

Figure 1

Transit Center and  
Shepherd-Durham BRT Station

7/6/2018  
H:\Engineering\SHARED\Capital Programs\Design Development\10-BRT Elevated\10-BRT RI.3 Studemont Sta. Shl.dgn

Attachment 1d

Studemont Station

BRT Platform - 25'x136'  
BRT Canopy - 40'x126'  
Stairs - ( 3 ) - 8' Wide  
Elevators - ( 6 ) - 10'x7'  
Aerial Crosswalk - 20'x145'  
Aerial Crosswalk - 15'x145'  
Bus Pads ( 2 ) - 10'x65'

Studenmont St.

CONCEPTUAL DESIGN  
SUBJECT TO CHANGE

REV	DATE	DESCRIPTION	ADD	AMD	CCR	RY	ENG	CHK	APP



M. TEGETHOFF  
DRN BY 7/6/2018  
DATE  
DRN CKD BY  
DATE  
DES BY  
DATE  
DES CKD BY  
DATE  
APPROVED BY  
DATE  
SCALE: 1"=60' With 11"x17"

I-10 - 610 to Katy/CBD Ramp

BRT - Opt 1.3  
STUDEMONT STATION

CONTRACT NO. DRAWING NO. REV.



Figure 3

Connections from the Shepherd-Durham and Studemont BRT Stations to the Houston Bikeways

# METRO UPTOWN NORTH BRT EXTENSION FEASIBILITY STUDY

**SUBMITTED TO:**



Metropolitan Transit Authority of Harris County Texas

**CONTENTS:**

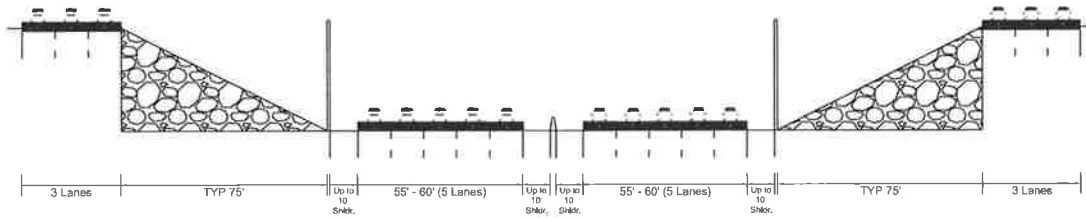
COVER SHEET  
CROSS SECTIONS  
ALTERNATIVE 01 PLAN SHEETS  
ALTERNATIVE 02 PLAN SHEETS  
ALTERNATIVE 03 PLAN SHEETS

**DRAFT**

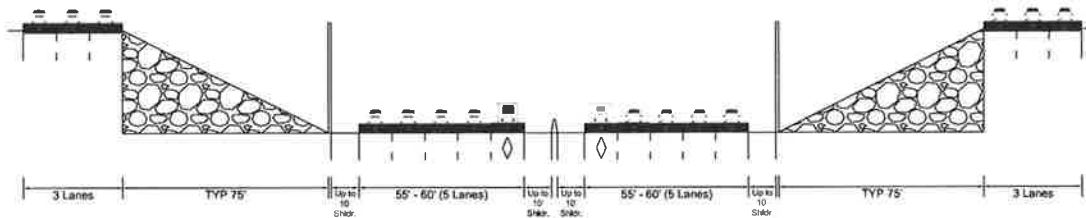
Attachment 1f



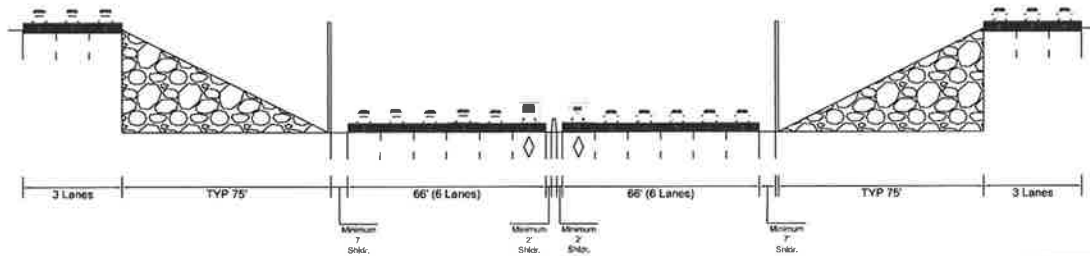
## EXISTING CONDITION



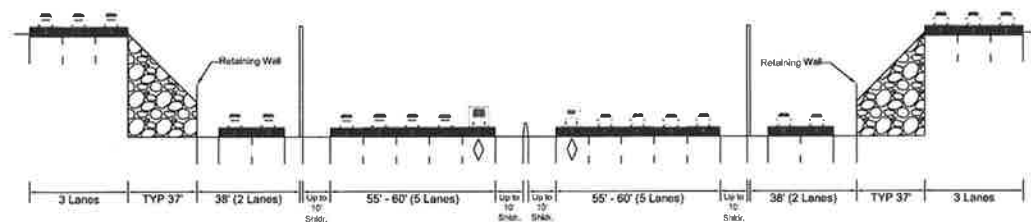
## ALTERNATIVE 1



## ALTERNATIVE 2



## ALTERNATIVE 3





LEGEND:

- NEW HIGH OCCUPANCY LANE
- ADDITIONAL SHOULDER REQUIRED

DRAFT



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 01



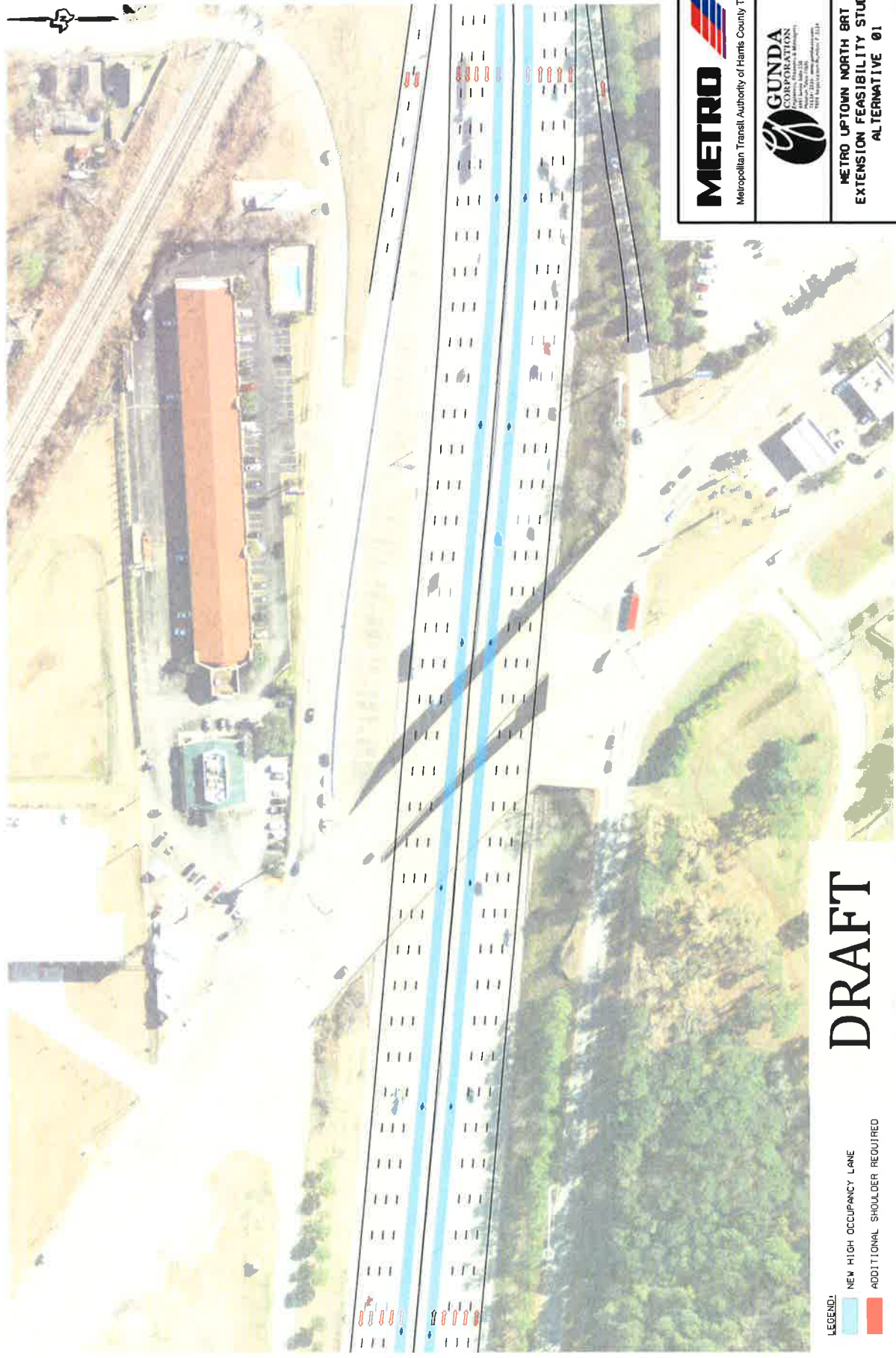
**DRAFT**

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - ADDITIONAL SHOULDER REQUIRED

**METRO**  
Metropolitan Transit Authority of Harris County, Texas

**GUNDA**  
CORPORATION  
4400 Katy Avenue, Suite 200  
Houston, Texas 77057  
Tel: 281.416.1000 www.gundacorp.com

**METRO UPTOWN NORTH BR1  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 01**



**DRAFT**

- LEGEND:**
- NEW HIGH OCCUPANCY LANE
  - ADDITIONAL SHOULDER REQUIRED

**METRO**  
Metropolitan Transit Authority of Harris County, Texas

**GUNDA CORPORATION**  
10000 Katy Road, Suite 100  
Houston, Texas 77054  
Tel: 281.466.1000  
Fax: 281.466.1001  
www.gundacorp.com

**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 01**

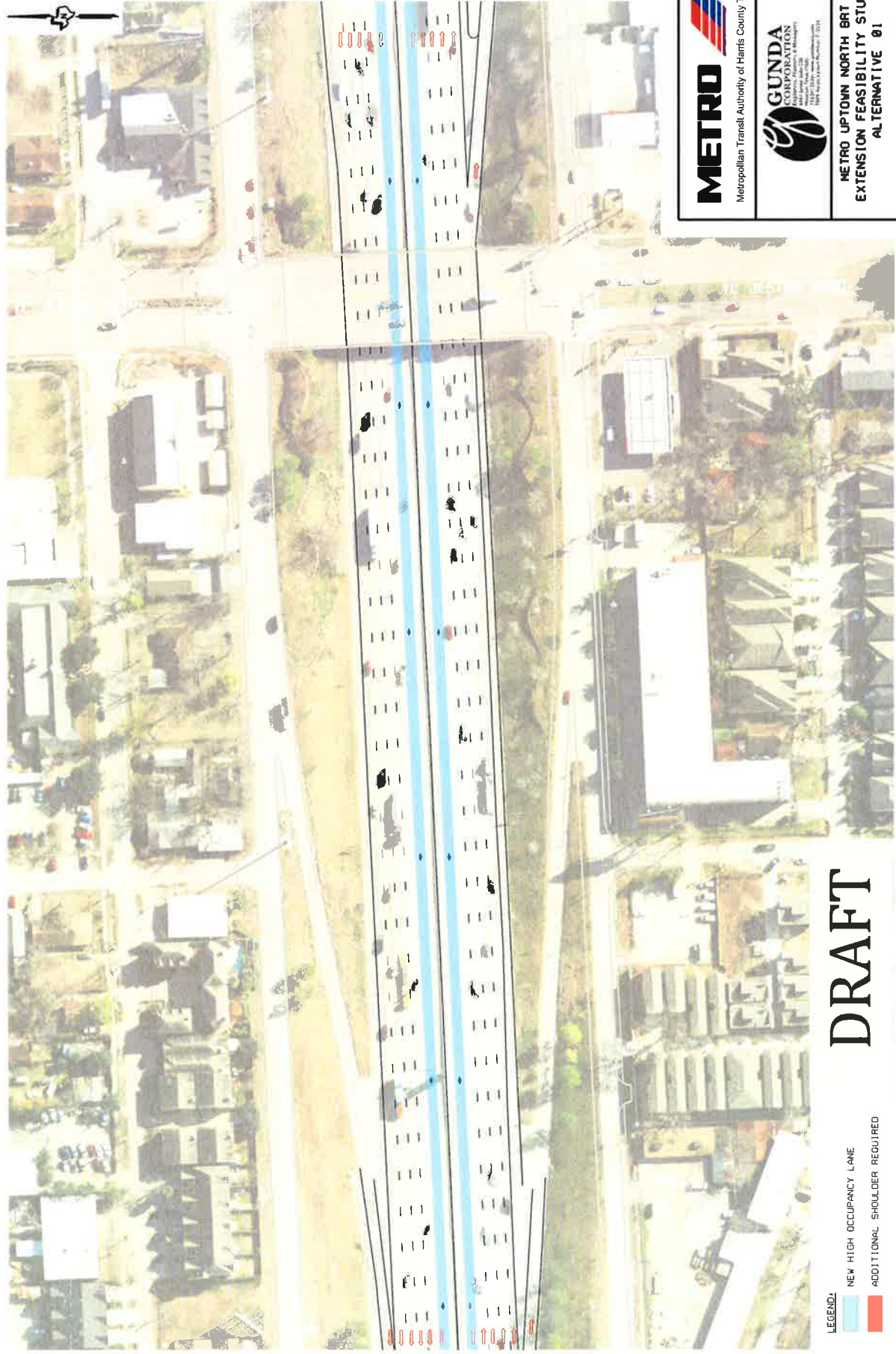


**DRAFT**

**LEGEND:**  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01**

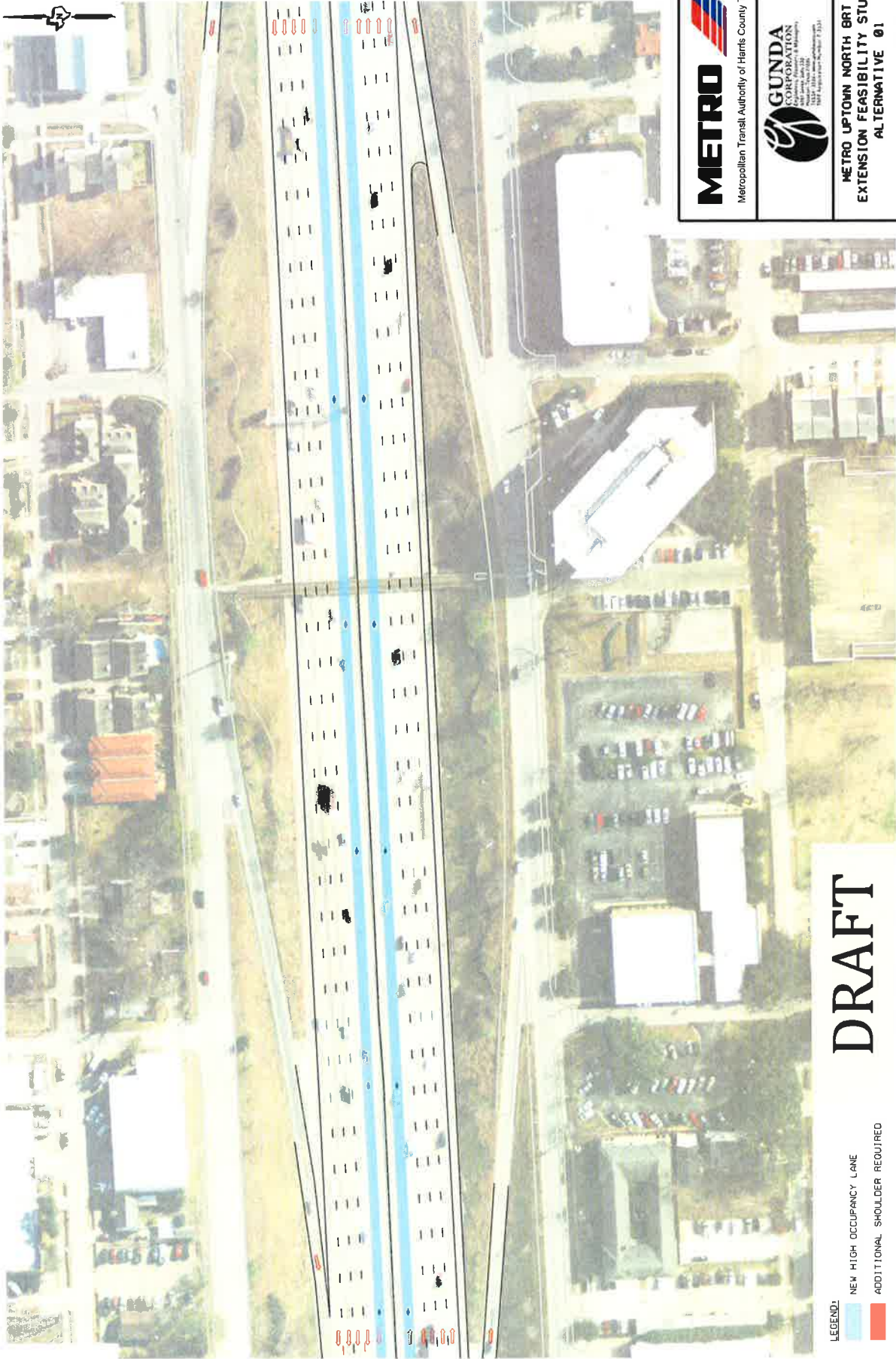


**DRAFT**

**LEGEND:**  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01**

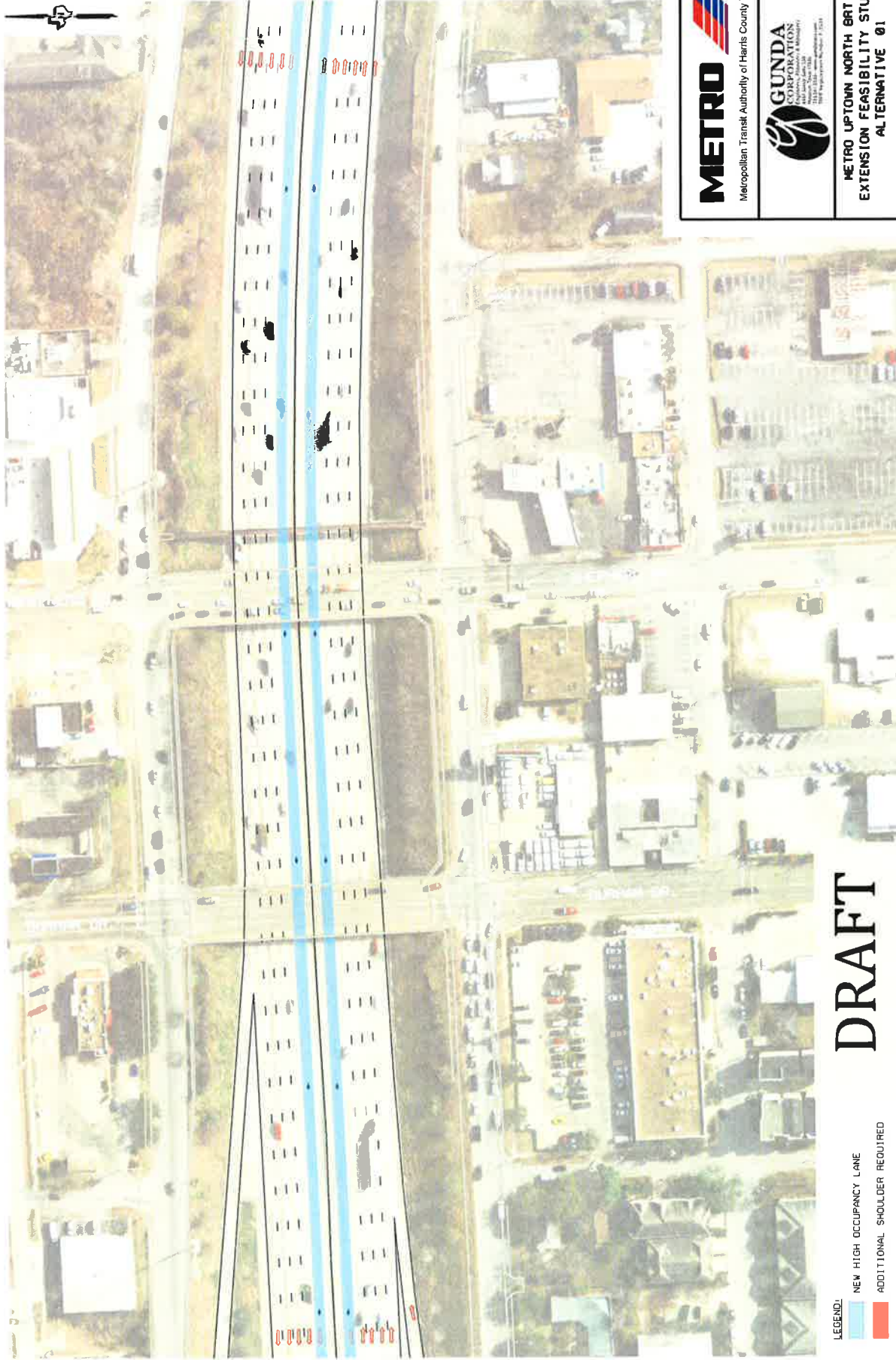


DRAFT

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01

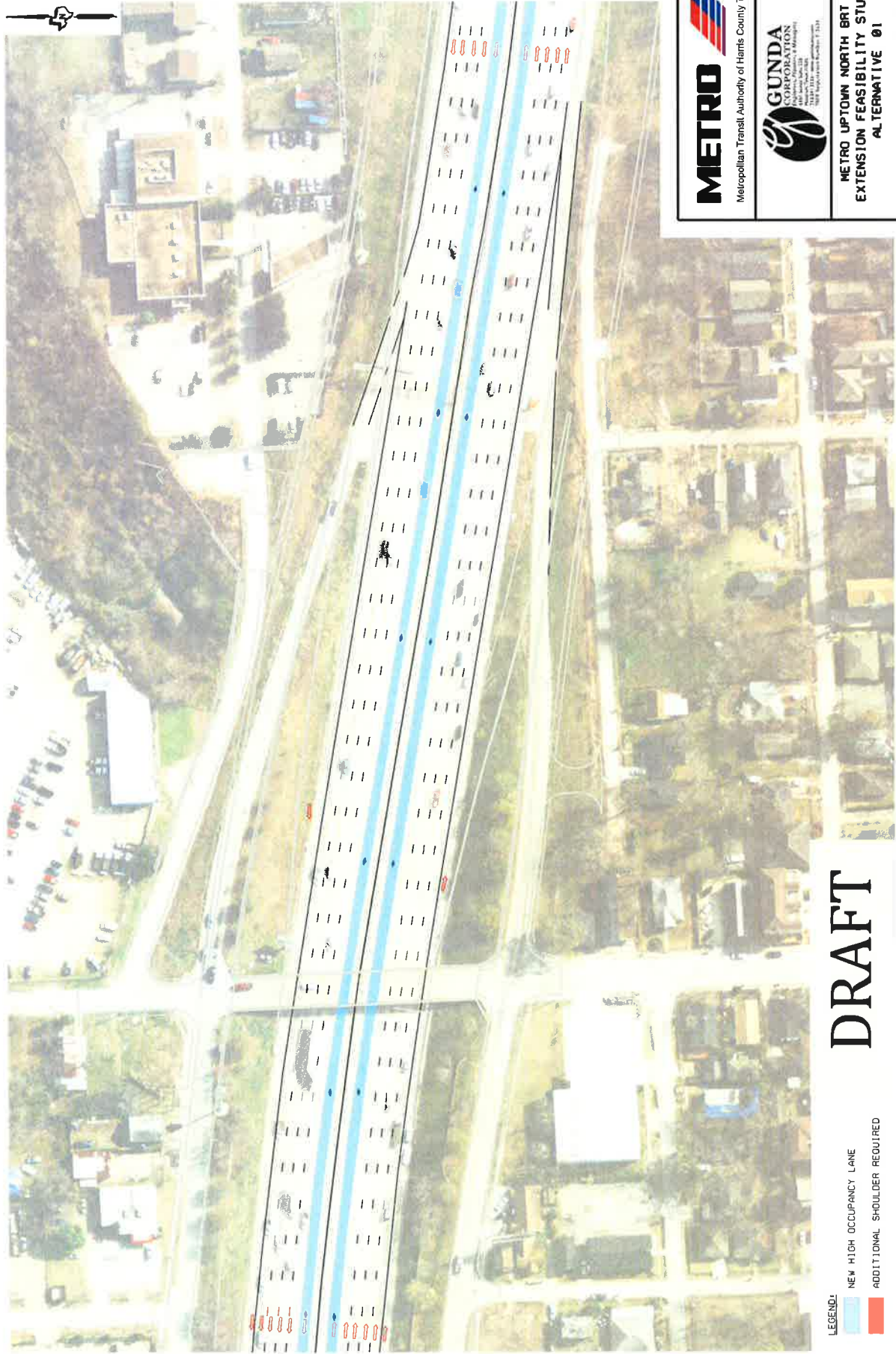


**DRAFT**

LEGEND:  
NEW HIGH OCCUPANCY LANE  
ADDITIONAL SHOULDER REQUIRED

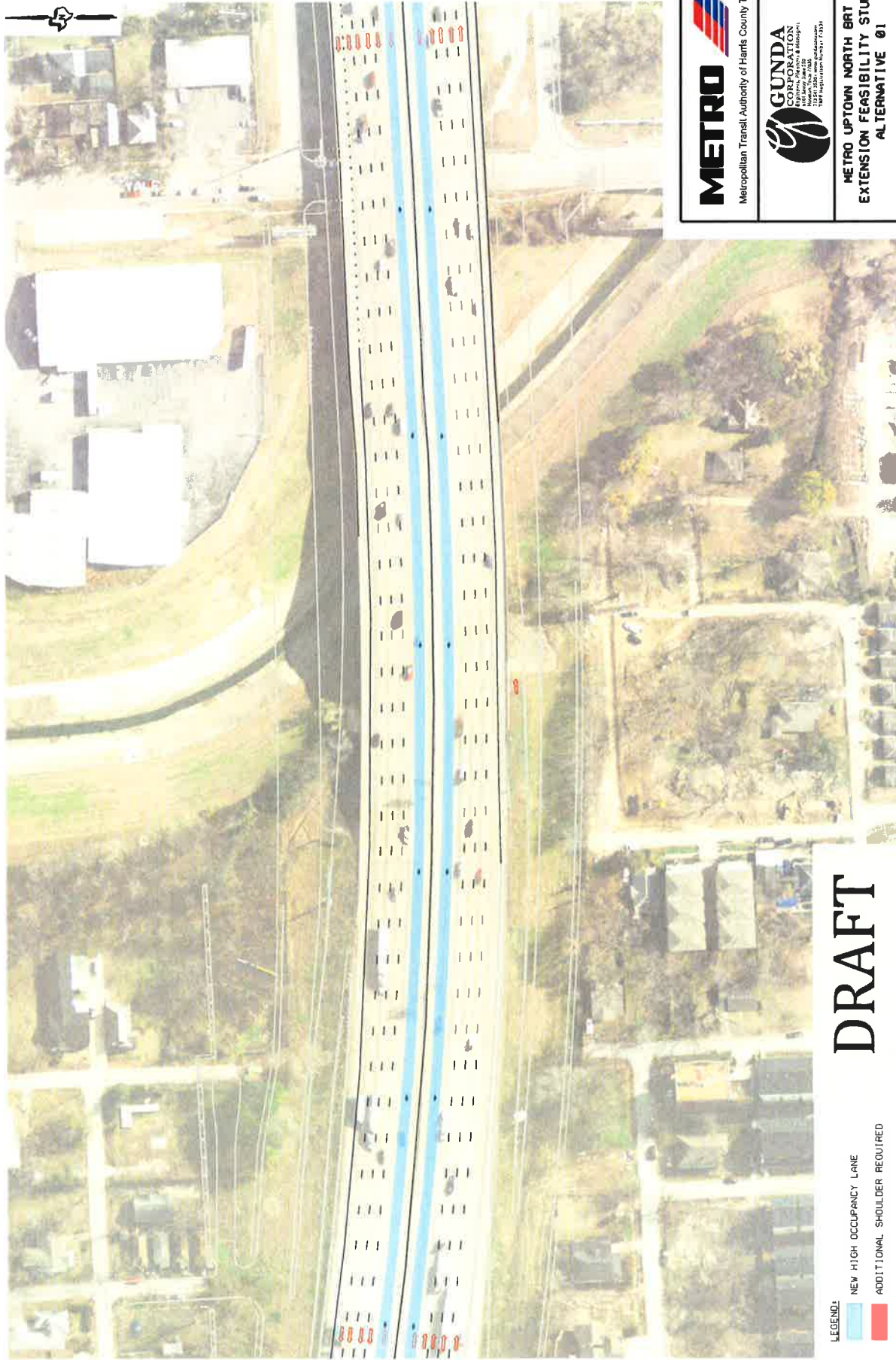


**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 01**





**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED

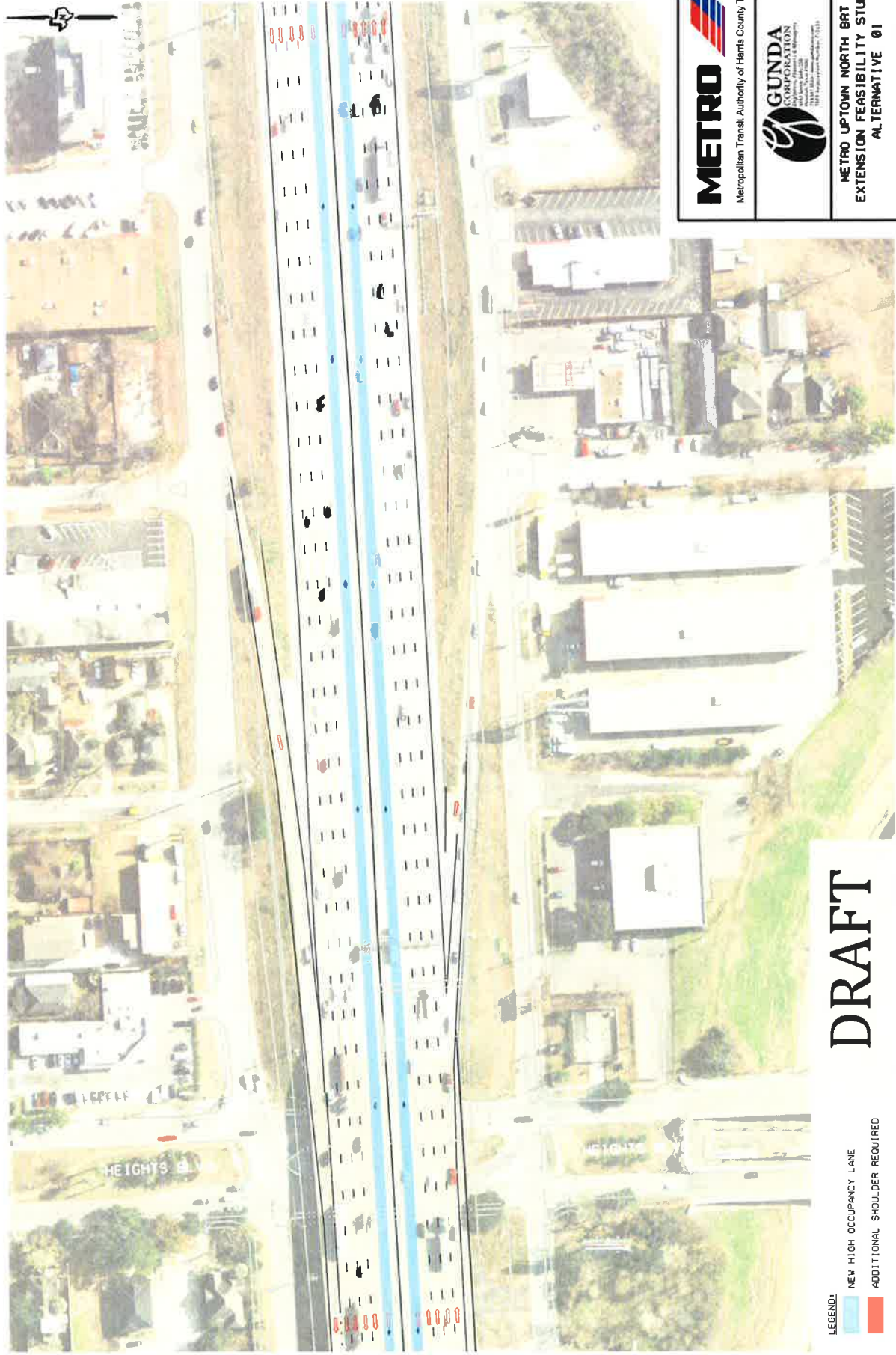


Metropolitan Transit Authority of Harris County, Texas



**GUNDA**  
 CORPORATION  
 12000 Katy Road, Suite 100  
 Houston, Texas 77059  
 281.460.1234  
 www.gundacorp.com

**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01**

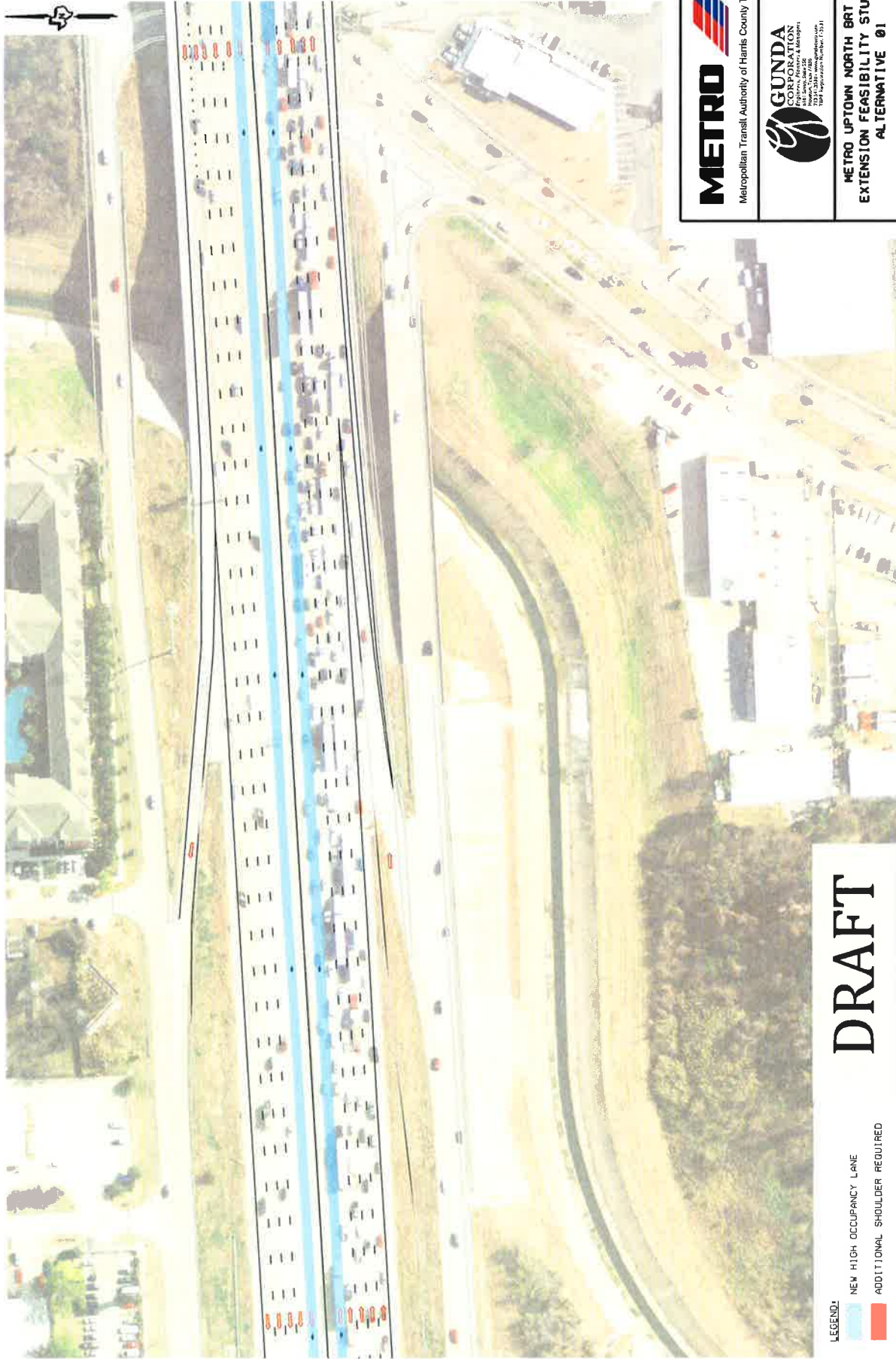


**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED

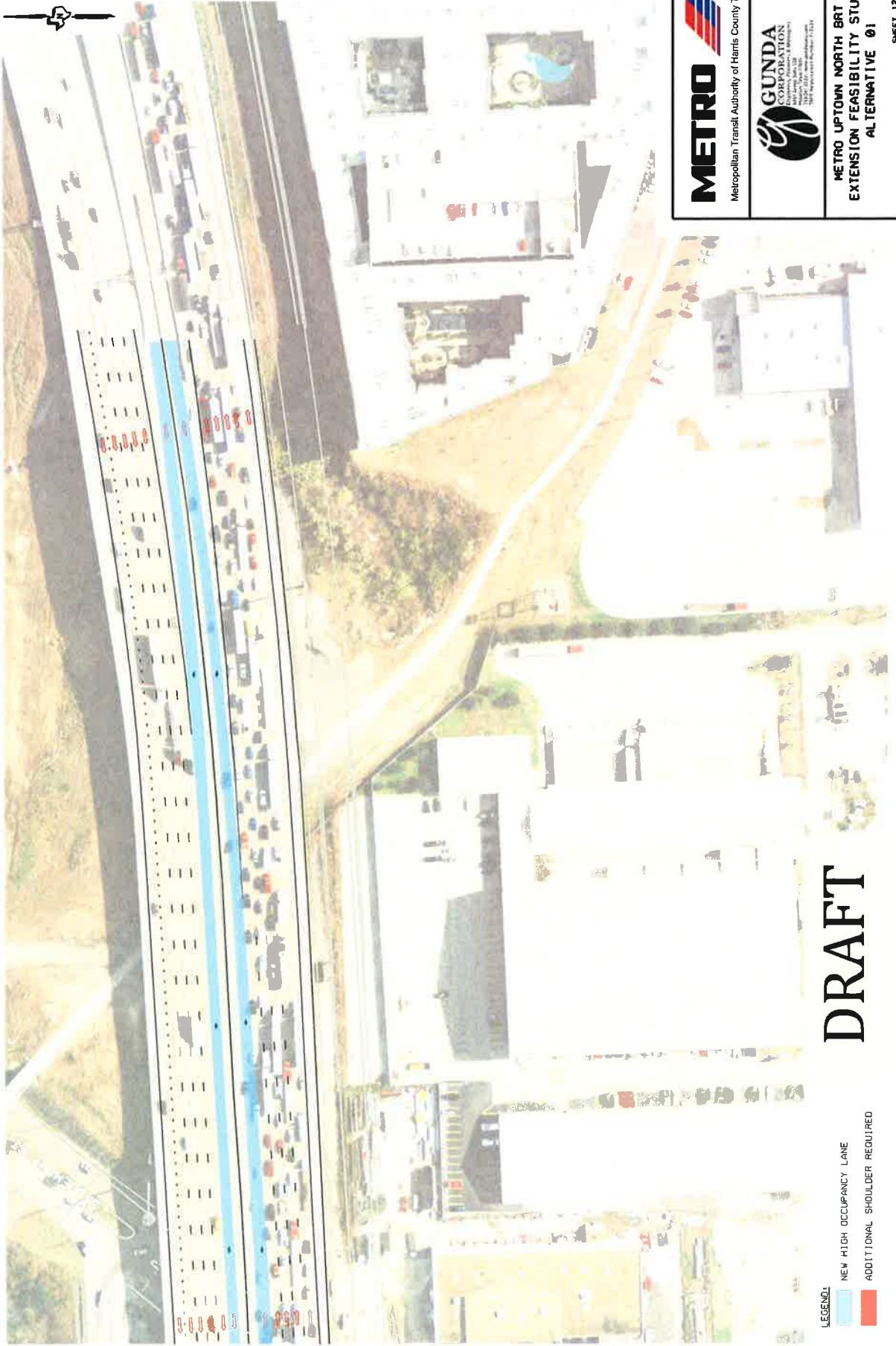


**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01**





# DRAFT

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 01**



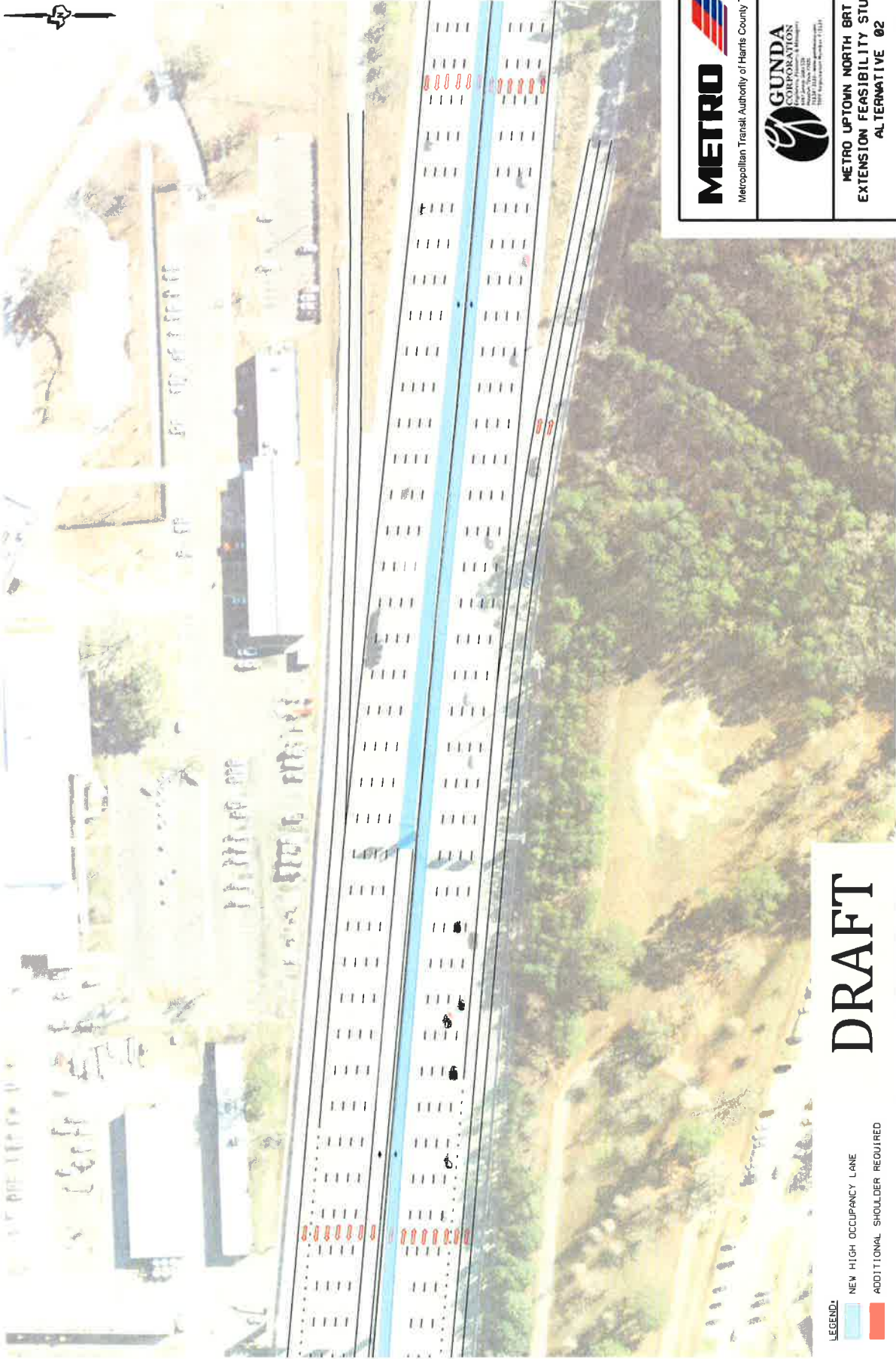
DRAFT

LEGEND:  
NEW HIGH OCCUPANCY LANE  
ADDITIONAL SHOULDER REQUIRED

**METRO**  
Metropolitan Transit Authority of Harris County, Texas



**GUNDA CORPORATION**  
METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02

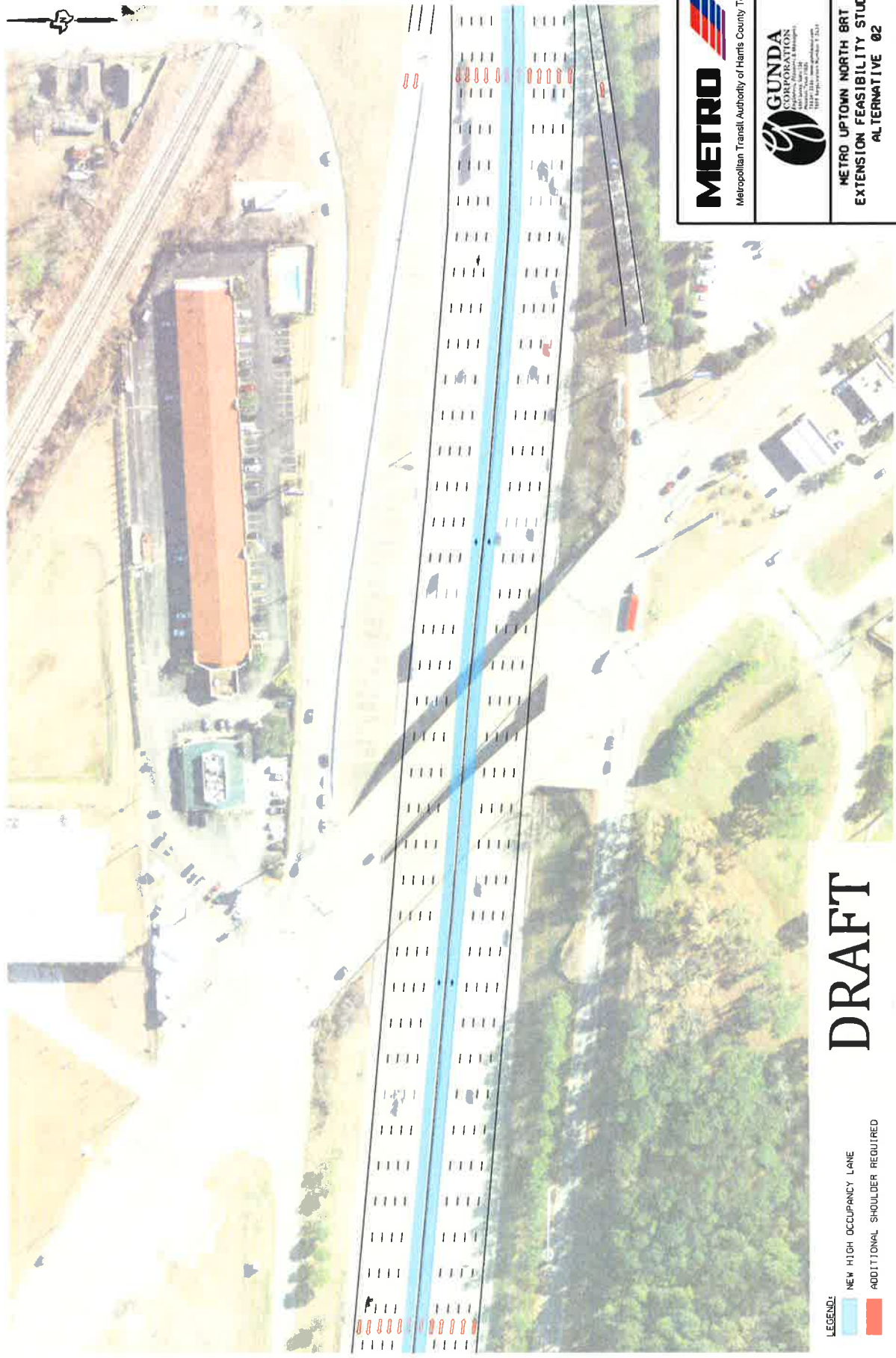


DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - ADDITIONAL SHOULDER REQUIRED



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02

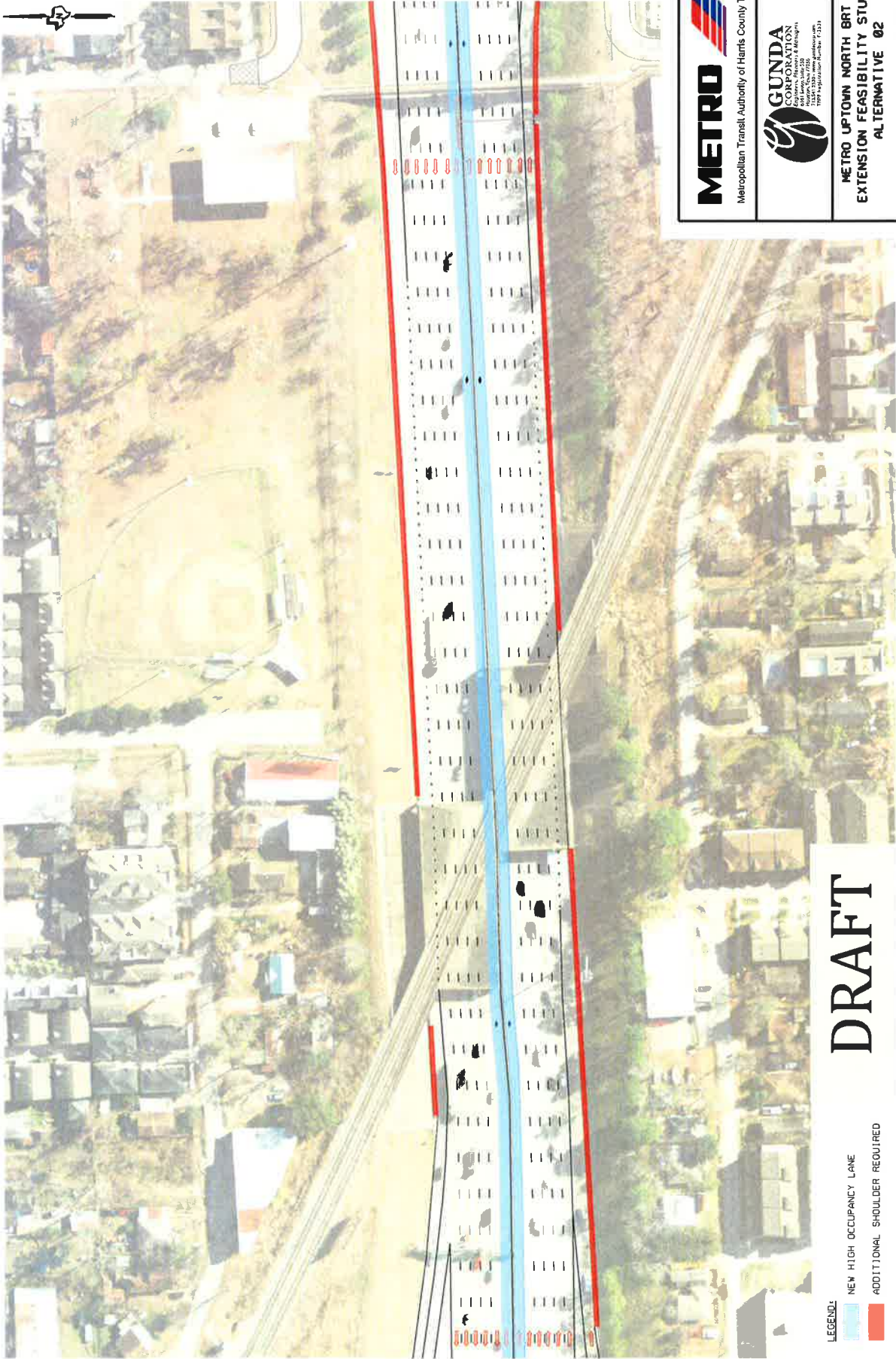


# DRAFT

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 02

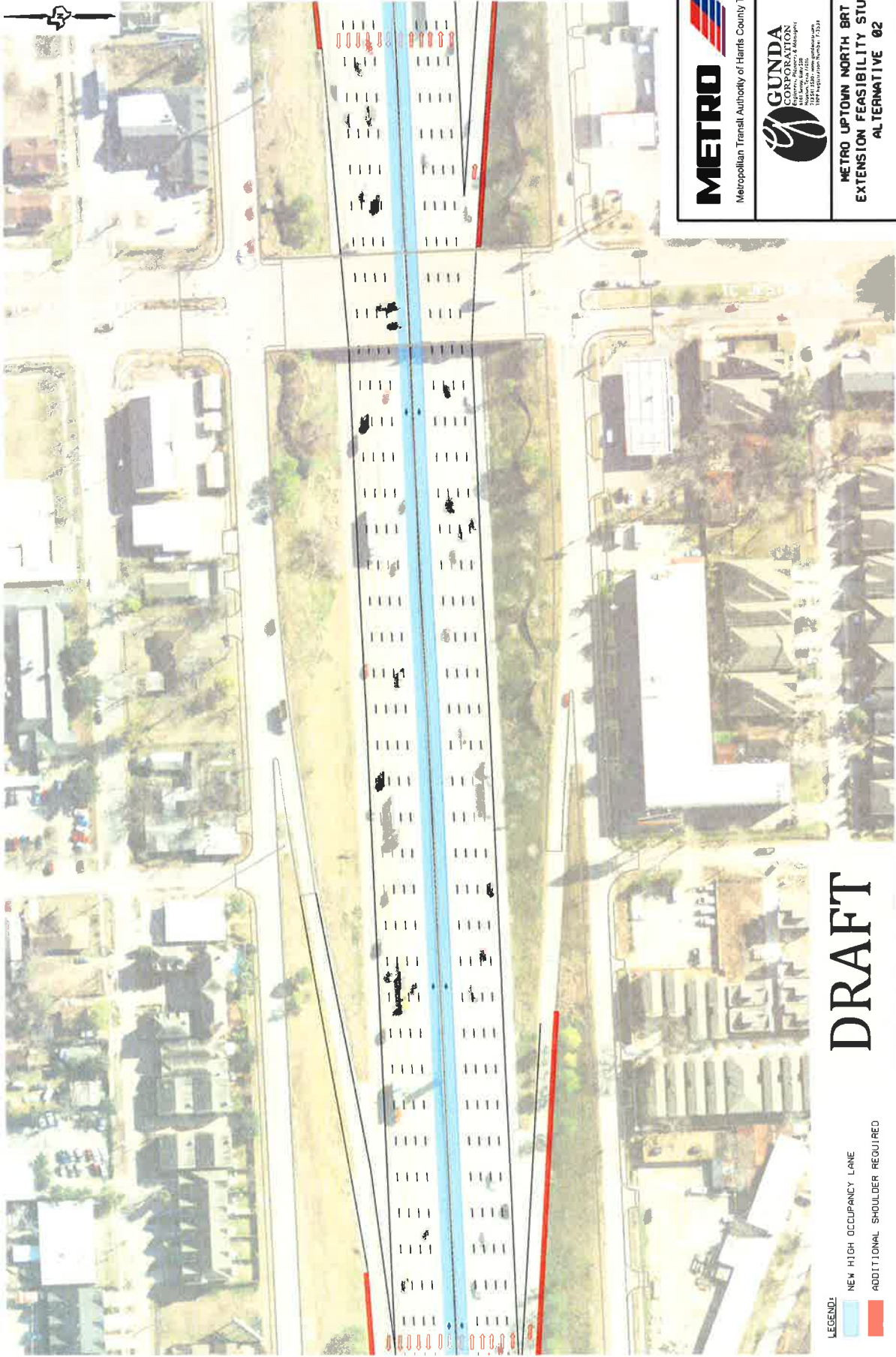


DRAFT

LEGEND:  
NEW HIGH OCCUPANCY LANE  
ADDITIONAL SHOULDER REQUIRED



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02

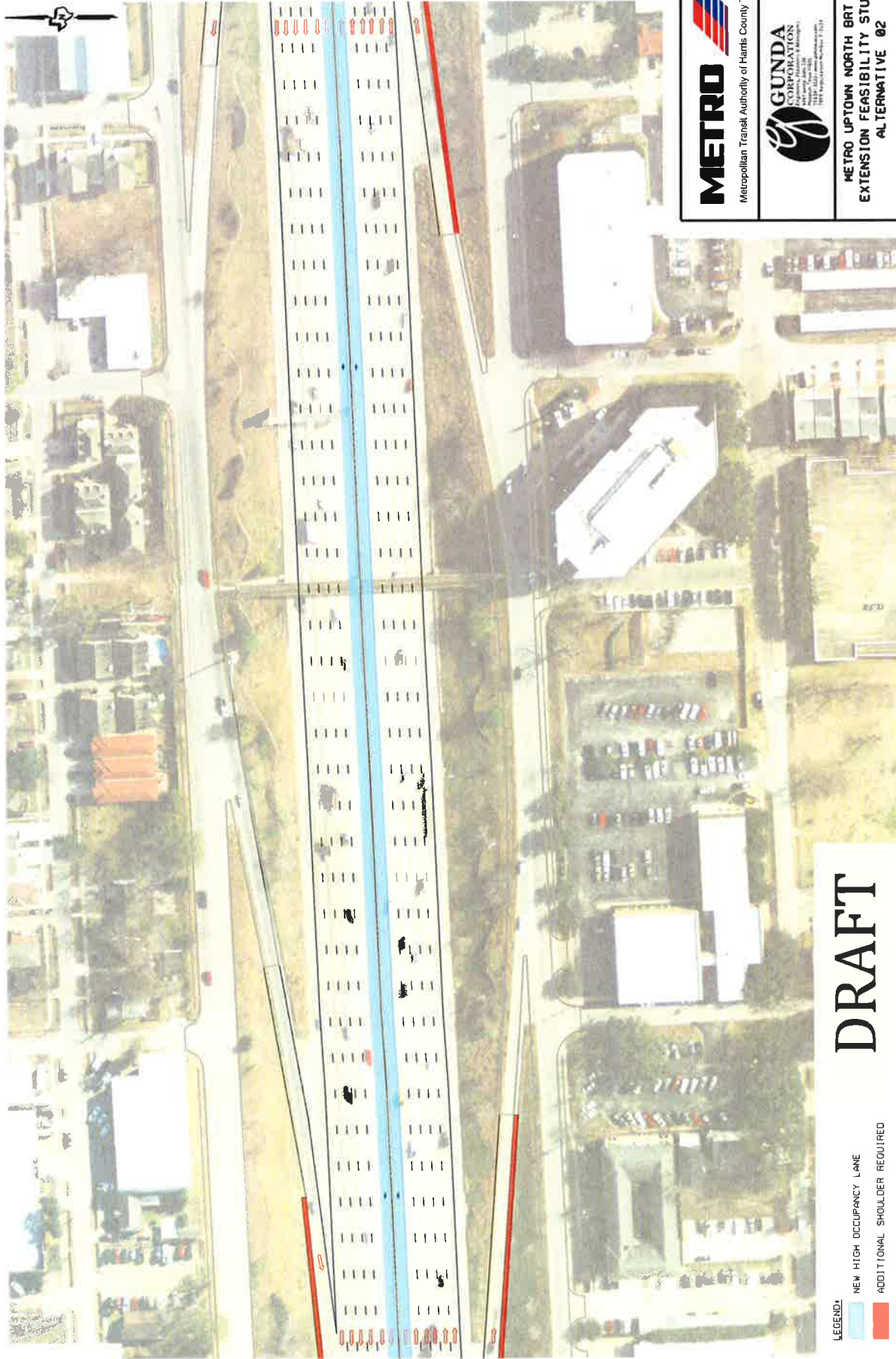


DRAFT



- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - ADDITIONAL SHOULDER REQUIRED



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02



**DRAFT**

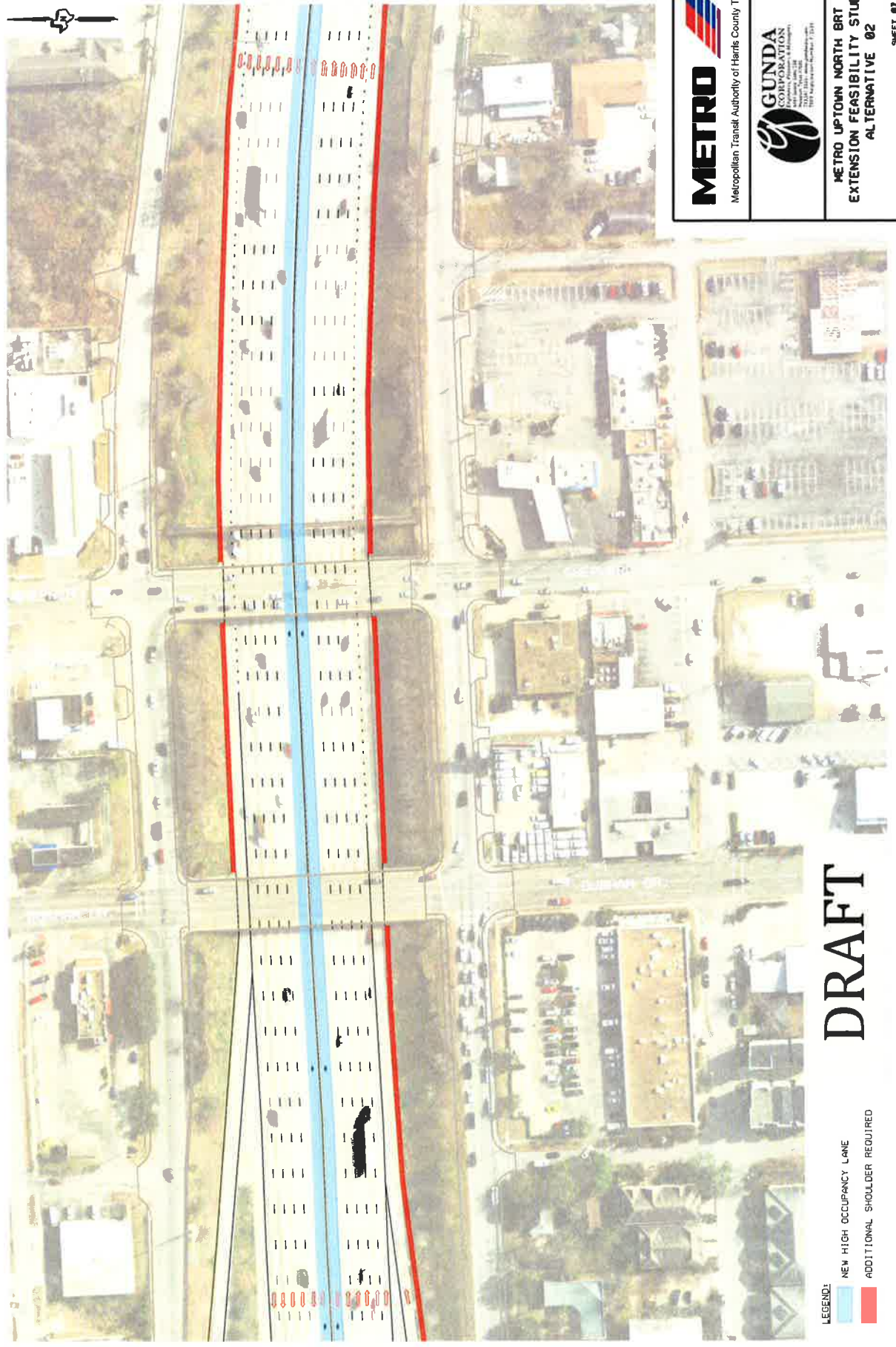
LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED





Metropolitan Transit Authority of Harris County, Texas



**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 02**



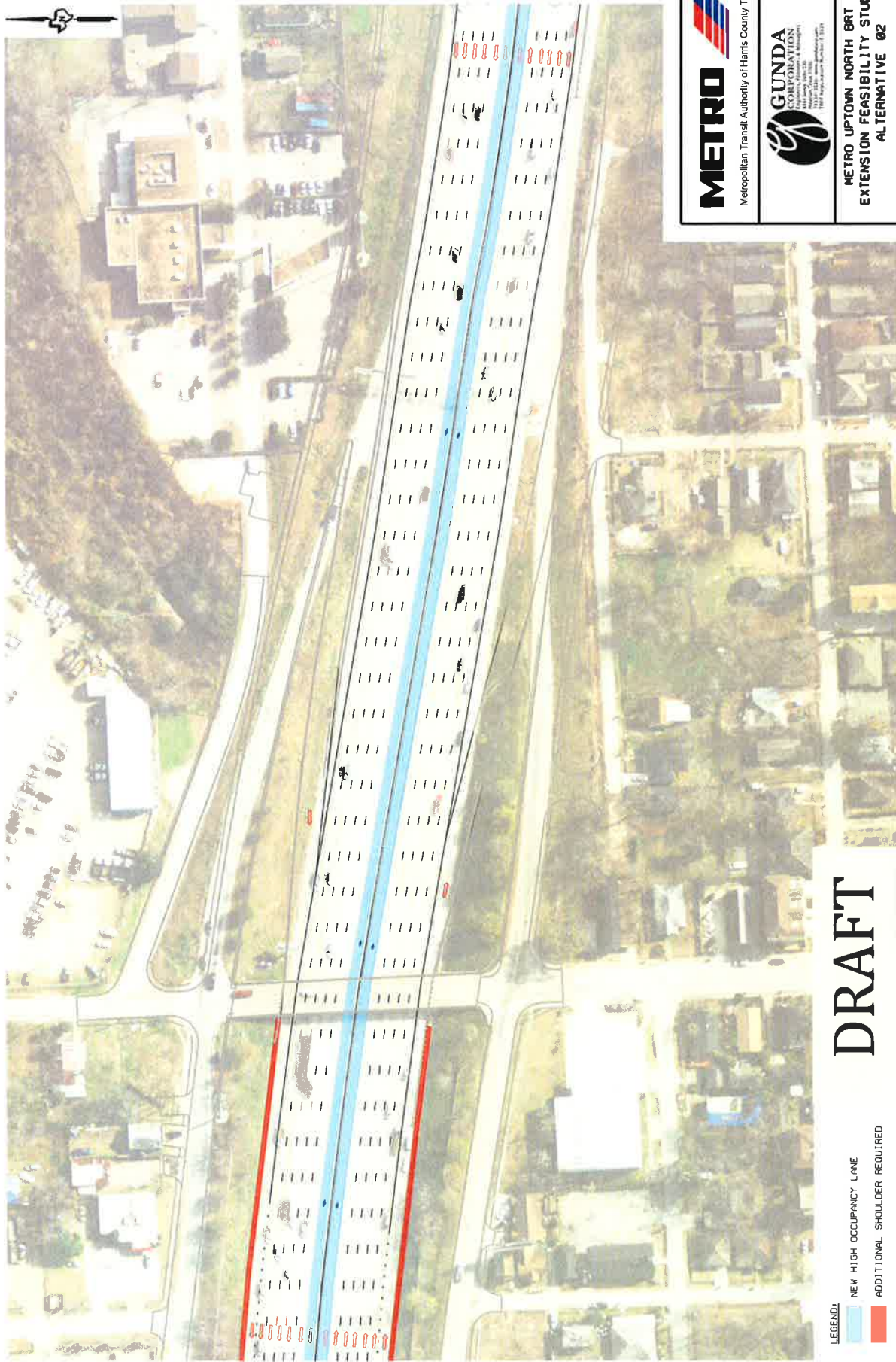
**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED

**METRO**  
 Metropolitan Transit Authority of Harris County, Texas

**GUNDA CORPORATION**  
 TRANSPORTATION CONSULTANTS  
 10000 Katy Road, Suite 100  
 Houston, Texas 77054  
 Phone: 281.469.1234  
 Fax: 281.469.1235  
 Email: gunda@gunda.com

**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 02**



**DRAFT**

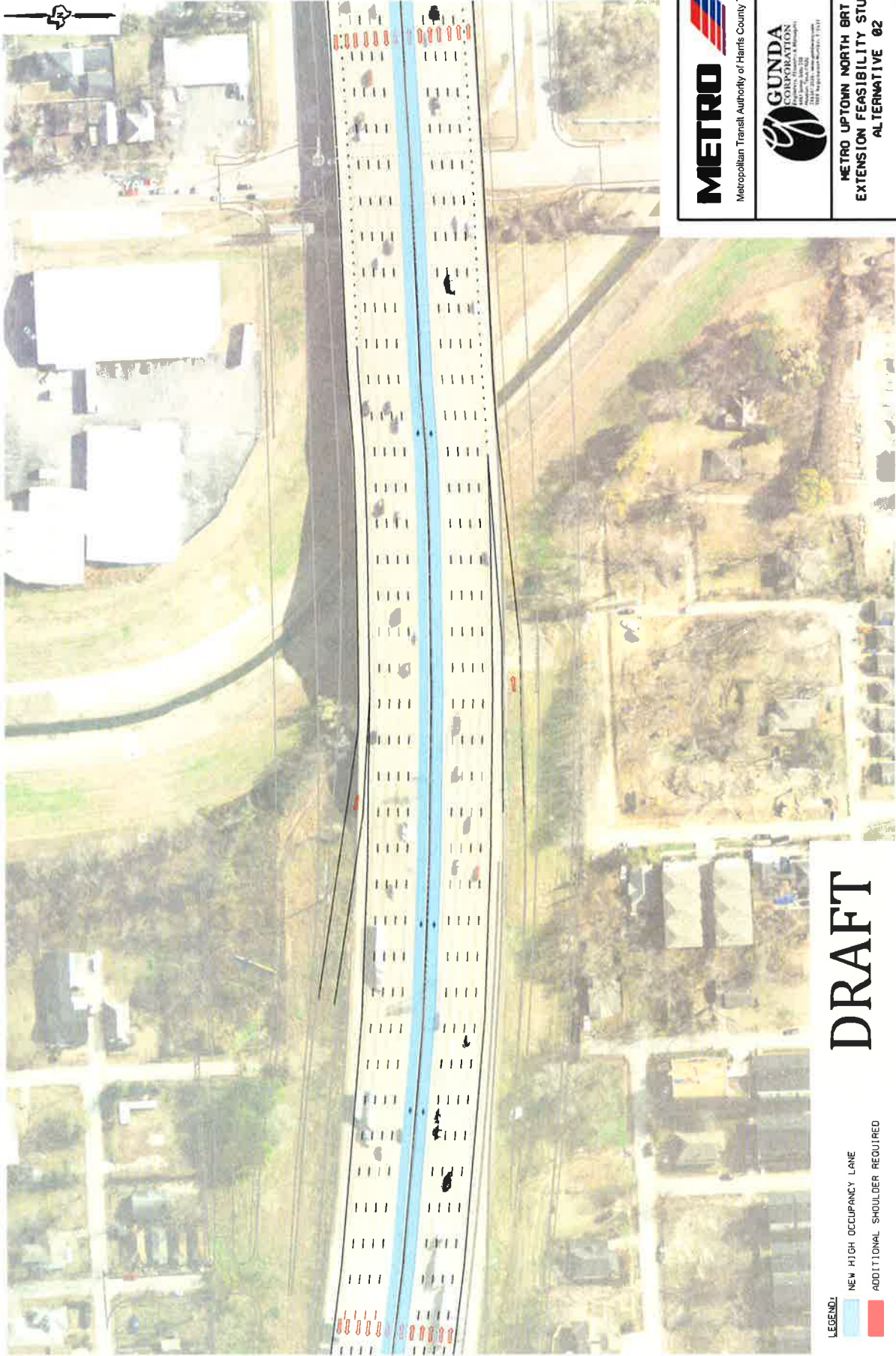
LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



Metropolitan Transit Authority of Harris County, Texas



**METRO UPTOWN NORTH BR  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 02**

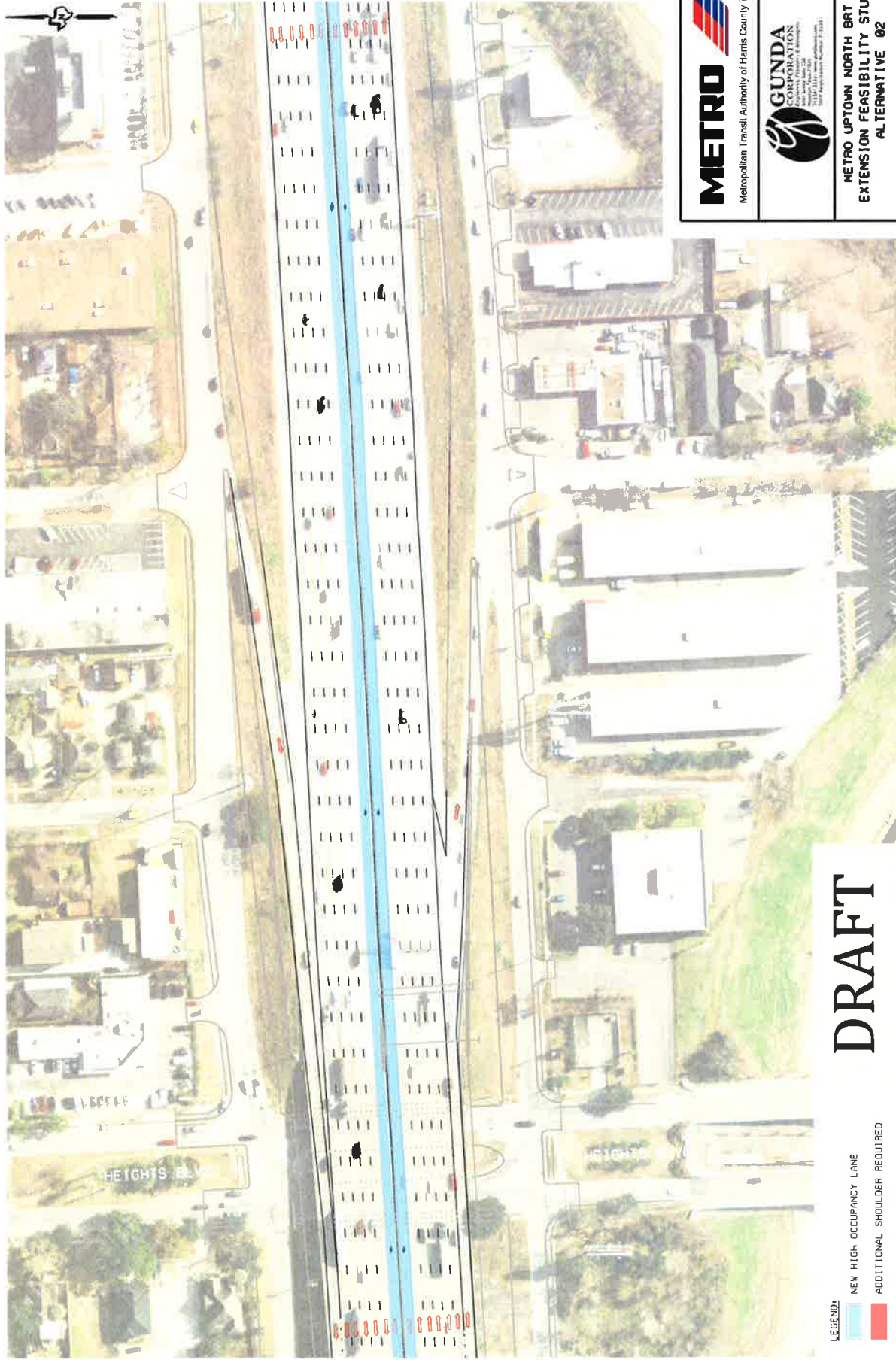


# DRAFT

- LEGEND:**
- NEW HIGH OCCUPANCY LANE
  - ADDITIONAL SHOULDER REQUIRED



**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02**



**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



Metropolitan Transit Authority of Harris County, Texas

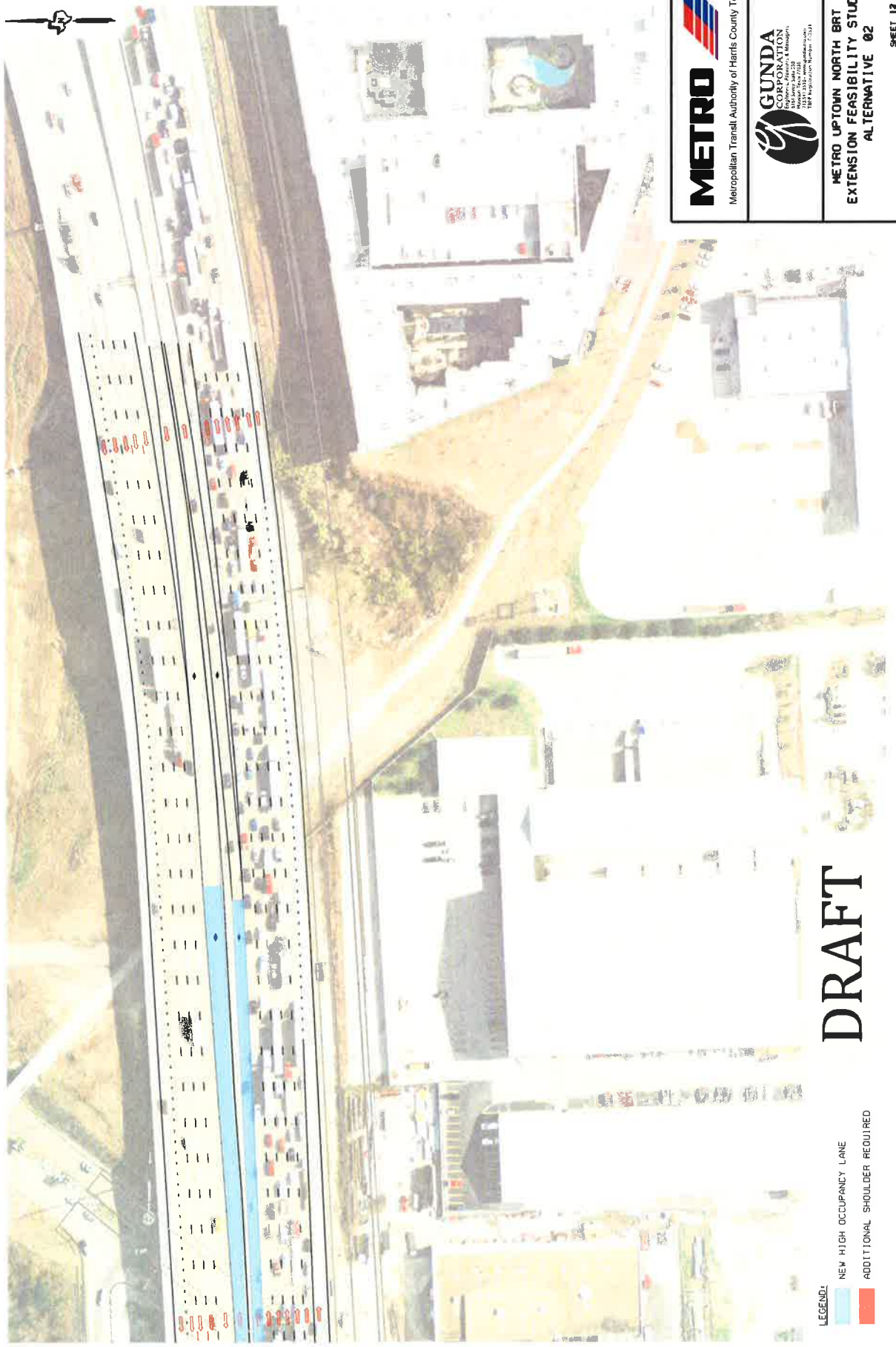


**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 02**



**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 ADDITIONAL SHOULDER REQUIRED



**DRAFT**

LEGEND:  
NEW HIGH OCCUPANCY LANE  
ADDITIONAL SHOULDER REQUIRED

**METRO**  
Metropolitan Transit Authority of Harris County, Texas

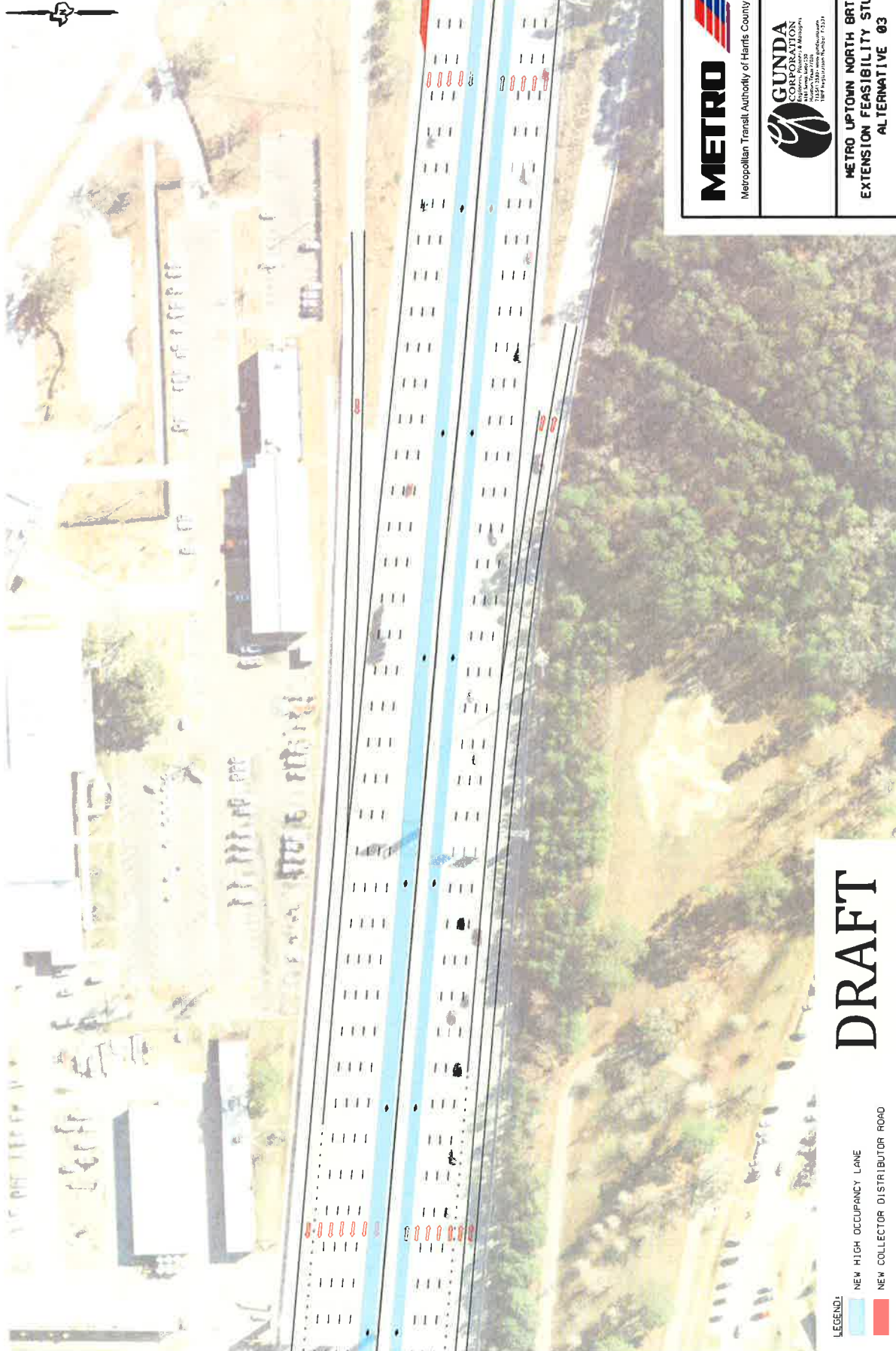
**GUNDA CORPORATION**  
10000 Katy Road, Suite 100  
Houston, Texas 77054  
713.461.1333  
10000 Katy Road, Suite 100  
Houston, Texas 77054

**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 02**



DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD

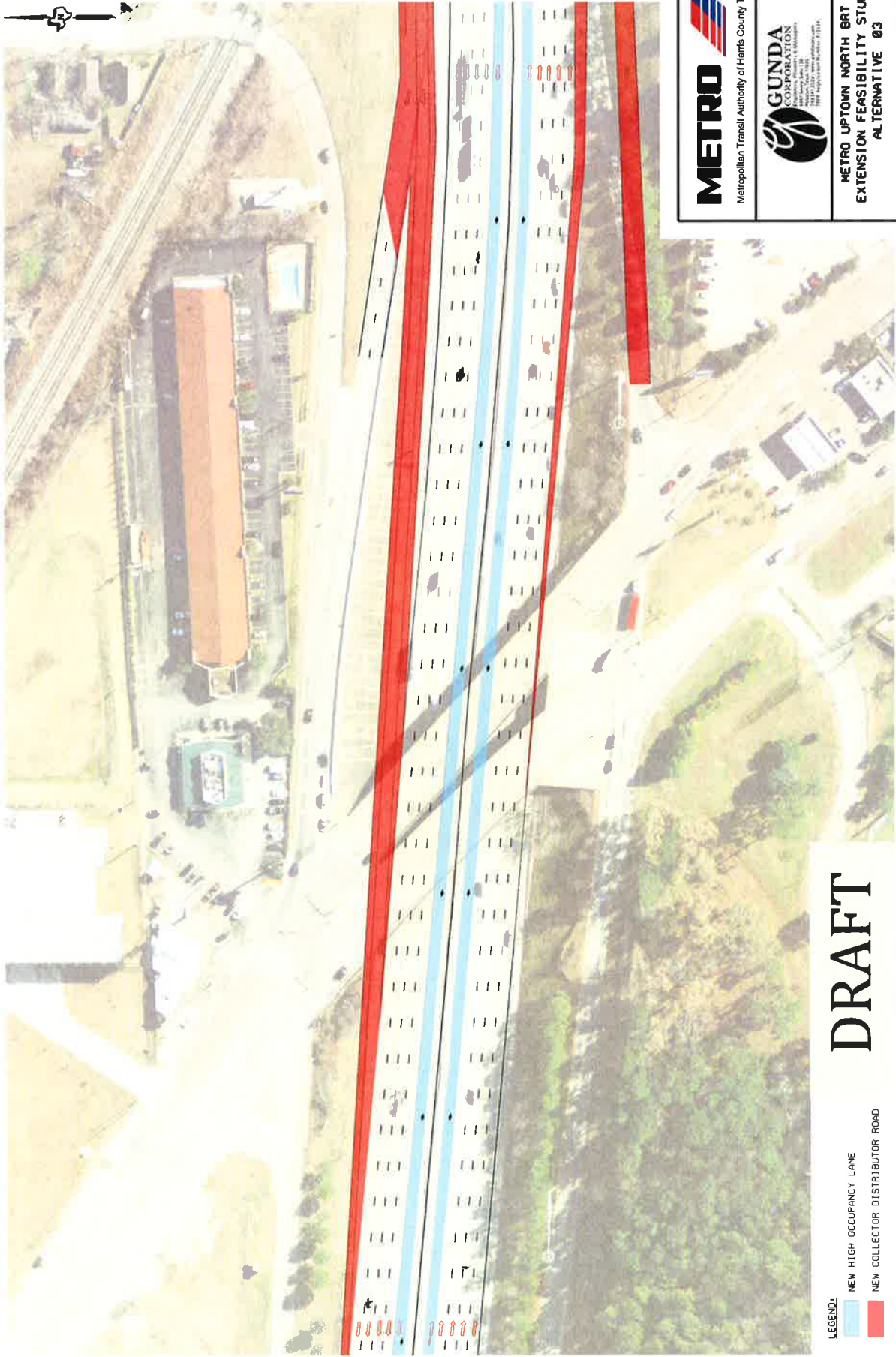


DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD

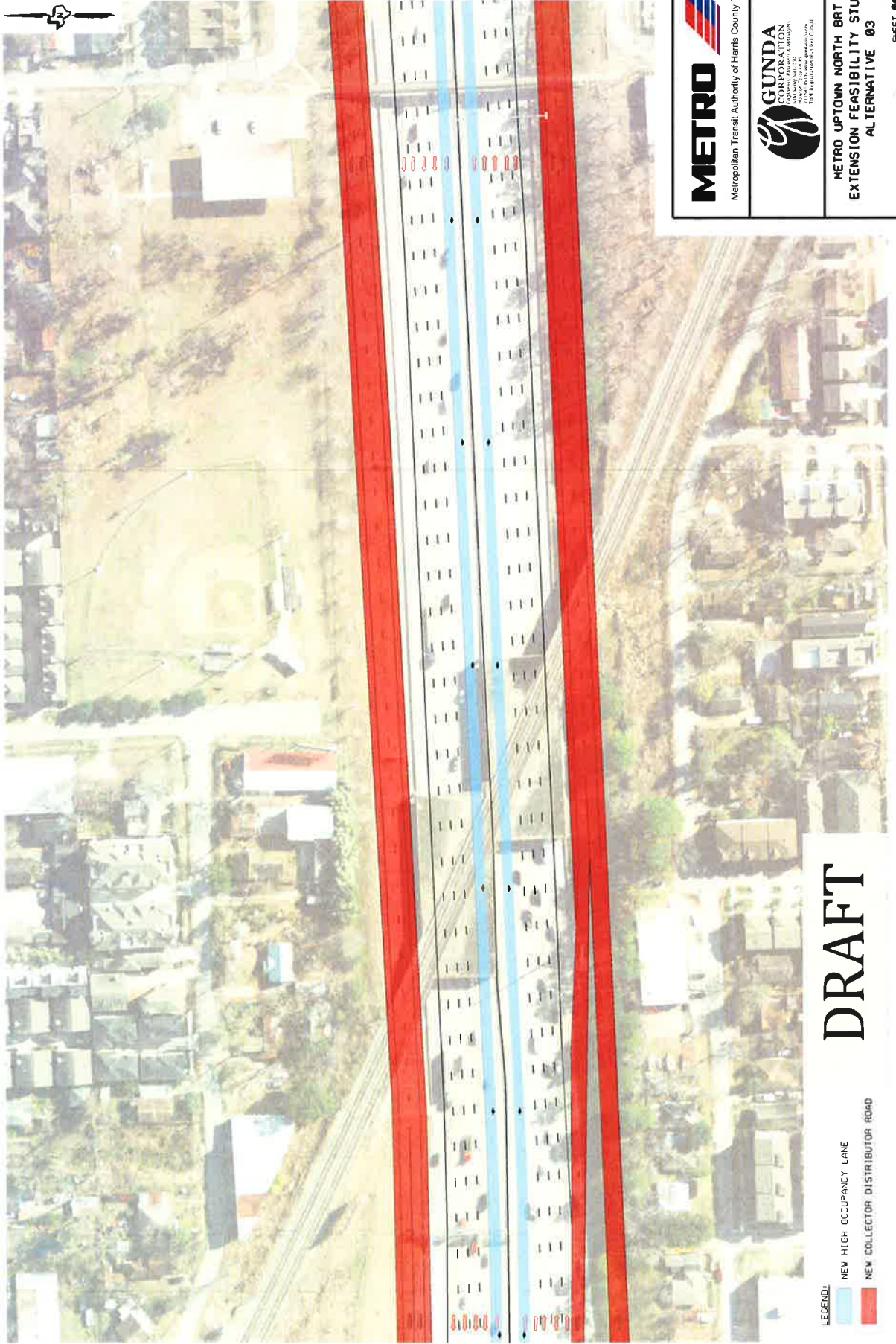


METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03



# DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD

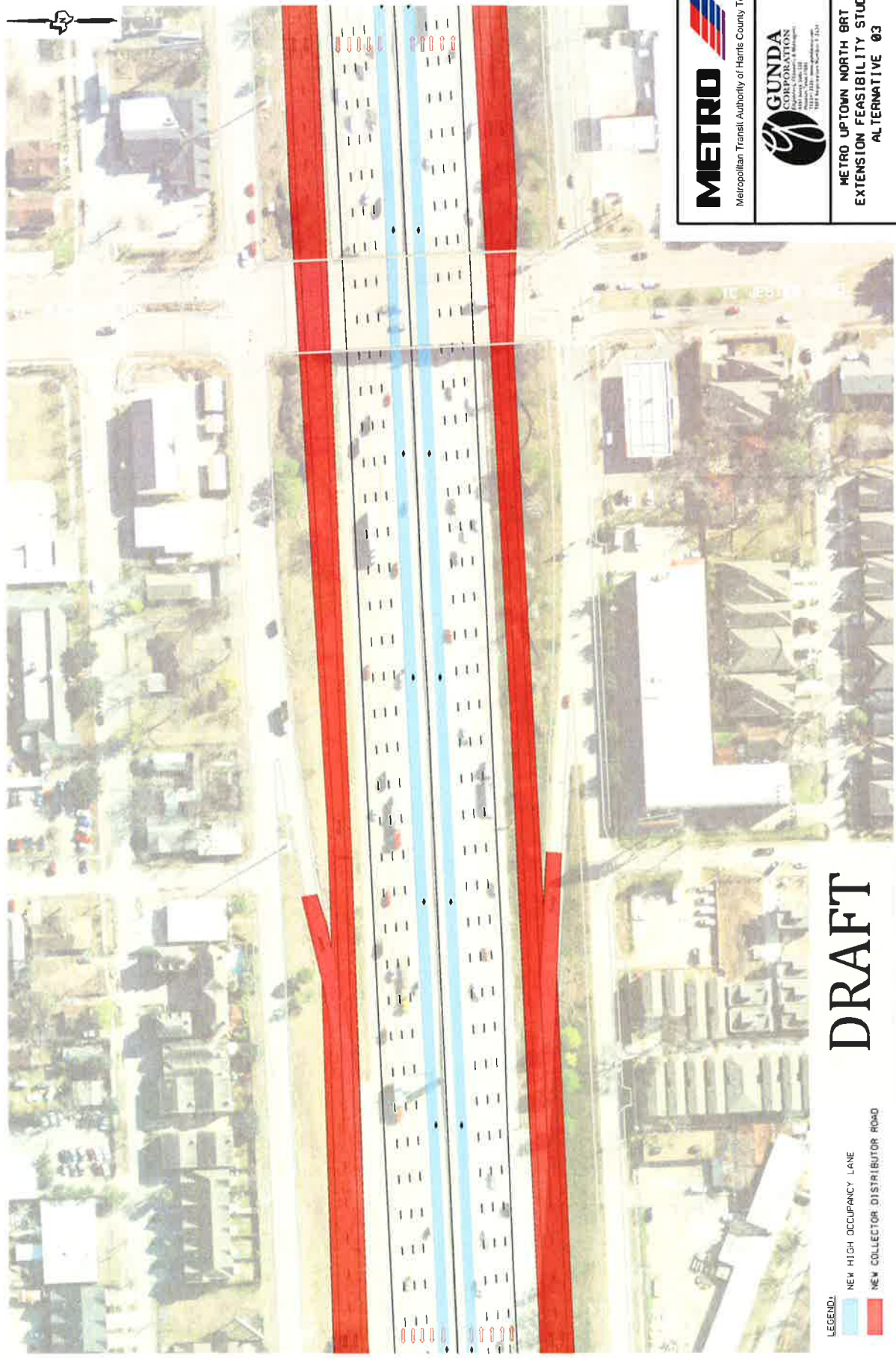


DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03



**DRAFT**

- LEGEND:**
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD



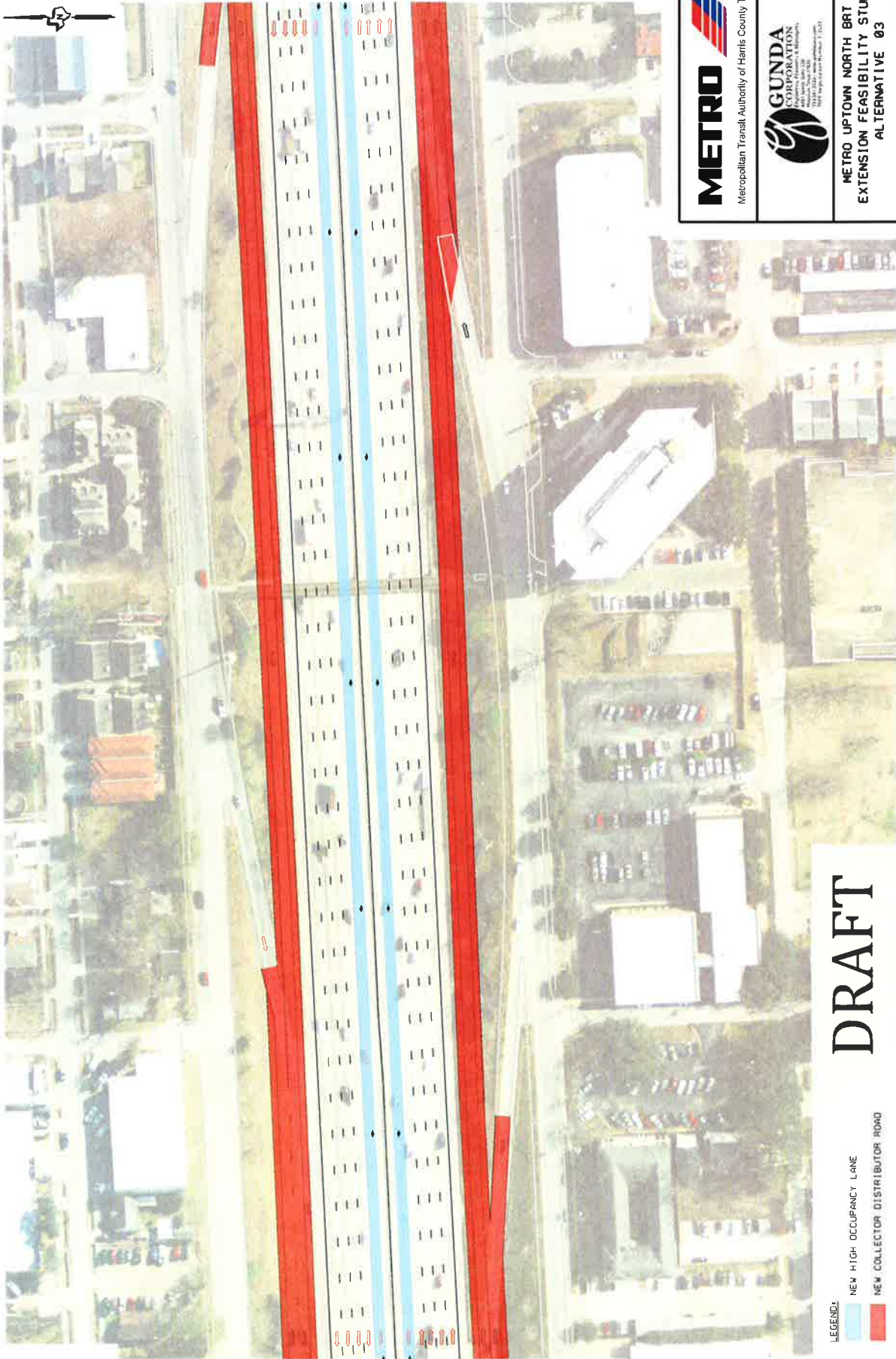
**METRO**  
Metropolitan Transit Authority of Harris County, Texas





**GUNDA CORPORATION**  
10000 Katy Road, Suite 100  
Houston, Texas 77054  
(713) 465-1000  
www.gundacorp.com

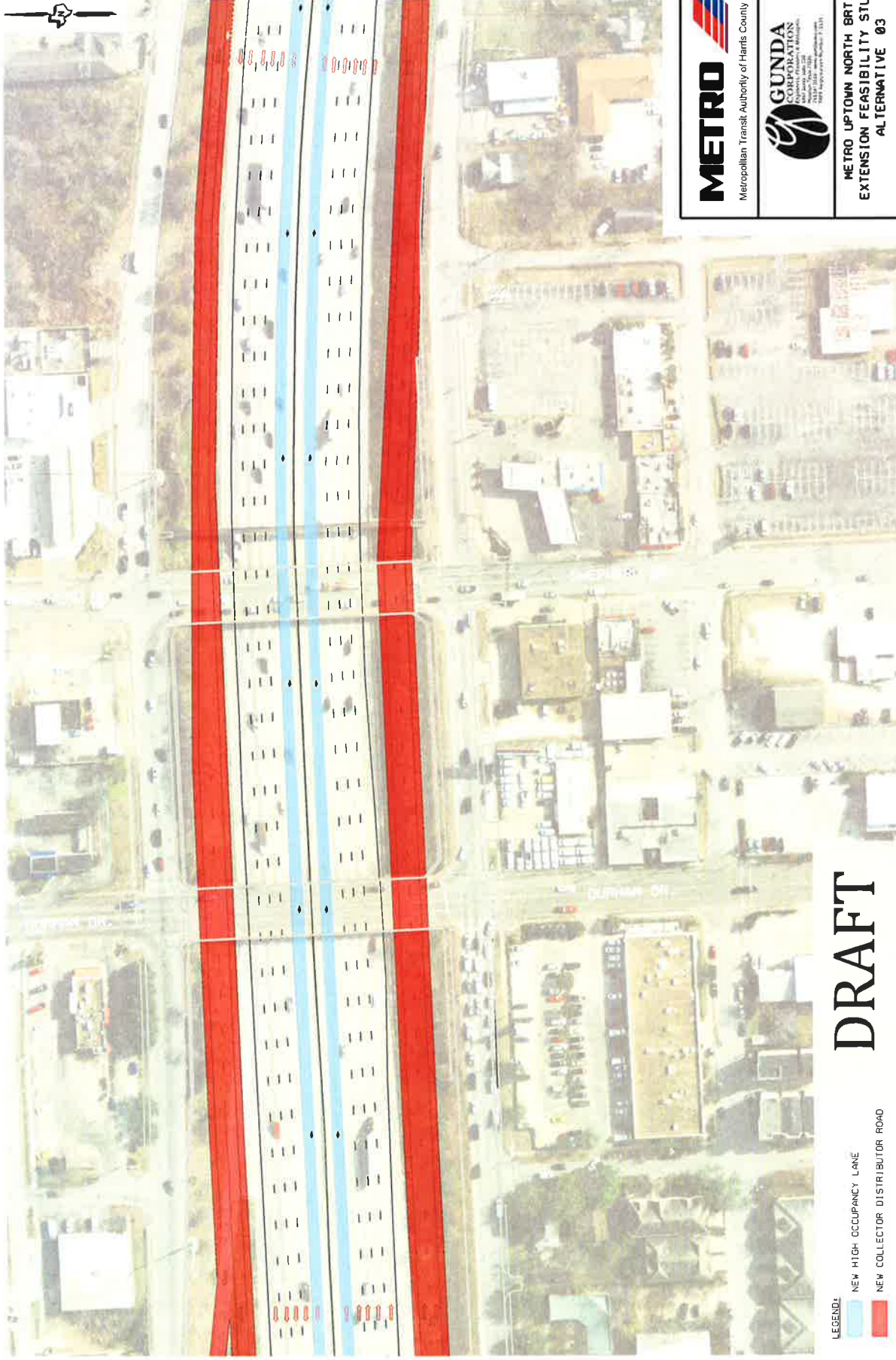
**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03**

SHEET 03 OF 12



**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 NEW COLLECTOR DISTRIBUTOR ROAD

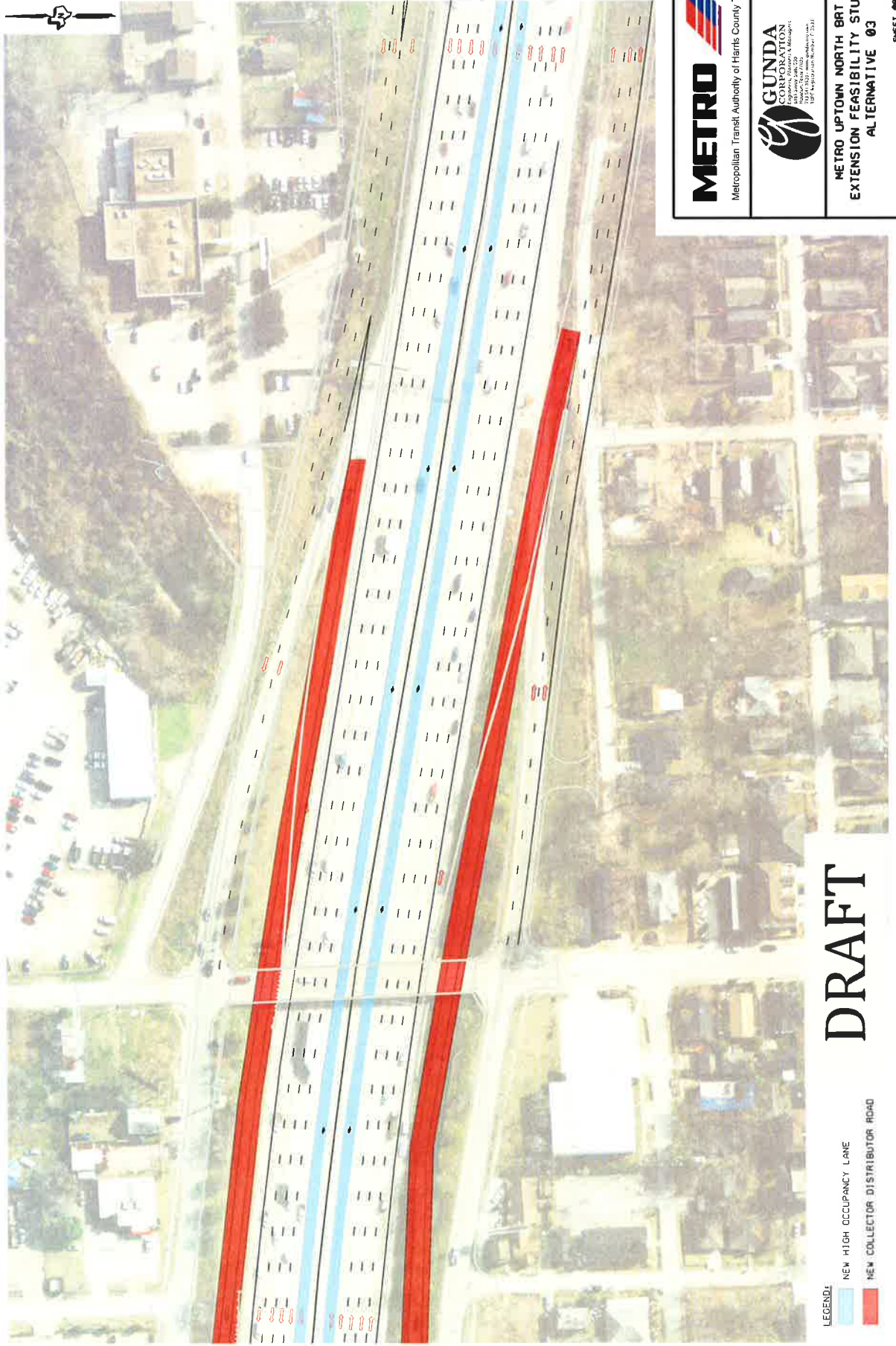


DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD

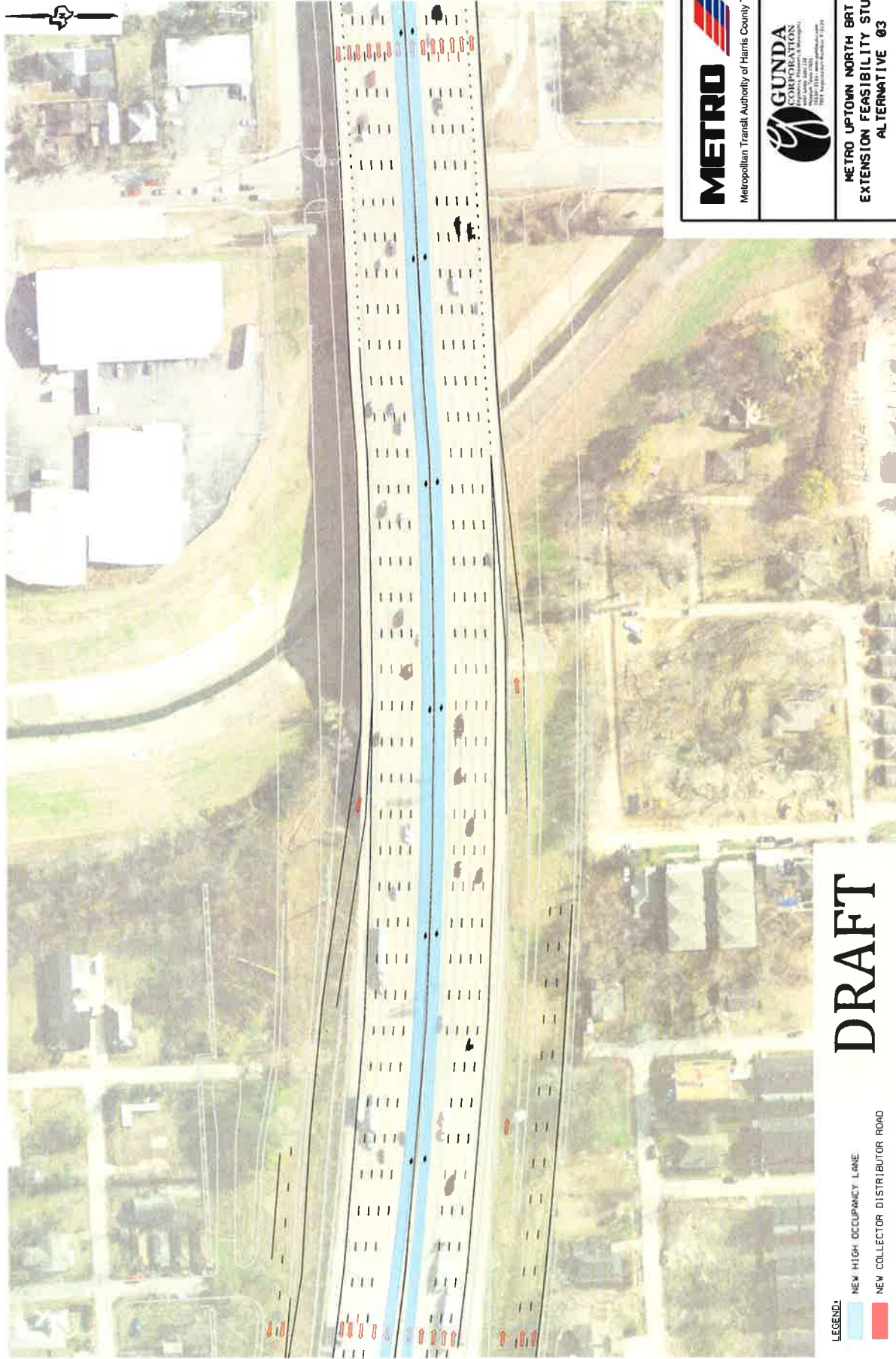


METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03



DRAFT

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 NEW COLLECTOR DISTRIBUTOR ROAD

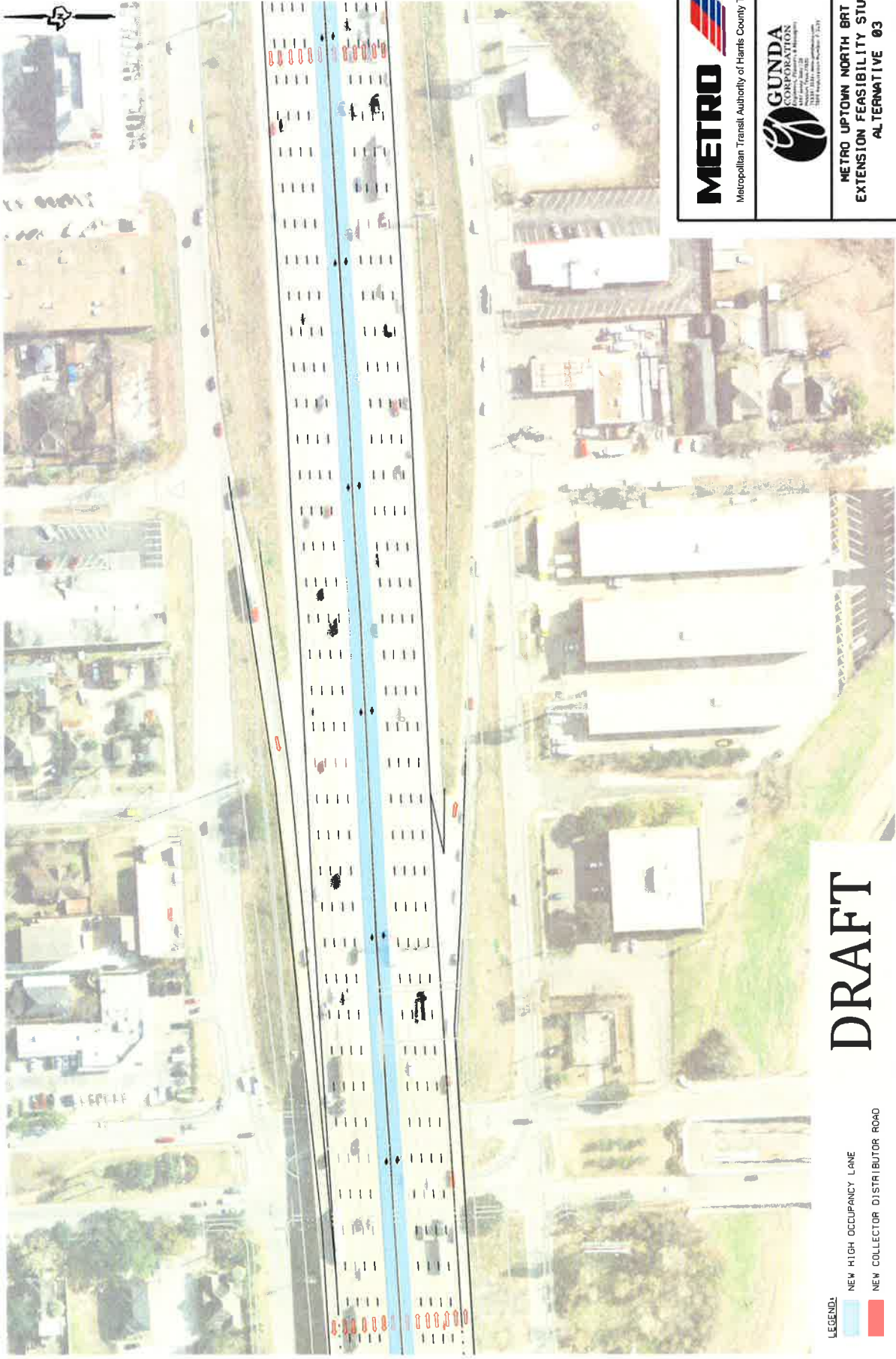


DRAFT

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD



METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03

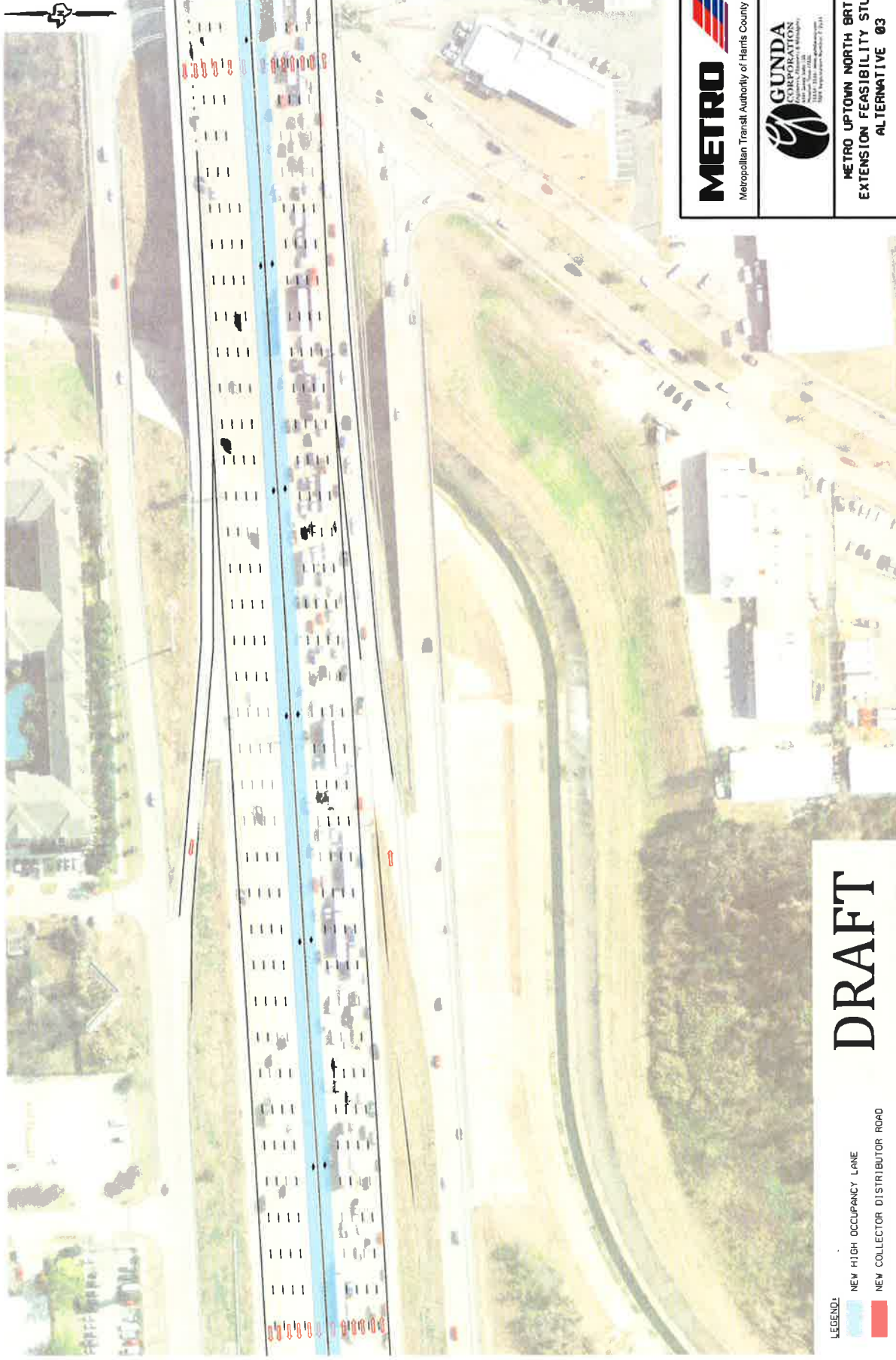


**DRAFT**

LEGEND:  
 NEW HIGH OCCUPANCY LANE  
 NEW COLLECTOR DISTRIBUTOR ROAD



**METRO UPTOWN NORTH BRT  
 EXTENSION FEASIBILITY STUDY  
 ALTERNATIVE 03**

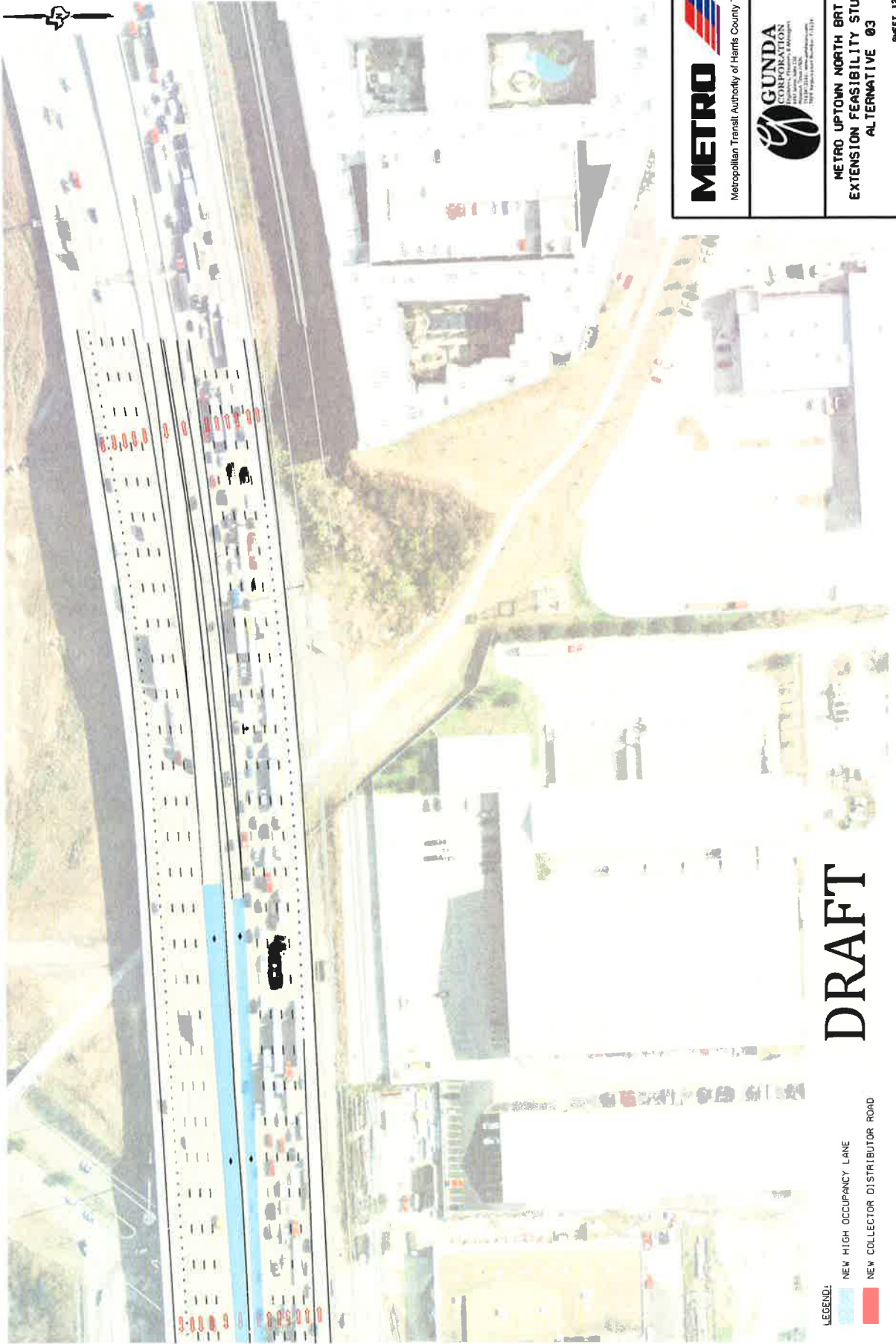


**DRAFT**

- LEGEND:
- NEW HIGH OCCUPANCY LANE
  - NEW COLLECTOR DISTRIBUTOR ROAD



**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03**



LEGEND:

- NEW HIGH OCCUPANCY LANE
- NEW COLLECTOR DISTRIBUTOR ROAD

**DRAFT**



**METRO UPTOWN NORTH BRT  
EXTENSION FEASIBILITY STUDY  
ALTERNATIVE 03**

# Uptown BRT Line North Extension Feasibility Study

## METRO STAFF PROGRESS MEETING

SEPTEMBER 19, 2017



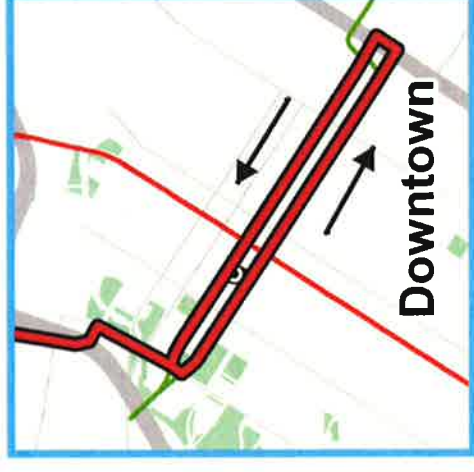
# Outline

- Study purpose
- Field observation
- Traffic Data summary
- Conceptual Alternatives
- Next Steps



## Study Purpose

- Extend BRT line – NWTTC to CBD
  - Primarily on IH-10 Corridor
  - Connect to Green Purple Lines
- Evaluate alternative concepts (2020)
- Budgetary costs
- Coordinate with TxDOT





# Field Observation

Eastbound

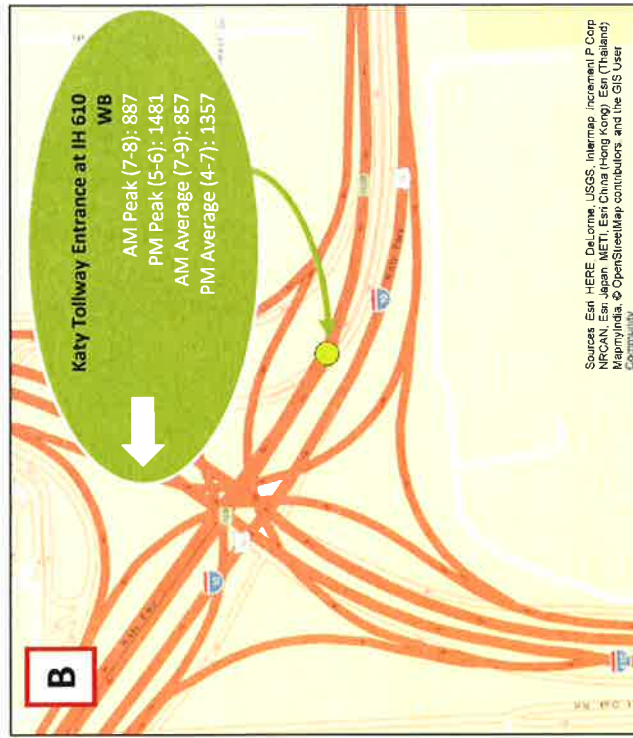
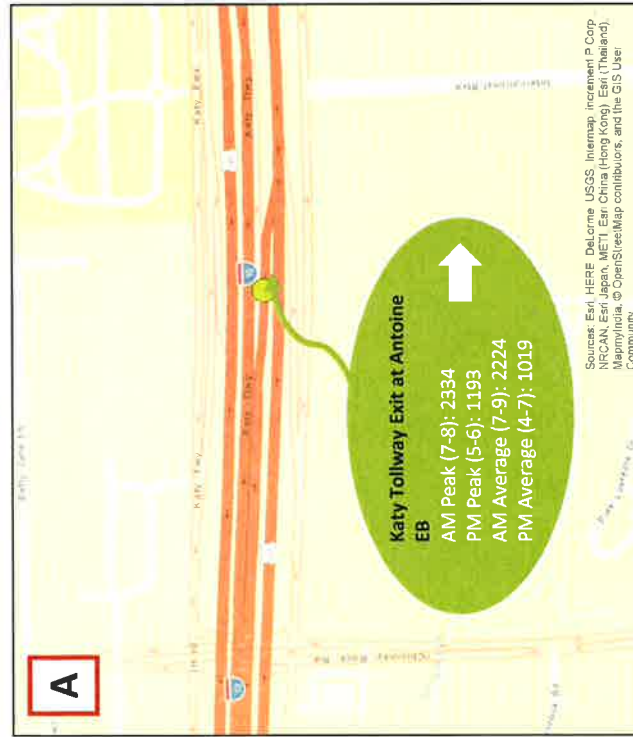
RR Crossing



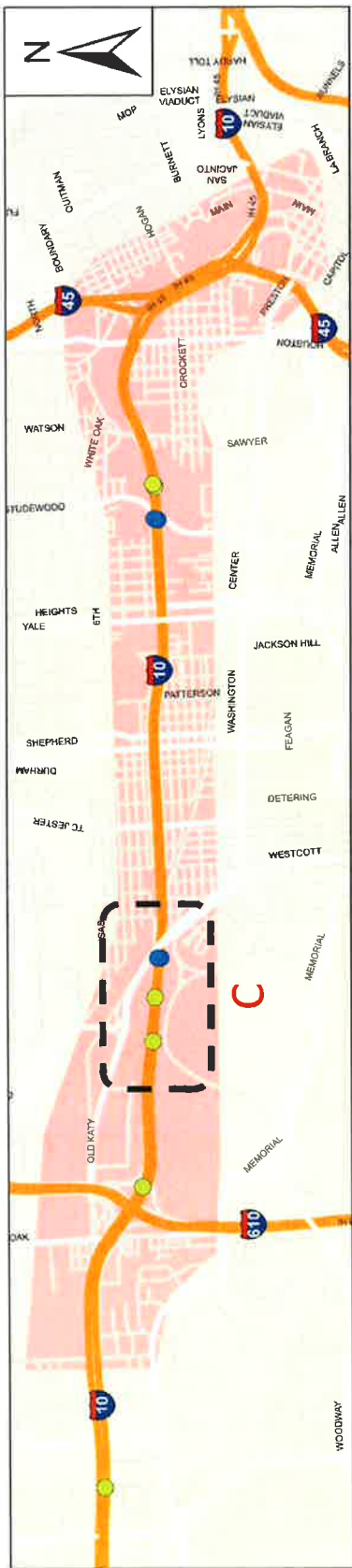
Westbound

TC Jester

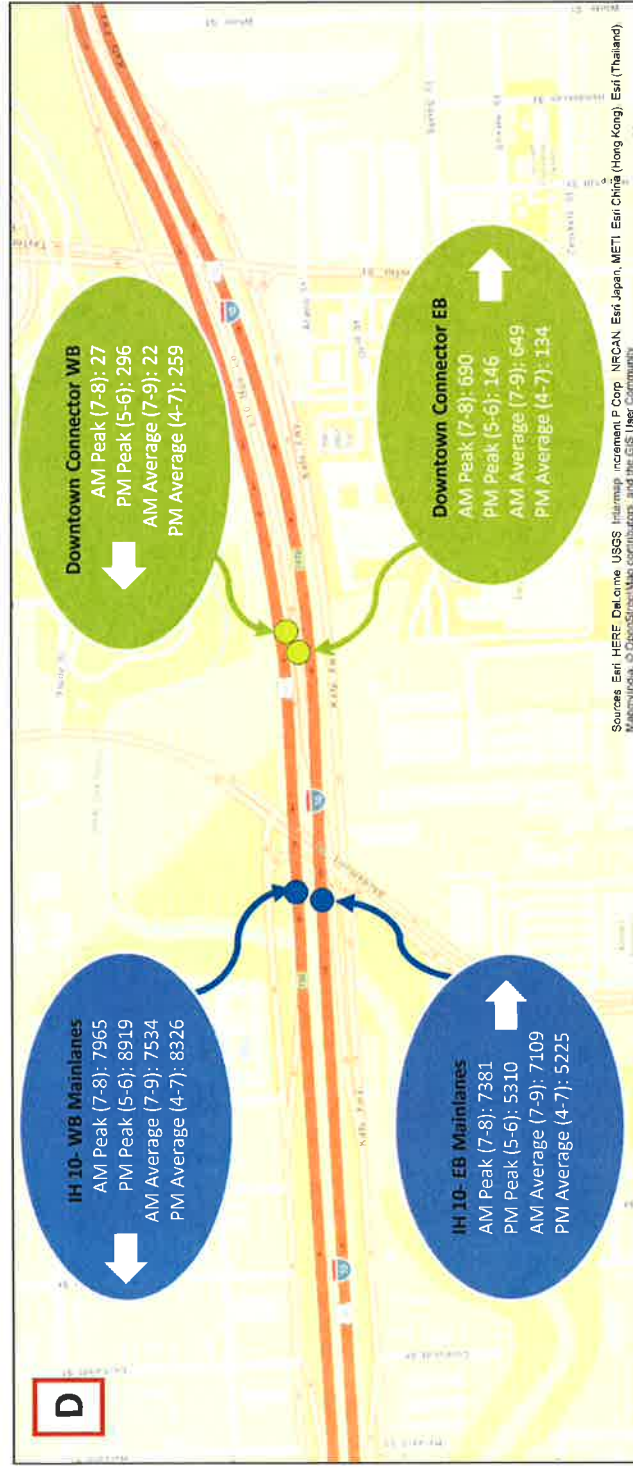
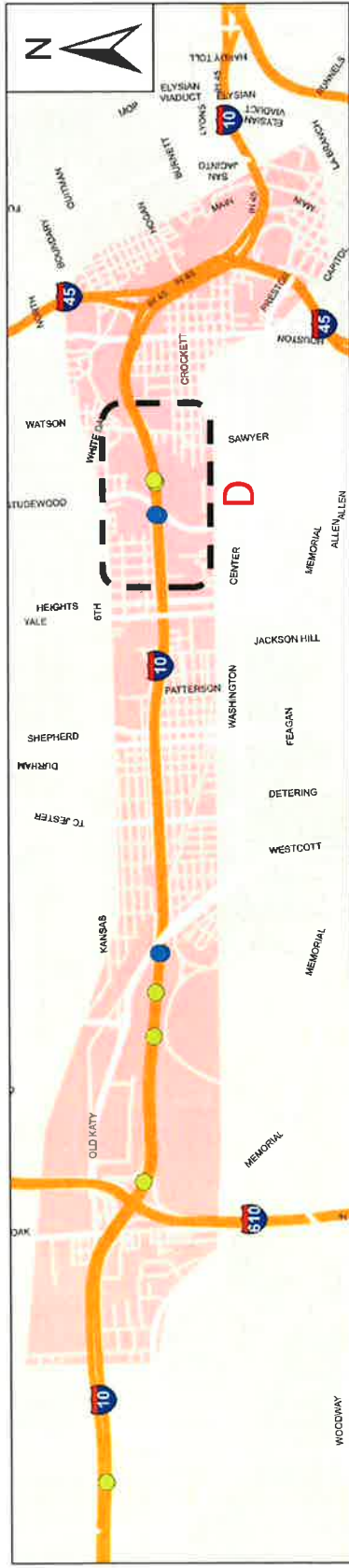




**Data Source:**  Gunda  TTI



Data Source: ● Gunda ● TTI



Data Source: ● Gunda ● TTI



## Conceptual Alternatives Discussion

**Alternative 1** – Convert existing left most lanes to diamond lane

**Alternative 2** – Add a diamond lane using shoulders and widening as necessary

**Alternative 2a** – Use of diamond lanes as shoulders during off-peak periods

**Alternative 3** – Add Collector- Distributor roadways





## Capacity Analysis

Eastbound	No Build	EB - Diamond Lane Volume				Alternative 1			Alternative 2			
		100%	80%	60%	Reduced ML Volume	Reduced ML Volume	Peak Hour	Reduced ML Volume	100%	80%	Peak Hour	
Peak Hour	Peak Hour											
AM (7-8) Volume	9072	2669	2135	1601		6403	6936.8	7471	60%	6403	6936.8	7470.6
PM (5-6) Volume	8227	1193	954	716		7034	7273	7511		7034	7272.6	7511.2
Lanes	5	1	1	1		4	4	4		5	5	5
Density AM	31.5	39	30	23		27.8	31	34.7		21.6	23.5	25.6
LOS AM	D	E	D	C		D	D	D		C	C	C
Density PM	28.8	18	14	10		31.7	33.3	35		23.9	24.8	25.7
LOS PM	D	B	B	A		D	D	E		C	D	D
AM (7-8) Passengers	11340	8007	6406	4804		8004	8671	9338		8004	8671	9338
PM (5-6) Passengers	10284	3579	2863	2147		8793	9091	9389		8793	9091	9389

Westbound	No Build	WB - Diamond Lane Volume				Alternative 1			Alternative 2			
		100%	80%	60%		100%	80%	60%	Reduced ML Volume	100%	80%	60%
Peak Hour	Peak Hour											
AM (7-8)	9460	887	710	532		8573	8750	8928		8573	8750	8928
PM (5-6)	8406	1910	1528	1146		6496	6878	7260		6496	6878	7260
Lanes	5	1	1	1		4	4	4		5	5	5
Density AM	35.5	14	10	7.5		45.1	47.3	49.6		30.5	31.4	32.4
LOS AM	E	B	A	A		F	F	F		D	D	D
Density PM	29.7	27	22	16		28.3	30.6	33.2		21.9	23.3	24.7
LOS PM	D	D	C	B		D	D	D		C	C	C
AM (7-8) Passengers	11825	2661	2129	1597		10716	10938	11160		10716	10938	11160
PM (5-6) Passengers	10508	5730	4584	3438		8120	8598	9075		8120	8598	9075

\* Diamond Lanes - Assumed a capacity of 2400 and FFS of 70 mph

Diamond Lane Occupancy Rate - 3 Passengers/Vehicle

Mainlane Occupancy Rate - 1.25 Passengers/Vehicle (Source: TTI 2015 Urban Mobility Scorecard)



## Capacity Analysis

Eastbound	No Build	EB - Diamond Lane Volume			Alternative 1			Alternative 2		
		100%	80%	60%	Reduced ML Volume - 100%	Reduced ML Volume - 80%	Reduced ML Volume - 60%	Reduced ML Volume - 100%	Reduced ML Volume - 80%	Reduced ML Volume - 60%
Peak Period	3 Hr Avg									
AM (7-9)	8763	2682	2146	1609	6081	6617	7154	6081	6617	7154
PM (4-7)	7882	1019	815	611	6863	7067	7271	6863	7067	7271
Lanes	5	1	1	1	4	4	4	5	5	5
Density AM	33.2	39	30	23	26.1	29	32.4	20.5	22.4	24.3
LOS AM	D	E	D	C	D	D	D	C	C	C
Density PM	27.3	15	11	8	30.5	31.9	33.3	23.2	24	24.8
LOS PM	D	B	B	A	D	D	D	C	C	C
AM (7-8) Passengers	10954	8046	6437	4828	7601	8272	8942	7601	8272	8942
PM (5-6) Passengers	9853	3057	2446	1834	8579	8834	9088	8579	8834	9088

Westbound	No Build	WB - Diamond Lane Volume			Alternative 1			Alternative 2		
		100%	80%	60%	Reduced ML Volume - 100%	Reduced ML Volume - 80%	Reduced ML Volume - 60%	Reduced ML Volume - 100%	Reduced ML Volume - 80%	Reduced ML Volume - 60%
Peak Period	3 Hr Avg									
AM (7-9)	8725	857	686	514	7868	8039	8210	7868	8039	8210
PM (4-7)	8064	1874	1499	1124	6190	6564	6939	6190	6564	6939
Lanes	5	1	1	1	4	4	4	5	5	5
Density AM	31.3	12	9	7	38	39.5	41.2	27.2	28	28.8
LOS AM	D	B	A	A	E	E	E	D	D	D
Density PM	28.1	26	22	16	26.7	28.7	31	20.9	22.2	23.5
LOS PM	D	D	C	B	D	D	D	C	C	C
AM (7-8) Passengers	10906	2571	2057	1543	9834	10049	10263	9834	10049	10263
PM (5-6) Passengers	10080	5622	4498	3373	7737	8206	8674	7737	8206	8674

\* Diamond Lanes - Assumed a capacity of 2400 and FFS of 70 mph

Diamond Lane Occupancy Rate - 3 Passengers/Vehicle

Mainlane Occupancy Rate - 1.25 Passengers/Vehicle (Source: TTI 2015 Urban Mobility Scorecard)



## Next Steps

- Develop strategic approach with METRO to present findings to TxDOT
- Further refine physical constraints and impact level
- Refine budgetary cost estimates

