0			1.5
Delay (s)			5.1			24.7
Level of Service			A			C
Approach Delay (s)		0.0	5.1		24.7	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay			5.4		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.67			
Actuated Cycle Length (s)			50.0		Sum of lost time (s)	12.2
Intersection Capacity Utilization			56.7%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
70: Troy Center Drive & EB Big Beaver Rd

Background Conditions
AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	1112	141	0	0	0	33
Future Volume (vph)	1112	141	0	0	0	33
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	0.98					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5262					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5262					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.64	0.64
Adj. Flow (vph)	1236	157	0	0	0	52
RTOR Reduction (vph)	23	0	0	0	0	50
Lane Group Flow (vph)	1370	0	0	0	0	2
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	35.6					2.2
Effective Green, g (s)	35.6					2.2
Actuated g/C Ratio	0.71					0.04
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	3746					167
v/s Ratio Prot	c0.26					c0.00
v/s Ratio Perm						
v/c Ratio	0.37					0.01
Uniform Delay, d1	2.8					22.9
Progression Factor	0.83					1.00
Incremental Delay, d2	0.3					0.0
Delay (s)	2.6					22.9
Level of Service	A					C
Approach Delay (s)	2.6		0.0		22.9	
Approach LOS	A		A		C	

Intersection Summary

HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Background Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	1676	0	0	457	0
Future Volume (vph)	0	1676	0	0	457	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5460			3686	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5460			3686	
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.85	0.85
Adj. Flow (vph)	0	1949	0	0	538	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1949	0	0	538	0
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		32.6			39.2	
Effective Green, g (s)		32.6			39.2	
Actuated g/C Ratio		0.65			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3559			3686	
v/s Ratio Prot		c0.36			c0.02	
v/s Ratio Perm					0.13	
v/c Ratio		0.55			0.15	
Uniform Delay, d1		4.7			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.6			0.0	
Delay (s)		5.3			1.4	
Level of Service		A			A	
Approach Delay (s)		5.3	0.0		1.4	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Crooks Rd & WB Big Beaver Rd













Background Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1569	545	0	1004	0	0	969	353	
Future Volume (vph)	0	0	0	0	1569	545	0	1004	0	0	969	353	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.82	0.82	0.82	
Adj. Flow (vph)	0	0	0	0	1687	586	0	1141	0	0	1182	430	
RTOR Reduction (vph)	0	0	0	0	0	35	0	0	0	0	0	23	
Lane Group Flow (vph)	0	0	0	0	1687	551	0	1141	0	0	1182	407	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					45.5	45.5		42.0			39.0	39.0	
Effective Green, g (s)					45.5	45.5		42.0			39.0	39.0	
Actuated g/C Ratio					0.46	0.46		0.42			0.39	0.39	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2435	758		1564			1452	650	
v/s Ratio Prot					0.32			0.31			c0.32		
v/s Ratio Perm						c0.33						0.24	
v/c Ratio					0.69	0.73		0.73			0.81	0.63	
Uniform Delay, d1					21.7	22.2		24.3			27.3	24.6	
Progression Factor					1.32	1.35		0.00			1.00	1.00	
Incremental Delay, d2					1.5	5.3		1.1			3.7	2.0	
Delay (s)					30.1	35.3		1.1			31.0	26.6	
Level of Service					C	D		A			C	C	
Approach Delay (s)		0.0			31.4			1.1			29.8		
Approach LOS		A			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			24.0		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.77										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)						15.5		
Intersection Capacity Utilization			80.1%		ICU Level of Service						D		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

21: Crooks Rd & EB Big Beaver Rd

Background Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑					↑↑	↑		↑↑	
Traffic Volume (vph)	0	1918	215	0	0	0	0	1004	544	0	969	0
Future Volume (vph)	0	1918	215	0	0	0	0	1004	544	0	969	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0	
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					3725	1667		3725	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					3725	1667		3725	
Peak-hour factor, PHF	0.86	0.86	0.86	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82
Adj. Flow (vph)	0	2230	250	0	0	0	0	1141	618	0	1182	0
RTOR Reduction (vph)	0	0	35	0	0	0	0	0	23	0	0	0
Lane Group Flow (vph)	0	2230	215	0	0	0	0	1141	595	0	1182	0
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		6						4			8	
Permitted Phases			6						4			
Actuated Green, G (s)		45.5	45.5					39.0	39.0		42.0	
Effective Green, g (s)		45.5	45.5					39.0	39.0		42.0	
Actuated g/C Ratio		0.46	0.46					0.39	0.39		0.42	
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0	
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5	
Lane Grp Cap (vph)		2435	758					1452	650		1564	
v/s Ratio Prot		c0.42						0.31			0.32	
v/s Ratio Perm			0.13						c0.36			
v/c Ratio		0.92	0.28					0.79	0.92		0.76	
Uniform Delay, d1		25.5	17.0					26.8	28.9		24.6	
Progression Factor		1.29	1.43					1.14	1.15		0.00	
Incremental Delay, d2		6.2	0.8					2.8	17.3		1.2	
Delay (s)		39.0	25.2					33.4	50.5		1.2	
Level of Service		D	C					C	D		A	
Approach Delay (s)		37.6			0.0			39.4			1.2	
Approach LOS		D			A			D			A	
Intersection Summary												
HCM 2000 Control Delay			30.3					HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			100.0					Sum of lost time (s)		15.5		
Intersection Capacity Utilization			80.1%					ICU Level of Service		D		
Analysis Period (min)			15									

c Critical Lane Group

HCM 6th Signalized Intersection Summary
30: Crooks Rd & Butterfield Ave

Background Conditions
PM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	46	64	1493	1144	40
Future Volume (veh/h)	55	46	64	1493	1144	40
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	71	60	68	1588	1285	45
Peak Hour Factor	0.77	0.77	0.94	0.94	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	128	114	369	4390	3056	1363
Arrive On Green	0.07	0.07	0.82	0.82	0.82	0.82
Sat Flow, veh/h	1875	1668	412	5552	3839	1668
Grp Volume(v), veh/h	71	60	68	1588	1285	45
Grp Sat Flow(s),veh/h/ln	1875	1668	412	1792	1870	1668
Q Serve(g_s), s	3.7	3.5	5.5	7.7	9.6	0.5
Cycle Q Clear(g_c), s	3.7	3.5	15.1	7.7	9.6	0.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	128	114	369	4390	3056	1363
V/C Ratio(X)	0.56	0.53	0.18	0.36	0.42	0.03
Avail Cap(c_a), veh/h	375	334	369	4390	3056	1363
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.1	45.0	4.7	2.4	2.6	1.7
Incr Delay (d2), s/veh	3.7	3.8	1.1	0.2	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	1.6	0.5	1.3	1.7	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	48.9	48.8	5.8	2.6	3.0	1.8
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	131			1656	1330	
Approach Delay, s/veh	48.8			2.7	2.9	
Approach LOS	D			A	A	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.2		12.8		87.2
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5
Max Green Setting (Gmax), s		* 69		20.0		* 69
Max Q Clear Time (g_c+l1), s		17.1		5.7		11.6
Green Ext Time (p_c), s		18.4		0.3		12.4
Intersection Summary						
HCM 6th Ctrl Delay			4.8			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Background Conditions
 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1785	329	0
Future Volume (vph)	0	0	0	1785	329	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.93	0.93
Adj. Flow (vph)	0	0	0	1879	354	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1879	354	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				31.3	38.7	
Effective Green, g (s)				31.3	38.7	
Actuated g/C Ratio				0.63	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3350	1643	
v/s Ratio Prot				c0.35	c0.03	
v/s Ratio Perm					0.16	
v/c Ratio				0.56	0.22	
Uniform Delay, d1				5.4	1.6	
Progression Factor				0.61	1.00	
Incremental Delay, d2				0.6	0.0	
Delay (s)				3.8	1.6	
Level of Service				A	A	
Approach Delay (s)	0.0			3.8	1.6	
Approach LOS	A			A	A	

Intersection Summary

HCM 2000 Control Delay	3.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

Background Conditions

50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	2133	0	0	0	0	0	0	0	216	0	0
Future Volume (vph)	0	2133	0	0	0	0	0	0	0	216	0	0
Ideal Flow (vphp)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4									5.4	
Lane Util. Factor		0.91									1.00	
Frt		1.00									1.00	
Flt Protected		1.00									0.95	
Satd. Flow (prot)		5353									1863	
Flt Permitted		1.00									0.95	
Satd. Flow (perm)		5353									1863	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.81	0.81	0.81
Adj. Flow (vph)	0	2370	0	0	0	0	0	0	0	267	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	104	0
Lane Group Flow (vph)	0	2370	0	0	0	0	0	0	0	0	163	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA	Perm						Prot	custom	NA	
Protected Phases		2!							4		3	
Permitted Phases			2							3 2!		
Actuated Green, G (s)		75.5									13.7	
Effective Green, g (s)		75.5									13.7	
Actuated g/C Ratio		0.76									0.14	
Clearance Time (s)		5.4									5.4	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		4041									255	
v/s Ratio Prot		c0.44										
v/s Ratio Perm											0.09	
v/c Ratio		0.59									0.64	
Uniform Delay, d1		5.4									40.8	
Progression Factor		0.26									0.92	
Incremental Delay, d2		0.2									4.5	
Delay (s)		1.7									42.0	
Level of Service		A									D	
Approach Delay (s)		1.7			0.0			0.0			42.0	
Approach LOS		A			A			A			D	

Intersection Summary

HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

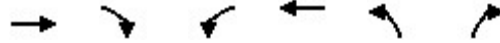
Background Conditions
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	1864	230	0	137
Future Volume (vph)	0	0	1864	230	0	137
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5265			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5265			2933
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.87	0.87
Adj. Flow (vph)	0	0	1962	242	0	157
RTOR Reduction (vph)	0	0	29	0	0	23
Lane Group Flow (vph)	0	0	2175	0	0	134
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			32.5			5.3
Effective Green, g (s)			32.5			5.3
Actuated g/C Ratio			0.65			0.11
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3422			310
v/s Ratio Prot			c0.41			c0.05
v/s Ratio Perm						
v/c Ratio			0.64			0.43
Uniform Delay, d1			5.2			20.9
Progression Factor			1.00			1.00
Incremental Delay, d2			0.9			1.0
Delay (s)			6.1			21.9
Level of Service			A			C
Approach Delay (s)		0.0	6.1		21.9	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay			7.2		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.61			
Actuated Cycle Length (s)			50.0		Sum of lost time (s)	12.2
Intersection Capacity Utilization			53.8%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
70: Troy Center Drive & EB Big Beaver Rd

Background Conditions
PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	2316	33	0	0	0	141
Future Volume (vph)	2316	33	0	0	0	141
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	1.00					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5342					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5342					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.76	0.76
Adj. Flow (vph)	2573	37	0	0	0	186
RTOR Reduction (vph)	1	0	0	0	0	22
Lane Group Flow (vph)	2609	0	0	0	0	164
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	78.3					9.5
Effective Green, g (s)	78.3					9.5
Actuated g/C Ratio	0.78					0.10
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	4182					361
v/s Ratio Prot	c0.49					c0.04
v/s Ratio Perm						
v/c Ratio	0.62					0.46
Uniform Delay, d1	4.6					42.8
Progression Factor	0.48					1.00
Incremental Delay, d2	0.6					0.9
Delay (s)	2.8					43.7
Level of Service	A					D
Approach Delay (s)	2.8			0.0	43.7	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	100	62	115	64	67
Average Queue (ft)	46	15	40	43	34
95th Queue (ft)	88	47	88	68	50
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				14	26
Queuing Penalty (veh)				36	67
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	103	136
Average Queue (ft)	31	66
95th Queue (ft)	76	118
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	328	304	248	323	15	26	402	393	325
Average Queue (ft)	227	193	149	159	1	1	279	240	93
95th Queue (ft)	304	272	221	286	8	12	378	358	217
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					0	1			
Queuing Penalty (veh)					1	2			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)								5	
Queuing Penalty (veh)								14	

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R	T	T
Maximum Queue (ft)	238	213	185	330	166	172	132	44	37
Average Queue (ft)	163	139	105	190	109	98	47	10	5
95th Queue (ft)	225	202	164	292	165	158	96	35	23
Link Distance (ft)	602	602	602	602	334	334	334	37	37
Upstream Blk Time (%)								12	5
Queuing Penalty (veh)								73	28
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 30: Crooks Rd & Butterfield Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (ft)	68	60	245	171	144	81	210	220	105
Average Queue (ft)	23	14	107	29	15	14	88	93	4
95th Queue (ft)	56	39	216	119	72	49	206	217	36
Link Distance (ft)		1022		336	336	336	333	333	
Upstream Blk Time (%)			1	1					
Queuing Penalty (veh)			0	1					
Storage Bay Dist (ft)	500		500						150
Storage Blk Time (%)			1	1				2	
Queuing Penalty (veh)			1	1				1	

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	73	59	70	92
Average Queue (ft)	42	28	37	65
95th Queue (ft)	72	61	69	87
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	11	6	8	28
Queuing Penalty (veh)	70	36	51	58
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	133	28	42	65
Average Queue (ft)	34	1	3	4
95th Queue (ft)	94	15	24	32
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	1		0	0
Queuing Penalty (veh)	2		0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	SB
Directions Served	T	T	T	LT
Maximum Queue (ft)	77	82	90	71
Average Queue (ft)	14	22	20	38
95th Queue (ft)	51	73	67	72
Link Distance (ft)	52	52	52	36
Upstream Blk Time (%)	1	2	2	8
Queuing Penalty (veh)	2	6	5	19
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	44	72	51	105
Average Queue (ft)	4	20	5	17
95th Queue (ft)	22	61	27	61
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	146	96	372	67	57
Average Queue (ft)	61	23	76	25	11
95th Queue (ft)	130	66	238	55	37
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	87	111	105	82	28
Average Queue (ft)	18	27	29	27	2
95th Queue (ft)	63	83	83	62	14
Link Distance (ft)	409	409	409	590	590
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 80: Crooks Rd & N. Site Drive

Movement	SB
Directions Served	T
Maximum Queue (ft)	10
Average Queue (ft)	0
95th Queue (ft)	7
Link Distance (ft)	334
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB
Directions Served	T
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	40
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 100: Crooks Rd & S. Site Drive

Movement	NB	NB
Directions Served	T	T
Maximum Queue (ft)	36	29
Average Queue (ft)	2	1
95th Queue (ft)	29	21
Link Distance (ft)	588	588
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

Network Summary

Network wide Queuing Penalty: 474

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	140	111	84	56	57
Average Queue (ft)	73	47	31	54	34
95th Queue (ft)	125	93	71	66	47
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				41	50
Queuing Penalty (veh)				96	115
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	157	171
Average Queue (ft)	76	89
95th Queue (ft)	139	153
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	292	270	283	333	15	33	335	286	248
Average Queue (ft)	209	191	170	171	1	4	223	178	106
95th Queue (ft)	279	259	245	282	7	20	309	266	204
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					0	3			
Queuing Penalty (veh)					2	16			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)								1	0
Queuing Penalty (veh)								3	0

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R	T	T
Maximum Queue (ft)	478	464	402	249	331	346	371	38	13
Average Queue (ft)	283	272	241	71	229	220	221	4	1
95th Queue (ft)	414	404	369	167	318	310	348	23	8
Link Distance (ft)	602	602	602	602	334	334	334	37	37
Upstream Blk Time (%)	0	0			0	0	2	5	0
Queuing Penalty (veh)	0	0			1	1	9	25	2
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 30: Crooks Rd & Butterfield Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (ft)	94	73	85	144	129	135	199	217	73
Average Queue (ft)	40	21	35	51	41	44	93	100	9
95th Queue (ft)	80	46	71	111	102	103	176	191	31
Link Distance (ft)		1022		336	336	336	333	333	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)	500		500						150
Storage Blk Time (%)								1	
Queuing Penalty (veh)								0	

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	67	60	76	84
Average Queue (ft)	48	40	42	70
95th Queue (ft)	68	69	73	83
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	16	10	11	40
Queuing Penalty (veh)	97	58	67	133
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	164	44	84	89
Average Queue (ft)	64	3	9	11
95th Queue (ft)	146	28	51	59
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	4	0	0	0
Queuing Penalty (veh)	21	0	0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	SB
Directions Served	T	T	T	LT
Maximum Queue (ft)	76	85	88	74
Average Queue (ft)	16	24	26	49
95th Queue (ft)	59	78	82	83
Link Distance (ft)	52	52	52	36
Upstream Blk Time (%)	2	3	3	20
Queuing Penalty (veh)	12	17	19	44
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	133	102	75	106
Average Queue (ft)	18	39	19	27
95th Queue (ft)	73	87	59	78
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	162	136	203	100	77
Average Queue (ft)	89	42	88	51	27
95th Queue (ft)	145	93	165	86	61
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	TR	R	R	R
Maximum Queue (ft)	161	200	204	174	127	11
Average Queue (ft)	45	76	93	89	26	0
95th Queue (ft)	114	150	172	150	85	6
Link Distance (ft)	409	409	409	590	590	590
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 80: Crooks Rd & N. Site Drive

Movement	NB
Directions Served	TR
Maximum Queue (ft)	69
Average Queue (ft)	5
95th Queue (ft)	41
Link Distance (ft)	333
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB	EB	EB
Directions Served	T	T	T
Maximum Queue (ft)	59	32	16
Average Queue (ft)	5	1	1
95th Queue (ft)	32	23	10
Link Distance (ft)		350	350
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	40		
Storage Blk Time (%)	1		0
Queuing Penalty (veh)	4		0

Intersection: 100: Crooks Rd & S. Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 744

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Future Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	1017	0	0	504	0
Future Volume (vph)	0	1017	0	0	504	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3650	
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.90	0.90
Adj. Flow (vph)	0	1130	0	0	560	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1130	0	0	560	0
Heavy Vehicles (%)	1%	1%	2%	2%	1%	1%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		31.9			39.2	
Effective Green, g (s)		31.9			39.2	
Actuated g/C Ratio		0.64			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3449			3650	
v/s Ratio Prot		c0.21			c0.02	
v/s Ratio Perm					0.13	
v/c Ratio		0.33			0.15	
Uniform Delay, d1		4.1			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.3			0.0	
Delay (s)		4.4			1.4	
Level of Service		A			A	
Approach Delay (s)		4.4	0.0		1.4	
Approach LOS		A	A		A	

Intersection Summary

HCM 2000 Control Delay	3.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Crooks Rd & WB Big Beaver Rd

Future Conditions
AM Peak Hour













													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1431	631	0	600	0	0	1309	300	
Future Volume (vph)	0	0	0	0	1431	631	0	600	0	0	1309	300	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	0	1626	717	0	706	0	0	1378	316	
RTOR Reduction (vph)	0	0	0	0	0	74	0	0	0	0	0	22	
Lane Group Flow (vph)	0	0	0	0	1626	643	0	706	0	0	1378	294	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					43.5	43.5		44.0			41.0	41.0	
Effective Green, g (s)					43.5	43.5		44.0			41.0	41.0	
Actuated g/C Ratio					0.44	0.44		0.44			0.41	0.41	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2328	725		1639			1527	683	
v/s Ratio Prot					0.30			0.19			c0.37		
v/s Ratio Perm						c0.39						0.18	
v/c Ratio					0.70	0.89		0.43			0.90	0.43	
Uniform Delay, d1					22.9	26.0		19.3			27.6	21.1	
Progression Factor					0.77	0.73		0.00			1.00	1.00	
Incremental Delay, d2					1.5	13.2		0.2			7.9	0.5	
Delay (s)					19.1	32.1		0.2			35.6	21.6	
Level of Service					B	C		A			D	C	
Approach Delay (s)		0.0			23.1			0.2			33.0		
Approach LOS		A			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			23.2		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.89										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)						15.5		
Intersection Capacity Utilization			75.7%		ICU Level of Service						D		
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

21: Crooks Rd & EB Big Beaver Rd

Future Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑↑	↗					↑↑	↗		↑↑		
Traffic Volume (vph)	0	996	525	0	0	0	0	600	288	0	1309	0	
Future Volume (vph)	0	996	525	0	0	0	0	600	288	0	1309	0	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0		
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		5353	1667					3725	1667		3725		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		5353	1667					3725	1667		3725		
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	
Adj. Flow (vph)	0	1107	583	0	0	0	0	706	339	0	1378	0	
RTOR Reduction (vph)	0	0	37	0	0	0	0	0	22	0	0	0	
Lane Group Flow (vph)	0	1107	546	0	0	0	0	706	317	0	1378	0	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		6						4			8		
Permitted Phases			6						4				
Actuated Green, G (s)		43.5	43.5					41.0	41.0		44.0		
Effective Green, g (s)		43.5	43.5					41.0	41.0		44.0		
Actuated g/C Ratio		0.44	0.44					0.41	0.41		0.44		
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0		
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5		
Lane Grp Cap (vph)		2328	725					1527	683		1639		
v/s Ratio Prot		0.21						0.19			c0.37		
v/s Ratio Perm			c0.33						0.19				
v/c Ratio		0.48	0.75					0.46	0.46		0.84		
Uniform Delay, d1		20.1	23.7					21.5	21.5		24.9		
Progression Factor		0.83	0.79					0.94	0.93		0.02		
Incremental Delay, d2		0.7	7.0					0.3	0.6		1.8		
Delay (s)		17.4	25.6					20.5	20.6		2.4		
Level of Service		B	C					C	C		A		
Approach Delay (s)		20.3			0.0			20.5			2.4		
Approach LOS		C			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			14.3									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			100.0									Sum of lost time (s)	15.5
Intersection Capacity Utilization			75.7%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

HCM 6th Signalized Intersection Summary
 30: Crooks Rd & Butterfield Ave/Middle Site Drive

Future Conditions
 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	0	26	37	0	38	113	840	5	12	1700	35
Future Volume (veh/h)	29	0	26	37	0	38	113	840	5	12	1700	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	36	0	32	40	0	41	128	955	6	14	1932	40
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	134	0	115	142	0	115	253	4498	28	526	3053	1362
Arrive On Green	0.07	0.00	0.07	0.07	0.00	0.07	0.82	0.82	0.82	1.00	1.00	1.00
Sat Flow, veh/h	1366	0	1668	1377	0	1668	221	5511	35	584	3741	1668
Grp Volume(v), veh/h	36	0	32	40	0	41	128	621	340	14	1932	40
Grp Sat Flow(s),veh/h/ln	1366	0	1668	1377	0	1668	221	1792	1963	584	1870	1668
Q Serve(g_s), s	2.6	0.0	1.8	2.8	0.0	2.3	25.2	3.9	3.9	0.1	0.0	0.0
Cycle Q Clear(g_c), s	4.9	0.0	1.8	4.7	0.0	2.3	25.2	3.9	3.9	4.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	134	0	115	142	0	115	253	2924	1602	526	3053	1362
V/C Ratio(X)	0.27	0.00	0.28	0.28	0.00	0.36	0.51	0.21	0.21	0.03	0.63	0.03
Avail Cap(c_a), veh/h	136	0	117	143	0	117	253	2924	1602	526	3053	1362
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.8	0.0	44.2	46.4	0.0	44.4	4.0	2.0	2.0	0.1	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	1.3	1.1	0.0	1.9	7.1	0.2	0.3	0.1	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.8	1.0	0.0	1.0	1.0	0.6	0.8	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.9	0.0	45.5	47.5	0.0	46.3	11.1	2.2	2.3	0.2	1.0	0.0
LnGrp LOS	D	A	D	D	A	D	B	A	A	A	A	A
Approach Vol, veh/h		68			81			1089			1986	
Approach Delay, s/veh		46.7			46.9			3.3			1.0	
Approach LOS		D			D			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		87.1		12.9		87.1		12.9				
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5		6.0				
Max Green Setting (Gmax), s		* 82		7.0		* 82		7.0				
Max Q Clear Time (g_c+I1), s		27.2		6.9		6.0		6.7				
Green Ext Time (p_c), s		14.5		0.0		29.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				3.9								
HCM 6th LOS				A								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Future Conditions
 AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1819	243	0
Future Volume (vph)	0	0	0	1819	243	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.90	0.90
Adj. Flow (vph)	0	0	0	2091	270	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	2091	270	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				33.1	38.7	
Effective Green, g (s)				33.1	38.7	
Actuated g/C Ratio				0.66	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3543	1643	
v/s Ratio Prot				c0.39	c0.02	
v/s Ratio Perm					0.13	
v/c Ratio				0.59	0.16	
Uniform Delay, d1				4.7	1.5	
Progression Factor				0.61	1.00	
Incremental Delay, d2				0.6	0.1	
Delay (s)				3.4	1.6	
Level of Service				A	A	
Approach Delay (s)	0.0			3.4	1.6	
Approach LOS	A			A	A	

Intersection Summary

HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

Future Conditions

50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	1030	3	0	0	0	0	0	46	232	113	0
Future Volume (vph)	0	1030	3	0	0	0	0	0	46	232	113	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4	5.4						5.4		5.4	
Lane Util. Factor		0.91	1.00						0.88		1.00	
Frt		1.00	0.85						0.85		1.00	
Flt Protected		1.00	1.00						1.00		0.97	
Satd. Flow (prot)		5250	1635						2992		1916	
Flt Permitted		1.00	1.00						1.00		0.97	
Satd. Flow (perm)		5250	1635						2992		1916	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.83	0.83	0.83
Adj. Flow (vph)	0	1144	3	0	0	0	0	0	77	280	136	0
RTOR Reduction (vph)	0	0	2	0	0	0	0	0	0	0	135	0
Lane Group Flow (vph)	0	1144	1	0	0	0	0	0	77	0	281	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm						Prot	custom	NA	
Protected Phases		2!							4		3	
Permitted Phases			2							3 2!		
Actuated Green, G (s)		20.5	20.5						3.0		10.3	
Effective Green, g (s)		20.5	20.5						3.0		10.3	
Actuated g/C Ratio		0.41	0.41						0.06		0.21	
Clearance Time (s)		5.4	5.4						5.4		5.4	
Vehicle Extension (s)		3.0	3.0						3.0		3.0	
Lane Grp Cap (vph)		2152	670						179		394	
v/s Ratio Prot		c0.22							c0.03			
v/s Ratio Perm			0.00								0.15	
v/c Ratio		0.53	0.00						0.43		0.71	
Uniform Delay, d1		11.1	8.7						22.7		18.5	
Progression Factor		0.64	1.00						1.00		0.93	
Incremental Delay, d2		0.8	0.0						1.7		4.9	
Delay (s)		8.0	8.7						24.3		22.2	
Level of Service		A	A						C		C	
Approach Delay (s)		8.0			0.0			24.3			22.2	
Approach LOS		A			A			C			C	

Intersection Summary

HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

Future Conditions
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	2115	265	0	49
Future Volume (vph)	0	0	2115	265	0	49
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5263			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5263			2933
Peak-hour factor, PHF	0.92	0.92	0.87	0.87	0.92	0.92
Adj. Flow (vph)	0	0	2431	305	0	53
RTOR Reduction (vph)	0	0	26	0	0	11
Lane Group Flow (vph)	0	0	2710	0	0	42
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			35.7			2.1
Effective Green, g (s)			35.7			2.1
Actuated g/C Ratio			0.71			0.04
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3757			123
v/s Ratio Prot			c0.51			c0.01
v/s Ratio Perm						
v/c Ratio			0.72			0.35
Uniform Delay, d1			4.2			23.3
Progression Factor			1.00			1.00
Incremental Delay, d2			1.2			1.7
Delay (s)			5.4			25.0
Level of Service			A			C
Approach Delay (s)		0.0	5.4		25.0	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 70: Troy Center Drive & EB Big Beaver Rd

Future Conditions
 AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	1167	141	0	0	0	33
Future Volume (vph)	1167	141	0	0	0	33
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	0.98					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5266					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5266					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.64	0.64
Adj. Flow (vph)	1297	157	0	0	0	52
RTOR Reduction (vph)	22	0	0	0	0	50
Lane Group Flow (vph)	1432	0	0	0	0	2
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	35.6					2.2
Effective Green, g (s)	35.6					2.2
Actuated g/C Ratio	0.71					0.04
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	3749					167
v/s Ratio Prot	c0.27					c0.00
v/s Ratio Perm						
v/c Ratio	0.38					0.01
Uniform Delay, d1	2.8					22.9
Progression Factor	0.25					1.00
Incremental Delay, d2	0.3					0.0
Delay (s)	1.0					22.9
Level of Service	A					C
Approach Delay (s)	1.0			0.0	22.9	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	1.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↘ ↘ ↘			↗ ↘	↗ ↘
Traffic Vol, veh/h	0	21	867	40	87	1747
Future Vol, veh/h	0	21	867	40	87	1747
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	305	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	85	85	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	23	1020	47	99	1985

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	534	0	0	1067
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	5.34
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	3.12
Pot Cap-1 Maneuver	0	*730	-	-	753
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %		1	-	-	1
Mov Cap-1 Maneuver	-	*730	-	-	753
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	730	753
HCM Lane V/C Ratio	-	-	0.031	0.131
HCM Control Delay (s)	-	-	10.1	10.5
HCM Lane LOS	-	-	B	B
HCM 95th %tile Q(veh)	-	-	0.1	0.5

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

90: W. Site Drive & EB Big Beaver Rd Performance by movement

Movement	EBT	EBR	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1	0.0
Total Delay (hr)	1.3	0.0	0.0	1.4
Total Del/Veh (s)	3.7	2.4	8.7	3.8

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘↗		↑↑↑		↘	↑↑
Traffic Vol, veh/h	8	10	948	4	2	1761
Future Vol, veh/h	8	10	948	4	2	1761
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	125	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	11	1077	5	2	2001

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2085	541	0	0	1082	0
Stage 1	1080	-	-	-	-	-
Stage 2	1005	-	-	-	-	-
Critical Hdwy	6.29	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.67	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	62	416	-	-	357	-
Stage 1	221	-	-	-	-	-
Stage 2	307	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	62	416	-	-	357	-
Mov Cap-2 Maneuver	144	-	-	-	-	-
Stage 1	221	-	-	-	-	-
Stage 2	305	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.4	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	226	357
HCM Lane V/C Ratio	-	-	0.087	0.006
HCM Control Delay (s)	-	-	22.4	15.1
HCM Lane LOS	-	-	C	C
HCM 95th %tile Q(veh)	-	-	0.3	0

HCM Signalized Intersection Capacity Analysis
 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Future Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↑↑	
Traffic Volume (vph)	0	1724	0	0	457	0
Future Volume (vph)	0	1724	0	0	457	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4			5.4	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5460			3686	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5460			3686	
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.85	0.85
Adj. Flow (vph)	0	2005	0	0	538	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	2005	0	0	538	0
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Turn Type		NA			pm+pt	
Protected Phases		2!			4	
Permitted Phases					2!	
Actuated Green, G (s)		32.6			39.2	
Effective Green, g (s)		32.6			39.2	
Actuated g/C Ratio		0.65			0.78	
Clearance Time (s)		5.4			5.4	
Vehicle Extension (s)		3.0			3.5	
Lane Grp Cap (vph)		3559			3686	
v/s Ratio Prot		c0.37			c0.02	
v/s Ratio Perm					0.13	
v/c Ratio		0.56			0.15	
Uniform Delay, d1		4.8			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.7			0.0	
Delay (s)		5.4			1.4	
Level of Service		A			A	
Approach Delay (s)		5.4	0.0		1.4	
Approach LOS		A	A		A	

Intersection Summary

HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.8
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Crooks Rd & WB Big Beaver Rd













Future Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑↑	↑		↑↑			↑↑	↑	
Traffic Volume (vph)	0	0	0	0	1635	547	0	1064	0	0	1008	353	
Future Volume (vph)	0	0	0	0	1635	547	0	1064	0	0	1008	353	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)					6.5	6.5		6.0			9.0	9.0	
Lane Util. Factor					0.91	1.00		0.95			0.95	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					5353	1667		3725			3725	1667	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					5353	1667		3725			3725	1667	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88	0.82	0.82	0.82	
Adj. Flow (vph)	0	0	0	0	1758	588	0	1209	0	0	1229	430	
RTOR Reduction (vph)	0	0	0	0	0	35	0	0	0	0	0	23	
Lane Group Flow (vph)	0	0	0	0	1758	553	0	1209	0	0	1229	407	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					2			8			4		
Permitted Phases						2						4	
Actuated Green, G (s)					45.5	45.5		42.0			39.0	39.0	
Effective Green, g (s)					45.5	45.5		42.0			39.0	39.0	
Actuated g/C Ratio					0.46	0.46		0.42			0.39	0.39	
Clearance Time (s)					6.5	6.5		6.0			9.0	9.0	
Vehicle Extension (s)					3.0	3.0		3.5			3.5	3.5	
Lane Grp Cap (vph)					2435	758		1564			1452	650	
v/s Ratio Prot					0.33			0.32			c0.33		
v/s Ratio Perm						c0.33						0.24	
v/c Ratio					0.72	0.73		0.77			0.85	0.63	
Uniform Delay, d1					22.1	22.2		24.9			27.8	24.6	
Progression Factor					0.73	0.70		0.00			1.00	1.00	
Incremental Delay, d2					1.7	5.4		1.3			4.9	2.0	
Delay (s)					17.8	20.9		1.4			32.6	26.6	
Level of Service					B	C		A			C	C	
Approach Delay (s)		0.0			18.6			1.4			31.1		
Approach LOS		A			B			A			C		
Intersection Summary													
HCM 2000 Control Delay			18.6		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.78										
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					15.5			
Intersection Capacity Utilization			82.1%		ICU Level of Service					E			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

21: Crooks Rd & EB Big Beaver Rd

Future Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑↑	↗					↑↑	↗		↑↑		
Traffic Volume (vph)	0	1942	239	0	0	0	0	1064	570	0	1008	0	
Future Volume (vph)	0	1942	239	0	0	0	0	1064	570	0	1008	0	
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
Total Lost time (s)		6.5	6.5					9.0	9.0		6.0		
Lane Util. Factor		0.91	1.00					0.95	1.00		0.95		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		5353	1667					3725	1667		3725		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		5353	1667					3725	1667		3725		
Peak-hour factor, PHF	0.86	0.86	0.86	0.92	0.92	0.92	0.88	0.88	0.88	0.82	0.82	0.82	
Adj. Flow (vph)	0	2258	278	0	0	0	0	1209	648	0	1229	0	
RTOR Reduction (vph)	0	0	35	0	0	0	0	0	23	0	0	0	
Lane Group Flow (vph)	0	2258	243	0	0	0	0	1209	625	0	1229	0	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		6						4			8		
Permitted Phases			6						4				
Actuated Green, G (s)		45.5	45.5					39.0	39.0		42.0		
Effective Green, g (s)		45.5	45.5					39.0	39.0		42.0		
Actuated g/C Ratio		0.46	0.46					0.39	0.39		0.42		
Clearance Time (s)		6.5	6.5					9.0	9.0		6.0		
Vehicle Extension (s)		3.0	3.0					3.5	3.5		3.5		
Lane Grp Cap (vph)		2435	758					1452	650		1564		
v/s Ratio Prot		c0.42						0.32			0.33		
v/s Ratio Perm			0.15						c0.37				
v/c Ratio		0.93	0.32					0.83	0.96		0.79		
Uniform Delay, d1		25.7	17.4					27.6	29.8		25.1		
Progression Factor		0.81	0.82					0.88	0.87		0.01		
Incremental Delay, d2		7.0	1.0					4.2	25.4		1.4		
Delay (s)		27.6	15.3					28.3	51.4		1.6		
Level of Service		C	B					C	D		A		
Approach Delay (s)		26.3			0.0			36.4			1.6		
Approach LOS		C			A			D			A		
Intersection Summary													
HCM 2000 Control Delay			24.2									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.94										
Actuated Cycle Length (s)			100.0									Sum of lost time (s)	15.5
Intersection Capacity Utilization			82.1%									ICU Level of Service	E
Analysis Period (min)			15										

c Critical Lane Group

HCM 6th Signalized Intersection Summary
 30: Crooks Rd & Butterfield Ave/Middle Site Drive

Future Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑↑		↖	↑↑	↗
Traffic Volume (veh/h)	55	0	46	61	0	17	64	1525	9	28	1143	40
Future Volume (veh/h)	55	0	46	61	0	17	64	1525	9	28	1143	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	71	0	60	66	0	18	68	1622	10	31	1284	45
Peak Hour Factor	0.77	0.77	0.77	0.92	0.92	0.92	0.94	0.94	0.94	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	202	0	171	165	0	171	394	4312	27	285	2926	1305
Arrive On Green	0.10	0.00	0.10	0.10	0.00	0.10	0.78	0.78	0.78	1.00	1.00	1.00
Sat Flow, veh/h	1395	0	1668	1343	0	1668	412	5512	34	308	3741	1668
Grp Volume(v), veh/h	71	0	60	66	0	18	68	1054	578	31	1284	45
Grp Sat Flow(s),veh/h/ln	1395	0	1668	1343	0	1668	412	1792	1963	308	1870	1668
Q Serve(g_s), s	4.9	0.0	3.3	4.8	0.0	1.0	4.3	9.1	9.1	1.3	0.0	0.0
Cycle Q Clear(g_c), s	5.8	0.0	3.3	8.2	0.0	1.0	4.3	9.1	9.1	10.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	202	0	171	165	0	171	394	2803	1535	285	2926	1305
V/C Ratio(X)	0.35	0.00	0.35	0.40	0.00	0.11	0.17	0.38	0.38	0.11	0.44	0.03
Avail Cap(c_a), veh/h	337	0	334	296	0	334	394	2803	1535	285	2926	1305
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.3	0.0	41.8	45.6	0.0	40.7	2.8	3.4	3.4	0.6	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	1.2	1.6	0.0	0.3	0.9	0.4	0.7	0.8	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	1.4	1.7	0.0	0.4	0.3	2.0	2.3	0.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	0.0	43.0	47.1	0.0	41.0	3.8	3.7	4.1	1.4	0.5	0.0
LnGrp LOS	D	A	D	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		131			84			1700			1360	
Approach Delay, s/veh		43.7			45.8			3.9			0.5	
Approach LOS		D			D			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		83.7		16.3		83.7		16.3				
Change Period (Y+Rc), s		* 5.5		6.0		* 5.5		6.0				
Max Green Setting (Gmax), s		* 69		20.0		* 69		20.0				
Max Q Clear Time (g_c+I1), s		11.1		7.8		12.4		10.2				
Green Ext Time (p_c), s		18.2		0.4		13.7		0.1				

Intersection Summary

HCM 6th Ctrl Delay	5.1
HCM 6th LOS	A

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Future Conditions
 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Volume (vph)	0	0	0	1773	409	0
Future Volume (vph)	0	0	0	1773	409	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.9	5.4	
Lane Util. Factor				0.91	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5353	1863	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5353	1863	
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.93	0.93
Adj. Flow (vph)	0	0	0	1866	440	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1866	440	0
Turn Type				NA	pm+pt	
Protected Phases				6!	8	
Permitted Phases					6!	
Actuated Green, G (s)				31.2	38.7	
Effective Green, g (s)				31.2	38.7	
Actuated g/C Ratio				0.62	0.77	
Clearance Time (s)				5.9	5.4	
Vehicle Extension (s)				3.0	4.0	
Lane Grp Cap (vph)				3340	1643	
v/s Ratio Prot				c0.35	c0.04	
v/s Ratio Perm					0.20	
v/c Ratio				0.56	0.27	
Uniform Delay, d1				5.4	1.7	
Progression Factor				0.61	1.00	
Incremental Delay, d2				0.6	0.0	
Delay (s)				3.9	1.7	
Level of Service				A	A	
Approach Delay (s)	0.0			3.9	1.7	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

Future Conditions

50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑						↑↑		↑	
Traffic Volume (vph)	0	2140	4	0	0	0	0	0	92	214	77	0
Future Volume (vph)	0	2140	4	0	0	0	0	0	92	214	77	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.4	5.4						5.4		5.4	
Lane Util. Factor		0.91	1.00						0.88		1.00	
Frt		1.00	0.85						0.85		1.00	
Flt Protected		1.00	1.00						1.00		0.96	
Satd. Flow (prot)		5353	1667						2992		1891	
Flt Permitted		1.00	1.00						1.00		0.96	
Satd. Flow (perm)		5353	1667						2992		1891	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.60	0.60	0.60	0.81	0.81	0.81
Adj. Flow (vph)	0	2378	4	0	0	0	0	0	153	264	95	0
RTOR Reduction (vph)	0	0	2	0	0	0	0	0	0	0	69	0
Lane Group Flow (vph)	0	2378	2	0	0	0	0	0	153	0	290	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA	Perm						Prot	custom	NA	
Protected Phases		2!							4		3	
Permitted Phases			2							3 2!		
Actuated Green, G (s)		57.1	57.1						7.6		19.1	
Effective Green, g (s)		57.1	57.1						7.6		19.1	
Actuated g/C Ratio		0.57	0.57						0.08		0.19	
Clearance Time (s)		5.4	5.4						5.4		5.4	
Vehicle Extension (s)		3.0	3.0						3.0		3.0	
Lane Grp Cap (vph)		3056	951						227		361	
v/s Ratio Prot		c0.44							c0.05			
v/s Ratio Perm			0.00								0.15	
v/c Ratio		0.78	0.00						0.67		0.80	
Uniform Delay, d1		16.6	9.2						45.0		38.7	
Progression Factor		0.35	1.00						1.00		0.86	
Incremental Delay, d2		0.8	0.0						7.7		10.2	
Delay (s)		6.5	9.2						52.7		43.3	
Level of Service		A	A						D		D	
Approach Delay (s)		6.5			0.0			52.7			43.3	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
60: WB Big Beaver Rd & Wilshire Drive

Future Conditions
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑↑			↑↑
Traffic Volume (vph)	0	0	1927	230	0	137
Future Volume (vph)	0	0	1927	230	0	137
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)			6.8			5.4
Lane Util. Factor			0.91			0.88
Frt			0.98			0.85
Flt Protected			1.00			1.00
Satd. Flow (prot)			5267			2933
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5267			2933
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.87	0.87
Adj. Flow (vph)	0	0	2028	242	0	157
RTOR Reduction (vph)	0	0	28	0	0	20
Lane Group Flow (vph)	0	0	2242	0	0	137
Turn Type			NA			Prot
Protected Phases			6			7
Permitted Phases						
Actuated Green, G (s)			32.5			5.3
Effective Green, g (s)			32.5			5.3
Actuated g/C Ratio			0.65			0.11
Clearance Time (s)			6.8			5.4
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			3423			310
v/s Ratio Prot			c0.43			c0.05
v/s Ratio Perm						
v/c Ratio			0.66			0.44
Uniform Delay, d1			5.3			21.0
Progression Factor			1.00			1.00
Incremental Delay, d2			1.0			1.0
Delay (s)			6.3			22.0
Level of Service			A			C
Approach Delay (s)		0.0	6.3		22.0	
Approach LOS		A	A		C	

Intersection Summary

HCM 2000 Control Delay	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 70: Troy Center Drive & EB Big Beaver Rd

Future Conditions
 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑					↑↑↑
Traffic Volume (vph)	2413	33	0	0	0	141
Future Volume (vph)	2413	33	0	0	0	141
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8					5.4
Lane Util. Factor	0.91					0.76
Frt	1.00					0.85
Flt Protected	1.00					1.00
Satd. Flow (prot)	5342					3800
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5342					3800
Peak-hour factor, PHF	0.90	0.90	0.92	0.92	0.76	0.76
Adj. Flow (vph)	2681	37	0	0	0	186
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	2717	0	0	0	0	169
Turn Type	NA					Prot
Protected Phases	2					3
Permitted Phases						
Actuated Green, G (s)	78.3					9.5
Effective Green, g (s)	78.3					9.5
Actuated g/C Ratio	0.78					0.10
Clearance Time (s)	6.8					5.4
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	4182					361
v/s Ratio Prot	c0.51					c0.04
v/s Ratio Perm						
v/c Ratio	0.65					0.47
Uniform Delay, d1	4.8					42.9
Progression Factor	0.24					1.00
Incremental Delay, d2	0.5					1.0
Delay (s)	1.6					43.8
Level of Service	A					D
Approach Delay (s)	1.6			0.0	43.8	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↑↑↑	↗ ↑↑↑		↘ ↑↑	↘ ↑↑
Traffic Vol, veh/h	0	70	1564	33	36	1211
Future Vol, veh/h	0	70	1564	33	36	1211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	305	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	88	88	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	76	1777	38	40	1361

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	908	0	0	1815
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	5.34
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	3.12
Pot Cap-1 Maneuver	0	*575	-	-	576
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %		1	-	-	1
Mov Cap-1 Maneuver	-	*575	-	-	576
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	575	576
HCM Lane V/C Ratio	-	-	0.132	0.07
HCM Control Delay (s)	-	-	12.2	11.7
HCM Lane LOS	-	-	B	B
HCM 95th %tile Q(veh)	-	-	0.5	0.2

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

90: W. Site Drive & EB Big Beaver Rd Performance by movement

Movement	EBT	EBR	NBR	All
Denied Delay (hr)	0.0	0.0	0.3	0.3
Denied Del/Veh (s)	0.0	0.1	13.9	0.4
Total Delay (hr)	4.1	0.0	1.7	5.8
Total Del/Veh (s)	5.9	3.5	73.1	8.0

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘↗		↑↑↑		↘	↑↑
Traffic Vol, veh/h	3	6	1592	9	7	1243
Future Vol, veh/h	3	6	1592	9	7	1243
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	125	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	94	94	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	7	1694	10	8	1397

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	2414	852	0	0	1704
Stage 1	1699	-	-	-	-
Stage 2	715	-	-	-	-
Critical Hdwy	6.29	7.14	-	-	5.34
Critical Hdwy Stg 1	6.64	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.67	3.92	-	-	3.12
Pot Cap-1 Maneuver	39	260	-	-	176
Stage 1	90	-	-	-	-
Stage 2	433	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	37	260	-	-	176
Mov Cap-2 Maneuver	76	-	-	-	-
Stage 1	90	-	-	-	-
Stage 2	414	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	31.8	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	144	176
HCM Lane V/C Ratio	-	-	0.068	0.045
HCM Control Delay (s)	-	-	31.8	26.4
HCM Lane LOS	-	-	D	D
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	104	57	126	63	47
Average Queue (ft)	43	18	45	43	32
95th Queue (ft)	91	50	100	68	42
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				13	27
Queuing Penalty (veh)				34	68
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	105	128
Average Queue (ft)	31	65
95th Queue (ft)	78	114
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	312	259	228	363	7	27	508	500	290
Average Queue (ft)	222	185	147	155	1	2	336	305	124
95th Queue (ft)	296	248	216	284	7	14	511	493	290
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					0	2			
Queuing Penalty (veh)					0	7			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)				0				11	0
Queuing Penalty (veh)				0				33	1

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R	T	T
Maximum Queue (ft)	254	242	200	369	174	174	147	49	42
Average Queue (ft)	165	142	113	219	99	92	53	14	7
95th Queue (ft)	228	207	176	338	158	154	104	43	31
Link Distance (ft)	602	602	602	602	340	340	340	37	37
Upstream Blk Time (%)								14	6
Queuing Penalty (veh)								90	37
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 30: Crooks Rd & Butterfield Ave/Middle Site Drive

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	TR	L	T	T	R
Maximum Queue (ft)	87	60	82	51	245	192	175	90	39	161	155	30
Average Queue (ft)	25	15	31	24	107	46	30	27	8	65	77	3
95th Queue (ft)	63	42	68	49	227	169	134	69	30	141	149	17
Link Distance (ft)		1022	473	473		335	335	335		339	339	
Upstream Blk Time (%)					1	2	0					
Queuing Penalty (veh)					0	7	0					
Storage Bay Dist (ft)	500				500				310			150
Storage Blk Time (%)					1	2						0
Queuing Penalty (veh)					3	2						0

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	73	52	71	77
Average Queue (ft)	41	30	38	64
95th Queue (ft)	71	62	70	84
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	11	6	9	31
Queuing Penalty (veh)	66	39	54	76
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	128	88	103	120
Average Queue (ft)	38	11	20	21
95th Queue (ft)	105	51	69	76
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	1	0	0	0
Queuing Penalty (veh)	3	0	0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	R	R	LT
Maximum Queue (ft)	99	103	101	25	86	46	72
Average Queue (ft)	48	58	62	2	28	4	66
95th Queue (ft)	99	109	102	14	65	24	85
Link Distance (ft)	52	52	52	52	331		36
Upstream Blk Time (%)	8	11	13				45
Queuing Penalty (veh)	20	29	35				156
Storage Bay Dist (ft)						150	
Storage Blk Time (%)					0		
Queuing Penalty (veh)					0		

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	200	82	47	108
Average Queue (ft)	64	19	7	20
95th Queue (ft)	158	58	28	67
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	167	115	186	75	37
Average Queue (ft)	64	23	65	27	9
95th Queue (ft)	143	74	149	58	32
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	71	105	116	70	19
Average Queue (ft)	13	26	28	27	1
95th Queue (ft)	47	73	77	60	11
Link Distance (ft)	409	409	409	590	590
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 80: Crooks Rd & N. Site Drive

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (ft)	39	9	79	5
Average Queue (ft)	16	0	32	0
95th Queue (ft)	42	4	66	4
Link Distance (ft)	557	339		340
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			305	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB	NB	NB
Directions Served	T	R	R
Maximum Queue (ft)	4	30	30
Average Queue (ft)	0	5	11
95th Queue (ft)	3	23	35
Link Distance (ft)		180	180
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	40		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 100: Crooks Rd & S. Site drive

Movement	WB	NB	NB	NB	SB
Directions Served	LR	T	T	TR	L
Maximum Queue (ft)	40	68	47	35	18
Average Queue (ft)	12	5	3	1	1
95th Queue (ft)	38	58	40	25	9
Link Distance (ft)	403	588	588		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				125	500
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Zone Summary

Zone wide Queuing Penalty: 762

Intersection: 10: EB Big Beaver Rd & WB-to-EB X/O W. of Crooks

Movement	EB	EB	EB	SB	SB
Directions Served	T	T	T	L	L
Maximum Queue (ft)	143	113	99	56	46
Average Queue (ft)	76	50	39	52	32
95th Queue (ft)	126	101	81	66	41
Link Distance (ft)	1376	1376	1376	24	24
Upstream Blk Time (%)				34	46
Queuing Penalty (veh)				80	105
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: WB-to-EB X/O W. of Crooks & WB Big Beaver Rd

Movement	WB	WB
Directions Served	L	L
Maximum Queue (ft)	118	133
Average Queue (ft)	53	63
95th Queue (ft)	97	108
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	375	375
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Crooks Rd & WB Big Beaver Rd

Movement	WB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	T	T	T	R	T	T	T	T	R
Maximum Queue (ft)	283	267	239	326	23	44	370	337	263
Average Queue (ft)	211	196	165	181	2	2	230	187	107
95th Queue (ft)	267	248	222	297	13	18	325	288	193
Link Distance (ft)	488	488	488		37	37	922	922	
Upstream Blk Time (%)					1	2			
Queuing Penalty (veh)					5	12			
Storage Bay Dist (ft)				450					250
Storage Blk Time (%)								1	0
Queuing Penalty (veh)								3	1

Intersection: 21: Crooks Rd & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	NB	SB
Directions Served	T	T	T	R	T	T	R	T
Maximum Queue (ft)	439	422	404	169	337	333	367	37
Average Queue (ft)	295	272	239	76	210	204	219	4
95th Queue (ft)	433	416	386	140	301	306	353	22
Link Distance (ft)	602	602	602	602	340	340	340	37
Upstream Blk Time (%)	0	0	0		0	0	2	4
Queuing Penalty (veh)	2	1	0		3	3	14	20
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 30: Crooks Rd & Butterfield Ave/Middle Site Drive

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	TR	L	T	T	R
Maximum Queue (ft)	112	64	124	52	88	138	117	140	73	48	73	32
Average Queue (ft)	40	19	52	12	37	55	41	56	23	9	25	3
95th Queue (ft)	86	46	100	39	73	114	94	116	56	35	62	19
Link Distance (ft)		1022	473	473		335	335	335		339	339	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	500				500				310			150
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 40: EB-to-WB X/O, E. of Crooks & WB Big Beaver Rd/Big Beaver Rd

Movement	WB	WB	WB	NB
Directions Served	T	T	T	L
Maximum Queue (ft)	69	83	68	91
Average Queue (ft)	51	44	47	71
95th Queue (ft)	64	73	70	80
Link Distance (ft)	18	18	18	37
Upstream Blk Time (%)	19	13	14	48
Queuing Penalty (veh)	113	74	80	197
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: EB Big Beaver Rd/Big Beaver Rd & EB-to-WB X/O, E. of Crooks

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	158	107	155	146
Average Queue (ft)	76	27	76	89
95th Queue (ft)	150	95	159	164
Link Distance (ft)	110	110	110	110
Upstream Blk Time (%)	6	0	4	7
Queuing Penalty (veh)	33	1	22	35
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 50: Kelly Drive/WB-to-EB X/O E. of Crooks & Big Beaver Rd/EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	R	R	LT
Maximum Queue (ft)	86	96	105	12	146	128	90
Average Queue (ft)	53	78	82	1	72	10	69
95th Queue (ft)	93	108	101	8	136	63	83
Link Distance (ft)	52	52	52	52	331		36
Upstream Blk Time (%)	14	25	28				56
Queuing Penalty (veh)	79	133	151				164
Storage Bay Dist (ft)						150	
Storage Blk Time (%)					0	0	
Queuing Penalty (veh)					0	0	

Intersection: 51: WB-to-EB X/O E. of Crooks & Big Beaver Rd/WB Big Beaver Rd

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	281	99	80	107
Average Queue (ft)	103	45	24	33
95th Queue (ft)	219	89	64	86
Link Distance (ft)		454	454	454
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	375			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: WB Big Beaver Rd & Wilshire Drive

Movement	WB	WB	WB	SB	SB
Directions Served	T	T	TR	R	R
Maximum Queue (ft)	172	110	178	119	64
Average Queue (ft)	84	39	88	57	23
95th Queue (ft)	145	86	159	99	55
Link Distance (ft)	1136	1136	1136	256	256
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 70: Troy Center Drive & EB Big Beaver Rd

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	TR	R	R	R
Maximum Queue (ft)	71	83	78	172	124	18
Average Queue (ft)	15	40	39	86	23	1
95th Queue (ft)	45	74	76	149	79	8
Link Distance (ft)	409	409	409	590	590	590
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 80: Crooks Rd & N. Site Drive

Movement	WB	NB	NB	NB	SB	SB
Directions Served	R	T	T	TR	L	T
Maximum Queue (ft)	99	12	6	92	75	7
Average Queue (ft)	38	0	0	6	25	0
95th Queue (ft)	76	6	4	44	59	5
Link Distance (ft)	557	339	339	339		340
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)					305	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 90: W. Site Drive & EB Big Beaver Rd

Movement	EB	EB	EB	EB	NB	NB
Directions Served	T	T	T	T	R	R
Maximum Queue (ft)	54	47	107	122	81	150
Average Queue (ft)	6	6	13	14	18	63
95th Queue (ft)	37	59	78	70	73	149
Link Distance (ft)		350	350	350	180	180
Upstream Blk Time (%)					1	8
Queuing Penalty (veh)					0	0
Storage Bay Dist (ft)	40					
Storage Blk Time (%)	2	0		1		
Queuing Penalty (veh)	12	0		8		

Intersection: 100: Crooks Rd & S. Site drive

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (ft)	51	30
Average Queue (ft)	10	8
95th Queue (ft)	36	28
Link Distance (ft)	403	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 1352

ITEM #8

DATE: January 5, 2023
TO: Planning Commission
FROM: R. Brent Savidant, Community Development Director
SUBJECT: ELECTION OF OFFICERS

The Planning Commission By-Laws call for the election of Officers (Chairperson and Vice Chairperson) and recommendation of appointment of Zoning Board of Appeals Representative each January at the Planning Commission Regular meeting.

The Chair shall take nominations from the floor for each position, with the election following immediately thereafter.

The Planning Commission By-Laws are attached for your information. Election provisions are in Article 3.

Attachment:

1. Planning Commission By-Laws

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**BY-LAWS AND RULES OF PROCEDURE OF THE CITY OF TROY
PLANNING COMMISSION**

ARTICLE I – COMPLIANCE AND AUTHORITY

The City of Troy Planning Commission shall comply with all applicable statutes, perform any duties, and exercise the powers granted to the Planning Commission by the Michigan Planning Enabling Act, Public Act 33 of 2008, as amended, the Michigan Zoning Enabling Act, Public Act 110 of 2006, as amended, and the Open Meetings Act, Public Act 267 of 1976, as amended, and the City of Troy Charter and Ordinances. The By-Laws and Rules of Procedure are adopted pursuant to the authority of those statutes and the City Charter.

ARTICLE II – OFFICERS AND THEIR DUTIES

- Section 1. The Planning Commission shall select from its membership a Chairperson and Vice-Chairperson who shall serve for a one (1) year term and who shall be eligible for re-election. The Planning Commission shall make a recommendation to City Council for a Zoning Board of Appeals Representative.
- Section 2. The Chairperson shall preside at all meetings and shall conduct all meetings in accordance with these by-laws and rules and in accordance with the usual duties conferred by parliamentary procedure on the position of Chairperson.
- Section 3. The Vice-Chairperson shall act in the capacity of the Chairperson in the absence of the Chairperson and shall succeed to the office of Chairperson in the event of a vacancy in that office, in which case the Planning Commission shall select a successor to the office of Vice-Chairperson at the earliest practicable time by election procedures as set out in Article III.
- Section 4. In the absence of both the Chairperson and the Vice-Chairperson, the Zoning Board of Appeals representative shall act as Chairperson for that meeting only. The temporary Chairperson shall have the same duties and privileges as the Chairperson.
- Section 5. The Chairperson and Vice-Chairperson may engage in discussion on all matters before the Planning Commission and shall have voting privileges.

ARTICLE III – ELECTION OF OFFICERS AND APPOINTMENT OF ZONING BOARD OF APPEALS (ZBA) REPRESENTATIVES

- Section 1. Each January at the Regular Meeting, the Planning Commission shall:
- A. Conduct elections of Officers (Chairperson and Vice Chairperson); and
 - B. Recommend appointment for a Zoning Board of Appeals Representative.

The Chairperson shall take nominations from the floor with the election immediately thereafter.

- Section 2. Candidates receiving a majority vote of the total number of members shall be declared elected as a Planning Commission Officer or recommended as a Zoning Board of Appeals Representative.

- Section 3. The Planning Commission Officers shall take office immediately following their election. Officers shall hold their office for a term of one (1) year, or until their successors are elected and assume office. The Zoning Board of Appeals Representative shall assume his or her responsibilities following confirmation of the appointment by City Council. The Zoning Board of Appeals Representative shall hold office for a term of one (1) year, or until a successor is appointed by City Council and assumes office.

- Section 4. The Method of Voting on Nominees shall be as follows:
- A. The Chairperson shall ask for nominations from the floor. A second shall not be required in order to nominate a person as an Officer or Zoning Board of Appeals Representative. The Chairperson shall announce each nomination as he or she hears it. If it becomes apparent to the Chairperson that there are no further nominations, the Chairperson shall inquire “are there further nominations?” If there are no further nominations, the Chairperson shall declare the nominations closed.
 - B. If there is only one nominee for each position, a single resolution may be used to elect all the officers. The resolution must be approved by a majority of Planning Commission members by a roll call vote.
 - C. If there is only one nominee for a particular position, a resolution electing that person to the particular position shall be approved by a roll call vote.

- D. If there is more than one nominee for a position, voting shall take place by calling a rotating roll of the Planning Commission and each member is to indicate the name of the individual he or she wishes to fill the position. If one candidate receives a majority vote, that person shall be deemed elected and the Chairperson shall announce such election. If no candidate receives a majority vote, the candidate with the least number of votes shall be eliminated from the ensuing ballot and the procedure shall be repeated until one candidate receives a majority vote.

ARTICLE IV – MEETINGS

- Section 1. All meetings shall be posted at City Hall according to the Open Meetings Act. The notice shall include the place, date and time of the meeting.
- Section 2. All meetings shall be conducted in accordance with generally accepted parliamentary procedure. The current version of Robert's Rules of Orders can serve as a guide.
- Section 3. Regular Meetings of the Planning Commission shall be held on the second and fourth Tuesday of each month at 7:00 p.m. at the Troy City Hall, 500 West Big Beaver Road, Troy, Michigan. Site Location Meetings may be scheduled by the Planning Commission at any reasonable time in accordance with the Open Meetings Act. Any changes in the date or time of any meeting shall be posted and noticed in accordance with the Open Meetings Act. When a Regular Meeting date falls on or near a legal holiday, the Planning Commission may schedule a meeting on a suitable alternate date in the same month.
- Section 4. The Chairperson may call Special Meetings. In addition, it shall be the duty of the Chairperson to call a Special Meeting when requested to do so by an affirmative vote of a majority of the Planning Commission members present. The business which the Planning Commission may perform at a Special Meeting may be the same business that the Planning Commission performs at a Regular Meeting. Notice of the time, date and place of the Special Meeting shall be given in a manner as required by the Open Meetings Act and the Planning Director shall notify all members of the Planning Commission not less than 48 hours in advance of a Special Meetings.
- Section 5. The Chairperson may call Study Meetings. At Study Meetings, the Planning Commission shall not vote on any of the following matters: (1) any matter requiring a public hearing, (2) matters which must be finally approved by the Planning Commission such as Site Plan review applications and Special Use Requests, and (3) matters where the Planning Commission is acting in an advisory capacity, such as, Rezoning

Requests, Ordinance Text Amendments, Subdivision Plats, Street and Alley Vacations, or Planned Unit Development Proposals. It may vote on housekeeping matters such as setting public hearing dates and approving minutes.

Section 6. All meetings of the Planning Commission, including Regular, Special, Study or Site Location meetings shall be open to the general public unless exempted from public meeting requirements under the Open Meetings Act. The Planning Commission, with guidance provided by the City Attorney's Office, shall make the determination as to whether the meeting or a portion of the meeting is exempt under the Open Meetings Act, and shall pass an appropriate resolution setting forth its determination.

Section 7. A majority of the membership of the Planning Commission constitutes a quorum and the number of votes necessary to transact business is as follows:

- A. The affirmative vote of six (6) members shall be necessary in order to adopt or amend a Master Plan.
- B. A majority vote of the members is necessary for those matters on which the Planning Commission has final jurisdiction, as per Section 3.10 of the City of Troy Zoning Ordinance.
- C. A majority vote of those members present at a meeting shall be necessary for those matters on which the Planning Commission serves in an advisory capacity.
- D. Voting on items on the Business Agenda shall be by a rotating roll call. A record of the vote shall be kept as a part of the minutes.
- E. When a quorum is not present, no official action shall take place. The Chairperson or Planning Director shall announce to the Commission and anyone in attendance that there is no quorum and that all agenda items will be rescheduled for a specific date.
- F. The Chairperson may ask members who vote "no" on an item to explain the "no" vote for clarification purposes and to add to the public record.

Section 8. The Planning Director of the City of Troy or his or her designee shall serve as the Secretary of the Planning Commission and keep the minutes and records of the Commission, prepare the agenda of Regular Meetings, Special Meetings and Study Meetings with the Chairperson, provide notice of meetings to Planning Commission members, present agenda items to the Planning Commission at its meetings, attend to correspondence of the

Planning Commission, and perform such other duties as necessary to carry out the business of the Planning Commission.

ARTICLE V – ORDER OF BUSINESS

The order of business at a Regular Meeting and Special Meetings shall be:

- A. Roll Call
- B. Approval of Agenda
- C. Approval of Minutes
- D. Public Comments for items not on the agenda
- E. Reports. Reports may include Zoning Board of Appeals reports, Downtown Development Authority reports, Planning and Zoning reports, and any other report on information that may be of interest to the Planning Commission as determined by the Planning Commission or Planning Department.
- F. Business Agenda. The business agenda may include postponed items, public hearings on zoning ordinance amendments and special use approval requests, preliminary site plan reviews, and any other matter that is before the Planning Commission seeking approval or a recommendation.
- G. Other Business
- H. Public Comments for items on the agenda.
- I. Planning Commissioner's Comments
- J. Adjournment

ARTICLE VI – PLANNING COMMISSION ACTIONS

Following consideration of matters submitted to it in accordance with the provisions of the City Code of Ordinances or other applicable law, or referred to it by the City Council, the Planning Commission shall take one of the following actions:

- A. Approve the proposal, or recommend positive action by the City Council.
- B. Deny the proposal, or recommend negative action by the City Council.

- C. Approve a proposal modified to meet reasonable conditions, or recommend approval of a modified proposal meeting reasonable conditions by the City Council. However, the Planning Commission shall not place conditions on an approval of a recommendation to City Council for rezoning, except for conditional rezoning in accordance with Section 16.04 of the City of Troy Zoning Ordinance.
- D. Postpone action on the proposal to a specific date or upon the occurrence a specific event. The Planning Director or his or her designee shall monitor the matter and determine when such specific event has occurred so that the matter may be rescheduled. The Planning Commission shall indicate in the resolution the reason(s) for such action.

The Planning Commission shall act on all applications within a reasonable time. This shall not be construed to alter other time limits prescribed by the Charter, Code of Ordinances or State statutes.

ARTICLE VII – HEARINGS

- Section 1. In addition to those required by law, the Planning Commission may in its discretion hold public hearings when it decides that such hearing will be in the public interest.
- Section 2. Notice of such hearings shall be published in the official newspaper of the City or in a newspaper of general circulation as required by the City Charter, Code of Ordinances and/or State statutes. The Planning Director or his or her designee shall take the necessary steps to see that notice is published in accordance with the City Charter, Code of Ordinances and/or State statutes.
- Section 3. Any request before the Planning Commission shall be presented in summary by the Planning Director or his or her representative or a designated member of the Planning Commission. The Planning Director may present additional information to the Planning Commission through personnel from other Departments and/or non-City employees, if the Planning Director believes that information would be helpful to the Planning Commission. Parties in interest shall have the privilege of the floor.
- Section 4. If the petitioner or petitioner's representative fails to appear for a scheduled hearing, the Planning Commission may proceed with the hearing in the absence of the petitioner and act on the proposal in accordance with Article VI. Adjournment of any scheduled hearing must be approved by a majority of the Planning Commission member in attendance. Requests for adjournment shall only be granted upon a demonstration of good cause.

Section 5. Public hearings and other proceedings conducted by the Planning Commission shall be run in an orderly and timely fashion. This shall be accomplished by the following procedure:

- A. If an agenda item does not formally require a public hearing, the Chairperson shall have the discretion to allow members of the public to address the agenda item. Once opened to the public for comment, the hearing shall be conducted in the same manner as a public hearing.
- B. After announcement by the Chairperson that the public hearing portion of the meeting for a specific agenda item is open, persons who wish to address the Planning Commission shall speak when recognized by the Chairperson and provide his/her name and address on the attendance sheet provided at the podium. All comments shall be addressed to the Chairperson.
- C. The Chairperson may order the removal of any member of the public that causes a breach of the peace during the public hearing.
- D. The Chairperson may place reasonable limits on the length of time speakers have to address an agenda item. The Planning Commission may override such time limitation by majority vote.

ARTICLE VIII – COMMITTEES

Section 1. Committees may be appointed as needed by the Chairperson for purposes and terms which the Planning Commission approves.

ARTICLE IX – EMPLOYEES

Section 1. The Planning Commission may recommend employment of such staff and/or experts as it sees fit to aid the Planning Commission in its work.

ARTICLE X – AMENDMENTS

These By-laws may be amended by a two-thirds vote of the entire membership of the Planning Commission.

ARTICLE XI – ETHICS

Planning Commission members shall adhere to the current version of the City of Troy Appointee Code of Ethics.