



# **PRELIMINARY ENGINEERING REPORT**

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**TC-0621**

**SAFETY IMPROVEMENTS**

**FLASHING YELLOW ARROW UPGRADES**

**Oklahoma City, Oklahoma**

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**Prepared for:**

**The City of Oklahoma City**

**July 2023**

**Prepared by:**

**Traffic Engineering Consultants, Inc.**

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CA # 1160 Exp. 06/30/2025

# THE CITY OF OKLAHOMA CITY APPROVAL SHEET

## PRELIMINARY REPORT FOR Safety Improvements Flashing Yellow Arrow Upgrades Project No. TC-0621

Prepared by:  
**Traffic Engineering Consultants, Inc.**  
6000 S. Western Ave., Ste. 300  
Oklahoma City, Oklahoma



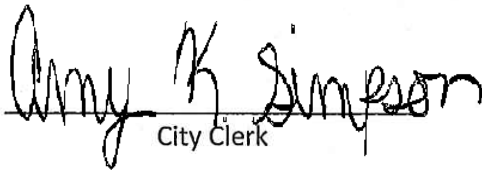
Esther M. Shaw-Smith, P.E., PTOE  
Recommended for Approval



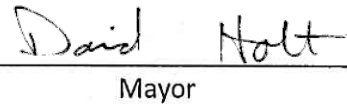
Eric J. Wenger, P.E., Director  
Public Works/City Engineer

**APPROVED** by the Council of the City of Oklahoma City this 29TH day of AUGUST, 2023.

**ATTEST:**

  
City Clerk

**THE CITY OF OKLAHOMA CITY**

  
Mayor



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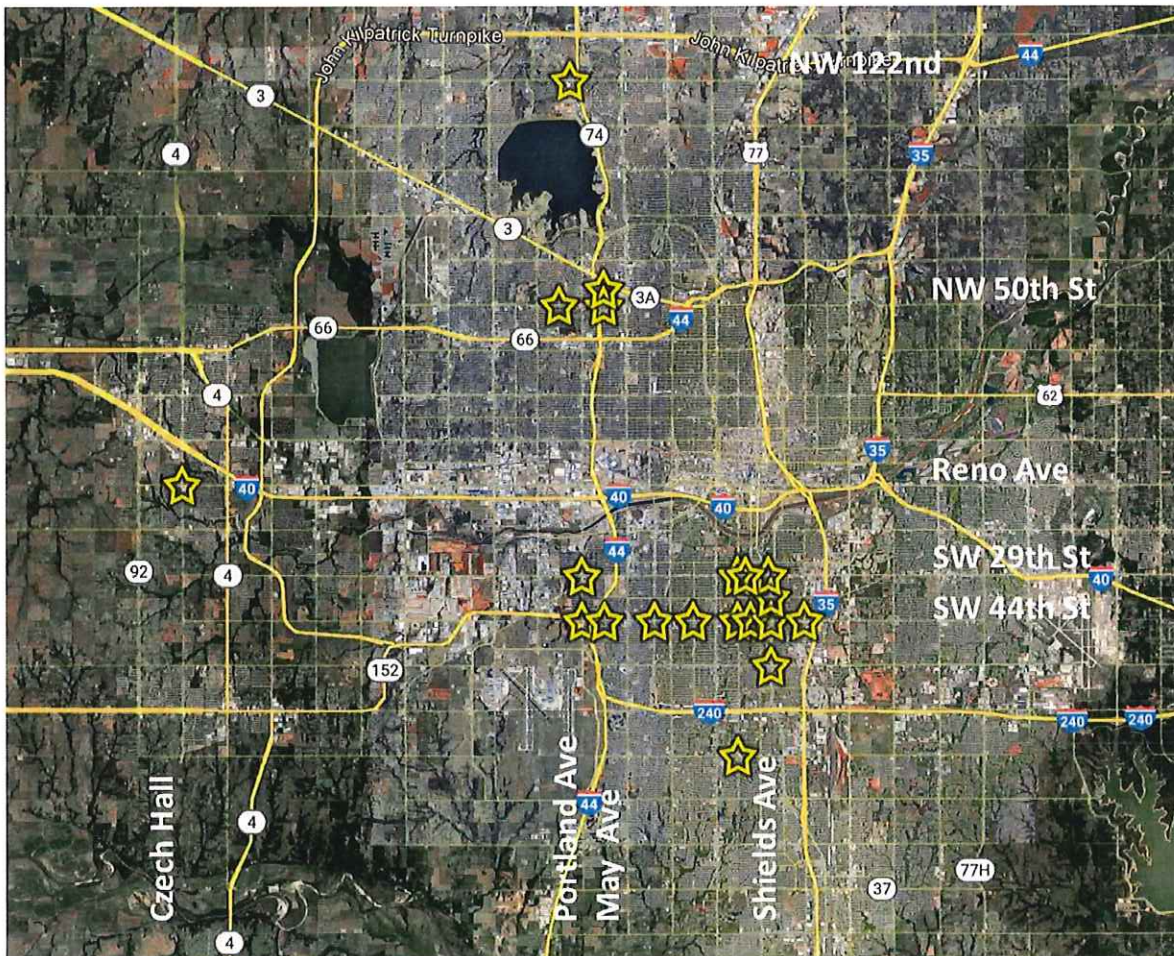
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## 1.0 EXECUTIVE SUMMARY

### 1.1 Scope

This document serves as the preliminary engineering report for this 2017 General Obligation Bond project for the flashing yellow arrow upgrades at twenty-one intersections within the City of Oklahoma City limits. Traffic Engineering Consultants, Inc. serves as the Prime Consultant on the project which has been conducted under the City's On-Call Traffic Studies and Engineering Services contract. Public Works Traffic Division identified multiple locations that are in need of FYA and funding. Funding was identified utilizing ODOT funds from a Surface Transportation Block Grant (STBG).



The goal of this project is to upgrade existing 5-section (doghouse style) signal heads to 4-section flashing yellow arrow (FYA) signal heads. This upgrade will provide consistency across the City with updated signal head configuration for permissive/protected left turn movements at these intersections. Minimal cabling, wiring, and mast arm sign replacements will be necessary to replace the affected signal heads. All existing traffic signal phasing, timing, and coordination will remain unchanged.

Locations included in this project are:

Intersection ID#	Intersection
1	S Walker Avenue and SW 89 Street
2	N Portland Avenue and NW 122 Street
3	Czech Hall Road and W Reno Avenue
4	N May Avenue and NW 164 Street
5	S Portland Avenue and SW 44 Street
6	S Independence Avenue and SW 44 Street
7	S Agnew Avenue and SW 44 Street
8	S Blackwelder Avenue and SW 44 Street
9	S Walker Avenue and SW 44 Street
10	S Robinson Avenue and SW 44 Street
11	S Shields Boulevard and SE 44 Street
12	S High Avenue and SW 44 Street
13	S Shields Boulevard and SE 59 Street
14	S Shields Boulevard and SE 36 Street
15	S Shields Boulevard and SE 29 Street
16	N Independence Avenue and NW 50 Street
17	N Independence Avenue and NW 56 Street
18	S Portland Avenue and SW 29 Street
19	S Harvey Avenue and SW 29 Street
20	S Walker Avenue and SW 29 Street
21	N Tulsa Avenue and NW 50 Street

As part of this project, a field inventory of existing controller equipment, firmware, signal heads, load switches, and user interface functionality was conducted. Intersections with older model TS-2 controllers were found to have faulty user interfaces and are therefore recommended for replacement.

For the preliminary report, an evaluation of two concepts was completed. Concept 1 is the “No-Build” alternative. Concept 2 is the “Traffic Signal Head Upgrade” alternative. The advantages and disadvantages of each concept are provided below in the decision matrix.

Concept 1 - No Build Alternative	
Advantages	Disadvantages
No Changes for Drivers to Adjust to	Use of Older Signal Head Equipment
No Additional Cost of Construction	Increased Maintenance Costs for Older Equipment
	Limited Firmware Updates with Faulty User Interfaces
COST: \$0	
Concept 2 - Traffic Signal Head Upgrade	
Advantages	Disadvantages
Provides Consistent Driver Experience	Limited Funds to 21 Intersections
Updates Signal Head Equipment to New Standards	Cost of Construction
Provides Opportunity to Improve Signal Performance with New Controllers	
COST: \$512,270	

## 1.2 Budget

The fixed limit of construction is \$515,006 and the project is under this amount. The cost of the proposed improvements is estimated to be \$512,270.

## 1.3 Schedule

The following schedule is a summary of the projected timeline for the completion of the intersection improvements. Due to this project not requiring utility or right-of-way coordination, it is recommended to move towards the 90% submittal phase after the approval of the Preliminary Engineering Report.

- Final Plans – Fall 2023
- Construction Begin Date – Late 2023
- Construction Completion Date – Spring 2024

Task	2023										2024				
	April	May	June	July	August	September	October	November	December	January	February	March	April	May	
NTP	★														
Preliminary Engineering															
Final Plans (Fall 2023)															
Construction Begin Date (Late 2023)															
Construction Completion Date (Spring 2024)															



#### 1.4 *Recommendation*

It is recommended to upgrade the signal heads for the protected/permissive left turn movements at the specified intersections. The replacement of five older model TS-2 controllers is also recommended in order to satisfactorily program the controller and update the controller firmware. Minimal cabling, wiring, and mast arm sign replacements will be necessary to replace the affected signal heads. All existing traffic signal phasing, timing, and coordination will remain unchanged.

## 2.0 EXISTING CONDITIONS

The location of the proposed improvements is at various locations around the City with several focused along the corridors of Shields, 44<sup>th</sup> Street, and 29<sup>th</sup> Street. A list of intersections and locations is provided below and shown in **Figure 1**.

Intersection ID#	Intersection
1	S Walker Avenue and SW 89 Street
2	N Portland Avenue and NW 122 Street
3	Czech Hall Road and W Reno Avenue
4	N May Avenue and NW 164 Street
5	S Portland Avenue and SW 44 Street
6	S Independence Avenue and SW 44 Street
7	S Agnew Avenue and SW 44 Street
8	S Blackwelder Avenue and SW 44 Street
9	S Walker Avenue and SW 44 Street
10	S Robinson Avenue and SW 44 Street
11	S Shields Boulevard and SE 44 Street
12	S High Avenue and SW 44 Street
13	S Shields Boulevard and SE 59 Street
14	S Shields Boulevard and SE 36 Street
15	S Shields Boulevard and SE 29 Street
16	N Independence Avenue and NW 50 Street
17	N Independence Avenue and NW 56 Street
18	S Portland Avenue and SW 29 Street
19	S Harvey Avenue and SW 29 Street
20	S Walker Avenue and SW 29 Street
21	N Tulsa Avenue and NW 50 Street

Each intersection listed above provides for protected/permissive left turn movements from at least one approach. The signal heads controlling the protected/permissive left turns are 5-section (doghouse style) heads. Since the approval of the use of flashing yellow arrows (FYA) by the Federal Highway Administration, the City has begun implementing the use of FYA through the replacement of the 5-section heads with 4-section heads.

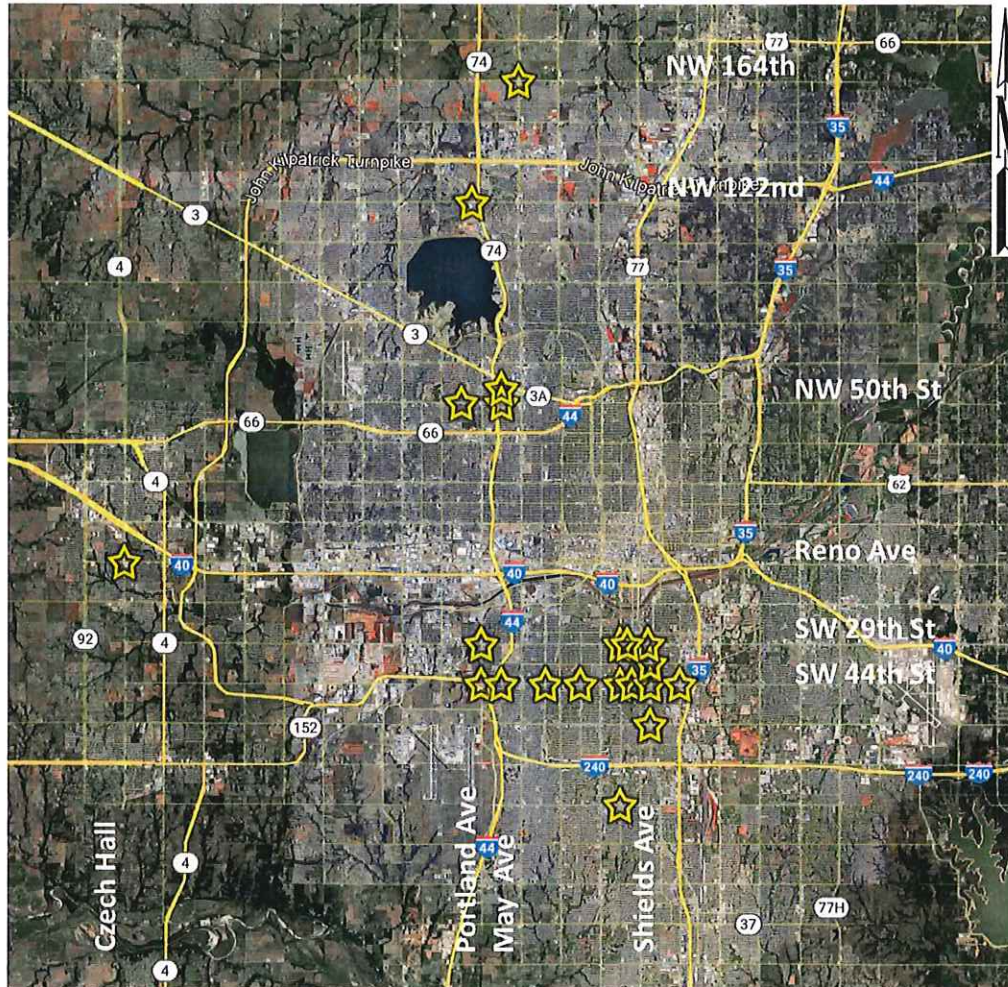


FIGURE 1. TC-0621 Project Location Map

Flashing Yellow Arrow Upgrades

As part of this project, a field inventory of existing controller equipment, firmware, signal heads, load switches, and user interface functionality was conducted. Intersections with older model TS-2 controllers were found to have faulty user interfaces and are therefore recommended for replacement. **Figure 2** provides a depiction of the various controllers, conflict monitors, and user interfaces found in the field.



Figure 2. Typical Field Equipment

A summary of documented field equipment is provided in Table 1.

**Table 1. Intersection Inventory**

Intersection ID#	Intersection	Field Visit Completed	Load Switches Total	Load Switches Used	Load Switches Available	Controller Model	Screen Visible	Controller Firmware	MMU Model	# 5/C Heads	# 7/C Heads	Equipment Notes
1	S Walker Avenue and SW 89 Street	6/8/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4g	516L	8	4	
2	N Portland Avenue and NW 122 Street	6/29/2023	16	11	5	Naztec Series 900 ATC	Yes	v76.8N	516L	9	2	
3	Czech Hall Road and W Reno Avenue	6/29/2023	16	12	4	Naztec Series 900 ATC	Yes	v76.15B	516L	8	4	
4	N May Avenue and NW 164 Street	6/29/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4i	516L	8	4	
5	S Portland Avenue and SW 44 Street	6/2/2023	16	12	4	Naztec Series 900 ATC	Yes	v76.8D	516L	8	4	
6	S Independence Avenue and SW 44	6/2/2023	16	10	6	Naztec Series 900 ATC	Yes	v76.13P	516L	8	2	
7	S Agnew Avenue and SW 44 Street	6/2/2023	16	10	6	Naztec Series 900 ATC	Yes	v76.8D	516L	8	2	
8	S Blackwelder Avenue and SW 44	6/2/2023	16	10	6	Naztec Series 900 ATC	Yes	v76.8D	516L	8	2	
9	S Walker Avenue and SW 44 Street	5/31/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4g	516L	8	4	Faulty User Interface
10	S Robinson Avenue and SW 44 Street	5/31/2023	16	8	8	Naztec Series 900 ATC	Yes	v76.8N	516L	8	3	
11	S Shields Boulevard and SE 44 Street	6/14/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4g	516L	12	2	Faulty User Interface
12	S High Avenue and SW 44 Street	6/14/2023	16	12	4	Naztec Series 900 ATC	Yes	v76.8D	516L	8	4	
13	S Shields Boulevard and SE 59 Street	6/14/2023	16	8	8	Naztec Series 900 TS2	Yes	v61.4g	516L	12	2	Faulty User Interface
14	S Shields Boulevard and SE 36 Street	6/14/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4g	516L	12	2	
15	S Shields Boulevard and SE 29 Street	6/14/2023	16	12	4	Trafficware Commander ATC	Yes	Scout v85.3.0 rev 652.9	516L	12	2	
16	N Independence Avenue and NW 50	6/29/2023	16	10	6	Naztec Series 900 ATC	Yes	v76.15G	516L	8	2	
17	N Independence Avenue and NW 56	6/29/2023	16	11	5	Naztec Series 900 ATC	Yes	v76.15G	516L	7	3	
18	S Portland Avenue and SW 29 Street	6/2/2023	16	10	6	Naztec Series 900 TS2	Yes	v61.4g	516L	8	4	Faulty User Interface
19	S Harvey Avenue and SW 29 Street	6/8/2023	16	11	5	Trafficware Commander ATC	Yes	Scout v85.3.0 rev 652.9	516L	8	3	
20	S Walker Avenue and SW 29 Street	6/2/2023	16	12	4	Naztec Series 900 TS2	Yes	v61.4i	516L	8	4	Faulty User Interface
21	N Tulsa Avenue and NW 50 Street	6/19/2023	16	10	6	Naztec Series 900 ATC	Yes	v76.12H	516L	8	2	

Based on the initial assessment at the intersections, all locations would benefit from upgrading one or more left turn movements to flashing yellow arrows. All controller cabinets have conflict monitors and load switch availability to accommodate the upgrade.

### 3.0 PROPOSED IMPROVEMENTS

It is recommended to upgrade the signal heads for the protected/permissive left turn movements at the specified intersections. The replacement of five older model TS-2 controllers is also recommended in order to satisfactorily program the controller and update the controller firmware. Minimal cabling, wiring, and mast arm sign replacements will be necessary to replace the affected signal heads. All existing traffic signal phasing, timing, and coordination will remain unchanged. **Figure 3** depicts the typical use of a 5-section (doghouse) head along with the use of a typical 4-section flashing yellow arrow signal head.



**Figure 3. Signal Head Comparison**

Traffic signal head installation can occur without conflict with existing utilities and without the need to acquire right-of-way or easements. All work is anticipated to be completed using safety funding provided by the Association of Central Oklahoma Governments and administered by the Oklahoma Department of Transportation Local Government Division. Due to the funding requirements of this project, no additional work beyond the upgrades and related cabling, wiring, and signing will be completed with this project.

### 4.0 COST ESTIMATE

The cost of the proposed improvements is estimated to be \$512,270, which includes a 10% contingency. The fixed limit of construction is \$515,006 and the project estimate is under this amount. A detailed cost estimate has been provided in the Appendix.

## 5.0 PRELIMINARY PLANS

The proposed location map depicting the affected intersections can be found in the Appendix.

## 6.0 SCHEDULE

The schedule for the subject project can be seen in Table 2.

**Table 2. Schedule**

Task	2023										2024				
	April	May	June	July	August	September	October	November	December	January	February	March	April	May	
Task 1 - Notice to Proceed															
Receipt of Intersection List															
Field Reconnaissance															
Preliminary Engineering Report															
OKC Review															
Task 2 - Notice to Proceed															
90% Plan Submittal															
OKC Review															
Final Plan Submittal															
OKC Review															
Task 3 - Bidding Services															
Task 4 - Construction Administration															
Task 5 - As-Built Drawings	30 Days Following Final Walk-Through														

## 7.0 DECISION MATRIX

The decision matrix for the subject project can be seen in Table 3.

**Table 3. Decision Matrix**

Concept 1 - No Build Alternative	
Advantages	Disadvantages
No Changes for Drivers to Adjust to	Use of Older Signal Head Equipment
No Additional Cost of Construction	Increased Maintenance Costs for Older Equipment
	Limited Firmware Updates with Faulty User Interfaces
COST: \$0	
Concept 2 - Traffic Signal Head Upgrade	
Advantages	Disadvantages
Provides Consistent Driver Experience	Limited Funds to 21 Intersections
Updates Signal Head Equipment to New Standards	Cost of Construction
Provides Opportunity to Improve Signal Performance with New Controllers	
COST: \$512,270	

## 8.0 RECOMMENDATION

It is recommended that Concept 2 – Traffic Signal Head Upgrade be constructed as part of this project. The replacement of five older model TS-2 controllers is also recommended in order to satisfactorily program the controller and update the controller firmware. Minimal cabling, wiring, and mast arm sign replacements will be necessary to replace the affected signal heads. All existing traffic signal phasing, timing, and coordination will remain unchanged.

## APPENDIX



7/13/2023

**Preliminary Cost Estimate**

TC-0621 FLASHING YELLOW ARROW UPGRADES, 21 LOCATIONS

ITEM	DESCRIPTION	UNIT	TOTAL	UNIT COST	TOTAL COST
1	(PL) REMOVAL OF TRAFFIC SIGNAL EQUIPMENT	LSUM	1.00	\$2,500.00	\$2,500.00
2	SIGNAL CONTROLLER REPLACEMENT	EA	5.00	\$6,200.00	\$31,000.00
3	1WAY 4SEC. ADJ. SIG. HD. S-13L	EA	61.00	\$1,400.00	\$85,400.00
4	BACKPLATE	EA	61.00	\$300.00	\$18,300.00
5	5/C TRAFFIC SIGNAL ELECTRICAL CABLE	LF	8,000.00	\$5.00	\$40,000.00
6	7/C TRAFFIC SIGNAL ELECTRICAL CABLE	LF	4,500.00	\$7.00	\$31,500.00
7	21/C TRAFFIC SIGNAL ELECTRICAL CABLE	LF	14,000.00	\$13.00	\$182,000.00
8	MAST ARM MOUNTED SIGNS (ALUM.)	SF	450.00	\$120.00	\$54,000.00
9	MOBILIZATION	LSUM	1.00	\$21,000.00	\$21,000.00
10	CONTINGENCY (10%)	LSUM	1.00	\$46,570.00	\$46,570.00
				<b>TOTAL</b>	<b>\$512,270.00</b>

REVISIONS	
NO.	DATE

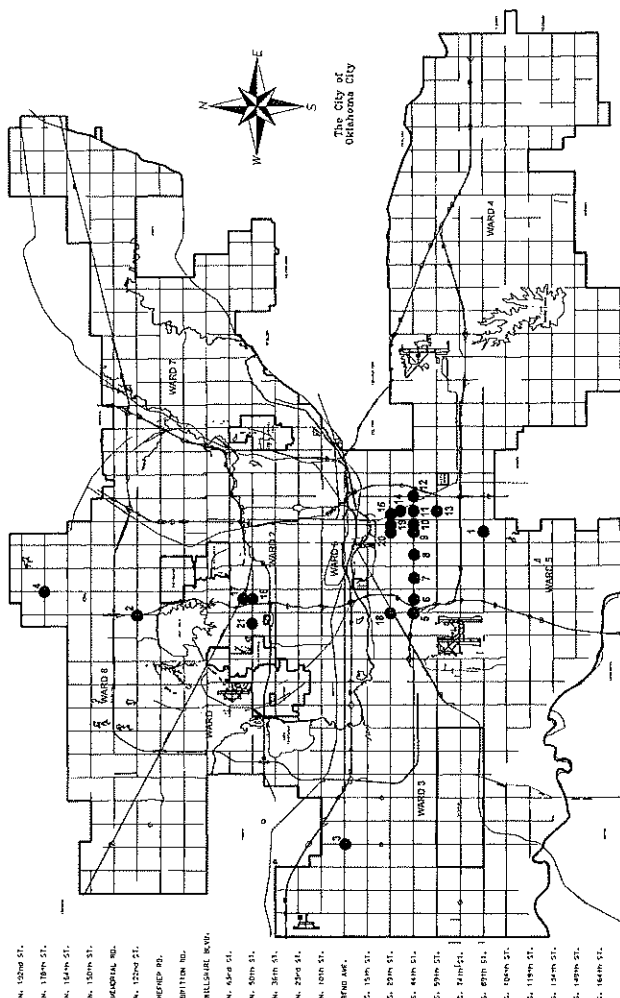
MAP NO. INTERSECTION

- | IP NO. | INTERSECTION                           |
|--------|--|
| 1      | S Walker Avenue and SW 89 Street       |
| 2      | N Portland Avenue and NW 122 Street    |
| 3      | Czech Hall Road and W Reno Avenue      |
| 4      | N May Avenue and NW 164 Street         |
| 5      | S Portland Avenue and SW 44 Street     |
| 6      | S Independence Avenue and SW 44 Street |
| 7      | S Agnew Avenue and SW 44 Street        |
| 8      | S Blackwell Drive and SW 44 Street     |
| 9      | S Walker Avenue and SW 44 Street       |
| 10     | S Robinson Avenue and SW 44 Street     |
| 11     | S Shields Boulevard and SE 44 Street   |
| 12     | S High Avenue and SW 44 Street         |
| 13     | S Shields Boulevard and SE 59 Street   |
| 14     | S Shields Boulevard and SE 36 Street   |
| 15     | S Shields Boulevard and SE 29 Street   |
| 16     | N Independence Avenue and NW 50 Street |
| 17     | N Independence Avenue and NW 56 Street |
| 18     | S Portland Avenue and SW 29 Street     |
| 19     | S Harvey Avenue and SW 29 Street       |
| 20     | S Walker Avenue and NW 50 Street       |
| 21     | N Tulsa Avenue and NW 29 Street        |

INDEX OF SHEETS	
SHEET NUMBER	SHEET DESCRIPTION

TITLE SHEET  
TRAFFIC PAY QUANTITIES AND NOTES  
TRAFFIC SIGNAL SUMMARY OF QUANTITIES  
TRAFFIC SIGNAL SCOPE OF WORK

THE FOLLOWING STANDARDS WILL  
BE REQUIRED ON THIS PROJECT:



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PROPOSED ROAD

- PROPOSED ROAD
- RANGE & TOWNSHIP
- SECTION LINES
- QUARTER SECTION LINES
- FENCES
- GROUND LINE
- EXISTING RIGHTS
- BASE LINE
- GRADE LINES
- TELEPHONE & TELEGRAPH
- POWER LINES
- BUILDINGS
- DUG WELL
- DRAINAGE STRUCTURES - IN PLACE
- RIGHT-OF-WAY LINES - EXISTING
- RIGHT-OF-WAY LINES - NEW
- CONTROLLED ACCESS
- RIGHT-OF-WAY FENCE

OKLAHOMA COUNTY  
 0001 DISTRICT 4  
 PROJECT LENGTH.....NONE  
 EQUATIONS.....NONE  
 EXCEPTIONS.....NONE

2019 OKLAHOMA STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION GOVERN, APPROVED BY THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, DECEMBER 18, 2019.

THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL, SIGNED AND SEALED DOCUMENT.

ESTHER M. SHAW-SMITH, P.E. # 23711  
C.A. # 1160, RENEWAL 06-30-25

**Traffic Engineering Consultants, Inc.**  
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OKLAHOMA DEPARTMENT OF TRANSPORTATION  
DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

DATE APPROVED		DATE APPROVED	
BY		BY	
CHEF ENGINEER		CHEF ENGINEER	
PROJECT NUMBER		PROJECT NUMBER	
W.O.		W.O.	
DIVISION ADMINISTRATOR		DIVISION ADMINISTRATOR	
SHEET NO. 1		SHEET NO. 1	

SHEET NO. 1