Appendix B

Concept Definitions Alignment Drawings

Minneapolis Southwest Corridor Figures A1 to A8

St. Paul Northeast Corridor Figures A9 to A18

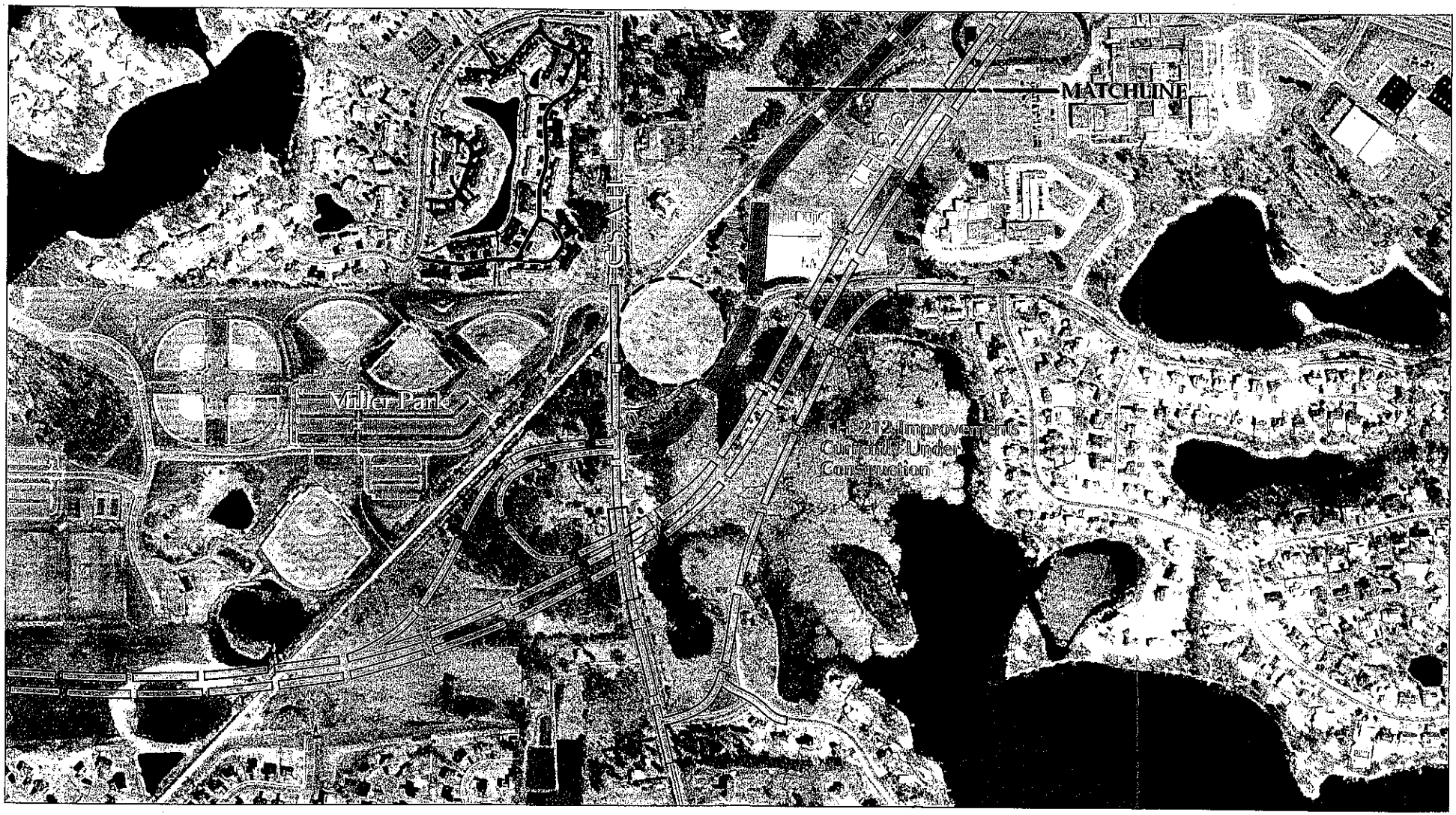


Figure A1

Minneapolis Southwest Corridor

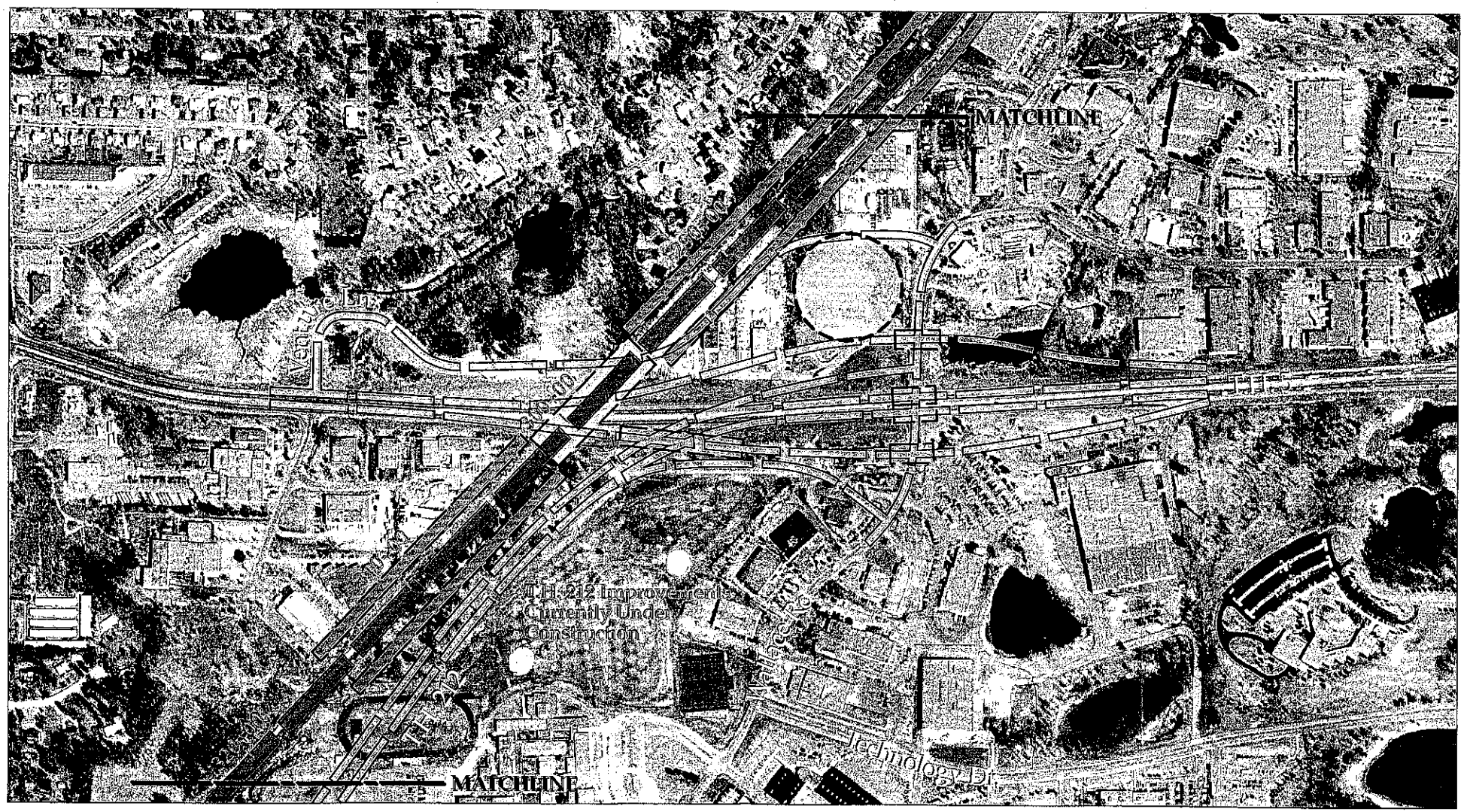
Aerial Base Map Provided by Metropolitan Council

Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

0 200 400 800 Feet

North

Twin Cities Exclusive Busway Study



Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Figure A2

Minneapolis Southwest Corridor

Twin Cities Exclusive Busway Study

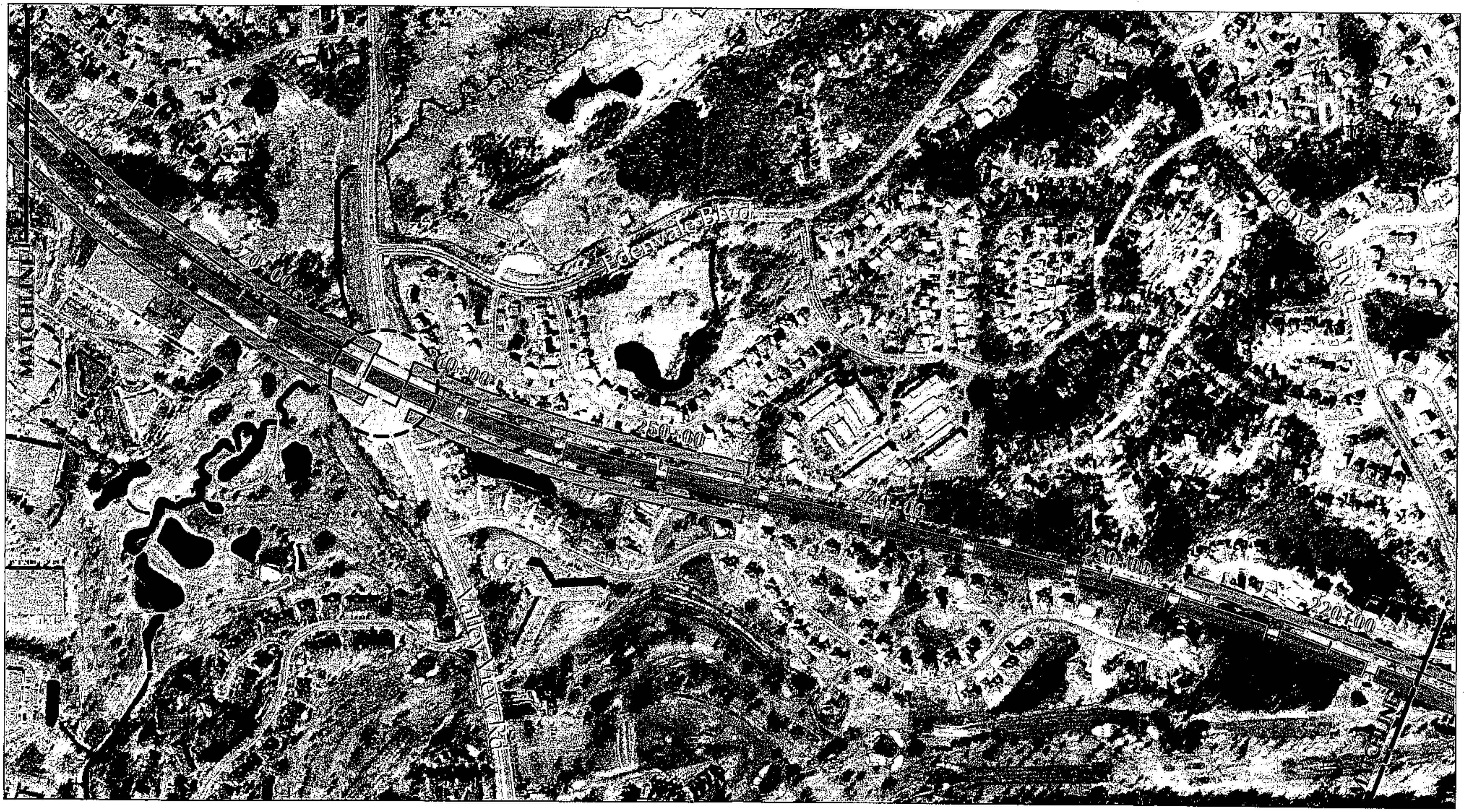


Figure A3

Minneapolis Southwest Corridor

Aerial Base Map Provided by Metropolitan Council

Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

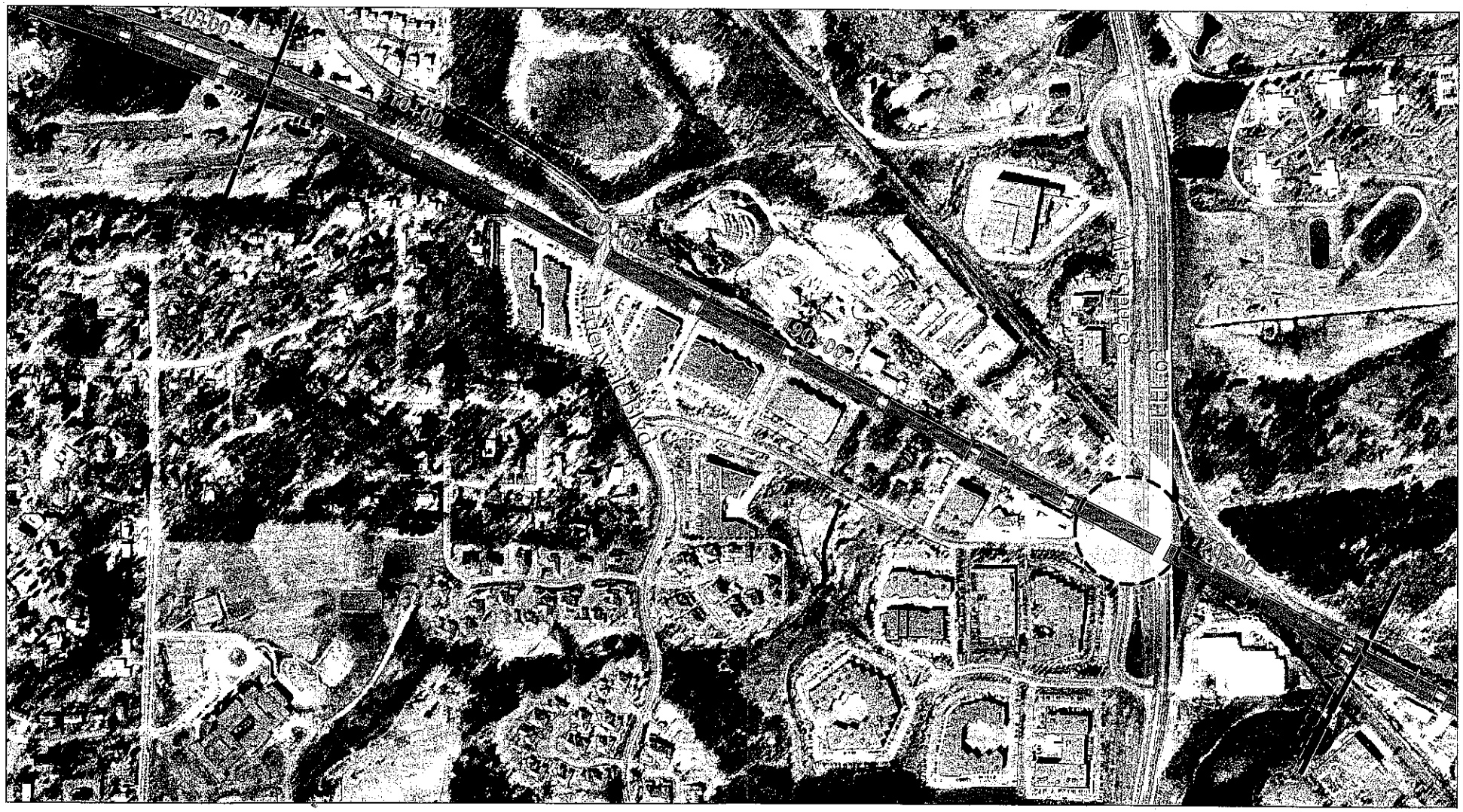
0 200 400 800 Feet

North

SEH

Minnesota Department of Transportation

Twin Cities Exclusive Busway Study



Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Figure A4

Minneapolis Southwest Corridor

Twin Cities Exclusive Busway Study

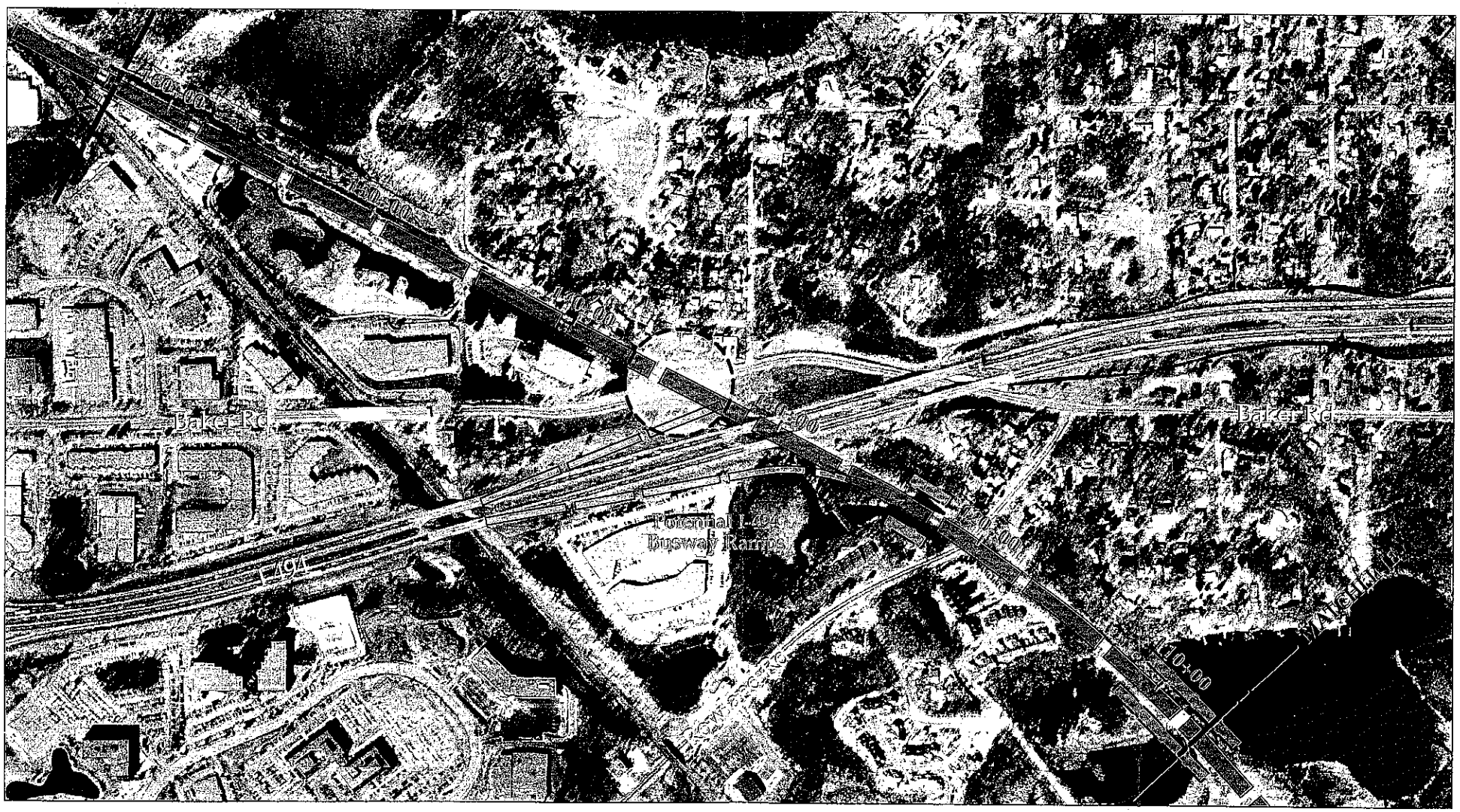


Figure A5

Minneapolis Southwest Corridor

Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

MINNESOTA DEPARTMENT OF TRANSPORTATION

Twin Cities Exclusive Busway Study

SEH

Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

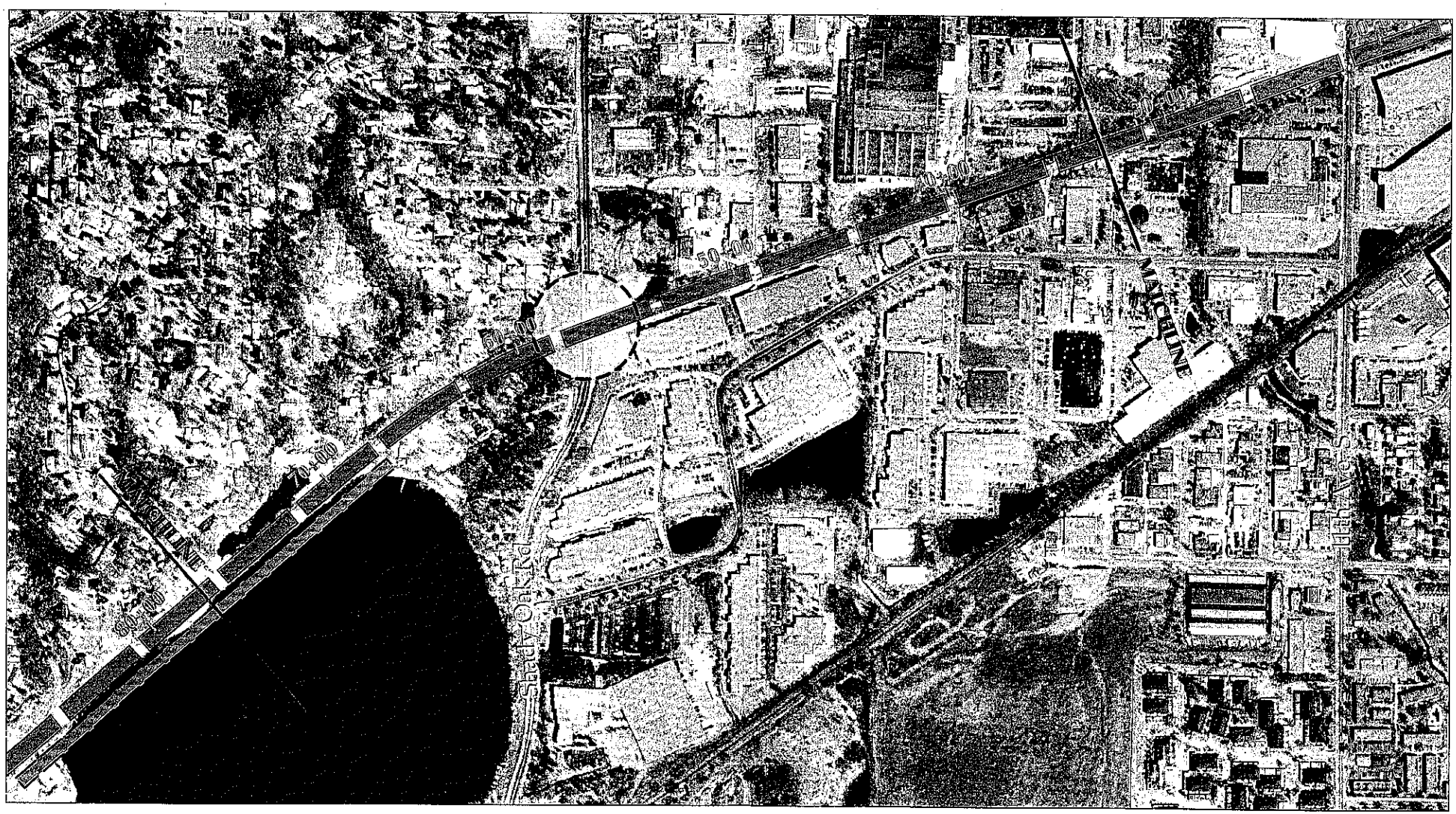
0 200 400 800 Feet

North

Twin Cities Exclusive Busway Study

Figure A6

Minneapolis Southwest Corridor



Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Figure A7

Minneapolis Southwest Corridor

Twin Cities Exclusive Busway Study

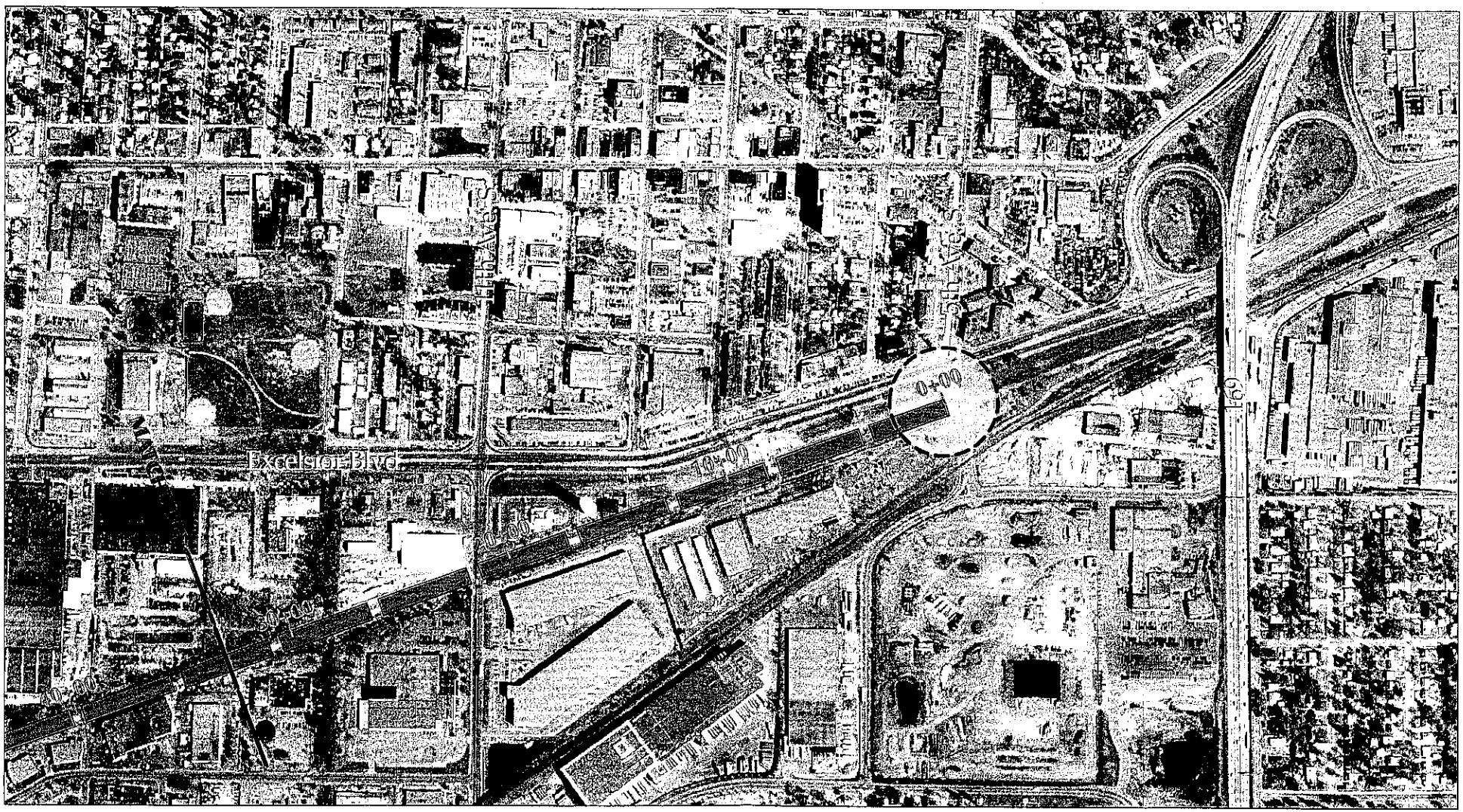


Figure A8

Minneapolis Southwest Corridor

Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

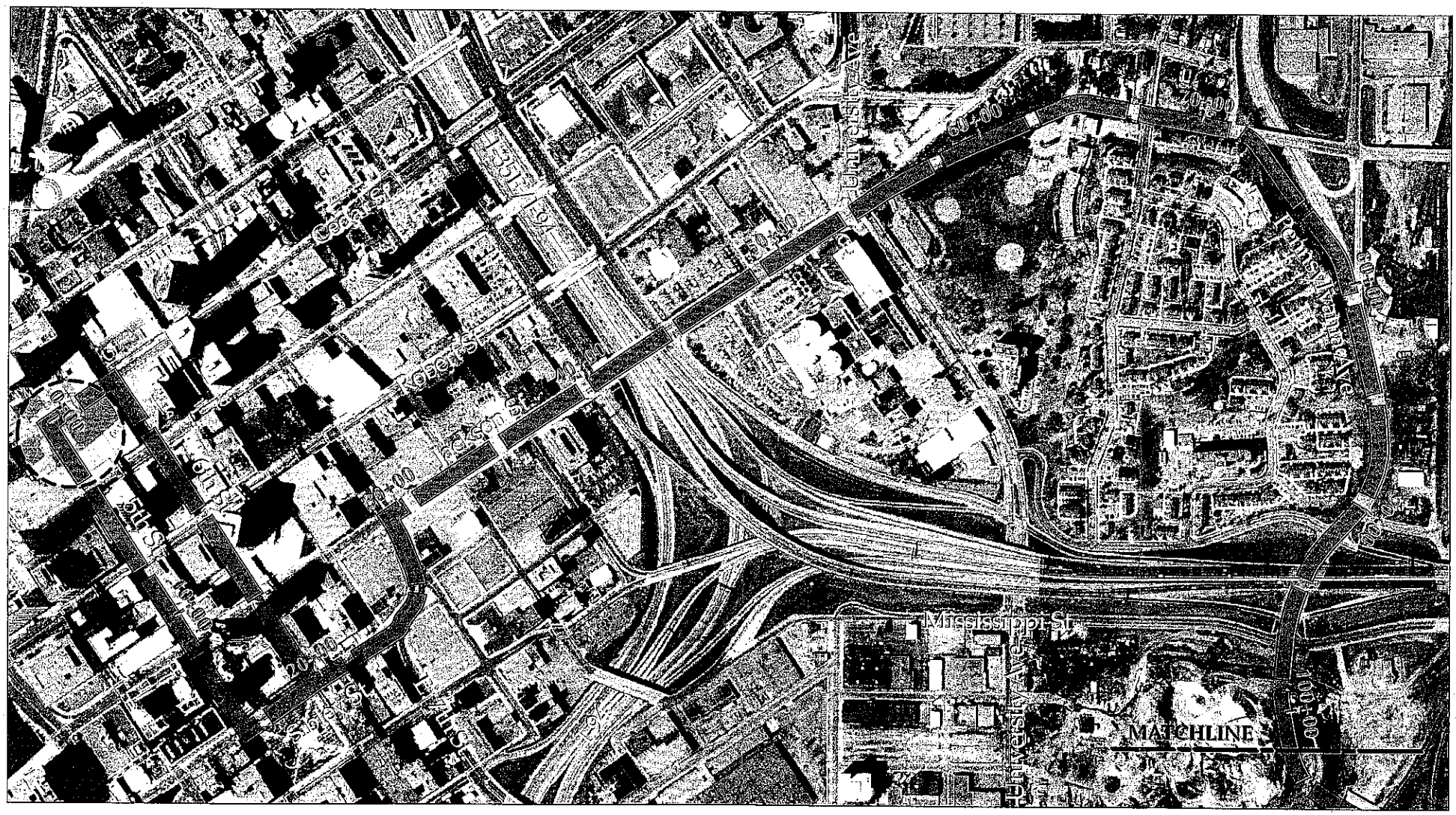
Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Twin Cities Exclusive Busway Study



Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Figure A9

St. Paul Northeast Corridor

Twin Cities Exclusive Busway Study

Figure A10

St. Paul Northeast Corridor

Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

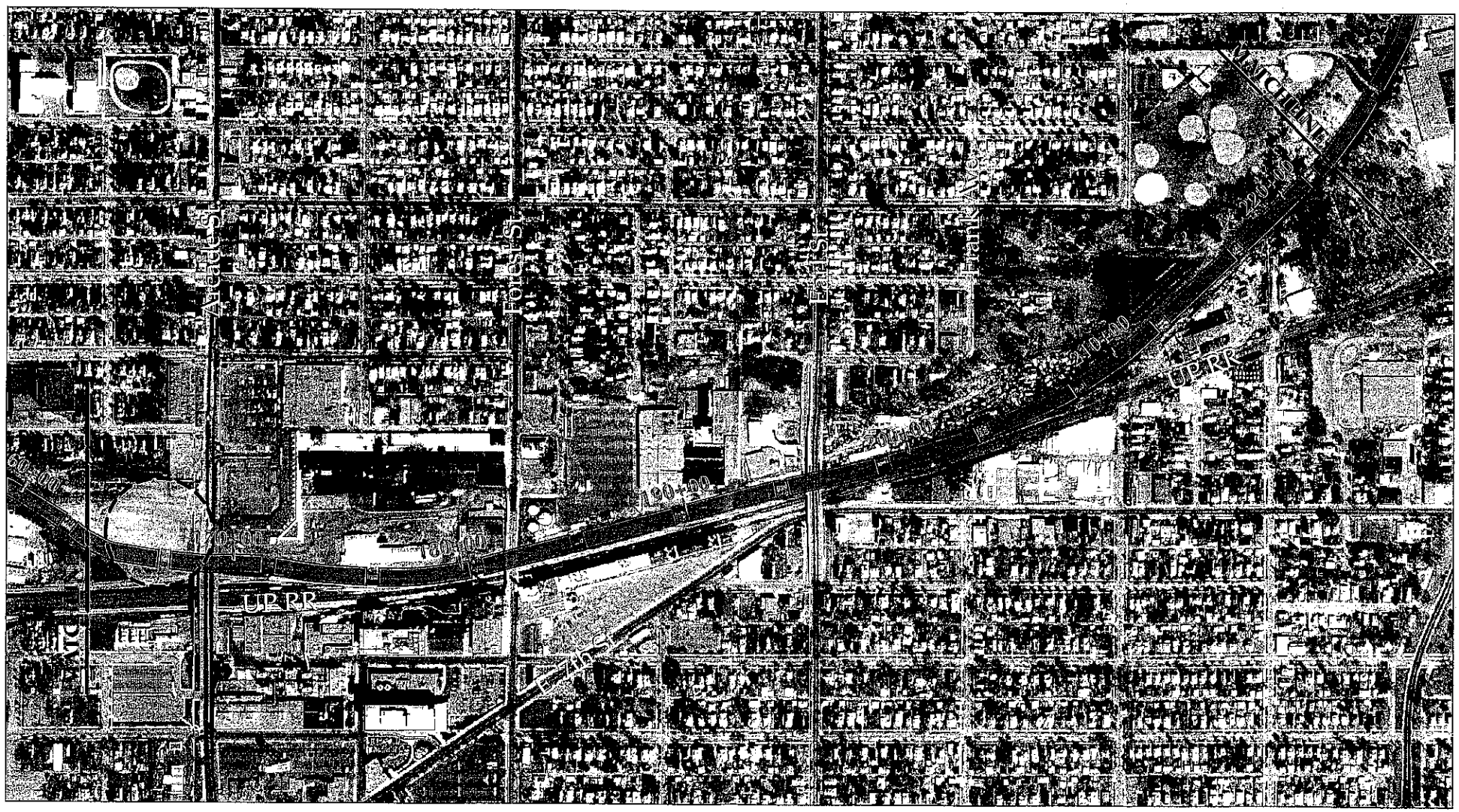
Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Twin Cities Exclusive Busway Study



Aerial Base Map Provided by Metropolitan Council

Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

0 200 400 800 Feet

North

Figure A11

St. Paul Northeast Corridor

Aerial Base Map Provided by Metropolitan Council

Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

0 200 400 800 Feet

North

Figure A12

St. Paul Northeast Corridor

Aerial Base Map Provided by Metropolitan Council

Figure A13

St. Paul Northeast Corridor

Busway Alignment

Preliminary Station Location

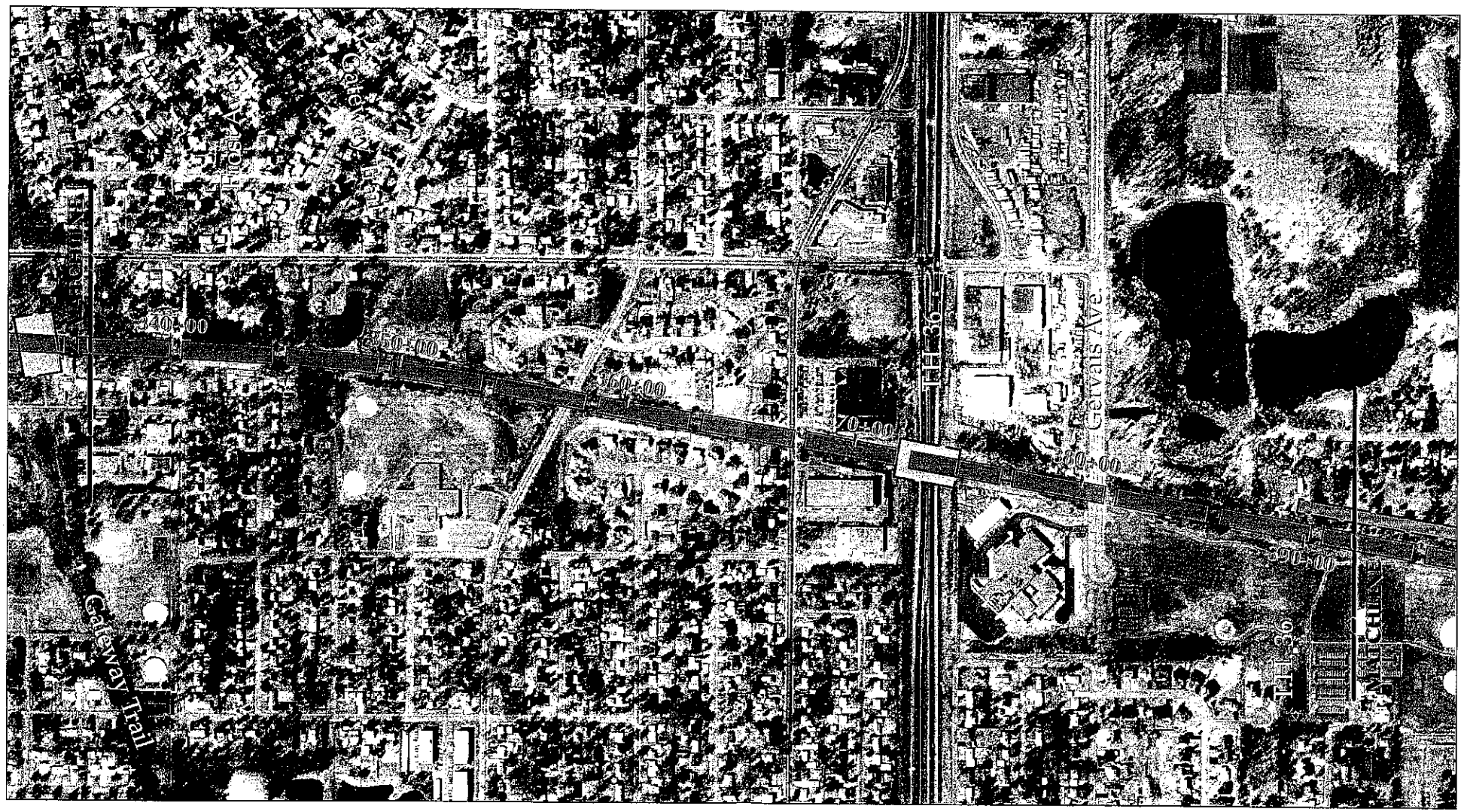
Bridge Structure

Retaining Wall

0 200 400 800 Feet

North

Twin Cities Exclusive Busway Study



Aerial Base Map Provided by Metropolitan Council

Busway Alignment

Preliminary Station Location

Bridge Structure

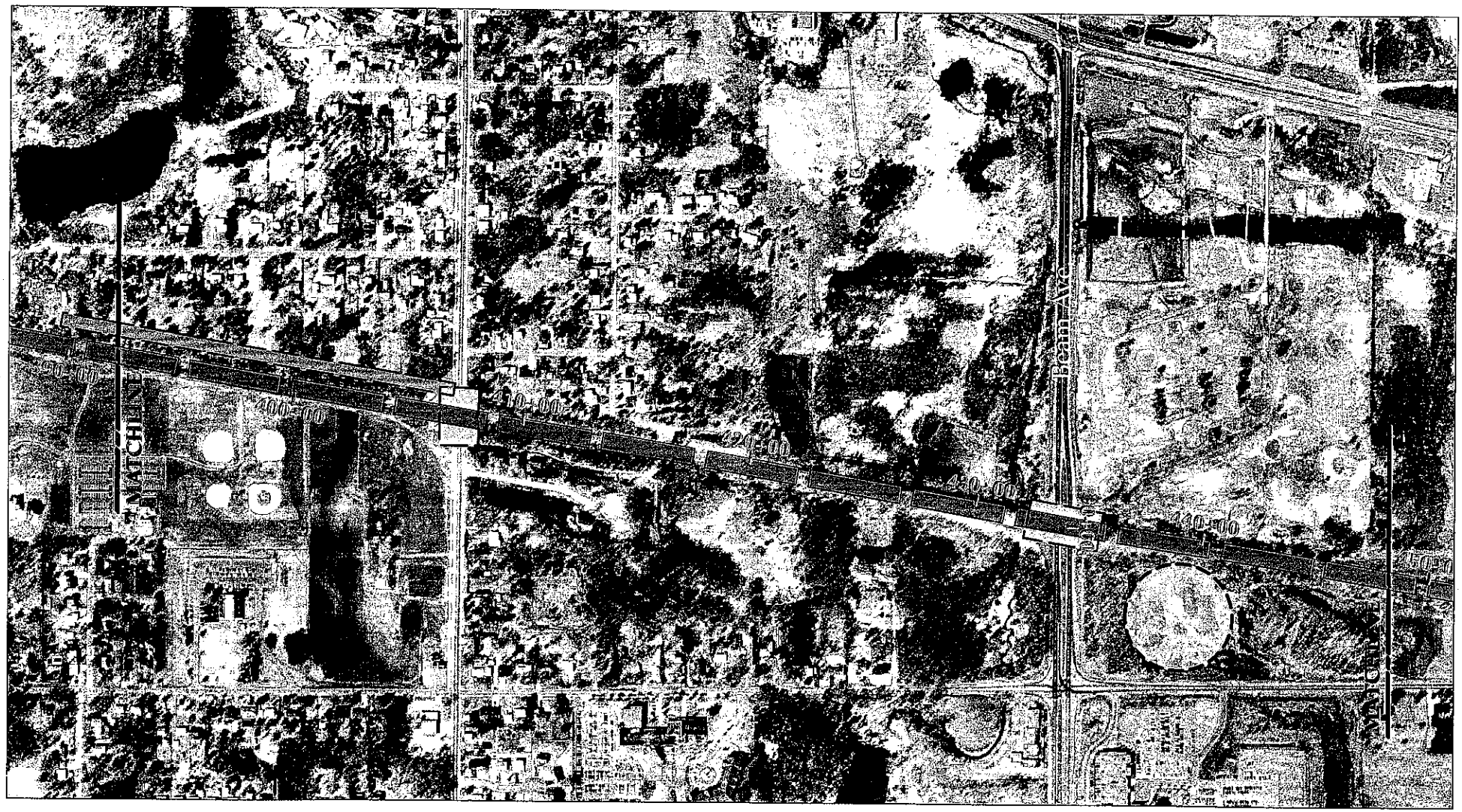
Retaining Wall

0 200 400 800 Feet

North

Figure A14

St. Paul Northeast Corridor



Aerial Base Map Provided by Metropolitan Council

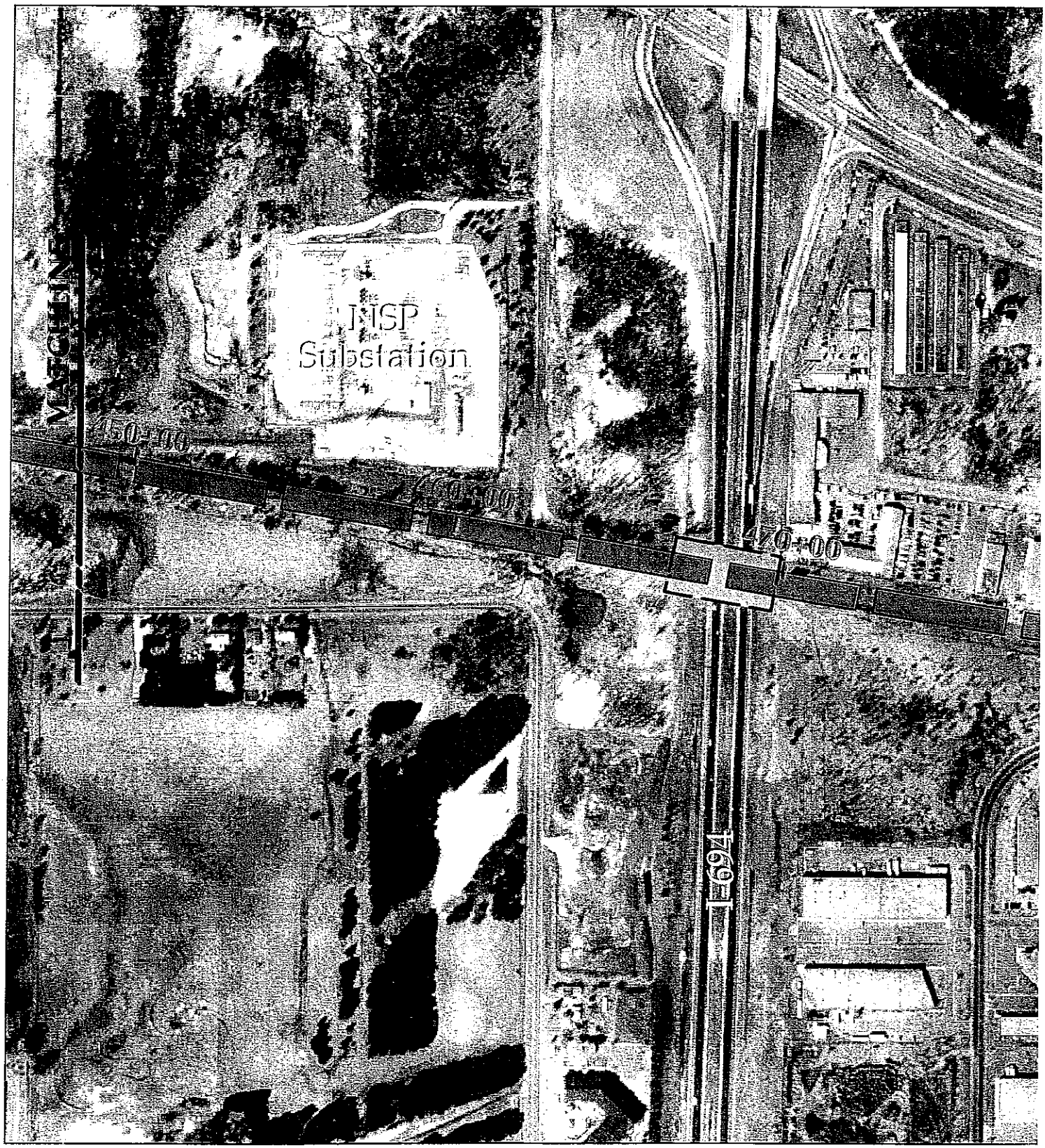
Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

0 200 400 800 Feet

North

Figure A15

St. Paul Northeast Corridor



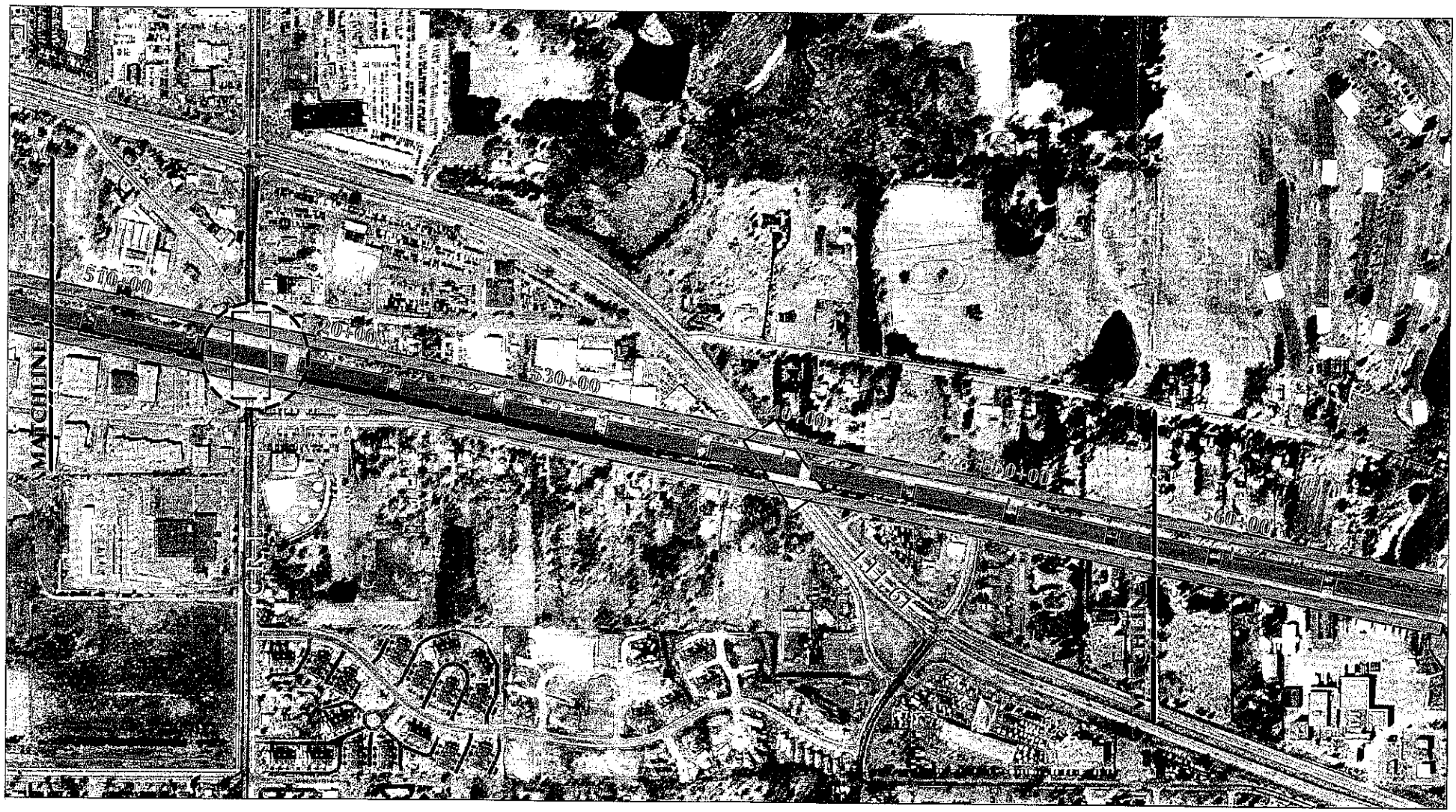
MINNESOTA DEPARTMENT OF TRANSPORTATION

Twin Cities Exclusive Busway Study

Aerial Base Map Provided by Metropolit

Busway Alignment

Preliminary Station Location



Aerial Base Map Provided by Metropolitan Council

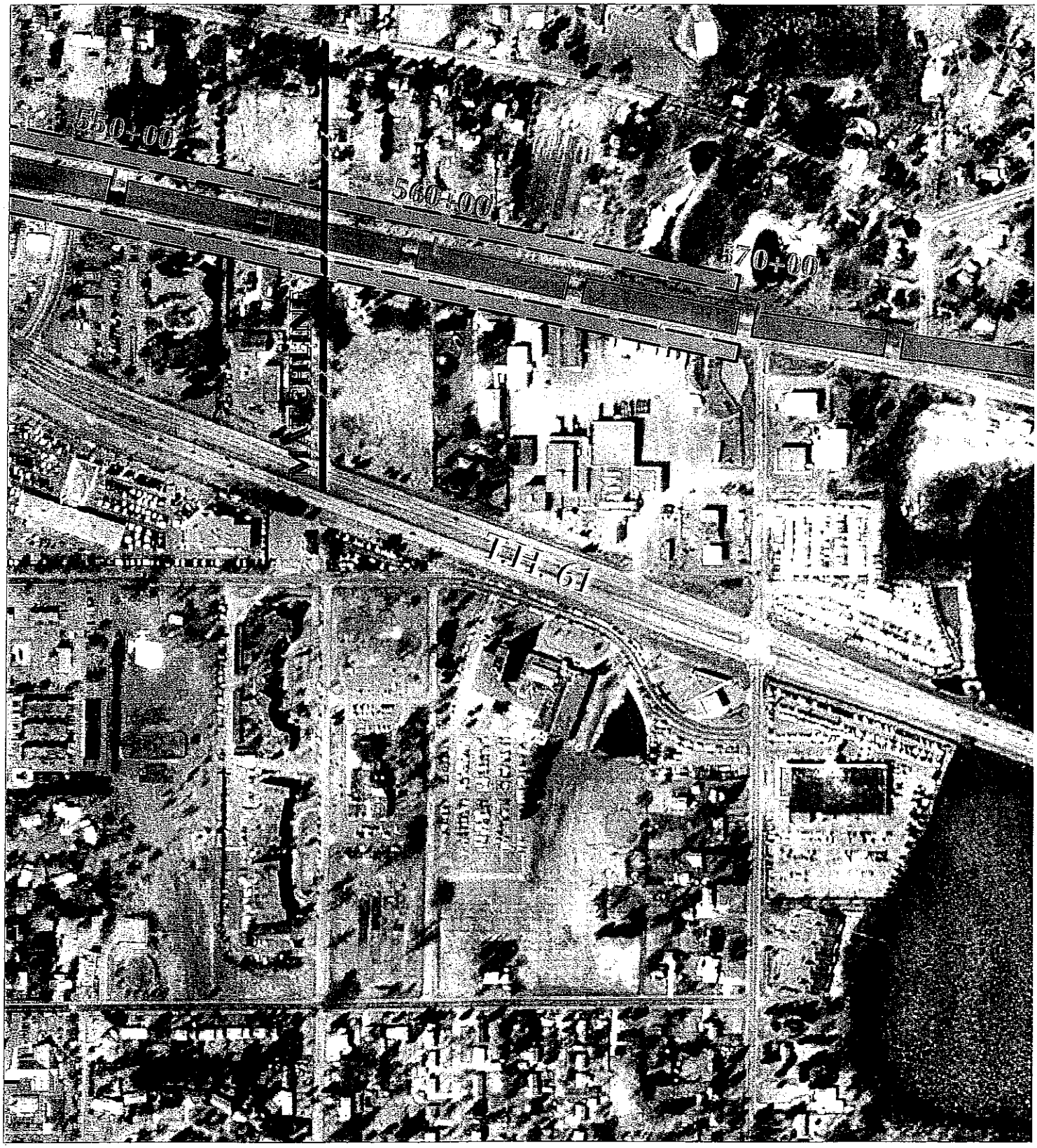
Busway Alignment
Preliminary Station Location
Bridge Structure
Retaining Wall

0 200 400 800 Feet

North

Figure A17

St. Paul Northeast Corridor



MINNESOTA DEPARTMENT OF TRANSPORTATION

Twin Cities Exclusive Busway Study

Aerial Base Map Provided by Metropoli

Busway Alignment

Preliminary Station Location

Appendix C

Cost Estimates

TWIN CITIES EXCLUSIVE BUSWAY STUDY 3/1/00

Conceptual Level Cost Estimate Summary

			SOUTHWEST EXT.*		NORTHEAST		NORTHWEST	
			Minneapolis		St. Paul		Minneapolis	
Distance (feet)			33900		52000		77700	
Distance (miles)			6.42		9.85		13.92	
Stations (each)			5		11		12	
COST ELEMENTS	Unit	Unit Cost	Quantity	Total	Quantity	Total	Quantity	Total
01 Roadway								
10 Roadway Section Cost	mile							
SW-1	L.F.	$212	6,800	$1,441,600				
SW-2	L.F.	$277	10,600	$2,936,200				
SW-3	L.F.	$981	6,950	$6,817,950				
SW-4	L.F.	$610	3,800	$2,318,000				
SW-5	L.F.	$288	5,000	$1,440,000				
I-494 Slip Ramps	Lump Sum	$486,550	1	$486,550				
NE-1	L.F.	$204			12,700	$2,587,244		
NE-2	L.F.	$254			16,300	$4,132,865		
NE-3	L.F.	$658			1,800	$1,184,400		
NE-4	L.F.	$1,148			6,700	$7,694,883		
NE-5	L.F.	$220			12,000	$2,640,000		
TH 36 Bus Ramps	Lump Sum	$973,100			1	$973,100		
NW-1	L.F.	$218					20,900	$4,556,200
NW-2	L.F.	$286					9,000	$2,574,000
NW-3	L.F.	$229					38,300	$8,770,700
NW-4	L.F.	$1,019					5,000	$5,095,800
NW-5	L.F.	$1,398					2,000	$2,796,000
NW-6	L.F.	$1,923					2,500	$4,808,525
TH 610 Bus Ramps	Lump Sum	$729,825					1	$729,825
.20 Structures	s.f.	$75	30,000	$2,250,000	39,500	$3,127,500	90,350	$8,920,850
.100 Contigency @15%				$2,653,545		$3,350,999		$5,737,785
Total Roadway ($)				$20,343,845		$25,690,991		$43,989,685
02 Utilities								
10 Utilities	mile	$100,000	6.42	$642,045	9.85	$984,848	13.92	$1,392,000
.20 Transmission Line Replacement	mile	$500,000		$0		$0	6.72	$3,361,742
.30 Contingency @30%				$192,614		$295,455		$1,426,123
Total Utilities($)				$834,659		$1,280,303		$6,179,865
03 Communications								
10 Communications	mile	$730,000	6.42	$4,686,932	9.85	$7,189,394	13.92	$10,161,600
.20 Contingency @ 10%				$468,693		$718,939		$1,016,160
Total Communications($)				$5,155,625		$7,908,333		$11,177,760
04 Park & Ride								
.10 Park & Ride	ea	$1,150,000	2	$2,300,000	3	$3,450,000	5	$5,750,000
.20 Contingency @20%				$460,000		$690,000		$1,150,000
Total Park & Ride($)				$2,760,000		$4,140,000		$6,900,000
05 Fare Collection								
10 Fare Collection System	ea	$250,526	5	$1,252,630	11	$2,755,786	12	$3,006,312
.20 Contingency @ 10%				$125,263		$275,579		$300,631
Total Fare Collection ($)				$1,377,893		$3,031,365		$3,306,943
06 Stations								
.10 Station w/ Vertical Circ	ea	$1,460,000		$0	0	$0	0	$0
.20 Station at grade	ea	$730,000	5	$3,650,000	11	$8,030,000	12	$8,760,000
.30 Contingency @ 20%				$730,000		$1,606,000		$1,752,000
Total Stations ($)				$4,380,000		$9,636,000		$10,512,000
07 Signals								
.10 Signal Equip & Gates	ea	$160,000	6	$960,000	11	$1,760,000	21	$3,360,000
.20 Contingency @ 15%				$144,000		$264,000		$504,000
Total Signals($)				$1,104,000		$2,024,000		$3,864,000
08 Freight Rail								
.10 Track Relocation	Mile	$550,000	0	$0	3	$1,457,500	10	$5,626,500
.20 Roadway Crossings	LF	$800	117	$93,600	136	$108,800	740	$592,000
.30 Turnouts	EA	$75,000	0	$0	4	$300,000	3	$225,000
.40 Diamonds	EA	$150,000	0	$0	0	$0	1	$150,000
.50 Contigency @20%				$18,720		$373,260.00		$1,318,700
Total Freight Rail				$112,320		$2,239,560		$7,912,200
09.0 Segment Constr. (2000$)				$36,068,342		$55,950,552		$93,842,453
09.1 Segment Constr. (2004$)				$41,478,593		$64,343,135		$107,918,821
10.0 Agency/Engr./Ins. @ 25%(2000$)				$9,017,086		$13,987,638		$23,460,613
11.0 Right of Way								
10 R.O.W Acquisition	Mile	$192,000	6.42	$1,232,727	9.85	$1,890,909	13.92	$2,672,640
.20 Contingency @ 20%				$246,545		$378,182		$534,528
Total Right of Way ($)		$192,000		$1,479,273		$2,269,091		$3,207,168
12.0 Vehicles								
.10 Vehicles	ea	$548,000	6	$3,288,000	24	$13,152,000	32	$17,536,000
.20 Spr.Prts,Test,Train@10%				$328,800		$1,315,200		$1,753,600
.30 Contingency @ 5%				$180,840		$723,360		$964,480
Total Vehicles ($)				$3,797,640		$15,190,560		$20,254,080
13.0 Major Wetland Mitigation ($)**								
.10 Mitigation	SF	$75					98,000	$7,350,000
.20 Contingency @ 50%								$3,675,000
Total Wetland Mitigation ($)								$11,025,000
TOTAL PROJECT COST (2000$)				$50,362,340		$87,397,841		$151,789,315
TOTAL PROJECT COST (2004$)				$57,916,691		$100,507,517		$174,557,712

* Cost for SOUTHWEST EXTENSION does not include the segment east of 5th Avenue in Hopkins.

** Equivalent structure cost through impacted areas.

TWIN CITIES EXCLUSIVE BUSWAY STUDY
ST. PAUL NORTHEAST CORRIDOR
COST ESTIMATE DETAILS

Distance (feet)	**52,000**				
Distance (miles)	**9.85**				
Stations (each)	**11**				
COST ELEMENTS	**Unit**	**Unit Cost**	**Quantity**	**Total**	**Comment**
CROSS SECTIONS:					
Section NE 1 Level Rural	LF	$204	12,700	$366,696	
Section NE 2 Fill Section	LF	$254	16,300	$4,132,865	Fill with bike trail
Section NE 3 Wall One Side	LF	$658	1,800	$1,184,400	Sig. cut one side
Section NE 4 Wall Both Sides	LF	$1,148	6,700	$7,694,883	Sig. cut both sides
Section NE 5 Phalen Exclusive	LF	$220	12,000	$2,640,000	Phalen to St. Paul Transit Hub
TH 36 Bus Ramps	Lump Sum	$973,100	1	$973,100	
CROSS SECTION SUBTOTAL				**$16,991,944**	
FREIGHT RAIL:					
Rail Relocation	Mile	$550,000	1.43	$786,458	
Roadway Crossings	LF	$800	136	$108,800	3M, Otter Lk Rd, Qual Wood
Turnouts	EA	$75,000	4	$300,000	1 - 3M; 3 - M&D Junction
Diamonds	EA	$150,000	0	$0	
FREIGHT RAIL SUBTOTAL				**$1,195,258**	
STRUCTURES:					
I-35E	SF	$75	0	$0	Assume Phalen Reconstruction
BNSF Crossing	SF	$75	0	$0	Assume Phalen Reconstruction
Burr	SF	$75	0	$0	Use Existing
Edgerton	SF	$75	0	$0	Use Existing
Arcade Street	SF	$75	0	$0	Use Existing
Forest Street	SF	$75	0	$0	Use Existing
Earl Street	SF	$75	0	$0	Use Existing
Johnson Parkway	SF	$75	2,200	$165,000	New Bridge
Maryland Avenue	SF	$75	3,200	$240,000	New Bridge
Arlington Avenue	SF	$75	1,700	$127,500	New Bridge
Gateway Trail Crossing	SF	$1,250	0	$0	No Bridge Required
TH 36	SF	$75	5,400	$405,000	Retrofit Bridge
County Road C	SF	$75	0	$0	Use Existing
Beam Avenue	SF	$75	7,700	$577,500	Retrofit Bridge
I-694	SF	$75	5,800	$435,000	Retrofit Bridge
County Road E	SF	$75	2,900	$217,500	Retrofit Abutment
TH 61	SF	$75	12,800	$960,000	New Bridge
STRUCTURE SUBTOTAL			**39,500**	**$3,127,500**	
GRADE CROSSING SIGNALS:					
E. Idaho Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Larpenter Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Ripley Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Frost Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Gateway Trail Crossing	EA	$160,000	1	$160,000	Crossing Signal/Gates
County Road B	EA	$160,000	1	$160,000	Crossing Signal/Gates
Cope Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Gervais Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Buerkle Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
Goose Lake Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
Quality Woods Access	EA	$160,000	1	$160,000	Crossing Signal/Gates
SIGNAL TOTAL			**11**	**$1,760,000**	

TWIN CITIES EXCLUSIVE BUSWAY STUDY
SOUTHWEST CORRIDOR EXTENSION
COST ESTIMATE DETAILS

Distance (feet)	33,900				
Distance (miles)	6.42				
Stations (each)	5				
COST ELEMENTS	**Unit**	**Unit Cost**	**Quantity**	**Total**	**Comment**
CROSS SECTIONS:					
Section SW 1 Rural Level	LF	$212	6,800	$1,441,600	
Section SW-2 Urban Level	LF	$277	10,600	$2,936,200	
Section SW-3 Wall Both Sides	LF	$981	6,950	$6,817,950	
Section SW-4 Wall One Side	LF	$610	3,800	$2,318,000	
Section SW-5 Cut No Wall	LF	$288	5,000	$1,440,000	
I-494 Slip Ramps	Lump Sum	$486,550	1	$486,550	
CROSS SECTION SUBTOTAL				**$15,440,300**	
FREIGHT RAIL:					
Rail Relocation	Mile	$550,000	0	$0	
Roadway Crossings	LF	$800	117	$93,600	
Turnouts	EA	$75,000	0	$0	
Diamonds	EA	$150,000	0	$0	
FREIGHT RAIL SUBTOTAL				**$93,600**	
STRUCTURES:					
Shady Oak Road	SF	$75	0	$0	Use Existing
I-494 NB	SF	$75	0	$0	Use Existing
I-494 SB	SF	$75	0	$0	Use Existing
TH 62	SF	$75	0	$0	Use Existing
Valley View Road	SF	$75	6,000	$450,000	New Bridge
TH 5/TH 212	SF	$75	24,000	$1,800,000	New Bridge
STRUCTURE SUBTOTAL			**30,000**	**$2,250,000**	
GRADE CROSSING SIGNALS:					
12th Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Rowland Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
Baker Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
TC & W Rail Crossing	EA	$160,000	1	$160,000	Crossing Signal/Gates
62nd Street W	EA	$160,000	1	$160,000	Crossing Signal/Gates
Edenvale Blvd	EA	$160,000	1	$160,000	Crossing Signal/Gates
SIGNAL TOTAL			**6**	**$960,000**	

TWIN CITIES EXCLUSIVE BUSWAY STUDY
MINNEAPOLIS NORTHWEST CORRIDOR
COST ESTIMATE DETAILS

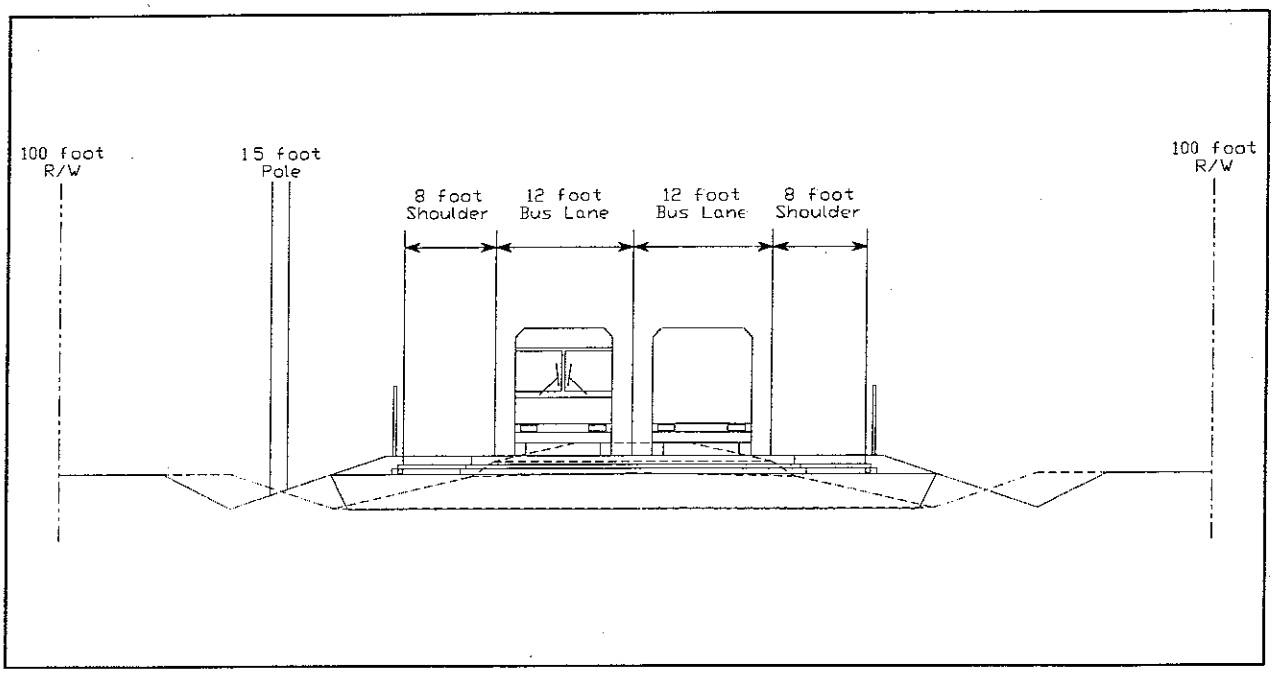
Distance (feet)	77,700				
Distance (miles)	13.92				
Stations (each)	12				
COST ELEMENTS	**Unit**	**Unit Cost**	**Quantity**	**Total**	**Comment**
CROSS SECTIONS:					
Section NW 1 Level Rural	LF	$218	20,900	$4,556,200	Fill ditch, no st. sewer
Section NW 2 Level Urban	LF	$286	9,000	$2,574,000	CR 81 curb incl
Section NW 3 Confined Urban	LF	$229	38,300	$8,770,700	Fill ditch, storm sewer
Section NW 4 Wall One Side	LF	$1,019	5,000	$5,095,800	Sig. cut one side
Section NW 5 Wall Both Sides	LF	$1,398	2,000	$2,796,000	Sig. cut both sides
Section NW 6 Significant Fill - Flyover	LF	$1,923	2,500	$4,808,525	TH 169 Flyover - 2 retaining walls
CROSS SECTION SUBTOTAL			77,700	**$28,601,225**	
FREIGHT RAIL:					
Rail Relocation	Mile	$550,000	10	$5,626,500	
Roadway Crossings	LF	$800	740	$592,000	41 1/2 Avenue Crossover (Bus Only)
Turnouts	EA	$75,000	3	$225,000	
Diamonds	EA	$150,000	1	$150,000	CP Rail (Soo Line)
FREIGHT RAIL SUBTOTAL				**$6,593,500**	
STRUCTURES:					
7th Street N	SF	$75		$0	Use Existing
Holden Street	SF	$75		$0	Use Existing
Glenwood Ave. (Downtown)	SF	$75		$0	Use Existing
I-94	SF	$75		$0	Use Existing
Cedar Lake Road	SF	$75	8,250	$618,750	New Bridge
Penn Avenue	SF	$75		$0	Use Existing
Bassett Creek Crossing #1 (105+00)	SF	$75	4,000	$300,000	
Glenwood Avenue	SF	$75		$0	Use Existing
Bassett Creek Crossing #2 (122+50)	SF	$75	4,000	$300,000	
TH 55	SF	$75	0	$0	Use Existing
Bassett Creek Crossing #3 (137+50)	SF	$75	4,000	$300,000	
Plymouth Avenue	SF	$75	11,000	$825,000	New Bridge
Theodore Wirth Parkway	SF	$75	8,000	$600,000	New Bridge
Golden Valley Road	SF	$75	12,000	$900,000	New Bridge
36th Avenue N	SF	$75	2,400	$180,000	Retrofit Abutment
TH 100	SF	$75	17,000	$1,275,000	New RR Bridge & Retrofit
I-94	SF	$75	4,500	$337,500	Retrofit Abutment
Creek Crossing #4 (597+00)	SF	$75	2,000	$150,000	
HWY 169	SF	$75	13,200	$3,134,600	New Bridge w/ret. Fill
STRUCTURE SUBTOTAL			**90,350**	**$8,920,850**	
GRADE CROSSING SIGNALS:					
Glenwood Inglewood Access	EA	$160,000	1	$160,000	Crossing Signal/Gates
40th Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
41st Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
41 1/2 Avenue Crossover (Bus Only)	EA	$160,000	1	$160,000	Crossing Signal/Gates
Rockford Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
44 1/2 Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
West Broadway	EA	$160,000	1	$160,000	Crossing Signal/Gates
Corvallis Avenue N	EA	$160,000	1	$160,000	Crossing Signal/Gates
CP Rail (Soo Line) Mainline Crossing	EA	$160,000	1	$160,000	Crossing Signal/Gates
Bass Lake Road	EA	$160,000	1	$160,000	Crossing Signal/Gates
63rd Avenue N	EA	$160,000	1	$160,000	Crossing Signal/Gates
West Broadway	EA	$160,000	1	$160,000	Crossing Signal/Gates
73rd Avenue N	EA	$160,000	1	$160,000	Crossing Signal/Gates
Green Haven Drive	EA	$160,000	1	$160,000	Crossing Signal/Gates
85th Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Jefferson Highway	EA	$160,000	1	$160,000	Crossing Signal/Gates
89th Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
Concrete Plant Access	EA	$160,000	1	$160,000	Crossing Signal/Gates
Concrete Plant Access	EA	$160,000	1	$160,000	Crossing Signal/Gates
Zachary Lane	EA	$160,000	1	$160,000	Crossing Signal/Gates
93rd Avenue	EA	$160,000	1	$160,000	Crossing Signal/Gates
SIGNAL TOTAL			**21**	**$3,360,000**	
MAJOR WELTAND MITIGATION					
Pond 1 (N of Golden Valley Rd)	SF	$75	28,000	$2,100,000	
Pond 2 (N of Dresden Lane)	SF	$75	44,000	$3,300,000	
Pond 3 (N or Yak Circle)	SF	$75	26,000	$1,950,000	
	SF	$75		$0	
	SF	$75		$0	
	SF	$75		$0	
WELTAND MITIGATION TOTAL			**98,000**	**$7,350,000**	

SOUTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: SW1 - FLAT RURAL SECTION

COSTS PER LINEAL FOOT

STATIONS 111 TO 122, 132 TO 165, & 315 TO 339



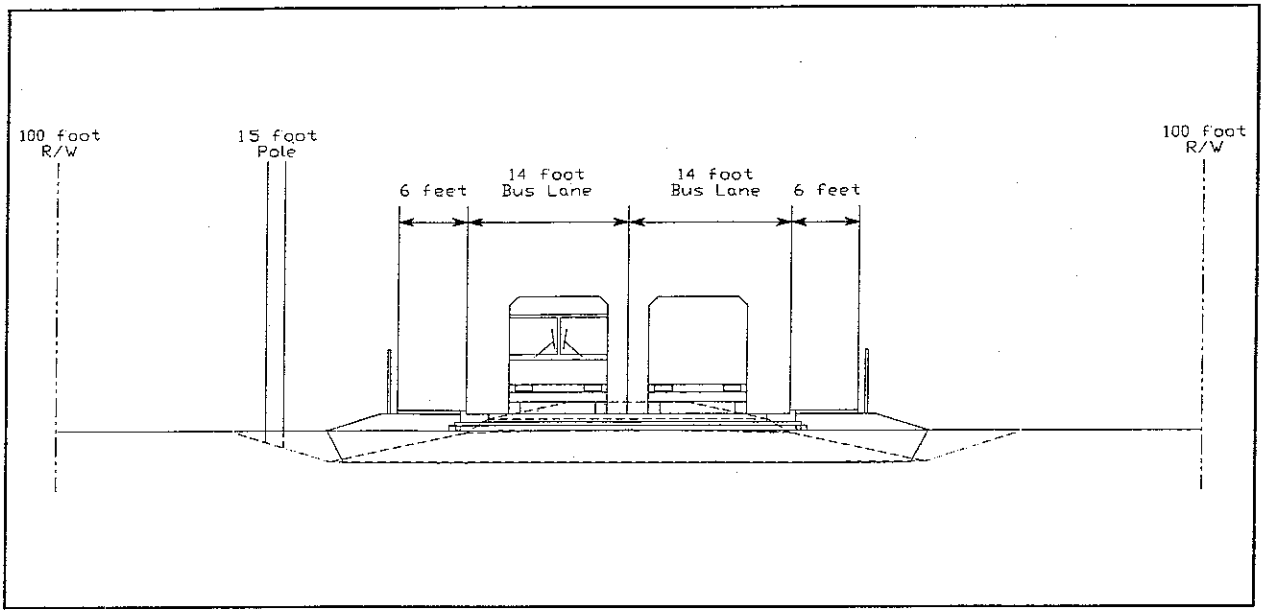
ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$211.96**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	8.04	1.35	$10.85
	Select Granular Borrow	CUYD	5.74	4.05	$23.25
	Class 5 Base	CUYD	1.19	12.15	$14.46
	PAB	CUYD	0.5	27	$13.50
	Concrete Pavement	SQFT	40	2.4	$96.00
	Curb & Gutter	LF	0	9.2	$0.00
	Concrete Walk	SQFT	0	1.8	$0.00
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$211.96**

SOUTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: SW2 - FLAT URBAN

COSTS PER LINEAL FOOT

STATIONS 0 TO 55, 89 TO 105, & 165 TO 200



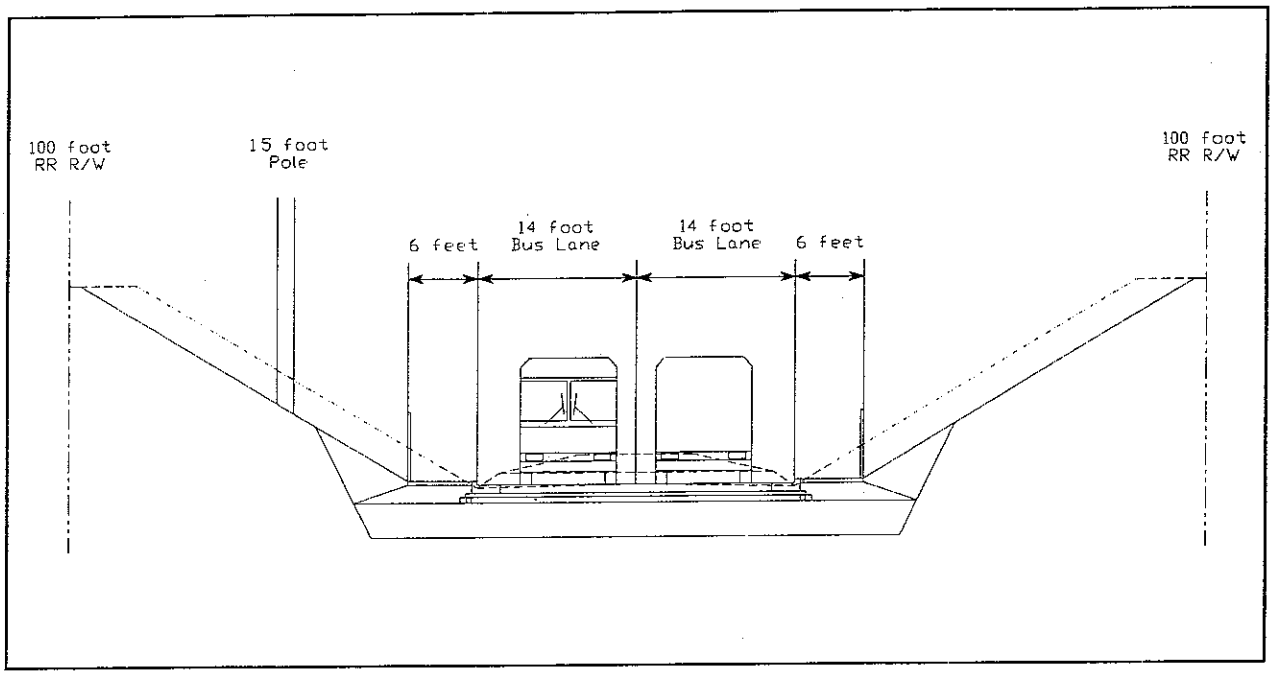
ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$277.31**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	7.3	1.35	$9.86
	Select Granular Borrow	CUYD	5.67	4.05	$22.96
	Class 5 Base	CUYD	1.63	12.15	$19.80
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$277.31**

SOUTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: SW5 - CUT SECTION

COSTS PER LINEAL FOOT

STATIONS 55 TO 67, 124 TO 132, 200 TO 211 & 227 TO 246



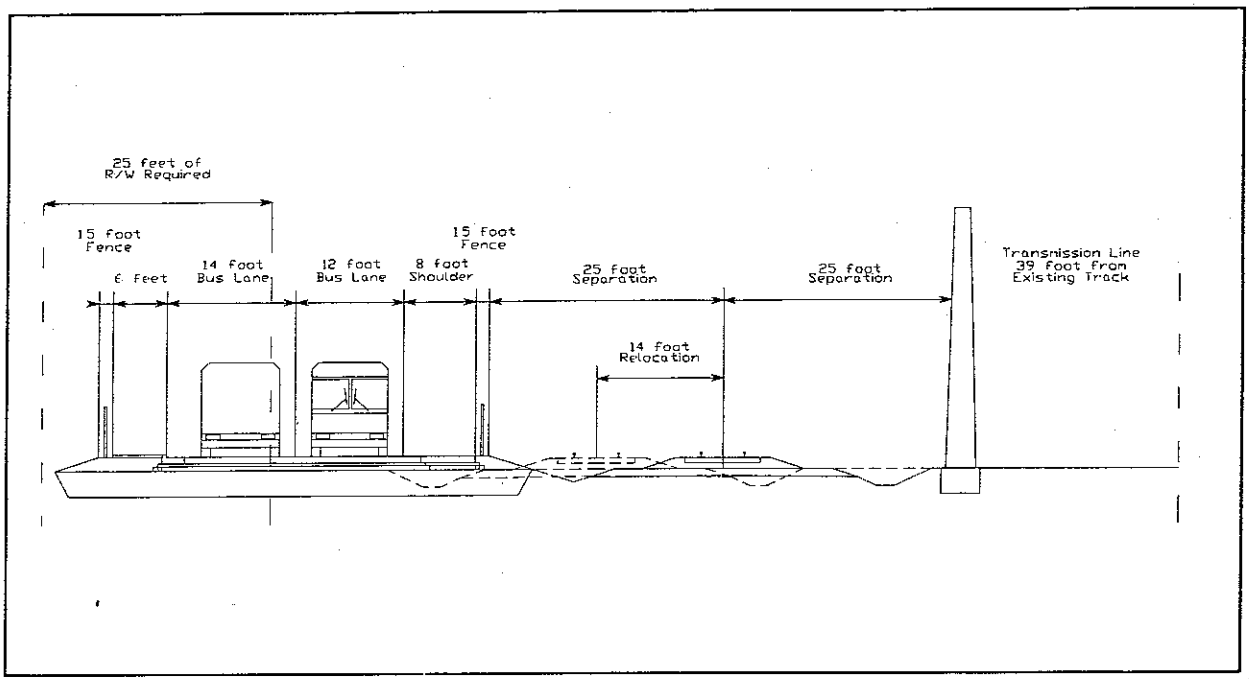
ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$287.94**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	17.9	1.35	$24.17
	Select Granular Borrow	CUYD	5.33	4.05	$21.59
	Class 5 Base	CUYD	1.44	12.15	$17.50
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall (Found., Drain)	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$287.94**

NORTHEAST ST. PAUL TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NE1 - FLAT SECTION

COSTS PER LINEAL FOOT

STATIONS 300 TO 390 & 565 TO 607



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$203.72**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	6.17	1.35	$8.33
	Select Granular Borrow	CUYD	5.83	4.05	$23.61
	Class 5 Base	CUYD	1.77	12.15	$21.49
	PAB	CUYD	0.56	27	$15.00
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	3	1.8	$5.40
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	0	65	$0.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$203.72**

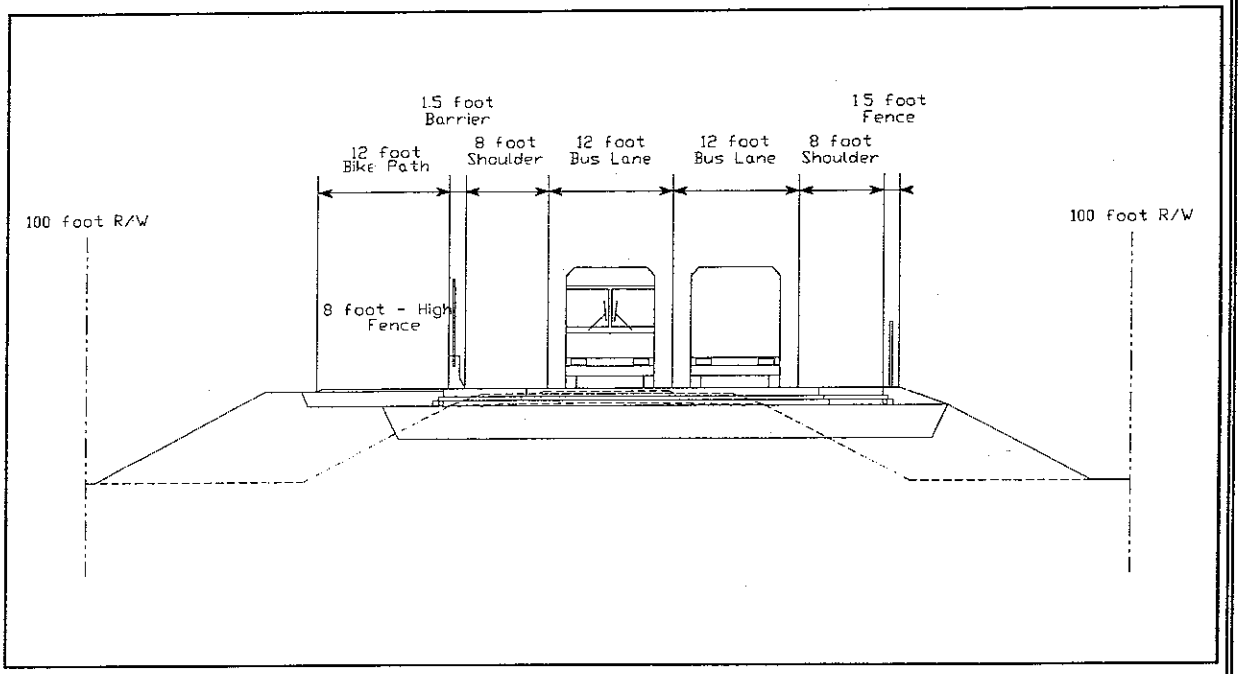
Note: Railroad relocation cost is not included in the busway section cost.

NORTHEAST ST. PAUL TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NE2 - CONFINED FILL SECTION

COSTS PER LINEAL FOOT

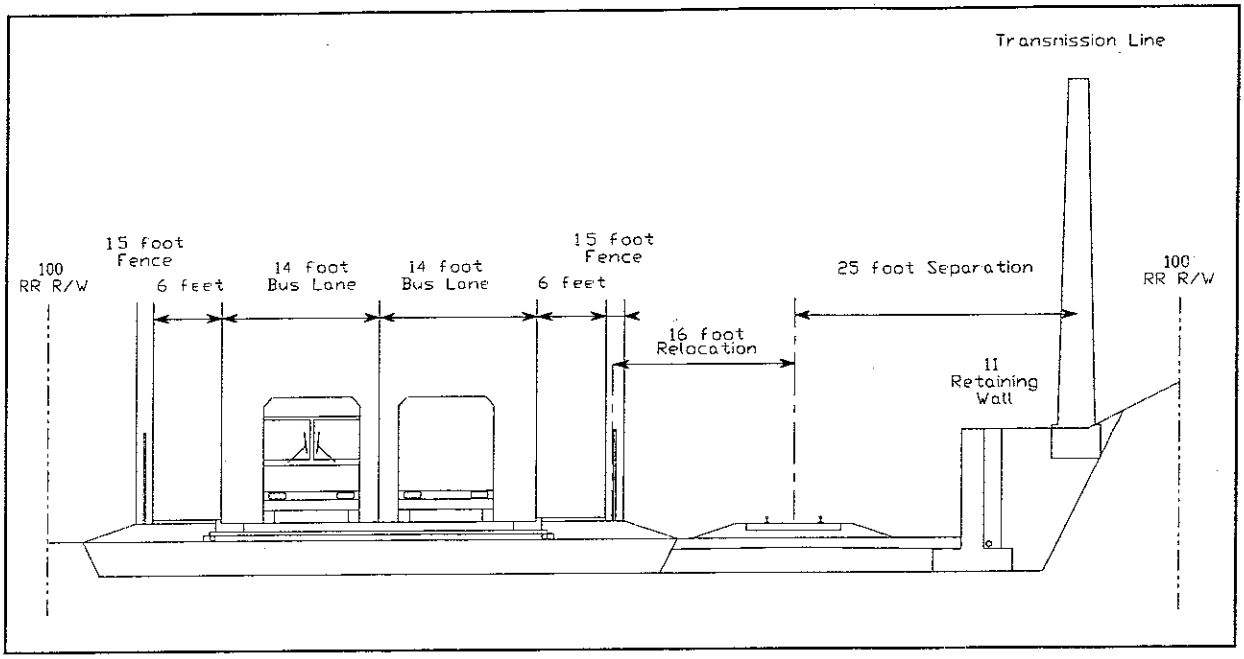
STATIONS 240 TO 300 & 410 TO 505



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$253.55**
	Trail Removal	SY	0.3	1.62	$0.54
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	0	0.05	$0.00
	Select Granular Borrow	CUYD	179.04	0.15	$26.86
	Class 5 Base	CUYD	27	0.45	$12.15
	PAB	CUYD	13.2	1	$13.20
	Concrete Pavement	SQFT	42	2.4	$100.80
	Curb & Gutter	LF	0	9.2	$0.00
	Concrete Walk	SQFT	0	1.8	$0.00
	J Barrier	LF	1	28	$28.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	0	65	$0.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	4" Bituminous Trail	SQFT	3	6.03	$18.10
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall (Found., Drain)	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$253.55**

NORTHEAST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NE3 - CONFINED CUT SECTION WITH 1 WALL
COSTS PER LINEAL FOOT
STATIONS 390 TO 410



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$283.47**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	12.81	1.35	$17.29
	Select Granular Borrow	CUYD	5.67	4.05	$22.96
	Class 5 Base	CUYD	1.59	12.15	$19.32
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$374.06**
	Retaining Wall	SQFT	11	30	$330.00
	Common Backfill	CUYD	3.11	2.7	$8.40
	Rock Backfill	CUYD	0.58	27	$15.66
	Fencing	LF	1	20	$20.00
	TOTAL BUSWAY ($)				**$657.52**

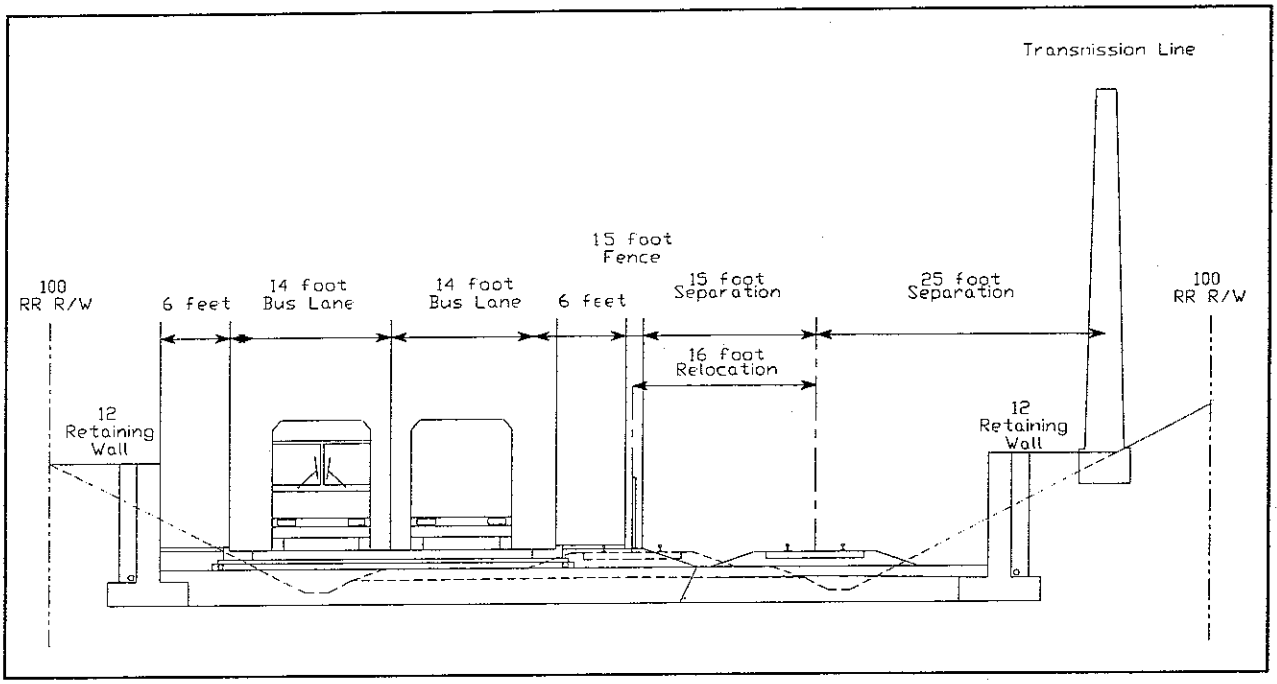
Note: Railroad relocation cost is not included in the busway section cost.

NORTHEAST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NE4 - CONFINED CUT SECTION WITH 2 WALLS

COSTS PER LINEAL FOOT

STATIONS 505 TO 565



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$295.96**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	40.67	1.35	$54.90
	Select Granular Borrow	CUYD	4.81	4.05	$19.48
	Class 5 Base	CUYD	1.39	12.15	$16.89
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	1	20	$20.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$852.53**
	Retaining Wall (Found., Drain)	SQFT	24	30	$720.00
	Common Backfill	CUYD	15.37	2.7	$41.50
	Rock Backfill	CUYD	1.89	27	$51.03
	Fencing	LF	2	20	$40.00
	TOTAL BUSWAY ($)				**$1,148.49**

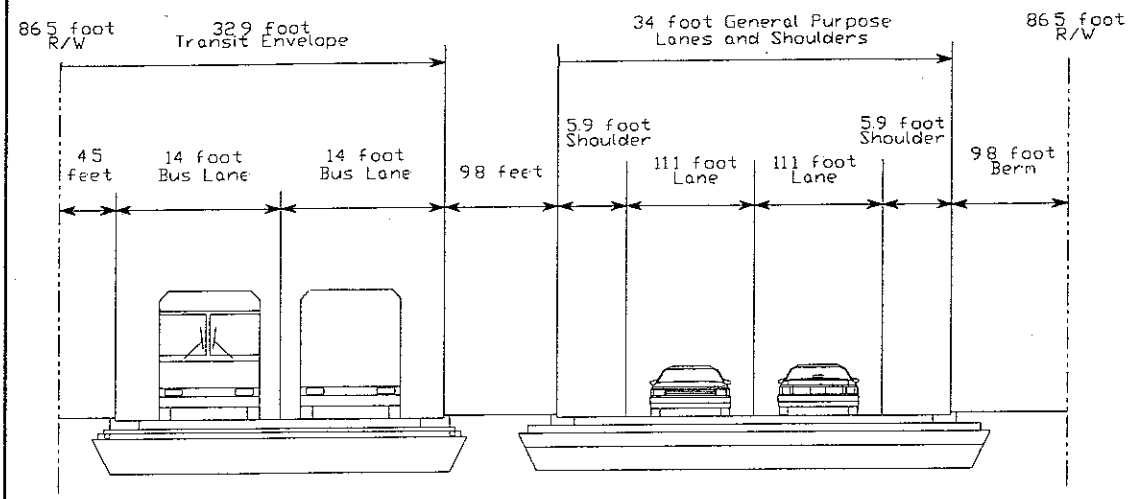
Note: Railroad relocation cost is not included in the busway section cost.

NORTHEAST ST. PAUL TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NE5 - PHALEN BLVD. EXCLUSIVE SECTION

COSTS PER LINEAL FOOT

STATIONS 95 TO 240



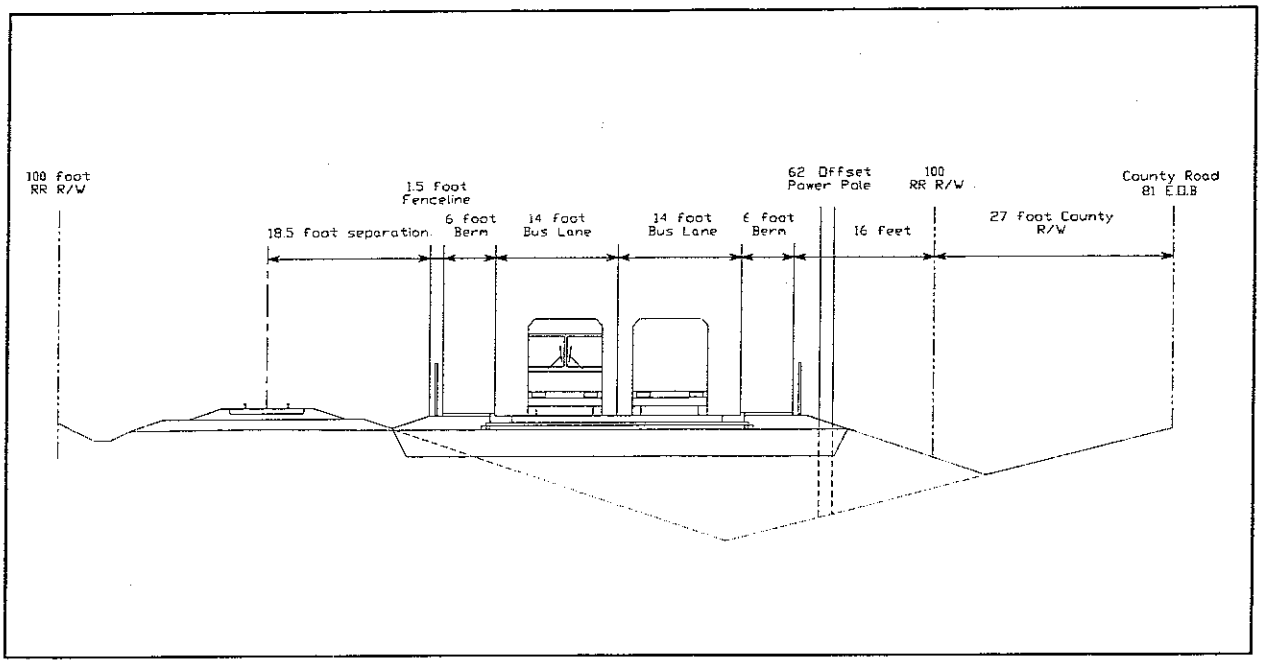
ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$220.32**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	5.63	1.35	$7.60
	Select Granular Borrow	CUYD	3.39	4.05	$13.73
	Class 5 Base	CUYD	0.56	12.15	$6.80
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	4.5	1.8	$8.10
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	1	20	$20.00
	Pavement Striping	LF	1	0.8	$0.00
1.6	**Retaining Wall**	**LF**			
	Retaining Wall (Found., Drain)	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$220.32**

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW1 - RURAL SECTION NORTH OF I-94

COSTS PER LINEAL FOOT

STATIONS 505 TO 602 & 665 TO 777



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$218.06**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	12.41	1.35	$16.75
	Select Granular Borrow	CUYD	5.74	4.05	$23.25
	Class 5 Base	CUYD	1.37	12.15	$16.65
	PAB	CUYD	0.43	27	$11.61
	Concrete Pavement	SQFT	32	2.4	$76.80
	Curb & Gutter	LF	1	9.2	$9.20
	Concrete Walk	SQFT	5.5	1.8	$9.90
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$218.06**

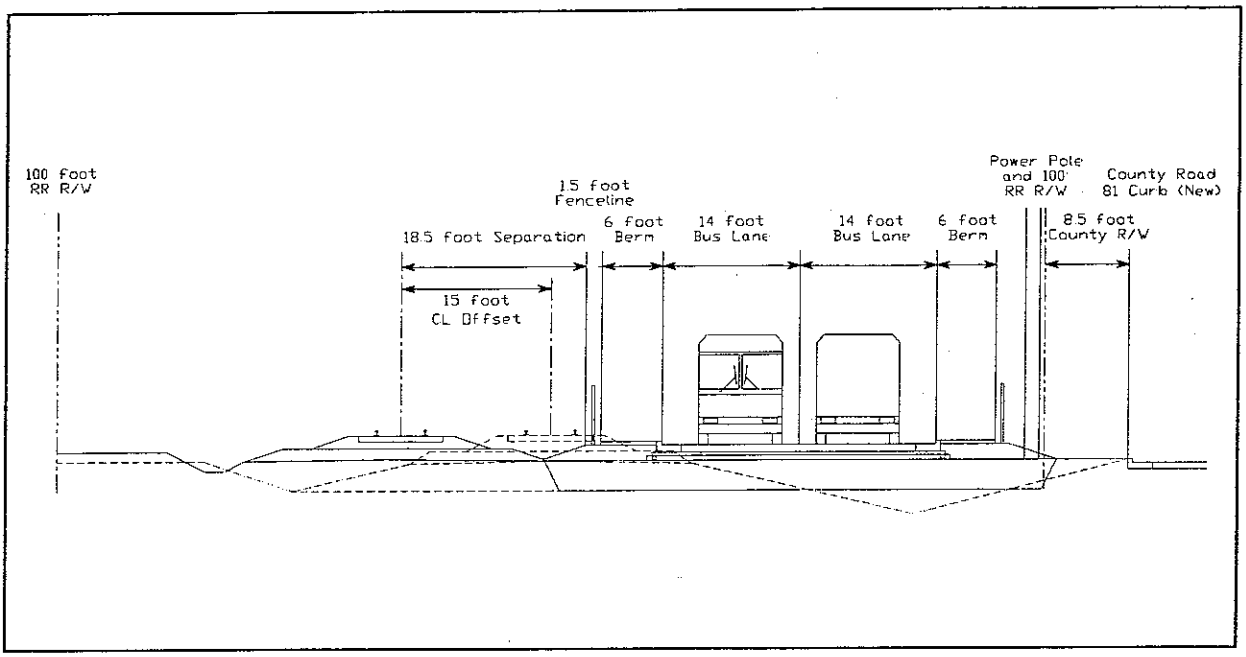
Note: Railroad relocation cost is not included in the busway section cost.

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW2 - RURAL SECTION SOUTH OF I-94

COSTS PER LINEAL FOOT

STATIONS 415 TO 505



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$286.05**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	6.93	1.35	$9.36
	Select Granular Borrow	CUYD	5.74	4.05	$23.25
	Class 5 Base	CUYD	1.61	12.15	$19.56
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	3	9.2	$27.60
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$286.05**

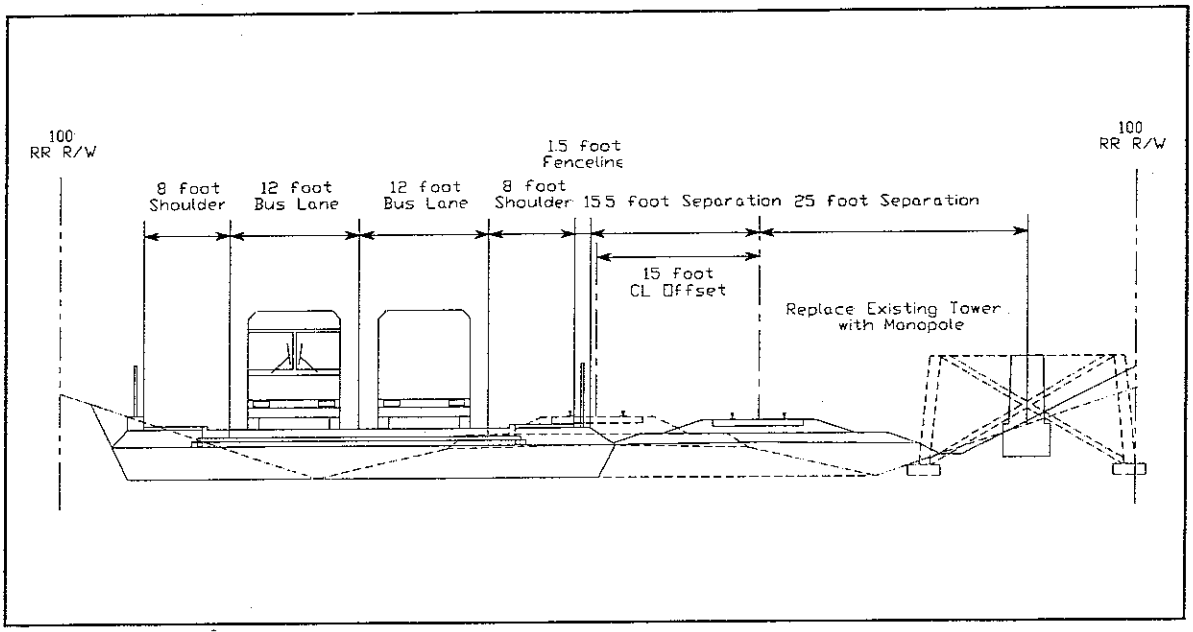
Note: Railroad relocation cost is not included in the busway section cost.

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW3 - FLAT SECTION

COSTS PER LINEAL FOOT

STATIONS 0 TO 60*, 80 TO 140, 190 TO 415, & 627 TO 665*



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$229.01**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	6.48	1.35	$8.75
	Select Granular Borrow	CUYD	4.81	4.05	$19.48
	Class 5 Base	CUYD	1.39	12.15	$16.89
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$0.00**
	Retaining Wall	SQFT	0	30	$0.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	0	27	$0.00
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$229.01**

Note: Railroad relocation cost is not included in the busway section cost.

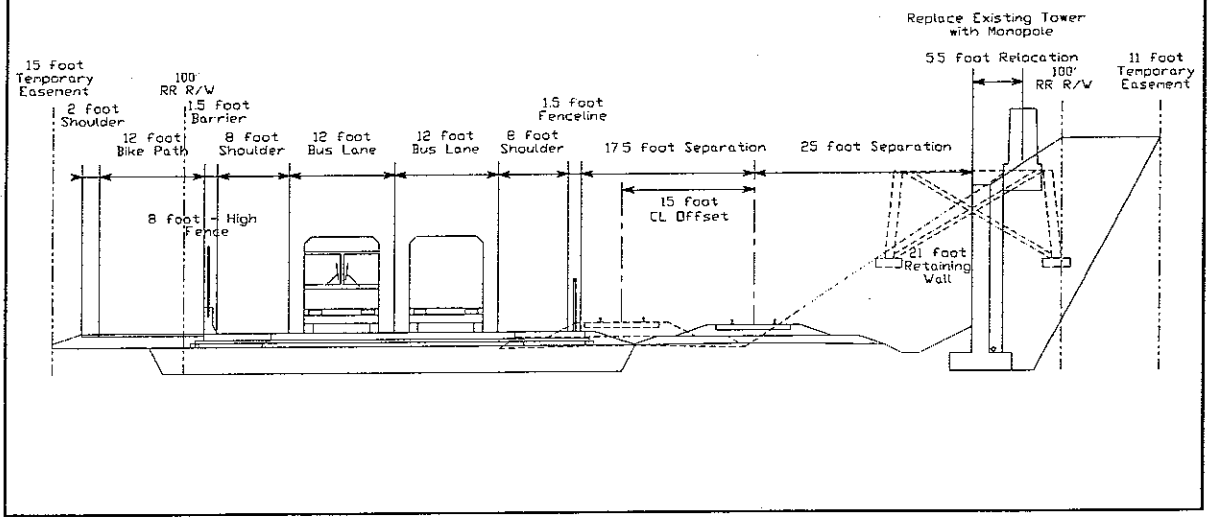
* Transmission towers not present

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW4 - CUT SECTION WITH 1 WALL AND TRAIL

COSTS PER LINEAL FOOT

STATIONS 140 TO 190



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$308.33**
	Trail	SY	0.33	1.62	$0.54
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	16.44	1.35	$22.19
	Select Granular Borrow	CUYD	5.74	4.05	$23.25
	Class 5 Base	CUYD	1.61	12.15	$19.56
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	2	20	$40.00
	4" Bituminous Trail	SQFT	3	6.03	$18.10
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$710.83**
	Retaining Wall	SQFT	21	30	$630.00
	Common Backfill	CUYD	9.93	2.7	$26.81
	Rock Backfill	CUYD	1.26	27	$34.02
	Fencing	LF	1	20	$20.00
	TOTAL BUSWAY ($)				**$1,019.16**

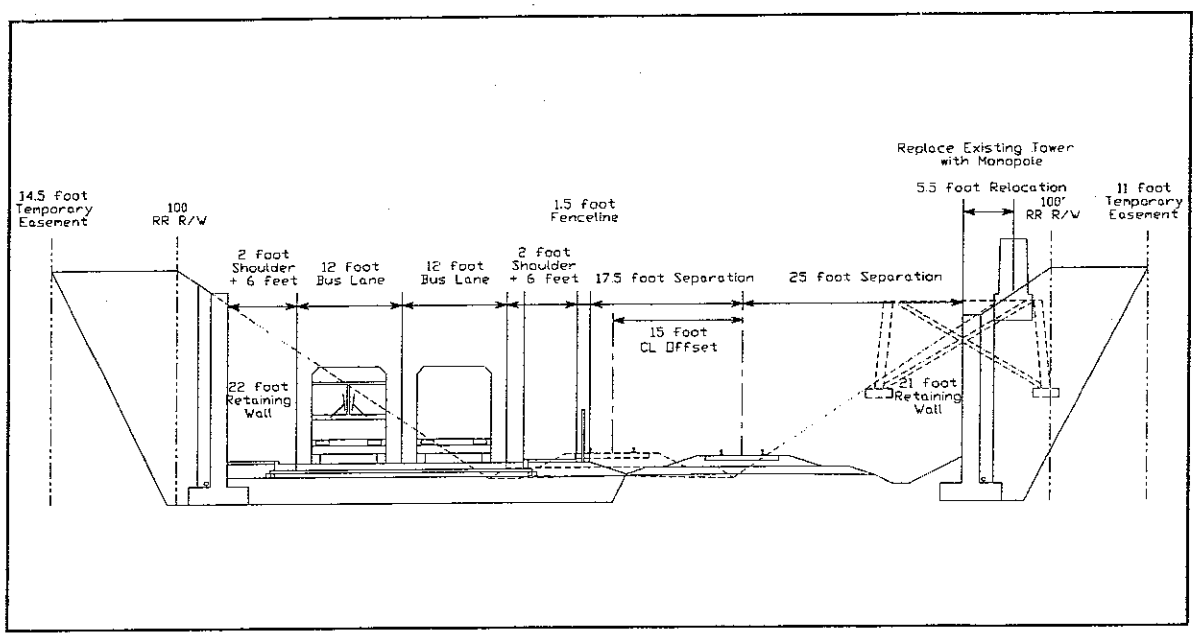
Note: Railroad relocation cost is not included in the busway section cost.

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW5 - CONFINED CUT SECTION

COSTS PER LINEAL FOOT

STATIONS 60 TO 80



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$275.16**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	40.67	1.35	$54.90
	Select Granular Borrow	CUYD	4.81	4.05	$19.48
	Class 5 Base	CUYD	1.39	12.15	$16.89
	PAB	CUYD	0.37	27	$9.99
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	0	28	$0.00
	Edge Drains	LF	2	2.6	$5.20
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	1	20	$20.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$1,122.53**
	Retaining Wall (Found., Drain)	SQFT	33	30	$990.00
	Common Backfill	CUYD	15.37	2.7	$41.50
	Rock Backfill	CUYD	1.89	27	$51.03
	Fencing	LF	2	20	$40.00
	TOTAL BUSWAY ($)				**$1,397.69**

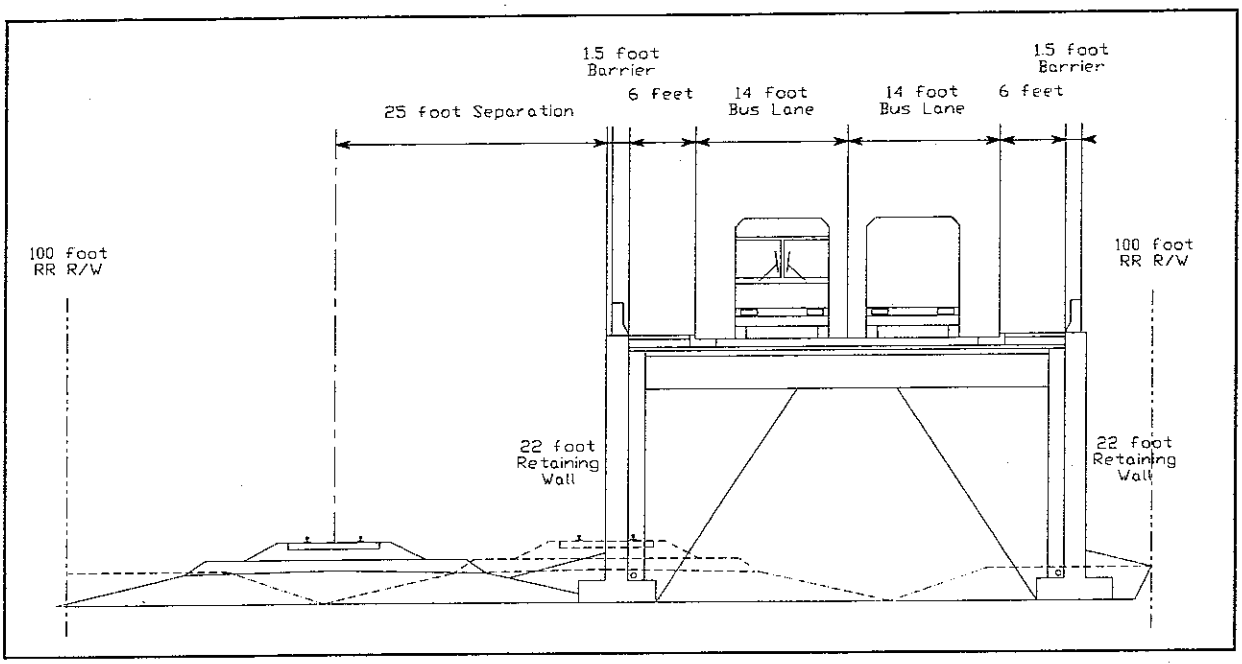
Note: Railroad relocation cost is not included in the busway section cost.

NORTHWEST TRANSIT CORRIDOR

EXCLUSIVE BUSWAY DESIGN SECTION ESTIMATE: NW6 - MAXIMUM STRUCTURE FILL SECTION

COSTS PER LINEAL FOOT

HWY 169 FLYOVER (602 TO 627)



ITEM NUMBER	DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL COST OF CONSTRUCTION PER L.F.
1.1	**Busway**	**LF**			**$353.48**
	Clearing & Grubbing	LF	1	1.8	$1.80
	Common Excavation	CUYD	22.78	1.35	$30.75
	Select Granular Borrow	CUYD	17.74	4.05	$71.85
	Class 5 Base	CUYD	1	12.15	$12.15
	PAB	CUYD	0.49	27	$13.23
	Concrete Pavement	SQFT	24	2.4	$57.60
	Curb & Gutter	LF	2	9.2	$18.40
	Concrete Walk	SQFT	11	1.8	$19.80
	J Barrier	LF	2	28	$56.00
	Edge Drains	LF	0	2.6	$0.00
	Storm Sewer	LF	1	65	$65.00
	Turf Establishment	LF	1	6.1	$6.10
	Fencing	LF	0	20	$0.00
	Pavement Striping	LF	1	0.8	$0.80
1.6	**Retaining Wall**	**LF**			**$1,569.93**
	Retaining Wall (Found., Drain)	SQFT	50	30	$1,500.00
	Common Backfill	CUYD	0	2.7	$0.00
	Rock Backfill	CUYD	2.59	27	$69.93
	Fencing	LF	0	20	$0.00
	TOTAL BUSWAY ($)				**$1,923.41**

Note: Railroad relocation cost is not included in the busway section cost.

Appendix D

Cost Adjustment Worksheet for 29th Street and Southwest Corridors Study Correlation

29th Street and Southwest Corridors
Busway Feasibility Study
Cost Adjustments for Use in Twin Cities
Exclusive Busway Study

From 29th Street Study
Route 3 (Southwest Corridor) $84 to $95 million in 2005 dollars

1. Factor to Year 2000 Dollars

$1.035^5 = 1.187686$
$84/1.187686 = \$71$ million
to
$95/1.187686 = \$80$ million

1. Factor To Take Out Bus Storage And Maintenance Facilities

28 buses X $220,000/bus = $6,160,000
$71 - 6.16 = \$64.84$ million
to
$80 - 6.16 = \$73.84$ million

2. Total Corridor Cost With Extension

$64.84 + 50.4 = \$115.24$
to
$73.84 + 50.4 = \$124.24$

SAY $115 to $124 million

Appendix E

29th Street and Southwest Corridors Busway Facility Study Executive Summary

Executive Summary

Introduction

The 29th Street and Southwest Corridors extend from 5th Avenue in Hopkins to Hiawatha Avenue in Minneapolis. In the early 1990s, the Hennepin County Regional Railroad Authority (HCRRA) purchased these corridors, preserving them for a future transit use.

This busway feasibility study was initiated in May 1999 as a joint effort of Hennepin County and Metro Transit to determine the feasibility, defined in terms of ridership forecasts and cost assumptions, of constructing and operating a limited-stop, rapid transit busway within these corridors and to determine if this was a practical first step toward light-rail transit (LRT). Study components included market assessment, ridership forecasts, cost estimates and analysis of issues relating to transit service provision. The determination of feasibility is based solely on the estimates of ridership and costs for a rapid-transit service.

Study Assumptions

Key study assumptions were that busway infrastructure elements such as transit stations, park-and-ride lots, fare collection systems and communications would be compatible with LRT and capable of re-use with conversion to LRT. Another assumption was that the bicycle/pedestrian trails constructed within the corridor would remain with conversion to a busway. For purposes of this study, a busway was defined as a two-lane roadway, separated from other traffic, operating with hybrid, diesel-electric, low-floor buses and a proof-of-payment fare collection system.

Study Conclusions

Based on ridership forecasts and cost estimates, an exclusive limited-stop busway in the 29th Street and Southwest Corridors is "technically" feasible. As such, the busway option should be included with other transit alternatives (e.g., LRT, Electric Trolley) in any future studies of these corridors. Furthermore, based on capital costs, constructing a busway will not preclude conversion to LRT in the future.

Summary of Key Study Findings

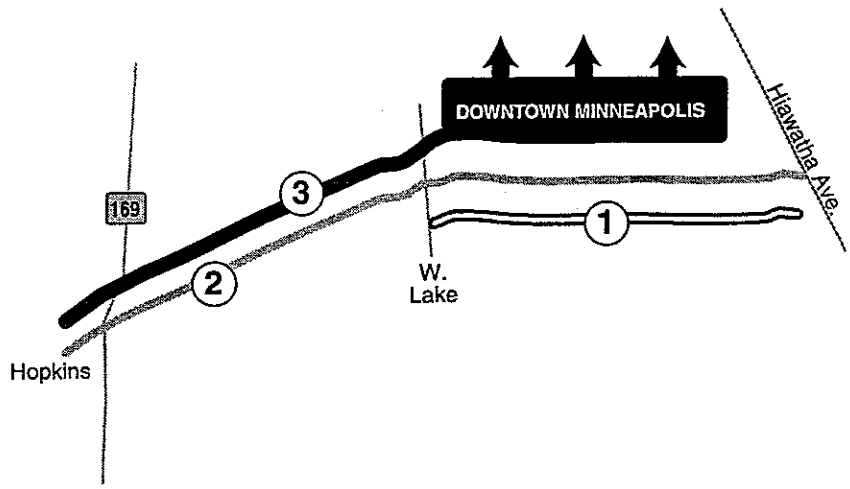
Market Assessment

- Based on responses from the focus group participants, telephone survey respondents, and on-board bus survey respondents, a market for busway service in the 29th Street and Southwest Corridors does exist.

- Connections to other regional systems such as the proposed Hiawatha LRT and downtown Minneapolis were viewed as critical to the corridor's success as a transit service.
- A modest preference for LRT over busway service was expressed; however, a busway was viewed as a positive precursor to LRT given LRT's long-term implementation prospects in this corridor.
- Current transit riders in the corridor are highly transit-dependent with 51 percent not owning an automobile and 36 percent riding the bus 10 or more times per week.

2020 Ridership Forecasts

- A substantial number of riders would be attracted to rapid transit service provided in the 29th Street and Southwest Corridors



Route 1: West Lake to Hiawatha:

- 7,300 daily busway riders
- 7,700 daily LRT riders

Route 2: Hopkins to Hiawatha

- 11,500 daily busway riders
- 12,100 daily LRT riders

Route 3: Hopkins to downtown Minneapolis:

- 16,000 daily busway riders
- 16,500 daily LRT riders

Cost Estimates

- Busway construction costs and operations and maintenance (O&M) costs are within a reasonable range. Based on regionally acceptable criteria, a busway will be operationally cost-effective.

BUSWAY COSTS (2005 DOLLARS)

	ROUTE 1	ROUTE 2	ROUTE 3
Construction	$59M	$104M	$84-95M
Annual O/M	$2.0M	$4.9M	$9.1M

LRT COSTS (2005 DOLLARS)

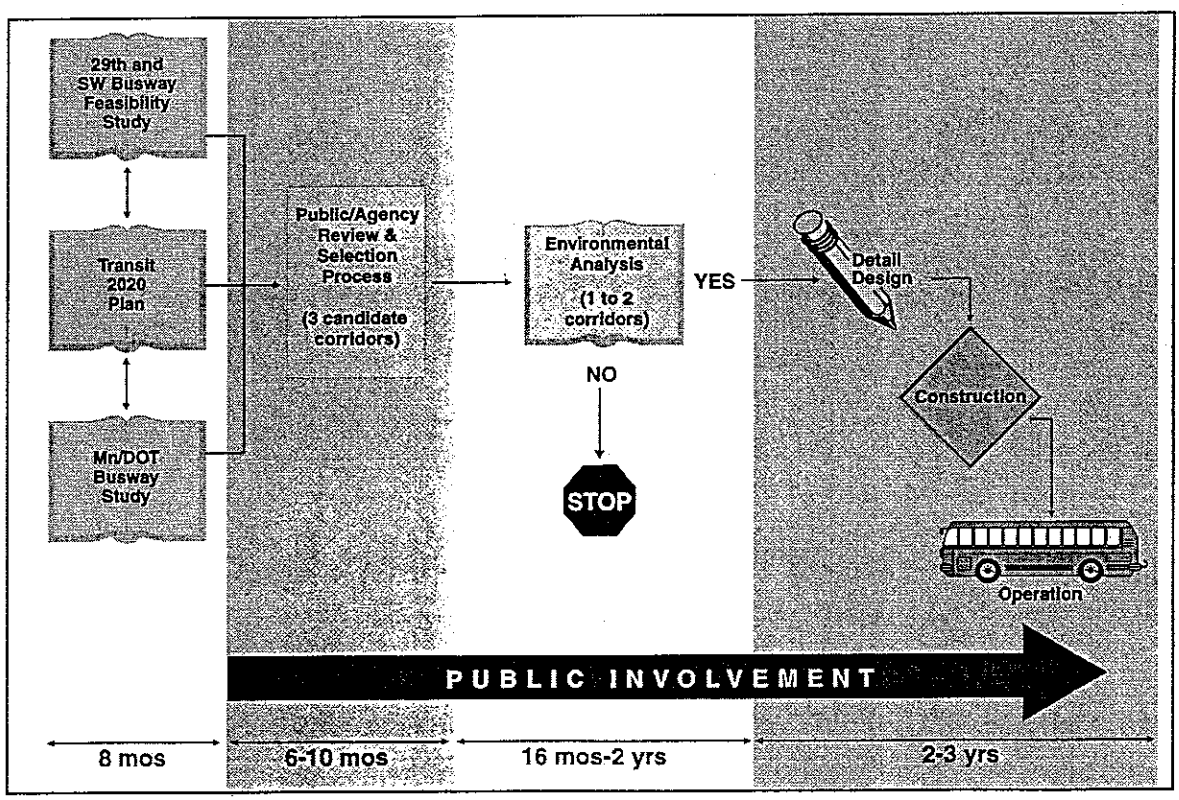
	ROUTE 1	ROUTE 2	ROUTE 3
Construction	$122M	$234M	$244-289M
Annual O/M	$2.3M	$4.9M	$8.4M

Issues Analysis

- Sufficient space exists in both the 29th Street and Southwest Corridors to accommodate both transit (Busway or LRT) and a bicycle/pedestrian trail, assuming the use of fencing, retaining walls and bridge modifications.
- Unresolved issues include issues relating to transit service (rapid transit or collector service using trolleys or other vehicle types), existing freight rail service, physical design (transit stations, transitway treatments, retaining walls, bridge work, and landscaping), and the environment. These issues will be explored in greater detail if future transit planning is initiated in the 29th Street and Southwest Corridors.

NEXT STEPS

This study is only the first step in the 29th Street and Southwest Corridors transit planning process. As illustrated in the graphic on the next page, the next step is a process of agency and public review to select one of three transitway candidate corridors for further study. Future studies will focus on identifying the type of transit service (LRT, busway, trolley, etc.) offered on the chosen corridor and how it may be designed. Public and agency involvement is critical to determining which corridor and which transit alternative is selected. A process for public involvement has been initiated and will be ongoing as the project development process continues. Future steps in planning for transit will involve the identification of environmental and other impacts directly resulting from project implementation as well as a discussion of how the transit service will be designed and operated.



Appendix F

Environmental Considerations Summary

Environmental Considerations Summary
Minneapolis Northwest Corridor

Introduction

A preliminary assessment of the environmental impacts within the Minneapolis Northwest corridor of the Twin Cities Busway Study was completed. The Minneapolis Northwest corridor extends from downtown Minneapolis to Osseo along an existing Burlington Northern Santa Fe Railway corridor. The corridor traverses through parts of the Cities of Minneapolis, Golden Valley, Crystal, New Hope, Brooklyn Park, and Osseo. The corridor route extends through a wide variety of urban settings and land uses. This section focuses on the potential preliminary environmental impacts.

Natural Resources

Natural resources within the proposed corridor route include streams, wetlands, parks, forests, ponds, springs, and open space. The topography along the corridor is variable and includes level to slightly rolling to steep sideslopes and hills. The entire corridor lies within urban land, but there are many significant parks and other resources.

Parks

Construction of the busway would potentially impact three parks: Wirth and Valley View Parks in Golden Valley, and Greenhaven Park in Brooklyn Park. The park impacts in these communities would include conversion of parkland, and possible filling of wetlands and other surface water bodies. The exact acreage and extent of impact is uncertain at this time. However, it appears there would be significant impacts to ponds and wetlands in all three parks.

Impacts to parklands may fall under federal 4(f) or 6(f) jurisdiction (parkland protection) which would require compensation and justification of impacts. A more detailed investigation of park funding would indicate whether 4(f) or 6(f) requirements would apply. Impacts to 6(f) parkland would require replacement of the impacted park area.

Wetland and surface water impacts would require permits at the federal, state, and local level. The federal and state permits would require wetland compensation. These impacts and the estimated compensation are discussed in other sections of the evaluation.

Streams and Creeks

Two creeks would be affected by the busway construction. The two creeks are Shingle Creek and Basset Creek. Both creeks are Minnesota Department of Natural Resources (MDNR) Public Waters. Additionally, an unnamed intermittent tributary would be impacted by the project. This watercourse is located in New Hope and is identified as Public Water on the MDNR Protected Waters Inventory Map.

The three streams/tributaries would be impacted by constructing the busway. Impacts may include filling, rerouting, bridging, culvert placement, and/or crossings. The impacts would require MDNR Protected Water Permits and Water Management Organization approval.

Pond and Springs

A pond within Wirth Park would potentially be impacted by the busway construction. The pond is listed by MDNR as a Public Water (651P) and impacts would require a MDNR Protected Waters Permit. Additionally, since the pond is within Wirth Park, the pond area may fall under 6(f) requirements. Springs have been identified within the Bassett Creek area of the corridor. Springs are direct groundwater discharges and indicate unique geologic conditions within the area. Wetlands have formed in the area and are hydrologically connected to these springs.

Wetlands

Numerous wetland areas are within the proposed busway corridor. Estimated wetland impacts would total more than 14 acres. Wetlands within the corridor were identified by reviewing National Wetland Inventory (NWI) and MDNR Protected Waters maps. Table 1 indicates the location, type, and amount of wetland impacts within the busway.

Table 1
Busway Study Wetland Impacts – Alternative 3

East Side of BNSF Railroad

Location	Wetland Type		Impact Area (Sq. Ft.)
	Cowardin	Circular 39	
Minneapolis	PUBF PEMF	Type 4	40,000
Minneapolis	PEMC	Type 3	20,000
Minneapolis	PUBF PSSIC	Type 4/6	20,000
Minneapolis	R2UBG	Riverine	56,000
Minneapolis	PEMC	Type 3	20,000
Brooklyn Park	PEMC	Type 3	40,000
		Total	**196,000**

West Side of BNSF Railway			
Location	Wetland Type		Impact Area (Sq. Ft.)
	Cowardin	Circular 39	
Brooklyn Park	PEMF, PEMC	Type 3	24,000
Brooklyn Park	PEMF	Type 3	48,000
Brooklyn Park	PEMC	Type 3	16,000
New Hope	PEMCd	Type 3	20,000
Golden Valley	PFOIC, PEMF	Type 3/7	64,000
Golden Valley	PEMC	Type 3	64,000
Golden Valley	R2UBG	Riverine	24,000
Golden Valley	P FO EM C, R2UBG	Type 3/7 Riverne	24,000
Golden Valley	PUBF, PEMC	Type 3/4	16,000
Golden Valley	P FO EM C	Type 3	24,000
Golden Valley	P FO EM C	Type 3	16,000
Golden Valley	PEMC, PEMF	Type 3	56,000
		Total	**308,000**

The majority of wetland impacts are Type 3 (PEMC, PEMF) wetlands, with a few Type 4 (PUBF), Type 6 (PSSIC), Type 7 (PFOC), and riverine systems wetlands. Types 3 and 4 wetland impacts may require compensation beyond the 2:1 ratio typically required under the Wetland Conservation Act, particularly in an urban area. The Army Corps of Engineers may also require additional compensation.

The MDNR will require a permit for impacts to protected waters. Three of the wetlands are listed as Protected Waters (644W, 563W, and 560W). Protected Water/Wetland 644W is in Wirth Park in Golden Valley, and Wetlands 563W and 560W are in Brooklyn Park.

Additionally, there are smaller wetland areas along the corridor that have not been identified on the NWI or Protected Waters maps that may be impacted. These wetlands would require identification and delineation to determine potential impacts.

Environmental Documentation

At a minimum, the Minneapolis Northwest corridor busway would require a mandatory Environmental Assessment Worksheet (EAW). The EAW would be required because of the significant impacts to Protected Waters (including wetlands) and as a transportation project involving the construction of a new roadway over one–mile in length.

It is possible, due to the significant impacts included in the busway alternative, that an Environmental Impact Statement (EIS) may be required. An EAW may take 60 days or more to prepare, review and make a determination of a negative declaration or the need for an EIS.

Preparation and review of an EIS can take 6 months to 1 year. An EIS requires a detailed analysis of environmental impacts.

Endangered Species

Although the busway corridor is within an urban area, there is a possibility that impacts to endangered, threatened, or rare species may occur. There is a record of a Loggerhead shrike (Lanius lundovicianus, a state threatened species) being observed in Wirth Park.

An endangered species review and survey would be warranted to identify if any species or habitat exists within the corridor route.

Archaeology, Historical and Cultural Resources

An archaeological/historical review/survey would be necessary to identify any site(s) within the corridor. If federal funds are used, Section 106 would apply and an assessment of the archaeological, historical, or cultural resources would need to be conducted under these guidelines. New criteria for evaluating historical resources are being developed, under which the railroad line may be a historic resource.

Permits

There are several permits that would be required to initiate construction of the busway. Table 2 outlines the regulatory agency, activity, required submittal, and lead–time. This table is not intended to be a comprehensive permit list, but rather reflects the permits related to environmental concerns.

Table 2
Potential Environmental Permit Requirements
Twin Cities Busway Study – Alternative 3

Regulatory Agency	Activity	Submittal DOC's Required	Lead Time
Army Corps of Engineers	Section 404 Individual Permit	Permit Application, Plan Sheets	90 Days+
Minnesota Department of Natural Resources	Protected Waters Permit	Permit Application	60 Days+
Minnesota Pollution Control Agency	Section 401 Water Quality Certification	401 Certification	60 Days
State Historical Preservation Office (SHPO)	Historical database review Section 106	Review	N/A
Cities of Mpls, Golden Valley, Crystal, New Hope, Brooklyn Park, Osseo	Wetland Permits	Permit Application	60 Days
Minneapolis Park Board	Section 6(f) Replacement	Approval	Variable
Minnesota Department of Transportation	EAW, EIS	Approval	N/A
Shingle Creek WMO	Protected Water Permit	Approval Review	N/A
Bassett Creek WMO	Protected Water Permit	Approval Review	N/A
Minnesota Pollution Control Agency	NPDES Construction Permit	Permit Application	48 hours

Costs

Section 6(f) or 4(f)

Costs associated with Section 6(f) replacement requirements are variable and depend on current land costs for acquisition to replace impacted parkland.

Streams, Creeks, Ponds

Costs associated with impacts to streams, creeks, and ponds would include permit fees and mitigation plan development and implementation. Permit fees can be up to $500.00 depending on the amount of impact. Mitigation plan development and implementation costs are variable.

Wetlands

Approximately 14 acres (and possibly more) of wetland would need to be replaced at a minimum 2:1 ratio. Costs for construction (not including land acquisition) in the metro area can be substantial and range from $20,000 to $70,000 or more per acre. The average tends to be $30,000 to $40,000 per acre. Replacement of 28 acres of wetlands would cost $1,120,000 for construction. Land acquisition costs would be added on top of this. Additionally, since the majority of wetland impacts are wetland Types 3 and 4, the replacement ratio maybe higher and therefore add to the cost.

The preferred wetland replacement is to be first onsite and second within the same watershed. This may add to the costs for land acquisition.

Environmental Documentation

The cost for preparation of an EAW is variable and would be based on the complexity of the project. The estimated cost would be $50,000 to $60,000 or more depending on the required number of meetings with agencies, public, etc.

Endangered Species

An endangered species review is estimated to cost $10,000 based on field review time and reporting.

Archaeology, Historical and Cultural Resources

The costs for conducting an archaeological, historical, and cultural review will depend on the level of effort necessary to meet the Section 106 requirements.

Appendix G

New Concepts of Guided Transit Systems

New Concepts of Guided Transit Systems: Between Guided Buses and Tramways on Tyres

a report by

Marc Ellenberg

Deputy Director, Centre d'Etudes des Réseaux, des Transports, de l'Urbanisme et des Constructions Publiques

Marc Ellenberg is an Ingenieur Civil des Ponts et Chaussees, (Civil Engineer of bridges and roadways). Since 1996, he has been Deputy Director of Centre d'Etudes des Réseaux, des Transports, de l'Urbanisme et des Constructions Publiques (CERTU), the French National Institute for Networks, Transport, Urbanism and Public Construction. Between 1970 and 1996, he was in charge of leading transportation studies for the French Ministry of Equipment in the eastern regions of France, including international research projects and local development plans.

Urban light rail (tramway) lines were considered old-fashioned in the middle of the 20th century. After this period, most of the towns and cities that were equipped with this type of transit system decided to give up on noisy vehicles and cumbersome tracks. Yet, within a few decades, the expansion of automobiles and the resultant traffic jams raised concern about the insufficient role of transit systems, as buses were too frequently stuck in the congestion

Bus lanes in centres proved to be of little use, so many medium-sized towns (of 200 to 800 thousand inhabitants) recently decided to build new and modern light rail lines. Almost 30 French towns are now developing a tramway network, while in Germany, more than 50 towns are already equipped. In the US, a tenth of towns have launched a light rail construction programme. Here, between 1986 and 1996, the number of travellers using light rail increased by 56%, while bus network use continued to decrease.

The main advantages of the tramways are to upgrade passenger capacity, commercial speed and environmental quality in the streets: This is achieved thanks to: the guidance principle; the electrical motorisation; and vehicle and street design.

The guidance principle has three main consequences. Firstly, the lane width needed for the curves is much narrower for a tramway than for a bus. In terms of the lane dimension needed, this is very important, due to the precision of trajectory. It is a fact that, for curves, a bus needs an extra width while the tramway is 'mono-track' – in other words, the rear axle follows the same trajectory as the front axle.

Secondly, a bus can easily avoid an obstacle on a lane by a small diversion of its trajectory, but the tramway cannot. If this is added to the fact that an approaching tram is more intimidating than that of a bus from a psychological point of view, the right of way of trams is more likely to be respected than that of buses, despite bus lanes. This means it is easier for police authorities in many countries to enforce driving laws.

The third advantage is to facilitate boarding for the passengers, because the guided tram comes automatically and precisely along the platform, with no step or wide gap.

The advantage of motorisation is that electrical power truly benefits the air quality. As far as vehicle and street design are concerned, the importance given to the development of a new light rail system ensures a high-quality project, which aims to provide sculptural, gleaming, noiseless, air-conditioned, comfortable vehicles and, correlatively, pavement and street furnishings of high standards with beautiful and easy-to-maintain landscaping.

However, modern tramway equipment is expensive to operate and many towns are seeking a cheaper and more flexible solution, while preserving most of the advantages mentioned above.

An Attractive New Solution?

The creation of a new bus lane requires an investment of just under one million euros per kilometre of line. The construction of a tramway costs 20 times more. The challenge for manufacturers has been to create an intermediate system in terms of budget, with similar advantages for medium-sized towns. This has been taken up by numerous companies, four of which proposed prototypes have been evaluated by the Centre d'Etudes des Réseaux, des Transports, de l'Urbanisme et des Constructions Publiques (CERTU). These French manufacturers are Alstom, Lohr Industries, Matra-Renault and Spie-Bombardier. Similar experiments have also been carried out in Germany (Mercedes), Italy (Ansaldo), UK and Japan.

The main characteristic of most of the presented intermediate systems is that they run on tyres, instead of metal wheels on rails. The main source of economy comes from the construction of the infrastructure: using less expensive parts that can still cope with the requirements of the vehicle. The new concept must therefore be placed somewhere between a 'guided bus', (able to be disconnected from the guidance system where and when needed to run freely on non-equipped streets, to the garage or for maintenance) and a 'tramway on tyres' (with a large capacity of passengers, but not able to run

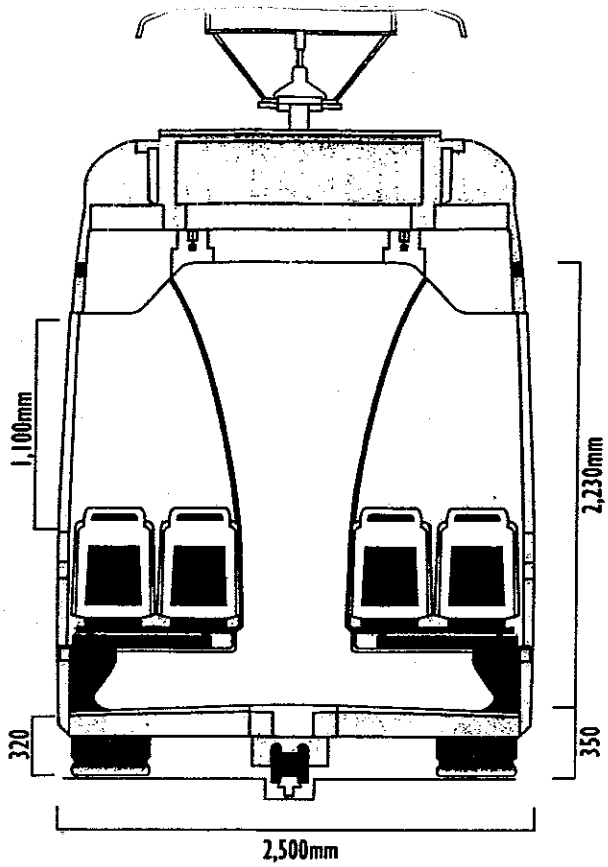


Figure 1: Cross-section of an 'Intermediate' Transit System

four-element tramway on tyres. The height varies from 2.95m to 3.40m. The width is from 2.20m to 2.65m.

For the systems on tyres, the acceptable slope is 13%. The one rail system can accept slopes up to 10%. Minimum radius in curves varies from 11.8m up to 25m. For the minimum radius, the lane width needed is 3m to 6.6m. For instance, one of the systems needs 3.2m lane width when guided on equipped streets and 4.3m on non-equipped streets.

The number of passengers can be set according to a standard of four persons per square metre (comfort) or six persons per square metre (normal). This equals 70 passengers for a one-element guided bus and up to 254 passengers for a four-element tramway on tyres.

Experiments

There are two different kinds of experiments. First, the technological aspects are tested on the private premises of the manufacturers, then a real test is initiated with customers on a real, specially-equipped public transport line. A national research financial grant was offered to the association of manufacturers. The experimental line is run by the Parisian transport company RATP and is called Trans-Val de Marne. It is 12.5km in length, with a guided section of 1.4km (four stations), a bi-directional lane width of at least 6.50m, and an overall infrastructure width of up to 13m in stations, including platforms. Maximum slopes are 5.3%. The line has 22 stations that are 40m in length, and the height between platform and pavement is 20cm. Crossroad lights are controlled by a green wave tuned to the theoretical speed of the public transport line.

Experiments into the Bombardier-Spie system, TVR, have been running on the site since the end of 1997. Tests of the Renault-Matra system, CIVIS, were carried out in Venissieux, near Lyon, in 1998 and early 1999, and a larger experiment is planned at the Trans-Val de Marne site in 2000/2001 and perhaps earlier in Clermont-Ferrand or Rouen. The Lohr Industries system, named Translohr type 'S', was tested throughout 1999 on the company's premises and it is hoped that this will continue in October 2000 on the Trans-Val de Marne site.

Experiments on the Alstom system (the system on rails) are planned in Aytre in 2001 or 2002. Discussions have started with the Italian manufacturer, Ansaldo, for tests of its system on the same site. Already, the Italian system has been running in Trieste, Italy, but is not allowed to transport passengers.

Potential Market

Higher average speed and higher number of passengers may give a better economical efficiency to the equipped line compared to a bus system, provided that the investment in the infrastructure and vehicles stay within due limits

A study by Calvet, a consultancy company, estimates that, during the next 10 years, demand for these systems in France could be as high as 440 vehicles on rail (of which 85 are for renewal) and 300 vehicles on tyres. The figures for other countries in Europe, Africa, the Middle East and Asia could be double that of France for vehicles on rails and nearly that for vehicles on tyres. In financial terms, the market potential could be a little less than one billion euros for the systems on tyres, and more than two billion euros for systems on rails.

The commercial success of guided systems on tyres will depend on setting up standards that will prevent the purchaser being tied for a long period to its first provider. However, for the moment, two French towns (Caen and Nancy) have already made in-depth studies for the future development of a network using intermediate transport systems (TVR). Clermont-Ferrand also recently announced the decision to build a 4.3km line for CIVIS

The 20th century has been the end for many old and noisy tramway lines. The 21st century could be the beginning for the latest, environmentally-friendly guided transit systems. ■

Table 1 : Objectives for General Characteristics

Type	*Bus*	*Intermediate*	*Tramway*
Line Capacity (passengers/hour)	*1,000–1500*	*1,500–5,000*	*5,000–10,000*
Commercial Speed (km/h)	*15*	*20*	*25*
Investment (million euros/km)	*1*	*10*	*20*

NB: The figures in the table refer to a whole line with a section in the town centre and other sections in the outskirts. In the town centre only, the figures for the intermediate and tramway are closer. An important difference between the bus and the intermediate or tramway is that, during peak hours, buses are unlikely to run to schedule due to traffic congestion, whilst the others are able to remain precisely to schedule.

outside the equipped streets). The proposed solutions cover the whole set of possibilities and are subject to the evaluation process.

Guidance Principles and Energy Supply

The guidance principle of the prototypes are of three different types:

- 'soft' guidance – the optical detection of a painted line. In this case the system is not fully mono-track;
- 'intermediate' guidance – a central rail is used to steer front and rear axles. This can be mono-track; and
- 'hard' guidance: lateral curbs for horizontal wheels are provided, as well as a central rail.

The intermediate systems can use the trolley-bus electric supply principle (two aerial wires), the tramway electric supply principle (one aerial wire), plus batteries for auxiliary purposes, or a fuel engine. The Italian experiment uses no aerial wire: instead an electric wire is placed in a trench and protected by a folded cover.

According to the various concepts of guidance and of energy supply, the intermediate system can run freely on ordinary streets, or can run for small distances on non-equipped but protected lanes (for garage or maintenance purposes), or not at all freely.

System Characteristics

The length of the experimental vehicles varies from 12m (the maximum authorised length for a non-articulated road vehicle in France) up to 38.5m for a