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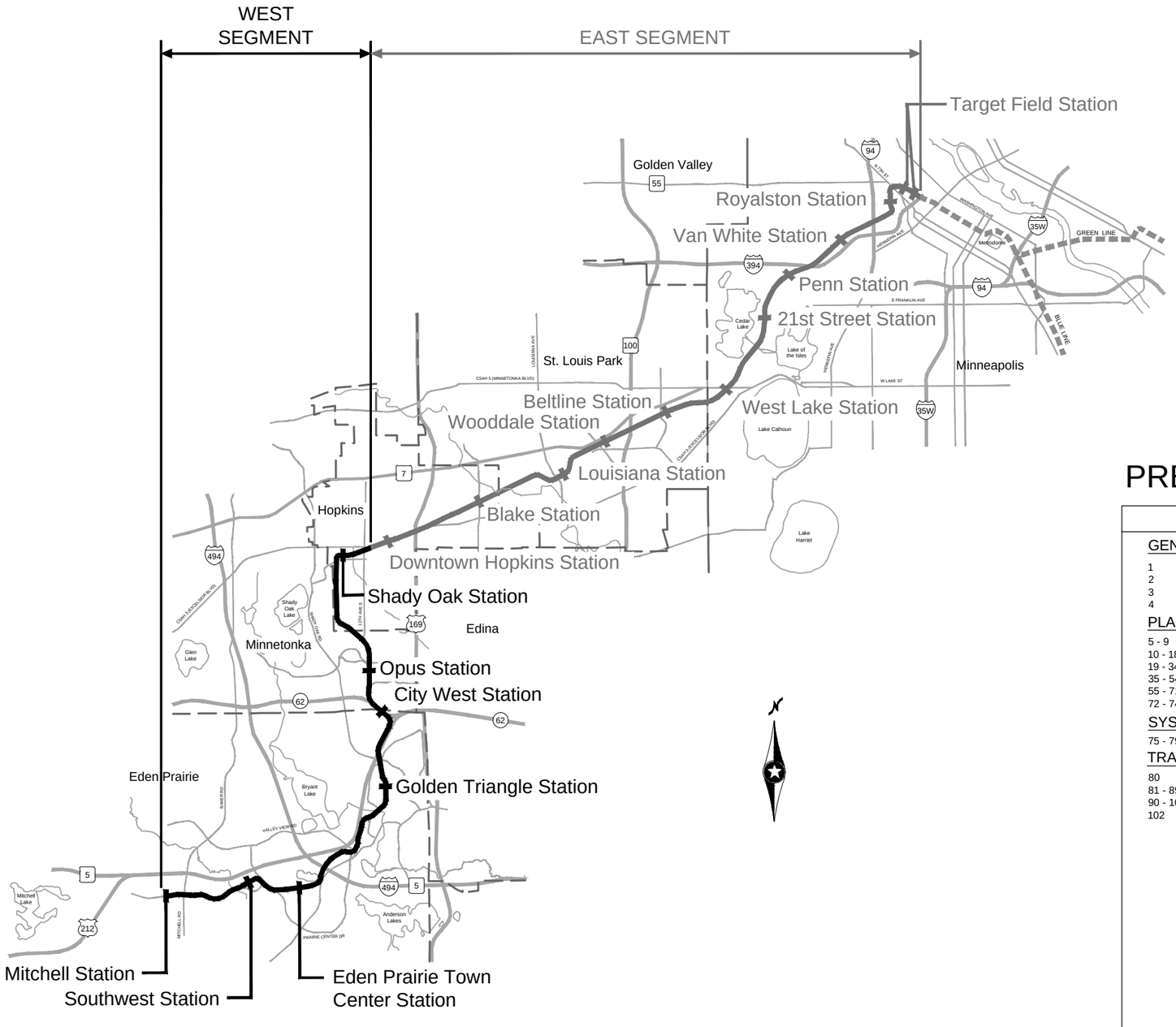

SOUTHWEST
Green Line LRT Extension

METROPOLITAN COUNCIL

WEST-VOLUME 3 (SYSTEMS)

PRELIMINARY ENGINEERING (SEPTEMBER 2014)

INDEX

AECOM

PRELIMINARY - NOT FOR CONSTRUCTION

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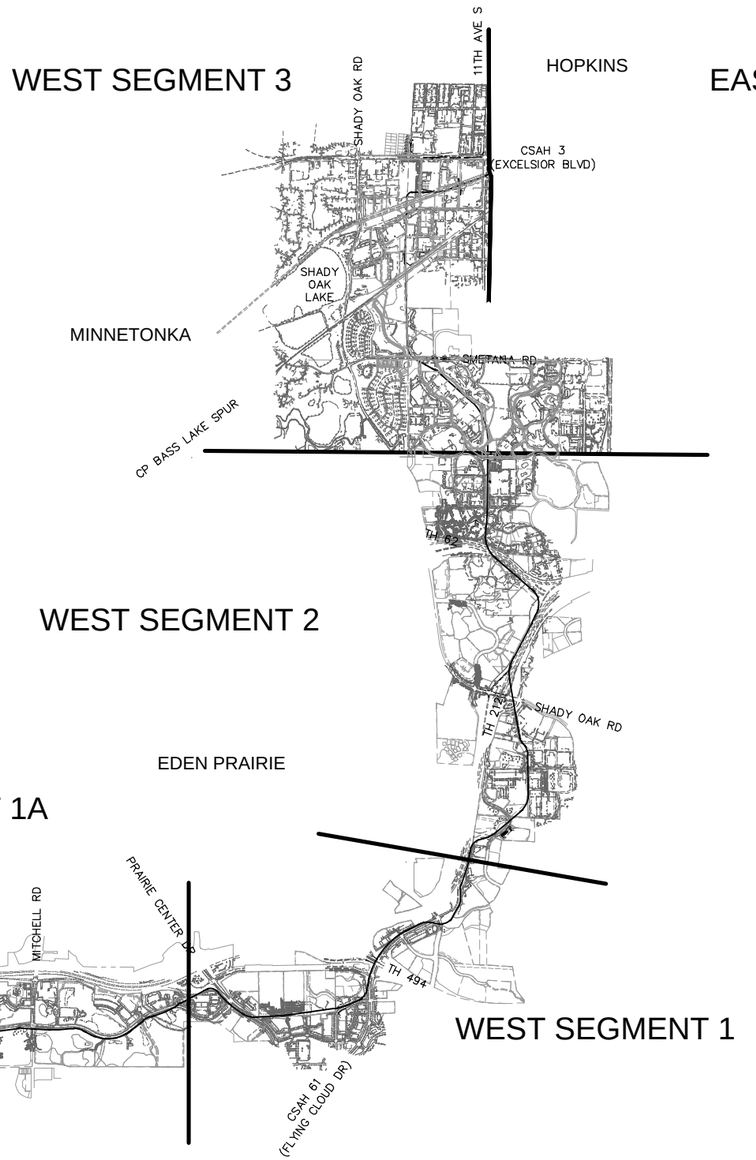

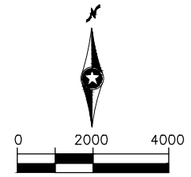

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)

GENERAL

SEGMENT KEY MAP

DISCIPLINE: SYSTEMS

SHEET NAME: SYS-GEN-KEY

SHEET 2 OF 202

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A

A	AMPERE
AB	ANCHOR BOLT
ABD	ABANDON, ABANDONED
ABUT	ABUTMENT
ABV	ABOVE
AC	ALTERNATING CURRENT
ACI	AMERICAN CONCRETE INSTITUTE
ACSR	ALUMINUM CONDUCTOR, STEEL REINFORCED
ADJ	ADJACENT
AF	AUDIO FREQUENCY
AFO	AUDIO FREQUENCY OVERLAY
A/G	AT GRADE
AH	AHEAD
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AL	ALUMINUM
AP	APPROACH
APPROX	APPROXIMATE
APT	AUXILIARY POWER TRANSFORMER
AREMA	AMERICAN RAILWAY ENGINEERING & MAINTENANCE OF WAY ASSOCIATION (FORMERLY AREA)
AS	AMMETER SWITCH
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY OF TESTING & MATERIALS
A/T	AUTO TENSION (A.T.)
ATM	ALONG TRACK MOVEMENT
ATR	ABOVE TOP OF RAIL
ATS	AUTOMATIC TRAIN STOP
AVG	AVERAGE
AWG	AMERICAN WIRE GAUGE
AWS	AMERICAN WELDING SOCIETY

B

BK	BACK
BARR	BARRIER
BAT	BATTERY
B/B	BACK TO BACK
BC	BOLT CIRCLE/BATTERY CHARGER
BFA	BY-PASS FEEDER ANCHOR
BIL	BASIC INSULATION LEVEL
BKR	BREAKER
BLDG	BUILDING
BL	BASELINE
BOBP	BOTTOM OF BASEPLATE
BOS	BOTTOM OF STEEL
BM	BEAM
BR	BRIDGE
BRKT	BRACKET
BSF	BAR SIGNAL FOUNDATION
B-SPAN	BODY SPAN
BTM	BOTTOM
BTWN	BETWEEN
B/W	BALANCE WEIGHT
BWA	BALANCE WEIGHT ANCHOR
BZ	BRONZE

C

C	CELSIUS
CAB	CABINET
CANT	CANTILEVER
CAT	CATENARY (CAT.)
CB	CIRCUIT BREAKER
CCLRT	CENTRAL CORRIDOR LRT
CCTV	CLOSED CIRCUIT TELEVISION
CF	CUBIC FEET
CHAM	CHAMFER
CHGR	CHARGER
CIP	CAST-IN-PLACE
CKT	CIRCUIT
℄	CENTERLINE
℄ TO ℄	CENTERLINE TO CENTERLINE
CISP	CAST IRON SEWER PIPE

C CONTINUED

CLF	CHAIN LINK FENCE
CLR	CLEARANCE, CLEAR
COMM	COMMUNICATIONS
COMPT	COMPARTMENT
CONC	CONCRETE
COND	CONDUCTOR
CONST	CONSTRUCTION
CONT	CONTINUATION, CONTINUOUS
CONTR	CONTRACTOR
CND	CONDUIT
CR	CONDUIT RISER
CT	CURRENT TRANSFORMER
CS	CURVE-TO-SPIRAL
CSO	CONDUIT STUB OUT
CSU	CONDUIT STUB UP
CT	CONDUIT TIES
CTR	CENTER
CU	COPPER
CW	CONTACT WIRE
CY	CUBIC YARD

D

D	DEPTH
DB	DIRECT BURIAL
DC	DIRECT CURRECT
DEG	DEGREE
DF	DIRECT FIXATION
DTL	DETAIL
DGA	DOWN GUY ANCHOR
DIA	DIAMETER, ø
DIM	DIMENSION (DIM)
DISC	DISCONNECT
DISC SW	DISCONNECT SWITCH
DIST	DISTRIBUTION
DLGT	DOME LIGHT
DOC	DEGREE OF CURVATURE
DS	DOOR SWITCH
DWG	DRAWING

E

E	EAST
EA	EACH
EB	EASTBOUND
Ea	SUPERELEVATION IN INCHES
EHS	EXTRA HIGH STRENGTH
ELEC	ELECTRICAL
ELEV	ELEVATION
EMI	ELECTROMAGNETIC INTERFERENCE
EPR	ETHYLENE PROPYLENE RUBBER
EQ	EQUAL
EQN	EQUATION
EQPT	EQUIPMENT (EQUIP)
ES	EXTRA STRENGTH
ET	ELEMENT OF TES DEVICES
ETC	ET CETERA
ETS	EMERGENCY TRIP STATION
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERNAL

F

F	FAHRENHEIT
FA	FIXED ANCHOR
FAC	FACILITY
FDN	FOUNDATION
FDR	FEEDER
FF	FOUNDATION TRAFFIC
FFJ	FULL FEEDING JUMPER
FJ	FEEDER JUMPER
FM	FRICTION MODIFIER
FOP	FACE OF POLE
FOS	FACTOR OF SAFETY
FP	FEEDER POLE
FREQ	FREQUENCY

F CONTINUED

FS	FAR SIDE
FT	FEET, FOOT
F TO F	FACE TO FACE
F/T	FIXED TERMINATION (FT)
FTG	FOOTING

G

GALV	GALVANIZED
GB	GROUND BUS
G/L	GROUND LINE
GND	GROUND
GRD	GROUNDING DEVICE
GRS	GALVANIZED RIGID STEEL
GRSC	GALVANIZED RIGID STEEL CONDUIT
GC	GRADE CROSSING
GTE	GENERAL TELEPHONE ELECTRIC

H

HD	HARD DRAWN
HDG	HOT DIPPED GALVANIZED AFTER FABRICATION
HDPE	HIGH DENSITY POLYETHYLENE
HEX	HEXAGONAL
HH	HANDHOLE
HIA	HIAWATHA LRT (HLRT)
HID	HIGH INTENSITY DISCHARGE
HO	HAND OPERATED
HORIZ	HORIZONTAL
HPS	HIGH PRESSURE SODUIM
HRL	HIGH RAIL LEVEL
H-SPAN	HEAD SPAN
HS	HANDHOLE SIGNAL
HSS	HIGH STRENGTH STEEL
HT	HEIGHT
HTR	HEATER
HV	HIGH VOLTAGE
HVAC	HEATING VENTILATION AIR CONDITIONING
HWY	HIGHWAY
Hz	HERTZ

I

I	INTERLOCK
IB	IMPEDANCE BONDS
IC	INSTRUMENT CASE
ID	INSIDE DIAMETER
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
IL	LINE CURRENT
IJ	INSULATED JOINT
IN	INCH, INCHES
INC	INCOMING
INCL	INCLUDE, INCLUDING
INSUL	INSULATION
IPT	INTERFACE PHASE TRANSFORMER
I/R	IN RUNNING (RIDING CONTACT WIRE)

J

J	JUMPER
JB	JUNCTION BOX
JCT	JUNCTION
JJ	(2) JUMPERS
JT	JUNCTION BOX TIES

K

K	KIP
KCMIL	THOUSAND CIRCULAR MILS
kA	KILOAMPERE
KN	KNUCKLE
kV	KILOVOLT
kVA	KILOVOLT AMPERE
KSF	KIPS PER SQUARE FOOT
KSI	KIPS PER SQUARE INCH
kW	KILOWATT

L

LA	LIGHTNING ARRESTER
LB	POUND, POUNDS
LB/FT	POUNDS PER FOOT
LC	LINE CURRENT
LF	LINEAR FEET
LED	LIGHT EMITTING DIODE
LG	LONG, LENGTH
LTG	LIGHTING
LOC	LOCATION
LPT	LOW POINT
LRT	LIGHT RAIL TRANSIT
LS	LUMP SUM/LINE SECTION/LINE SEGMENT
LT	LIGHT OR LEFT
LTS	LIGHTS
LV	LOW VOLTAGE

M

M	METER (DISTANCE)
MAX	MAXIMUM
M/W	MESSENGER WIRE
MC	MOTOR CONTROL
MCM	THOUSAND CIRCULAR MILS
mH	MILLIHENRY
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
M/L	MAIN LINE
MNDOT	MINNESOTA DEPARTMENT OF TRANSPORTATION
MOP	MOTOR OPERATED
MP	MILE POST - MORE PERMISSIVE SPEED
MPA	MID POINT ANCHOR
MPH	MILES PER HOUR
MS	MANHOLE SIGNAL
MTG	MOUNTING
MT	METRO TRANSIT
MVA	MEGAVOLT AMPERE
mV	MILLIVOLT
MW	MEGAWATT
MW	MESSENGER WIRE

N

N	NORTH, NEUTRAL
N/A	NOT APPLICABLE
NB	NORTH BOUND
NBR	NON-BRIDGING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEG	NEGATIVE
NESC	NATIONAL ELECTRICAL SAFETY CODE
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
No.	NUMBER
NOM	NOMINAL
NR	NOT REGISTERED
	NEGATIVE RETURN
NS	NEAR SIDE
NS	NOT SUPPORTED
NSR	NOT SUPPORTED OR REGISTERED
NTS	NOT TO SCALE

O

OC	ON CENTER
OCS	OVERHEAD CONTACT SYSTEM
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OHB	OVERHEAD BRIDGE
O/L	OVERLAP
O/R	OUT OF RUNNING (NON-RIDING CONTACT WIRE)

P

PAN	PANTOGRAPH
PB	PULLBOX
PC	POINT OF CURVE
PD	POWER DISTRIBUTION PANEL
PE	PHOTOELECTRIC CELL

P CONTINUED

PED	PEDESTRIAN
PF	POINT OF FROG
	PEDESTRIAN FLASHER
PGRS	PVC COATED GRSC
PH	PHASE
PI	POINT OF INTERSECTION
PITO	POINT OF INTERSECTION OF TURNOUT
PL	PLATE
P/L	PROPERTY LINE
PLAT	PLATFORM
POS	POSITIVE
PRE-C	PRE-CAST CONCRETE
PROP	PROPOSED
PS	POINT OF SWITCH
PSF	POUNDS PER SQUARE FEET
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENT
P/T	POCKET TRACK
PUC	PUBLIC UTILITY COMMISSION
PVC	POLYVINYL CHLORIDE COUNDUIT (PVCC) OR POINT OF VERTICAL CURVE
PWR	POWER
PX	PEDESTRIAN CROSSING

Q

QTY	QUANTITY

R

R	RADIUS
RAB	RAIL ACCESS BOX
RE	RUNNING EDGE OF RAIL
RECT	RECTIFIER
REF	REFERENCE
REV	REVISE/REVISION
REQD	REQUIRED
RPZ	RUNWAY PROTECTION ZONE
RT	RIGHT
RTU	REMOTE TERMINAL UNIT
RR	RAILROAD
RRX	RAILROAD GRADE CROSSING
RW	RETAINING WALL
ROW	RIGHT OF WAY

S

S	SOUTH
SA	SURGE ARRESTER
SAP	SUBSTATION ALARM PANEL
SB	SOUTHBOUND OR SPLICE BOX
SC	SIGNAL/COMMUNICATION
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SCAT	SIMPLE CATENARY AUTO TENSION
SCFT	SIMPLE CATENARY FIXED TERMINATION
SECT	SECTION
SI	SECTION INSULATOR
SIG	SIGNAL
SOP	SET OUT POINT
SP	SURGE PROTECTION
SPEC	SPECIFICATION
SPS	SMALL PART STEELWORK
SPST	SINGLE POLE SINGLE THROW
SQ	SQUARE
Sq Ft	SQUARE FEET
Sq In	SQUARE INCHES
S-SPAN	STEADY SPAN
SST	STAINLESS STEEL
ST	SPIRAL TO TANGENT, STREET
STA	STATION, STATIONING
STD	STANDARD
STRUCT	STRUCTURE
SU	STUB-UP
SUSP	SUSPENDED
SW	SWITCH
SWA	SINGLE WIRE ANCHOR

S CONTINUED

SWAT	SINGLE WIRE AUTO TENSION
SWFT	SINGLE WIRE FIXED TERMINATION
SWH	SWITCH HEATER
SWHC	SWITCH HEATER CABINET
SWHT	SWITCH HEATER TRANSFORMER
S/E	SUPERELEVATION

T

T	TIE SWITCH
TB	TAP BOX, TERMINAL BLOCK
TBD	TO BE DETERMINED
TBR	TO BE REMOVED
TE	TRACTION ELECTRIFICATION
TEL	TELEPHONE
TEMP	TEMPERATURE
TEM	TEMPORARY
TERM	TERMINAL, TERMINATION
TF	AXEL COUNTER
THK	THICK
T/F	TOP OF FOUNDATION
T/G	TOP OF GROUND LINE
TL	TENSION LENGTH OR TRACK LIGHTING
T/LR	TOP OF LOW RAIL
TO	TURNOUT
TOC	TOP OF CONCRETE
TOLR	TOP OF LOW RAIL
TOR	TOP OF RAIL
TORW	TOP OF RETAINING WALL
TP	TRACTION POWER
TPSS	TRACTION POWER SUBSTATION
TPT	TRACTION POWER CONTROLLER
TRAC	TRACTION
TRANSF	TRANSFORMER, TRANSFER
TRK	TRACK
TS	TANGENT TO SPIRAL
TTC	TELEPHONE TERMINAL CABINET
TVM	TICKET VENDING MACHINE
TWA	TIE WIRE ANCHOR
TWC	TRAIN-TO-WAYSIDE COMMUNICATIONS, TWC LOOP
TYP	TYPICAL

U

UG	UNDERGRADE, UNDERGROUND
UGB	UNDERGRADE BRIDGE
U/S	UNDERSIDE
UTIL	UTILITY (UTIL)

V

V	VOLT
VA	VOLT AMPS
VERT	VERTICAL
V/S	VERSINE
VS	VOLTMETER SWITCH

W

W	WATT, WIDTH OR WIRE
W/	WITH
WB	WESTBOUND
WI	WEIGHT - WROUGHT IRON
W/O	WITHOUT
WF	WIDE FLANGE
WWF	WELDED WIRE FABRIC

X

XB	CROSS BOND.
XFMR	TRANSFORMER
X-ING	CROSSING
XOVER	CROSSOVER
XPASS	CROSS PASSAGE
X-SECT	CROSS SECTION
X-SPAN	CROSS SPAN

Y

Y	YARD
YL	YARD LEAD

Z

ZBOND	IMPEDANCE BOND

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)

GENERAL

ABBREVIATIONS

DISCIPLINE: SYSTEMS

SHEET NAME: SYS-GEN-002

SHEET 3 OF 202

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SYSTEMS LEGEND & GENERAL NOTES

LAYOUT PLAN SYMBOLS:

SC MANHOLE

TE MANHOLE

SC HANDHOLE

SNOW MELTER CASE

TPSS FENCE

MAINLINE SC DUCTBANK

MAINLINE TE DUCTBANK

INTRUSION DETECTION

MC DUCTBANK

COMM CABINET

TPSS BUILDING (TPSS-SW-##)

SIGNAL OR INTERMEDIATE OR PLATFORM OR XING OR TUNNEL HOUSE OR ANY COMBINATION OF THESE

FP OCS FEEDER POLE

OCS POLE/FOUNDATION

POLE WITH SINGLE CANTILEVER

DOWN GUY ANCHOR

SECTION INSULATOR, BRIDGING TYPE

GRADE CROSSING GATE AND FLASHER

BALANCE WEIGHT ANCHOR, SINGLE CONTACT WIRE

POLE WITH TWIN CANTILEVER

CROSSING CONTACT BRIDGE

NEW POLE WITH WIRE PULL-OFF FOR TWO WIRES

FIXED TERMINATION - FISH TAIL STYLE SINGLE CONTACT WIRE

EXISTING DOWN GUY ANCHOR

NEW DOWN GUY ANCHOR

LAYOUT PLAN SYMBOLS CONT:

STEADY SPAN STRUCTURE (NO SUPPORT)

HEADSPAN SUPPORT STRUCTURE WITHOUT STEADY SPAN REGISTRATION

PORTAL STRUCTURE

NEW POLE WITH BACK-TO-BACK CANTILEVERS

POLE, JOINT USE WITH BACK-TO-BACK OCS CANTILEVERS AND STREET LIGHTS

TWO TRACK CANTILEVER - HINGED SUPPORT

SINGLE CONTACT WIRE BRIDLE SUPPORT AND REGISTRATION ASSEMBLY

POTENTIAL EQUALIZING JUMPER

POLE WITH BACK-TO-BACK DOUBLE CANTILEVERS

INSULATOR CUT INTO OUT-OF-RUNNING C/W

FULL CURRENT JUMPER

HEADSPAN SUPPORT STRUCTURE WITH STEADY SPAN REGISTRATION

SPRING TENSIONER - SINGLE CONTACT WIRE

BALANCE WEIGHT ANCHOR SIMPLE CATENARY SYSTEM

OUT OF RUNNING CONTACT WIRE

FIXED TERMINATION - SIMPLE CATENARY SYSTEM

TUNNEL OR BRIDGE SUPPORT

TUNNEL OR BRIDGE SUPPORT AND REGISTRATION

POLE WITH WIRE PULL OFF FOR ONE WIRE

GENERAL NOTES:

1. ITEMS SHOWN SCREENED ARE EITHER NOT-IN-CONTRACT OR ARE PART OF ANOTHER DESIGN PACKAGE.
2. DEPTH OF CONDUITS MAY VARY SLIGHTLY IN ORDER TO ACHIEVE ADEQUATE DRAINAGE INTO MANHOLES, HANDHOLES AND PULLBOXES. SEE SPECIFICATIONS.
3. ALL HANDHOLES AND MANHOLES SHALL BE LOCATED WITH LONG SIDE PARALLEL TO TRACKS UNLESS OTHERWISE NOTED
4. COORDINATE INSTALLATION OF DUCTBANKS AT TRACK DRAINS AND BELOW TRACK SLABS.
5. LOCATION OF KNOWN EXISTING UNDERGROUND UTILITIES IS INDICATED ON UTILITY DRAWINGS. FIELD VERIFY LOCATIONS OF EXISTING UTILITIES PRIOR TO BEGINNING INSTALLATION OF THIS WORK.

A SECTION
SCALE: NTS
SECTION A

1 XXXX
DETAIL No. 1 ON XXXX = SHEET NO.

1 DETAIL SCALE: NTS
DETAIL No. 1 (WHERE INDICATED OR SHOWN)

A
SECTION CROSS SECTION

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
GENERAL
LEGEND, SYMBOLS
AND GENERAL NOTES

DISCIPLINE: SYSTEMS

SHEET NAME: SYS-GEN-003

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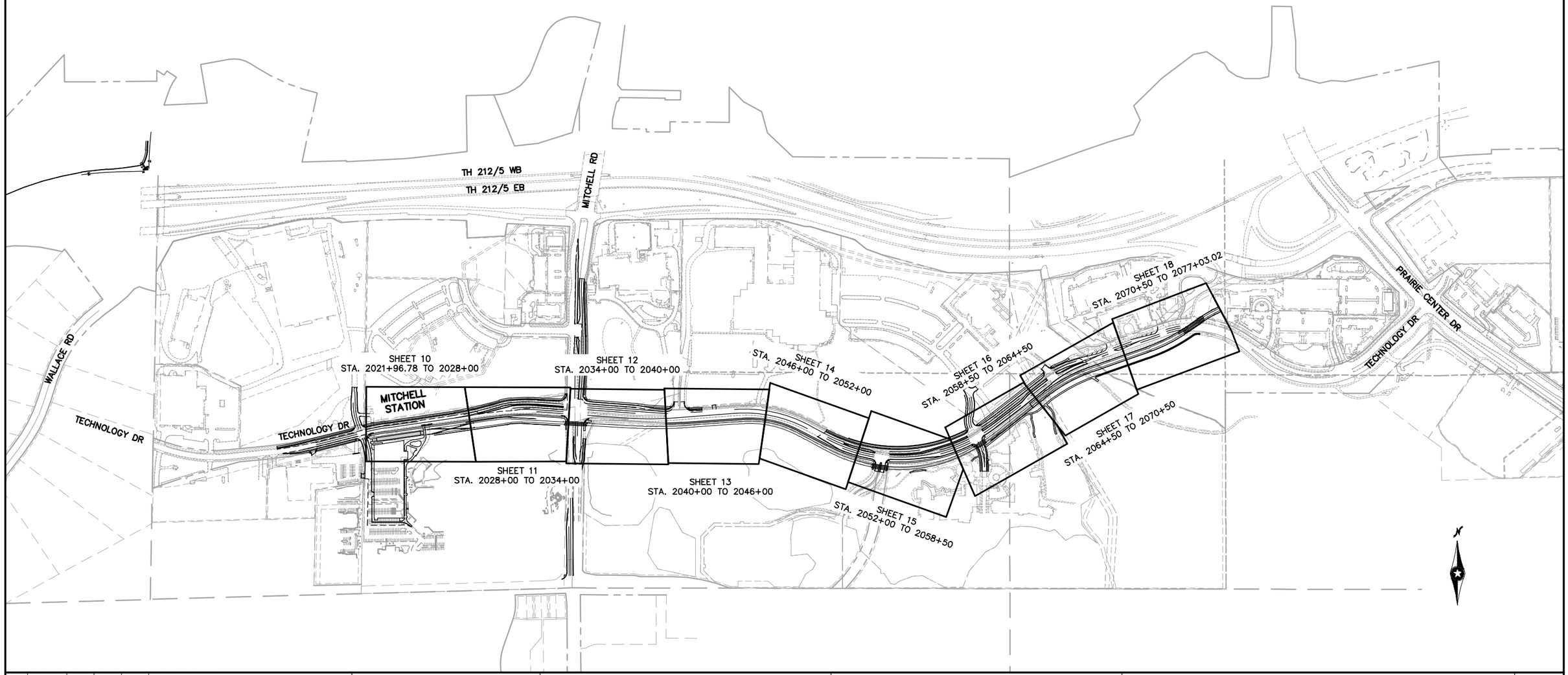

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
SHEET LAYOUT INDEX

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-IDX-001

SHEET 5 OF 202

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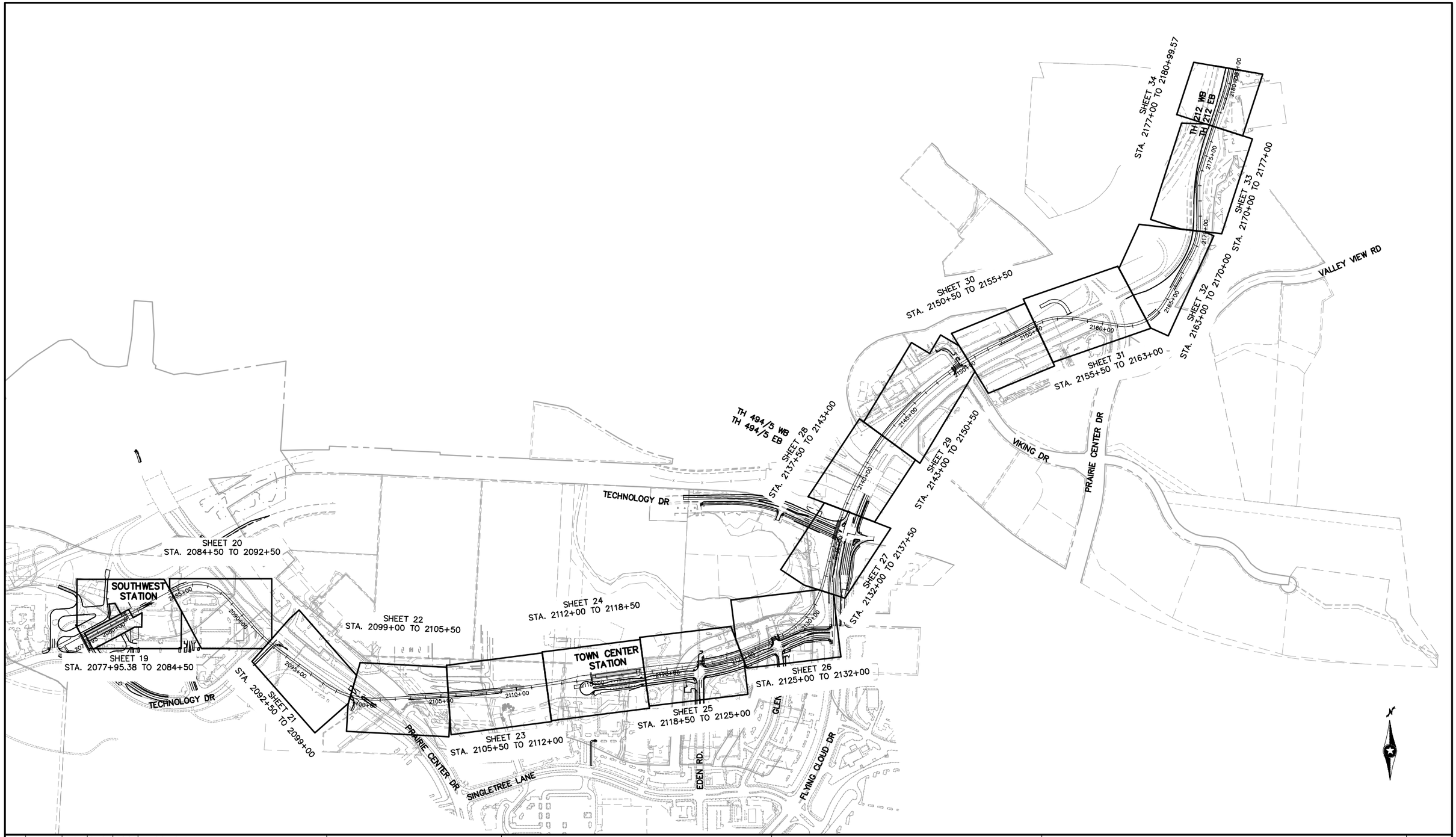

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST
Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
SHEET LAYOUT INDEX

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-IDX-002

SHEET 6 OF 202

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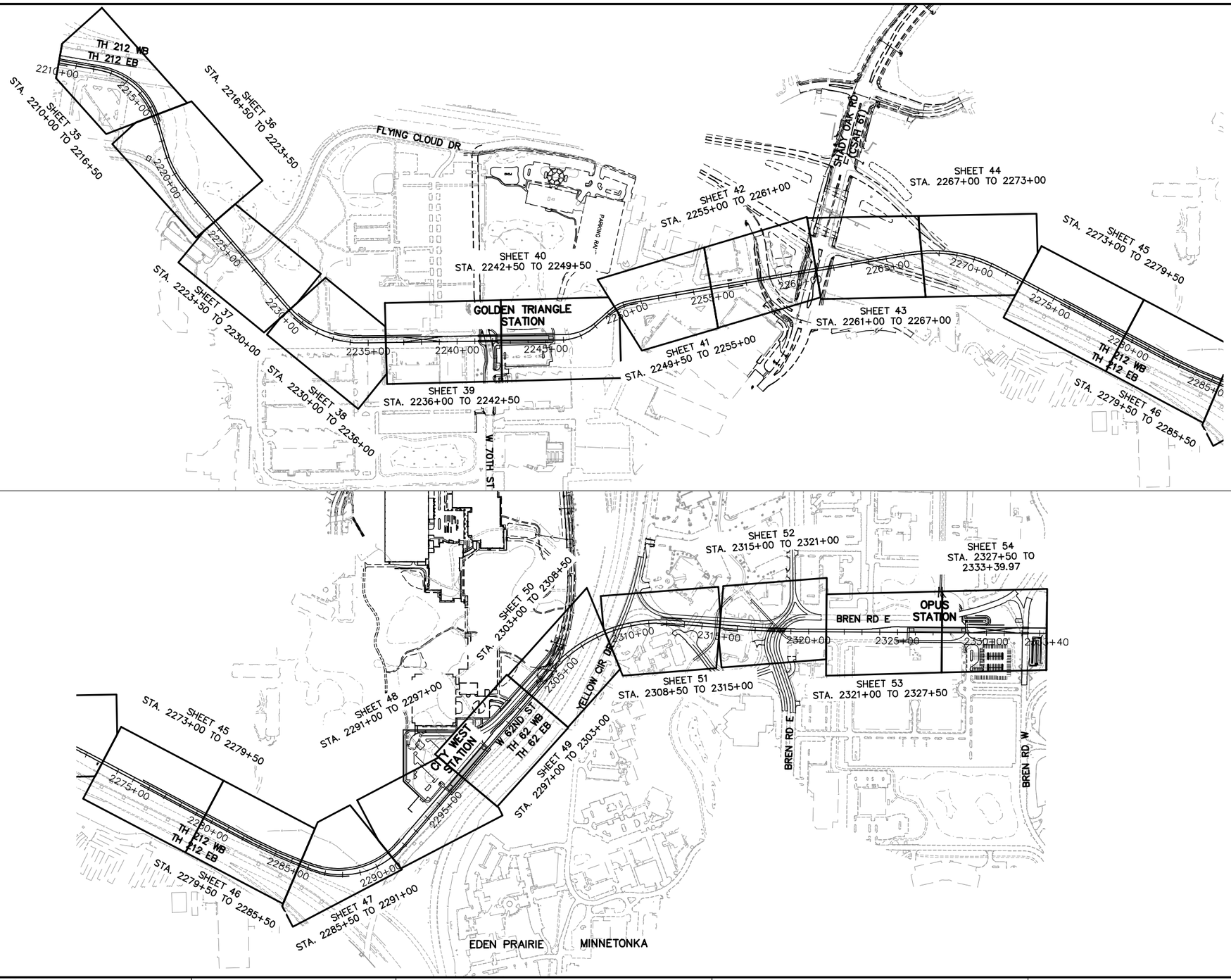

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
SHEET LAYOUT INDEX

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-IDX-003

SHEET 7 OF 202

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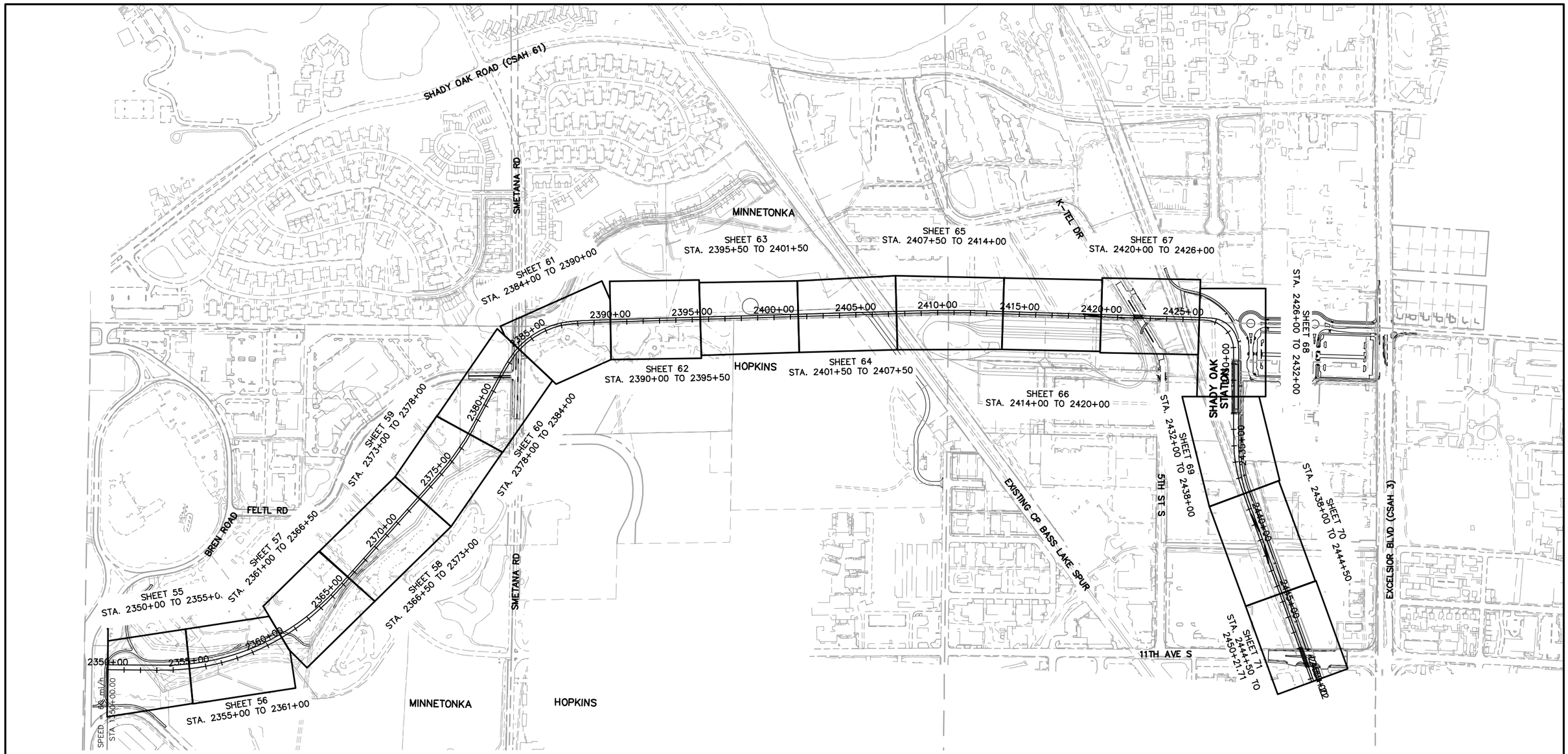

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

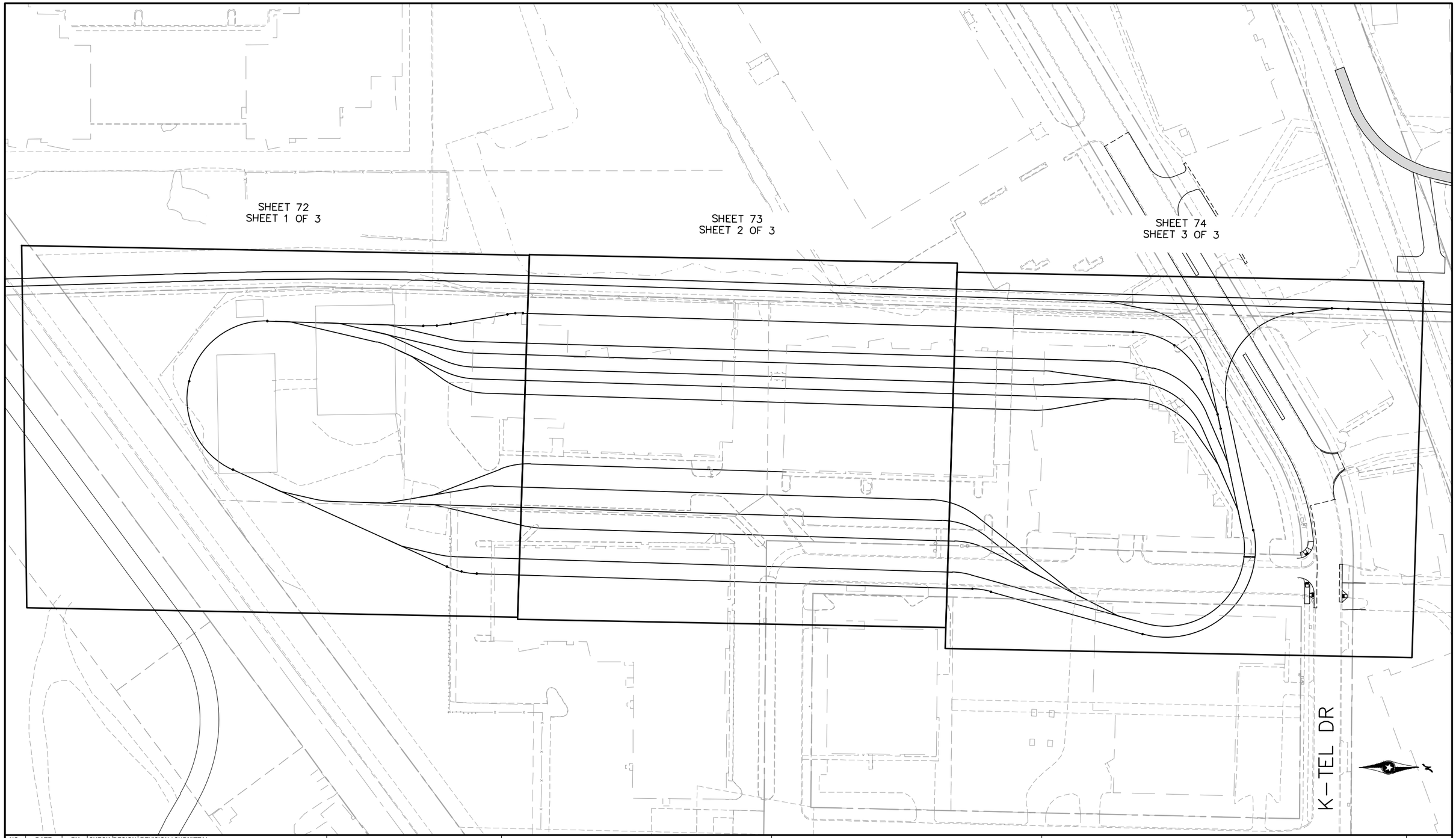
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
SHEET LAYOUT INDEX

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-IDX-004

SHEET 8 OF 202

Jun. 27 2014 08:38 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-IDX.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

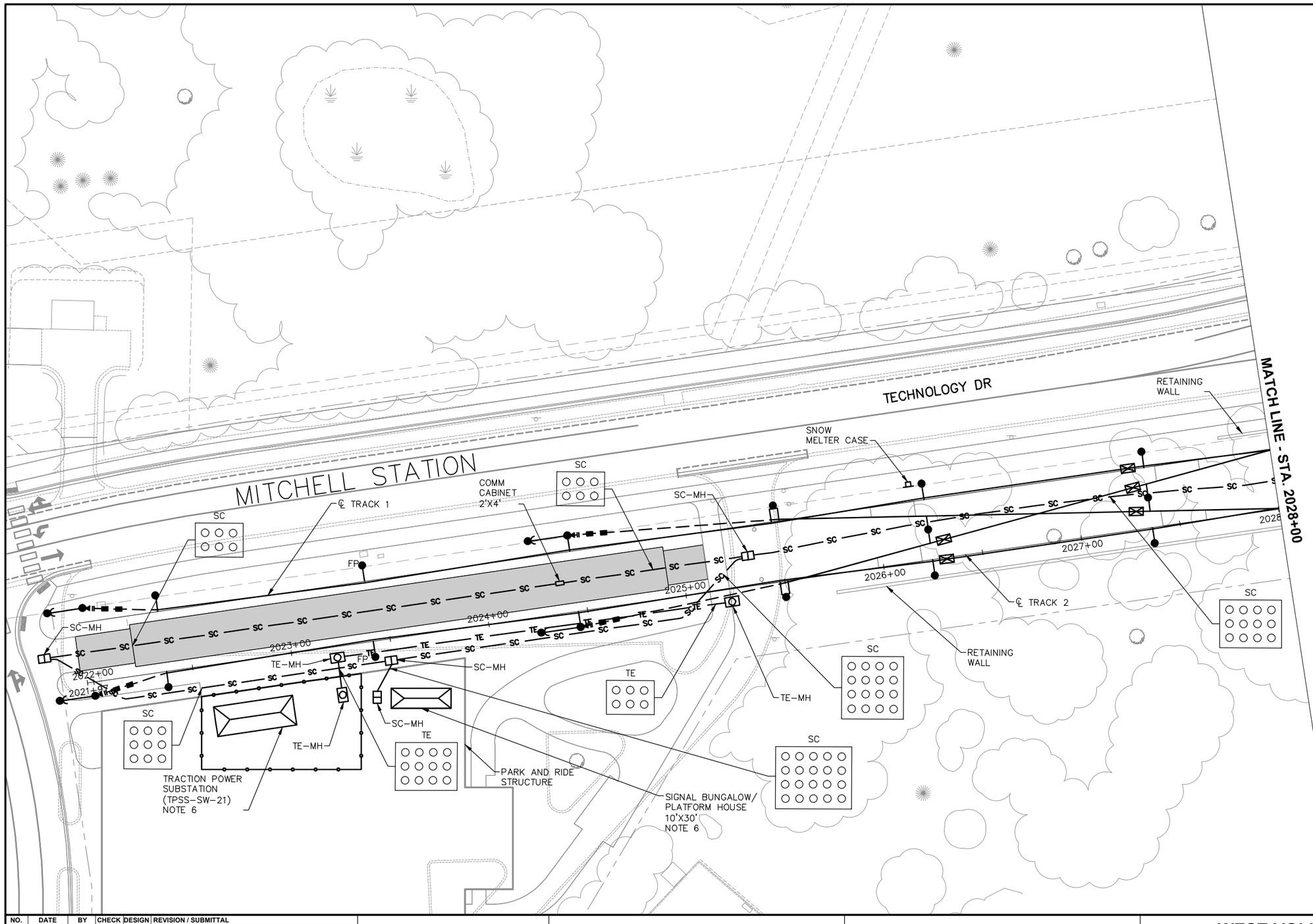
WEST-VOLUME 3 (SYSTEMS)
SEGMENT OMF
PLAN SHEET LAYOUTS
SHEET LAYOUT INDEX

DISCIPLINE: SYSTEMS

SHEET NAME: OMF-SYS-IDX-005

SHEET 9 OF 202

Jun, 27 2014 08:39 am V:\3200_PEC-W\CAD\OMF\PLAN SHEET\SYSTEMS\OMF-SYS-IDX.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.
6. TRACTION POWER SUBSTATION AND SIGNAL BUNGALOW/PLATFORM HOUSE ARE LOCATED IN THE PARK AND RIDE STRUCTURE. ACCESS TO THE SITE WILL BE THROUGH ENTRANCE OF THE STRUCTURE.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2021+96.78 TO STA. 2028+00

DISCIPLINE: SYSTEMS

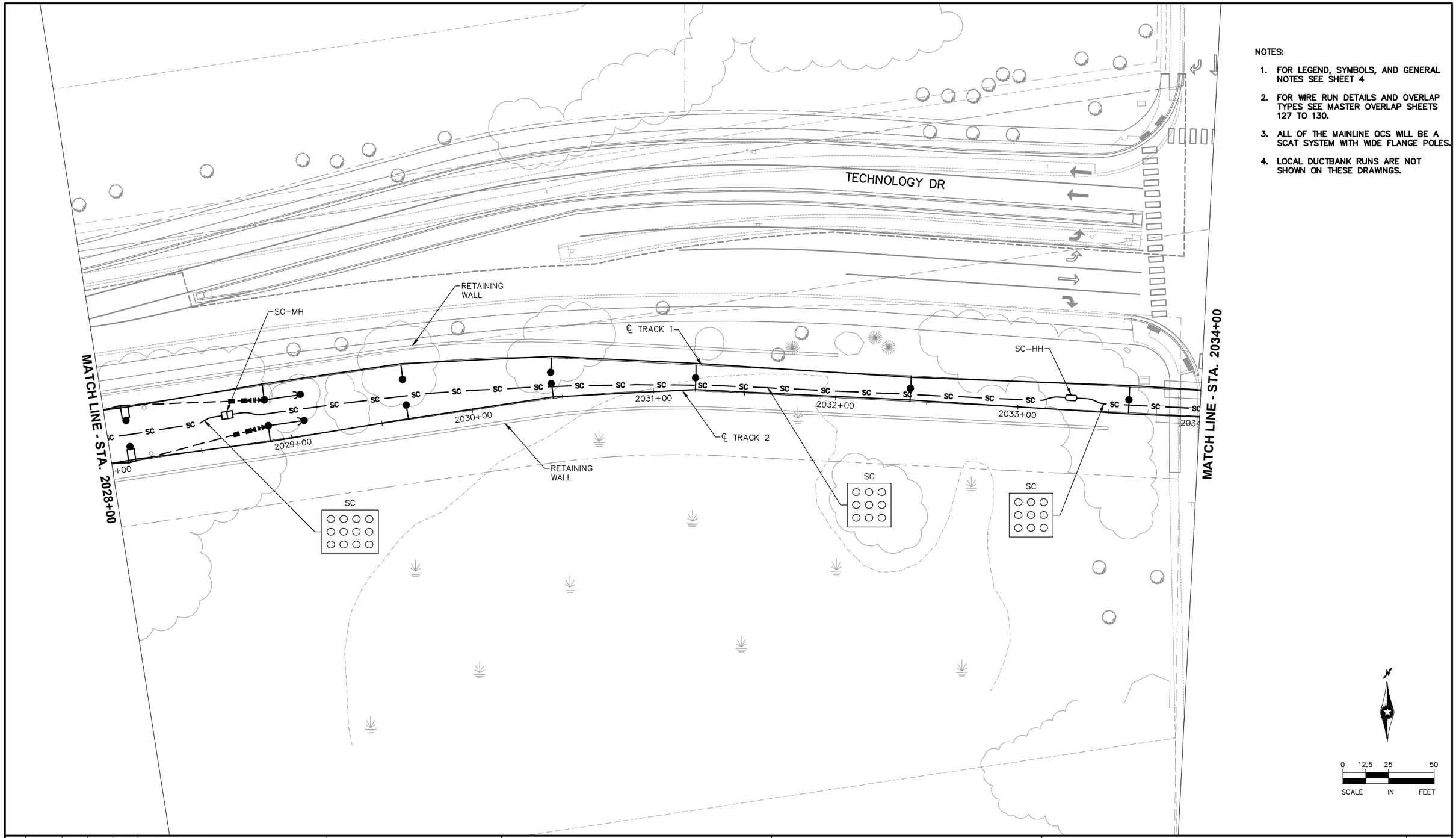
SHEET NAME: W1A-SYS-PLN-001

SHEET 10 OF 202

Aug. 28 2014 08:34 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

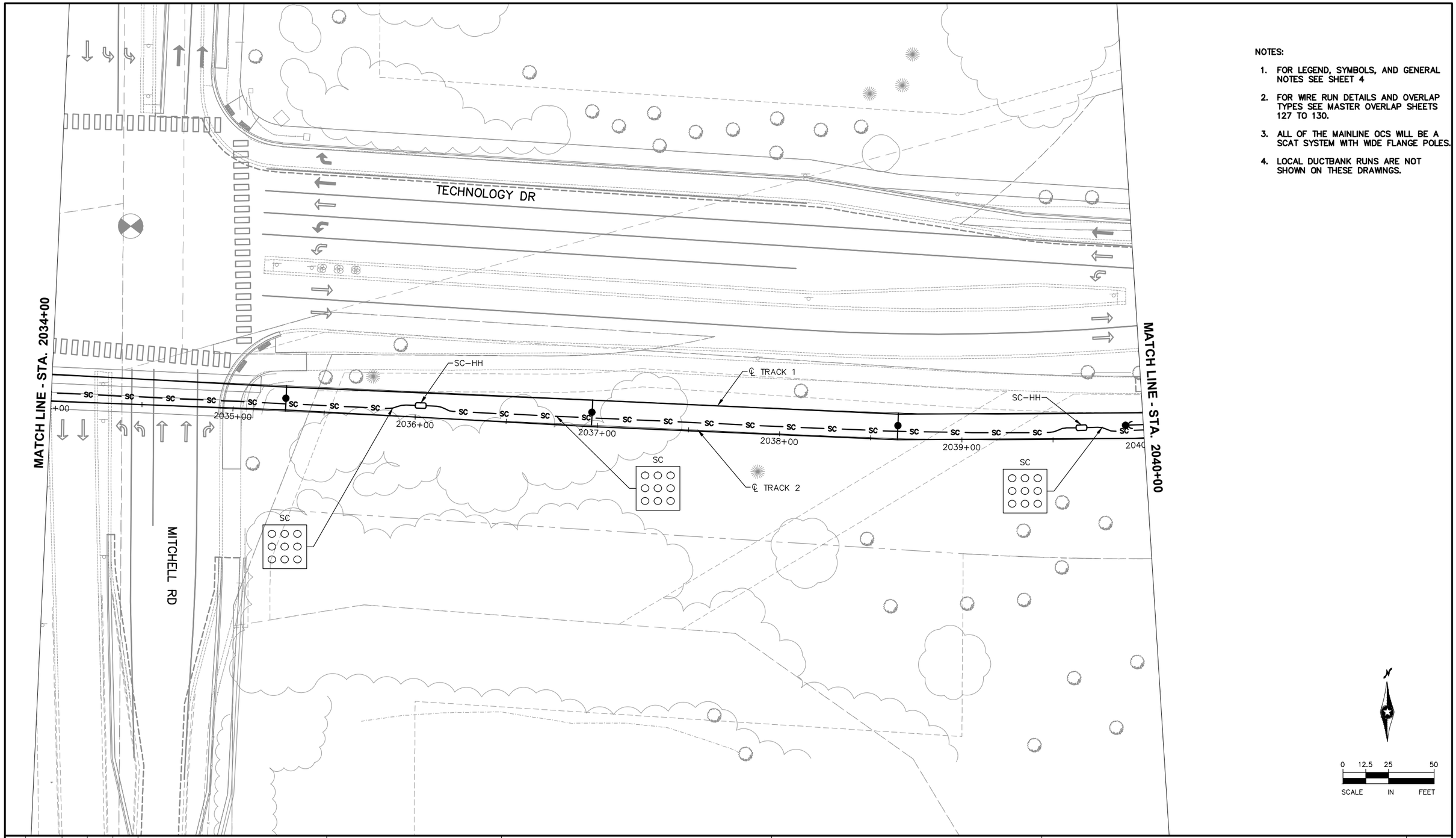
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2028+00 TO STA. 2034+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-002

SHEET 11 OF 202

Jun, 27 2014 08:43 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

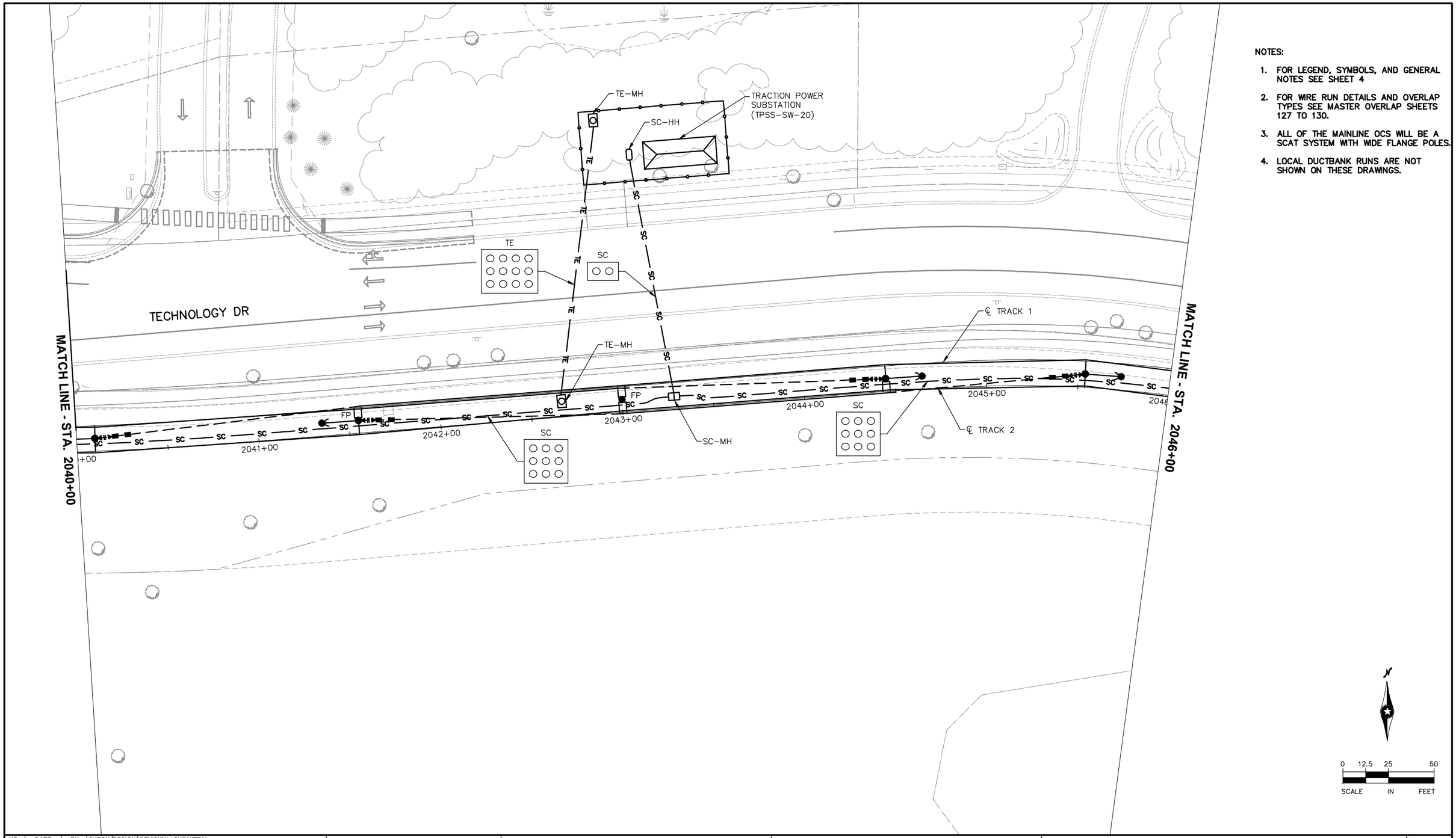
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2034+00 TO STA. 2040+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-003

SHEET 12 OF 202

Jun, 27 2014 08:44 am v:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2040+00 TO STA. 2046+00

DISCIPLINE: SYSTEMS

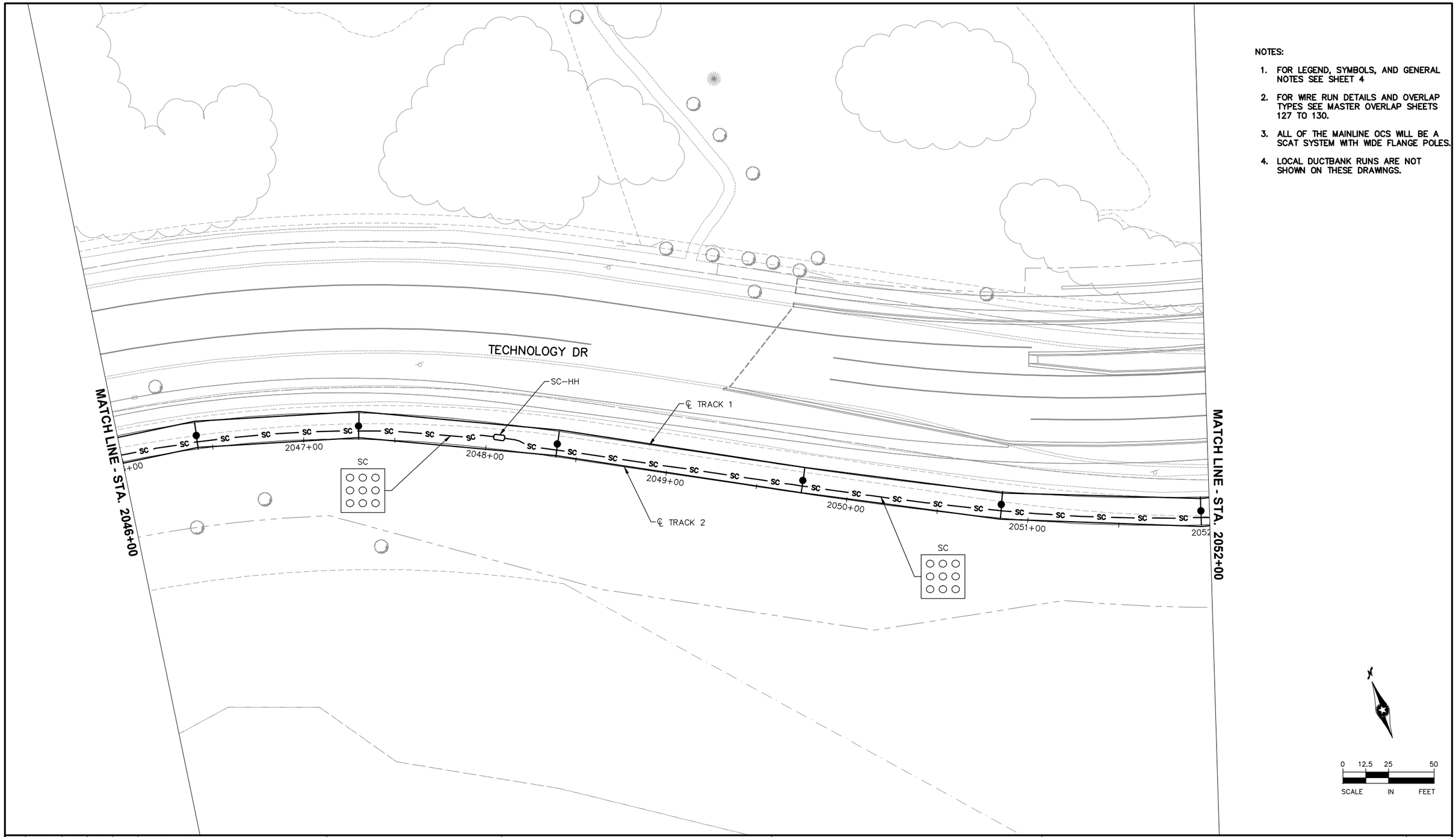
SHEET NAME: W1A-SYS-PLN-004

SHEET 13 OF 202

Jun, 27 2014 08:44 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: HeinEE

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

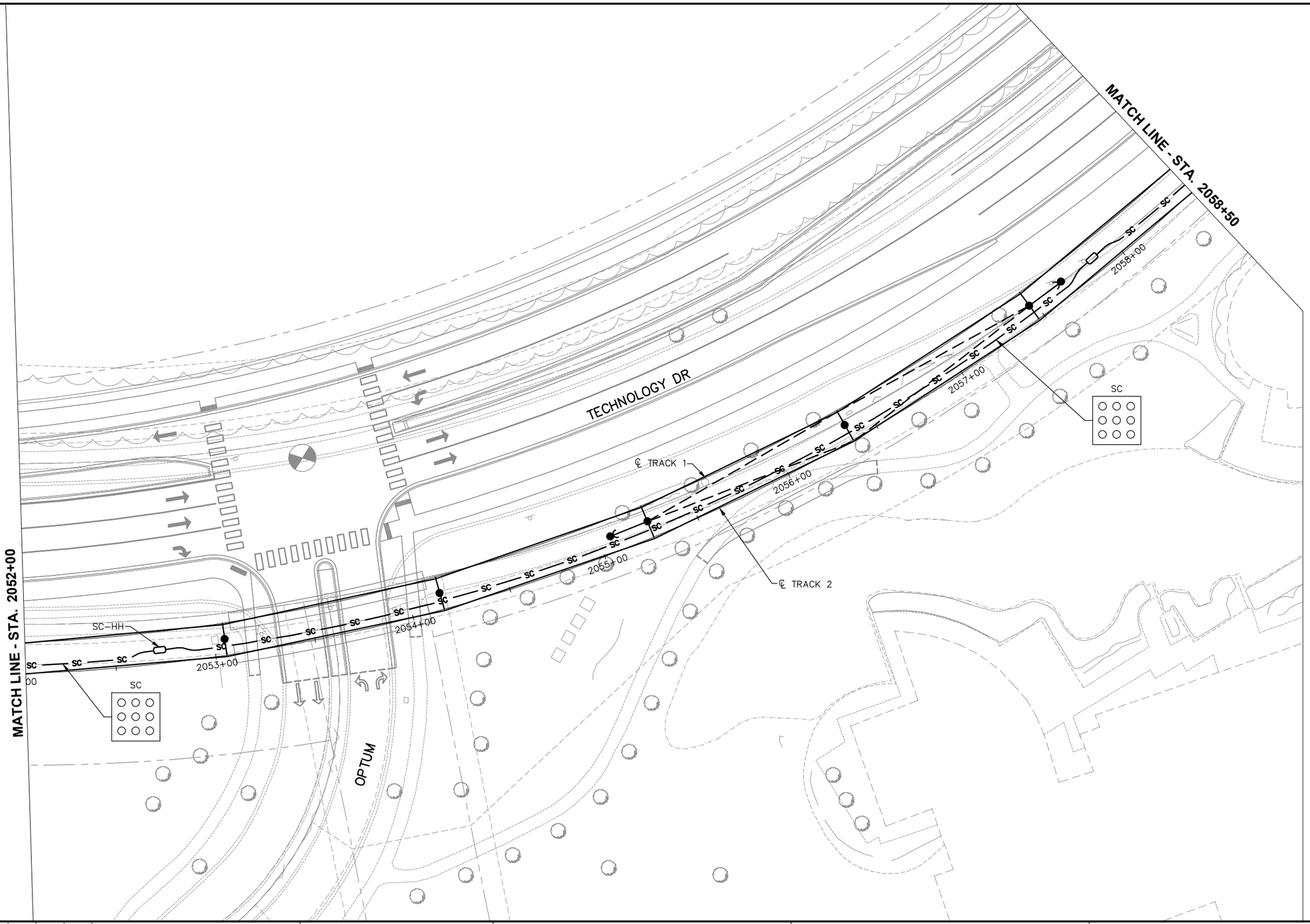
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2046+00 TO STA. 2052+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-005

SHEET 14 OF 202

Jun, 27 2014 08:45 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

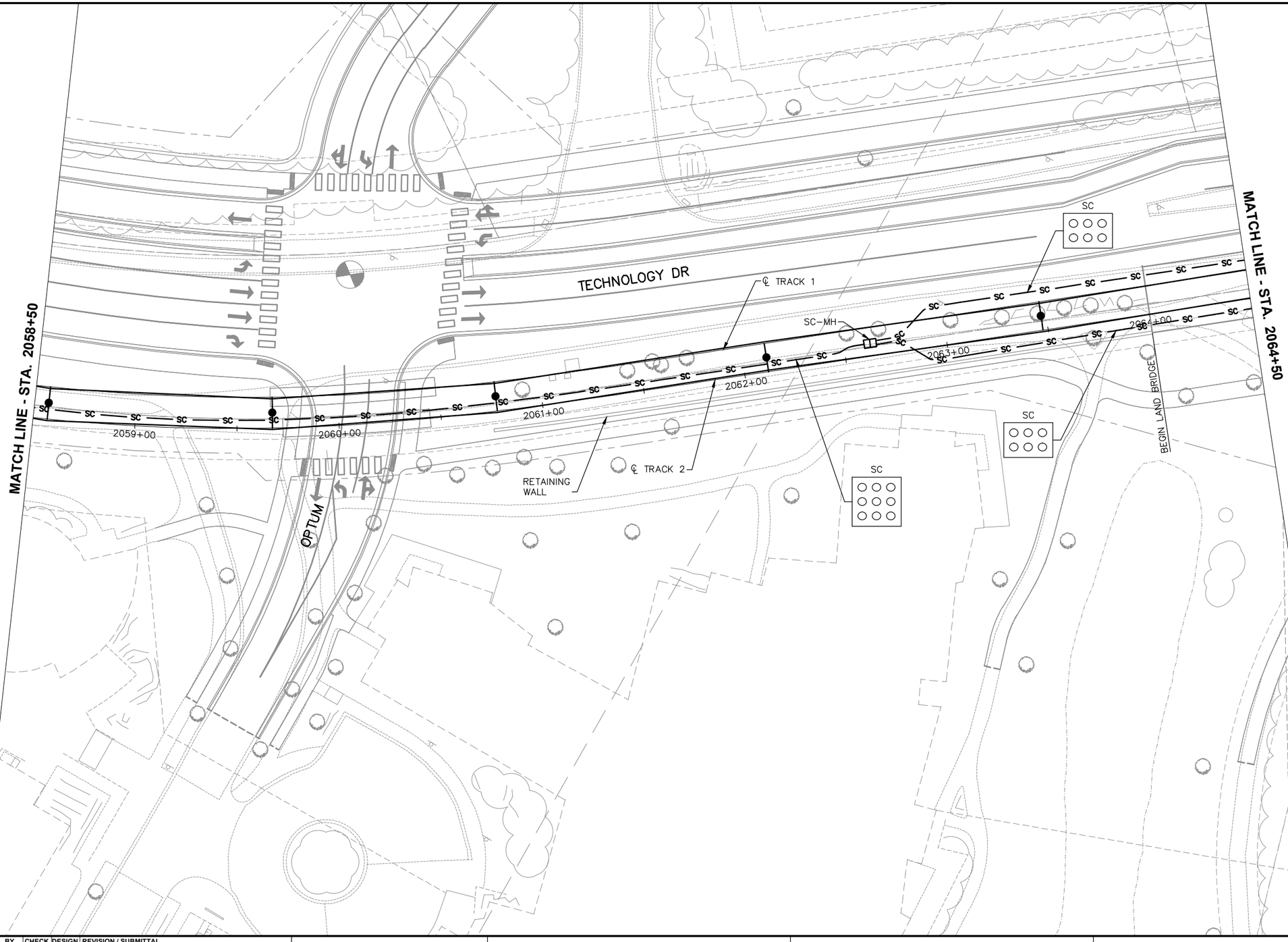
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2052+00 TO STA. 2058+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-006

SHEET 15 OF 202

Jun, 27 2014 08:46 am v:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

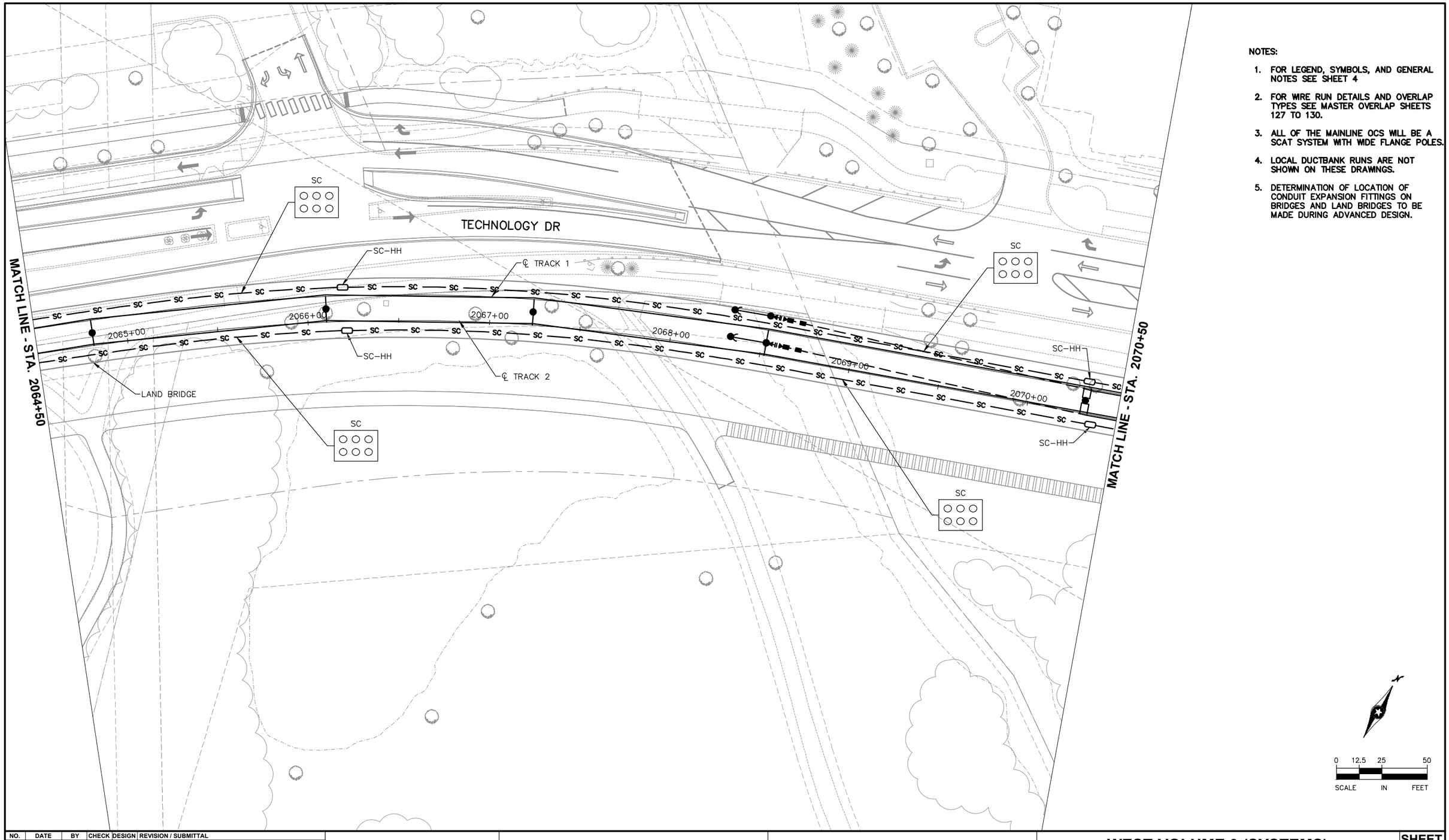
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2058+50 TO STA. 2064+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-007

SHEET 16 OF 202

Aug. 28 2014 08:34 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

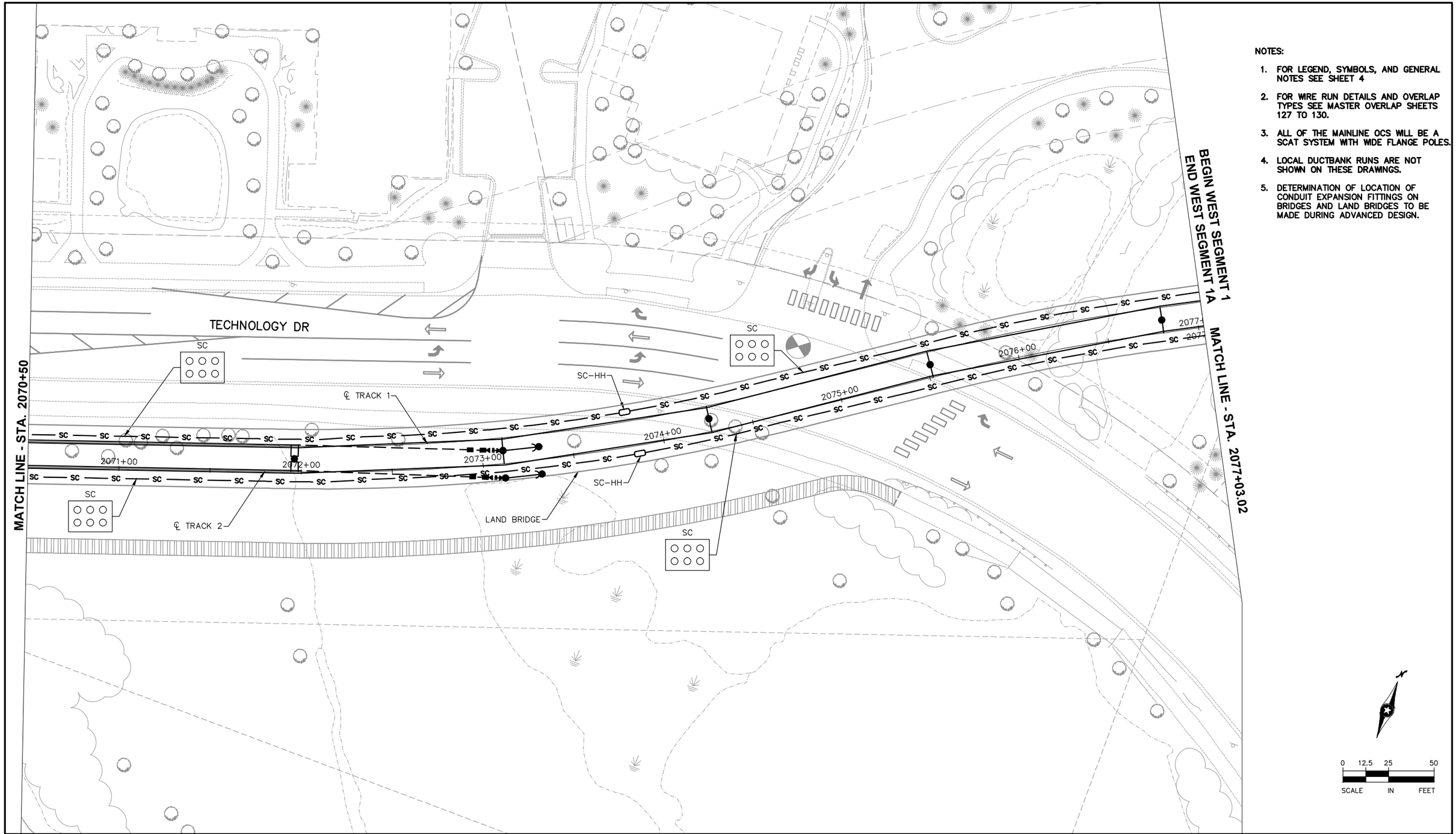
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2064+50 TO STA. 2070+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-008

SHEET 17 OF 202

Aug. 28 2014 08:34 am V:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

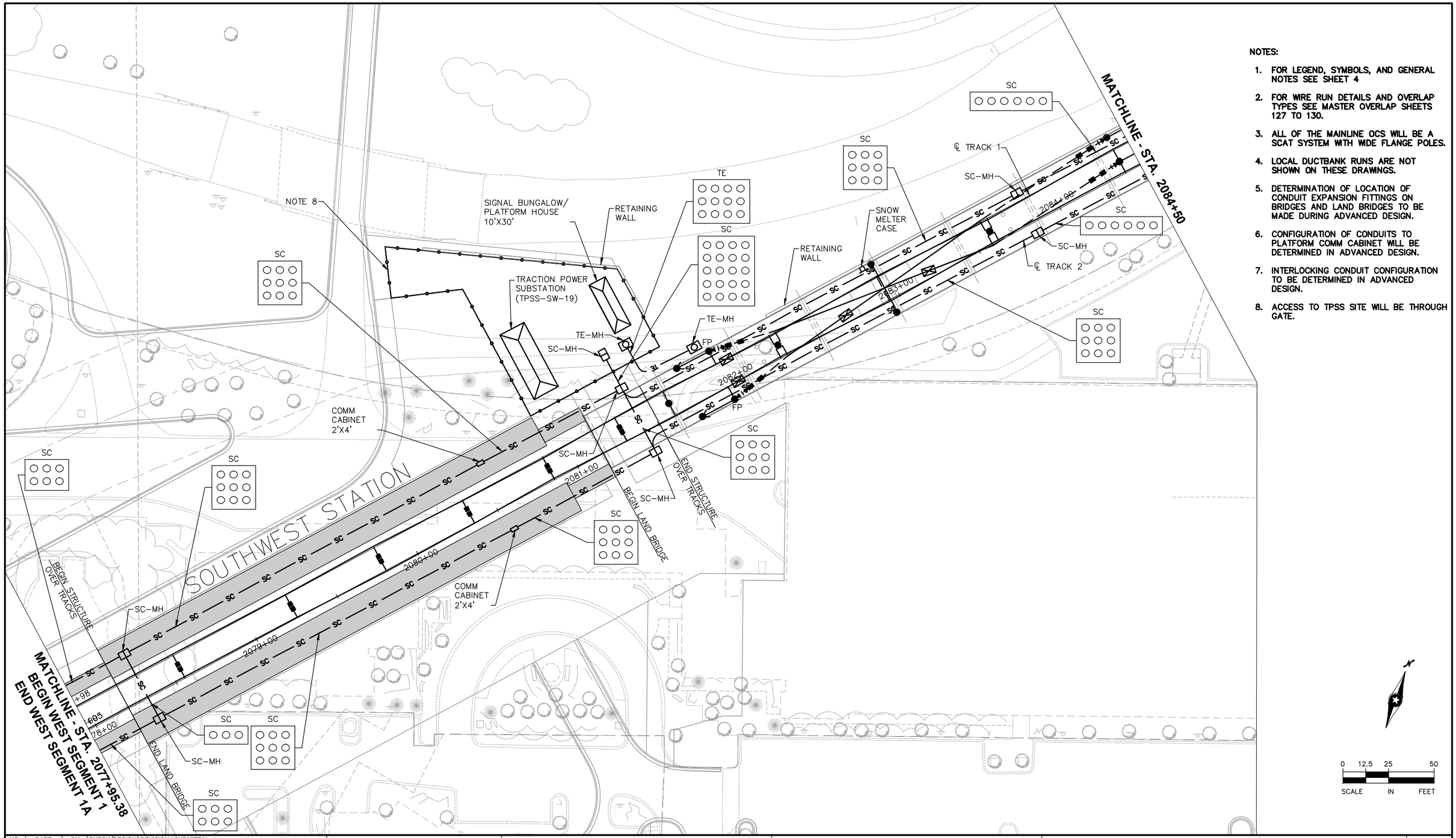
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1A
PLAN SHEET LAYOUTS
STA. 2070+50 TO STA. 2077+03.02

DISCIPLINE: SYSTEMS

SHEET NAME: W1A-SYS-PLN-009

SHEET 18 OF 202

Aug. 28 2014 08:35 am v:\3200_PEC-W\CAD\SEGMENT-W1A\SHEET\SYSTEMS\W1A-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.
6. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.
7. INTERLOCKING CONDUIT CONFIGURATION TO BE DETERMINED IN ADVANCED DESIGN.
8. ACCESS TO TPSS SITE WILL BE THROUGH GATE.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2077+95.38 TO STA. 2084+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-001

SHEET 19 OF 202

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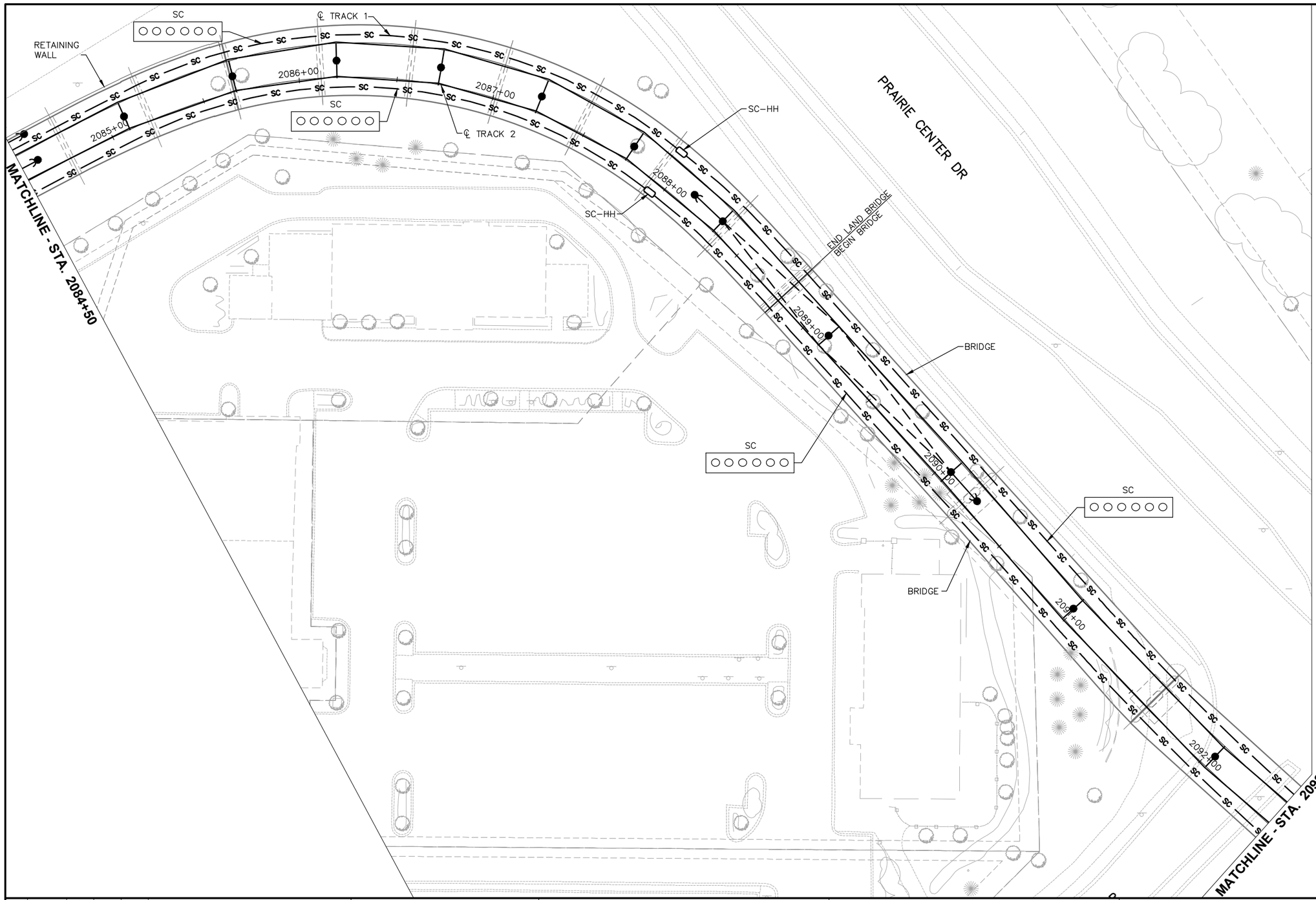

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

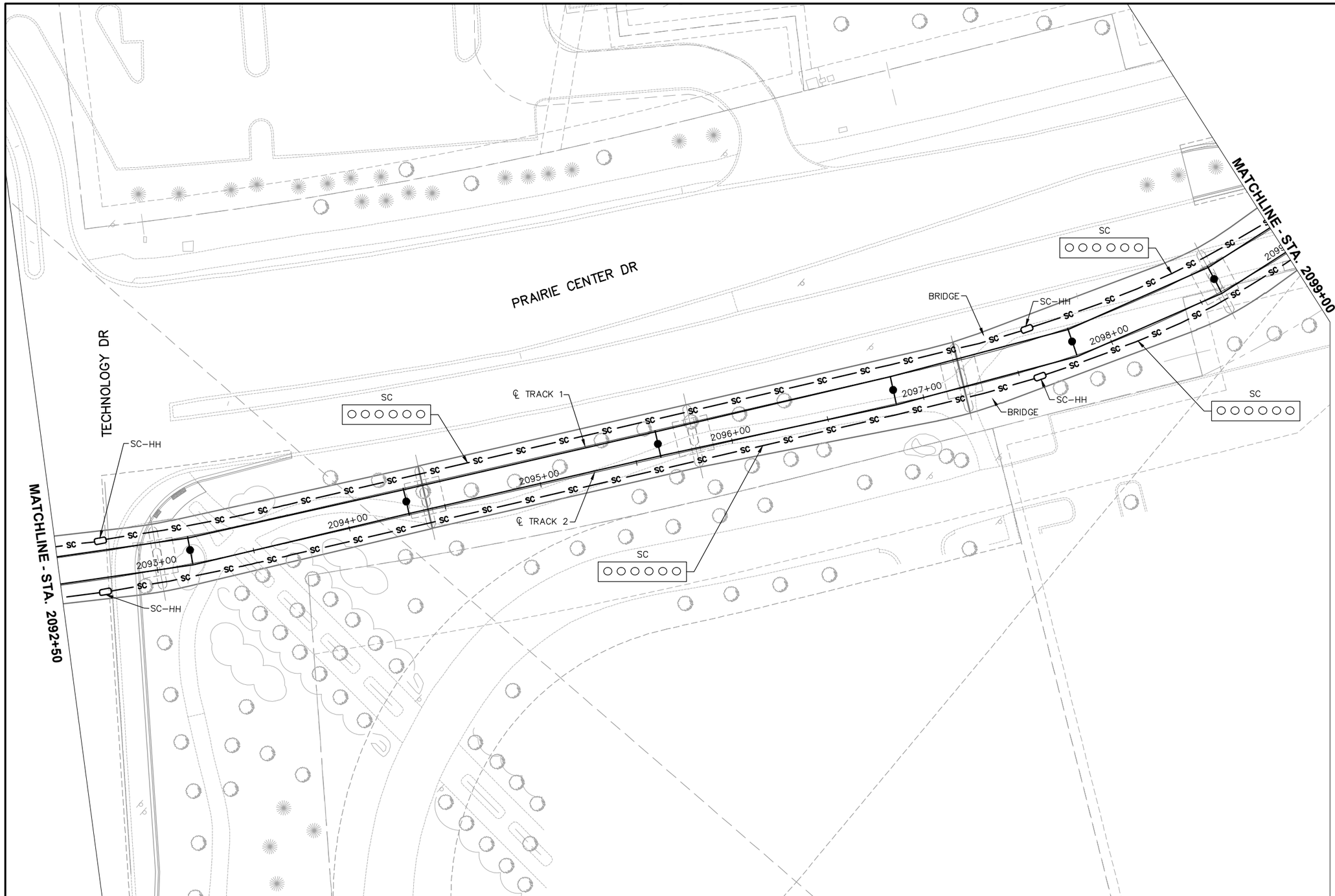
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2084+50 TO STA. 2092+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-002

SHEET 20 OF 202

Aug, 28 2014 08:36 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

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2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

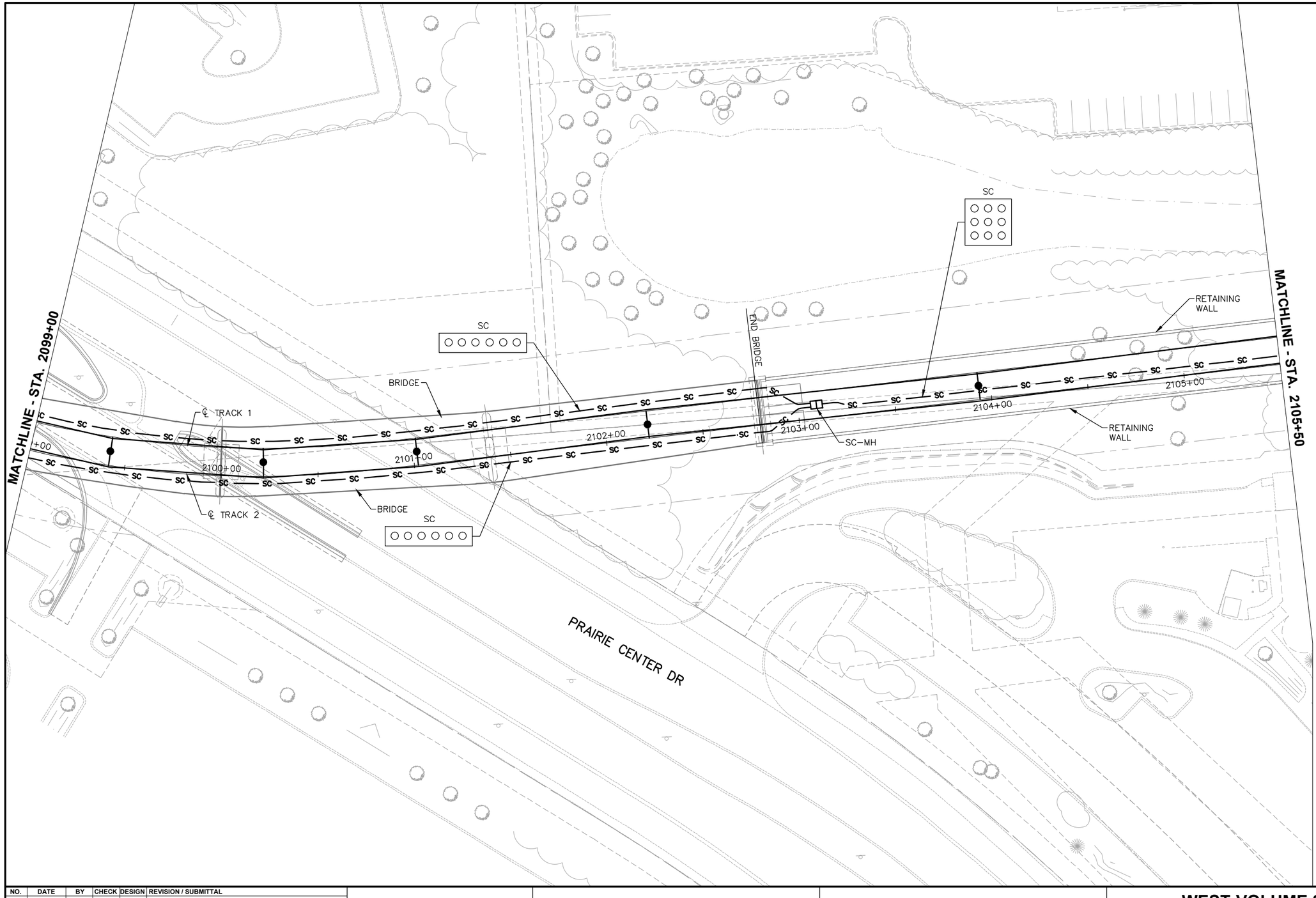
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2092+50 TO STA. 2099+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-003

SHEET 21 OF 202

Aug. 28 2014 08:36 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

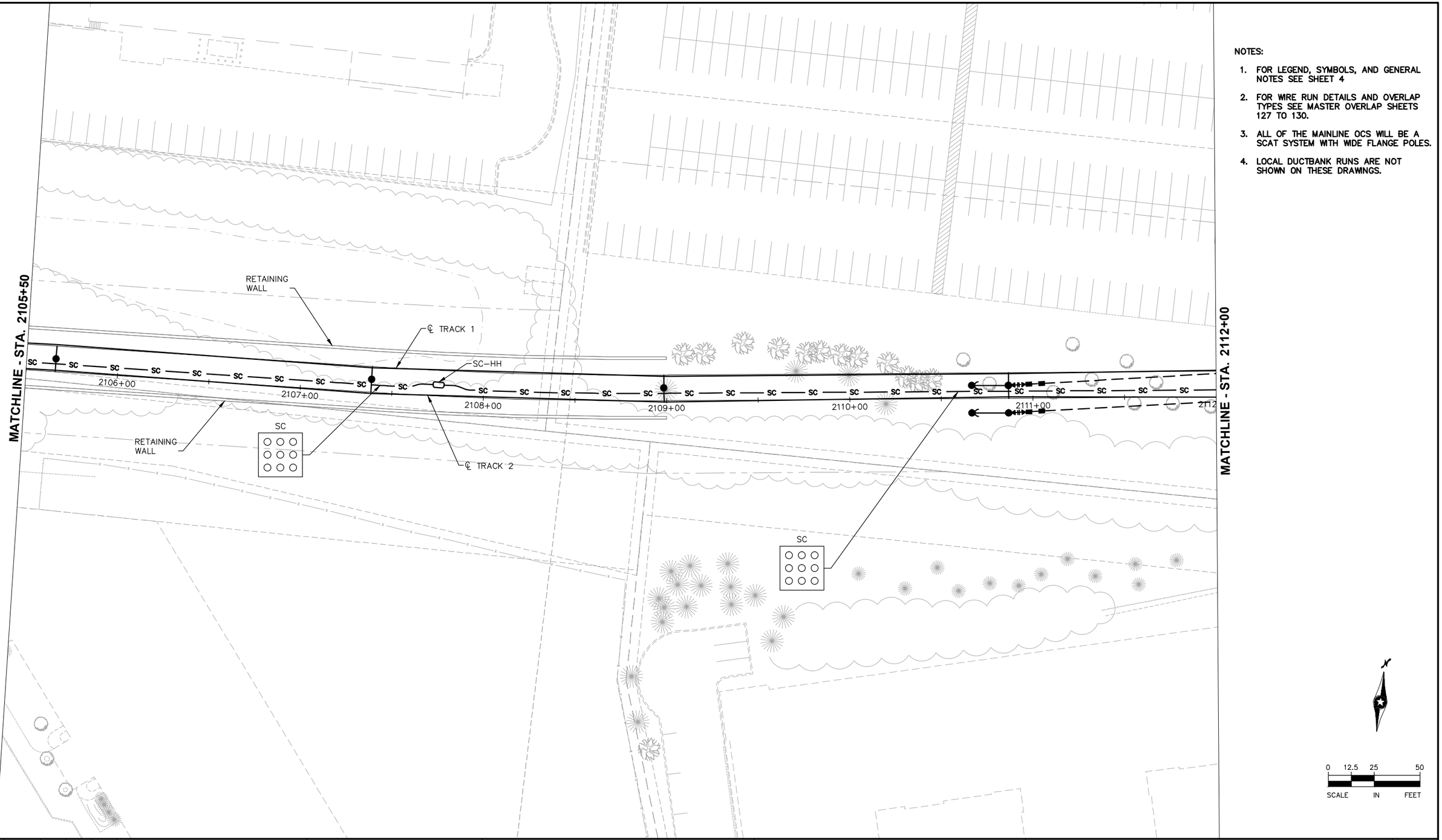
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2099+00 TO STA. 2105+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-004

SHEET 22 OF 202

Aug, 28 2014 08:36 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2105+50 TO STA. 2112+00

DISCIPLINE: SYSTEMS

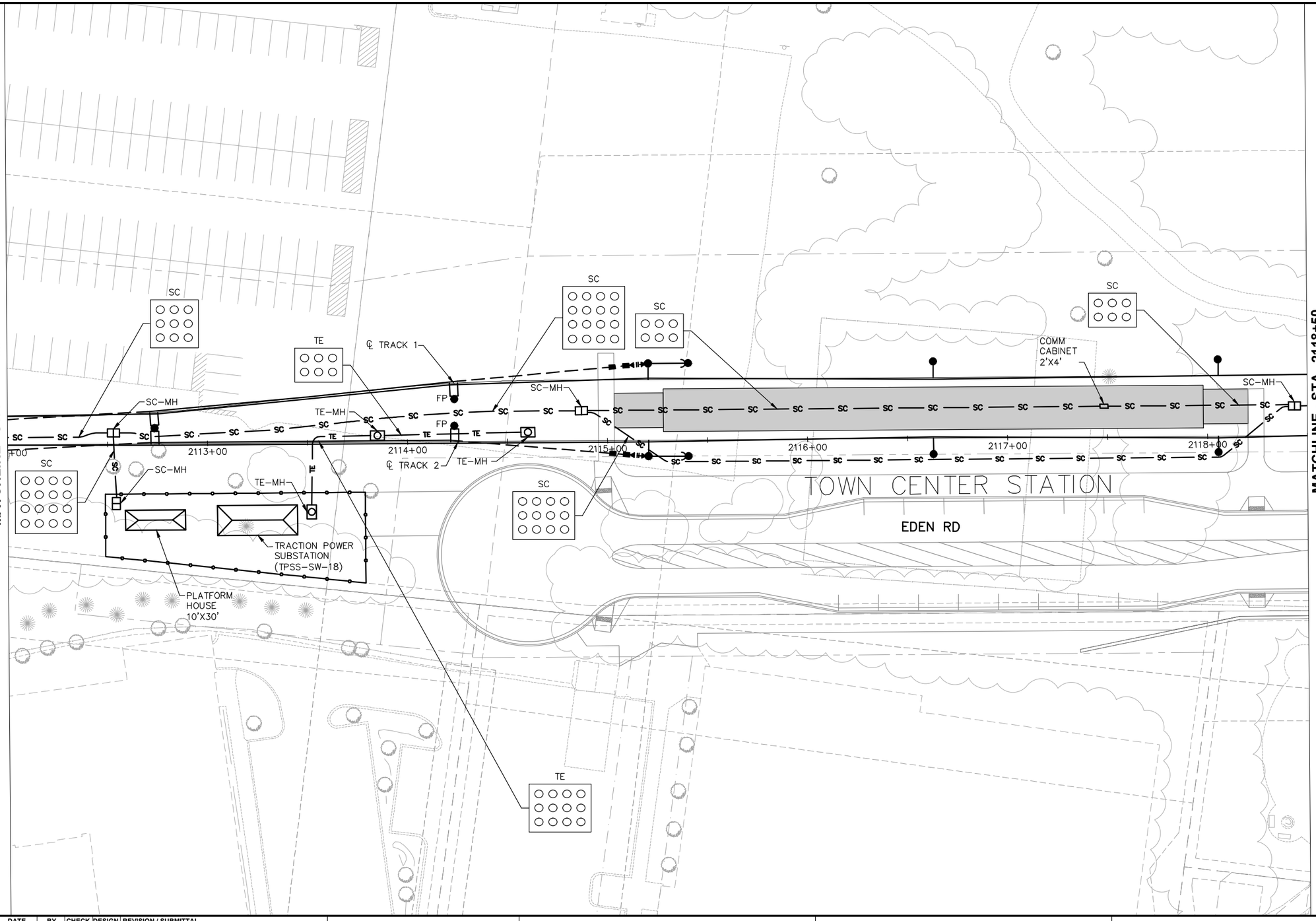
SHEET NAME: W1-SYS-PLN-005

SHEET 23 OF 202

Jun. 27 2014 09:00 am v:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: HeinEE

MATCHLINE - STA. 2112+00

MATCHLINE - STA. 2118+50



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.

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0 12.5 25 50

SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

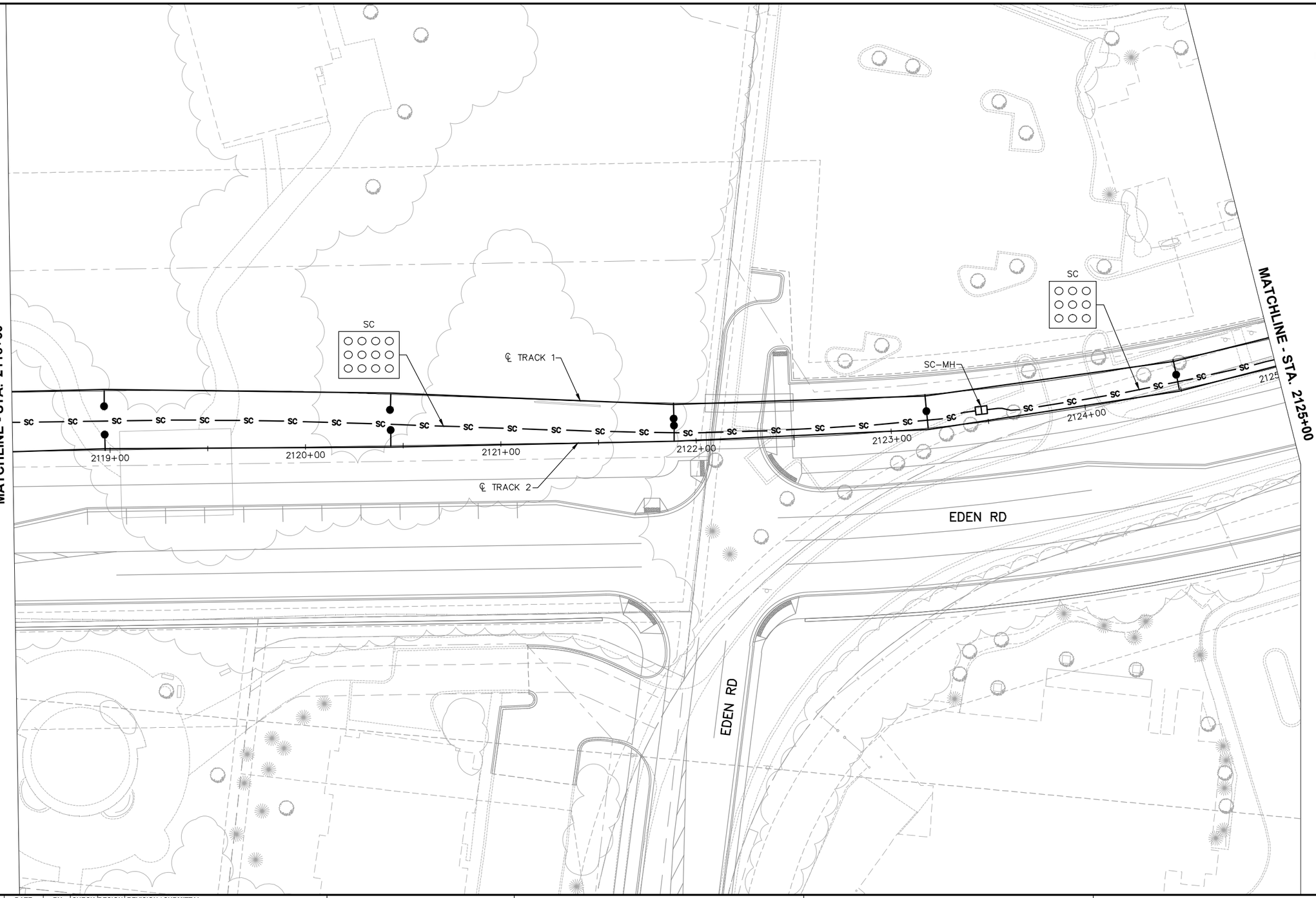
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2112+00 TO STA. 2118+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-006

SHEET 24 OF 202

Aug. 28 2014 08:37 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

0 12.5 25 50
SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

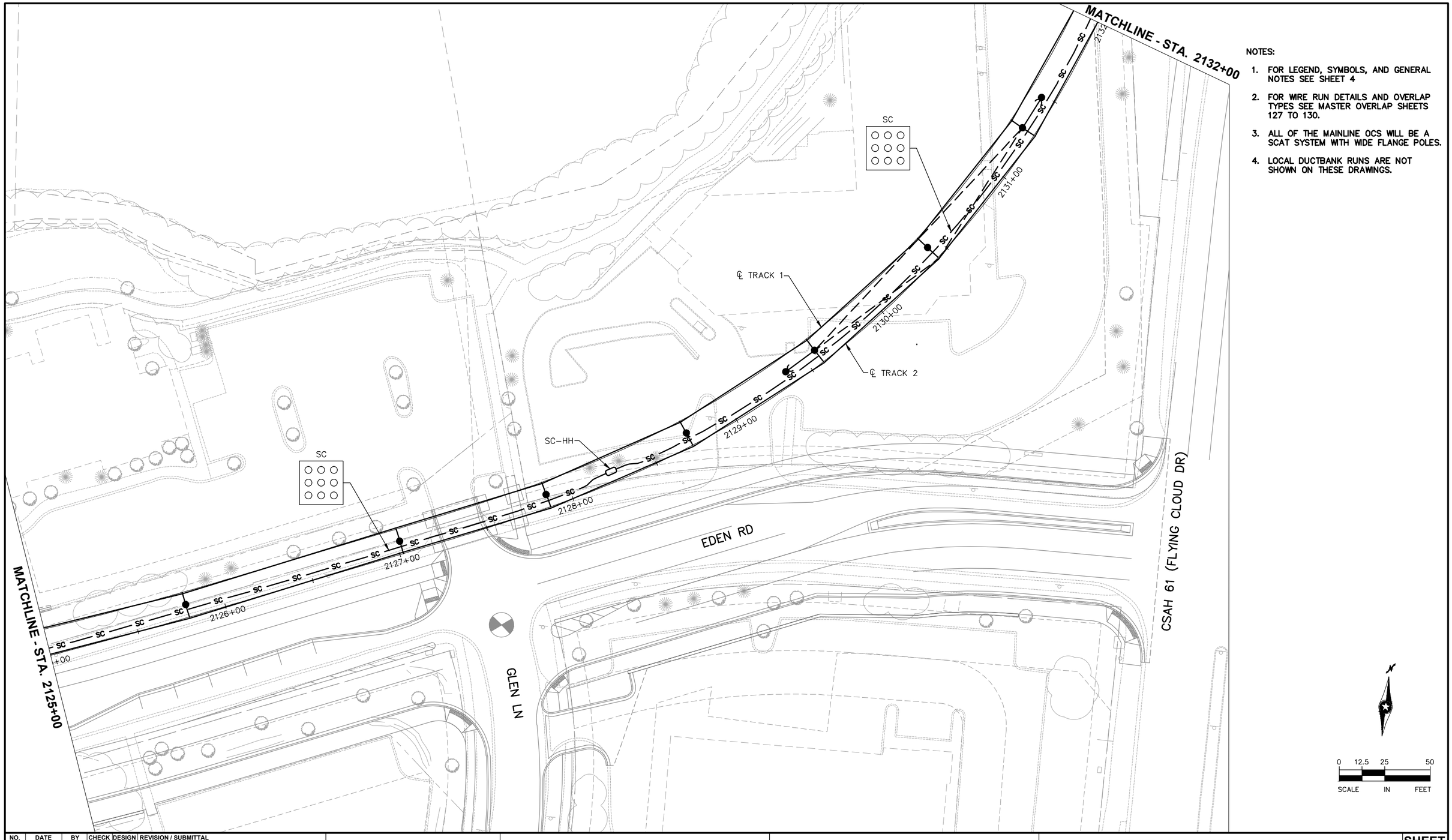
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2118+50 TO STA. 2125+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-007

SHEET 25 OF 202

Jun. 27 2014 09:02 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2125+00 TO STA. 2132+00

DISCIPLINE: SYSTEMS

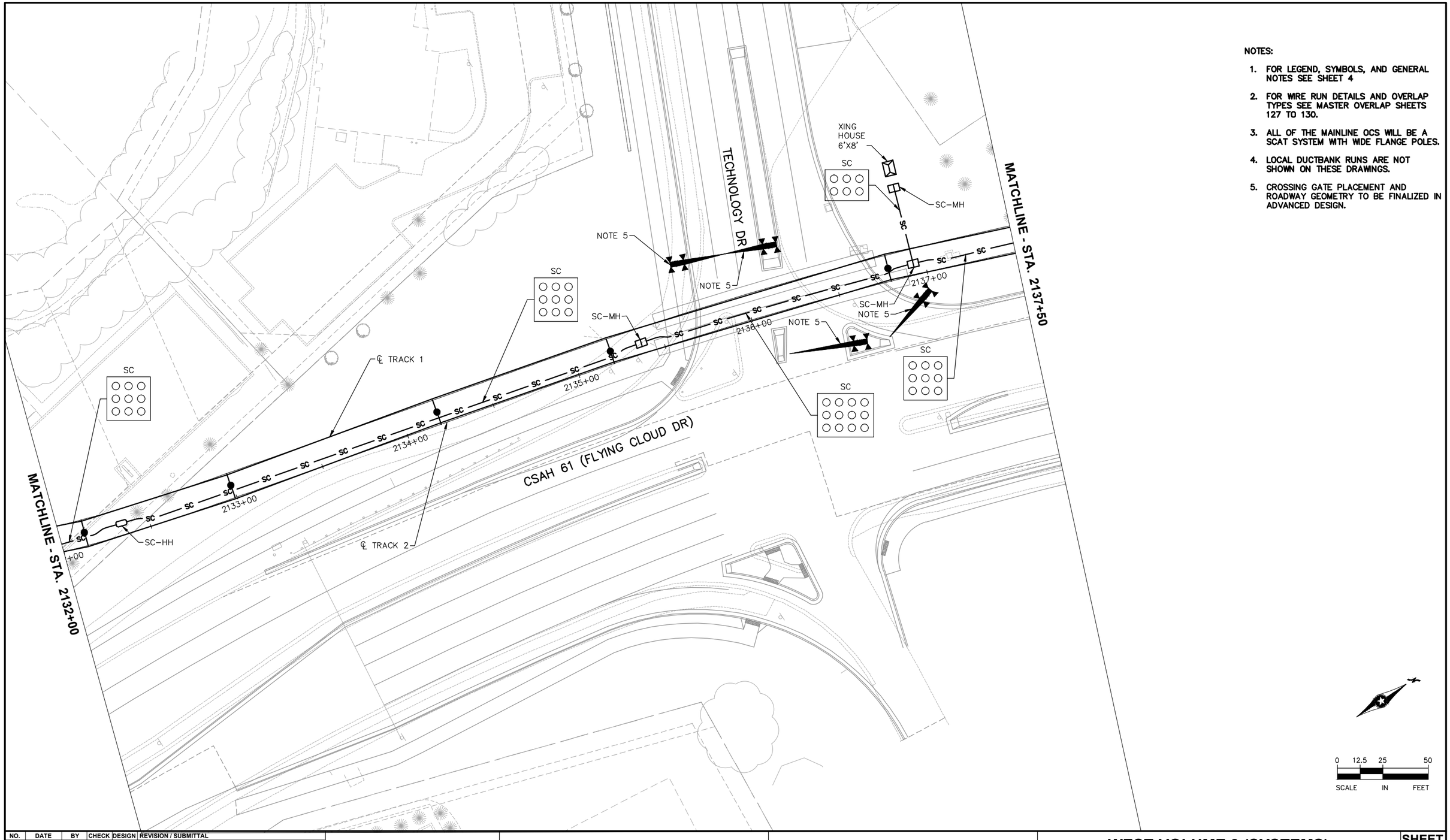
SHEET NAME: W1-SYS-PLN-008

SHEET 26 OF 202

Aug. 28 2014 08:37 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

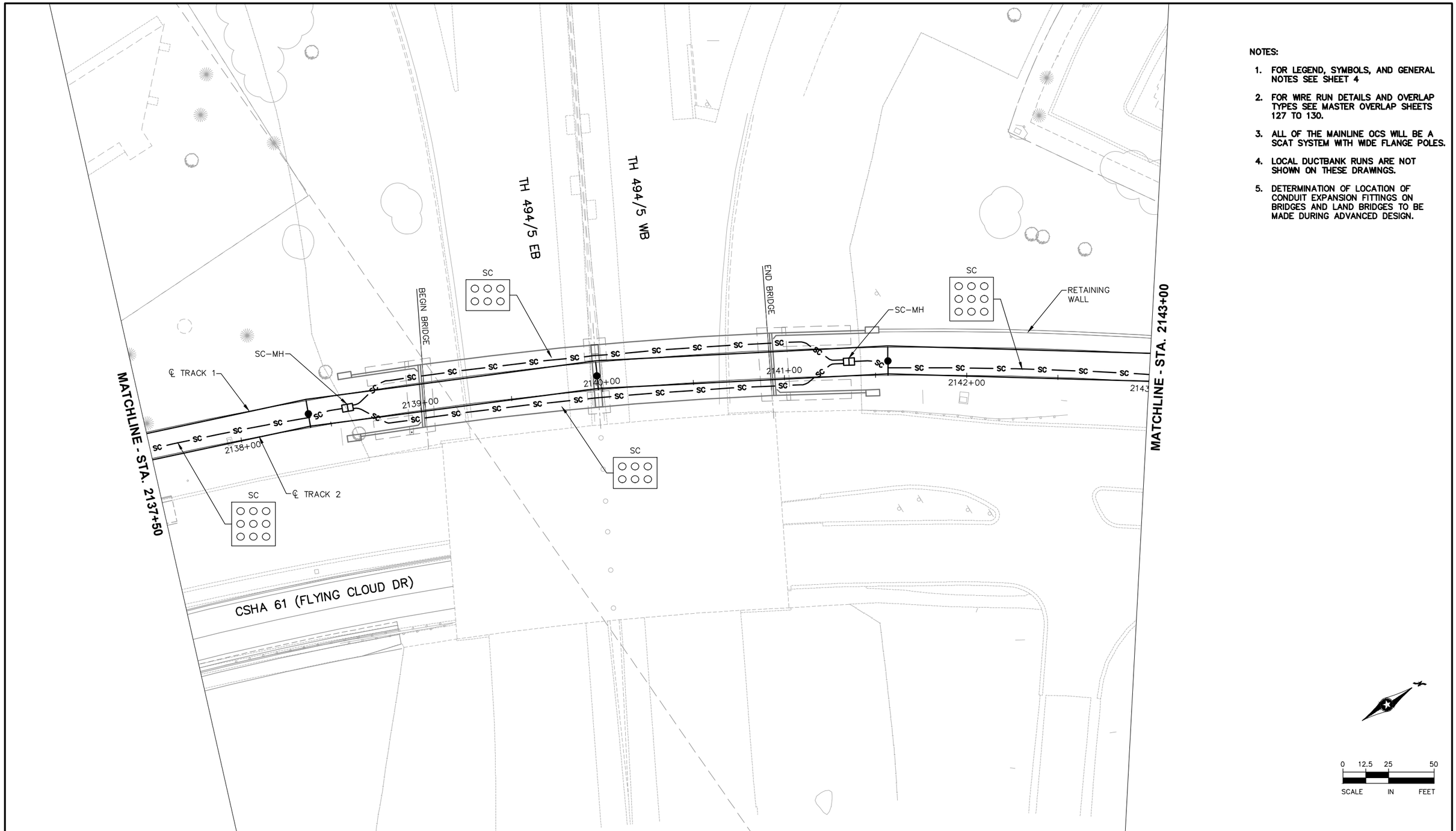
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2132+00 TO STA. 2137+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-009

SHEET 27 OF 202

Aug, 28 2014 08:37 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2137+50 TO STA. 2143+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-010

SHEET 28 OF 202

Aug. 28 2014 08:38 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.

MATCHLINE - STA. 2143+00

RETAINING WALL

SC

SC-HH

SC-MH

2144+00

2145+00

2146+00

2147+00

2148+00

2149+00

2150+00

℄ TRACK 1

℄ TRACK 2

CSAH 61 (FLYING CLOUD DR)

XING HOUSE 6'X8'

NOTE 5

MATCHLINE - STA. 2150+50

0 12.5 25 50

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

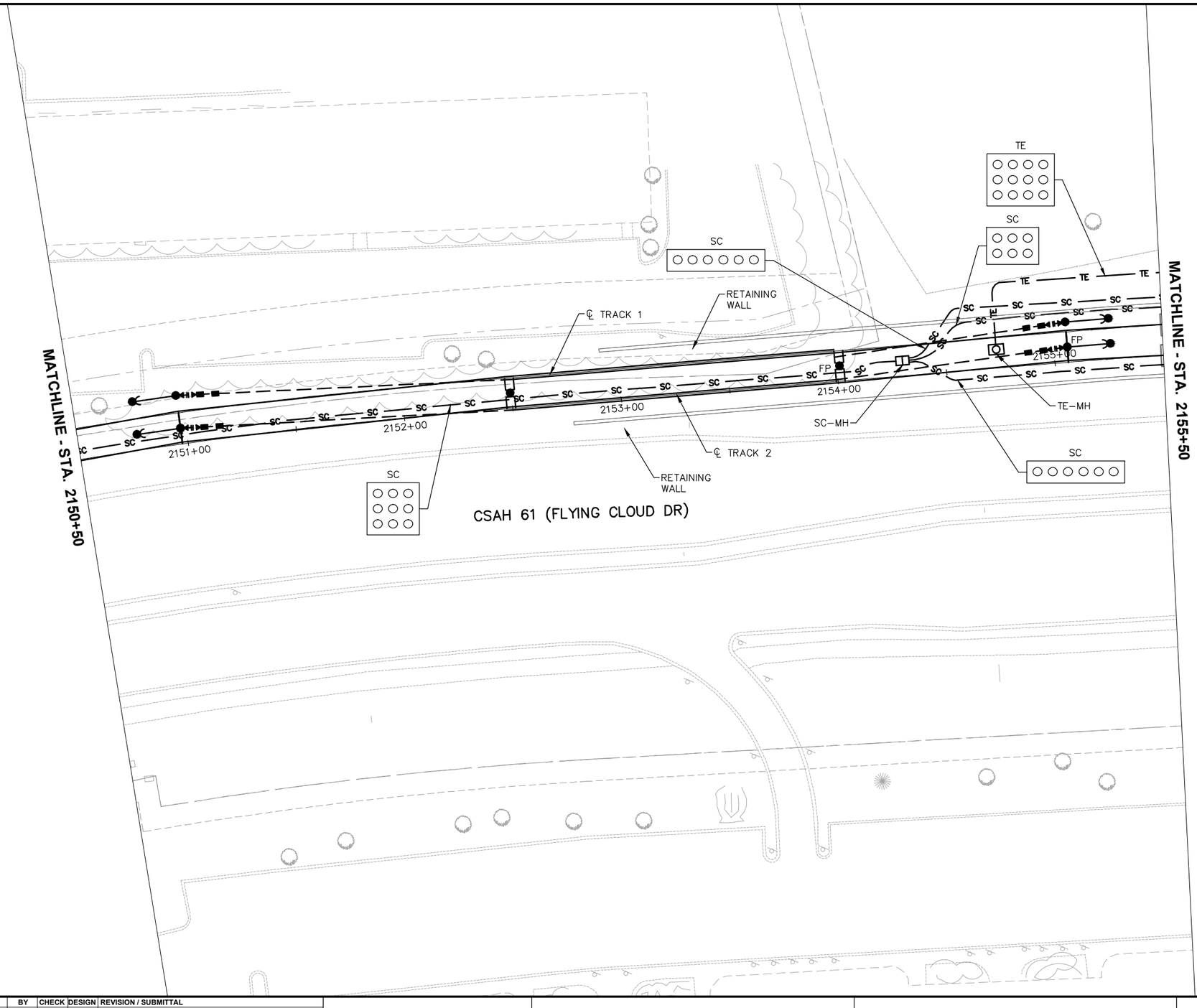
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2143+00 TO STA. 2150+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-011

SHEET 29 OF 202

Aug. 28 2014 08:38 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

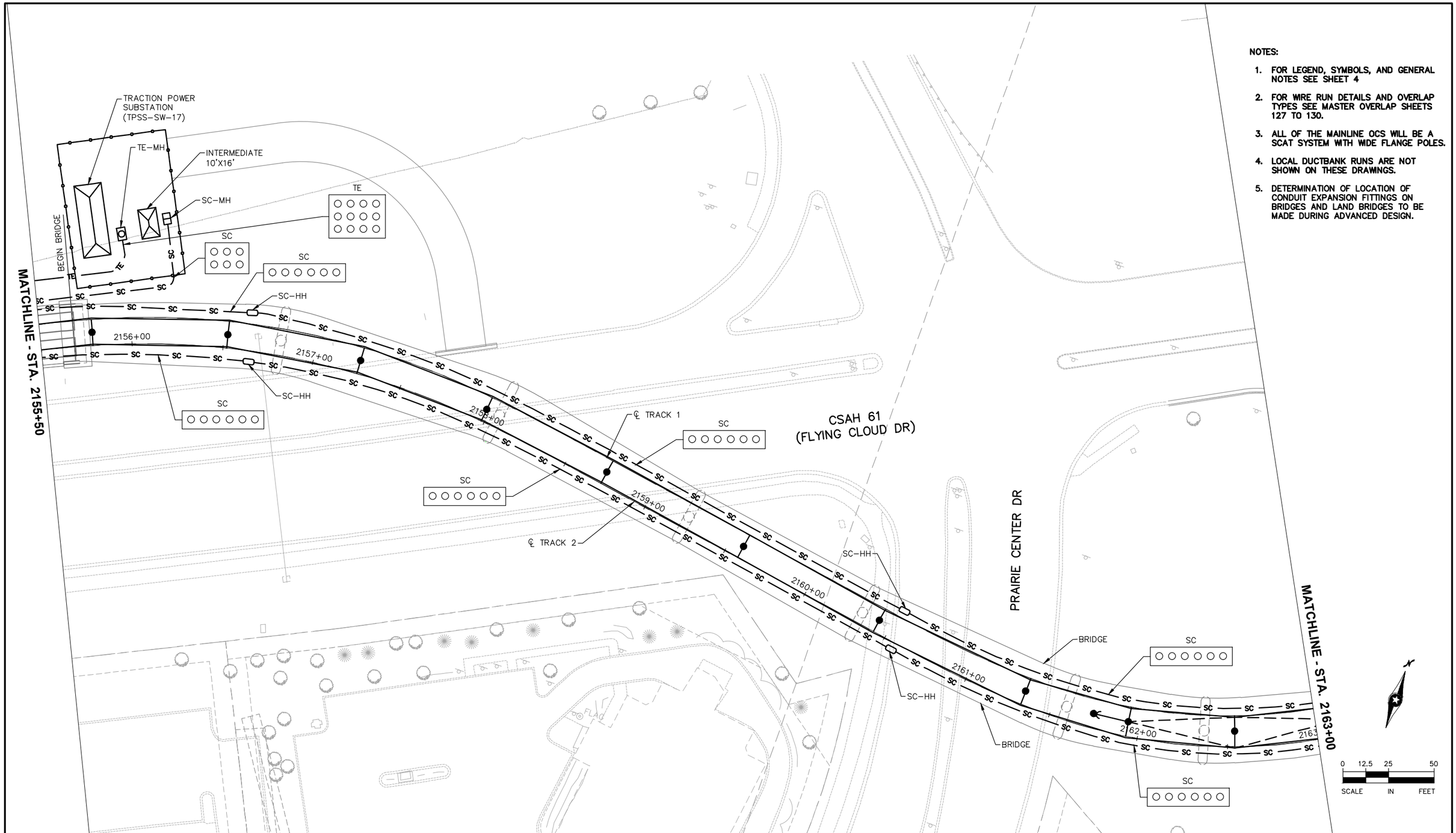
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2150+50 TO STA. 2155+50

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-012

SHEET 30 OF 202

Aug, 28 2014 08:38 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2155+50 TO STA. 2163+00

DISCIPLINE: SYSTEMS

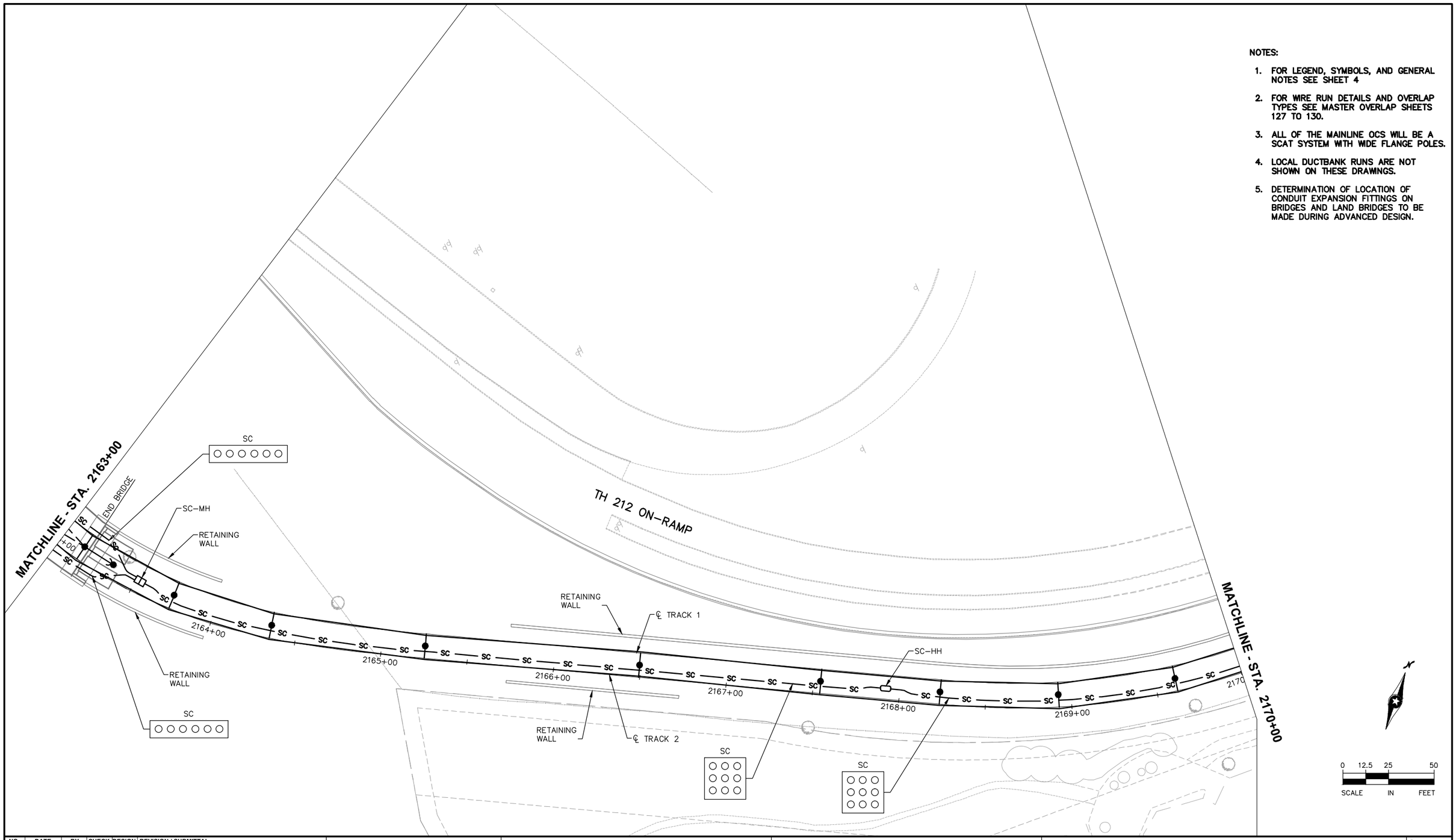
SHEET NAME: W1-SYS-PLN-013

SHEET 31 OF 202

Aug. 28 2014 08:39 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2163+00 TO STA. 2170+00

DISCIPLINE: SYSTEMS

SHEET NAME: W1-SYS-PLN-014

SHEET 32 OF 202

Aug. 28 2014 08:39 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

TH 212 SB

TH 212 NB

TH 212 ON-RAMP

RETAINING WALL

℄ TRACK 1

℄ TRACK 2

SC

SC-HH

2170+00

2171+00

2172+00

2173+00

2174+00

2175+00

2176+00

MATCHLINE - STA. 2170+00

MATCHLINE - STA. 2177+00

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2170+00 TO STA. 2177+00

DISCIPLINE: SYSTEMS

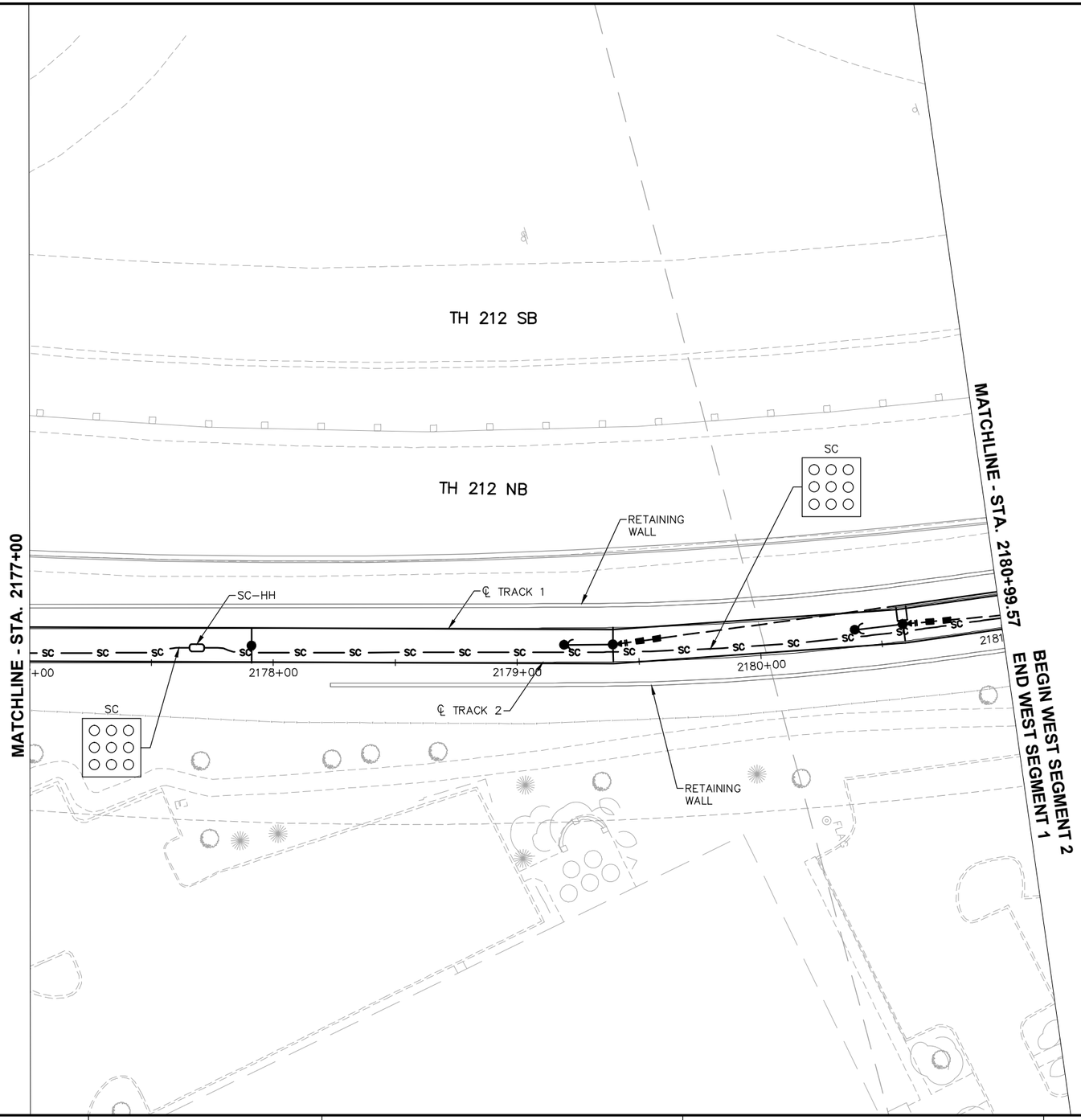
SHEET NAME: W1-SYS-PLN-015

SHEET 33 OF 202

Aug. 28 2014 08:39 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W1
PLAN SHEET LAYOUTS
STA. 2177+00 TO STA. 2180+99.57

DISCIPLINE: SYSTEMS

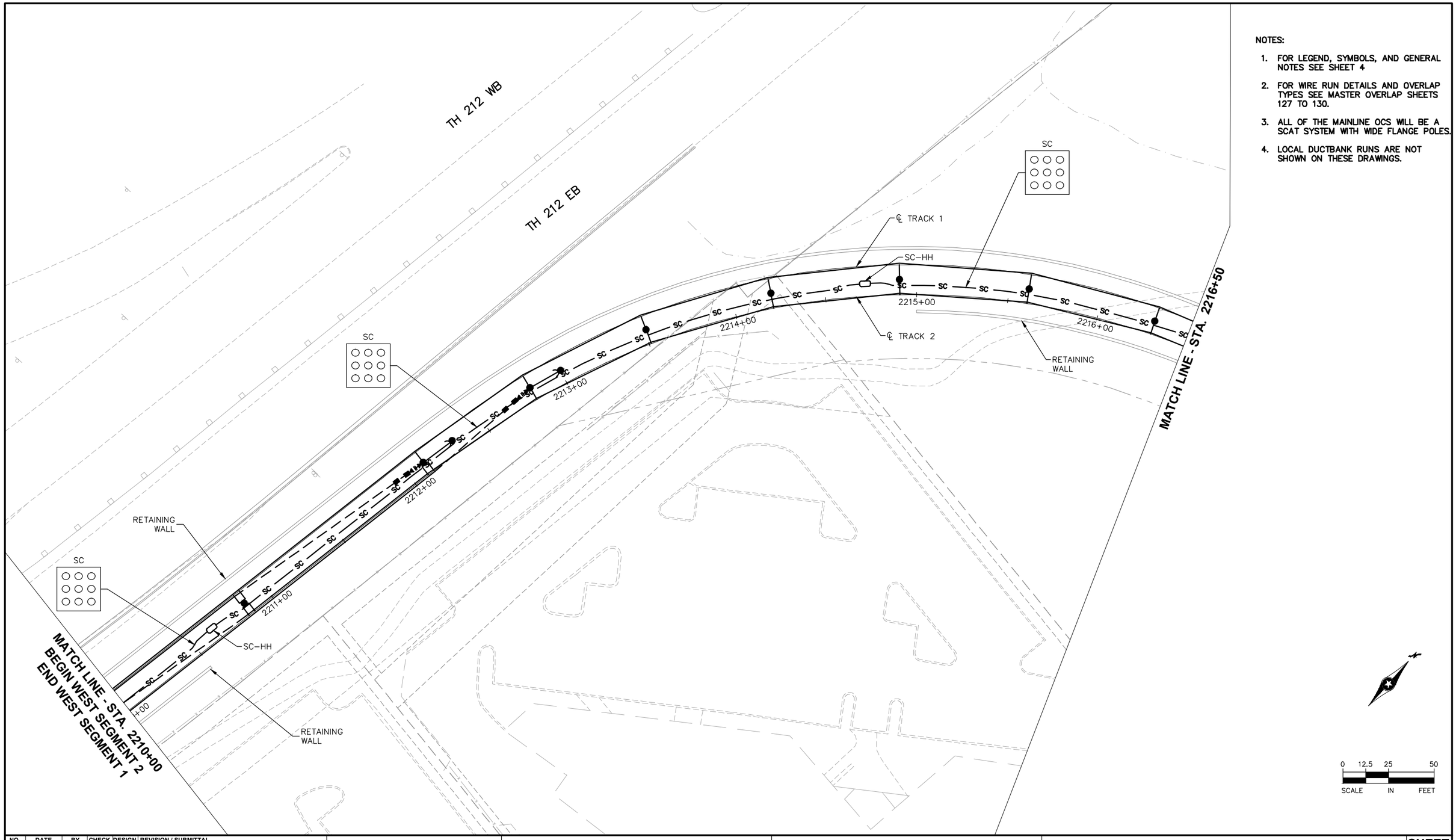
SHEET NAME: W1-SYS-PLN-016

SHEET 34 OF 202

Aug. 28 2014 08:40 am V:\3200_PEC-W\CAD\SEGMENT-W1\SHEET\SYSTEMS\W1-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2210+00 TO STA. 2216+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-001

SHEET 35 OF 202

Jun. 27 2014 09:19 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DUCTBANK TO TRANSITION FROM GROUND LEVEL MANHOLE TO BRIDGEDECK ALONG BRIDGE PIER.
6. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.
7. TE CONDUIT CONFIGURATION TO BRIDGE DECK TO BE DETERMINED IN FINAL DESIGN . CONDUIT MAY RUN UNDER BRIDGE DECK AND SLEEVE THROUGH DECK TO FEEDER POLES AND NEGATIVE RETURN CONNECTIONS.

MATCH LINE - STA. 2216+50

MATCH LINE - STA. 2223+50

RETAINING WALL

RETAINING WALL

BEGIN BRIDGE

SC-MH

TE-MH NOTE 5

TE-MH

SC-HH

TRACTION POWER SUBSTATION (TPSS-SW-16)

TE

FP

SC-HH

SC-HH

℄ TRACK 1

℄ TRACK 2

2218+00

2219+00

2220+00

2221+00

2222+00

2223+00

FLYING CLOUD DR

SCALE 0 12.5 25 50 IN FEET

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AECOM LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

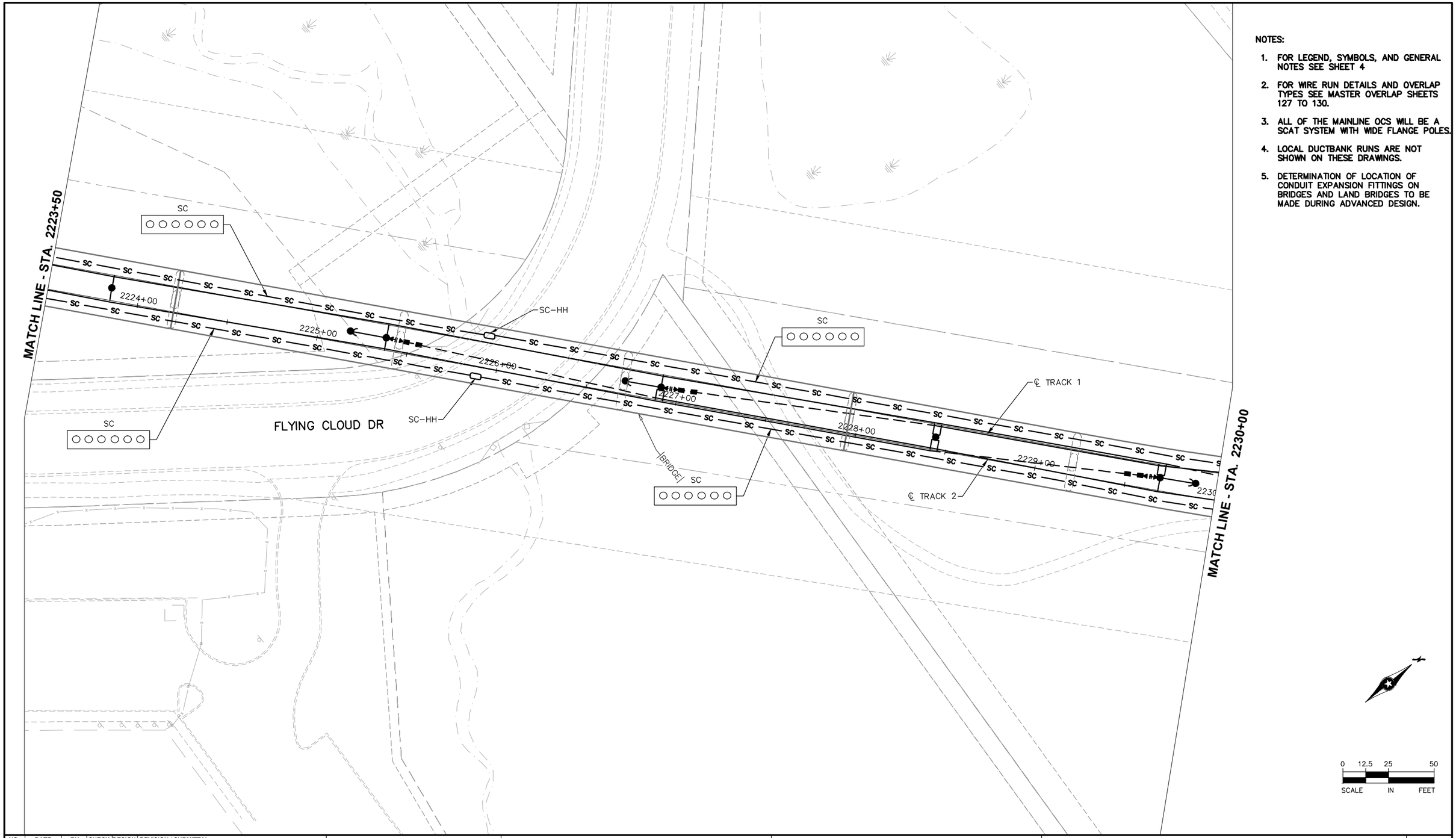
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2216+50 TO STA. 2223+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-002

SHEET 36 OF 202

Aug. 28 2014 08:40 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

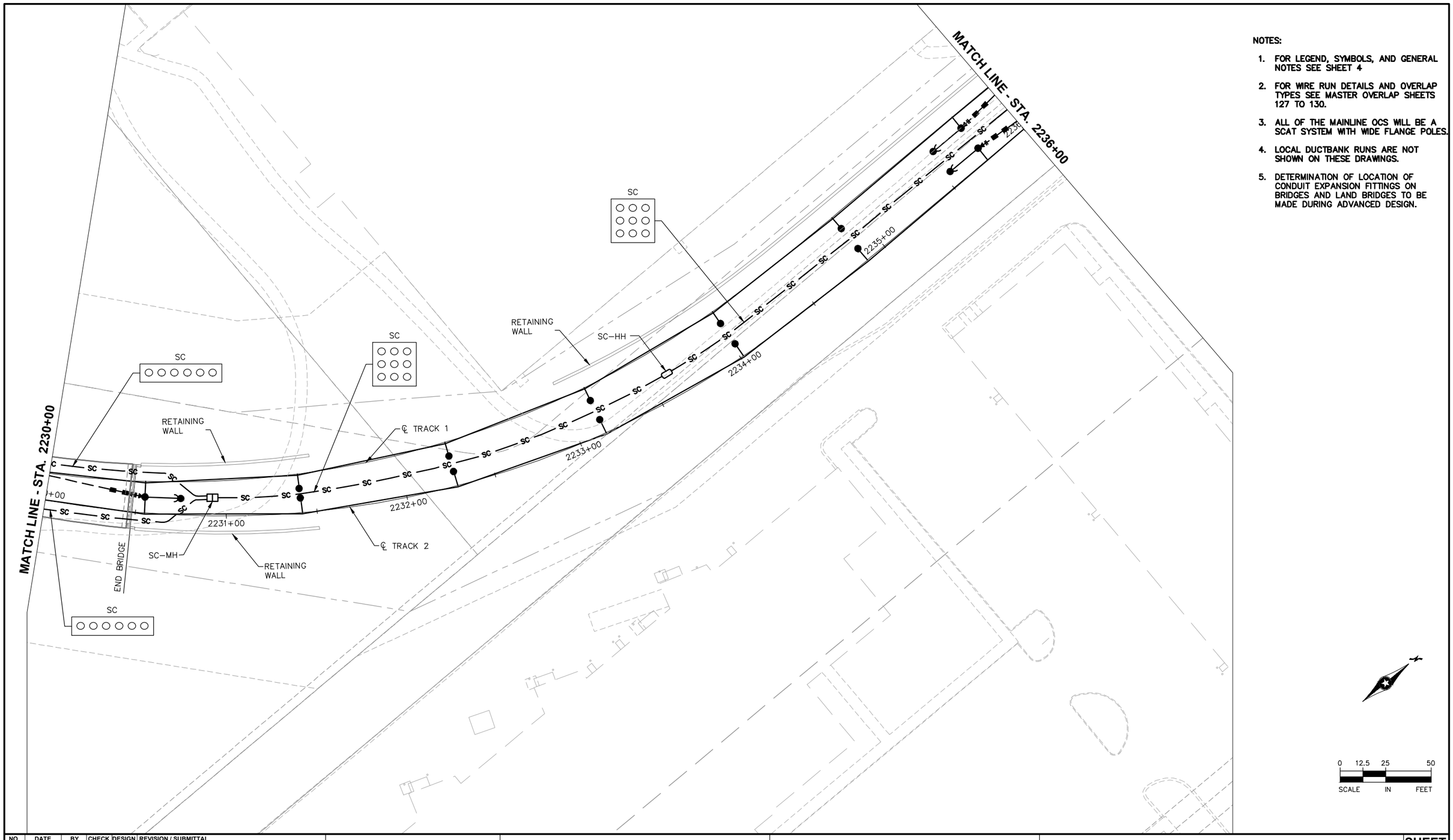
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2223+50 TO STA. 2230+00

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-003

SHEET 37 OF 202

Aug. 28 2014 08:41 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2230+00 TO STA. 2236+00

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-004

SHEET 38 OF 202

Aug. 28 2014 08:41 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein

MATCH LINE - STA. 2236+00

MATCH LINE - STA. 2242+50

RETAINING WALL

SC-MH

℄ TRACK 1

℄ TRACK 2

SNOW MELTER CASE

2237+00

2238+00

2239+00

2240+00

2241+00

2242+00

NOTE 5

SC

SIGNAL BUNGALOW/ PLATFORM/XING HOUSE 10'X35'

W 70TH ST

0 12.5 25 50

SCALE IN FEET

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

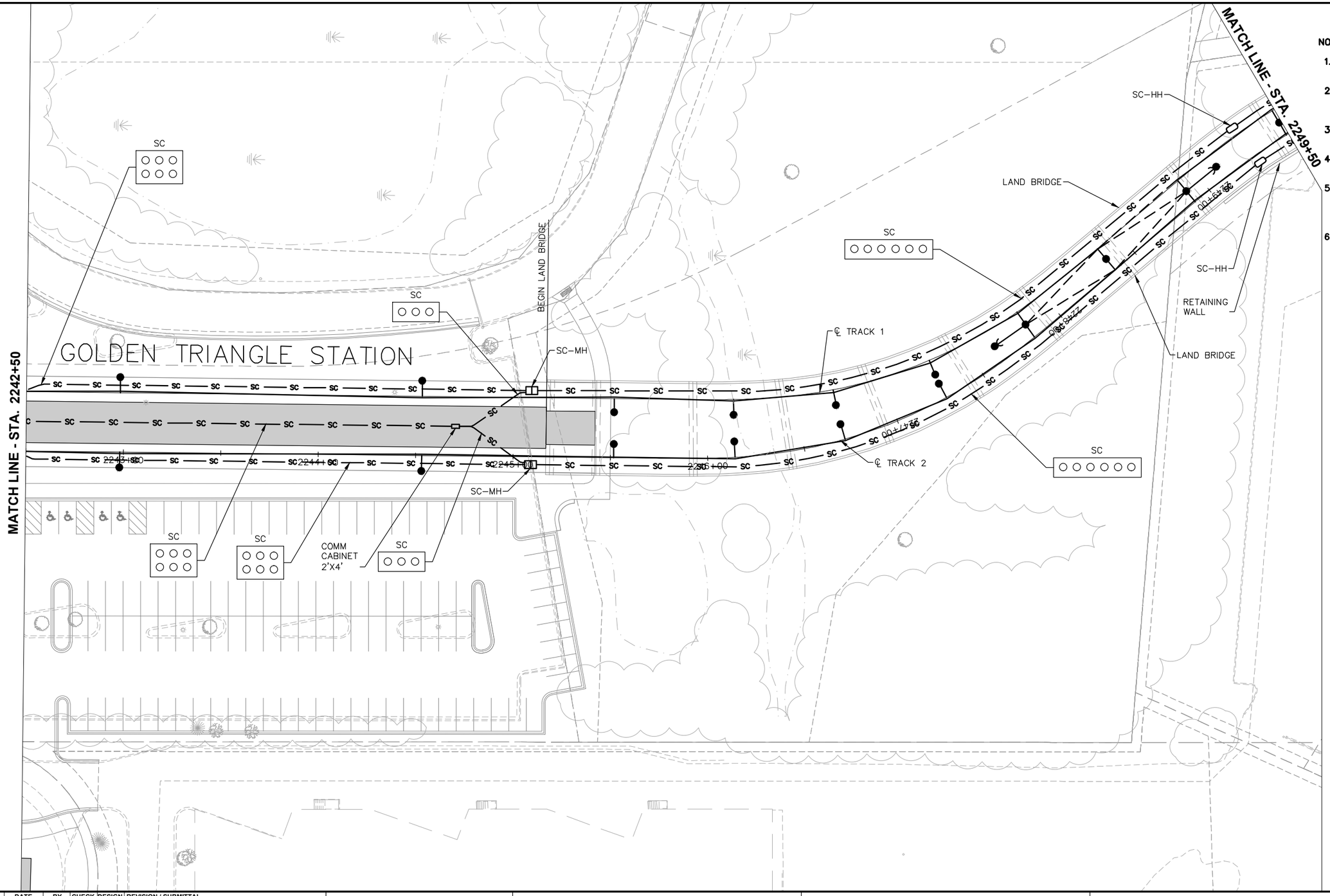
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2236+00 TO STA. 2242+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-005

SHEET 39 OF 202

Aug, 28 2014 08:41 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.
6. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.

0 12.5 25 50
SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

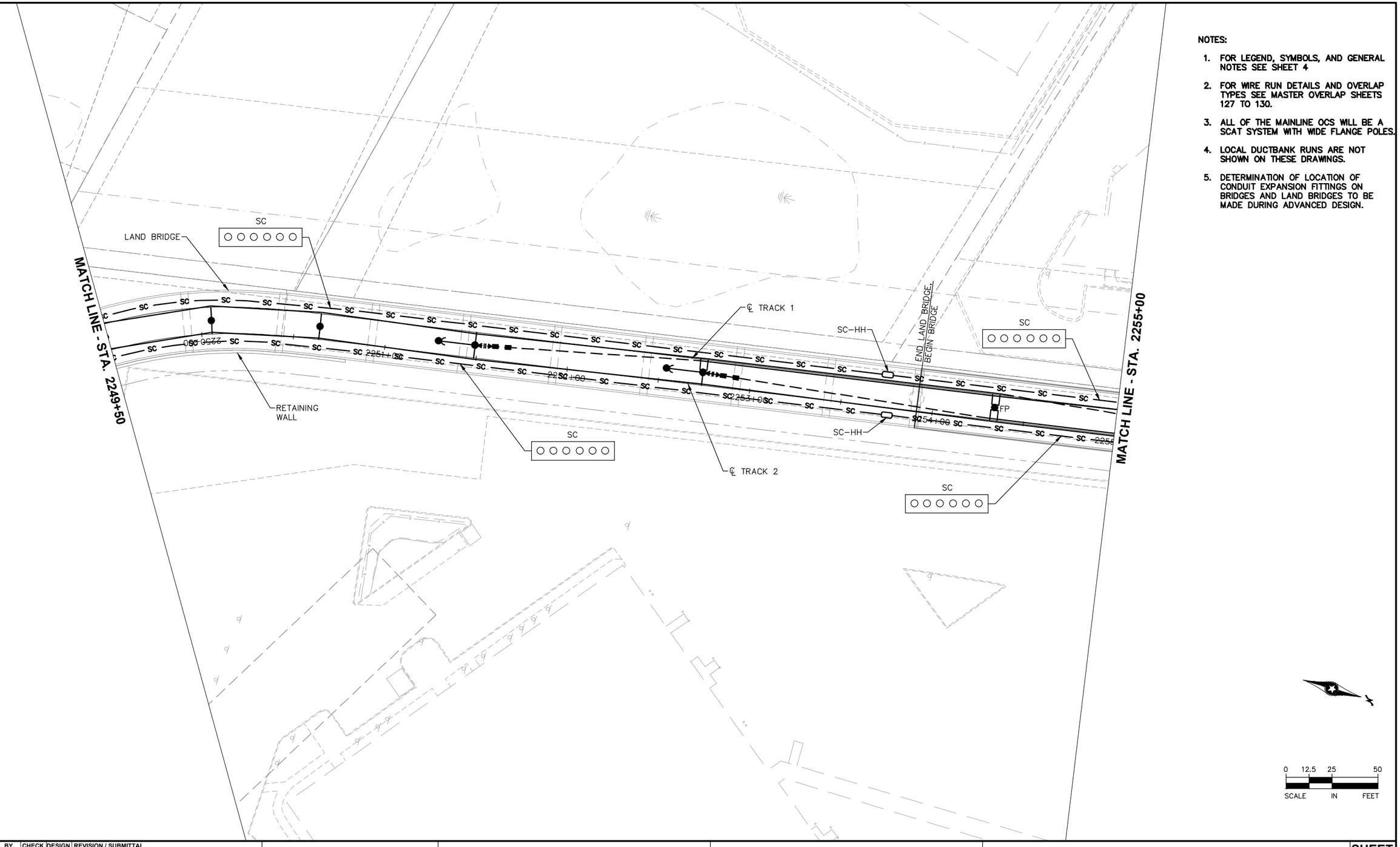
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2242+50 TO STA. 2249+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-006

SHEET 40 OF 202

Aug. 28 2014 08:42 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

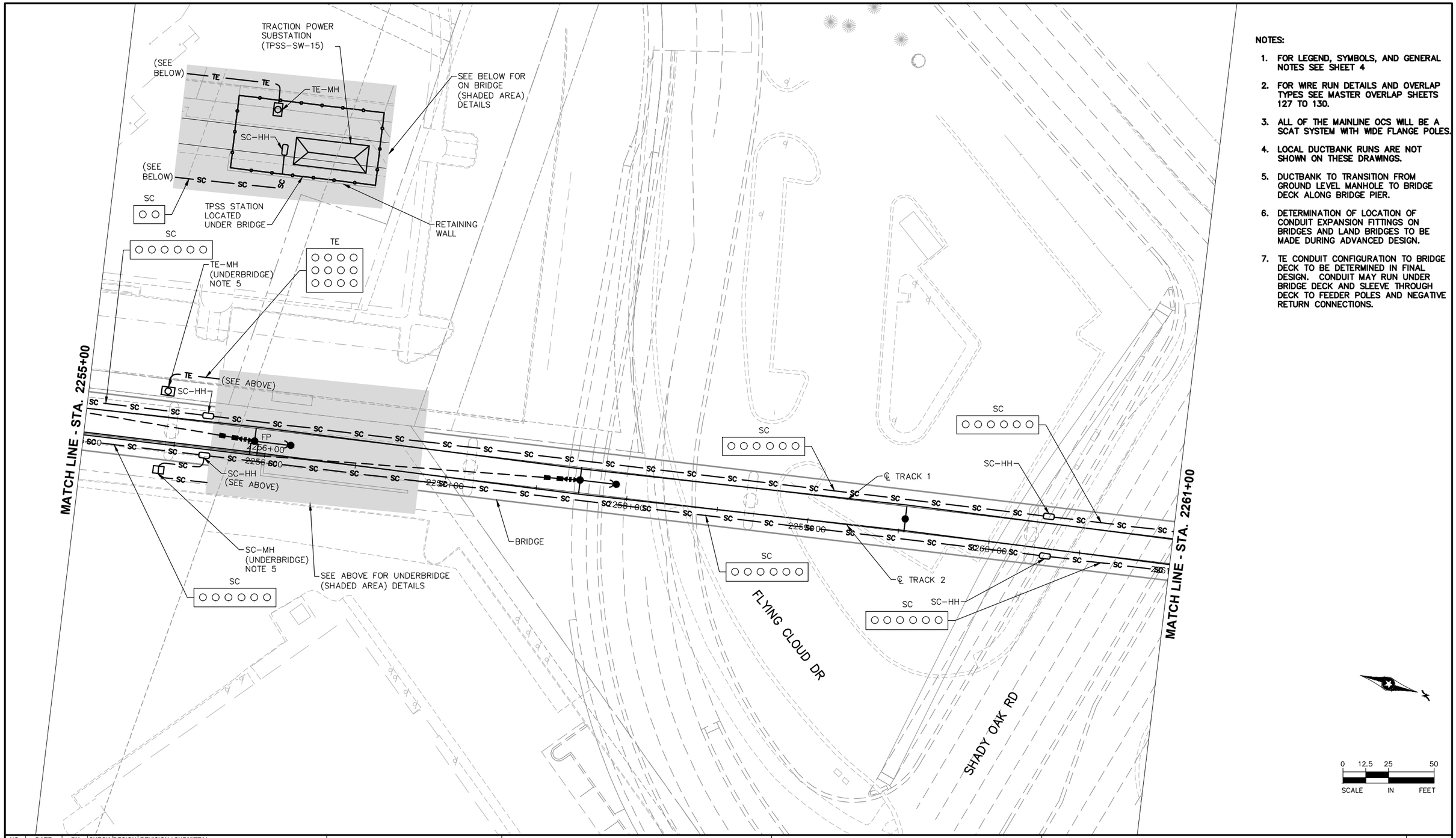
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2249+50 TO STA. 2255+00

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-007

SHEET 41 OF 202

Aug, 28 2014 08:42 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DUCTBANK TO TRANSITION FROM GROUND LEVEL MANHOLE TO BRIDGE DECK ALONG BRIDGE PIER.
6. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.
7. TE CONDUIT CONFIGURATION TO BRIDGE DECK TO BE DETERMINED IN FINAL DESIGN. CONDUIT MAY RUN UNDER BRIDGE DECK AND SLEEVE THROUGH DECK TO FEEDER POLES AND NEGATIVE RETURN CONNECTIONS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2255+00 TO STA. 2261+00

DISCIPLINE: SYSTEMS

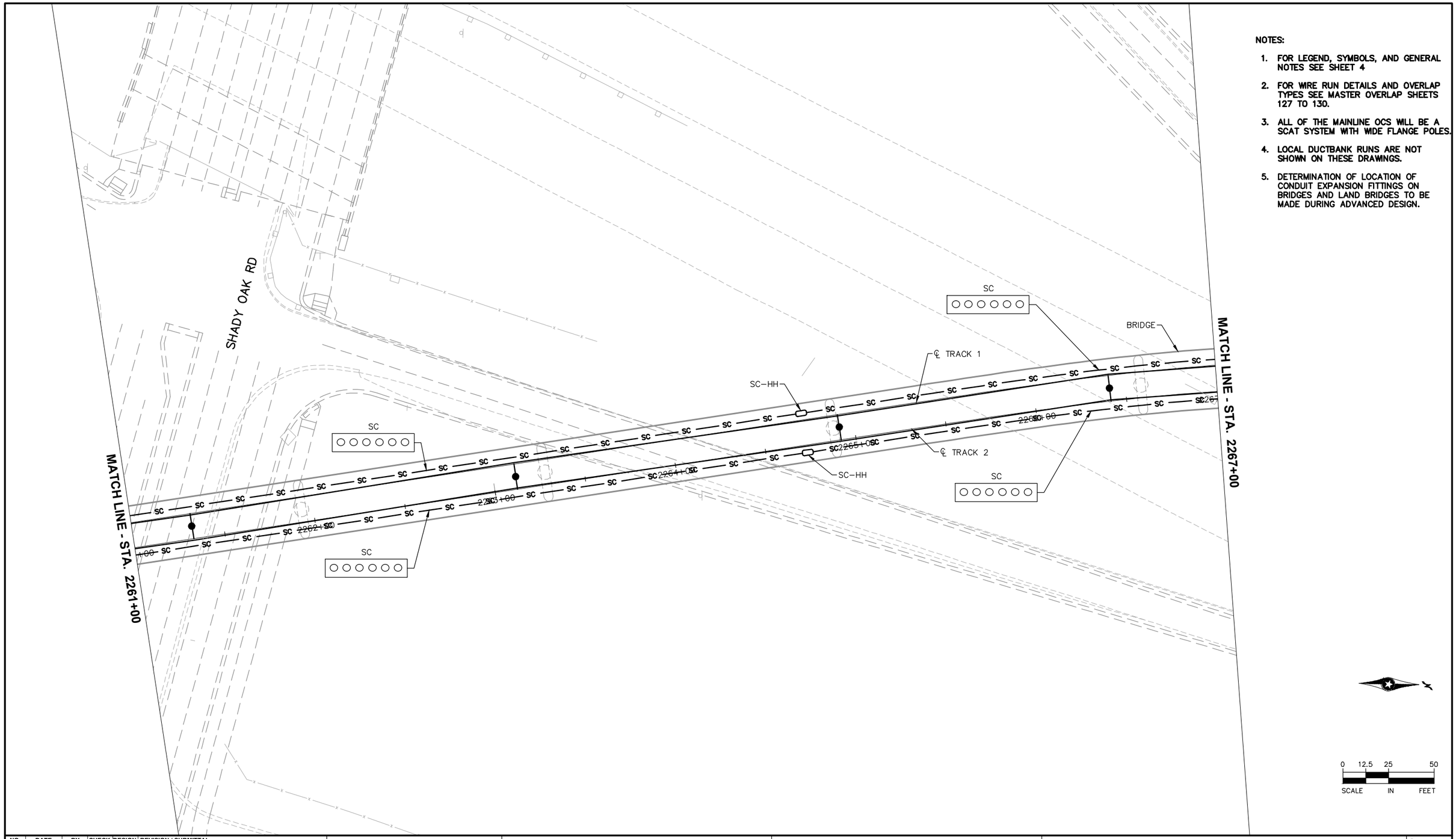
SHEET NAME: W2-SYS-PLN-008

SHEET 42 OF 202

Aug. 28 2014 08:43 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2261+00 TO STA. 2267+00

DISCIPLINE: SYSTEMS

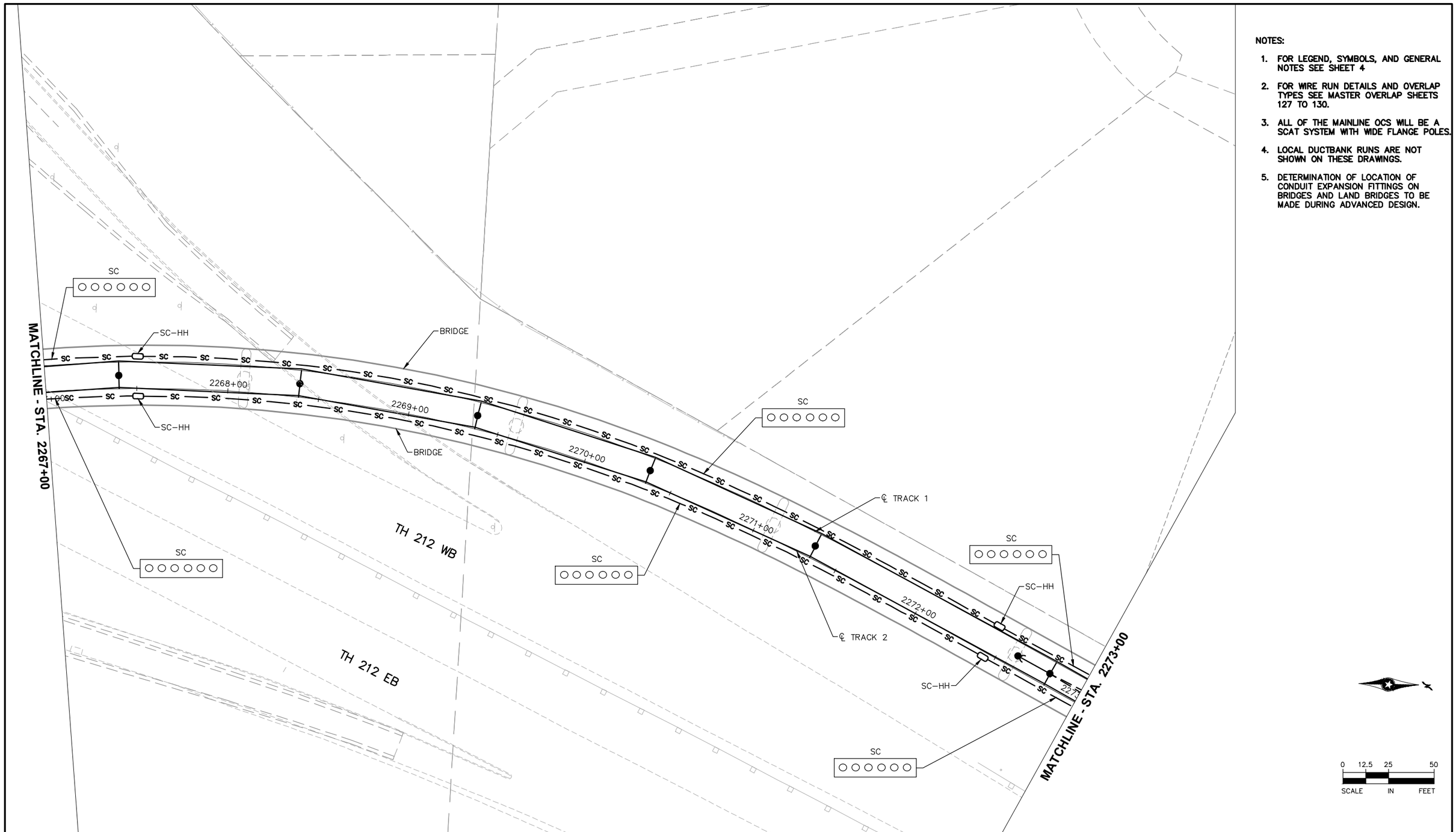
SHEET NAME: W2-SYS-PLN-009

SHEET 43 OF 202

Aug, 28 2014 08:43 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

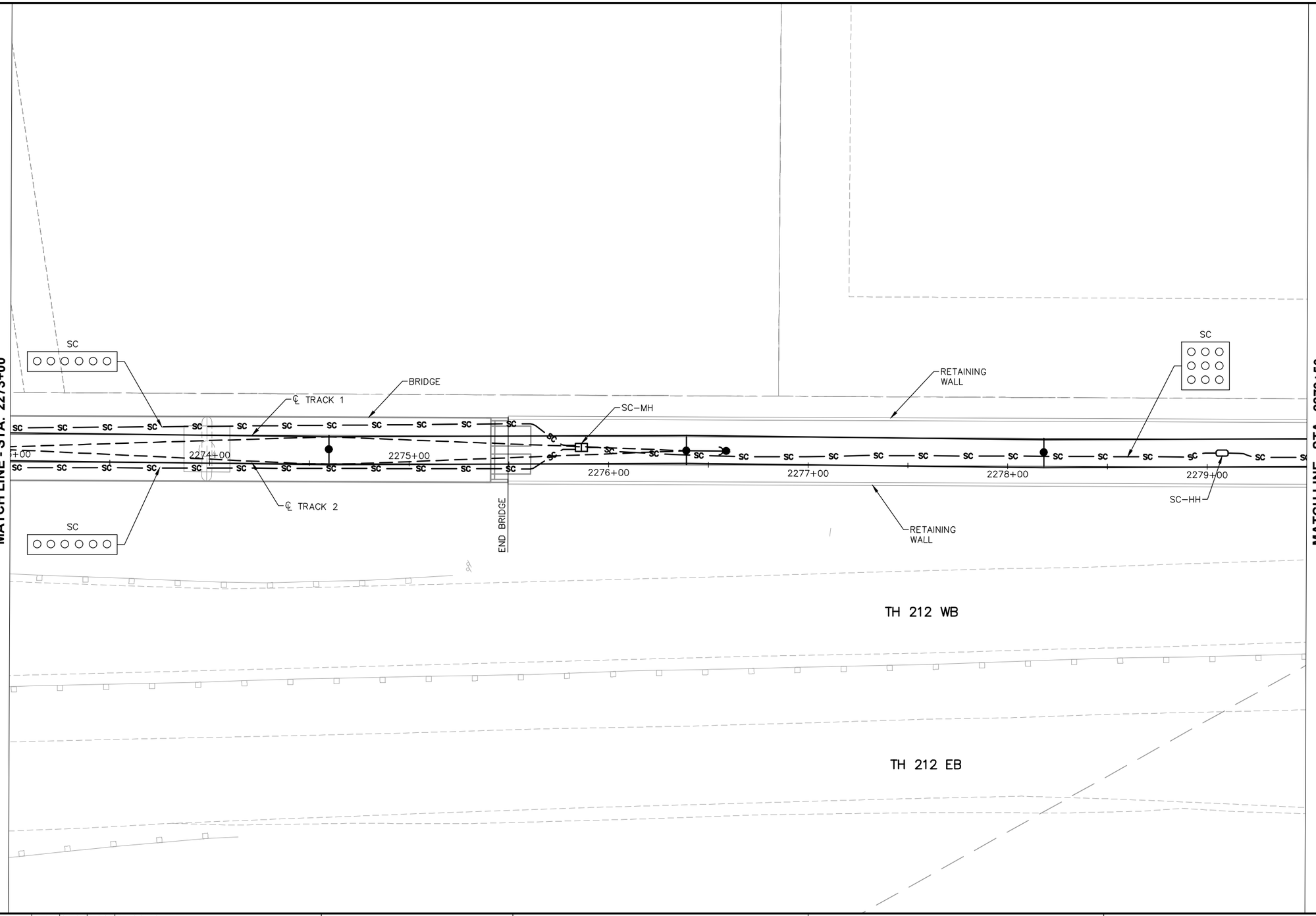
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2267+00 TO STA. 2273+00

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-010

SHEET 44 OF 202

Aug, 28 2014 08:43 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2273+00 TO STA. 2279+50

DISCIPLINE: SYSTEMS

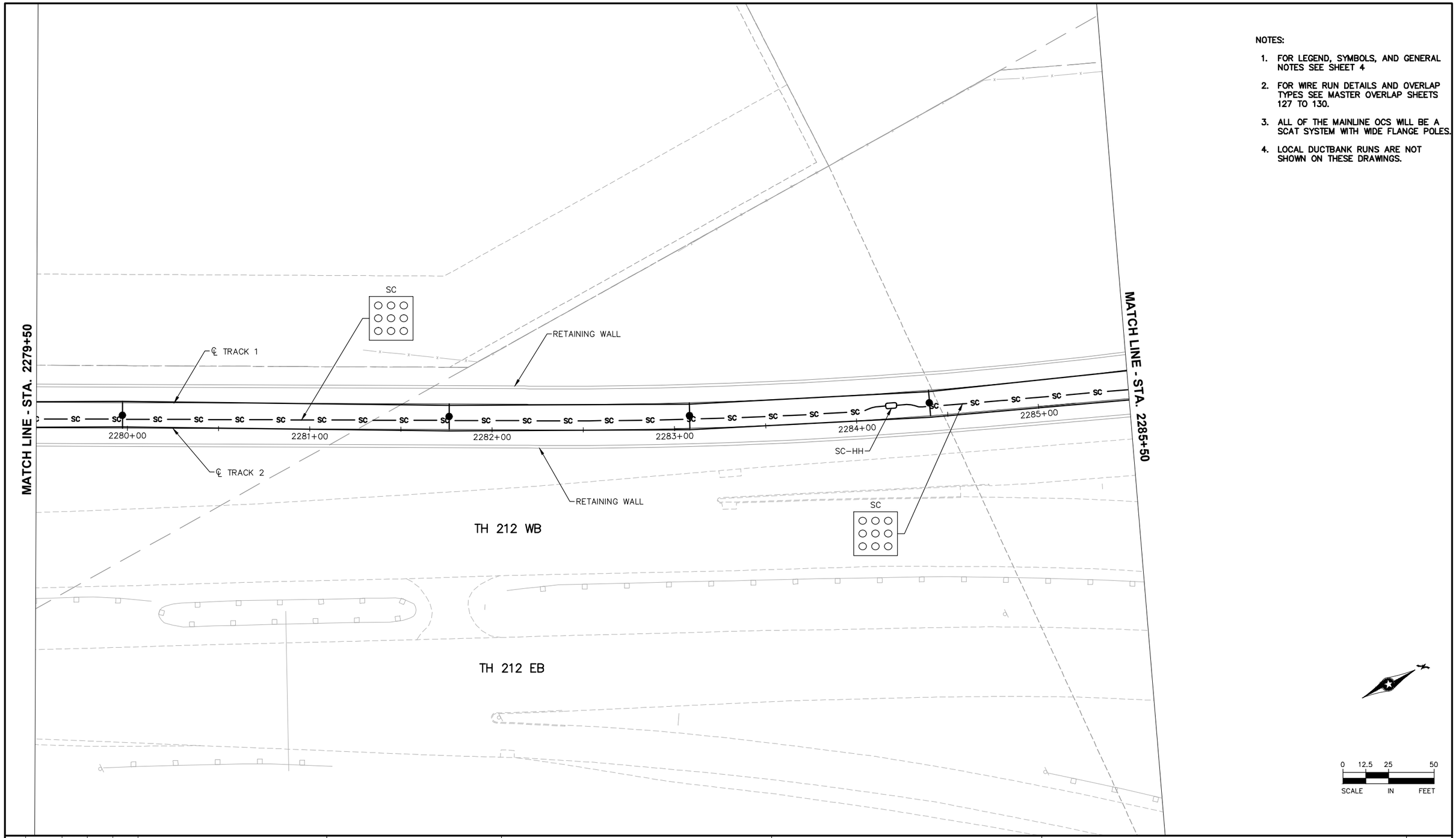
SHEET NAME: W2-SYS-PLN-011

SHEET 45 OF 202

Aug. 28 2014 08:43 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK
LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL
SOUTHWEST
Green Line LRT Extension

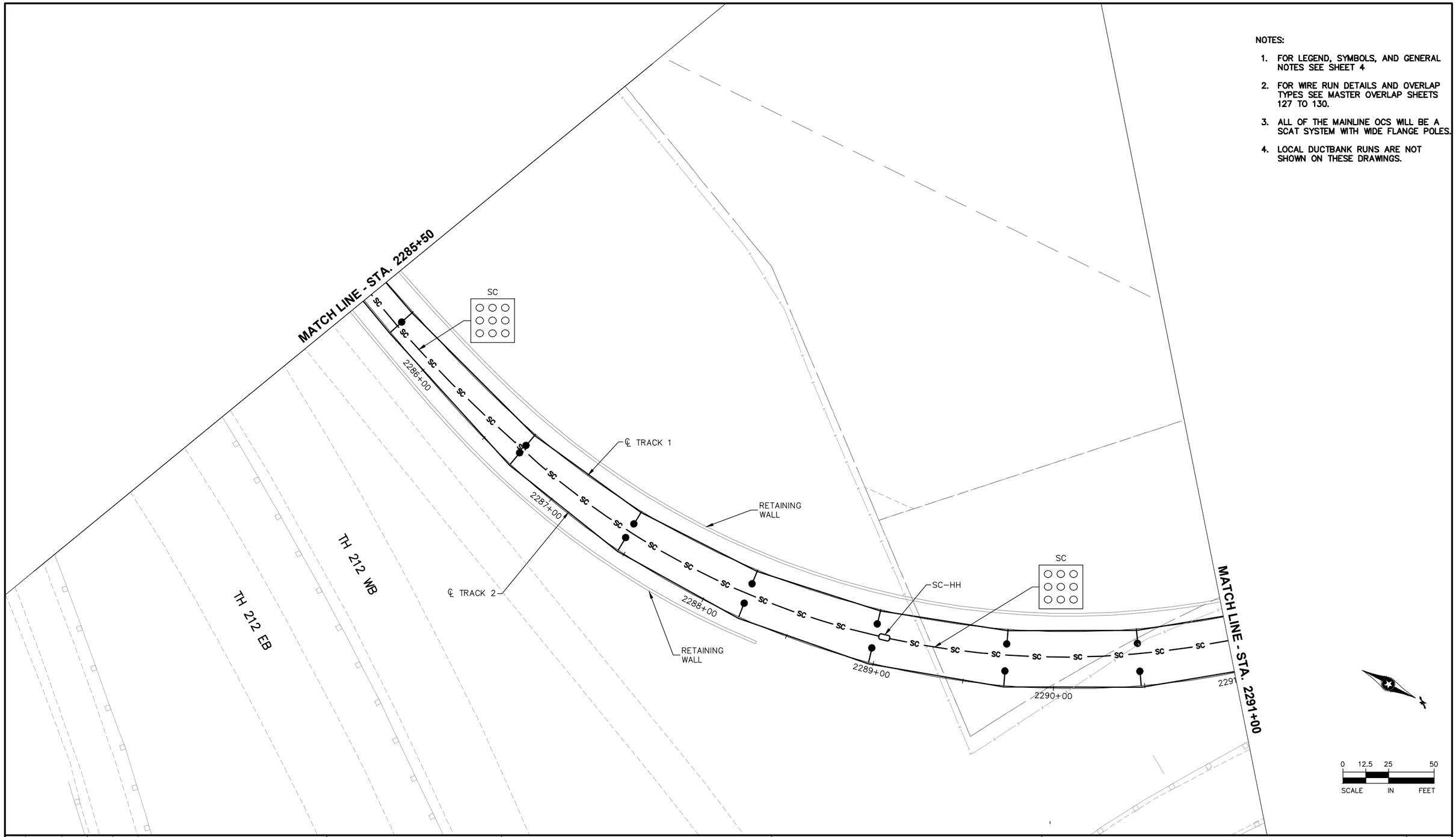
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2279+50 TO STA. 2285+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-012

SHEET 46 OF 202

Jun, 27 2014 09:28 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK
LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL
SOUTHWEST
Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2285+50 TO STA. 2291+00

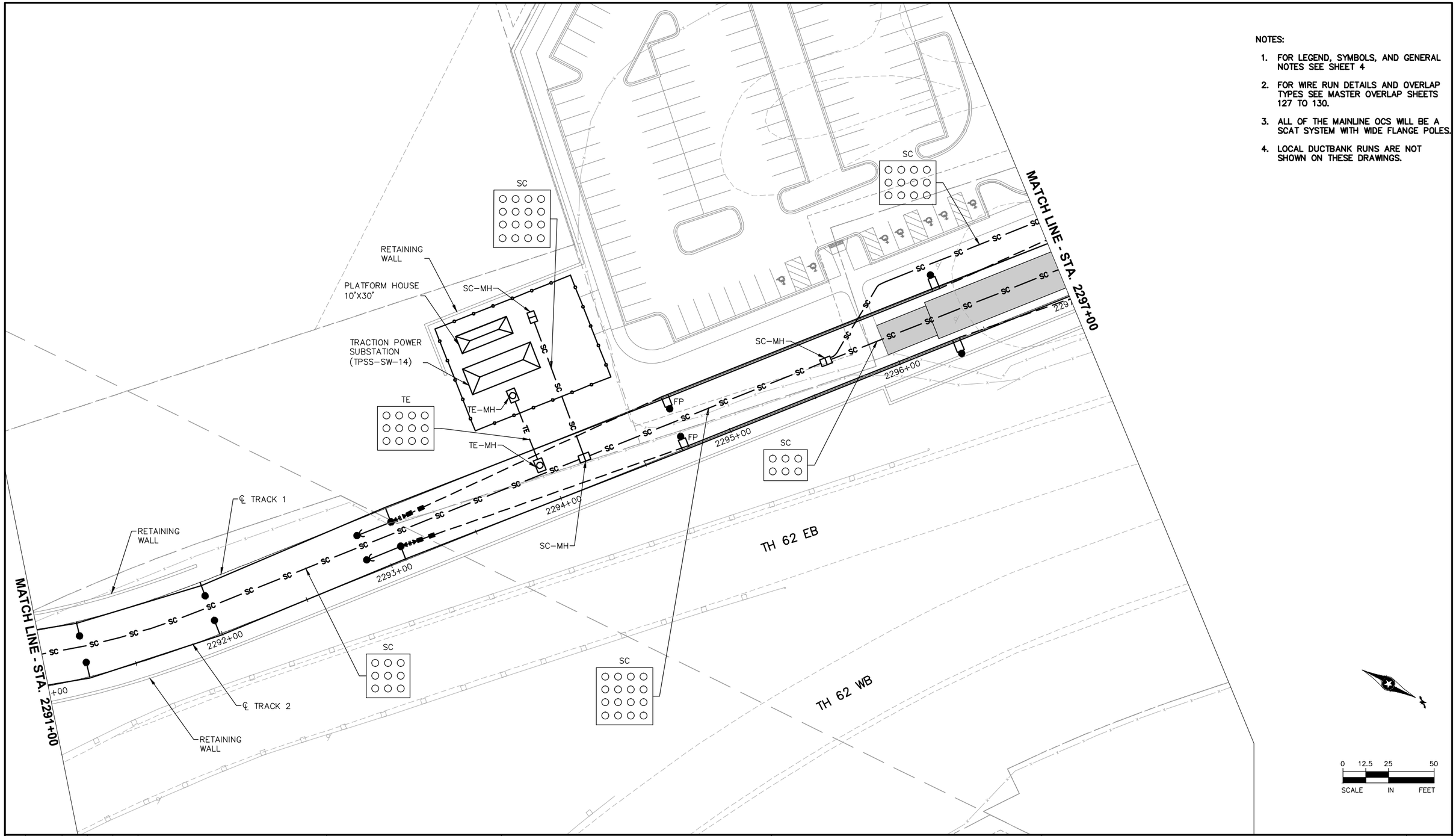
DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-013

SHEET 47 OF 202

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

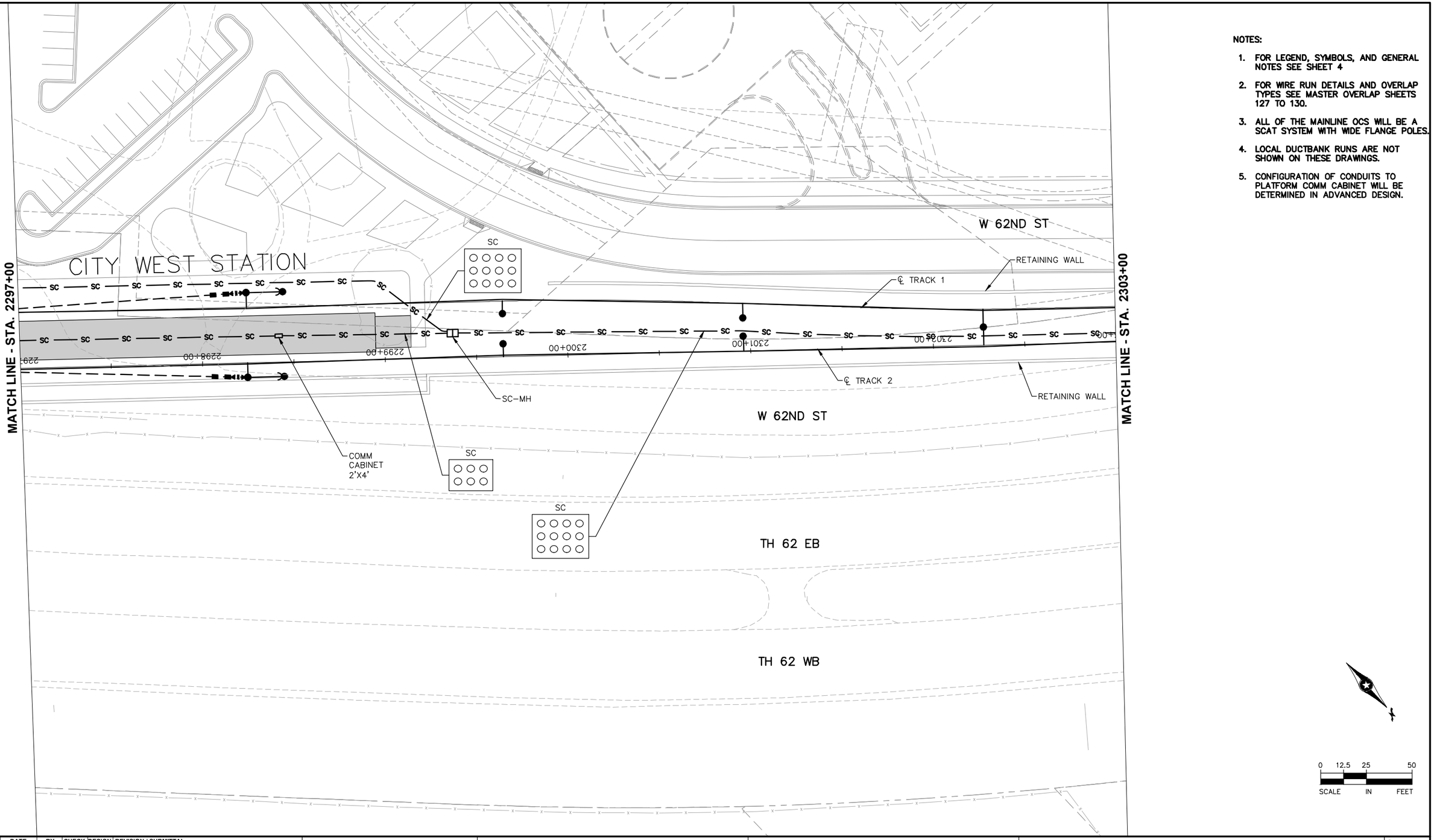
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2291+00 TO STA. 2297+00

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-014

SHEET 48 OF 202

Jun, 27 2014 09:30 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2297+00 TO STA. 2303+00

DISCIPLINE: SYSTEMS

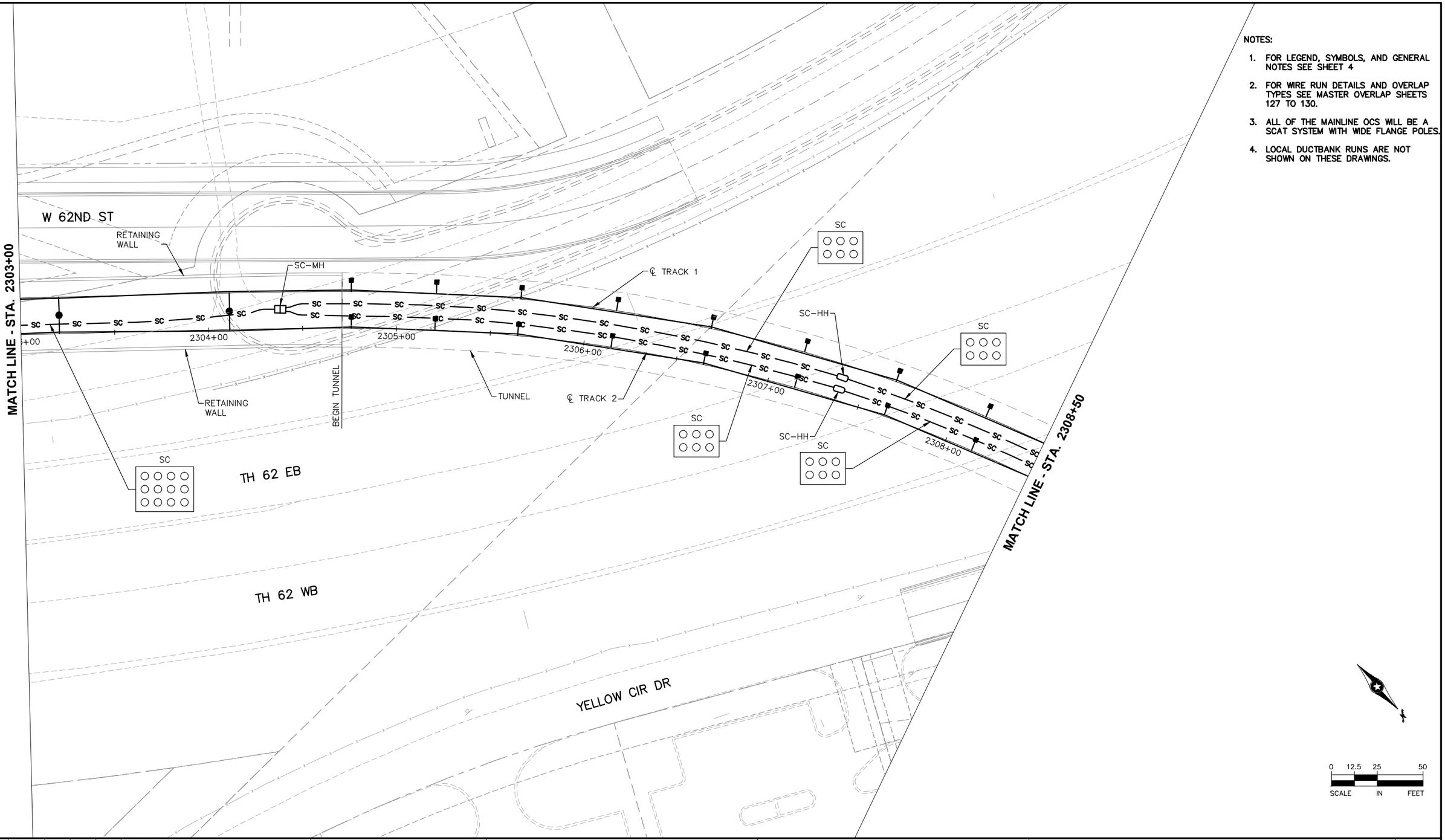
SHEET NAME: W2-SYS-PLN-015

SHEET 49 OF 202

Aug, 28 2014 08:44 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

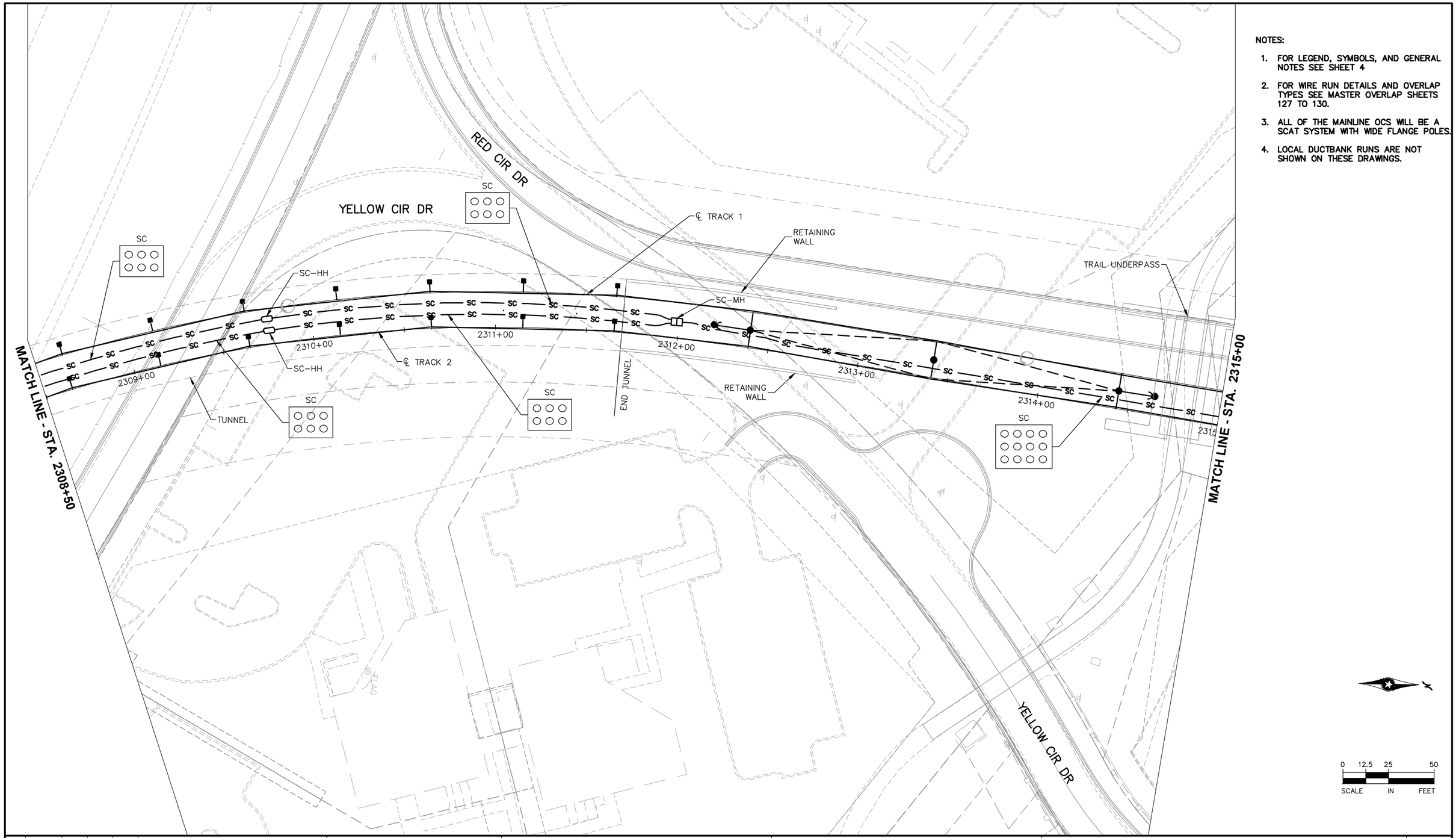
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2303+00 TO STA. 2308+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-016

SHEET 50 OF 202

Jun, 27 2014 09:31 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2308+50 TO STA. 2315+00

DISCIPLINE: SYSTEMS

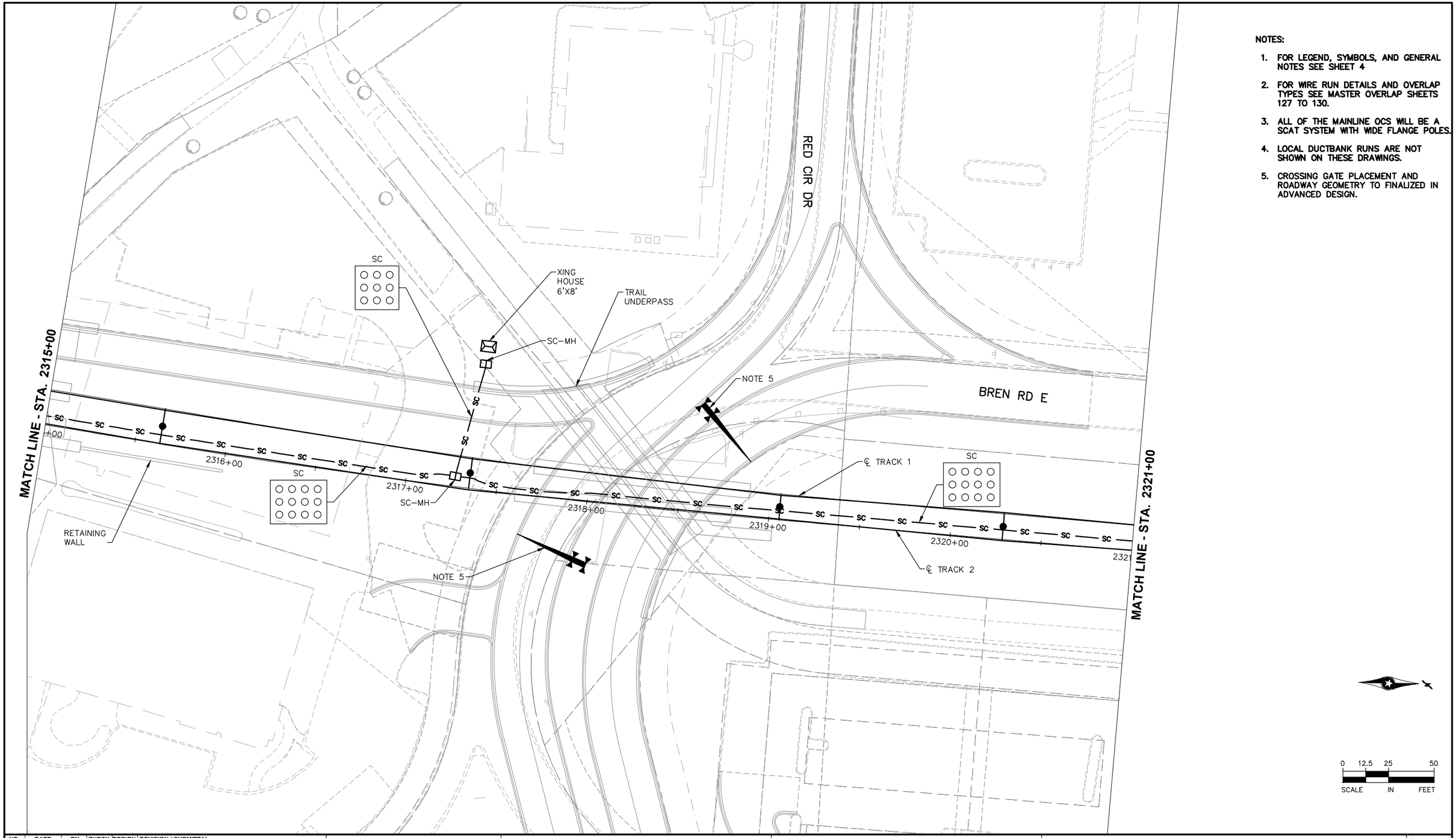
SHEET NAME: W2-SYS-PLN-017

SHEET 51 OF 202

Jun, 27 2014 09:32 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO FINALIZED IN ADVANCED DESIGN.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

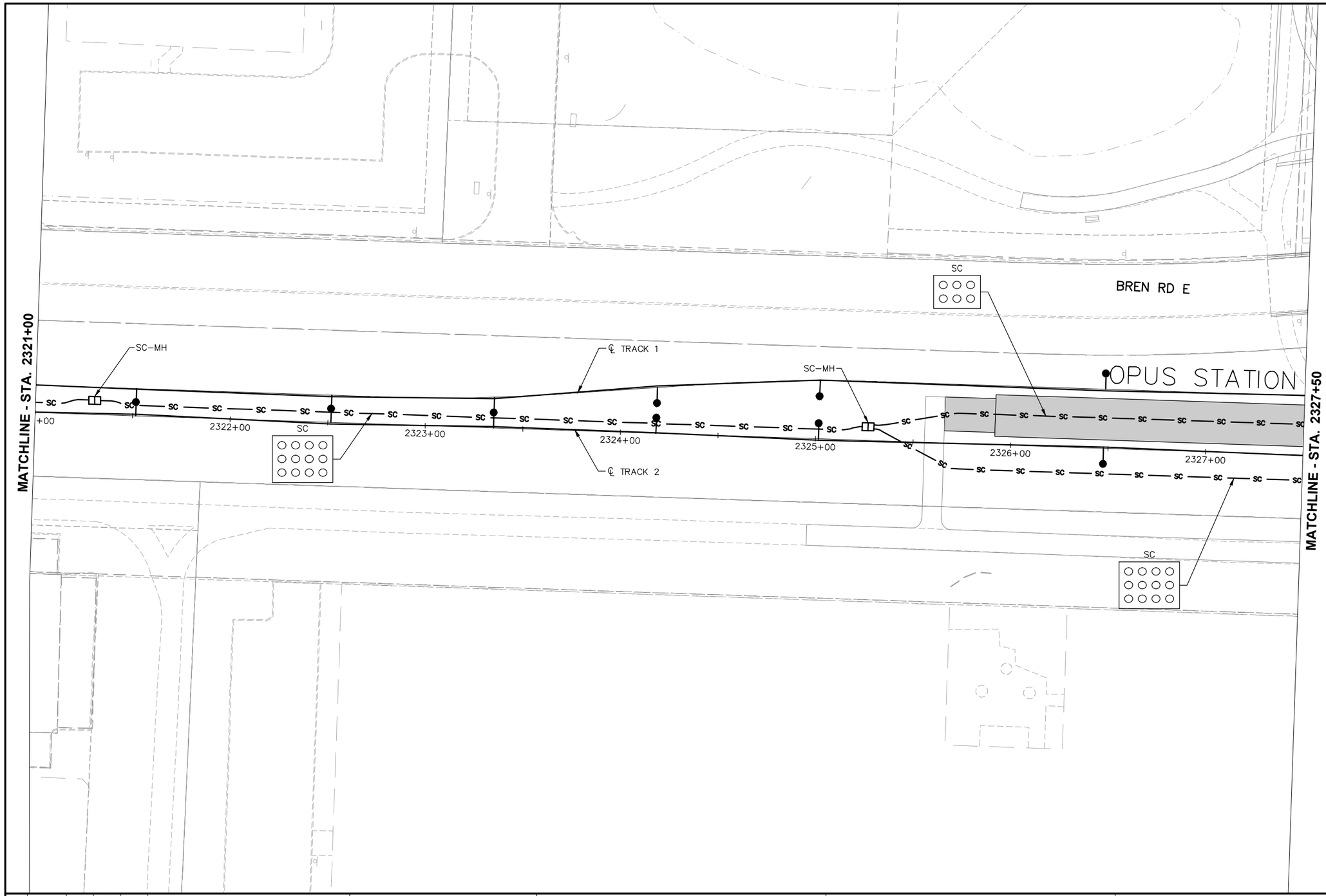
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2315+00 TO STA. 2321+00

DISCIPLINE: SYSTEMS
SHEET NAME: W2-SYS-PLN-018

SHEET 52 OF 202

Aug, 28 2014 08:44 am V: \3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

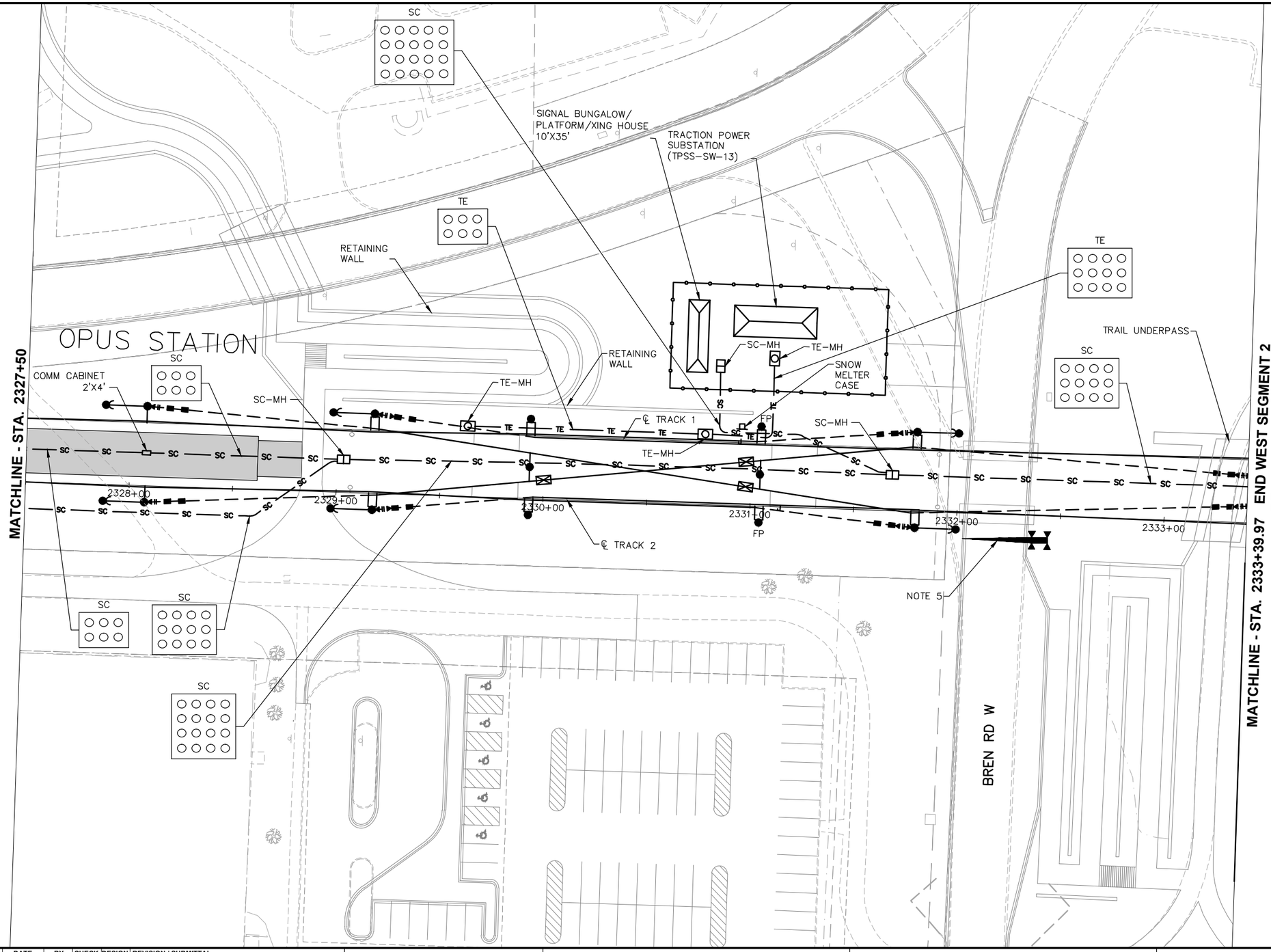
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2321+00 TO STA. 2327+50

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-019

SHEET 53 OF 202

Jun, 27 2014 09:34 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.
6. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABINET WILL BE DETERMINED IN ADVANCED DESIGN.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

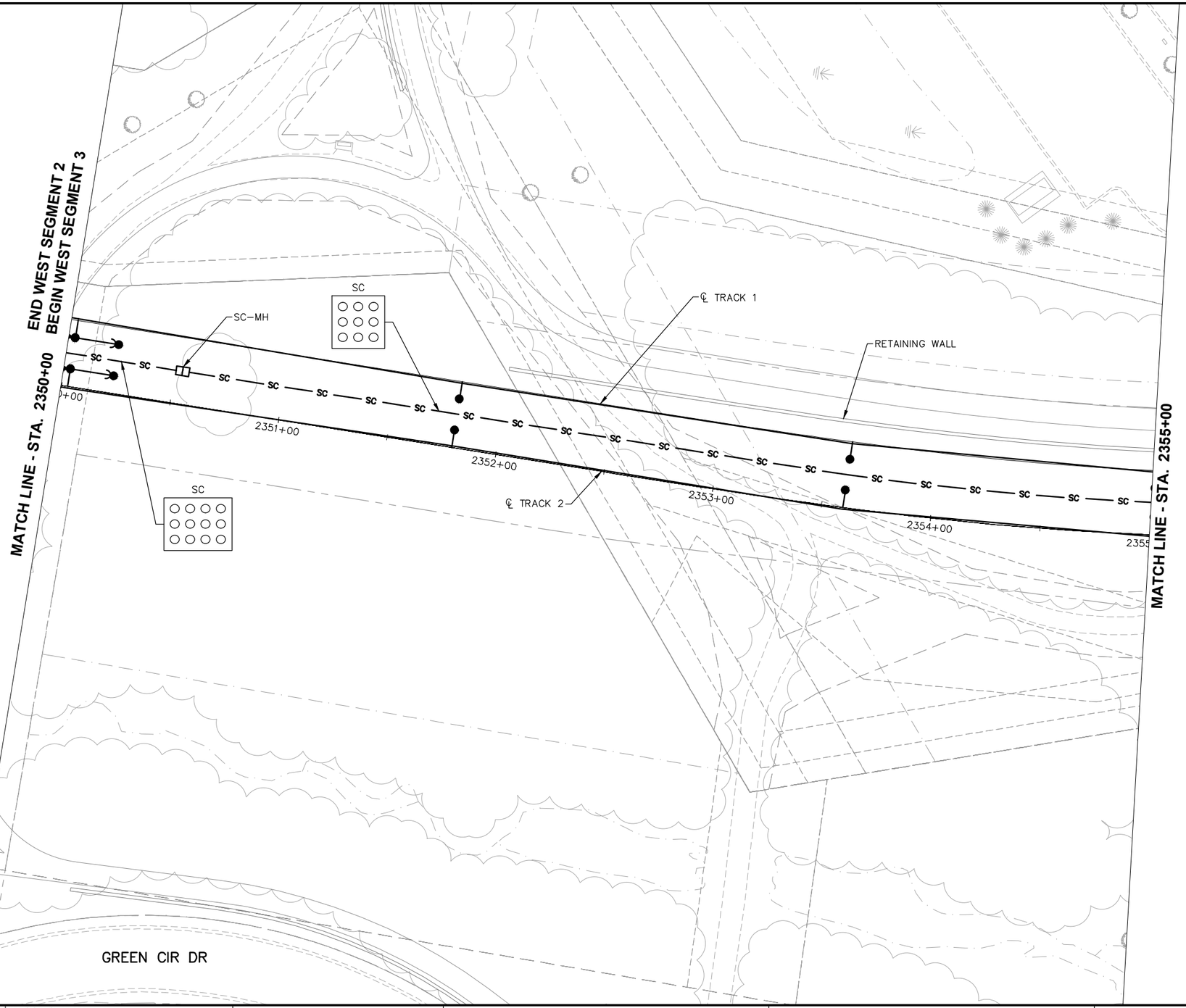
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W2
PLAN SHEET LAYOUTS
STA. 2327+50 TO STA. 2333+39.97

DISCIPLINE: SYSTEMS

SHEET NAME: W2-SYS-PLN-020

SHEET 54 OF 202

Aug. 28 2014 08:45 am V:\3200_PEC-W\CAD\SEGMENT-W2\SHEET\SYSTEMS\W2-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
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PRELIMINARY ENGINEERING

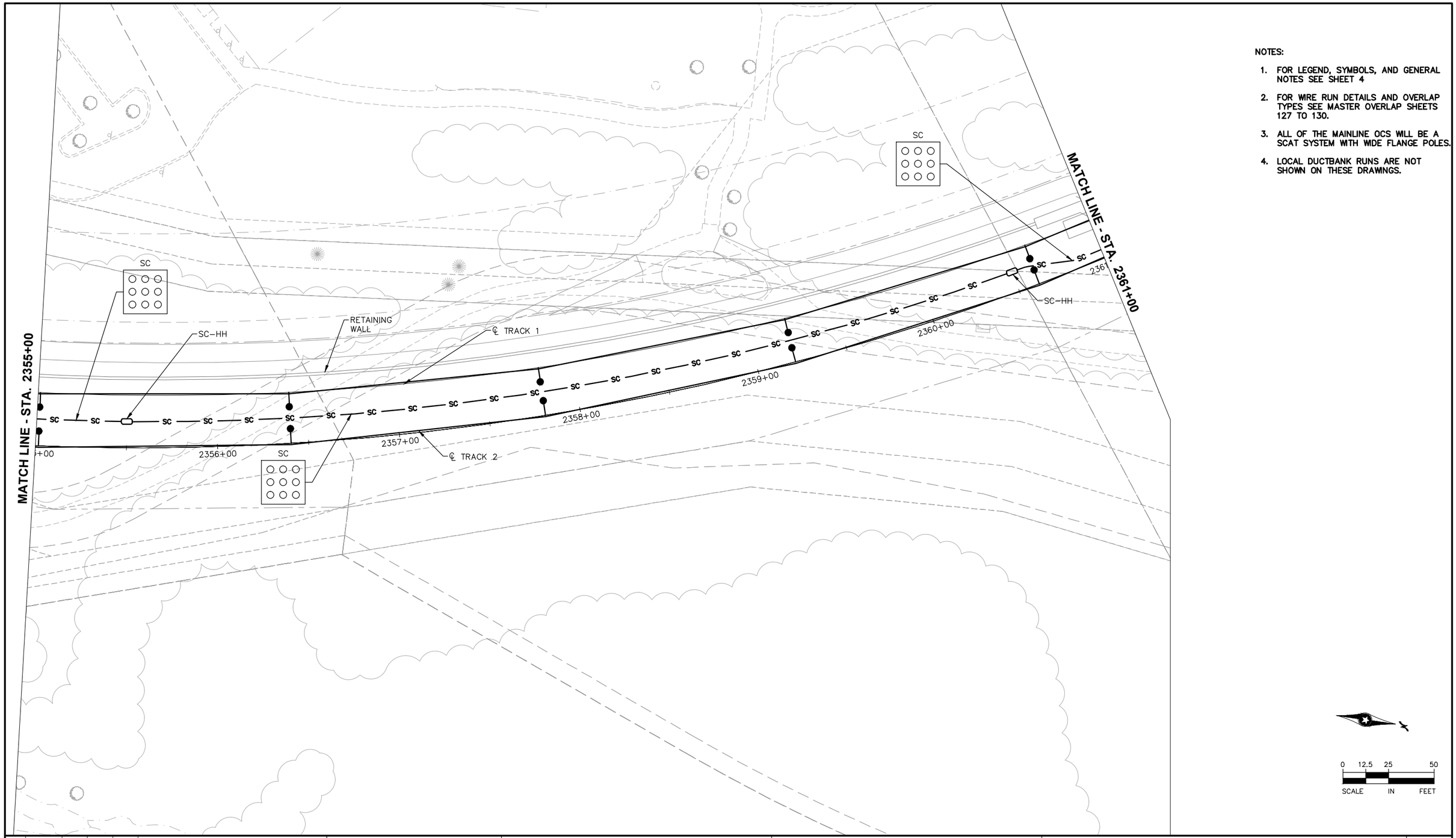
METROPOLITAN COUNCIL
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2350+00 TO STA. 2355+00

DISCIPLINE: SYSTEMS
SHEET NAME: W3-SYS-PLN-001

SHEET 55 OF 202

Jun, 27 2014 09:48 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

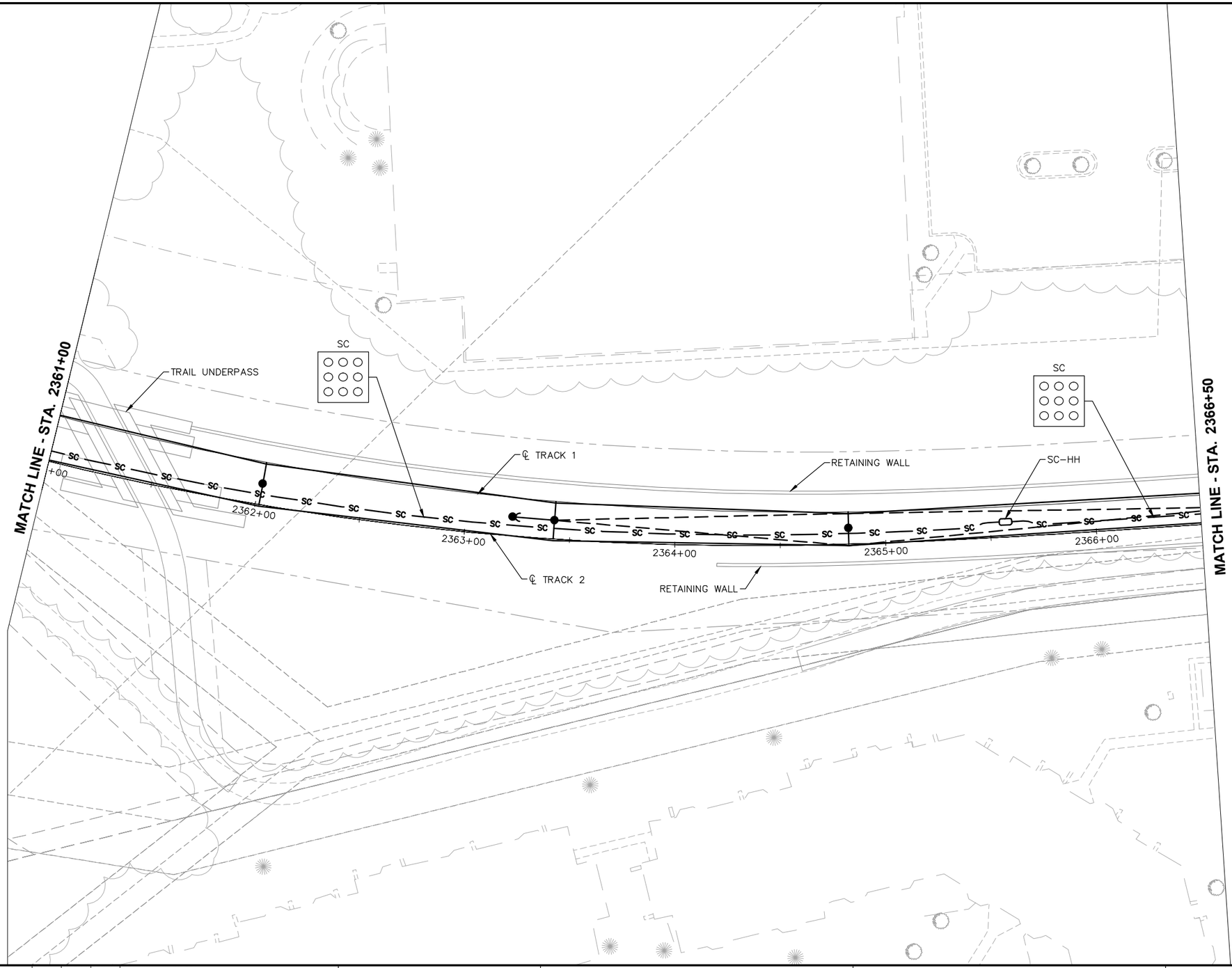
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2355+00 TO STA. 2361+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-002

SHEET 56 OF 202

Jun, 27 2014 09:48 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST
Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2361+00 TO STA. 2366+50

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-003

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NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

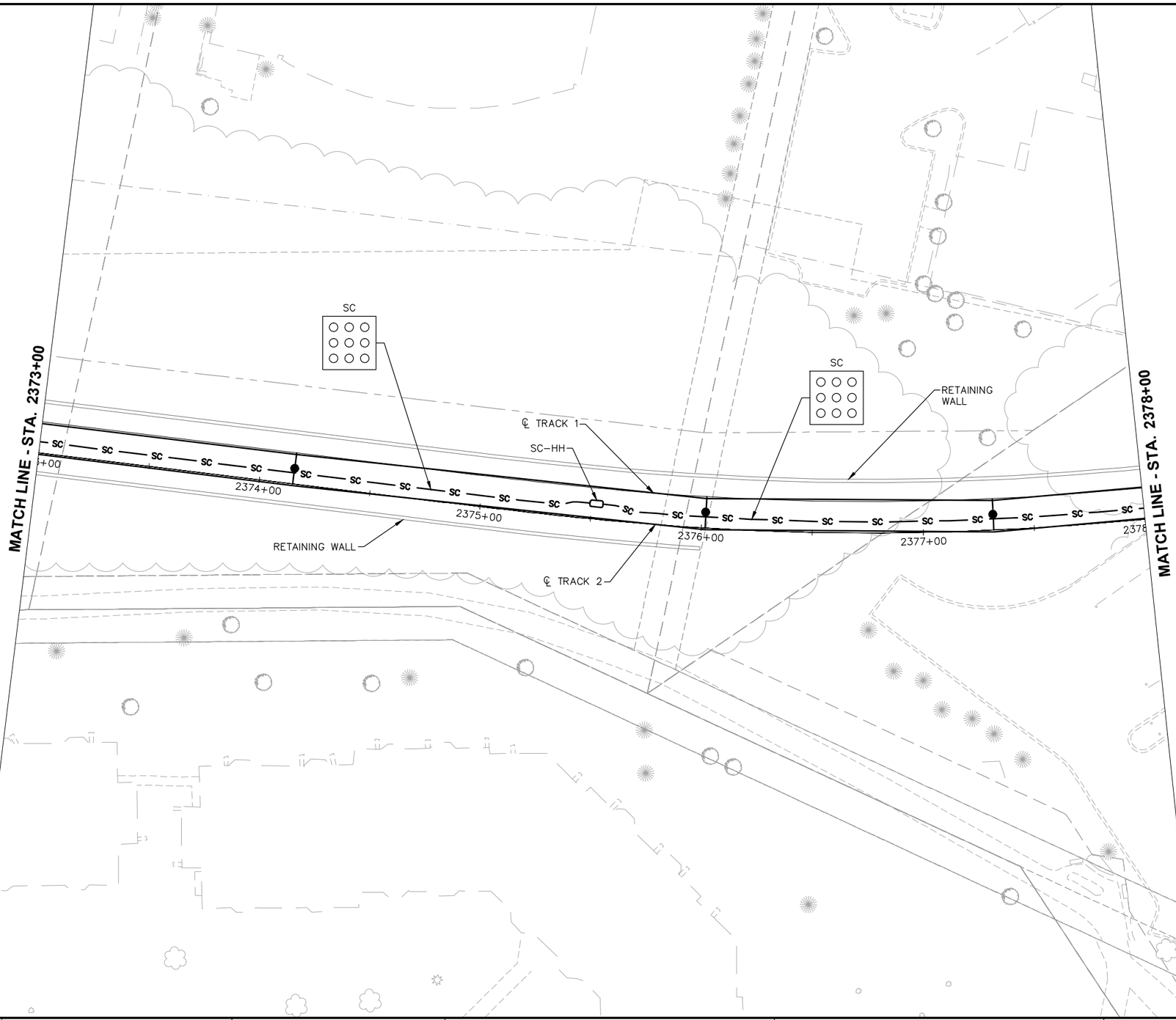
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2366+50 TO STA. 2373+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-004

SHEET 58 OF 202



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2373+00 TO STA. 2378+00

DISCIPLINE: SYSTEMS

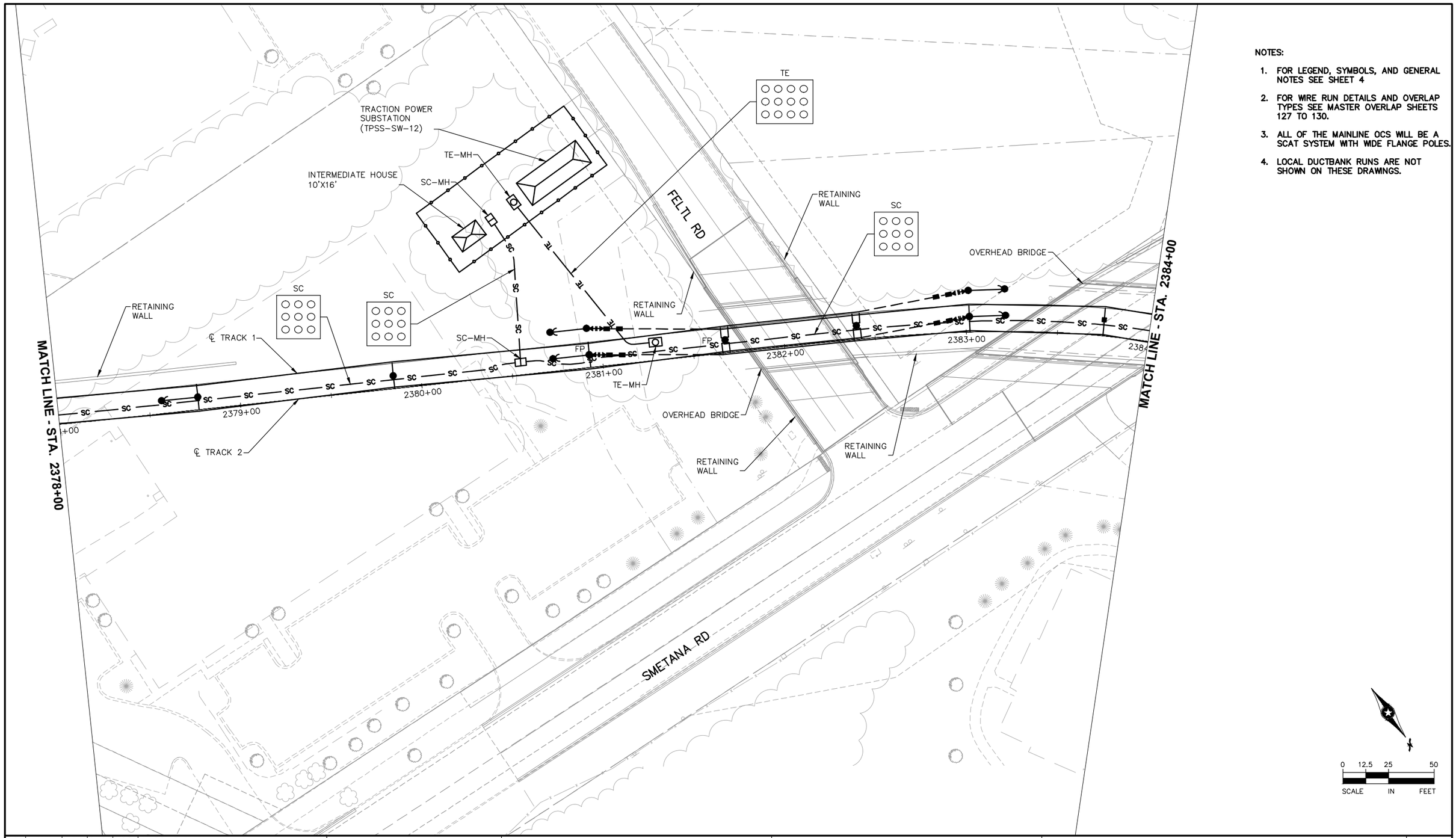
SHEET NAME: W3-SYS-PLN-005

SHEET 59 OF 202

Jun. 27 2014 09:50 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

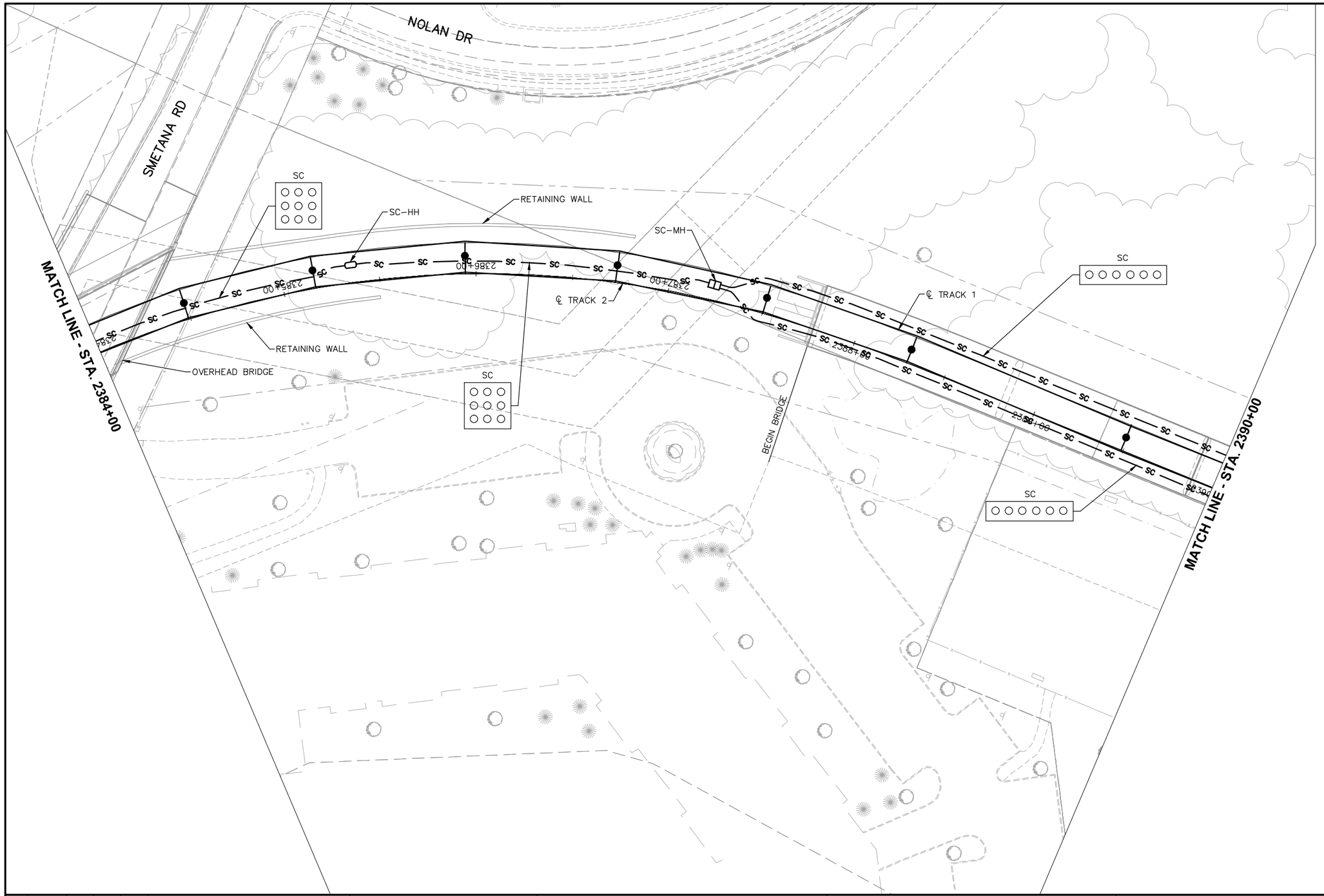
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2378+00 TO STA. 2384+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-006

SHEET 60 OF 202

Jun, 27 2014 09:51 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

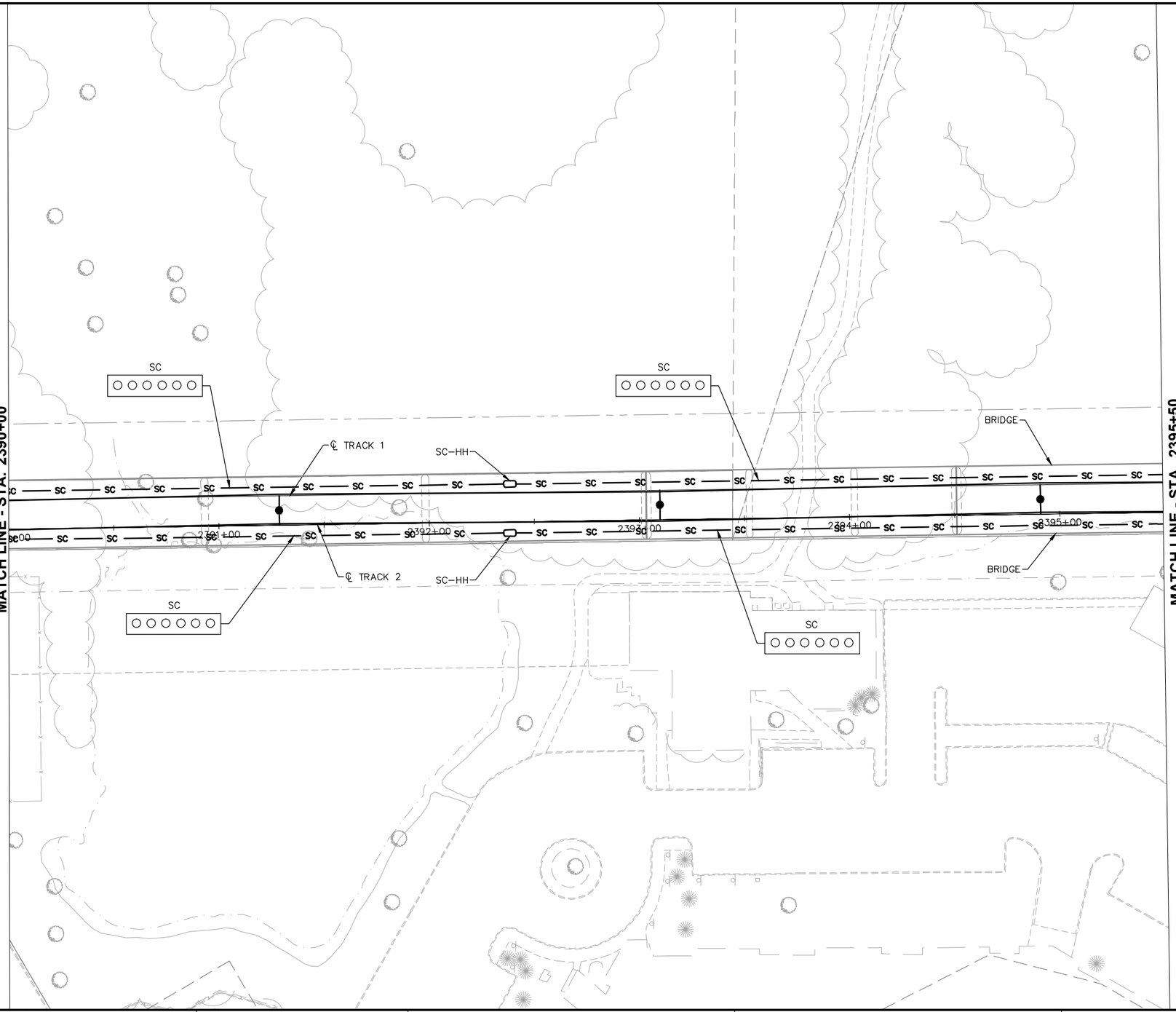
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2384+00 TO STA. 2390+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-007

SHEET 61 OF 202

Aug. 28 2014 08:46 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

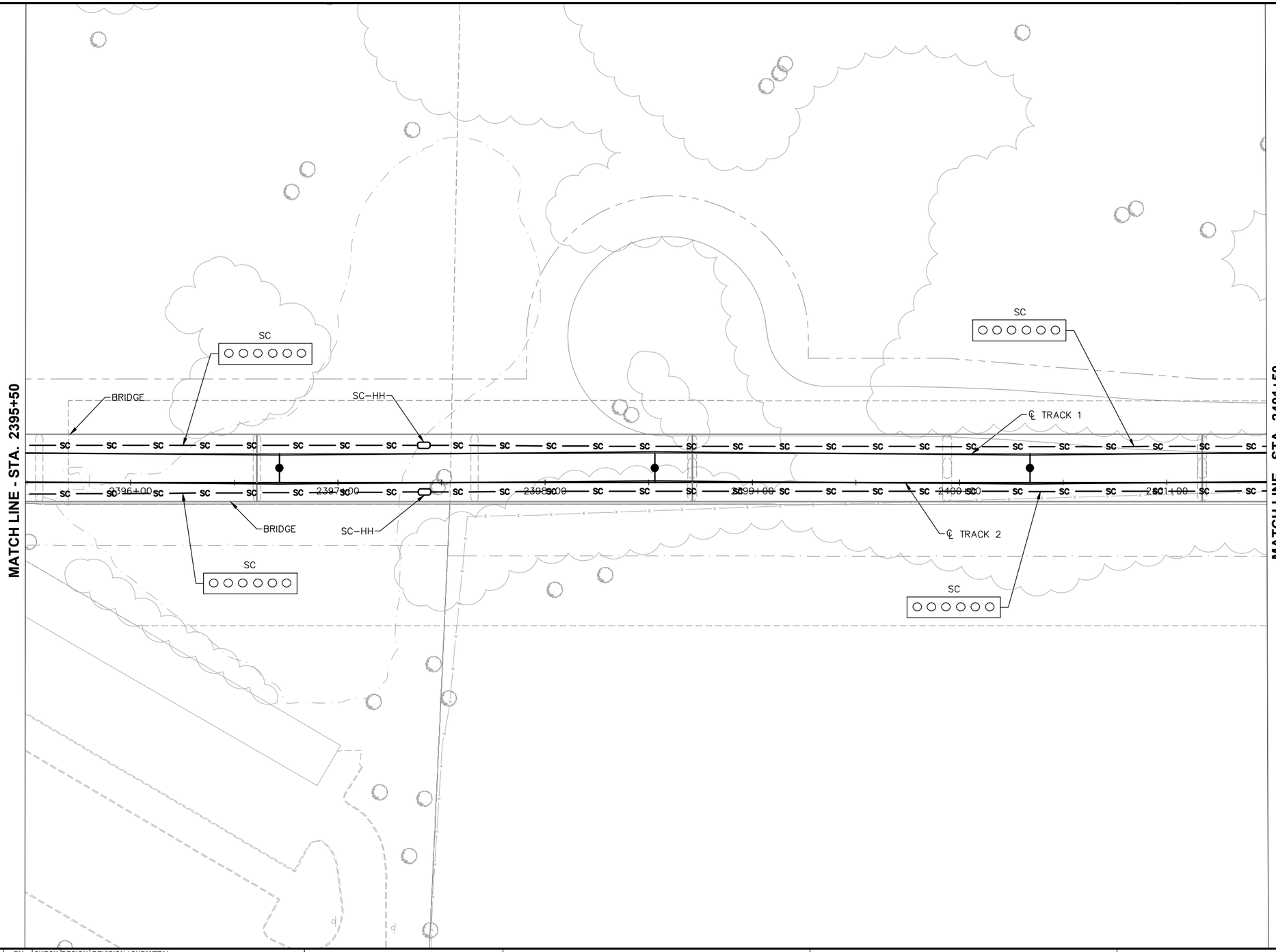
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2390+00 TO STA. 2395+50

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-008

SHEET 62 OF 202

Aug. 28 2014 08:46 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

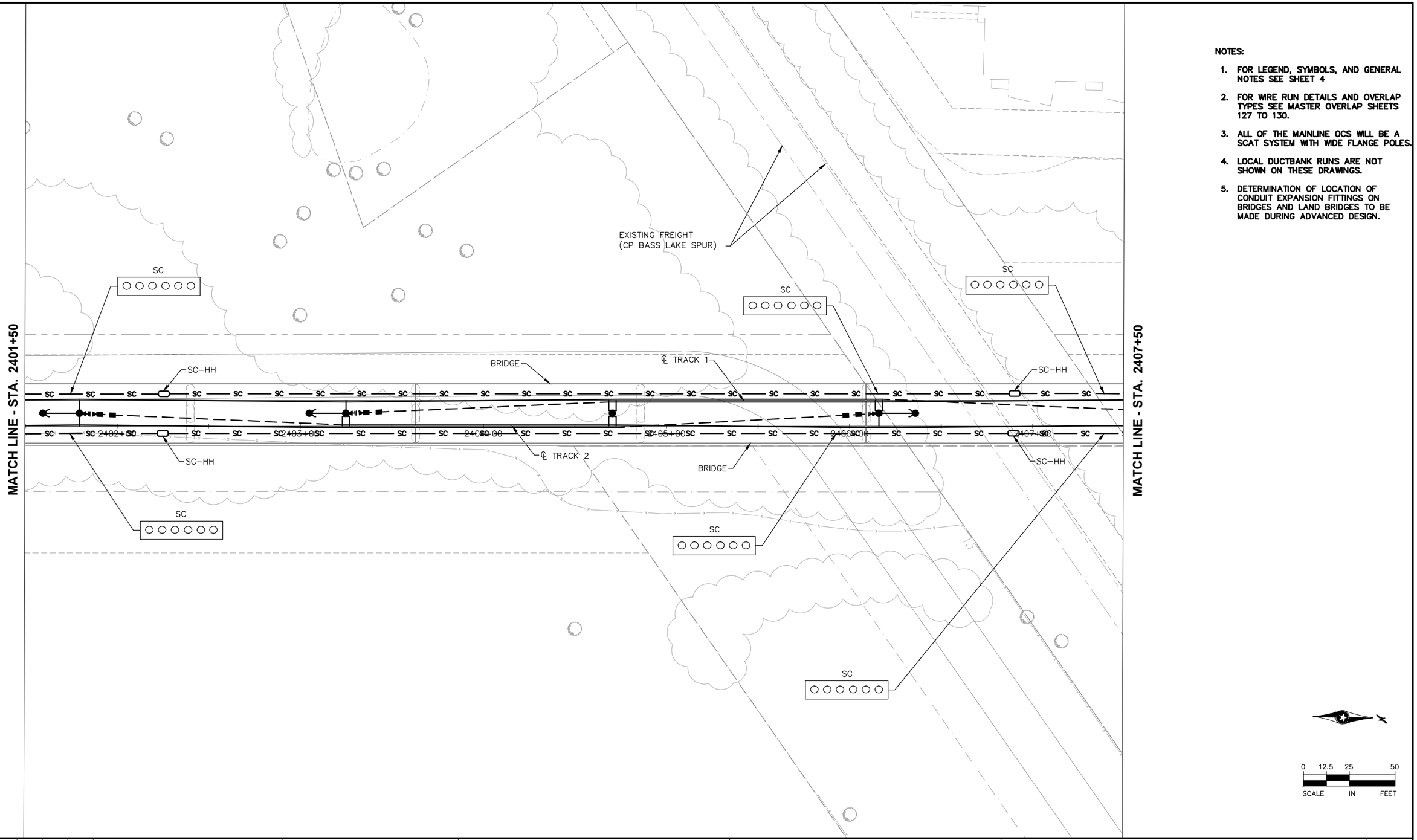
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2395+50 TO STA. 2401+50

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-009

SHEET 63 OF 202

Aug, 28 2014 08:46 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
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4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

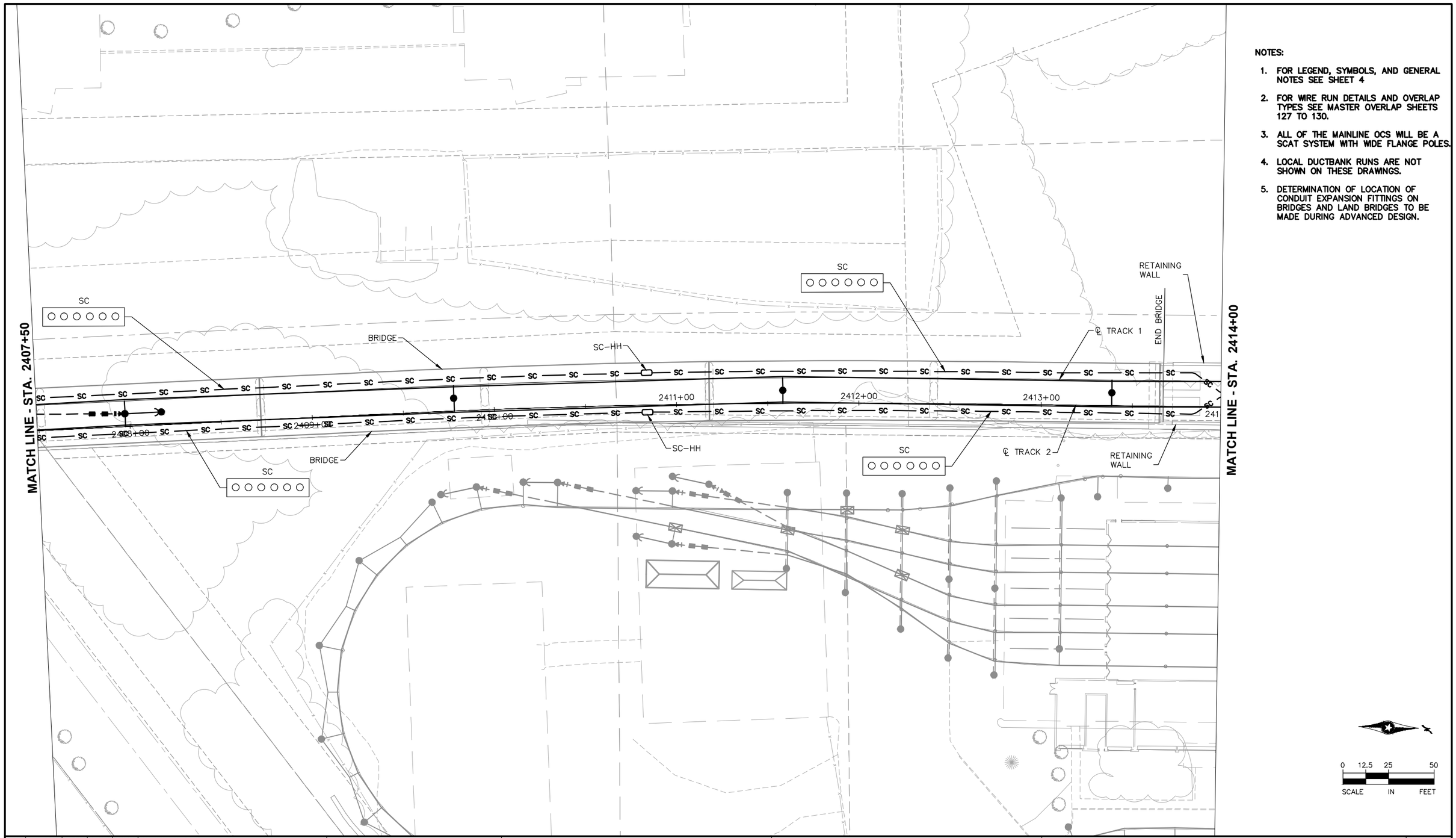
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2401+50 TO STA. 2407+50

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-010

SHEET 64 OF 202

Aug. 28 2014 08:46 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. DETERMINATION OF LOCATION OF CONDUIT EXPANSION FITTINGS ON BRIDGES AND LAND BRIDGES TO BE MADE DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

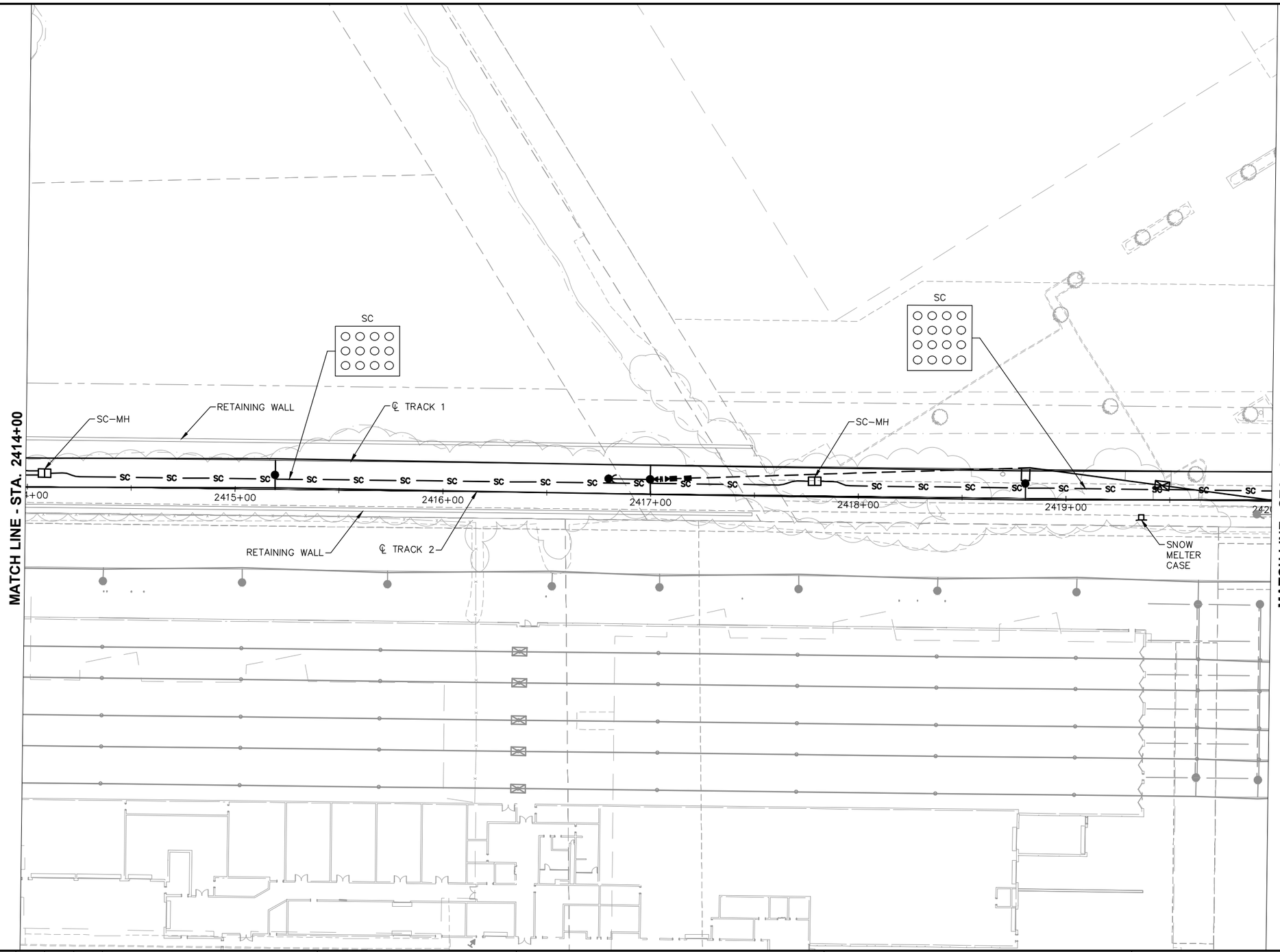
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2407+50 TO STA. 2414+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-011

SHEET 65 OF 202

Aug. 28 2014 08:47 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

0 12.5 25 50
SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

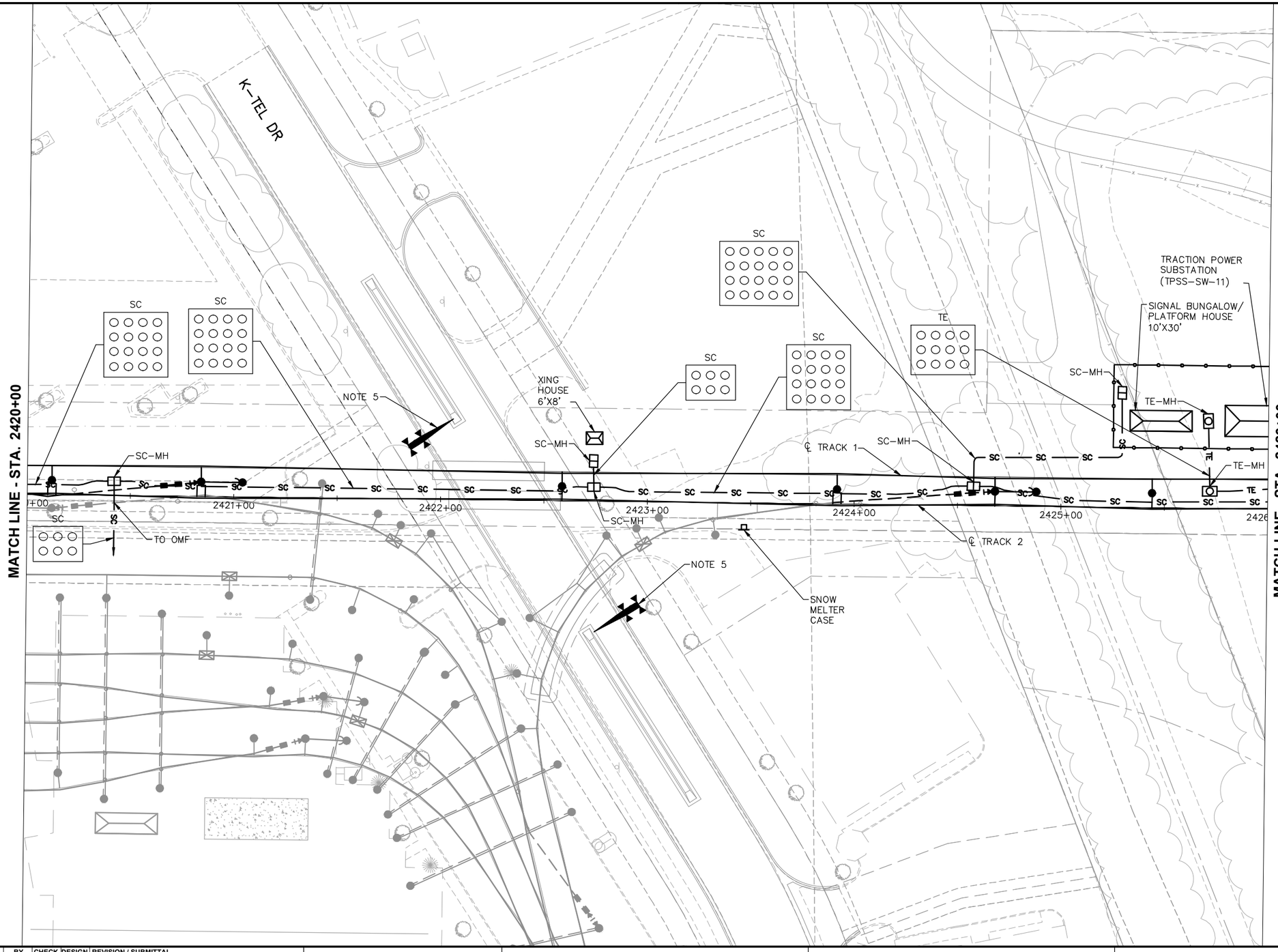
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2414+00 TO STA. 2420+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-012

SHEET 66 OF 202

Jun, 27 2014 09:56 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWORK GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.
6. CONFIGURATION OF SC DUCTBANK TO OMF WILL BE DETERMINED DURING ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2420+00 TO STA. 2426+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-013

SHEET 67 OF 202

Aug. 28 2014 08:47 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

SHADY OAK STATION

℄ TRACK 1

℄ TRACK 2

SC–MH

TE–MH

FP

SC

TE

2429+00

2428+00

2427+00

2430+00

2431+00

CELL TOWER

MATCH LINE - STA. 2426+00

MATCH LINE - STA. 2432+00

0 12.5 25 50

SCALE IN FEET

Aug. 28 2014 08:47 am V:\3200_PEC–W\CAD\SEGMENT–W3\SHEET\SYSTEMS\W3–SYS–PLN.dwg By: ehein

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

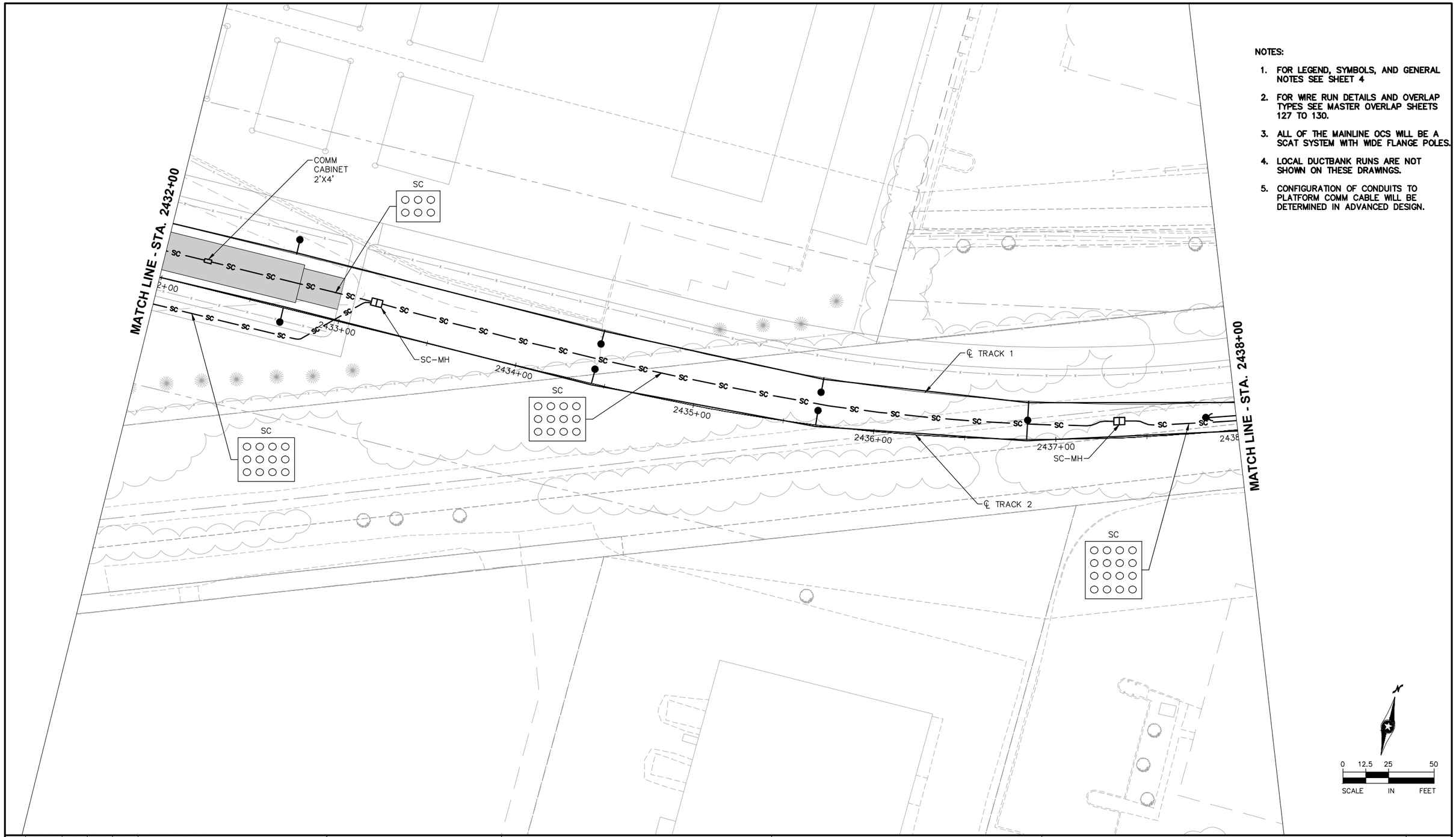
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2426+00 TO STA. 2432+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-014

SHEET 68 OF 202



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF CONDUITS TO PLATFORM COMM CABLE WILL BE DETERMINED IN ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2432+00 TO STA. 2438+00

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-015

SHEET 69 OF 202

Aug. 28 2014 08:48 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: ehein

MATCH LINE - STA. 2438+00

MATCH LINE - STA. 2444+50

SIGNAL BUNGALOW
10'X30'

SC

SC

SC

SC

℄ TRACK 1

SC–MH

SNOW
MELTER
CASE

2439+00

2440+00

2441+00

2442+00

2443+00

2444+00

SC–MH

SC–MH

℄ TRACK 2

SC

SC

NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.

0 12.5 25 50
SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

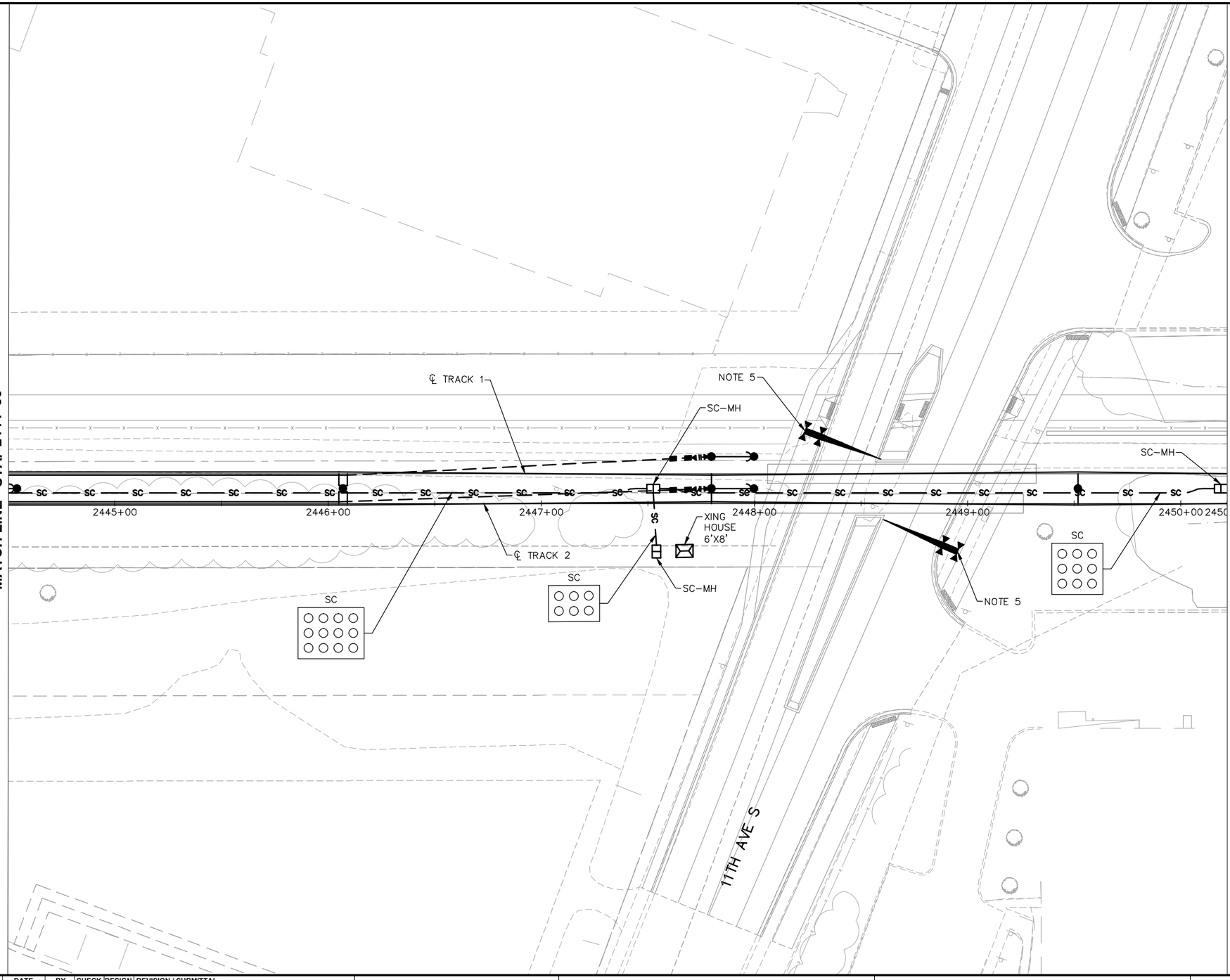
WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2438+00 TO STA. 2444+50

DISCIPLINE: SYSTEMS

SHEET NAME: W3-SYS-PLN-016

SHEET 70 OF 202

Jun, 27 2014 09:59 am V:\3200_PEC-W\CAD\SEGMENT-W3\SHEET\SYSTEMS\W3-SYS-PLN.dwg By: HeinEE



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. ALL OF THE MAINLINE OCS WILL BE A SCAT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CROSSING GATE PLACEMENT AND ROADWAY GEOMETRY TO BE FINALIZED IN ADVANCED DESIGN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

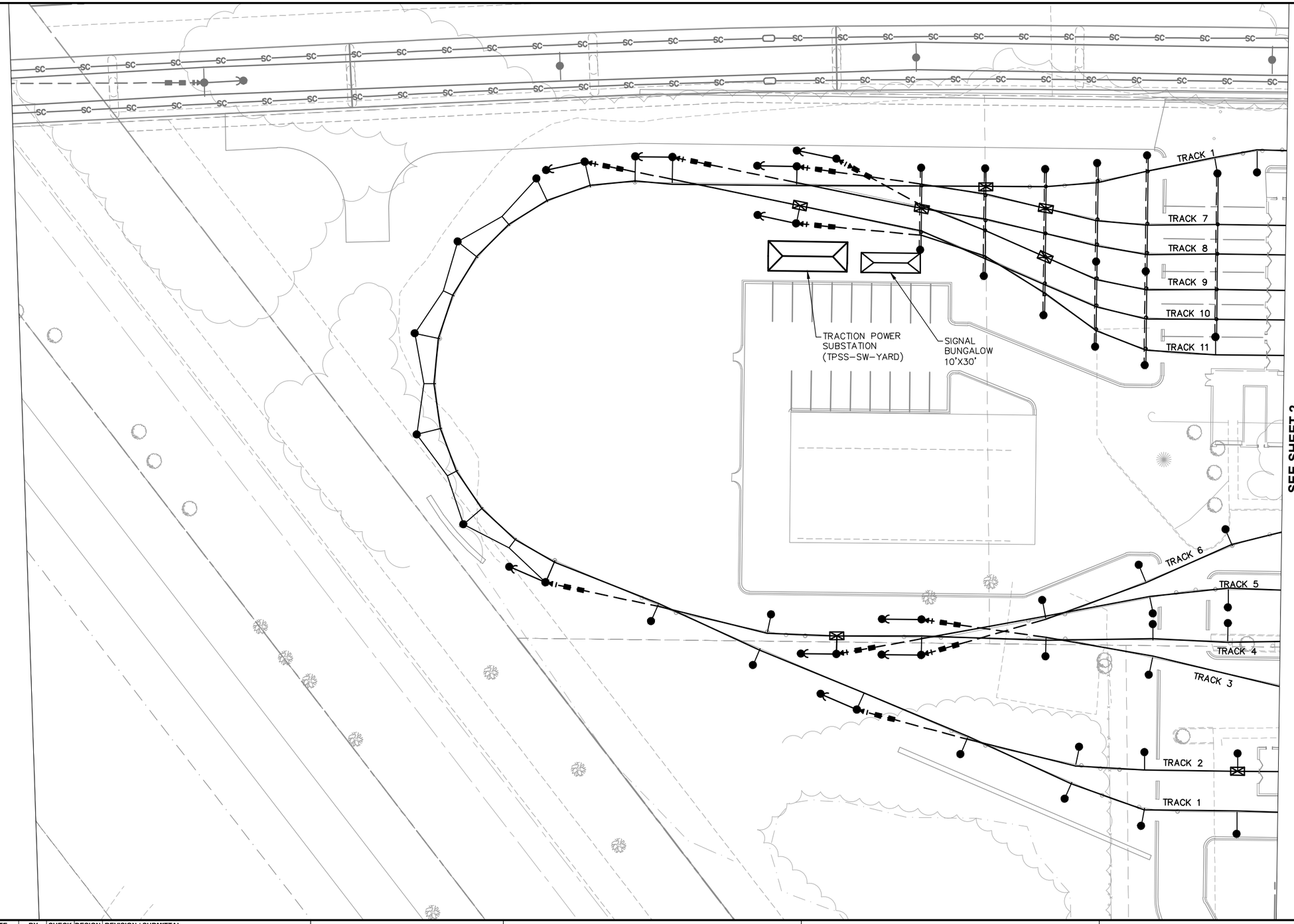
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SEGMENT W3
PLAN SHEET LAYOUTS
STA. 2444+50 TO STA. 2450+21.71

DISCIPLINE: SYSTEMS

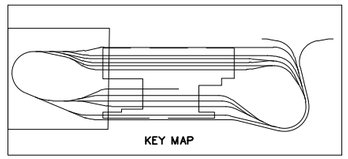
SHEET NAME: W3-SYS-PLN-017

SHEET 71 OF 202



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. THE OCS IN THE YARD SHALL BE A SWFT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF SC DUCTBANK TO OMF WILL BE DETERMINED DURING ADVANCED DESIGN.



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SCALE IN FEET

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

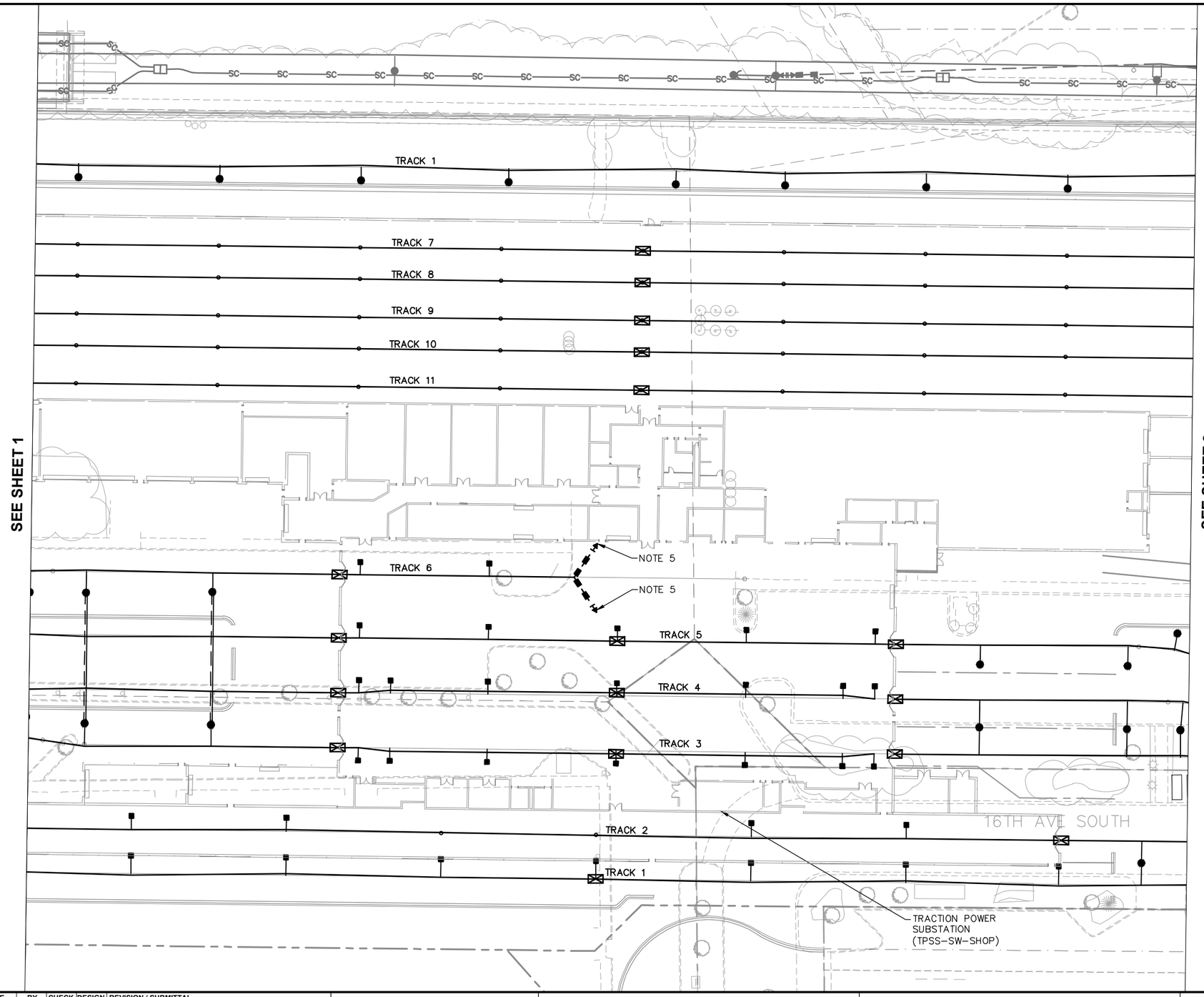
WEST-VOLUME 3 (SYSTEMS)
SEGMENT OMF
PLAN SHEET LAYOUTS
SHEET 1 OF 3

DISCIPLINE: SYSTEMS

SHEET NAME: OMF-SYS-PLN-001

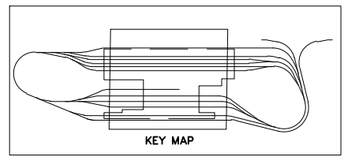
SHEET 72 OF 202

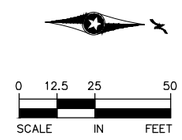
Aug, 28 2014 08:49 am V:\3200_PEC-W\CAD\OMF\PLAN SHEET\SYSTEMS\OMF-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. THE OCS IN THE YARD SHALL BE A SWFT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. WIRE TERMINATED ON COLUMN.
6. CONFIGURATION OF SC DUCTBANK TO OMF WILL BE DETERMINED DURING ADVANCED DESIGN.





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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

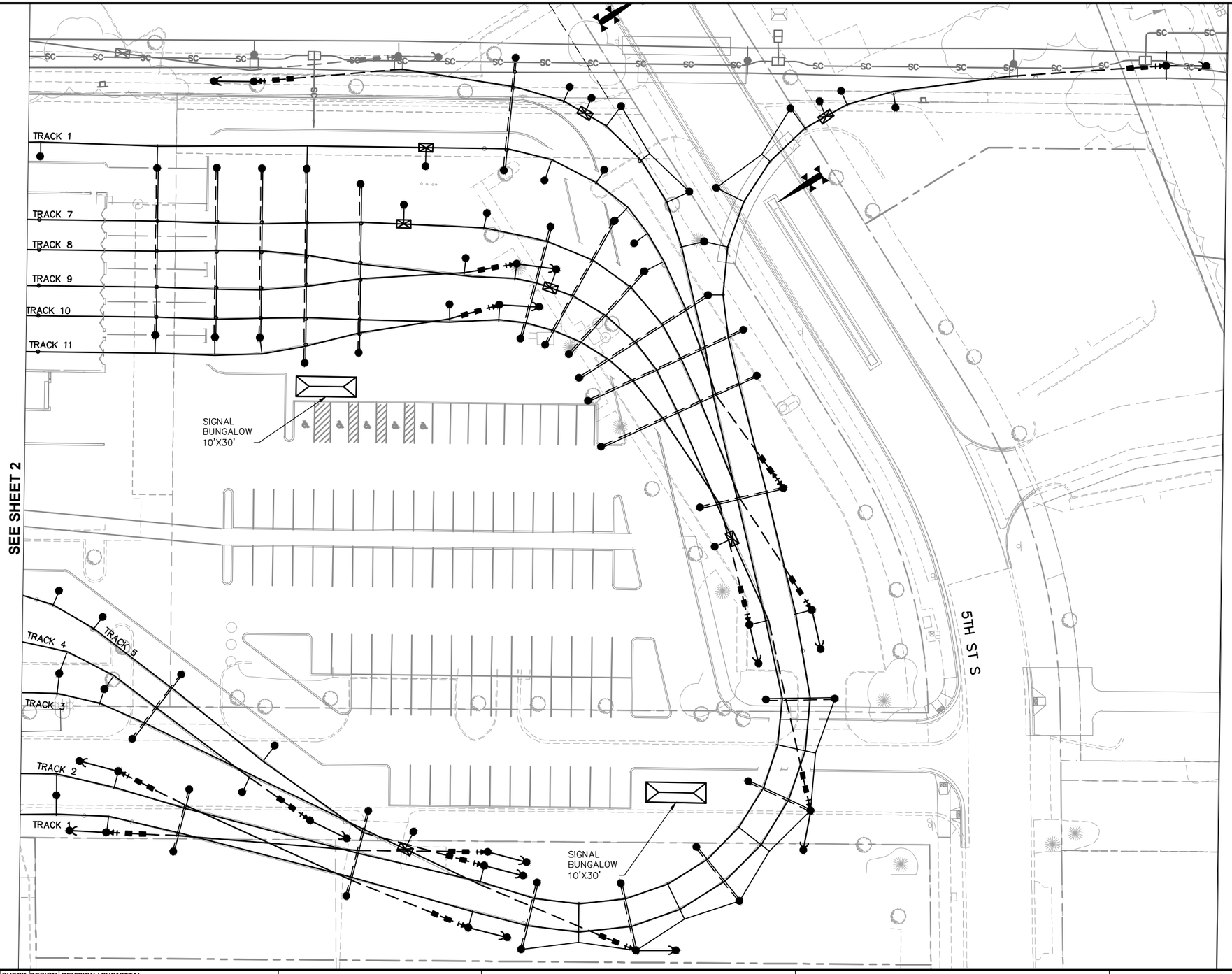
WEST-VOLUME 3 (SYSTEMS)
SEGMENT OMF
PLAN SHEET LAYOUTS
SHEET 2 OF 3

DISCIPLINE: SYSTEMS

SHEET NAME: OMF-SYS-PLN-002

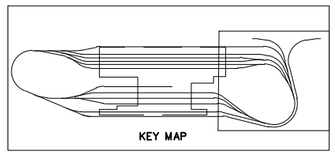
SHEET 73 OF 202

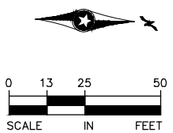
Aug. 28 2014 08:49 am V:\3200_PEC-W\CAD\OMF\PLAN SHEET\SYSTEMS\OMF-SYS-PLN.dwg By: ehein



NOTES:

1. FOR LEGEND, SYMBOLS, AND GENERAL NOTES SEE SHEET 4
2. FOR WIRE RUN DETAILS AND OVERLAP TYPES SEE MASTER OVERLAP SHEETS 127 TO 130.
3. THE OCS IN THE YARD SHALL BE A SWFT SYSTEM WITH WIDE FLANGE POLES.
4. LOCAL DUCTBANK RUNS ARE NOT SHOWN ON THESE DRAWINGS.
5. CONFIGURATION OF SC DUCTBANK TO OMF WILL BE DETERMINED DURING ADVANCED DESIGN.





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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

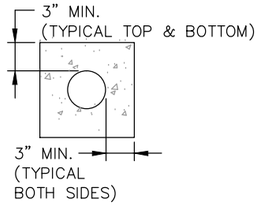
WEST-VOLUME 3 (SYSTEMS)
SEGMENT OMF
PLAN SHEET LAYOUTS
SHEET 3 OF 3

DISCIPLINE: SYSTEMS

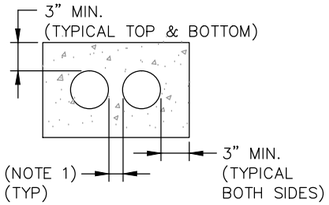
SHEET NAME: OMF-SYS-PLN-003

SHEET 74 OF 202

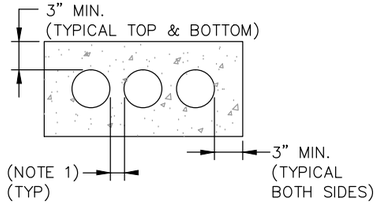
Aug, 28 2014 08:50 am V:\3200_PEC-W\CAD\OMF\PLAN SHEET\SYSTEMS\OMF-SYS-PLN.dwg By: ehein



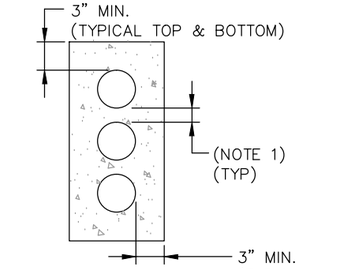
1 TYPE 1
(NOTE 2)



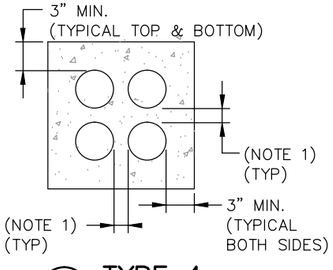
2 TYPE 2
(NOTE 2)



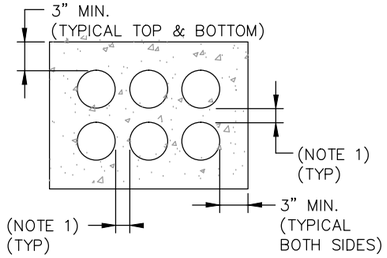
3 TYPE 3
(NOTE 2)



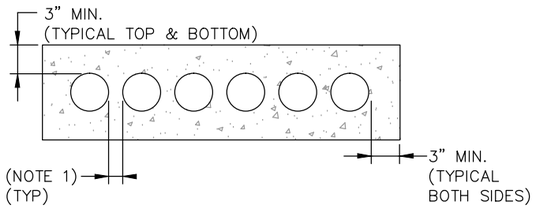
3V TYPE 3V
(NOTE 2)



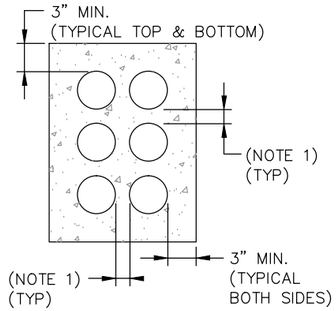
4 TYPE 4
(NOTE 2)



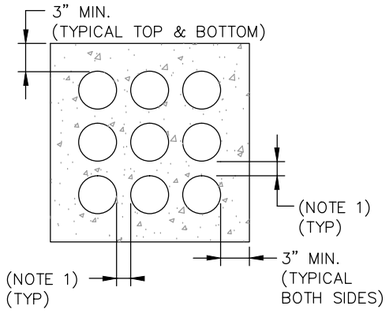
6 TYPE 6
(NOTE 2)



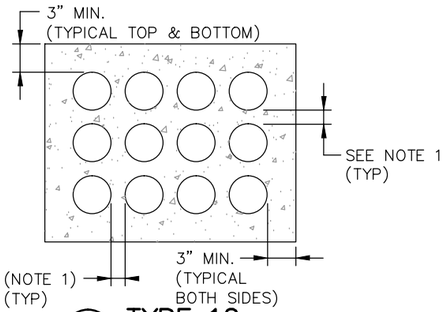
6H TYPE 6H
(NOTE 2)



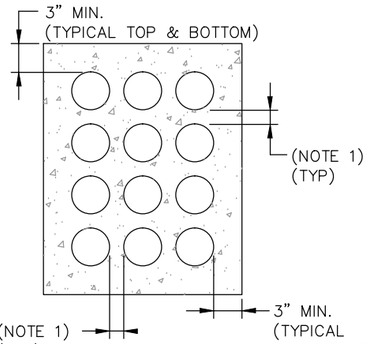
6V TYPE 6V
(NOTE 2)



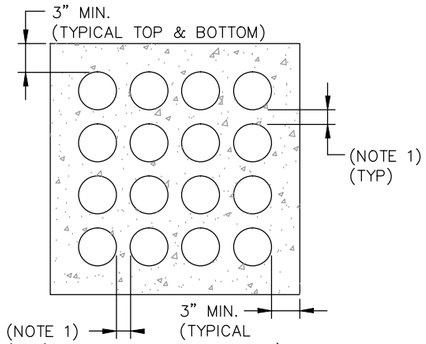
9 TYPE 9
(NOTE 2)



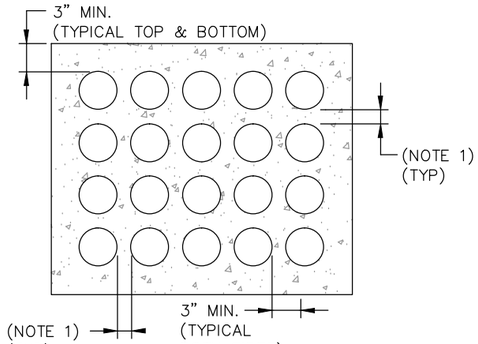
12 TYPE 12
(NOTE 2)



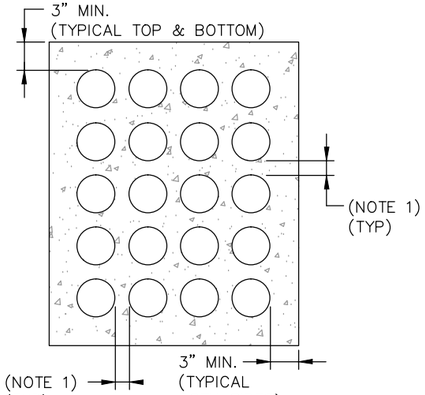
12V TYPE 12V
(NOTE 2)



16 TYPE 16
(NOTE 2)



20 TYPE 20
(NOTE 2)



20V TYPE 20V
(NOTE 2)

TYPICAL DUCTBANK SECTIONS

NOTES:

1. USE PVC ELECTRICAL CONDUIT SPACERS TO MAINTAIN A SPACING OF 1 1/2" CLEAR BETWEEN CONDUITS FOR SIGNAL/ COMMUNICATION AND LV DUCTBANKS. FOR TRACTION ELECTRIFICATION AND HV DUCTBANKS MAINTAIN A SPACING OF 3" CLEAR BETWEEN CONDUITS

2. DUCTBANK EXAMPLE:

   TYPE (2), INDICATES NUMBER OF CONDUITS AND THE CONDUIT SIZES VARY

   (V) INDICATES VERTICAL CONFIGURATION

   (H) INDICATES HORIZONTAL CONFIGURATION

3. ALL CONDUIT TYPICALLY 4 INCH

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

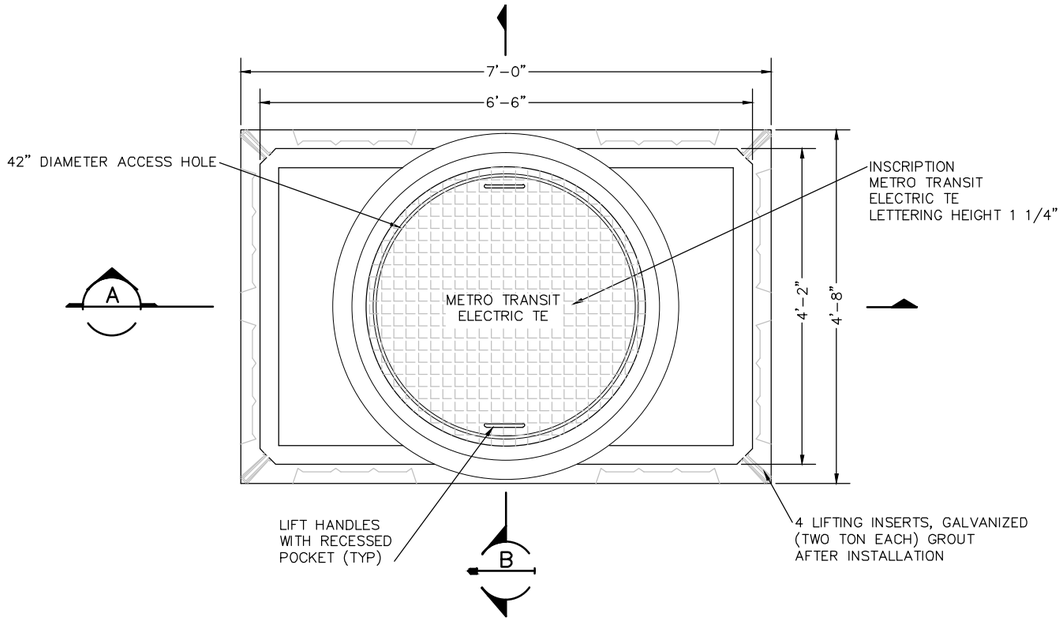
WEST-VOLUME 3 (SYSTEMS)
SYSTEMWIDE ELECTRICAL
DETAILS & TECHNICAL SHEETS
DUCTBANK SECTIONS

DISCIPLINE: SYSTEMS

SHEET NAME: SWE-DTL-101

SHEET 75 OF 202

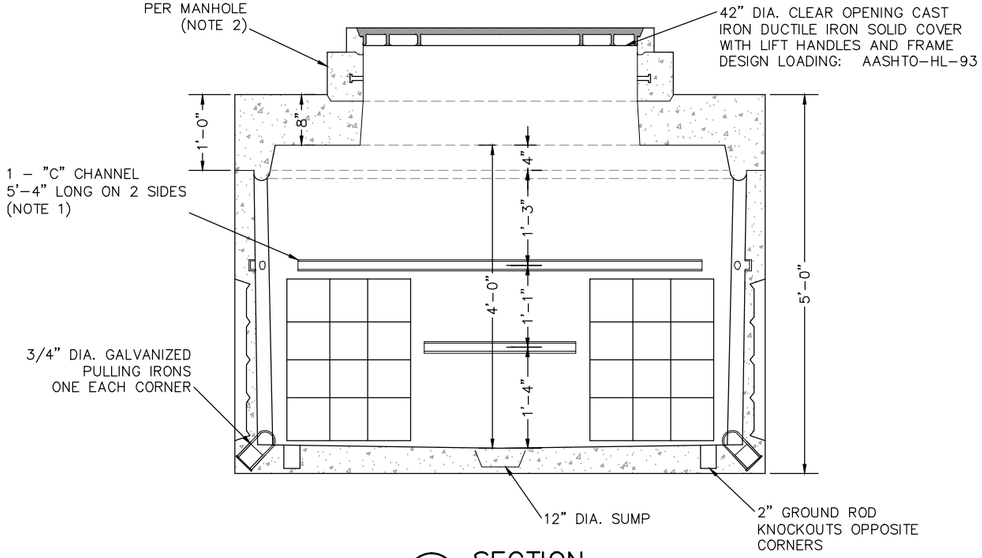
Jun, 26 2014 11:52 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SWE\WO-SYS-SWE-DTL.dwg By: HeinEE



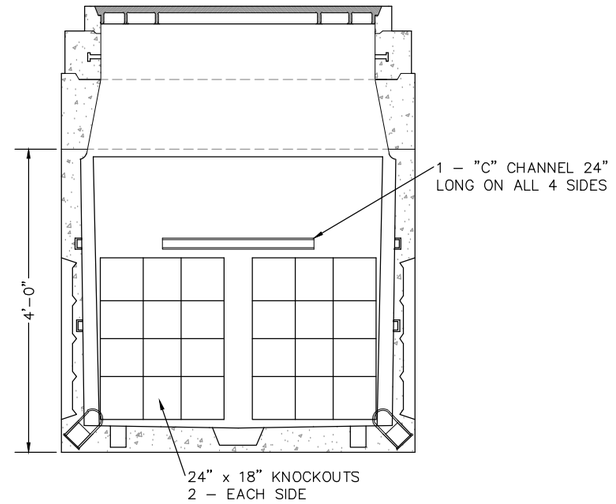
1 TE MANHOLE PLAN
NTS

NOTE:

1. INSTALL SIX CABLE RACKS WITH TWELVE INSULATORS PER MANHOLE.
2. USE ROUND ACCESS RISERS (30" MAX) TO ACHIEVE FINAL ELEVATION.



A SECTION
SCALE: NTS



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SCALE: NTS

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SYSTEMWIDE ELECTRICAL
DETAILS & TECHNICAL SHEETS
MANHOLE TYPE TE

DISCIPLINE: SYSTEMS

SHEET NAME: SWE-DTL-102

SHEET 76 OF 202

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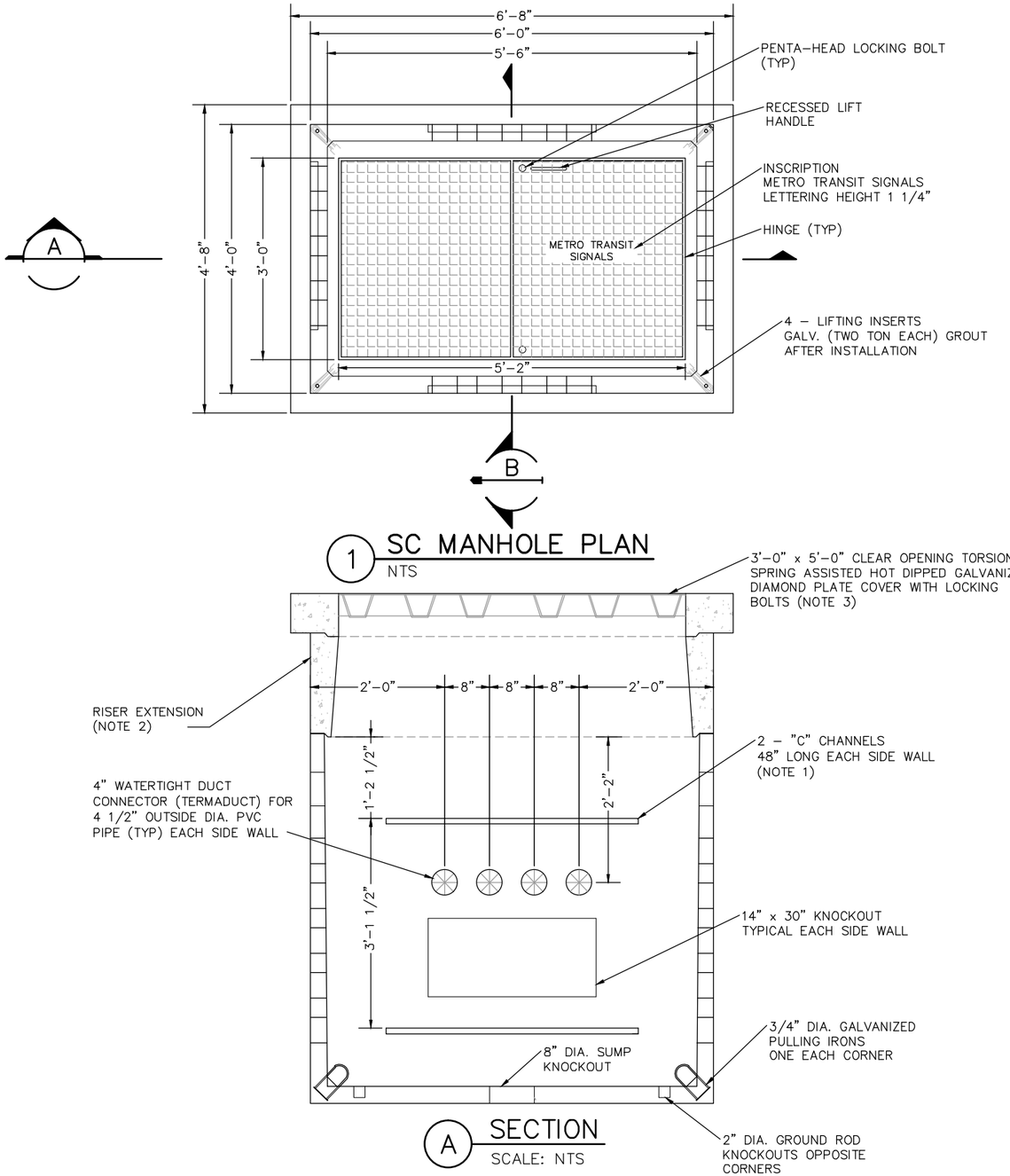
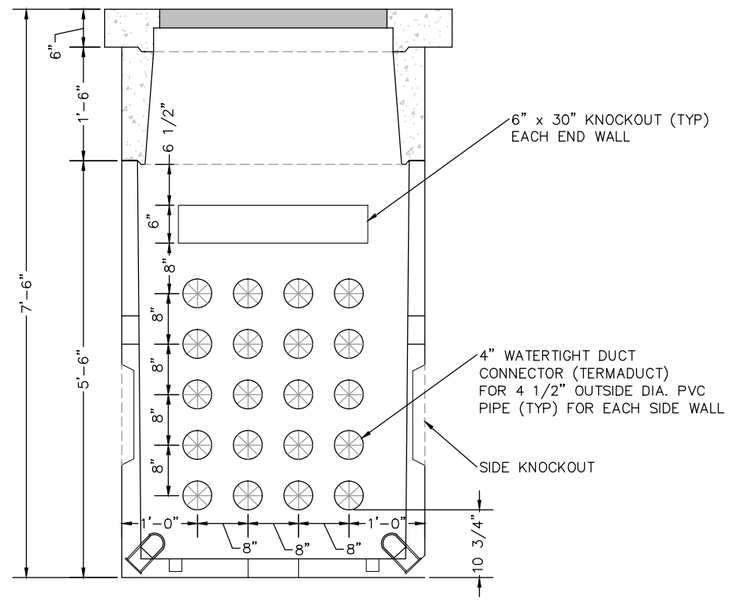


1 SC MANHOLE PLAN
NTS

A SECTION
SCALE: NTS

NOTE:

1. INSTALL EIGHT CABLE RACKS WITH SIXTEEN INSULATORS PER MANHOLE.
2. USE RISER EXTENSIONS TO ACHIEVE FINAL ELEVATION.
3. COVERS SHALL BE DESIGNED TO WITHSTAND AASHTO HL-93 WHEEL LOADINGS. SUITABLE FOR USE IN OFF STREET LOCATIONS.



B SECTION
SCALE: NTS

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

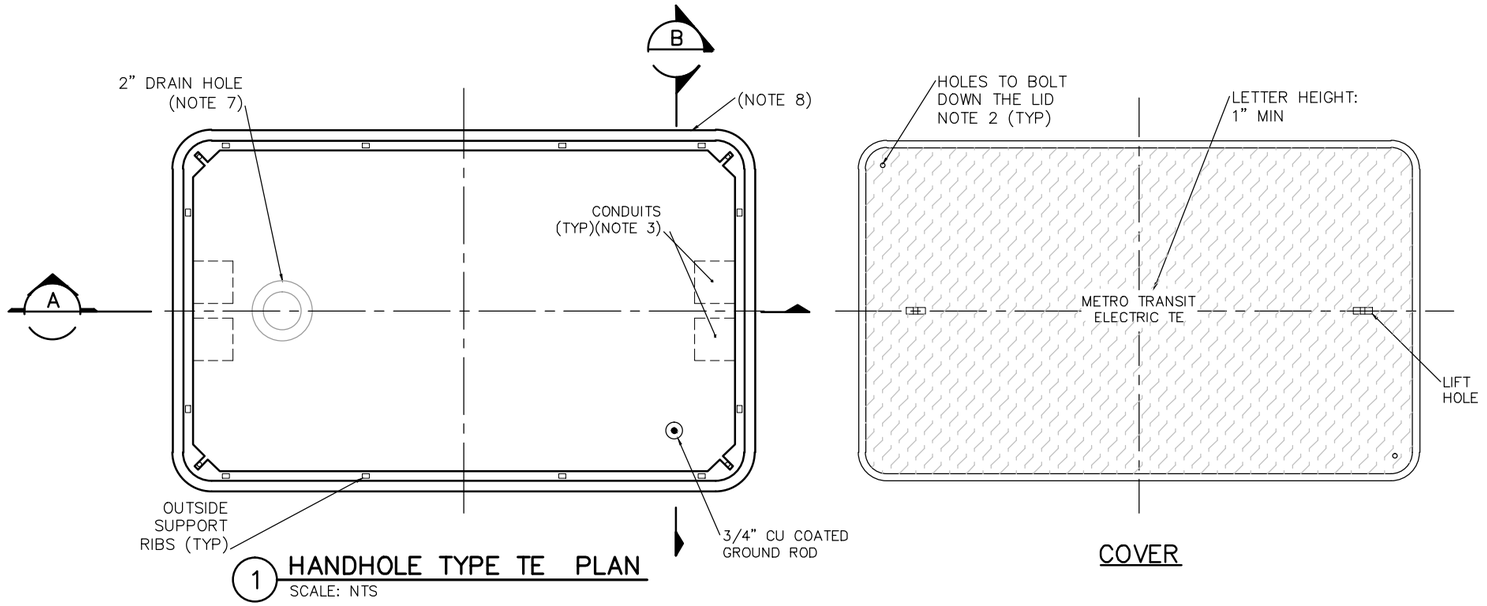
WEST-VOLUME 3 (SYSTEMS)
SYSTEMWIDE ELECTRICAL
DETAILS & TECHNICAL SHEETS
MANHOLE TYPE SC

DISCIPLINE: SYSTEMS

SHEET NAME: SWE-DTL-103

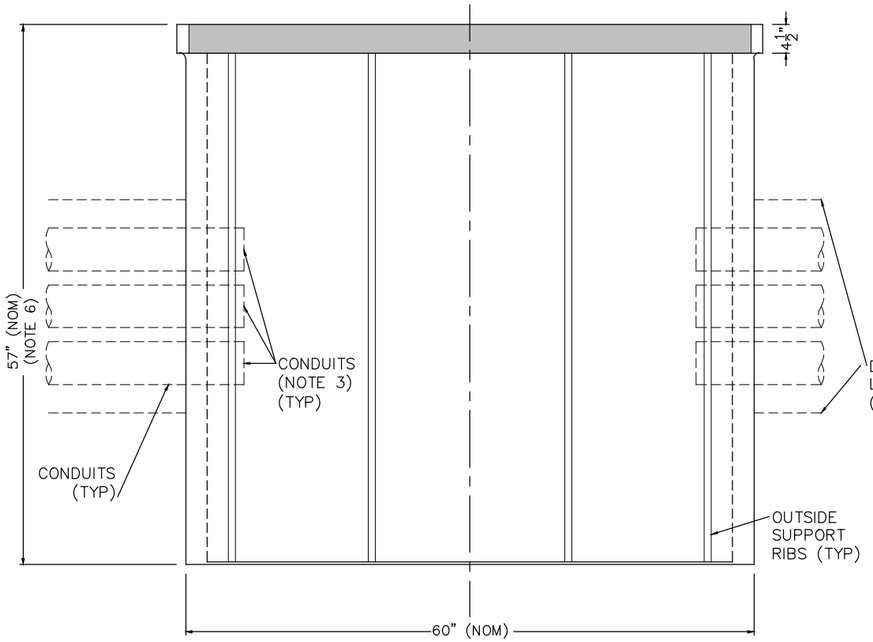
SHEET 77 OF 202

Jun. 26 2014 11:52 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SWE\WO-SYS-SWE-DTL.dwg By: HeinEE

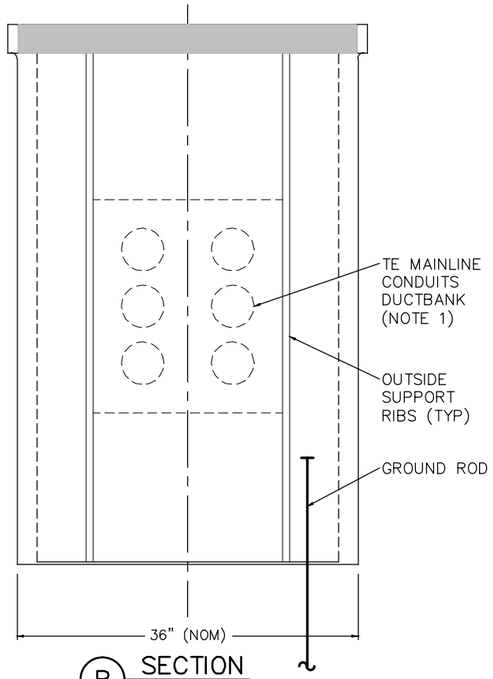


1 HANDHOLE TYPE TE PLAN
SCALE: NTS

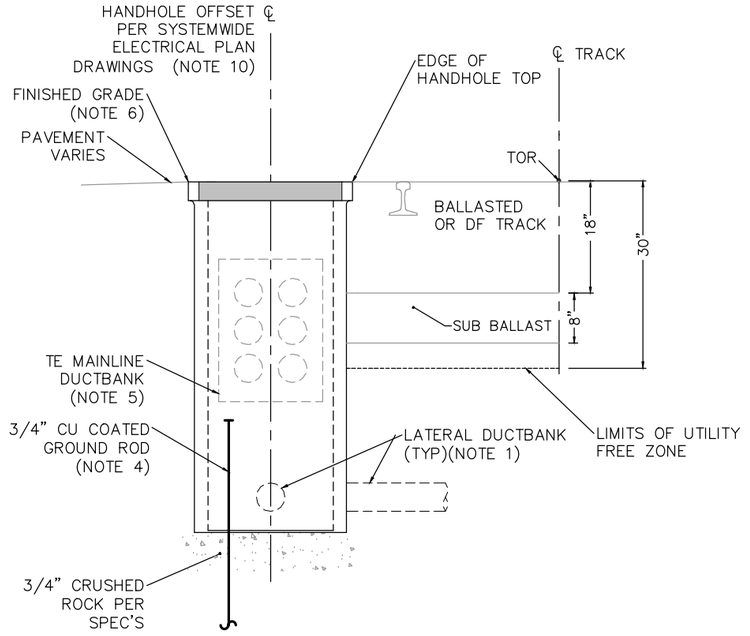
COVER



A SECTION
SCALE: NTS



B SECTION
SCALE: NTS



2 HANDHOLE TYPE TE TYPICAL INSTALLATION
SCALE: NTS

NOTES:

1. CONDUITS SHOWN ARE FOR EXAMPLE ONLY. ADDITIONAL CONDUITS MAY BE REQUIRED AS SHOWN ON THE PLAN SHEETS.
2. SEE SPECIFICATIONS REGARDING HOLD–DOWN BOLTS FOR COVERS.
3. CONDUITS SHALL EXTEND INTO THE HANDHOLE A MAXIMUM OF 1" FROM THE INSIDE WALL AND TERMINATE WITH BELL END FITTINGS.
4. INSTALL GROUND ROD CAUTIOUSLY TO AVOID DAMAGE TO POSSIBLE UTILITY INSTALLATIONS.
5. ADJUST CONDUIT ENTRY INTO THE HANDHOLE TO CREATE POSITIVE CONDUIT DRAINAGE AND TO ENTER CENTER OF HANDHOLE.
6. ADJUST DEPTH OF HANDHOLE TO ASSURE THAT COVER IS FLUSH WITH FINISHED GRADE. FOR LOCATIONS ON BRIDGES AND LAND BRIDGES TOP OF HANDHOLE IS TO BE AT THE SAME ELEVATION AS TOP OF RAIL.
7. LOCATE DRAIN HOLE ON LOWER END OF HANDHOLE AND PROVIDE STAINLESS STEEL SNAP–IN TYPE GRATE.
8. HANDHOLE MANUFACTURER IS SYNERTECH, MODEL NO. S3660C60FA OR APPROVED EQUAL.
9. SPECIAL HANDHOLE TYPES MAY BE REQUIRED AT SOME LOCATIONS.
10. HANDHOLE OFFSET DIMENSION IS VARIABLE. FINAL PLACEMENT OF HANDHOLE SHALL ASSURE THAT HANDHOLE TOP DOES NOT CONFLICT WITH TRACK CONSTRUCTION.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

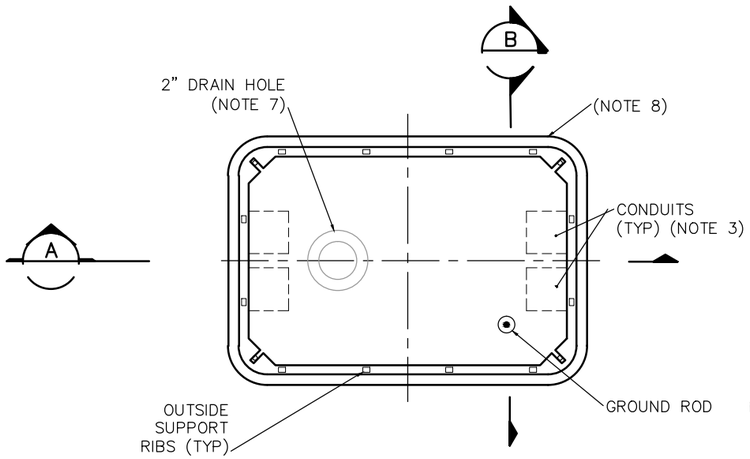
WEST-VOLUME 3 (SYSTEMS)
SYSTEMWIDE ELECTRICAL
DETAILS & TECHNICAL SHEETS
HANDHOLE TYPE TE

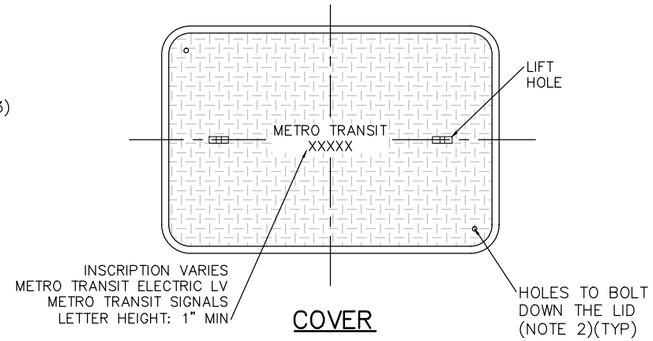
DISCIPLINE: SYSTEMS

SHEET NAME: SWE-DTL-104

SHEET 78 OF 202

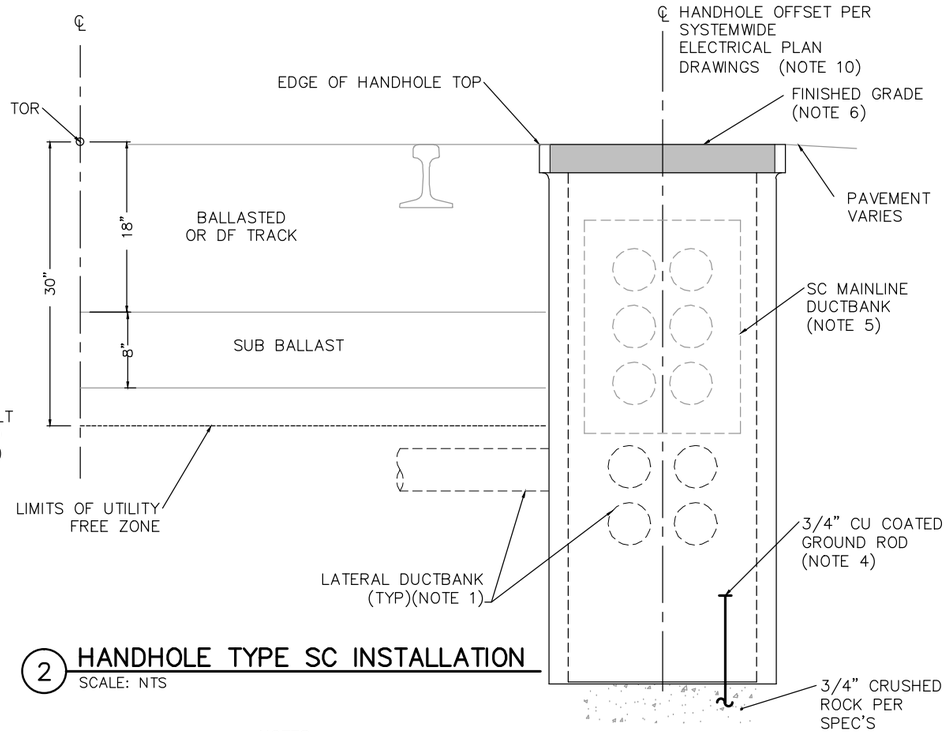
Jun. 26 2014 11:52 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SWE\WO-SYS-SWE-DTL.dwg By: HeinEE



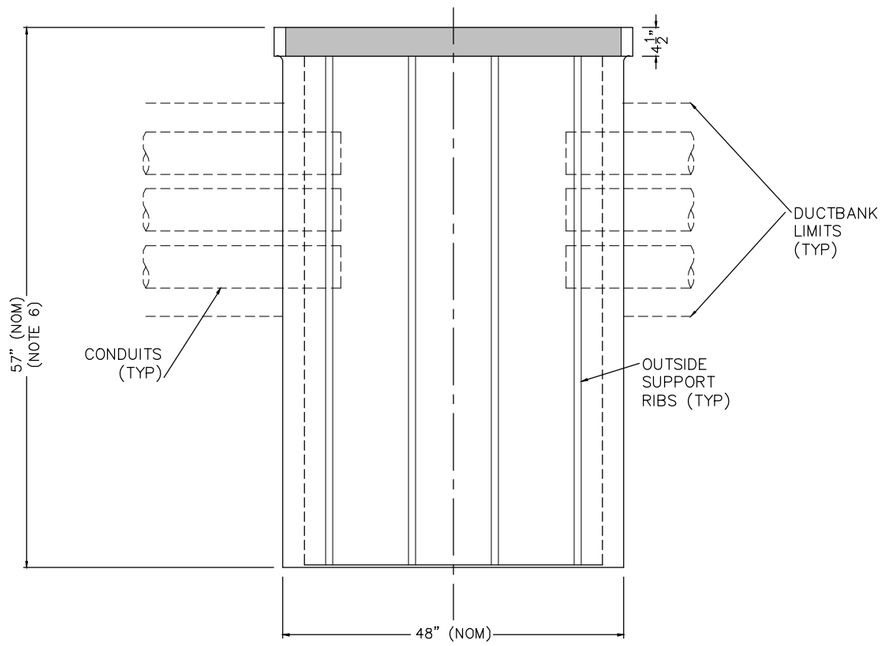


COVER

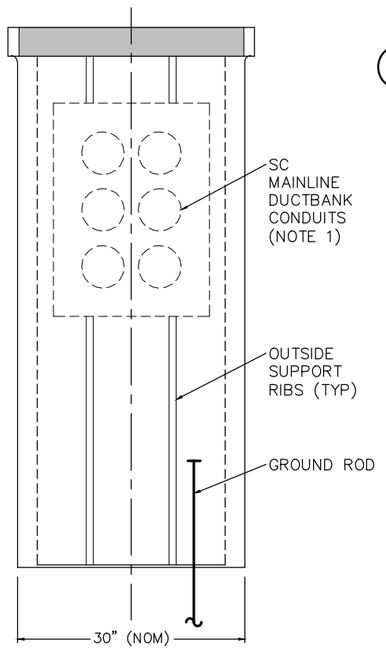
1 HANDHOLE TYPE SC PLAN
SCALE: NTS



2 HANDHOLE TYPE SC INSTALLATION
SCALE: NTS



A SECTION
SCALE: NTS



B SECTION
SCALE: NTS

NOTES:

1. CONDUITS SHOWN ARE FOR EXAMPLE ONLY. ADDITIONAL CONDUITS MAY BE REQUIRED AS SHOWN ON THE PLAN SHEETS.
2. SEE SPECIFICATIONS REGARDING HOLD–DOWN BOLTS FOR COVERS.
3. CONDUITS SHALL EXTEND INTO THE HANDHOLE A MAXIMUM OF 1" FROM THE INSIDE WALL AND TERMINATE WITH BELL END FITTINGS.
4. INSTALL GROUND ROD CAUTIOUSLY TO AVOID DAMAGE TO POSSIBLE UTILITY INSTALLATIONS.
5. ADJUST CONDUIT ENTRY INTO THE HANDHOLE TO CREATE POSITIVE CONDUIT DRAINAGE AND TO ENTER CENTER OF HANDHOLE.
6. ADJUST DEPTH OF HANDHOLE TO ASSURE THAT COVER IS FLUSH WITH FINISHED GRADE. FOR LOCATIONS ON BRIDGES AND LAND BRIDGES TOP OF HANDHOLE IS TO BE AT THE SAME ELEVATION AS TOP OF RAIL.
7. LOCATE DRAIN HOLE ON LOWER END OF HANDHOLE AND PROVIDE STAINLESS STEEL SNAP–IN TYPE GRATE.
8. HANDHOLE MANUFACTURER IS SYNERTECH, MODEL NO. S3048C60FA OR APPROVED EQUAL.
9. SPECIAL HANDHOLE TYPES MAY BE REQUIRED FOR SOME LAYOUTS.
10. HANDHOLE OFFSET DIMENSION IS VARIABLE. FINAL PLACEMENT OF HANDHOLE SHALL ASSURE THAT HANDHOLE TOP DOES NOT CONFLICT WITH TRACK CONSTRUCTION.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SYSTEMWIDE ELECTRICAL
DETAILS & TECHNICAL SHEETS
HANDHOLE TYPE SC

DISCIPLINE: SYSTEMS

SHEET NAME: SWE-DTL-105

SHEET 79 OF 202

Jun. 26 2014 11:53 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SWE\WO-SYS-SWE-DTL.dwg By: HeinEE

RECTIFIER TRANSFORMER

POWER TRANSFORMER

SECONDARY GROUNDED NEUTRAL (Y)

VOLTAGE TRANSFORMER

CURRENT TRANSFORMER
100/5 — CURRENT RATIO
3 — QUANTITY OF TRANSFORMERS

DELTA TRANSFORMER CONNECTION

WYE TRANSFORMER CONNECTION

TEST SWITCH

RECTIFIER

FUSE

INDICATING FUSE

REMOVABLE FUSE

CIRCUIT BREAKER, DRAWOUT

CIRCUIT BREAKER, FIXED MOUNTED

DC CIRCUIT BREAKER, WITH DIRECT ACTING OVERCURRENT TRIP

LIMIT DEVICE – NORMALLY OPEN CONTACT

MOMENTARY NORMALLY OPEN PUSH BUTTON CONTACT

MOMENTARY NORMALLY CLOSED PUSH BUTTON CONTACT WITH LOCK–OUT DEVICE

CONTACTOR COIL

INDICATING LIGHT

ELECTRO–MECHANICAL SOLENOID INTERLOCK

NORMALLY OPEN CONTACT

NORMALLY CLOSED CONTACT

SHUNT

REMOVABLE LINK

SURGE ARRESTER

DIRECTION OF CONTROL OR RELAY INFLUENCE LINE

CONCEALED/BURIED CONDUIT OR DUCTBANK

FUTURE OMF TRACKS

4–4" — INDICATES DUCTBANK OF (4) 4" CONDUITS

AUXILIARY POWER SUPPLY

POWER DISTRIBUTION BLOCK

KILOWATT HOUR METER

VOLTAGE TRANSDUCER

VOLTAGE SWITCH

AMMETER SWITCH

MICROSWITCH

MOTORIZED

VOLTMETER

AMMETER

POWER METER

INTERLOCK

KIRK KEY INTERLOCK

ELECTRICAL INTERLOCK

SCADA

RAIL TO GROUND

ETS PUSH BUTTON

IMPEDANCE BOND

INSULATED RAIL JOINT

OCS SECTION INSULATOR

OCS INSULATED OVERLAP

PASSENGER STATION

ANNUNCIATOR

NO — NORMALLY OPEN DISCONNECT SWITCH

NC — NORMALLY CLOSED DISCONNECT SWITCH

OCS — OMF OCS DISCONNECT SWITCH AND CONTACTOR

APS — OMF APS DISCONNECT SWITCH, PLUG, AND CONTACTOR

SH — OMF SWITCH HEATER PANEL

OMF CONTACT WIRE ALIVE INDICATOR LIGHT

OMF FALL GATE PROXIMITY DETECTOR

GROUNDING:

GROUND ROD

LYNCOLE XIT GROUND ROD

COILED PIGTAIL FOR CONNECTION

GROUND

BARE COPPER CABLE

GROUND CABLE "SPLICE" CONNECTION (EXOTHERMIC)

GROUND CABLE "CROSS" CONNECTION (EXOTHERMIC)

GROUND CABLE CONNECTION TO REBAR IN FOUNDATION

GROUND CABLE "TEE" CONNECTION (EXOTHERMIC)

52 — DEVICE WITH ANSI FUNCTION/NUMBER QUANTITY SHOWN OUTSIDE DEVICE CIRCLE

5	EMERGENCY TRIP STATION
26R1	RECTIFIER OVERTEMP ALARM (1ST. STAGE)
26R2	RECTIFIER OVERTEMP ALARM (2ND. STAGE)
27	AC UNDERVOLTAGE RELAY
27 BATC	BATTERY CHARGER UNDERVOLTAGE
30	ANNUNCIATOR/SUPERVISORY
32	REVERSE POWER RELAY
33A	AC EQUIPMENT REAR DOOR OPEN
33D	DC EQUIPMENT REAR DOOR OPEN
33N	NEGATIVE CUBICLE DOOR SWITCH
33R	RECTIFIER DOOR SWITCH
33T	TRANSFORMER DOOR SWITCH
47	PHASE SEQUENCE RELAY
48	INCOMPLETE SEQUENCE RELAY
49T1	TRANSFORMER OVERTEMP ALARM (1ST STAGE)
49T2	TRANSFORMER OVERTEMP TRIP (2ND STAGE)
50	PHASE INSTANTANEOUS TIME OVER CURRENT RELAY
50N	GROUND INSTANTANEOUS TIME OVER CURRENT RELAY
51	PHASE TIME DELAY OVER CURRENT RELAY
51N	GROUND TIME DELAY OVER CURRENT RELAY
52	AC CIRCUIT BREAKER
58AX	DIODE FUSE MONITOR, 1ST STAGE ALARM
58TX	DIODE FUSE MONITOR, 2ND STAGE TRIP
64/164	FRAME FAULT RELAY
64V	DC NEGATIVE TO GROUND VOLTAGE MONITOR
59	AC OVER VOLTAGE RELAY
64HS	FRAME FAULT HOT STRUCTURE MONITORING RELAY
64GS	FRAME FAULT GROUNDED STRUCTURE MONITORING RELAY
64V	RAIL TO GROUND VOLTAGE RELAY
72/172	DC CIRCUIT BREAKERS
76/176	DC DIRECT ACTING OVERCURRENT TRIP DEVICE
85	TRANSFER TRIP RELAY
85L	TRANSFER TRIP RELAY(LOCKOUT)
86	AC LOCKOUT RELAY
89	AC POWER DISCONNECT SWITCH
89N	NEGATIVE DISCONNECT SWITCH
95A	BATTERY CHARGER FAILURE ALARM
98R1	RECTIFIER DIODE FAILURE ALARM (1ST STAGE)
98R2	RECTIFIER DIODE FAILURE ALARM (2ND STAGE)
99T	RECTIFIER DC SURGE SUPPRESSION FUSE FAILURE
127/27DC	DC FEEDER UNDERVOLTAGE RELAY
127A	LOSS OF AC CONTROL VOLTAGE
127B	LOSS OF DC CONTROL VOLTAGE
127C	BATTERY UNDERVOLTAGE
150/150R	DC RATE OF RISE AND OVERCURRENT RELAY
159	DC OVER VOLTAGE RELAY
159A	125 VDC CONTROL VOLTAGE SHORTED WITH 750VDC
164N	NEGATIVE TO EARTH POTENTIAL RELAY
182	DC LOAD MEASUREMENT AND RECLOSING RELAY
183	RECLOSING RELAY
186	DC LOCKOUT RELAY
SDR	SMOKE DETECTOR RELAY
UX	GROUND SENSING (VOLTAGE)
UI	GROUND SENSING (CURRENT)

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

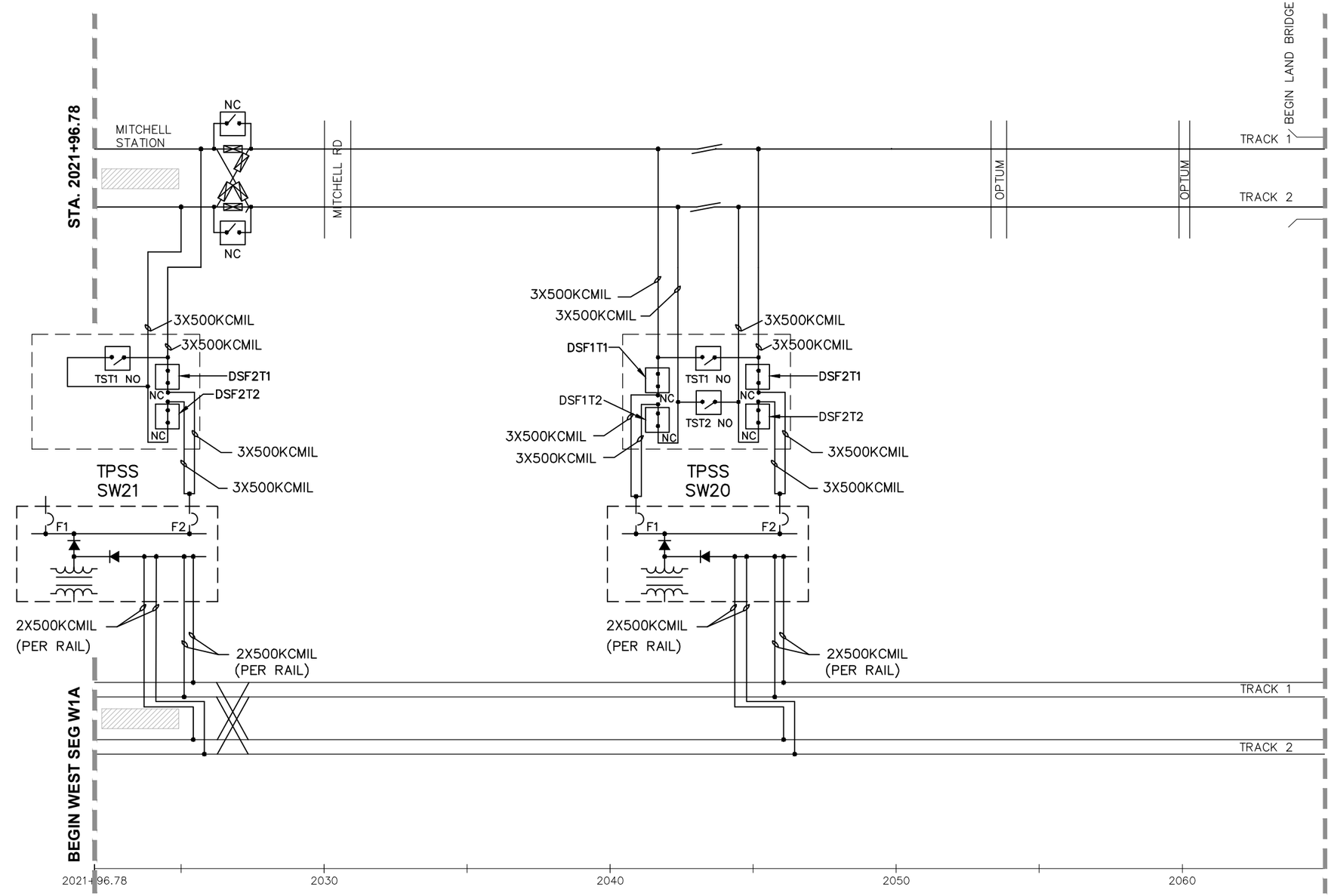
WEST-VOLUME 3 (SYSTEMS) TRACTION POWER SYSTEM SYMBOLS, LEGEND AND GENERAL NOTES

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-GEN-001

SHEET 80 OF 202

Jun, 26 2014 10:34 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-TPS\TPS-GEN-001.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

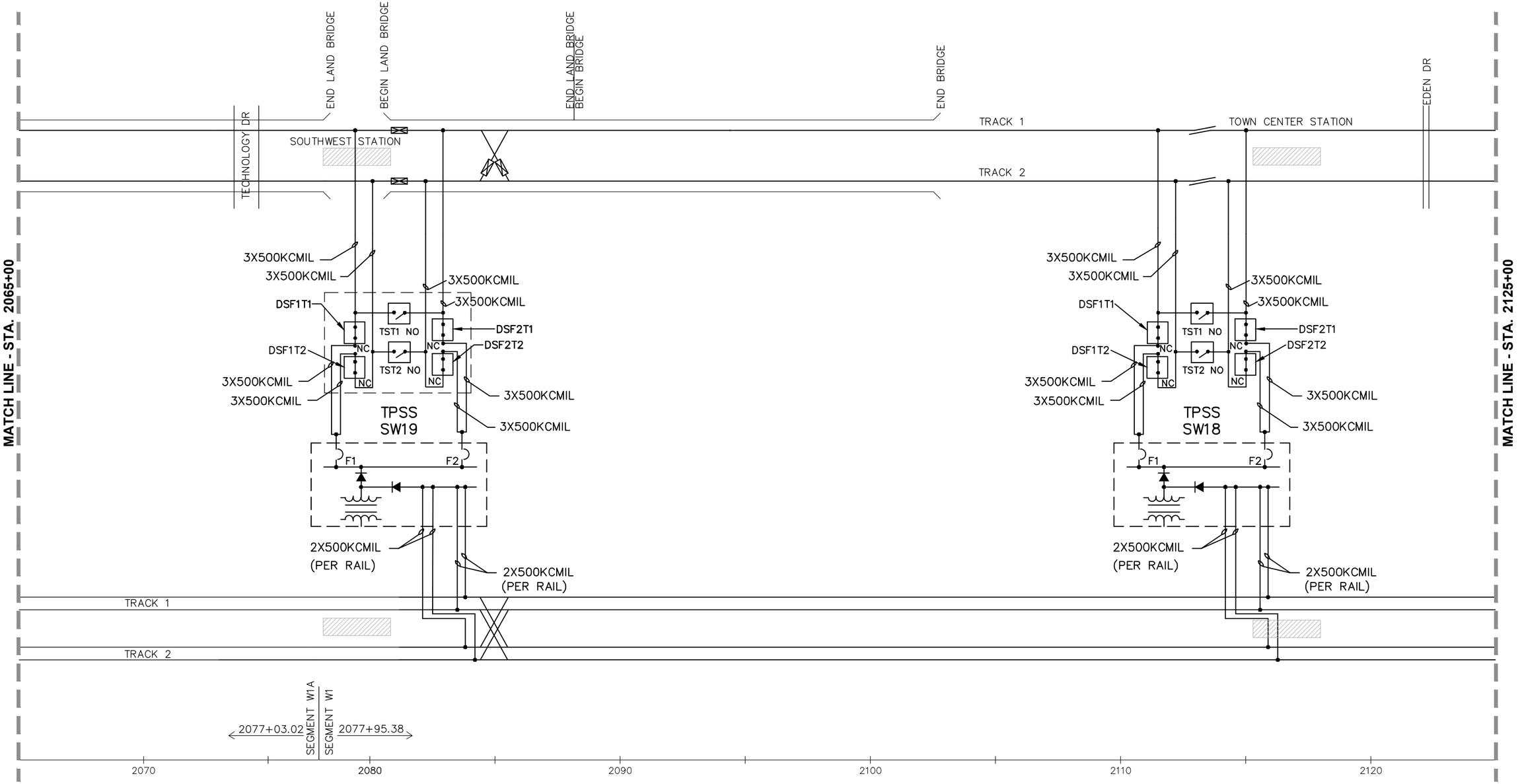
WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2021+96.78 TO STA. 2065+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-001

SHEET 81 OF 202

Jun, 26 2014 10:35 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Reference Sectionalizing Diagram\SYS-OCS-SCD.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2065+00 TO STA. 2125+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-002

SHEET 82 OF 202

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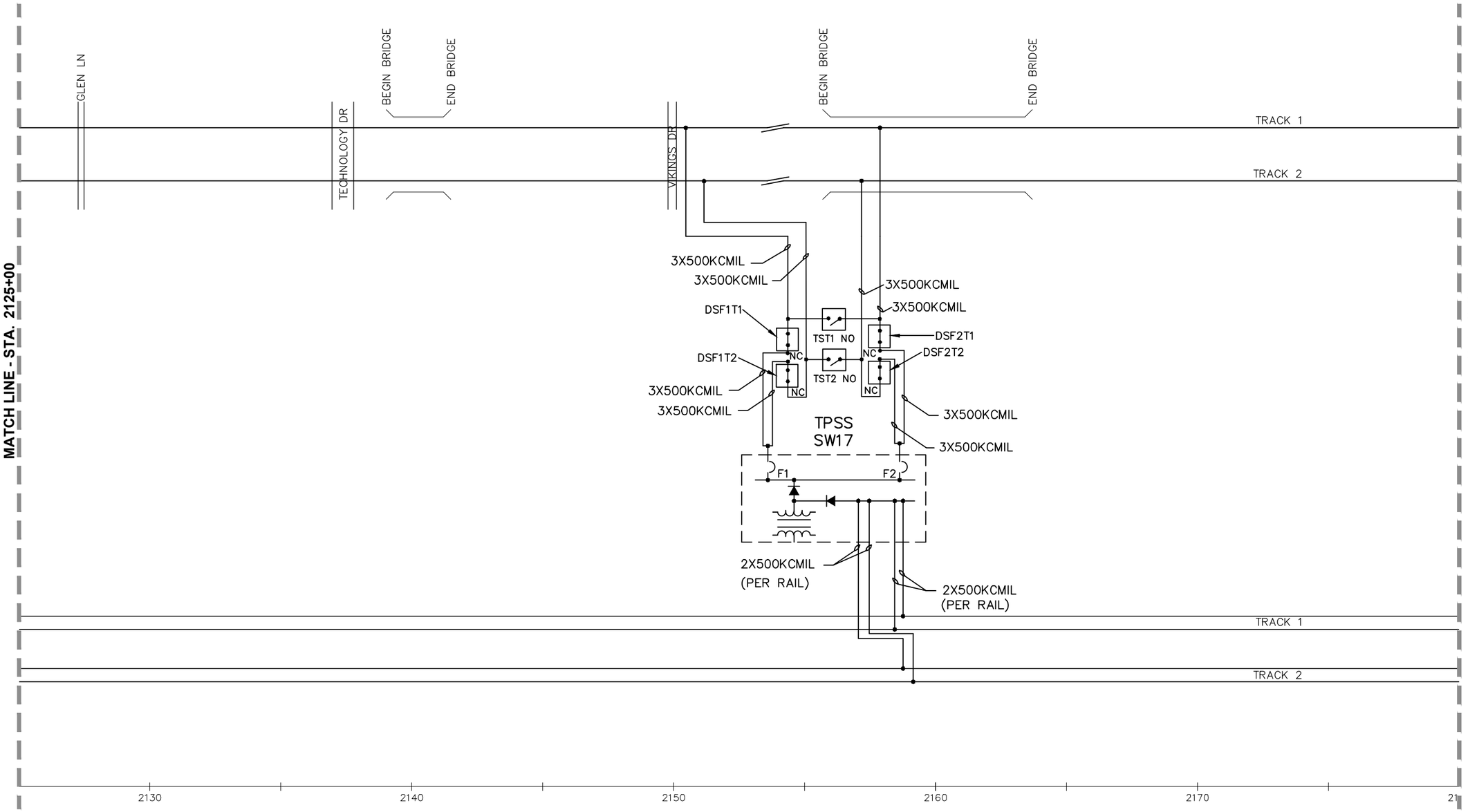

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AECOM LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2125+00 TO STA. 2180+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-003

SHEET 83 OF 202

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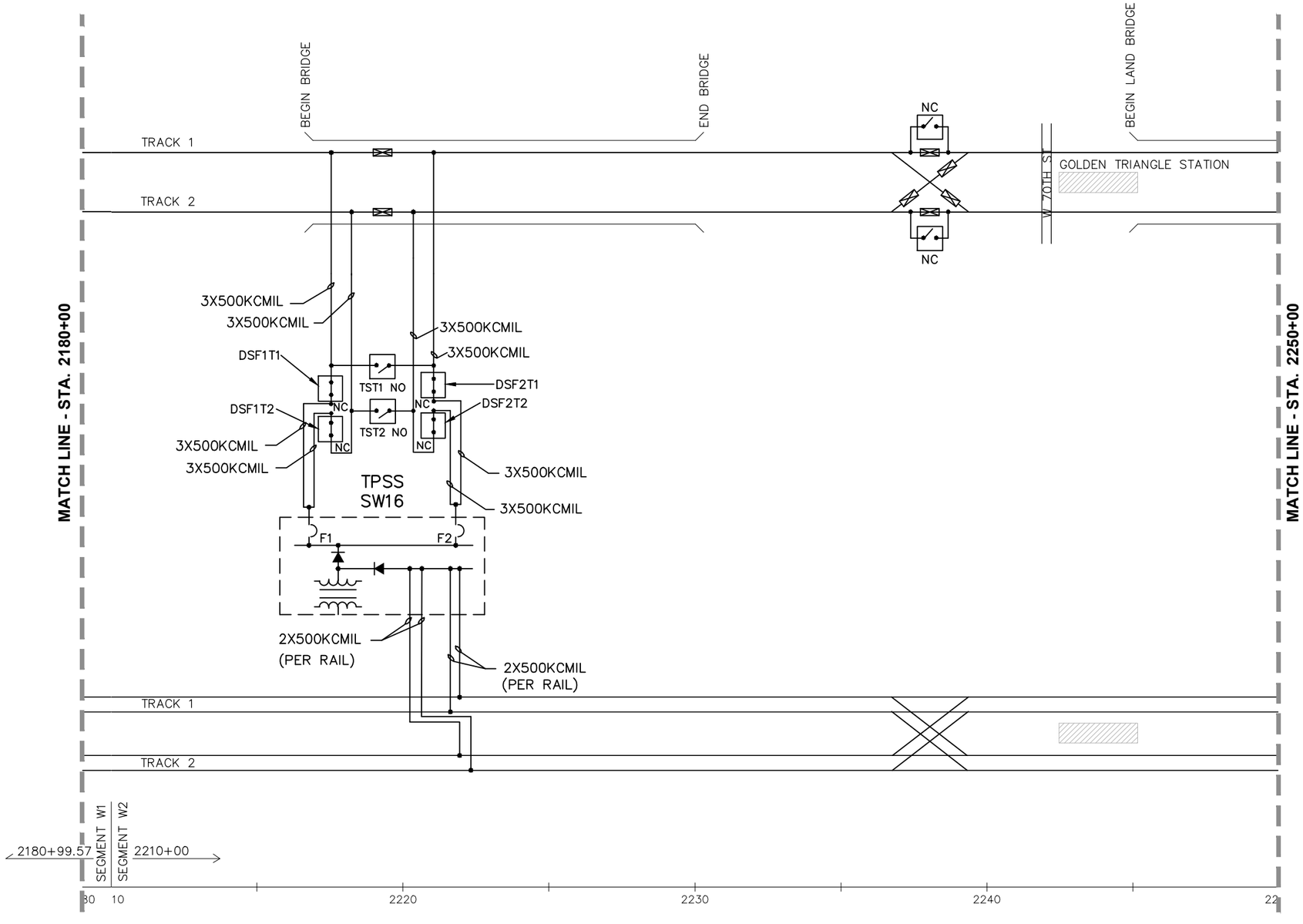

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2180+00 TO STA. 2250+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-004

SHEET 84 OF 202

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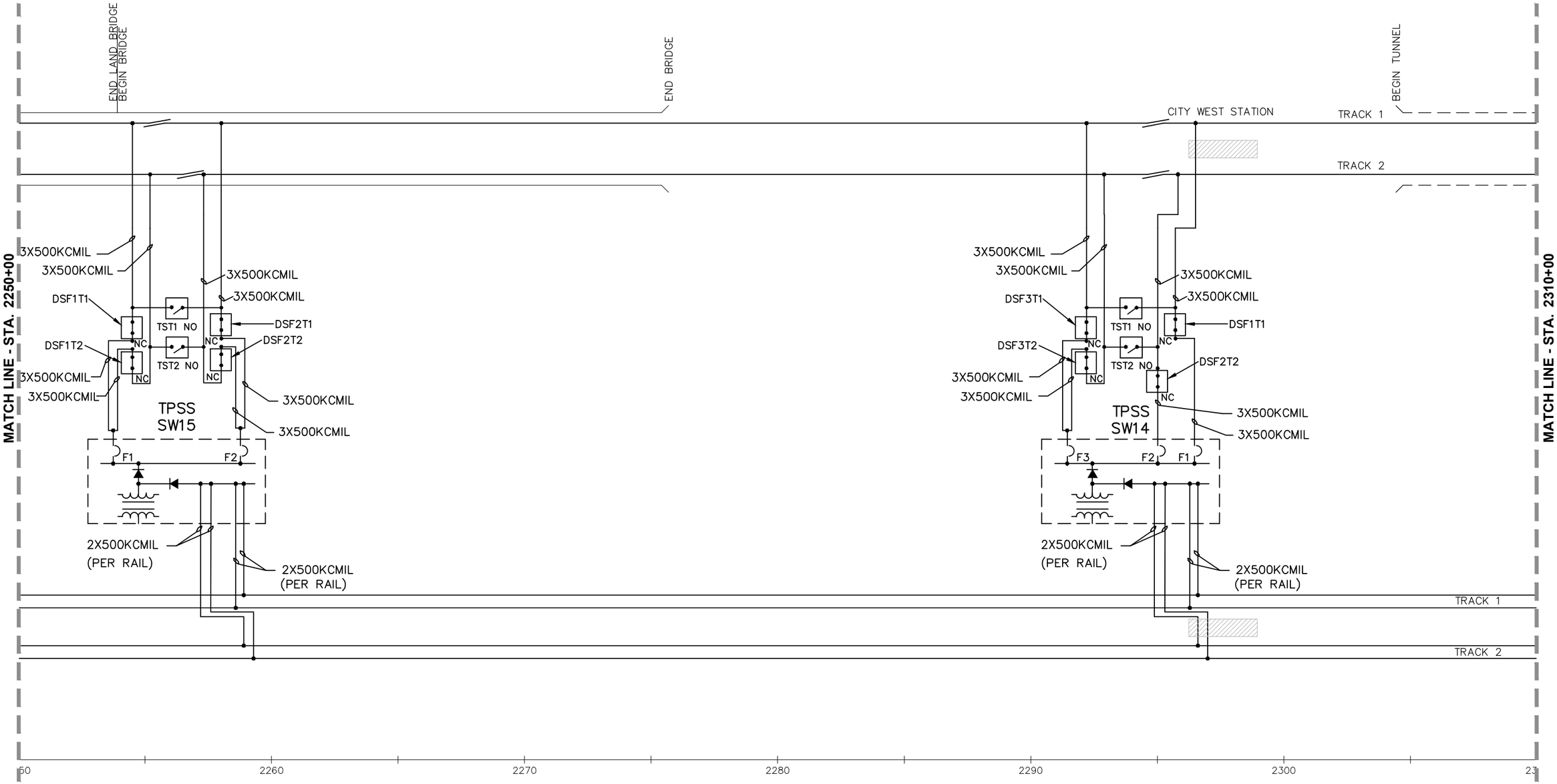

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2250+00 TO STA. 2310+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-005

SHEET 85 OF 202

MATCH LINE - STA. 2310+00

END TUNNEL

BIKE PATH TUNNEL

BIKE PATH TUNNEL

BREN RD E

TRACK 1

TRACK 2

OPUS STATION

BREN RD W

BIKE PATH TUNNEL

BIKE PATH TUNNEL

3X500KCMIL
3X500KCMIL
DSF2T1
DSF1T2
3X500KCMIL
3X500KCMIL
TST1 NO
TST2 NO
NC
NC
NC
NC
3X500KCMIL
3X500KCMIL
DSF3T1
DSF3T2
3X500KCMIL
3X500KCMIL
TPSS
SW13
F2
F1
F3
2X500KCMIL
(PER RAIL)
2X500KCMIL
(PER RAIL)

TRACK 1

TRACK 2

2333+39.97

SEGMENT W2

SEGMENT W3

2350+00

2310

2320

2330

2340

2350

2360

2370

2380

2390

ALTL RD

SMETANA RD

BEGIN BRIDGE

3X500KCMIL
3X500KCMIL
DSF1T1
DSF1T2
3X500KCMIL
3X500KCMIL
TST1 NO
TST2 NO
NC
NC
NC
NC
3X500KCMIL
3X500KCMIL
DSF2T1
DSF2T2
3X500KCMIL
3X500KCMIL
TPSS
SW12
F1
F2
2X500KCMIL
(PER RAIL)
2X500KCMIL
(PER RAIL)

MATCH LINE - STA. 2390+00

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
STA. 2310+00 TO STA. 2390+00

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-006

SHEET 86 OF 202

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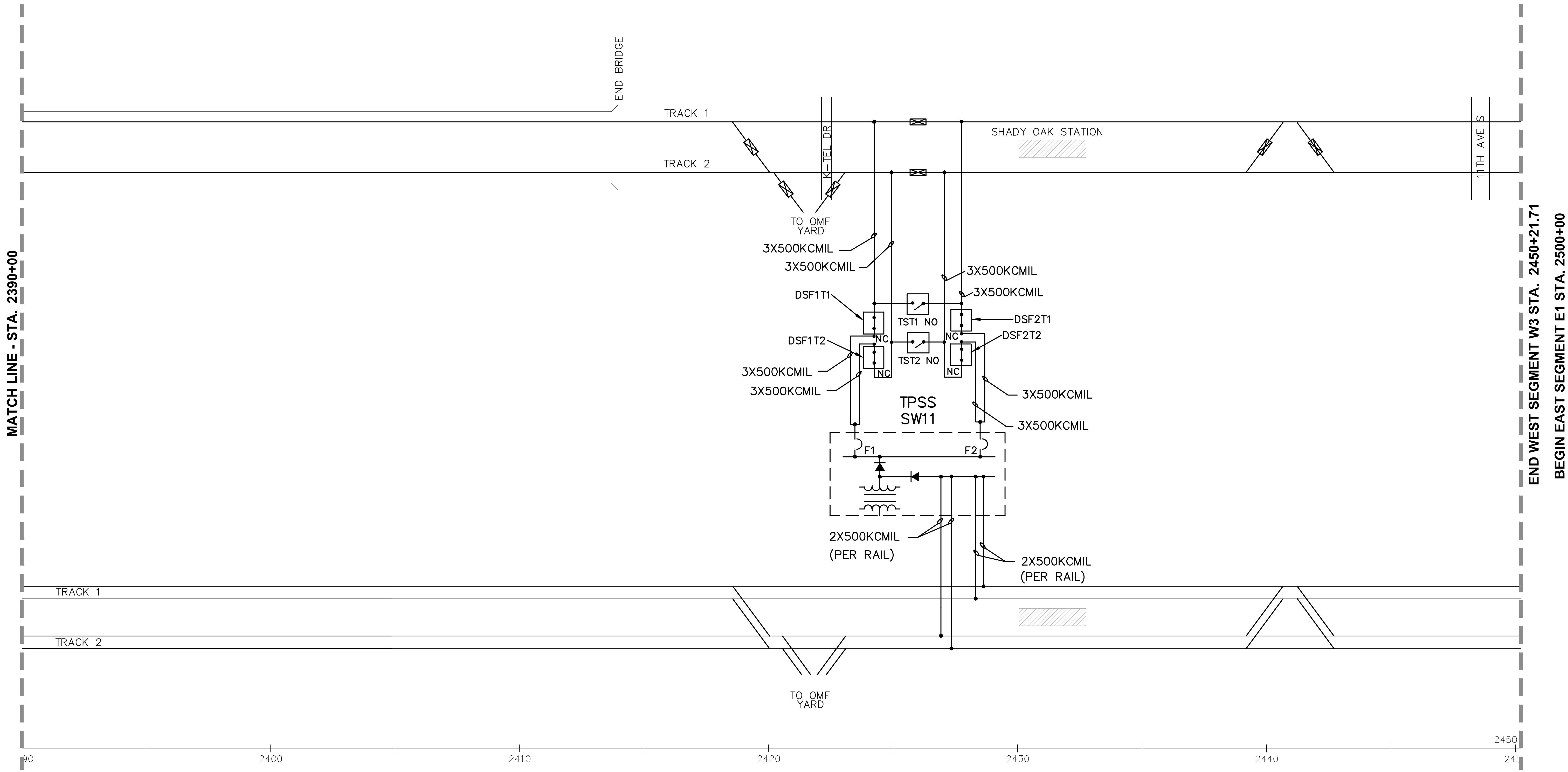

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PRELIMINARY ENGINEERING

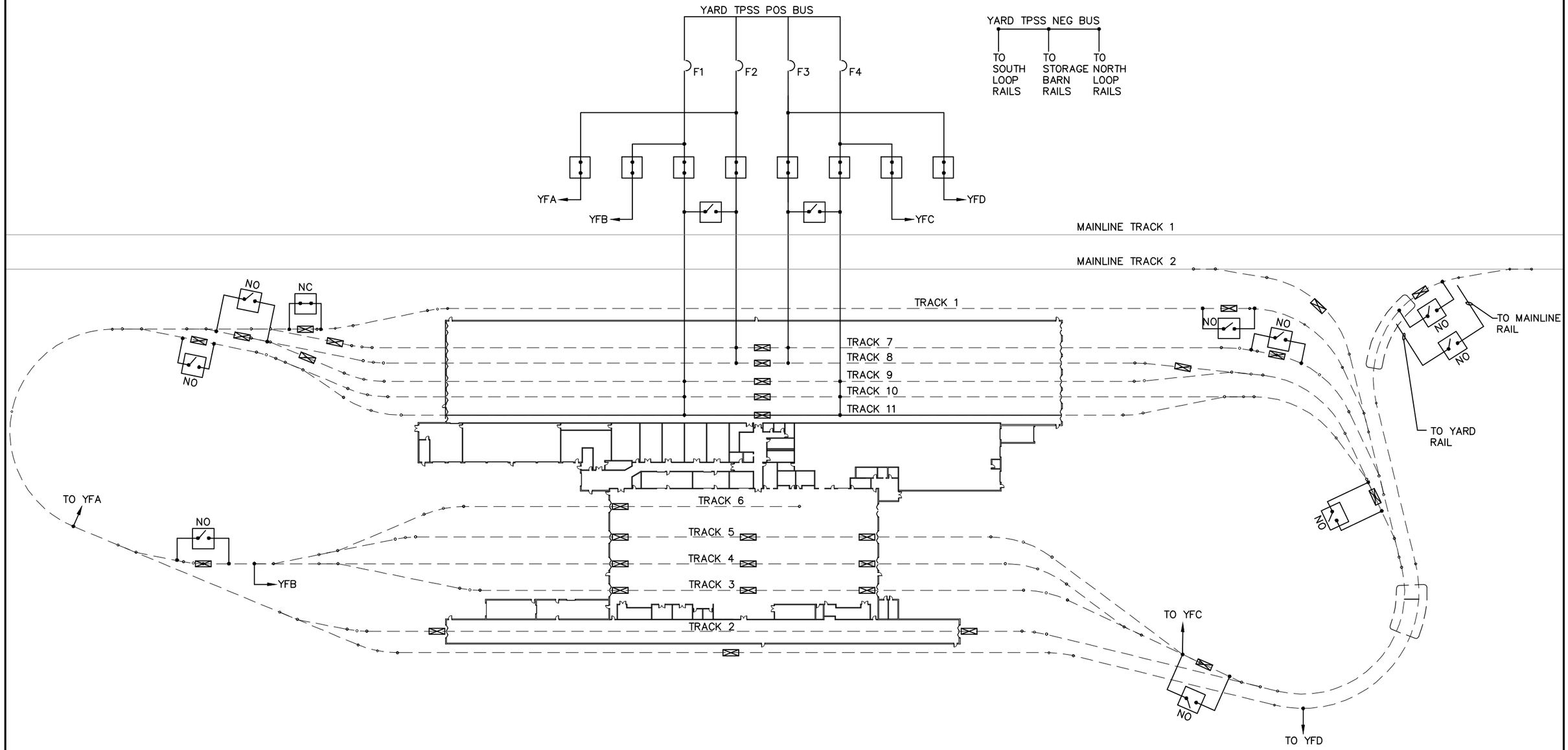
METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM SECTIONALIZING DIAGRAM
STA. 2390+00 TO STA. 2450+21.71

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-007



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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
OMF - YARD

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-008

SHEET 88 OF 202

Jun, 26 2014 10:36 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Reference Sectionalizing Diagram\SYS-OCS-SCD.dwg By: HeinEE

OMF SUBSTATION POS BUS

NEG BUS

TO SHOP RAILS

TO BLDG GROUND

400A

200A

200A

200A

200A

200A

200A

200A

TRACK 6

TRACK 5

TRACK 4

TRACK 3

TRACK 2

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SECTIONALIZING DIAGRAM
OMF - SHOP

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SCD-009

SHEET 89 OF 202

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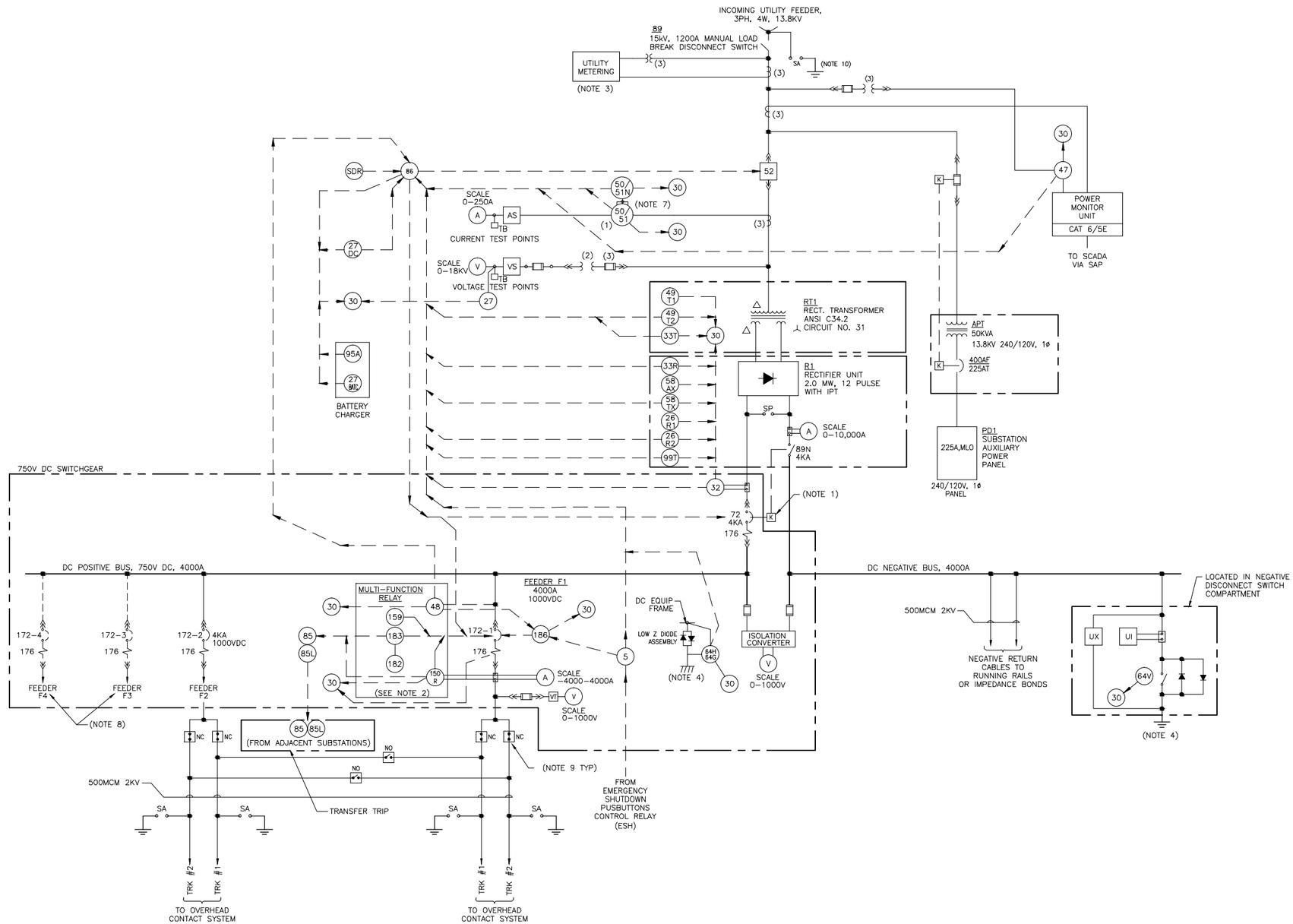

ANSI DEVICE LEGEND:

5	EMERGENCY STOP PUSHBUTTON
26R1	RECTIFIER DIODE OVERTEMPERATURE, 1ST STEP
26R2	RECTIFIER DIODE OVERTEMPERATURE, 2ND STEP
27	AC SUPPLY UNDERVOLTAGE
27 BATC	BATTERY CHARGER UNDERVOLTAGE
30	ANNUNCIATOR/SUPERVISORY
32	REVERSE CURRENT INSTANTANEOUS RELAY
33R	RECTIFIER DOOR POSITION SWITCH
33T	RECTIFIER TRANSFORMER DOOR POSITION SWITCH
47	PHASE SEQUENCE AND UNDERVOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49T1	TRANSFORMER WINDING OVERTEMPERATURE, 1ST STEP
49T2	TRANSFORMER WINDING OVERTEMPERATURE, 2ND STEP
50/51	PHASE FAULT TIME OVERCURRENT RELAY W/INSTANTANEOUS ELEMENT
50/51N	GROUND FAULT TIME OVERCURRENT RELAY W/INSTANTANEOUS ELEMENT
52	AC CIRCUIT BREAKER
58AX	DIODE FUSE MONITOR, 1ST STAGE ALARM
58TX	DIODE FUSE MONITOR, 2ND STAGE TRIP
64HS/GS	FRAME FAULT RELAY
64V	DC NEGATIVE TO GROUND VOLTAGE MONITOR
72	DC MAIN BREAKER
85	TRANSFER TRIP
85L	TRANSFER TRIP, LOCKOUT
86	AC LOCKOUT RELAY, HAND RESET
89	AC POWER DISCONNECT SWITCH
89N	NEGATIVE DISCONNECT SWITCH
95A	BATTERY CHARGER FAILURE ALARM
99T	RECTIFIER DC SURGE SUPPRESSION FUSE FAILURE
150R	DC FEEDER RATE OF RISE RELAY
159	DC OVER VOLTAGE RELAY
172	DC FEEDER BREAKER
176	DC FEEDER DIRECT ACTING TRIP DEVICE
182	DC FEEDER LOAD MEASURING AND VOLTAGE SENSING
183	RECLOSING RELAY
186	DC LOCKOUT RELAY, HAND RESET
SDR	SMOKE DETECTOR ALARM

NOTES:

1. KEY INTERLOCK SHALL PREVENT OPENING OF 89N DEVICE UNLESS 72 DEVICE IS OPEN.
2. PROTECTIVE DEVICES AND INSTRUMENTS FOR FEEDER 2 IS IDENTICAL TO FEEDER 1.
3. CURRENT AND POTENTIAL TRANSFORMERS AND UTILITY METER ARE PROVIDED BY THE UTILITY.
4. CONNECT TO SUBSTATION GROUND GRID.
5. SEPARATE DRIVEN RODS LOCATED AT CATENARY FEEDER POLE.
6. NOTE NOT USED.
7. ONE 3–PHASE SOLID STATE OVERCURRENT RELAY PROGRAMMED TO FOLLOW NEMA RI–9 EXTRA HEAVY DUTY TRACTION OVERLOAD PROFILE.
8. FUTURE FEEDERS.
9. GROUND–MOUNTED DC FEEDER DISCONNECT SWITCHES RATED AT 2KA, 1000VDC LOCATED ADJACENT TO TRACTION POWER SUBSTATION.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS) TRACTION POWER SYSTEM SUBSTATION DETAILS MAINLINE TPSS-- ONE LINE DIAGRAM

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-OLD-001

SHEET 90 OF 202

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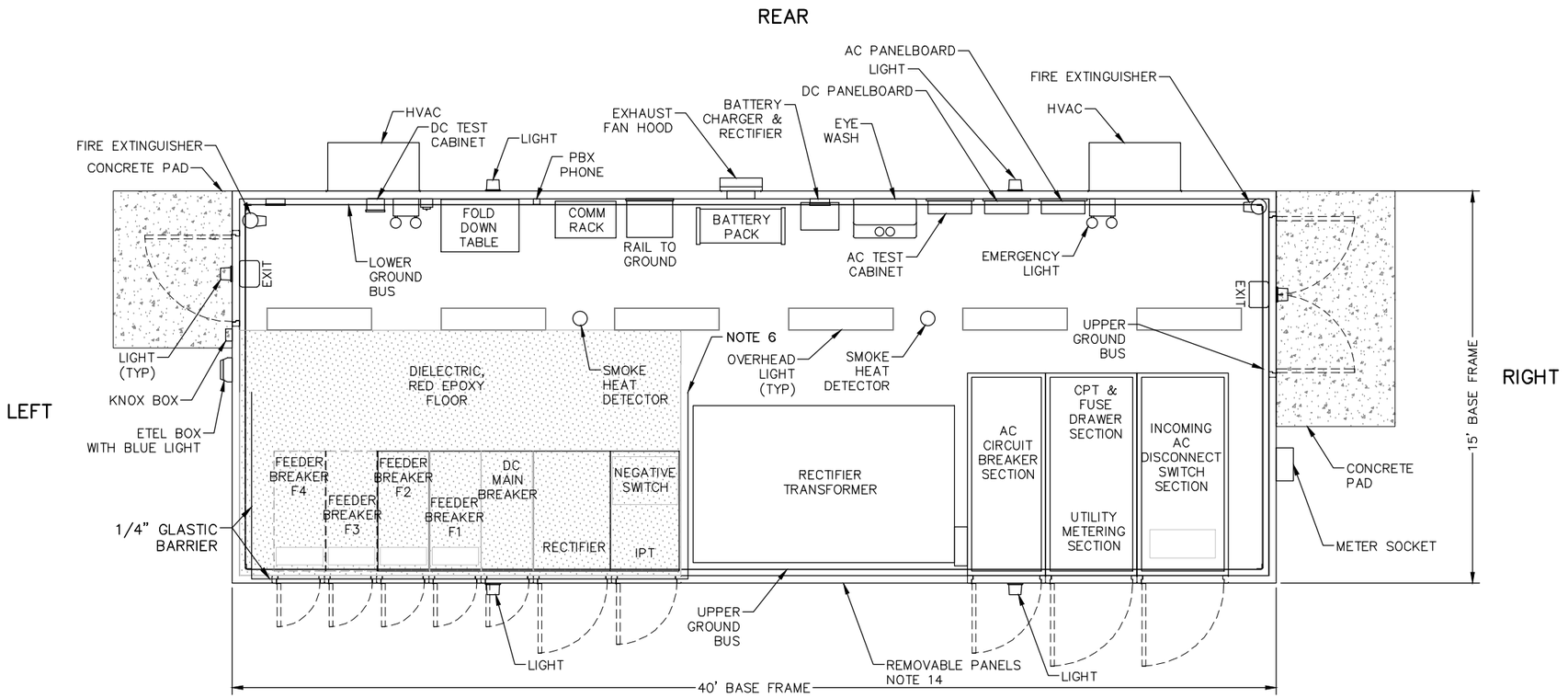

NOTES:

1. PROVIDE PREFABRICATED BUILDING AND EQUIPMENT UNDER THIS CONTRACT
2. EQUIPMENT DIMENSIONS ARE APPROXIMATE. SUBMIT FINAL DIMENSIONS TO THE C.A.R. FOR APPROVAL
3. MOUNT ROOF VENTILATORS TO PREVENT INCURSION OF WATER UNDER ALL CONDITIOINS
4. SIZE AND LOCATION OF DC CABLE ENTRANCES TO BE DETERMINED BY CONTRACTOR
5. PROVIDE ELECTRICAL INSULATION ON WALLS AND FLOOR IN AREAS SHOWN
6. PROVIDE GLASTIC BARRIER BETWEEN RECTIFIER TRANSFORMER AND RECTIFIER. EXTEND GLASTIC 1'-6" BEYOND RECTIFIER TRANSFORMER AS SHOWN. PROVIDE AN INSULATED FINISHED EDGE ON EXPOSED GLASTIC EDGE. ALSO, INSTALL GLASTIC BARRIER BETWEEN EACH DC FEEDER BREAKER, AND DC MAIN BREAKER AND NEGATIVE DISCONNECT SWITCH
7. SPACE DC SWITCHGEAR AND RECTIFIER 2 INCHES OFF REAR WALL
8. PROVIDE WALL MOUNTED HINGED WORK TABLE WITH SUPPORTS.
9. PROVIDE DRAW OUT FUSE TRUNNION WITH MECHANICAL INTERLOCK TO L.V. MAIN AC C.B. PANELS
10. BLUE LIGHT, ETEL, CARD READER, KNOX BOX, CAMERA, AND ACCESS CONTROLLER PANEL ONLY LOCATED ON ONE END OF TPSS. CONSULT WITH C.A.R. REGARDING LOCATION OF THIS EQUIPMENT ON PER SITE BASIS.
11. FRONT OF COMMUNICATION RACK TO FACE WORK BENCH
12. GROUND BUS BAR MUST BE SILVER PLATED. REFER TO SPECIFICATIONS FOR DETAILED REQUIREMENTS. EQUIPMENT GROUNDS MUST ALSO BE SILVER PLATED BUS BAR.
13. INSULATED COVERS MUST BE FURNISHED WITHIN THE FLOOR.
14. PROVIDE REMOVABLE PANELS TO ALLOW REMOVAL OF TRANSFORMERS.
15. INSTALL ACS READER, ETEL, AND CAMERA AT MAIN DOOR OF TPSS.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

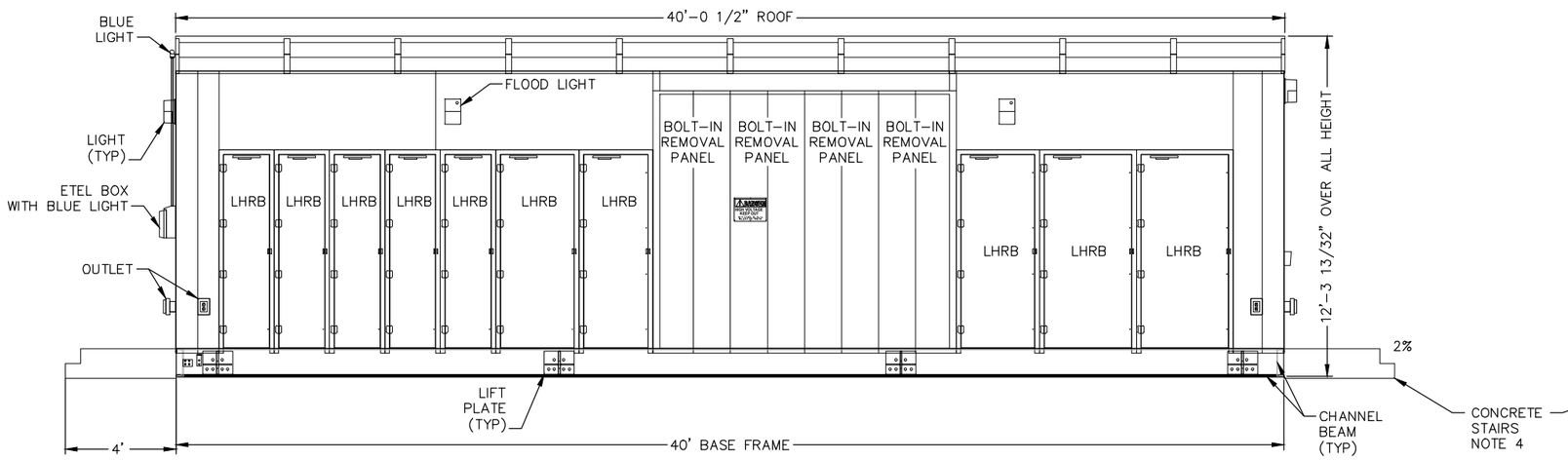
WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
MAINLINE TPSS EQUIPMENT LAYOUT PLAN

DISCIPLINE: SYSTEMS

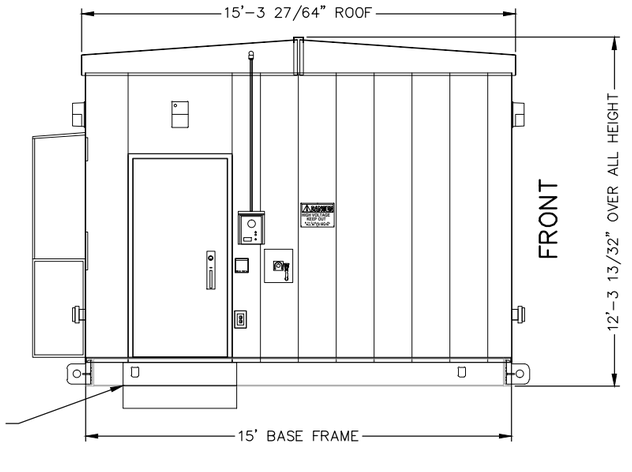
SHEET NAME: TPS-DTL-101

NOTE:

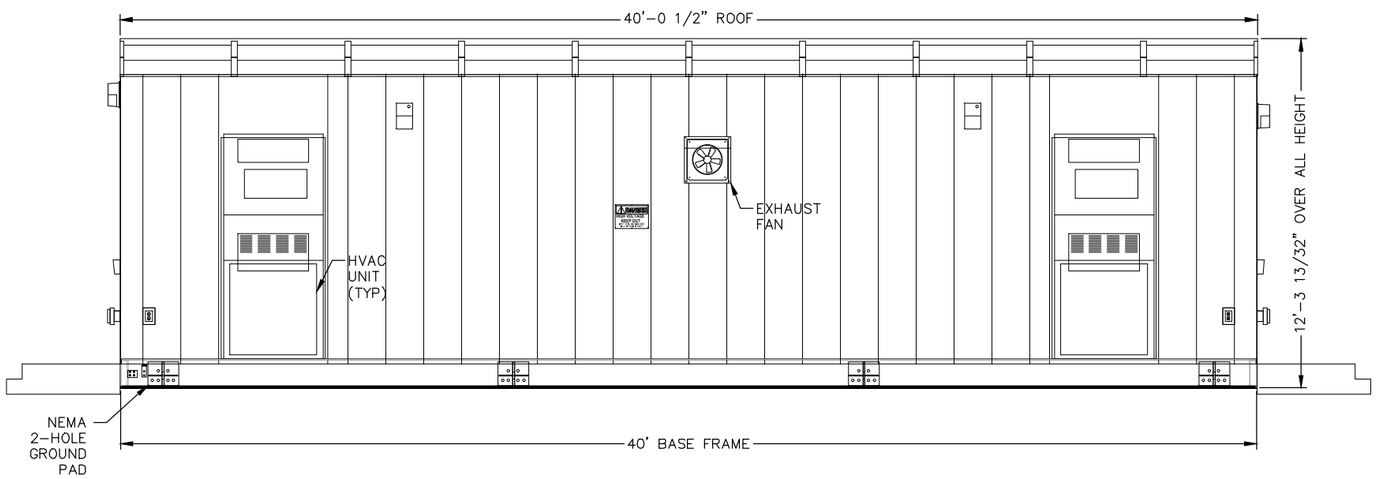
1. ALL DIMENSIONS ARE APPROXIMATE. SUBMIT THE FINAL DIMENSIONS TO THE C.A.R. FOR APPROVAL
2. CONSULT WITH C.A.R. REGARDING LOCATION OF BLUE LIGHT, ETEL, CARD READER, AND KNOX BOX
3. NUMBER OF RISERS FOR CONCRETE PAD WILL VARY FROM ONE SITE TO THE NEXT. CONTRACTOR TO CONSTRUCT CONCRETE PAD WITH EQUAL VERTICAL RISERS SUCH THAT NO RISER EXCEEDS 9 INCHES IN HEIGHT.
4. MOUNT NEGATIVE SURGE ARRESTER ON THE EXTERIOR ABOVE DOOR FOR NEGATIVE CUBICLE.



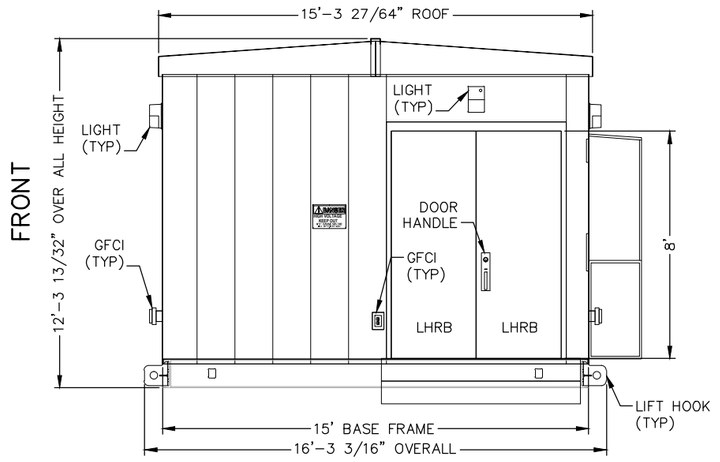
FRONT EXTERIOR ELEVATION



LEFT EXTERIOR ELEVATION



REAR EXTERIOR ELEVATION



RIGHT EXTERIOR ELEVATION

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AECOM LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
MAINLINE TPSS BUILDING ELEVATIONS

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-102

SHEET 92 OF 202

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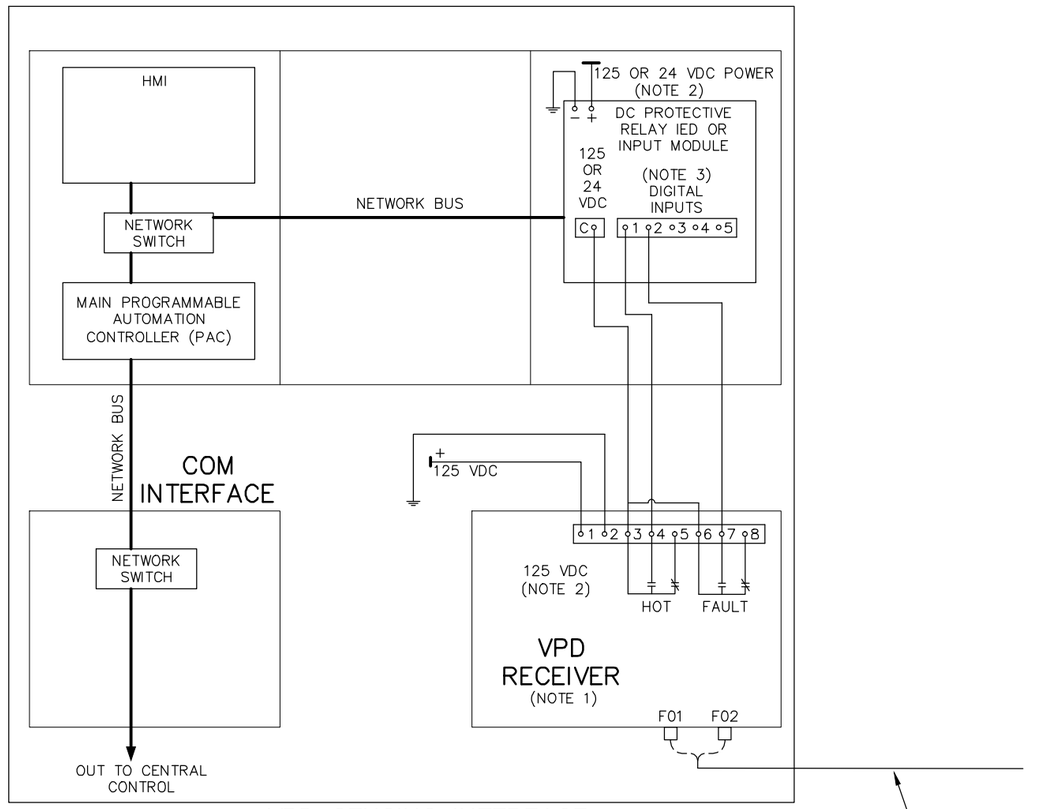
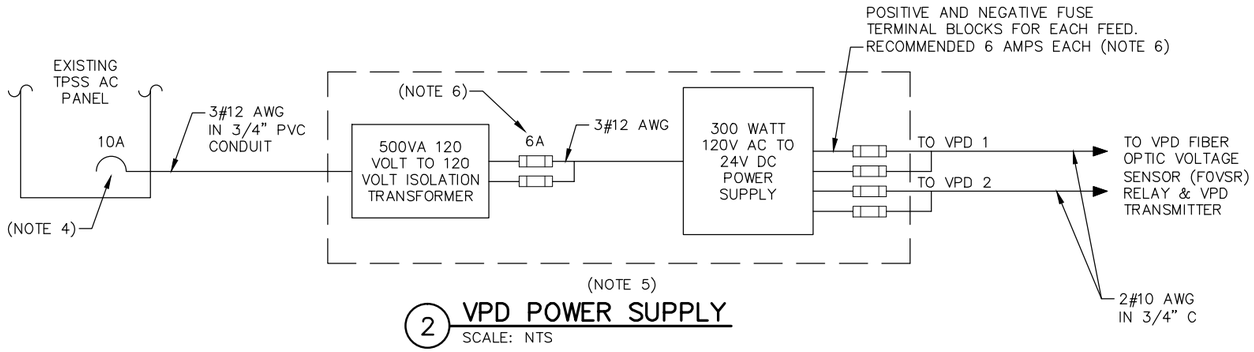


1 VPD SENSING INTERFACE
SCALE: NTS



2 VPD POWER SUPPLY
SCALE: NTS

NOTES:

1. INSTALL VPD RECEIVERS IN DC FEEDER CONTROL CABINET OR PROVIDE A SEPARATE NEMA 4 PVC ENCLOSURE FOR VPD INSTALLATION IF REQUIRED.
2. REFER TO MANUFACTURERS REQUIREMENTS FOR CONTROL POWER VOLTAGE.
3. VPD HOT AND FAULT STATUS TO BE MONITORED AND INDICATED BY LCMS HMI AND CENTRAL CONTROL SYSTEM.
4. EXISTING AC PANELBOARD IN TPSS. PROVIDE A 10/1 POLE BREAKER TO FEED VPD POWER SUPPLY.
5. FURNISH AND INSTALL ISOLATION TRANSFORMER, 300 WATT 120V AC TO 24V DC POWER SUPPLY IN A NON-METALLIC ENCLOSURE WITH MOUNTING PANEL TO BE USED TO POWER THE VPD EQUIPMENT.
6. PROVIDE A SET OF FUSED TERMINAL BLOCKS IN THE ENCLOSURE WITH FUSES AND WIRING TO FEED EQUIPMENT AS SHOWN.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
MAINLINE VOLTAGE PRESENCE DETECTOR

DISCIPLINE: SYSTEMS
SHEET NAME: TPS-DTL-103

SHEET 93 OF 202

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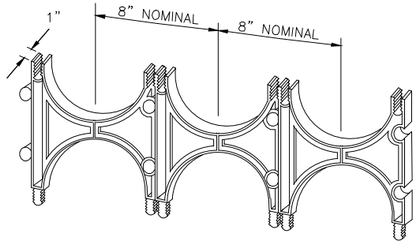
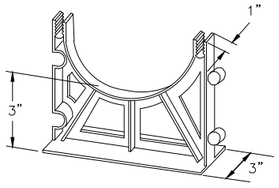
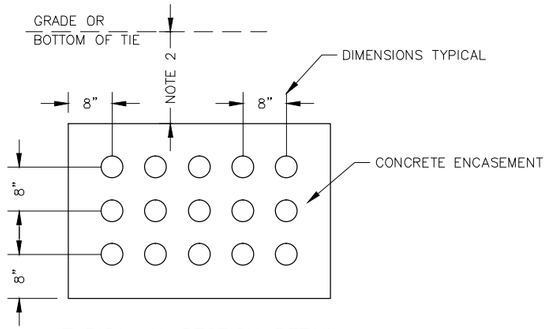


INTERMEDIATE SPACER



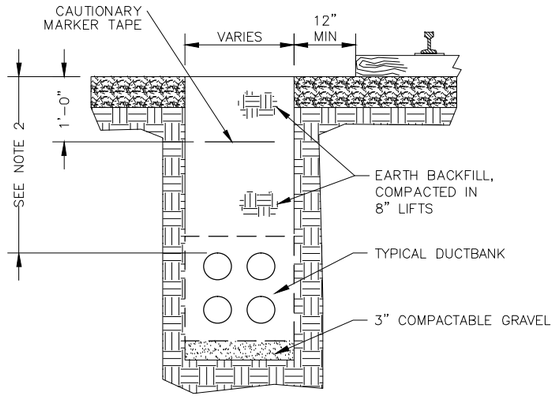
BASE SPACER

(BASE SPACER PROVIDES 3" SEPERATION BETWEEN THE BOTTOM ROW OF DUCTS AND THE TRENCH FLOOR)



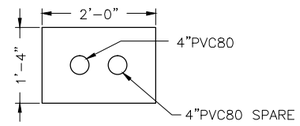
TYPICAL X-SECTION DETAIL

NOT TO SCALE



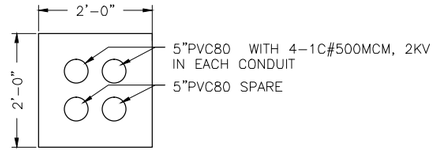
TYPICAL TRENCH DETAIL

NOT TO SCALE



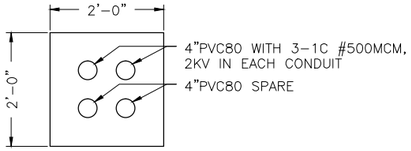
SECTION A

MEDIUM VOLTAGE CABLES



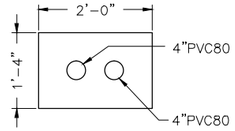
SECTION B

NEGATIVE TRACTION POWER CABLES



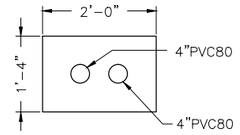
SECTION C

POSITIVE TRACTION POWER CABLES



SECTION D

COMMUNICATION CABLES



SECTION E

LOW VOLTAGE (UNDER 600VAC)
DISTRIBUTION CABLES

NOTES:

1. DUCTBANK SECTION VIEWS ARE INDICATED ON TYPICAL SUBSTATION LAYOUT PLAN.
2. DEPTH OF DUCTBANKS SHALL BE AS FOLLOW:
   * GENERAL: 30 INCHES BELOW GRADE
   * UNDER TRACKS: 50 INCHES BELOW BOTTOM OF TIE
3. SPARE CONDUITS SHALL BE TERMINATED AT RESPECTIVE MANHOLES WHEN INDICATED ON SITE PLAN. IF NO MANHOLE IS INDICATED, SPARE CONDUITS SHALL BE CAPPED 5 FEET BEYOND THE SUBSTATION FOUNDATION.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
TYPICAL DUCTBANK CONFIGURATIONS

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-104

SHEET 94 OF 202

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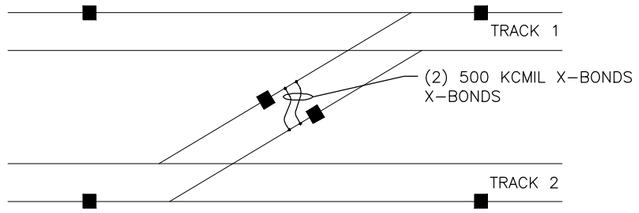
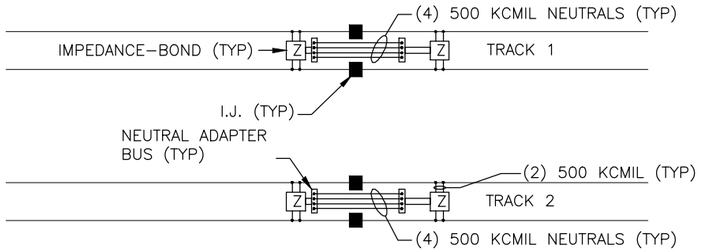
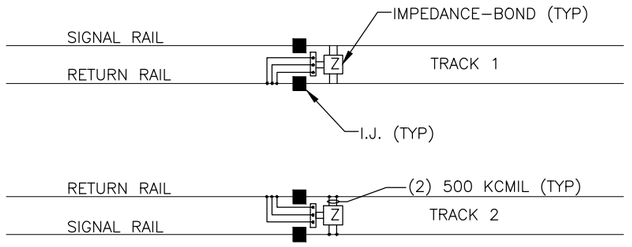


"TYPE 1" TYPICAL POWER BONDING CONNECTION
SINGLE RETURN RAIL IN CROSSOVER



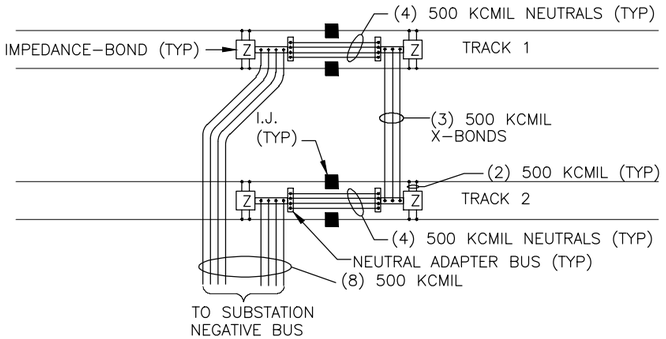
TYPICAL NEGATIVE RETURN CONNECTION
AC TRACK CIRCUIT TERRITORY WITH DOUBLE
IMPEDANCE BONDS AND I.J.'S ON BOTH TRACKS

"TYPE 4"



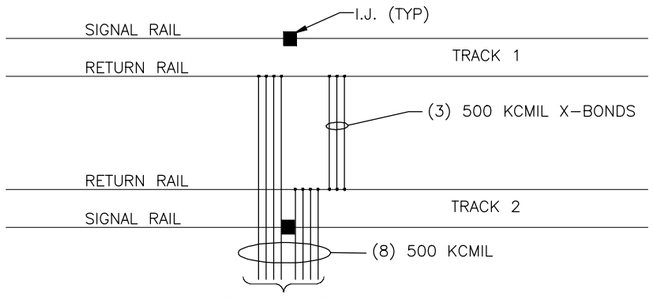
TYPICAL NEGATIVE RETURN CONNECTION
SINGLE RETURN RAIL TO DOUBLE
RETURN RAIL TRANSITION

"TYPE 7"



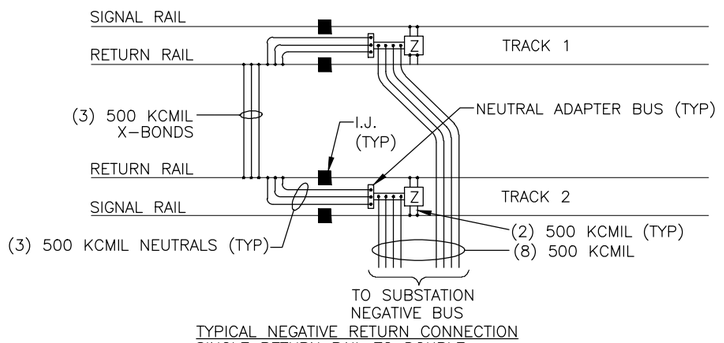
TYPICAL NEGATIVE RETURN CONNECTION
AC TRACK CIRCUIT TERRITORY WITH DOUBLE
IMPEDANCE BONDS AND I.J.'S ON BOTH TRACKS

"TYPE 2"



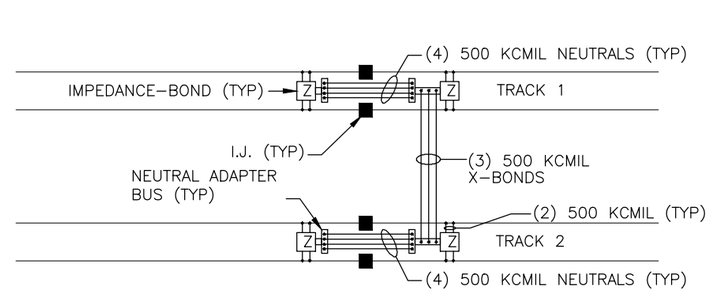
TYPICAL NEGATIVE RETURN CONNECTION
SINGLE RETURN RAIL TERRITORY

"TYPE 5"



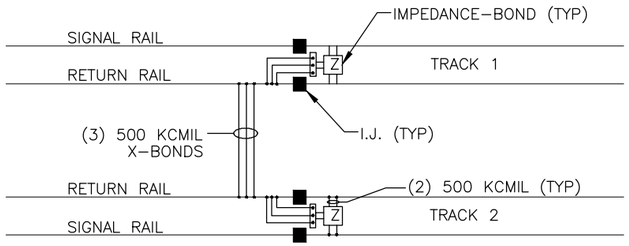
TYPICAL NEGATIVE RETURN CONNECTION
SINGLE RETURN RAIL TO DOUBLE
RETURN RAIL TRANSITION

"TYPE 8"



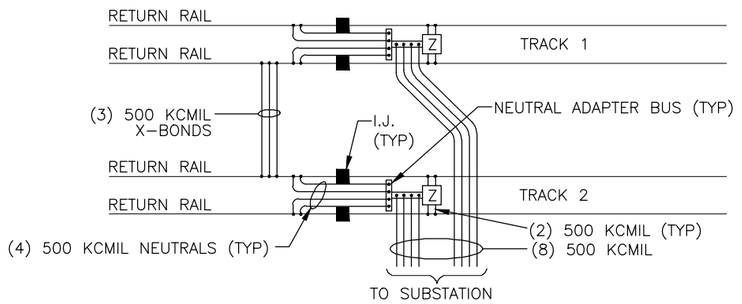
TYPICAL CROSSBONDING CONNECTION
AC TRACK CIRCUIT TERRITORY WITH DOUBLE
IMPEDANCE BONDS AND I.J.'S ON BOTH TRACKS

"TYPE 3"



TYPICAL CROSSBONDING CONNECTION
SINGLE RETURN RAIL TO DOUBLE
RETURN RAIL TRANSITION

"TYPE 6"



TYPICAL NEGATIVE RETURN CONNECTION
UNSIGNALED RETURN RAIL TO DOUBLE
RETURN RAIL TRANSITION

"TYPE 9"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

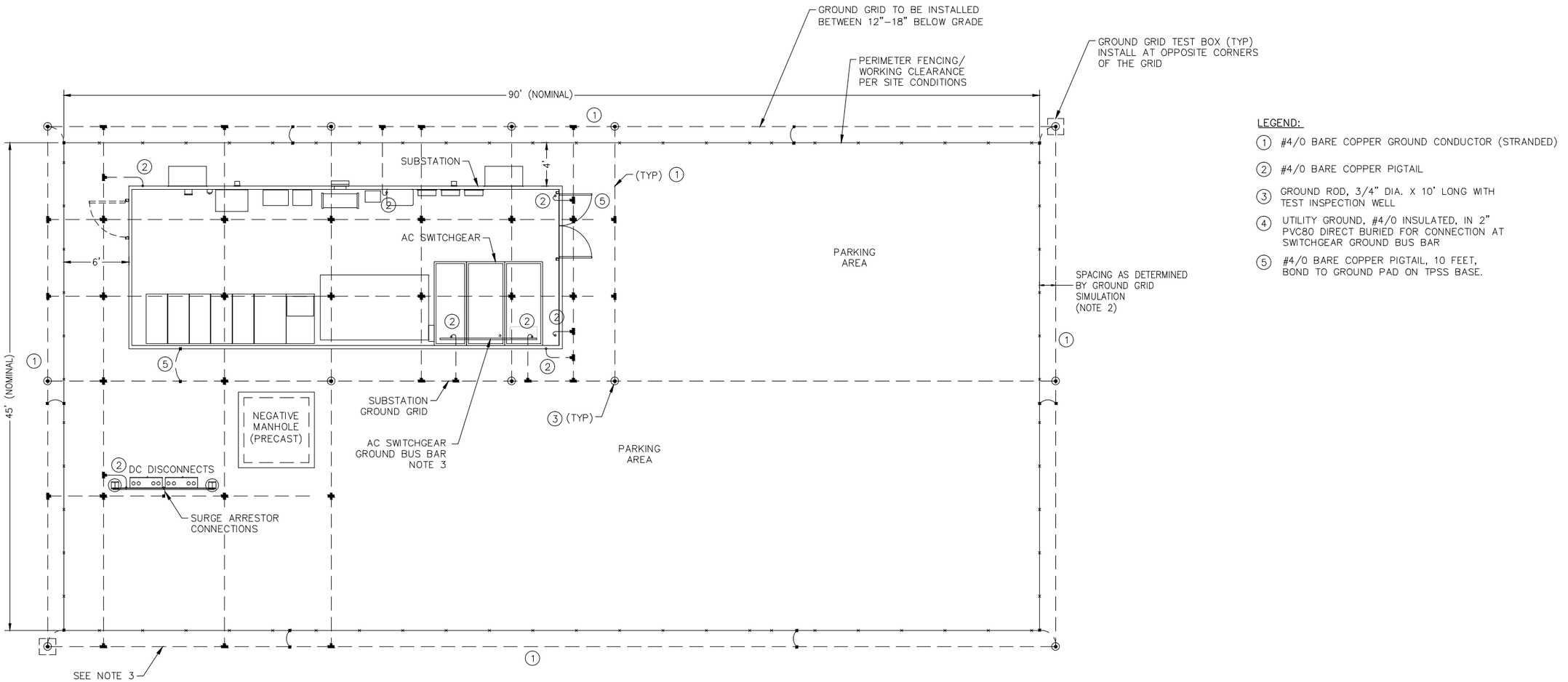
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
TYPICAL RAIL RETURN BONDING DETAILS

DISCIPLINE: SYSTEMS
SHEET NAME: TPS-DTL-105

SHEET 95 OF 202

Jun, 26 2014 10:41 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-TPS\TPS-DTL-019.dwg By: HeinEE



TYPICAL GROUND GRID DETAILS

2 1 0 2 4 6
SCALE IN FEET

NOTES:

1. FOR SUBSTATION EQUIPMENT LAYOUT SEE SHEET 103.
2. GROUND GRID FINAL DESIGN TO BE DETERMINED BY SIMULATION ON A SITE BY SITE BASIS. MUST COMPLY WITH IEEE 80.
3. BOND PIGTAIL TO GROUND BUS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
TYPICAL GROUND GRID DETAILS

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-106

SHEET 96 OF 202

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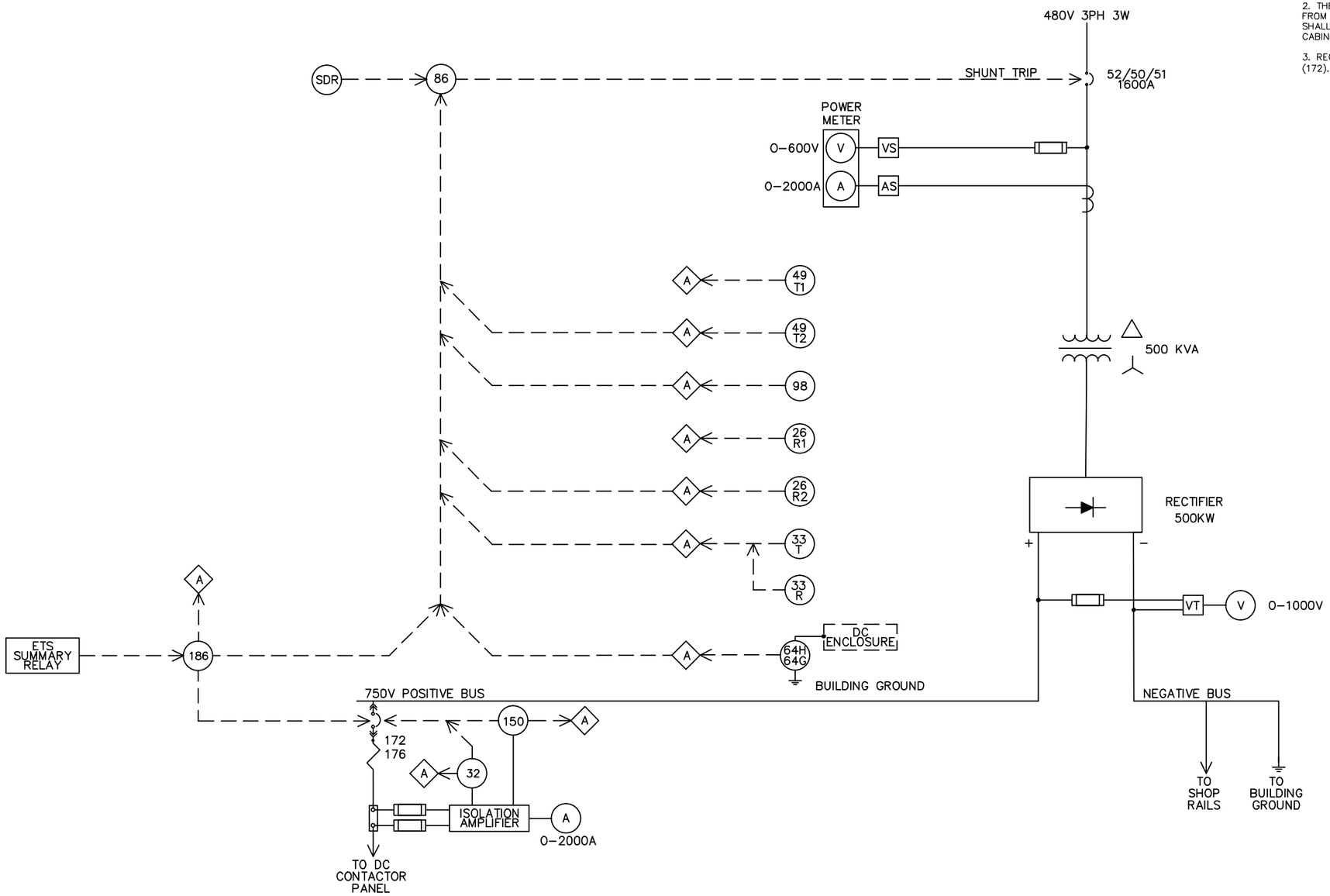
NOTES:

1. THE SHOP SUBSTATION SHALL PRODUCE NO MORE THAN 1% VOLTAGE THD AT THE 480V SUPPLY TERMINALS. HARMONIC FILTERING MAY BE REQUIRED TO ACHIEVE THIS VALUE.

2. THE RECTIFIER AND MAIN DC BREAKER CABINETS SHALL BE ISOLATED FROM EARTH GROUND. DIELECTRIC FLOORING AND INSULATING BARRIERS SHALL PREVENT SIMULTANEOUS PERSONNEL CONTACT BETWEEN ISOLATED CABINETS AND EARTH GROUND.

3. RECLOSING CAPABILITY IS NOT PERMITTED ON THE MAIN DC BREAKER (172).



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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
OMF - ONE LINE DIAGRAM - SHOP

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-OLD-003

SHEET 97 OF 202

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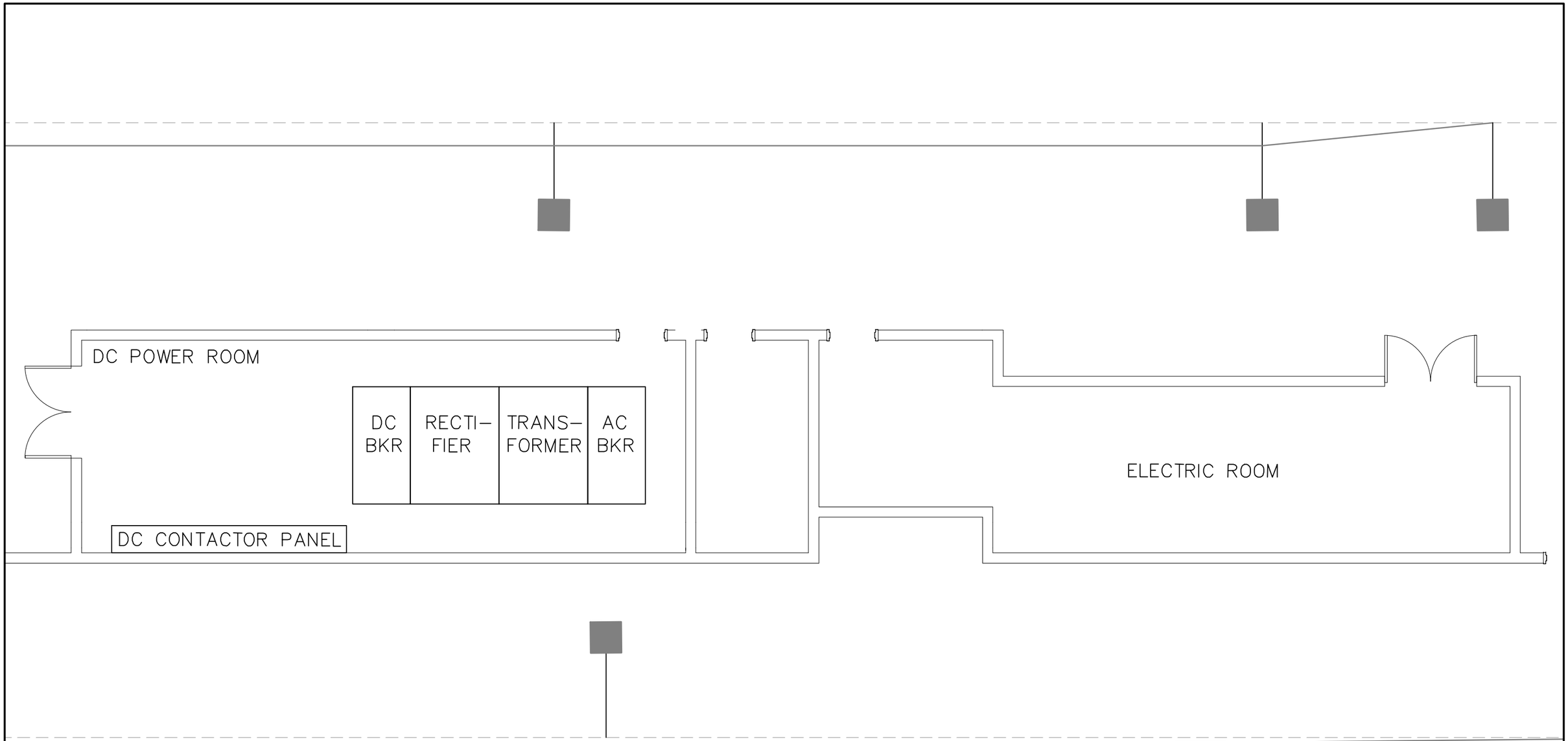

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

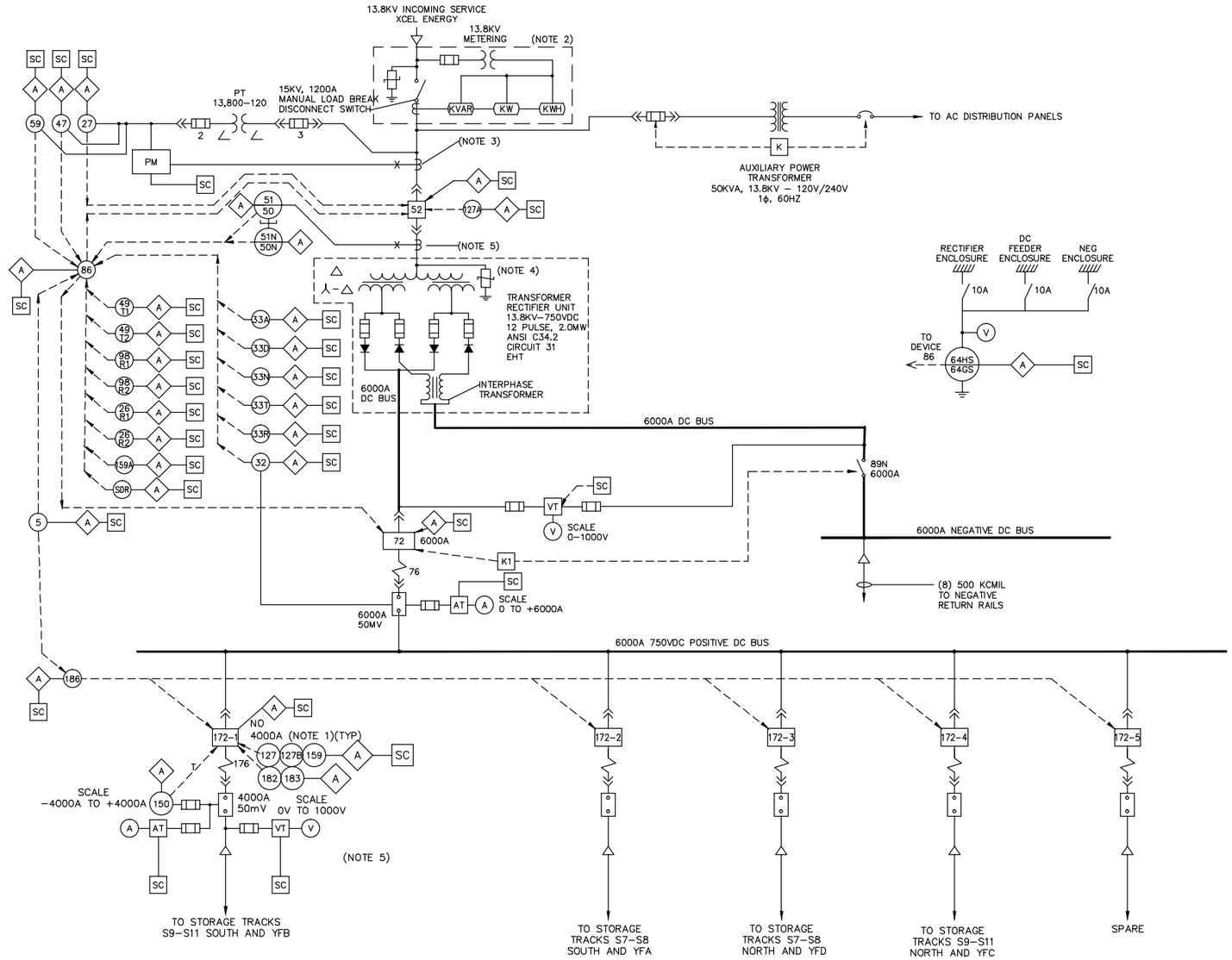
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
OMF - EQUIPMENT LAYOUT - SHOP

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-201

SHEET 98 OF 202



NOTE:

1. SEE SECTIONALIZING DIAGRAM FOR ADDITIONAL INFORMATION ON NUMBERING
2. COORDINATE METERING REQUIREMENTS WITH XCEL ENERGY
3. CT SIZE SUBJECT TO C.A.R. APPROVAL. POWER METER CTS TO BE REVENUE METERING ACCURACY
4. PROVIDE SURGE ARRESTER IN SEPARATE ENCLOSURE WITHIN TRANSFORMER ENCLOSURE.
5. PROTECTIVE DEVICES TYPICAL FOR ALL BREAKERS

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
OMF - ONE LINE DIAGRAM - YARD

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-OLD-004

SHEET 99 OF 202

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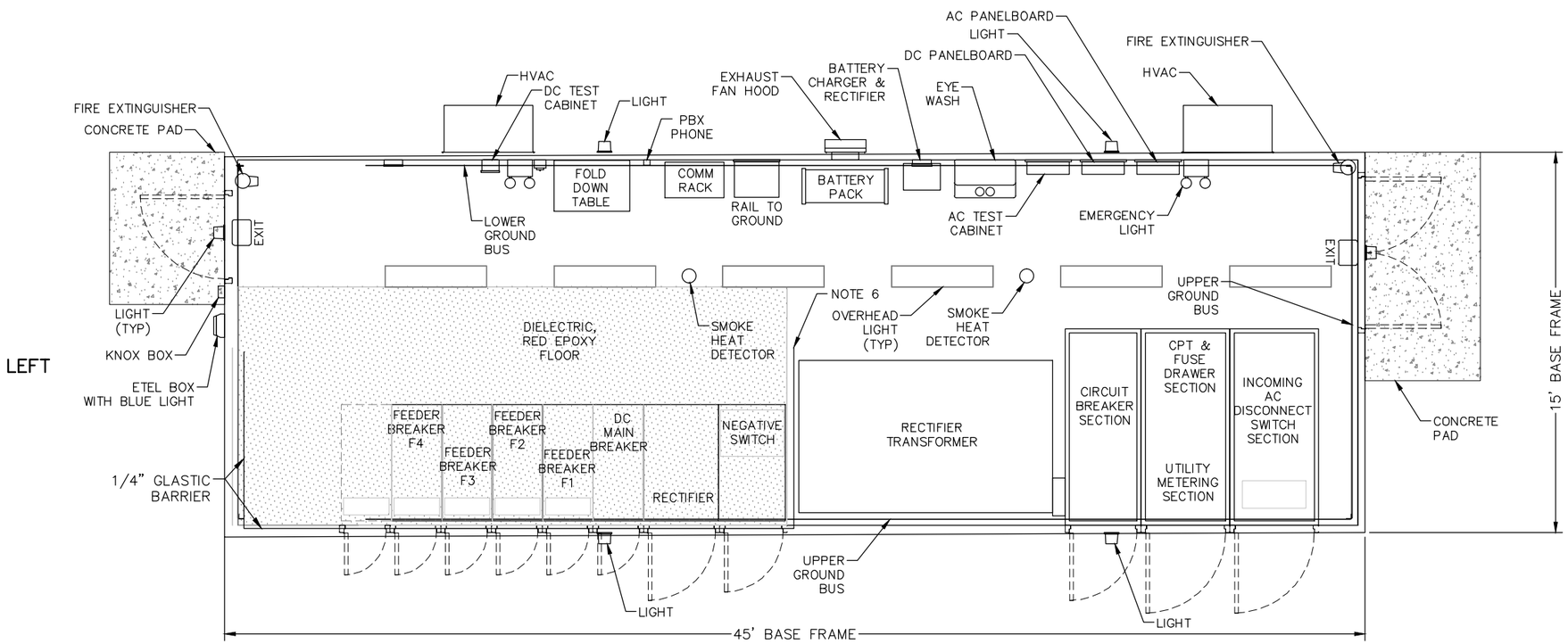

FRONT

NOTES:

1. PROVIDE PREFABRICATED BUILDING AND EQUIPMENT UNDER THIS CONTRACT
2. EQUIPMENT DIMENSIONS ARE APPROXIMATE. SUBMIT FINAL DIMENSIONS TO THE C.A.R. FOR APPROVAL
3. MOUNT ROOF VENTILATORS TO PREVENT INCURSION OF WATER UNDER ALL CONDITIOINS
4. SIZE AND LOCATION OF DC CABLE ENTRANCES TO BE DETERMINED BY CONTRACTOR
5. PROVIDE ELECTRICAL INSULATION ON WALLS AND FLOOR IN AREAS SHOWN
6. PROVIDE GLASTIC BARRIER BETWEEN RECTIFIER TRANSFORMER AND RECTIFIER. EXTEND GLASTIC 1'-6" BEYOND RECTIFIER TRANSFORMER AS SHOWN. PROVIDE AN INSULATED FINISHED EDGE ON EXPOSED GLASTIC EDGE. ALSO, INSTALL GLASTIC BARRIER BETWEEN EACH DC FEEDER BREAKER, AND DC MAIN BREAKER AND NEGATIVE DISCONNECT SWITCH
7. SPACE DC SWITCHGEAR AND RECTIFIER 2 INCHES OFF REAR WALL
8. PROVIDE WALL MOUNTED HINGED WORK TABLE WITH SUPPORTS.
9. PROVIDE DRAW OUT FUSE TRUNNION WITH MECHANICAL INTERLOCK TO L.V. MAIN AC C.B. PANELS
10. BLUE LIGHT, ETEL, CARD READER, KNOX BOX, CAMERA, AND ACCESS CONTROLLER PANEL ONLY LOCATED ON ONE END OF TPSS. CONSULT WITH C.A.R. REGARDING LOCATION OF THIS EQUIPMENT ON PER SITE BASIS.
11. GROUND BUS BAR MUST BE SILVER PLATED. EQUIPMENT GROUNDS MUST ALSO BE SILVER PLATED BUS BAR.
12. INSTALL ACS READER, ETEL, AND CAMERA AT MAIN DOOR OF TPSS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

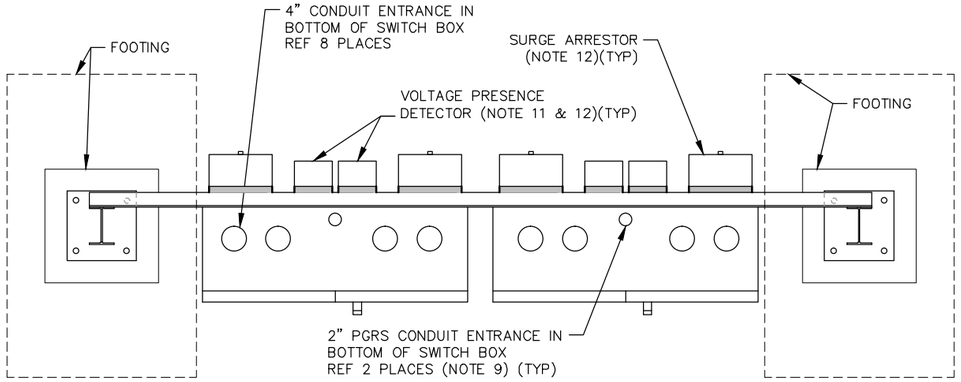
WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
OMF - EQUIPMENT LAYOUT - YARD

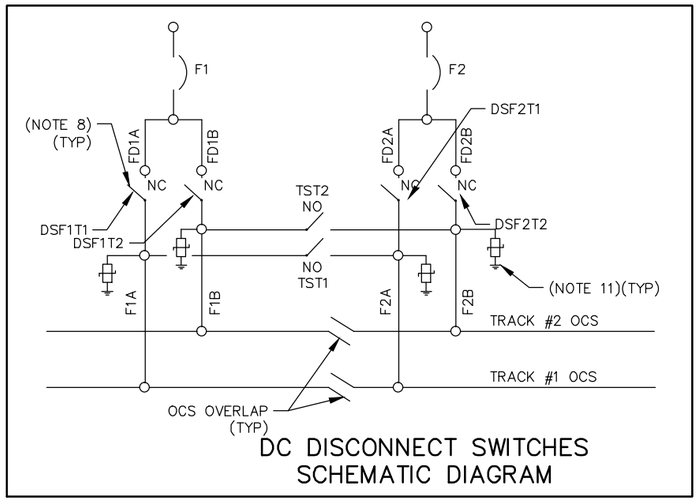
DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-301

SHEET 100 OF 202

Jun. 26 2014 10:44 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-TPS\TPS-DTL-301.dwg By: HeinEE

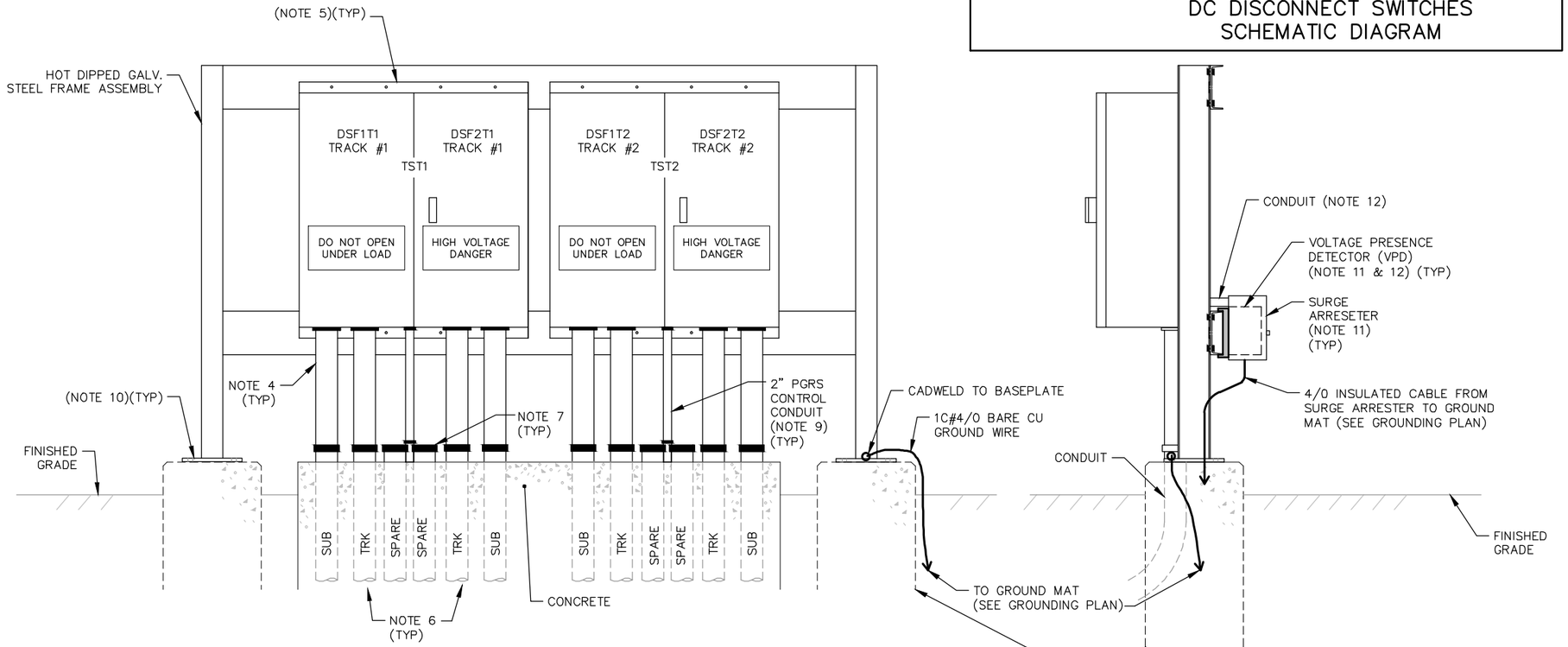




DC DISCONNECT SWITCHES SCHEMATIC DIAGRAM

NOTES:

1. ALL STEEL TO CONFORM TO ASTM A36
2. ALL WELDING TO CONFORM TO AWS D1.1
3. HOT DIP GALVANIZED PER ASTM A123/A123–97A AFTER MACHINING AND WELDING
4. 4" PVC CONDUIT EXPOSED FROM BOTTOM OF SWITCH BOX TO PVC CONDUIT COUPLING PROJECTING 3" ABOVE CONCRETE ENCASEMENT
5. ALL SWITCHES ARE RATED 2KA, 1000VDC
6. ALL CONDUITS TO TRACK ARE 4" PVC–80, CONCRETE ENCASED.
7. STUB AND CAP SPARE CONDUITS 6" ABOVE TOP OF DUCTBANK
8. PROVIDE SWITCH STATUS DEVICE AND HARDWARE IN CABINET FOR EACH SWITCH TO INDICATE SWITCH POSITION.
9. PROVIDE CONTROL CABLE FROM SWITCH STATUS DEVICE TO TPS FOR INDICATION TO LCMS AND CCS. ALSO, PROVIDE VPD FIBER OPTIC CABLE AND NEGATIVE REFERENCE CABLE BACK TO TPSS.
10. SS #10 – SHIMS PLACED UNDER BASEPLATE TO LEVEL FRAME
11. PROVIDE CONDUIT TO SWITCH ENCLOSURE USING INSULATED HARDWARE. SEAL AROUND PENETRATIONS. SURGE ARRESTER TO BE CONNECTED ON LOAD SIDE OF DISCONNECT SWITCH.
12. VOLTAGE PRESENCE DETECTOR IS MOUNTED BESIDE THE SURGE ARRESTER, AS SHOWN IN THE PLAN VIEW. WELD CHANNEL BRACKET OR PLATE ACROSS CHANNEL FOR MOUNTING ENCLOSURES.



FRAME MOUNTED DC FEEDER DISCONNECT SWITCHES

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION DETAILS
TPSS FEEDER DISCONNECT SWITCHES

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-DTL-401

SHEET 101 OF 202

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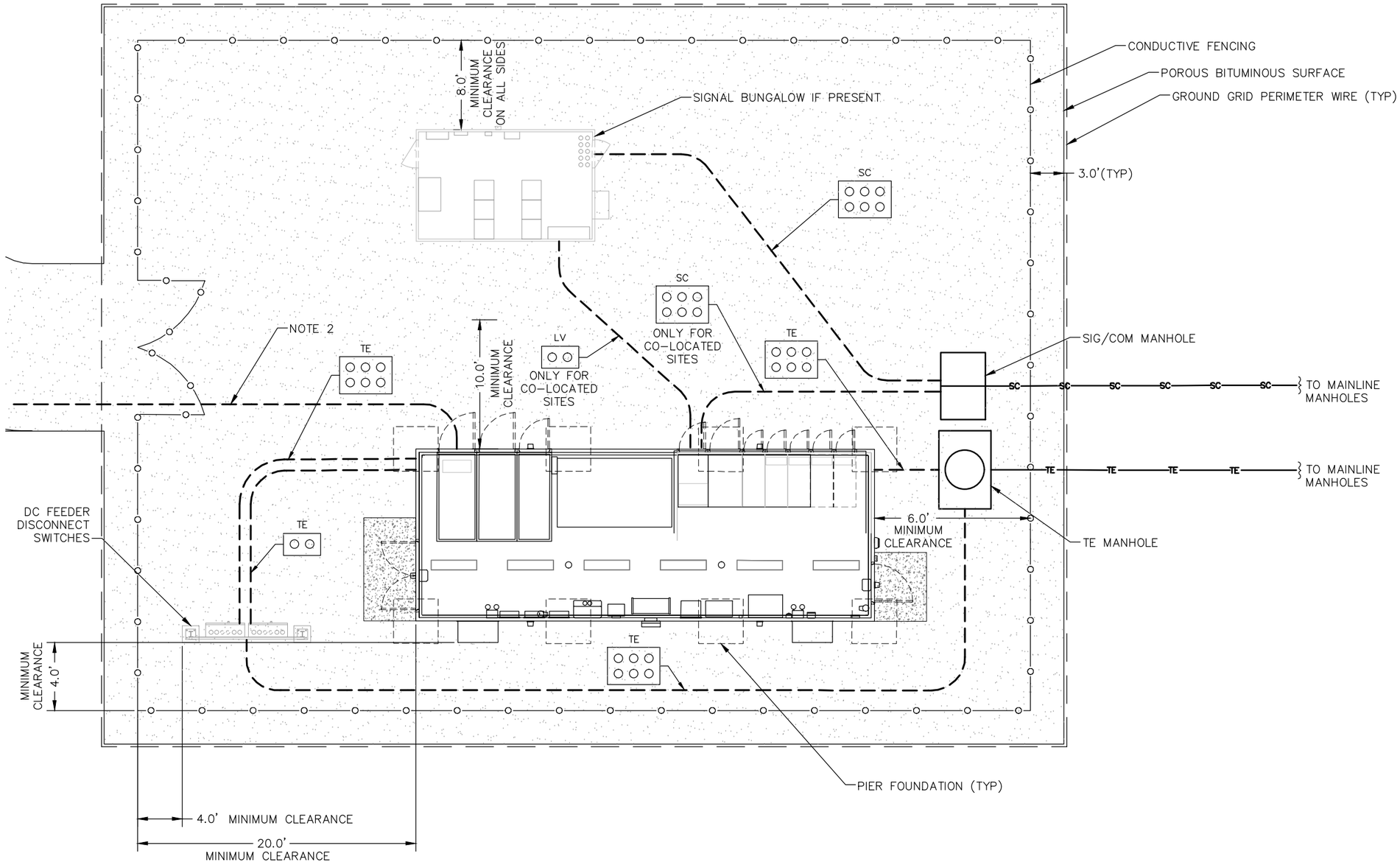

NOTE:

1. TRACTION ELECTRIFICATION & SIGNAL/COMM STUB-UPS WILL BE DETERMINED BY THE CONFIGURATION OF SUBSTATION.

2. EXCEL DUCTBANK SIZE AS REQUIRED BY UTILITY.

3. TYPICAL STAND ALONE SUBSTATION SITE DIMENSION WOULD BE 45'X90'. TYPICAL COMBINE TPSS AND SIGNAL BUNGALOW SITE DIMENSION WOULD BE 60'X90'.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
TRACTION POWER SYSTEM
SUBSTATION SITE PLANS
TYPICAL SUBSTATION SITE PLAN

DISCIPLINE: SYSTEMS

SHEET NAME: TPS-SW11-GSP

SHEET 102 OF 202

Jun, 26 2014 10:44 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-TPS\TPS-GSP-PLN.dwg By: HeinEE

MASTER OVERLAP CHART SYMBOLS

BWA XXX	BALANCE WEIGHT ANCHOR LABEL XXX–LENGTH IN FEET FROM BALANCE WEIGHT ANCHOR TO FIXED ANCHOR OR TO MID–POINT TERMINATION
FT XXX	FIXED TERMINATION LABEL XXX–LENGTH IN FEET FROM FIXED ANCHOR TO BALANCE WEIGHT ANCHOR
MPA XXXXXX	MID POINT ANCHOR LABEL XXX–HALF TENSION LENGTH IN FEET FROM MID–POINT TERMINATION TO BALANCE WEIGHT ANCHOR
246 6	TENSION LENGTH IDENTIFICATION NUMBER
S	SPRING TENSIONER
	FIXED ANCHOR
	BALANCE WEIGHT ANCHOR
	NON–INSULATED OVERLAP
	INSULATED OVERLAP
	SECTION INSULATOR

LAYOUT PLAN SYMBOLS

	OCS POLE, NEW
FP	OCS POLE WITH DC FEEDER
	POLE WITH SINGLE CANTILEVER
	DOWN GUY ANCHOR
	SECTION INSULATOR, BRIDGING TYPE
NB	SECTION INSULATOR, NON–BRIDGING TYPE

LAYOUT PLAN SYMBOLS CONT.

	BALANCE WEIGHT ANCHOR, SINGLE CONTACT WIRE
	POLE WITH TWIN CANTILEVER
	CROSSING CONTACT BRIDGE
F	AERIAL FEEDER WIRE PARALLEL TO TRACK
	NEW POLE WITH WIRE PULL–OFF FOR TWO WIRES
15"	STRING LINE OFFSET OF RAIL AT MIDSPAN
	IN SPAN JUMPER
	POLE, JOINT USE WITH SINGLE CANTILEVER AND STREET LIGHT
	FIXED TERMINATION – FISH TAIL STYLE SINGLE CONTACT WIRE
	EXISTING DOWN GUY ANCHOR
	NEW DOWN GUY ANCHOR
STATION	PASSENGER STATION
	TRACTION POWER SUBSTATION
	TURNBUCKLE
SA	SURGE ARRESTOR
	POLE MOUNTED SINGLE DISCONNECT SWITCH
	POLE MOUNTED DOUBLE DISCONNECT SWITCHES
BWA XXX	BALANCE WEIGHT ANCHOR LABEL XXX–LENGTH IN FEET FROM BALANCE WEIGHT ANCHOR TO FIXED ANCHOR OR TO MID–POINT TERMINATION
FA XXX	FIXED ANCHOR LABEL XXX–LENGTH IN FEET FROM FIXED ANCHOR TO BALANCE WEIGHT ANCHOR
MPA XXXXXX	MID POINT ANCHOR LABEL XXX–HALF TENSION LENGTH IN FEET FROM MID–POINT TERMINATION TO BALANCE WEIGHT ANCHOR
246 6	TENSION LENGTH IDENTIFICATION NUMBER

LAYOUT PLAN SYMBOLS CONT.

	STEADY SPAN STRUCTURE (NO SUPPORT)
	HEADSPAN SUPPORT STRUCTURE WITHOUT STEADY SPAN REGISTRATION
	PORTAL STRUCTURE
	NEW POLE WITH BACK–TO–BACK CANTILEVERS
	POLE, JOINT USE WITH BACK–TO–BACK OCS CANTILEVERS AND STREET LIGHTS
	TWO TRACK CANTILEVER – HINGED SUPPORT
	SINGLE CONTACT WIRE BRIDLE SUPPORT AND REGISTRATION ASSEMBLY
	POTENTIAL EQUALIZING JUMPER
	POLE WITH BACK–TO–BACK DOUBLE CANTILEVERS
	INSULATOR CUT INTO OUT–OF–RUNNING C/W
	FULL CURRENT JUMPER
	HEADSPAN SUPPORT STRUCTURE WITH STEADY SPAN REGISTRATION
	SPRING TENSIONER – SINGLE CONTACT WIRE
	BALANCE WEIGHT ANCHOR SIMPLE CATENARY SYSTEM
	OUT OF RUNNING CONTACT WIRE
	FIXED TERMINATION – SIMPLE CATENARY SYSTEM
	HEADSPAN STRUCTURE ATTACHED TO BUILDING ANCHORS
	TUNNEL OR BRIDGE SUPPORT
	TUNNEL OR BRIDGE SUPPORT AND REGISTRATION
	POLE WITH WIRE PULL OFF FOR ONE WIRE

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METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

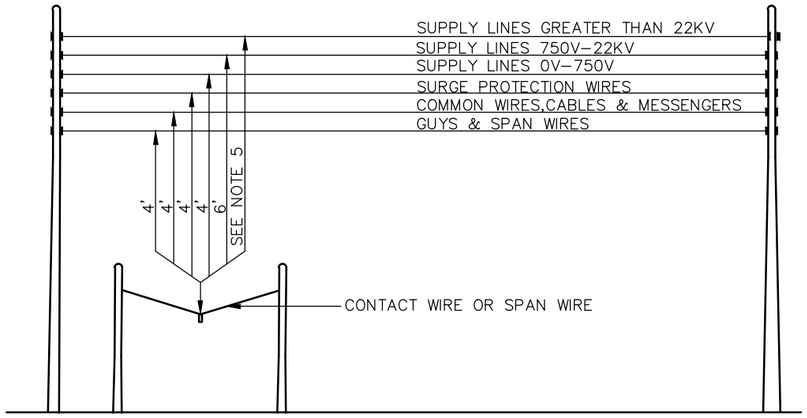
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
GENERAL
SYMBOLS, LEGEND, AND GENERAL NOTES

DISCIPLINE: SYSTEMS

SHEET NAME: SYS-OCS-GEN-001

SHEET 103 OF 202

Jun. 26 2014 10:21 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-GEN-001.dwg By: HeinEE



NON O.C.S. CONDUCTOR CLEARANCES ABOVE CONTACT WIRE

NOTES:
1. ALL CLEARANCES SHALL COMPLY WITH NATIONAL ELECTRIC SAFETY CODE

2. ALL CLEARANCES ARE MINIMUM VALUES

3. VERTICAL CLEARANCES APPLY TO CONTACT WIRES UNDER THE FOLLOWING CONDITIONS:

   A. CONDUCTOR TEMPERATURE OF 60° F, NO ICE, NO WIND, WITH FINAL SAG IN THE WIRE. OR CONDUCTOR TEMPERATURE OF 32° F, ICE (OPERATING CONDITIONS) NO WIND, WITH FINAL SAG IN THE WIRE, WHICHEVER IS GREATER

   B. SPAN LENGTHS NOT GREATER THAN THE FOLLOWING:

      AUTO TENSIONED SIMPLE CATENARY – 220 FT

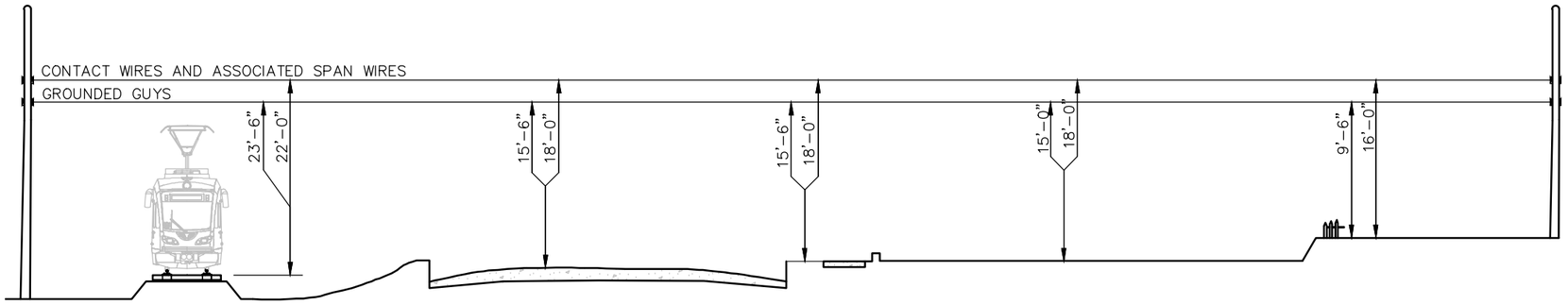
4. VERTICAL CLEARANCES APPLY TO NON–OCS CONDUCTORS ABOVE OCS CONTACT WIRES OR SPAN WIRE WITH NO ICE OR UNDER THE FOLLOWING CONDITIONS:

   A. CONDUCTOR SAG AT 120° F

   B. OR MAXIMUM CONDUCTOR TEMPERATURE IS GREATER THAN 120° F

   C. OR 32° F WITH RADIAL ICE OF 0.25 INCHES WHICHEVER PRODUCES THE LARGEST SAG AND O.C.S. CONTACT WIRES, AND SPAN WIRE WITH NO ICE

5. FOR VOLTAGES EXCEEDING 22KV (UP TO 470KV) THE CLEARANCE SHALL BE INCREASED BY 0.4 INCHES FOR EACH 1KV, OR FRACTION THEREOF, IN EXCESS OF 22KV



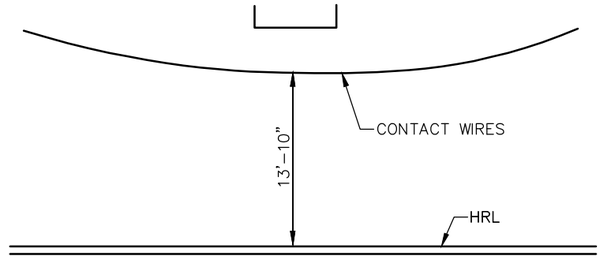
TRACK RAILS OF RAILROADS (EXCEPT ELECTRIFIED RAILROADS USING OVER–HEAD CONDUCTOR.)

ROADS, STREETS, AND OTHER AREAS SUBJECT TO ANY VEHICLE EXCEEDING 8 FT HEIGHT

OVER GROUND PARALLEL TO AND WITHIN R.O.W. OF PUBLIC STREETS BUT NOT OVERHANGING ROADWAY

DRIVEWAYS, PARKING LOTS AND ALLEYS SUBJECT TO ANY VEHICLE EXCEEDING 8 FT HEIGHT

ABOVE GROUND IN AREAS ACCESSIBLE TO PEDESTRIANS OR RESTRICTED TO RIDERS ON HORSES, ANIMALS, AND VEHICLES LESS THAN 8 FT HEIGHT



OVERHEAD BRIDGE OR TUNNEL OCS CONTACT WIRE CLEARANCES ABOVE RAIL INCLUDING ICE LOADING

OCS WIRE CLEARANCES ABOVE GROUND OR RAILS

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
VERTICAL ELECTRICAL CLEARANCE REQUIREMENTS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-101

SHEET 104 OF 202

Jun. 26 2014 10:21 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL.dwg By: HeinEE

DESIGN CRITERIA

1. CLIMATIC PARAMETERS

TEMPERATURE	OPEN ROUTE
NORMAL AMBIENT	60°F
MINIMUM AMBIENT	−40°F
MAXIMUM CONTACT WIRE	120°F

ICE	CONTACT	MESSENGER
OPERATING	1/4" RADIAL	1/2" RADIAL
NON−OPERATING	1/2" RADIAL	1/2" RADIAL

WIND	OPEN ROUTE
OPERATING (ICE)	40mph
OPERATING (NO ICE)	55mph
NON OPERATING (NO ICE)	90mph

2. ELECTRICAL CLEARANCES

	NORMAL
STATIC	4 INCHES
PASSING	3 INCHES

3. CATENARY SYSTEM PARAMETERS

ITEM	UNITS	SCAT MAINLINE	SWFT YARD
WIRE SIZE:			
CONTACT	KCMIL	350	350
MESSENGER	KCMIL	500	–
TENSION AT DESIGN TEMP (60°F)			
CONTACT WIRE	LB	3000	1750
MESSENGER WIRE	LB	5000	–
NORMAL CONTACT WIRE HEIGHT	FEET	18.5	18.5
MAXIMUM WIRE HEIGHT	FEET	22.3	22.3
NORMAL SYSTEM HEIGHT	FEET	4.0	–
MAXIMUM SPAN	FEET	220	80
MAXIMUM STAGGER	INCHES	9	9
MAXIMUM 1/2 TENSION LENGTH	FEET	2650	–
CONTACT WIRE MAXIMUM WEAR	PERCENT	30	30
POLE DEFLECTION AT CWH (MAXIMUM)	INCHES	2	2
MAX LIVE LOAD POLE DEFLECTION AT CONTACT WIRE HEIGHT	INCHES	1	1
FOUNDATION ROTATION (MAXIMUM)	DEGREES	0.50	0.50
MAX CONTACT WIRE GRADIENT			
(30mph) CONSTANT GRADIENT	RATIO	1 in 150	1 in 150
(30mph) CHANGE OF GRADIENT	RATIO	1 in 300	1 in 300

4. TOLERANCES AND RELATED INFORMATION:

A. TRACK

	EMBEDDED/DF	OPEN ROUTE	YARD
	DIRECT FIXATION	BALLASTED	BALLASTED
VERTICAL	0.125 INCHES	0.50 INCHES	1.00 INCHES
HORIZONTAL	0.50 INCHES	0.50 INCHES	0.50 INCHES
GROSS LEVEL	0.125 INCHES/GAUGE	0.125 INCHES/GAUGE	0.25 INCHES/GAUGE
GAUGE	0.125 INCHES	0.125 INCHES	−0.125 TO +0.25 INCHES

B. VEHICLE (ARTICULATED)

LATERAL DISPLACEMENT (EACH SIDE)	1.81 INCHES
ROLL TO EACH SIDE – MAXIMUM	4.00 DEGREES
BOUNCE – MAXIMUM	2.00 INCHES
TRUCK CENTER	32.43 FEET
WIDTH (OVER SIDE SHEETS)	8.7 – 8.8 FEET
LENGTH (OVER COUPLERS)	90 – 94 FEET
TRUCK WHEELBASE	5.91 TO 6.23 FEET
TRUCK CENTER TO COUPLER FACE	11.56 FEET

C. PANTOGRAPH

OVERALL WIDTH	6.50 FEET
CARBON WIDTH	3.50 FEET
MAXIMUM CARBON WEAR	0.75 INCHES
MAX LOCKDOWN HEIGHT	12.70 FEET ABOVE RAIL
MINIMUM PANTOGRAPH HEIGHT	13.00 FEET
MAXIMUM DEFLECTION RELATIVE TO CAR	1.50 INCHES TO EACH SIDE

D. OVERHEAD CONTACT SYSTEM INSTALLATION TOLERANCES	UNITS	
STRUCTURE FOUNDATION LOCATION ALONG TRACK: TANGENT & CURVE > 500 FT RADIUS	FEET	±5.0
TRACK CURVE LESS THAN 500 FT RADIUS	FEET	±2.00
ADJACENT TO SPECIAL TRACKWORK	FEET	±2.00
MAX SPAN CHANGE BETWEEN TWO ADJACENT STRUCTURES	FEET	±5.00
STRUCTURE FOUNDATION LOCATION – ACROSS TRACK		
– OUTSIDE POLES	INCHES	−0 +1.0
– CENTER POLES	INCHES	±1.00
FOUNDATION ELEVATION	INCHES	±1.00
POLE BASEPLATE ELEVATION	INCHES	±1.00
HANGER SPACING	INCHES	±3.00
CONDUCTOR HEIGHT AT SUPPORTS (SEE NOTE 1)		
– OPEN ROUTE	INCHES	±1.00
– TUNNEL UNDER & BRIDGES	INCHES	±0.50
STAGGER AT SUPPORTS	INCHES	±1.00
MESSENGER & CONTACT WIRE STAGGER DIFFERENCE AT SUPPORTS	INCHES	±2.00
WIRE TENSION	POUNDS	±50

5. MINIMUM CONTACT WIRE HEIGHT	FT	IN
TRACK VERTICAL TOLERANCE	0	0.5
VEHICLE HEIGHT ABOVE RAIL LEVEL	12	5
PANTOGRAPH LOCKDOWN ABOVE VEHICLE HEIGHT	0	3.5
PANTOGRAPH LOCKDOWN TO MINIMUM OPERATING HEIGHT	0	8
CONTACT WIRE ERECTION TOLERANCE	0	0.5
VEHICLE VERTICAL BOUNCE	0	1
MINIMUM CONTACT WIRE HEIGHT	13	6.5

6. DESIGN MINIMUM CONTACT WIRE HEIGHT	FT	IN
EXCLUSIVE R.O.W.	13	10
ROAD GRADE CROSSING	18	0
"HIGH & WIDE" GRADE CROSSING	22	0
IN STREET (NOT DOWNTOWN)	18	6
DOWNTOWN	16	0
TUNNEL SECTIONS	13	10
YARD	18	6

NOTE:

1. THE TOLERANCE GIVEN AT THE SUPPORTS FOR THE CONDUCTOR HEIGHT IS ONLY APPLICABLE PROVIDED THE CONDUCTOR GRADIENT IS ACCEPTABLE
2. FOR PANTOGRAPH CLEARANCE ENVELOPE SEE SHEET 106
3. ALL MINIMUM CONTACT WIRE HEIGHTS SHALL NOT BE EXCEEDED BY DROOP DUE TO ICE LOADING.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS PARAMETERS, TOLERANCES AND WIRE HEIGHTS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-102

SHEET 105 OF 202

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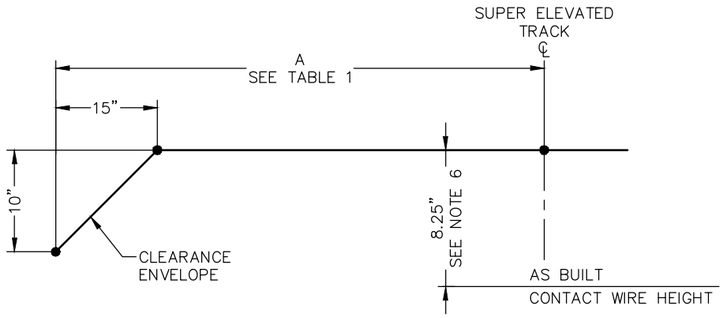
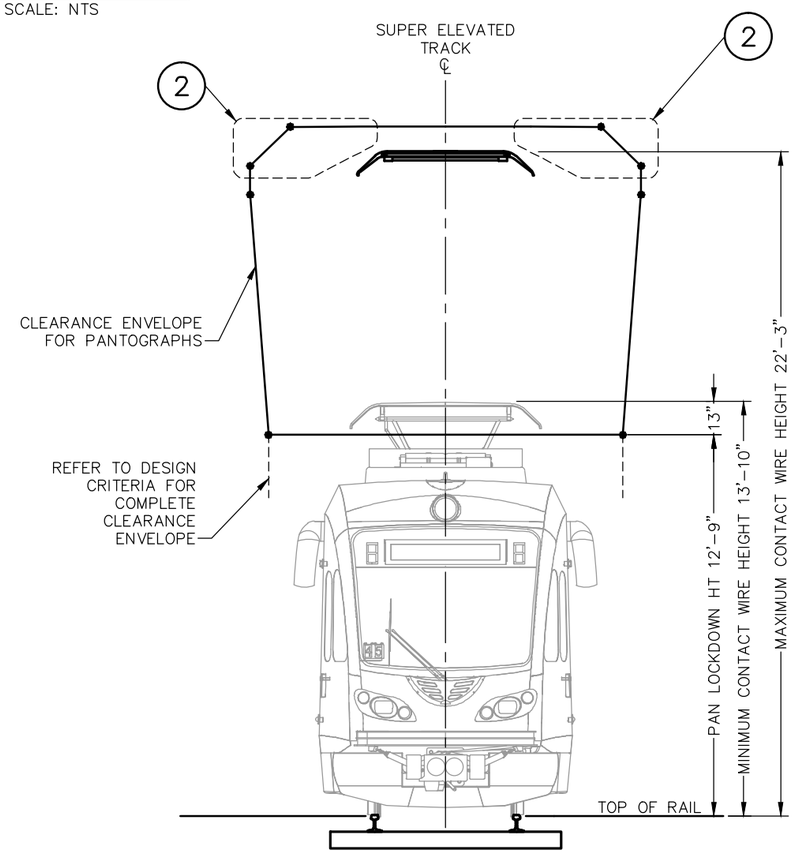


2 DETAIL
SCALE: NTS

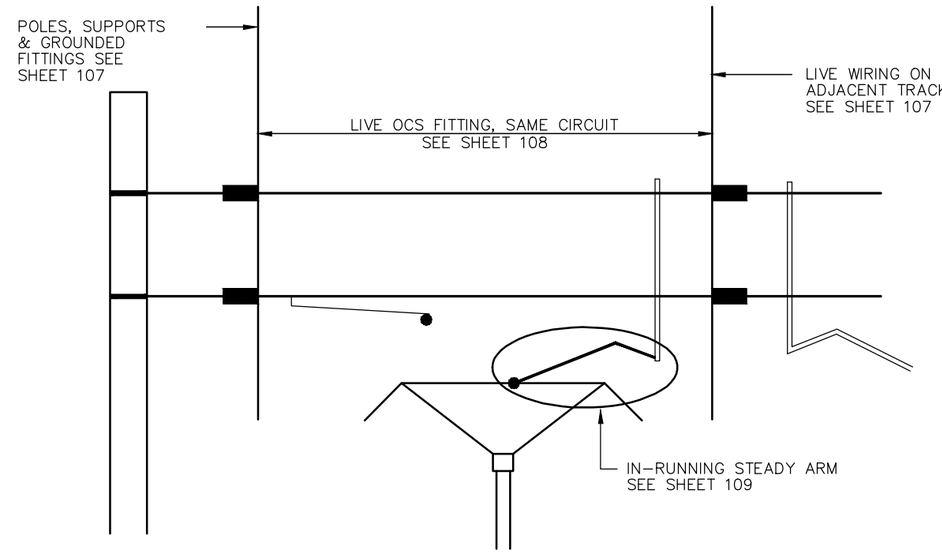
TABLE 1: DIMENSION TABLE		
AS-BUILT CW HT	DIMENSION A INCHES	
	EMBEDDED TRACK	BALLASTED TRACK
22'-0"	65.6	69.3
18'-6"	62.4	65.7
16'-0"	60.0	63.1
13'-10"	58.0	60.8

NOTES:

1. THIS DRAWING PROVIDES A SIMPLIFIED PANTOGRAPH CLEARANCE ENVELOPE FOR USE WITH AS BUILT OCS EQUIPMENT. TRACK AND POLES, MASONRY WALLS AND STRUCTURES. THE DIMENSIONS ARE TO BE MEASURED RELATIVE TO THE SUPERELEVATED TRACK.
2. OBSTRUCTIONS NOT CLEARING THIS OUTLINE MAY BE FURTHER EXAMINED AGAINST THE CONDITIONS AND MINIMUM CLEARANCES OF SHEETS 107, 108 & 109. SEE DETAIL 3.
3. FOR VALUES OF CONTACT WIRE HEIGHT BETWEEN THOSE LISTED IN TABLE 1, USE LINEAR INTERPOLATION TO DETERMINE A VALUE FOR DIMENSION A.
4. MINIMUM CLEARANCES FOR USE PRIOR TO CONSTRUCTION ARE TO BE CALCULATED USING ALLOWANCES SHOWN ON SHEETS 107, 108 & 109.
5. MINIMUM CLEARANCES BETWEEN LIVE WIRES OR FITTINGS AND OTHER FIXED INFRASTRUCTURE SHALL BE DETERMINED FROM NATIONAL ELECTRIC SAFETY CODE (N.E.S.C) AND SHEET 104.
6. FOR STRUCTURAL MEMBERS THE VERTICAL CLEARANCE IS TO BE INCREASED TO 11.25".



1 SIMPLIFIED PANTOGRAPH CLEARANCE ENVELOPE FOR AS-BUILT CONDITIONS
SEE NOTE 1



3 RELATED MINIMUM CLEARANCE DETAIL
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SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SIMPLIFIED PANTOGRAPH CLEARANCE ENVELOPE

DISCIPLINE: SYSTEMS

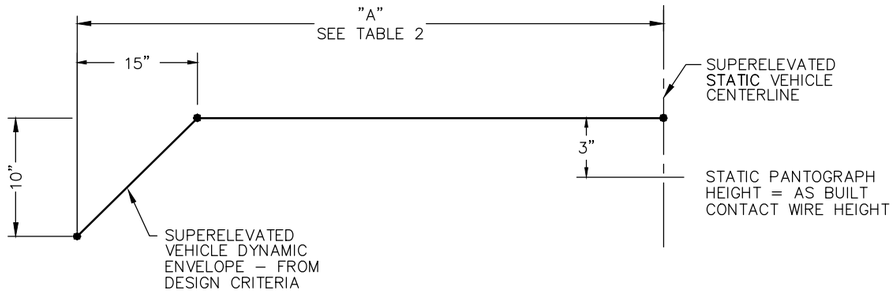
SHEET NAME: OCS-DTL-103

SHEET 106 OF 202

Jun. 26 2014 10:21 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL.dwg By: HeinEE

TABLE 1: HORIZONTAL OFFSET DUE TO TRACK SUPERELEVATION (OS)						
AS–BUILT CW HEIGHT ABOVE TOR	SUPERELEVATION (INCHES)					
	1	2	3	4	5	6
22'–0"	4.7	9.5	14.2	18.9	23.7	28.4
18'–6"	4.0	8.0	12.0	16.0	20.0	24.0
16'–0"	3.5	6.9	10.4	13.8	17.3	20.8
13'–10"	3.0	6.0	9.0	12.0	15.0	18.0

TABLE 2: CLEARANCE DIMENSIONS SEE NOTE 5		
AS–BUILT CW HT	DIMENSION A INCHES	
	EMBEDDED TRACK	BALLASTED TRACK
22'–0"	62.1	64.3
18'–6"	58.9	60.7
16'–0"	56.5	58.1
13'–10"	54.5	55.8



EXTRACT FROM PANTOGRAPH DYNAMIC ENVELOPE

SEE NOTE 5

NOTES:

1. THIS DRAWING PROVIDES DETAILED RELATIONSHIPS AND DIMENSIONS FOR DETERMINATION OF MINIMUM CLEARANCES BETWEEN A PANTOGRAPH AND ADJACENT FIXED INFRASTRUCTURE. THESE CLEARANCES MAY BE FURTHER REDUCED ONLY FOR THOSE CASES LISTED IN NOTE 2

2. FOR THE PURPOSE OF DETERMINATION OF CLEARANCES TO A PANTOGRAPH, AN OCS FITTING SHALL BE CONSIDERED LIVE WHERE IT IS SEPARATED FROM GROUNDED POLES OR LIVE WIRING OF ADJACENT TRACKS, BY AT LEAST ONE LEVEL OF SYSTEM RATED INSULATION

   – FOR IN–RUNNING LIVE STEADY ARMS, SEE SHEET 109
   – FOR OTHER LIVE OCS EQUIPMENT, SEE SHEET 108
   – ALL OTHER STRUCTURES, POLES OR EQUIPMENT REQUIRE PANTOGRAPH CLEARANCES DETERMINED FROM THIS DRAWING

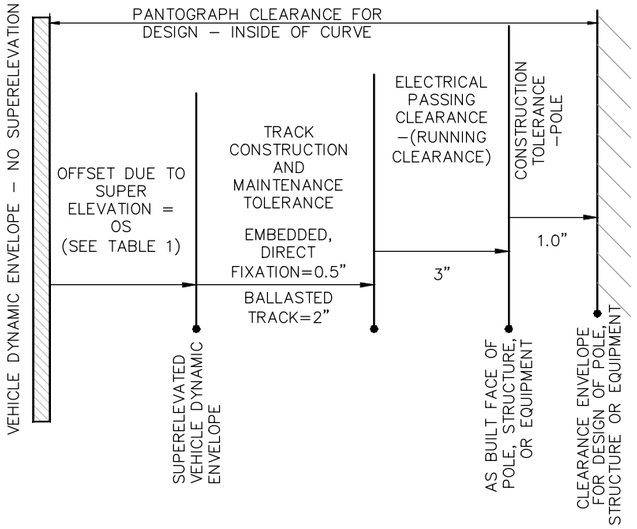
3. FOR OBJECTS DIAGONALLY SEPARATED, BOTH HORIZONTAL AND VERTICAL CLEARANCES ARE TO BE APPLIED. RUNNING CLEARANCES COMPONENTS MAY BE MEASURED RADIALLY

4. MINIMUM CLEARANCES BETWEEN LIVE WIRES OR FITTINGS AND OTHER FIXED INFRASTRUCTURE SHALL BE DETERMINED FROM NATIONAL ELECTRIC SAFETY CODE (N.E.S.C.) AND SHEET 104

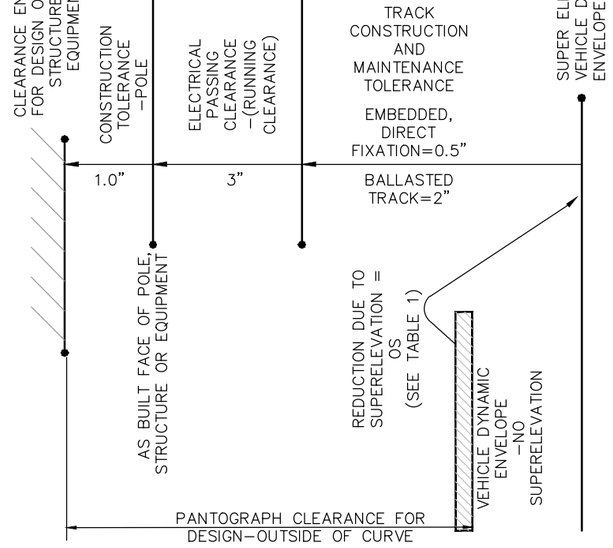
5. VEHICLE DYNAMIC ENVELOPE DETERMINED FOR SUPERELEVATION = 0" FROM CLEARANCE REQUIREMENTS OF DESIGN CRITERIA

6. SUPERELEVATION OFFSET (OS) IS TO BE CONSIDERED WHEN MEASUREMENTS ARE TAKEN FROM VERTICAL TRACK CENTERLINE

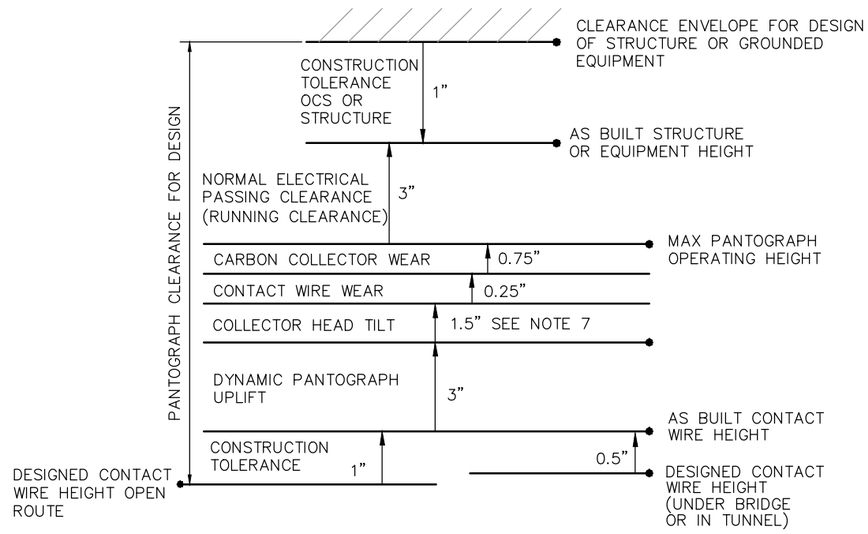
7. COLLECTOR HEAD TILT TO BE CONSIDERED ONLY WHERE ALL IN–RUNNING CONTACT WIRES ARE STAGGERED TO THE FAR SIDE OF THE SUPERELEVATED VEHICLE CENTERLINE



MINIMUM HORIZONTAL CLEARANCE TO OBJECTS ON THE INSIDE OF CURVE FROM A PANTOGRAPH



MINIMUM HORIZONTAL CLEARANCE TO OBJECTS ON THE OUTSIDE OF CURVE FROM A PANTOGRAPH



MINIMUM VERTICAL CLEARANCE TO OBJECTS ABOVE THE TRACK FROM A PANTOGRAPH

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
PANTOGRAPH CLEARANCE TO GROUNDED ITEMS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-104

SHEET 107 OF 202

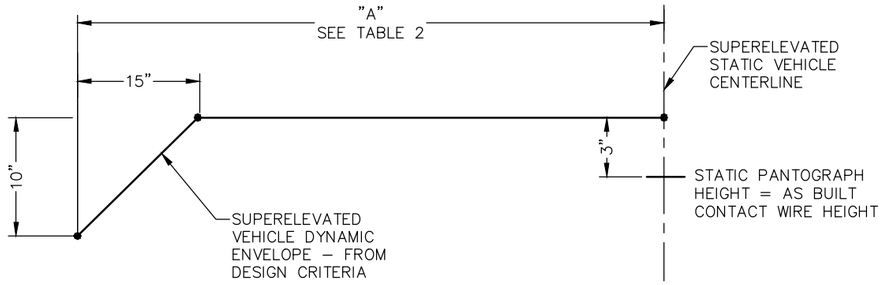
Jun. 26 2014 10:21 am V:\3200_PEC–W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS–OCS\WO–SYS–OCS–DTL.dwg By: HeinEE

TABLE 1: HORIZONTAL OFFSET DUE TO TRACK SUPERELEVATION (OS)						
AS–BUILT CW HEIGHT ABOVE TOR	SUPERELEVATION (INCHES)					
	1	2	3	4	5	6
22'–0"	4.7	9.5	14.2	18.9	23.7	28.4
18'–6"	4.0	8.0	12.0	16.0	20.0	24.0
16'–0"	3.5	6.9	10.4	13.8	17.3	20.8
13'–10"	3.0	6.0	9.0	12.0	15.0	18.0

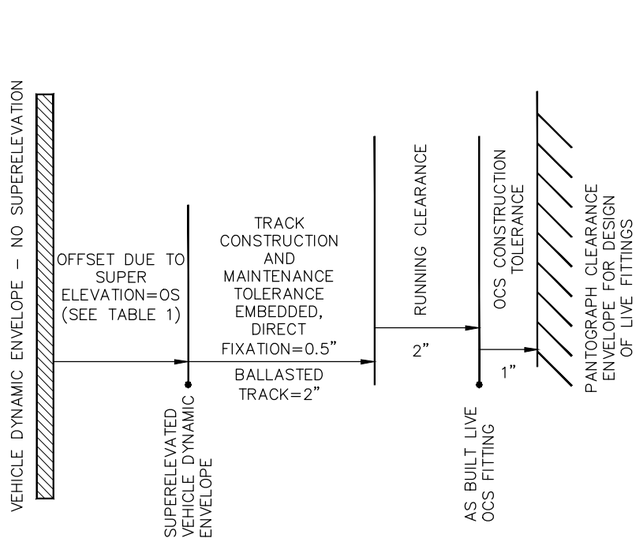
TABLE 2: CLEARANCE DIMENSIONS SEE NOTE 5		
AS–BUILT CW HT	DIMENSION A INCHES	
	EMBEDDED TRACK	BALLASTED TRACK
22'–0"	62.1	64.3
18'–6"	58.9	60.7
16'–0"	56.5	58.0
13'–10"	54.5	55.8

NOTES:

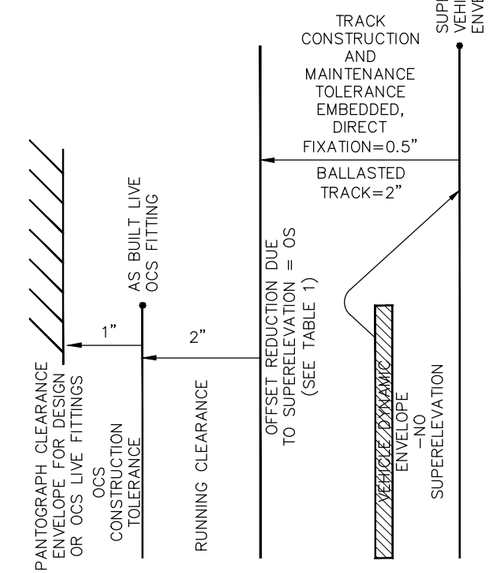
1. THE DRAWING PROVIDES RELATIONSHIPS AND DIMENSIONS FOR DETERMINATION OF MINIMUM CLEARANCES BETWEEN A PANTOGRAPH AND ADJACENT LIVE OCS, FITTINGS, EXCEPTING FOR IN–RUNNING STEADY ARMS.
2. FOR THE PURPOSE OF DETERMINATION OF CLEARANCES TO A PANTOGRAPH, AN OCS FITTING SHALL BE CONSIDERED LIVE ONLY WHERE IT IS SEPARATED FROM GROUNDED POLES OR LIVE WIRING OF ADJACENT TRACKS, BY AT LEAST ONE LEVEL OF SYSTEM RATED INSULATION.
   - FOR IN–RUNNING STEADY ARM, SEE SHEET 109
   - CLEARANCES FOR OTHER LIVE OCS FITTINGS TO BE DETERMINED FROM THIS DRAWING
   - ALL OTHER STRUCTURES, POLES OR EQUIPMENT REQUIRE CLEARANCES DETERMINED FROM SHEET 107
3. FOR OBJECTS DIAGONALLY SEPARATED, BOTH HORIZONTAL AND VERTICAL CLEARANCES ARE TO BE APPLIED. RUNNING CLEARANCE COMPONENTS MAY BE MEASURED RADIALLY.
4. MINIMUM CLEARANCES BETWEEN LIVE WIRES OR FITTINGS AND OTHER FIXED INFRASTRUCTURE SHALL BE DETERMINED FROM NATIONAL ELECTRIC SAFETY CODE (N.E.S.C.) AND SHEET 104
5. VEHICLE DYNAMIC ENVELOPE DETERMINED FROM CLEARANCE REQUIREMENTS OF DESIGN CRITERIA.
6. SUPERELEVATION OFFSET (OS) IS TO BE CONSIDERED WHEN MEASUREMENTS ARE TAKEN FROM VERTICAL TRACK CENTERLINE.
7. COLLECTOR HEAD TILT TO BE CONSIDERED ONLY WHERE ALL IN–RUNNING CONTACT WIRES ARE STAGGERED TO THE FAR SIDE OF THE SUPERELEVATED VEHICLE CENTERLINE.



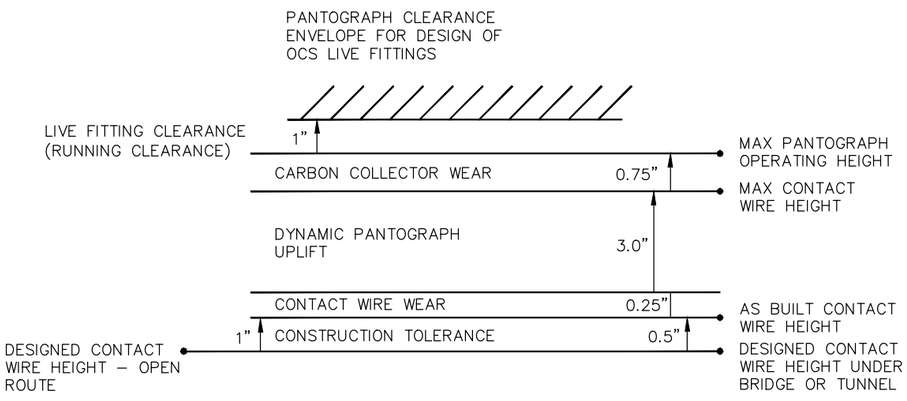
EXTRACT FROM PANTOGRAPH DYNAMIC ENVELOPE
SEE NOTE 5



MINIMUM HORIZONTAL CLEARANCE TO LIVE FITTINGS ON THE INSIDE OF CURVE FROM A PANTOGRAPH



MINIMUM HORIZONTAL CLEARANCE TO LIVE FITTINGS ON THE OUTSIDE OF CURVE FROM A PANTOGRAPH



MINIMUM VERTICAL CLEARANCE FROM A PANTOGRAPH TO LIVE FITTINGS

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
PANTOGRAPH CLEARANCE
TO LIVE OCS FITTINGS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-105

SHEET 108 OF 202

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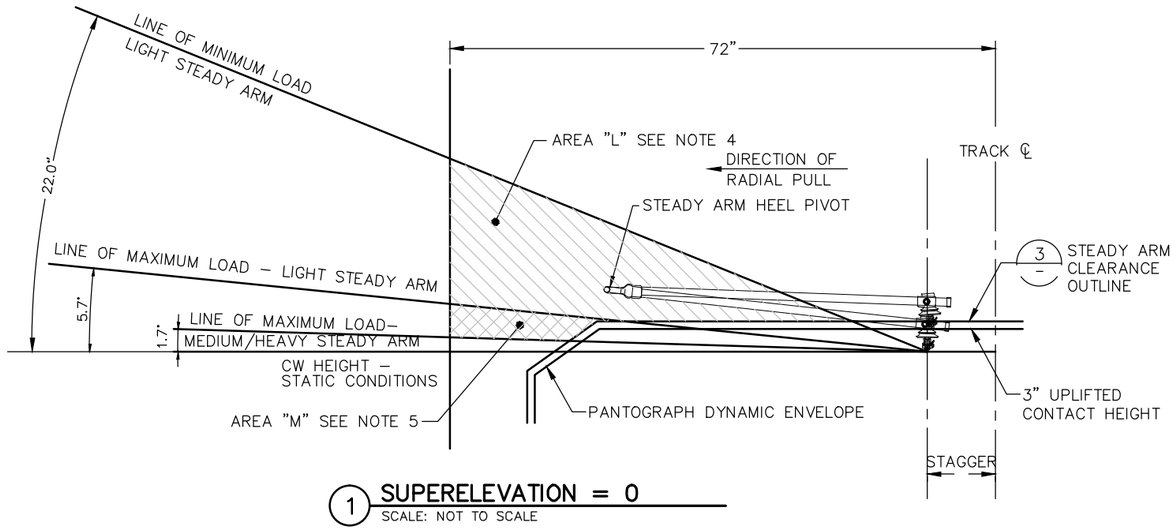
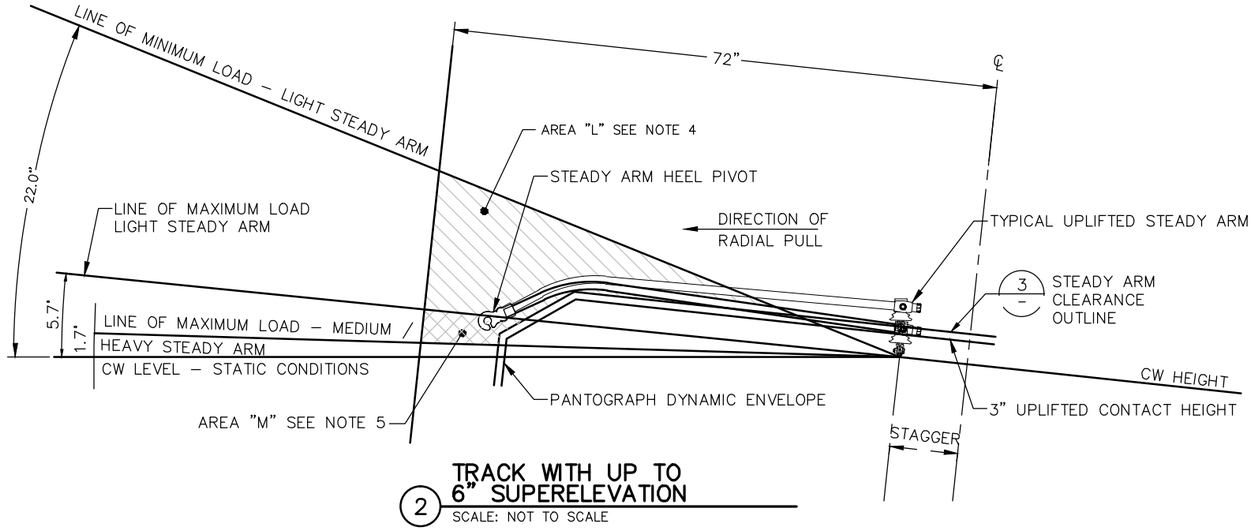
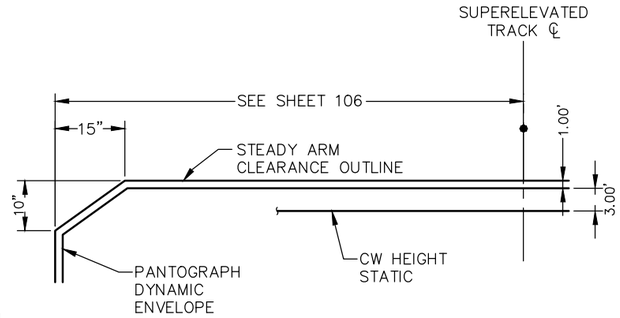


1 **SUPERELEVATION = 0**
SCALE: NOT TO SCALE



2 **TRACK WITH UP TO 6" SUPERELEVATION**
SCALE: NOT TO SCALE



3 **STEADY ARM CLEARANCE FROM UPLIFTED PANTOGRAPH**
SCALE: NOT TO SCALE

NOTE:

1. THIS DRAWING IS TO BE USED FOR THE DESIGN AND APPLICATION OF STEADY ARMS REGISTERING IN–RUNNING CONTACT WIRES. IT DOES NOT APPLY TO UPLIFT RESTRICTING STEADY ARMS

2. ALL STEADY ARMS SHALL BE SHAPED SO AS NOT TO ENCROACH INSIDE THE STEADY ARM CLEARANCE OUTLINE OR WITHIN 1" RUNNING CLEARANCE OF THE PANTOGRAPH DYNAMIC ENVELOPE EXCEPTING FOR CONTACT WIRE CLAMP COMPONENTS

3. THE DIRECTION OF LOAD PULL IS TO BE MEASURED FROM THE STATIC CONTACT WIRE HEIGHT, WITH THE ANGLE RELATIVE TO LEVEL

4. LIGHT LOAD STEADY ARMS ARE TO BE SUITABLE FOR RADIAL LOADS UP TO 200 POUNDS. THE STEADY ARM HEEL PIVOT POINT IS TO FALL WITHIN AREA "L" SHOWN

5. MEDIUM LOAD STEADY ARMS ARE TO BE SUITABLE FOR RADIAL LOADS UP TO 500 POUNDS. THE STEADY ARM HEEL PIVOT POINT IS TO FALL WITHIN AREA "M" SHOWN

6. HEAVY RADIAL LOADS OF UP TO 1000 POUNDS SHALL BE SERVICED BY USING TWO MEDIUM LOAD STEADY ARMS ARRANGED TO SHARE LOAD EQUALLY

7. FOR AUTO–TENSIONED CONTACT WIRE THE MINIMUM DISTANCE FROM CONTACT WIRE TO HEEL PIVOT SHALL BE 36"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
STEADY ARM CLEARANCE
SHAPES AND DIMENSIONS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-106

SHEET 109 OF 202

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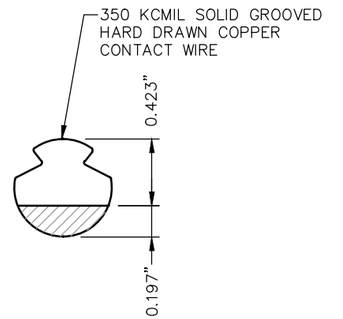
SIMPLE CATENARY AUTO–TENSIONED (SCAT)			
CONDUCTOR PARTICULARS (UNWORN CONDITION)	UNITS	CONDUCTOR	
		CONTACT	MESSENGER
CONDUCTOR TYPE	–	350 KCMIL SOLID GROOVED	500 KCMIL 19 STRAND
MATERIAL	–	HARD DRAWN COPPER	HARD DRAWN COPPER
DIAMETER	IN	0.620	0.811
CROSS SECTIONAL AREA	SQ IN	0.2758	0.3926
WEIGHT OF CONDUCTOR	LB/FT	1.063	1.544
WEIGHT OF SYSTEM	LB/FT	2.654	
RADIAL THICKNESS OF ICE (O)	IN.	0.25	0.50
WEIGHT OF ICE (O)	LB/FT	0.270	0.815
WEIGHT OF SYSTEM WITH ICE (O)	LB/FT	3.739	
RADIAL THICKNESS OF ICE (NO)	IN	0.50	0.50
WEIGHT OF ICE (NO)	LB/FT	0.696	0.815
WEIGHT OF SYSTEM WITH ICE (NO)	LB/FT	4.165	
CONDUCTOR BREAKING LOAD	LB	11810	21590
MAXIMUM SPAN	FT	220	
CONDUCTOR TENSIONS AT:			
60°F NO WIND	LB	3000	5000
120°F NO WIND	LB	3000	5000
–40°F WIND & ICE (O)	LB	3962	6707
–40°F WIND & ICE (NO)	LB	4038	7052
CONDUCTOR SAG ON MAXIMUM SPAN AT:			
60°F NO WIND	FT	0	3.211
120°F NO WIND	FT	0	3.211
–40° NO WIND ICE (O)	FT	0.162	3.373
–40°F NO WIND ICE (NO)	FT	0.362	3.573
SYSTEM HEIGHT	FT	4.0 (NORMAL)	
CONTACT WIRE HEIGHT AT 60°F	FT	18.50 (NORMAL)	
LOWER LIMIT OF AUTO TENSIONING	°F	–20	
UPPER LIMIT OF AUTO TENSIONING	°F	120	
MODULUS OF ELASTICITY	PSI	$16x10^{6}$	$16x10^{6}$
COEFFICIENT OF THERMAL EXPANSION	–/°F	$9.4x10^{-6}$	$9.4x10^{-6}$
MINIMUM FACTOR OF SAFETY	–	2.92	3.06

SIMPLE CATENARY AUTO–TENSIONED (SCAT)			
CONDUCTOR PARTICULARS (WORN CONDITION)	UNITS	CONDUCTOR	
		CONTACT	MESSENGER
PERMISSIBLE WEAR	% OF AREA	30.00	–
WEIGHT OF SYSTEM	LB/FT	2.335	
WEIGHT OF SYSTEM WITH ICE (O)	LB/FT	3.383	
WEIGHT OF SYSTEM WITH ICE (NO)	LB/FT	3.772	
CONDUCTOR TENSION AT:	–		
–40°F WIND & ICE (NO)	LB	3727	–
CONDUCTOR BREAKING LOAD	LB	8267	–
MINIMUM SAFETY FACTOR	–	2.22	–

NOTE:

1. ICE (O) OPERATING CONDITION IS WITH 1/2" RADIAL ICE ON THE MESSENGER WIRE AND 1/4" RADIAL ICE ON THE CONTACT WIRE
2. ICE (NO) NON OPERATING CONDITION IS WITH 1/2" RADIAL ICE ON BOTH MESSENGER & CONTACT WIRES
3. SYSTEM WEIGHTS SHOWN ARE FOR DESIGN PURPOSES AND CONSIST OF CONDUCTOR WEIGHTS PER FOOT, WHICH WERE TAKEN FROM MANUFACTURERS INFORMATION TABLES



PERMISSIBLE WEAR 30% OF THE ORIGINAL CROSS SECTIONAL AREA

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SCAT - CONDUCTOR PARTICULARS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-107

SHEET 110 OF 202

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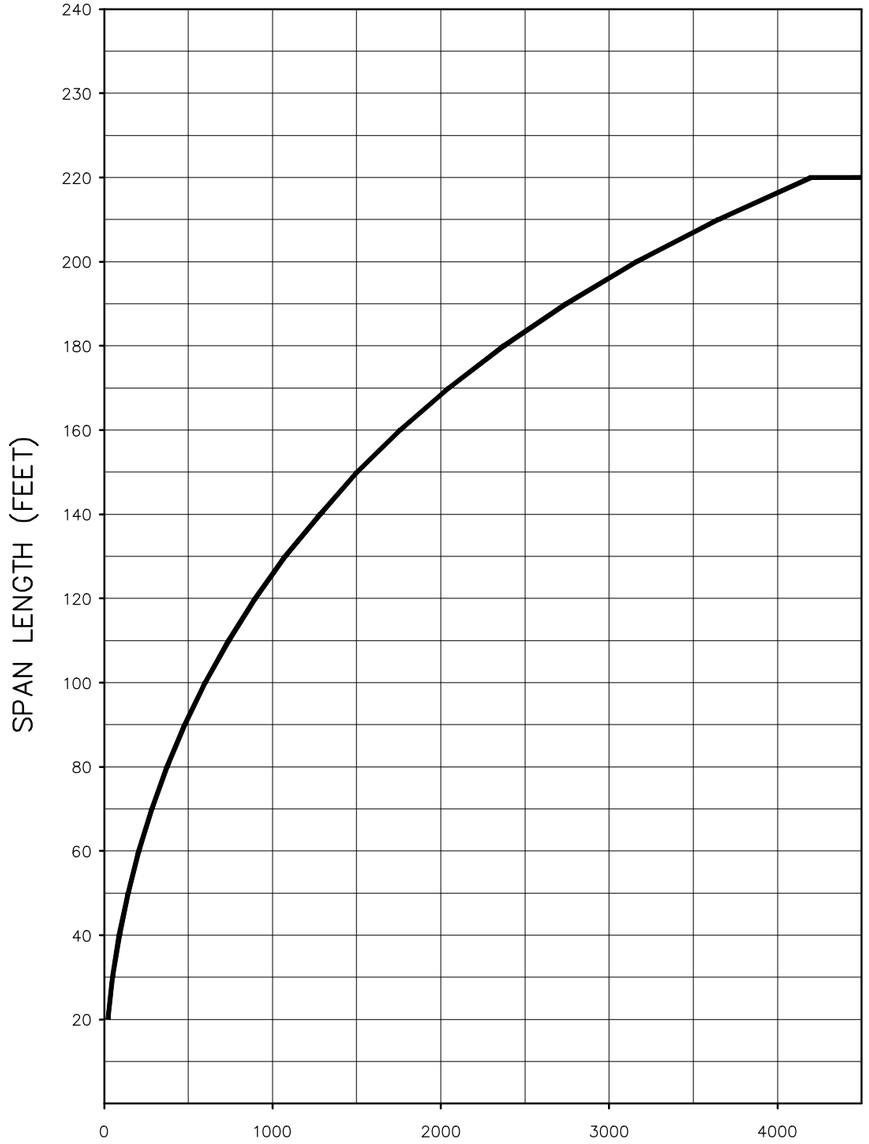

MAXIMUM STRUCTURE SPACING
SEE NOTE 4

MAXIMUM CONSTRUCTED SPAN – CURVED TRACK				
18'–6" CONTACT WIRE HEIGHT				
SPAN [FT]	MAX VERSINE [IN]	STATIC OFFSET [IN]	BLOW–OFF [FT]	MIN. CURVE RADIUS [FT]
20	26.880	14.880	0.007	22
30	26.780	14.780	0.015	50
40	26.640	14.640	0.027	90
50	26.460	14.460	0.042	142
60	26.240	14.240	0.060	206
70	25.980	13.980	0.082	283
80	25.680	13.680	0.107	374
90	25.340	13.340	0.135	479
100	24.960	12.960	0.167	601
110	24.540	12.540	0.202	740
120	24.080	12.080	0.240	897
130	23.580	11.580	0.282	1075
140	23.040	11.040	0.327	1276
150	22.460	10.460	0.375	1503
160	21.840	9.840	0.427	1758
170	21.180	9.180	0.482	2047
180	20.480	8.480	0.540	2373
190	19.740	7.740	0.602	2743
200	18.960	6.960	0.667	3165
210	18.140	6.140	0.735	3647
220	17.280	5.280	0.807	4201

TABLE 1: MAXIMUM MID–SPAN STATIC OFFSET
SEE NOTE 6

NOTES:

1. MAXIMUM STRUCTURE SPACINGS FOR SPANS WHOLLY OVER CONSTANT RADIUS TRACK CURVE, ARE TO BE DETERMINED FROM THE GRAPHS AND RELATED NOTES. FOR ALL OTHER HORIZONTAL ALIGNMENT COMBINATIONS, SPACING MUST SATISFY MAXIMUM STATIC MIDSPAN OFFSET CRITERIA APPLIED TO STAGGERED CONTACT WIRE.
2. THE MAXIMUM STATIC MIDSPAN OFFSET IS THE VALUE THE CONTACT WIRE CAN BE FROM THE CENTER LINE OF A STATIC PANTOGRAPH UNDER STILL AIR CONDITIONS MEASURED AT MID–SPAN.
3. WHERE AS–BUILT STATIC MIDSPAN OFFSET EXCEEDS THE MAXIMUM VALUE LISTED IN TABLE 1, FURTHER CONSTRUCTION MAY ONLY CONTINUE AFTER SITE SPECIFIC APPROVAL.
4. THE SPACINGS SHOWN ARE THE ABSOLUTE MAXIMUM FOR EACH CONTACT WIRE HEIGHT AND TRACK TYPE CONDITION. FOR DESIGN PURPOSES THE MAXIMUM SPAN SHALL BE REDUCED BY 5 FEET TO CATER FOR SITE ADJUSTMENTS IF OBSTRUCTIONS ARE ENCOUNTERED.
5. MAXIMUM CONTACT WIRE STAGGER = 9".
6. INSTALLED CONTACT WIRE SPANS MAY BE ACCEPTED WITH 1 INCH OF ADDITIONAL MIDSPAN OFFSET CONSTRUCTION TOLERANCE ABOVE THE MAXIMUM VALUES LISTED.
7. THE CONDITIONS FOR THE STRUCTURE SPACING CHART AND THE TABLES ARE 60° F WITH A WIND SPEED OF 55 MPH.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SCAT - STRUCTURE SPACING

DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-108

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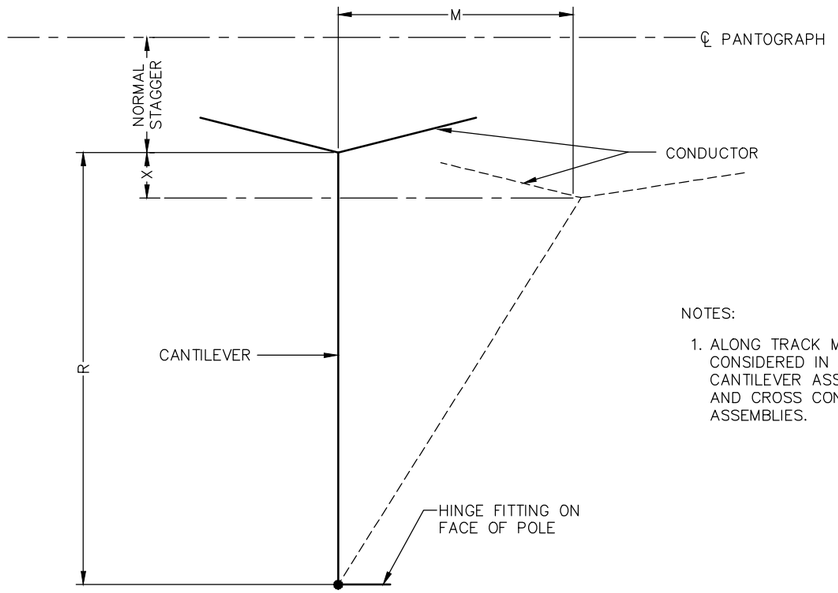
		ALONG TRACK MOVEMENT [IN]													
		DISTANCE FROM MID POINT OR FIXED TERMINATION [FT]													
		200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2640
TEMPERATURE	−20	−1.80	−3.61	−5.41	−7.22	−9.02	−10.83	−12.63	−14.44	−16.24	−18.05	−19.85	−21.66	−23.46	−23.82
	−10	−1.58	−3.16	−4.74	−6.32	−7.90	−9.48	−11.05	−12.63	−14.21	−15.79	−17.37	−18.95	−20.53	−20.85
	0	−1.35	−2.71	−4.06	−5.41	−6.77	−8.12	−9.48	−10.83	−12.18	−13.54	−14.89	−16.24	−17.60	−17.87
	10	−1.13	−2.26	−3.38	−4.51	−5.64	−6.77	−7.90	−9.02	−10.15	−11.28	−12.41	−13.54	−14.66	−14.89
	20	−0.90	−1.80	−2.71	−3.61	−4.51	−5.41	−6.32	−7.22	−8.12	−9.02	−9.93	−10.83	−11.73	−11.91
	30	−0.68	−1.35	−2.03	−2.71	−3.38	−4.06	−4.74	−5.41	−6.09	−6.77	−7.44	−8.12	−8.80	−8.93
	40	−0.45	−0.90	−1.35	−1.80	−2.26	−2.71	−3.16	−3.61	−4.06	−4.51	−4.96	−5.41	−5.87	−5.96
	50	−0.23	−0.45	−0.68	−0.90	−1.13	−1.35	−1.58	−1.80	−2.03	−2.26	−2.48	−2.71	−2.93	−2.98
	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	70	0.23	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.26	2.48	2.71	2.93	2.98
	80	0.45	0.90	1.35	1.80	2.26	2.71	3.16	3.61	4.06	4.51	4.96	5.41	5.87	5.96
	90	0.68	1.35	2.03	2.71	3.38	4.06	4.74	5.41	6.09	6.77	7.44	8.12	8.80	8.93
	100	0.90	1.80	2.71	3.61	4.51	5.41	6.32	7.22	8.12	9.02	9.93	10.83	11.73	11.91
	110	1.13	2.26	3.38	4.51	5.64	6.77	7.90	9.02	10.15	11.28	12.41	13.54	14.66	14.89
	120	1.35	2.71	4.06	5.41	6.77	8.12	9.48	10.83	12.18	13.54	14.89	16.24	17.60	17.87

− (VE) INDICATES MOVEMENT TOWARD MID POINT ANCHOR
+ (VE) INDICATES MOVEMENT AWAY FROM MID POINT ANCHOR
ALONG TRACK MOVEMENT IS IN INCHES

ALONG TRACK MOVEMENT − AUTO−TENSIONED O.C.S.



NOTES:

1. ALONG TRACK MOVEMENT IS TO BE CONSIDERED IN ADJUSTMENT OF CANTILEVER ASSEMBLIES, STEADY ARMS, AND CROSS CONTACT BRIDGE ASSEMBLIES.

M=ALONG TRACK MOVEMENT
X=STAGGER CHANGE
R=DISTANCE FROM FACE OF POLE TO CONDUCTOR

$M = \alpha L T$

WHERE α =COEFFICIENT OF EXPANSION OF CONDUCTOR
L =DISTANCE FROM MID POINT ANCHOR
T =TEMPERATURE RANGE

$X = R - \sqrt{R^2 - M^2}$

WHERE R=CANTILEVER REACH
M=ALONG TRACK MOVEMENT

ALONG TRACK MOVEMENT [IN]	CANTILEVER REACH (DIMENSION R FEET−INCHES)													
	6'−0"	6'−6"	7'−0"	7'−6"	8'−0"	8'−6"	9'−0"	9'−6"	10'−0"	10'−6"	11'−0"	11'−6"	12'−0"	12'−6"
2	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
4	0.11	0.10	0.10	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05
6	0.25	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.14	0.13	0.13	0.12
8	0.45	0.41	0.38	0.36	0.33	0.31	0.30	0.28	0.27	0.25	0.24	0.23	0.22	0.21
10	0.70	0.64	0.60	0.56	0.52	0.49	0.46	0.44	0.42	0.40	0.38	0.36	0.35	0.33
12	1.01	0.93	0.86	0.80	0.75	0.71	0.67	0.63	0.60	0.57	0.55	0.52	0.50	0.48
14	1.37	1.27	1.17	1.10	1.03	0.97	0.91	0.86	0.82	0.78	0.74	0.71	0.68	0.65
16	1.80	1.66	1.54	1.43	1.34	1.26	1.19	1.13	1.07	1.02	0.97	0.93	0.89	0.86
18	2.29	2.11	1.95	1.82	1.70	1.60	1.51	1.43	1.36	1.29	1.23	1.18	1.13	1.08
20	2.83	2.61	2.42	2.25	2.11	1.98	1.87	1.77	1.68	1.60	1.52	1.46	1.40	1.34
22	3.44	3.17	2.93	2.73	2.55	2.40	2.26	2.14	2.03	1.94	1.85	1.76	1.69	1.62
24	4.12	3.78	3.50	3.26	3.05	2.86	2.70	2.55	2.42	2.31	2.20	2.10	2.01	1.93

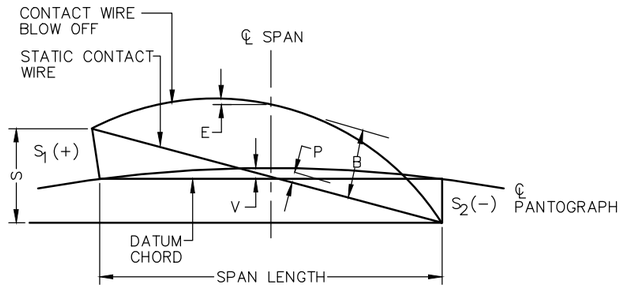
STAGGER CHANGE − AUTO−TENSIONED O.C.S.

STAGGER CHANGE VALUES IN INCHES

B−V [IN]	STAGGER DIFFERENCE(S) [IN]								
	2	4	6	8	10	12	14	16	18
2	0.13	0.50	1.13	2.00	3.13	4.50	6.13	8.00	10.13
4	0.06	0.25	0.56	1.00	1.56	2.25	3.06	4.00	5.06
6	0.04	0.17	0.38	0.67	1.04	1.50	2.04	2.67	3.38
8	0.03	0.13	0.28	0.50	0.78	1.13	1.53	2.00	2.53
10	0.03	0.10	0.23	0.40	0.63	0.90	1.23	1.60	2.03
12	0.02	0.08	0.19	0.33	0.52	0.75	1.02	1.33	1.69
14	0.02	0.07	0.16	0.29	0.45	0.64	0.88	1.14	1.45
16	0.02	0.06	0.14	0.25	0.39	0.56	0.77	1.00	1.27
18	0.01	0.06	0.13	0.22	0.35	0.50	0.68	0.89	1.13
20	0.01	0.05	0.11	0.20	0.31	0.45	0.61	0.80	1.01

STAGGER EFFECT − ALL O.C.S. STYLES

STAGGER EFFECT VALUES IN INCHES



S = STAGGER DIFFERENCE
S1 & S2 = STAGGER AT EACH SUPPORT
V = VERSINE OF CURVE BETWEEN SUPPORTS
P = CONTACT WIRE MIDSPAN OFFSET
B = CONTACT WIRE BLOW OFF
E = STAGGER EFFECT
STAGGER DIFFERENCE (S) = S1−S2

$$\text{STAGGER EFFECT (E)} = \frac{(S)^2}{16(B-V)}$$

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SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SCAT - RISE & FALL AND
ALONG TRACK MOVEMENT

DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-109

SHEET 112 OF 202

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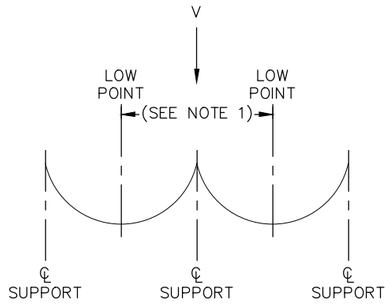
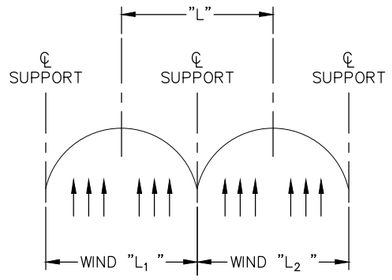
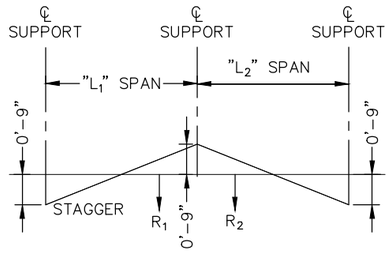


V = VERTICAL LOAD



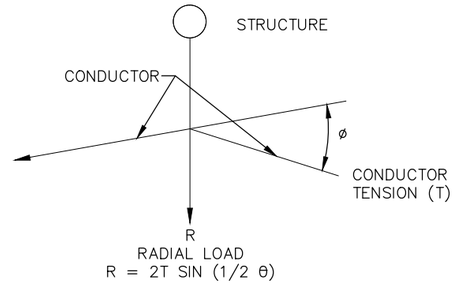
$$L = \frac{L_1 + L_2}{2}$$



RADIAL LOAD (R) AT SUPPORT
$R = R_1 + R_2$
RADIAL LOAD IS BASED ON 9" STAGGER AT SUPPORTS

NOTE:

1. L = SUM OF THE DISTANCE TO THE LOW POINT OF THE MESSENGER WIRE ON BOTH SIDES OF THE SUPPORT



RADIAL LOAD
$R = 2T \sin (1/2\ \theta)$

TO DETERMINE RADIAL LOAD, MEASURE ANGLE θ AND USE TABLE TO DETERMINE LOAD FOR CONDITION REQUIRED.

VERTICAL LOADING

SPAN (FEET)	CONDITION AND LOAD VALUE (V) (LB)		
	BARE	ICE (NO)	ICE (O)
40	106.16	166.60	149.56
50	132.70	208.25	186.95
60	159.24	249.90	224.34
70	185.78	291.55	261.73
80	212.32	333.20	299.12
90	238.86	374.85	336.51
100	265.40	416.50	373.90
110	291.94	458.15	411.29
120	318.48	499.80	448.68
130	345.02	541.45	486.07
140	371.56	583.10	523.46
150	398.10	624.75	560.85
160	424.64	666.40	598.24
170	451.18	708.05	635.63
180	477.72	749.70	673.02
190	504.26	791.35	710.41
200	530.80	833.00	747.80
210	557.34	841.64	785.19
220	583.88	916.30	822.58

WIND LOADING

SPAN (FEET)	CONDITION AND FORCE (WIND LOADING) (LB)							
	BARE WIRE 90 MPH WIND (N/O)		BARE WIRE 55 MPH WIND (O)		1/2" ICE MW & CW 40 MPH WIND (N/O)		1/2" ICE MW 1/4" ICE CW 40 MPH WIND (O)	
	CW	MW	CW	MW	CW	MW	CW	MW
40	42.8	56.0	16.0	20.8	22.0	24.8	15.2	24.8
50	553.5	70.0	20.0	26.0	27.5	31.0	19.0	31.0
60	64.2	84.0	24.0	31.2	33.0	37.2	22.8	37.2
70	74.9	98.0	28.0	36.4	38.5	43.4	26.6	43.4
80	85.6	112.0	32.0	41.6	44.0	49.6	30.4	49.6
90	96.3	126.0	36.0	46.8	49.5	55.8	34.2	55.8
100	107.0	140.0	40.0	52.0	55.0	62.0	38.0	62.0
110	117.7	154.0	44.0	57.2	60.5	68.2	41.8	68.2
120	128.4	168.0	48.0	62.4	66.0	74.4	45.6	74.4
130	139.1	182.0	52.0	67.6	71.5	80.6	49.4	80.6
140	149.8	196.0	56.0	72.8	77.0	86.8	53.2	86.8
150	160.5	210.0	60.0	78.0	82.5	93.0	57.0	93.0
160	171.2	224.0	64.0	83.2	88.0	99.2	60.8	99.2
170	181.9	238.0	68.0	88.4	93.5	105.4	64.6	105.4
180	192.6	252.0	72.0	93.6	99.0	111.6	68.4	111.6
190	203.3	266.0	76.0	98.8	104.5	117.8	72.2	117.8
200	214.0	280.0	80.0	104.0	110.0	124.0	76.0	124.0
210	224.7	294.0	84.0	109.2	115.5	130.2	79.8	130.2
220	235.4	308.0	88.0	114.4	121.0	136.4	83.6	136.4

RADIAL LOAD TANGENT TRACK

SPAN (FEET)	CONDITION AND RADIAL LOAD (LB) (R1 AND R2)					
	60°F NO WIND		OPERATING 40°F 40 MPH		NON-OPERATING -40°F, 40 MPH	
	NO ICE	NO ICE	1/4" ICE	1/2" ICE	1/2" ICE	1/2" ICE
	CW	MW	CW	MW	CW	MW
40	224.84	374.74	296.94	502.67	302.64	528.53
50	179.92	299.87	237.61	402.24	242.17	422.93
60	149.95	249.92	198.04	335.25	201.84	352.49
70	128.54	214.24	169.76	287.38	173.02	302.16
80	112.48	187.47	148.55	251.47	151.40	264.40
90	99.99	166.64	132.05	223.54	134.58	235.03
100	89.99	149.98	118.85	201.19	121.13	211.54
110	81.81	136.35	108.04	182.90	110.12	192.31
120	74.99	124.99	99.04	167.66	100.94	176.29
130	69.23	115.38	91.42	154.77	93.18	162.73
140	64.28	107.14	84.90	143.71	86.52	151.11
150	60.00	100.00	79.24	134.13	80.76	141.03
160	56.25	93.75	74.28	125.75	75.71	132.22
170	52.94	88.23	69.91	118.35	71.26	124.44
180	50.00	83.33	66.03	111.78	67.30	117.53
190	47.37	78.94	62.56	105.90	63.76	111.34
200	45.00	75.00	59.43	100.60	60.57	105.78
210	42.86	71.43	56.60	95.81	57.68	100.74
220	40.91	68.18	54.03	91.46	55.06	96.16

RADIAL LOAD BY ANGLE

ANGLE (DEGREES) θ	CONDITION AND RADIAL LOAD (LB)					
	60°F NO WIND		OPERATING 40°F 40 MPH		NON-OPERATING -40°F, 40 MPH	
	NO ICE	NO ICE	1/4" ICE	1/2" ICE	1/2" ICE	1/2" ICE
	CW	MW	CW	MW	CW	MW
0.5	26.18	43.63	34.57	58.53	35.24	61.54
1	52.36	87.27	69.14	117.06	70.48	123.08
1.5	78.54	130.90	103.72	175.58	105.71	184.62
2	104.71	174.52	138.29	234.11	140.95	246.15
2.5	130.89	218.15	172.86	292.62	176.18	307.68
3	157.06	261.77	207.43	351.14	211.41	369.20
4	209.40	348.99	276.54	468.14	281.85	492.22
5	261.72	436.19	345.64	585.11	352.27	615.21
6	314.02	523.36	414.71	702.03	422.67	738.15
7	366.29	610.49	483.75	818.91	493.03	861.03
8	418.54	697.56	552.75	935.71	563.35	983.85
9	470.75	784.59	621.71	1052.45	633.64	1106.59
10	522.93	871.56	690.62	1169.11	703.87	1229.24
11	575.07	958.46	759.48	1285.67	774.05	1351.81
12	627.17	1045.28	828.28	1402.14	844.17	1474.27
13	679.22	1132.03	897.02	1518.51	914.23	1596.62
14	731.22	1218.69	965.69	1634.76	984.22	1718.85
15	783.16	1305.26	1034.29	1750.88	1054.13	1840.94

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METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SCAT - VERTICAL WIND & RADIAL LOADS

DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-110

SHEET 113 OF 202

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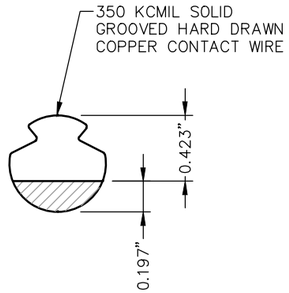
SINGLE WIRE FIXED TERMINATED (SWFT)		
CONDUCTOR PARTICULARS (UNWORN CONDITION)	UNITS	CONDUCTOR
		CONTACT
CONDUCTOR TYPE	–	350 MCM SOLID GROOVED
MATERIAL	–	HARD DRAWN COPPER
DIAMETER	IN	0.620
CROSS SECTIONAL AREA	SQ IN	0.2758
WEIGHT OF CONDUCTOR	LB/FT	1.063
WEIGHT OF SYSTEM	LB/FT	1.063
RADIAL THICKNESS OF ICE (O)	IN	0.25
WEIGHT OF ICE (O)	LB/FT	0.270
WEIGHT OF SYSTEM WITH ICE (O)	LB/FT	1.333
RADIAL THICKNESS OF ICE (NO)	IN.	0.50
WEIGHT OF ICE (NO)	LB/FT	0.696
WEIGHT OF SYSTEM WITH ICE (NO)	LB/FT	1.759
CONDUCTOR BREAKING LOAD	LB	11810
MAXIMUM CONSTRUCTED SPAN	FT	80
CONDUCTOR TENSIONS AT:	–	
60°F NO WIND	LB	1750
165°F NO WIND	LB	604
–40°F 40 MPH WIND & ICE (O)	LB	5538
–40°F 40 MPH WIND & ICE (NO)	LB	5592
CONDUCTOR SAG (80 FT SPAN) AT:		
60°F NO WIND	FT	0.486
–40°F NO WIND ICE (O)	FT	0.193
120°F NO WIND	FT	1.040
CONDUCTOR HEIGHT AT 60°F	FT	19'–0" @ SUPPORT (NORMAL)
MODULUS OF ELASTICITY	PSI	16×10^{6}
COEFFICIENT OF EXPANSION	–/° F	9.4×10^{-6}
MINIMUM FACTOR OF SAFETY	–	2.11

CONDUCTOR PARTICULARS (WORN CONDITION)	UNITS	CONDUCTOR
		CONTACT
PERMISSIBLE WEAR	% OF AREA	30.00
WEIGHT OF CONTACT WIRE	LB/FT	0.7441
WEIGHT OF CONTACT WIRE WITH ICE (O)	LB/FT	0.977
WEIGHT OF CONTACT WIRE WITH ICE (NO)	LB/FT	1.366
CONDUCTOR TENSION AT:		
–40°F 40 MPH WIND & ICE (NO)	LB	3938
CONDUCTOR BREAKING LOAD	LB	8260
MINIMUM FACTOR OF SAFETY	–	2.10



NOTE:

1. OPERATING (O) ICE CONDITION IS WITH 1/4" RADIAL ICE ON THE CONTACT
2. NON OPERATING (NO) ICE CONDITION IS WITH 1/2" RADIAL ICE ON CONTACT WIRE
3. SYSTEM WEIGHTS SHOWN ARE FOR DESIGN PURPOSES AND CONSIST OF CONDUCTOR WEIGHTS PER FOOT, WHICH WERE TAKEN FROM MANUFACTURERS INFORMATION TABLES
4. PERMISSIBLE WEAR IS 30% OF THE ORIGINAL CROSS SECTIONAL AREA

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METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SWFT - CONDUCTOR PARTICULARS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-112

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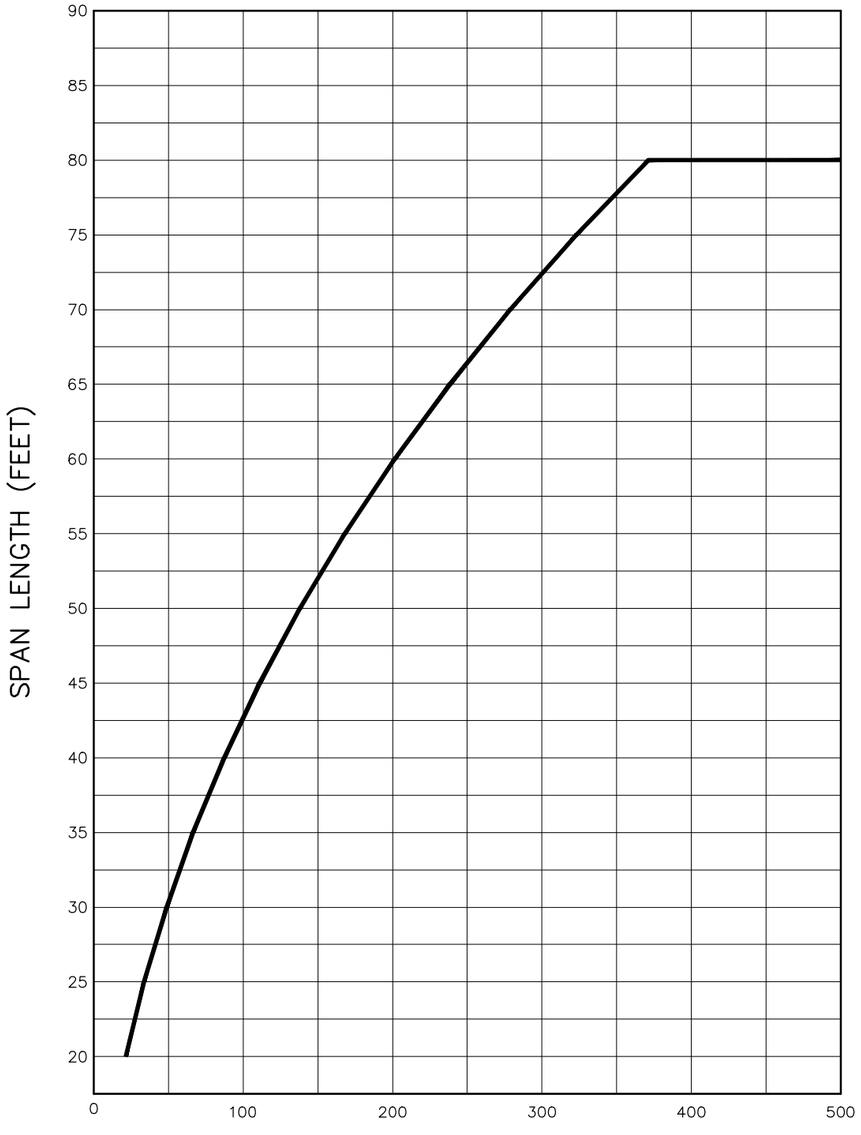

MAXIMUM STRUCTURE SPACING
SEE NOTE 4

MAXIMUM CONSTRUCTED SPAN – CURVED TRACK				
19'–0" CONTACT WIRE HEIGHT				
SPAN [FT]	MAX VERSINE [IN]	STATIC OFFSET [IN]	BLOW–OFF [FT]	MIN. CURVE RADIUS [FT]
20	27.903	14.403	0.011	22
25	27.826	14.326	0.018	34
30	27.731	14.231	0.026	49
35	27.620	14.120	0.035	67
40	27.491	13.991	0.046	87
45	27.346	13.846	0.058	111
50	27.183	13.683	0.071	138
55	27.003	13.503	0.086	168
60	26.806	13.306	0.103	201
65	26.591	13.091	0.121	238
70	26.360	12.860	0.140	279
75	26.111	12.611	0.161	323
80	25.846	12.346	0.183	371

TABLE1: MAXIMUM MID–SPAN STATIC OFFSET
SEE NOTE 6

NOTES:

1. MAXIMUM STRUCTURE SPACINGS FOR SPANS WHOLLY OVER CONSTANT RADIUS TRACK CURVE, ARE TO BE DETERMINED FROM THE GRAPHS AND RELATED NOTES. FOR ALL OTHER HORIZONTAL ALIGNMENT COMBINATIONS, SPACING MUST SATISFY MAXIMUM STATIC MIDSPAN OFFSET CRITERIA APPLIED TO STAGGERED CONTACT WIRE.
2. THE MAXIMUM STATIC MIDSPAN OFFSET IS THE VALUE THE CONTACT WIRE CAN BE FROM THE CENTER LINE OF A STATIC PANTOGRAPH UNDER STILL AIR CONDITIONS MEASURED AT MID–SPAN.
3. WHERE AS–BUILT STATIC MIDSPAN OFFSET EXCEEDS THE MAXIMUM VALUE LISTED IN TABLE 1, FURTHER CONSTRUCTION MAY ONLY CONTINUE AFTER SITE SPECIFIC APPROVAL.
4. THE SPACINGS SHOWN ARE THE ABSOLUTE MAXIMUM FOR EACH CONTACT WIRE HEIGHT AND TRACK TYPE CONDITION. FOR DESIGN PURPOSES THE MAXIMUM SPAN SHALL BE REDUCED BY 5 FEET TO CATER FOR SITE ADJUSTMENTS IF OBSTRUCTIONS ARE ENCOUNTERED.
5. MAXIMUM CONTACT WIRE STAGGER = 9",
6. INSTALLED CONTACT WIRE SPANS MAY BE ACCEPTED WITH 1 INCH OF ADDITIONAL MIDSPAN OFFSET CONSTRUCTION TOLERANCE ABOVE THE MAXIMUM VALUES LISTED.
7. THE CONDITIONS FOR THE STRUCTURE SPACING CHART AND THE TABLES ARE 60° F WITH A WIND SPEED OF 55 MPH.

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METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SWFT - STRUCTURE SPACING

DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-113

SHEET 115 OF 202

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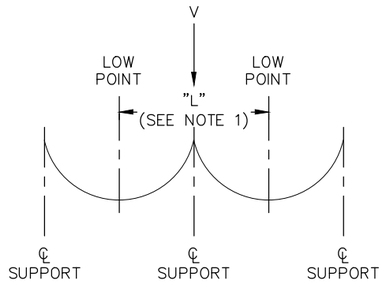
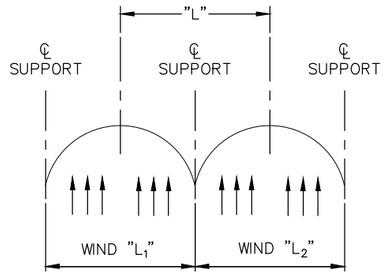
NOTES:

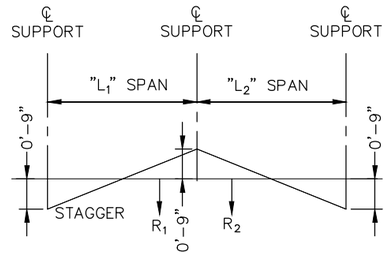
1. L = SUM OF THE DISTANCE TO THE LOW POINT OF THE CONTACT WIRE ON BOTH SIDES OF THE SUPPORT.



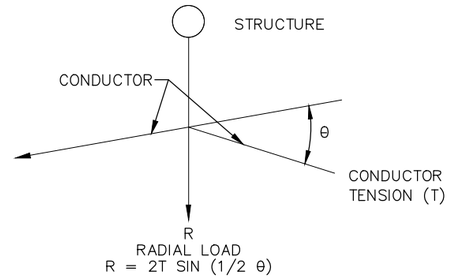
V = VERTICAL LOAD



$$L = \frac{L_1 + L_2}{2}$$



RADIAL LOAD (R) AT SUPPORT
$R = R_1 + R_2$
RADIAL LOAD IS BASED ON 9" STAGGER AT SUPPORTS



TO DETERMINE RADIAL LOAD, MEASURE ANGLE θ AND USE TABLE TO DETERMINE LOAD FOR CONDITION REQUIRED.

VERTICAL LOADING

SPAN (FEET)	CONDITION AND LOAD VALUE (V) (LB)		
	BARE	ICE (NO)	ICE (O)
20	21.26	35.18	26.66
25	26.58	43.98	33.33
30	31.89	52.77	39.99
35	37.21	61.57	46.66
40	42.52	70.36	53.32
45	47.84	79.16	59.99
50	53.15	87.95	66.65
55	58.47	96.75	73.32
60	63.78	105.54	79.98
65	69.10	114.34	86.65
70	74.41	123.13	93.31
75	79.73	131.93	99.98
80	85.04	140.72	106.64

WIND LOADING

SPAN (FEET)	CONDITION AND FORCE (WIND LOADING) (LB)			
	BARE WIRE 90 MPH WIND (N/O)	NO ICE 55 MPH WIND (O)	1/2" ICE 40 MPH WIND (N/O)	1/4" ICE 40 MPH WIND (O)
20	21.4	8.0	11.0	7.6
25	26.8	10.0	13.8	9.5
30	32.1	12.0	16.5	11.4
35	37.5	14.0	19.3	13.3
40	42.8	16.0	22.0	15.2
45	48.2	18.0	24.8	17.1
50	53.5	20.0	27.5	19.0
55	58.9	22.0	30.3	20.9
60	64.2	24.0	33.0	22.8
65	69.6	26.0	35.8	24.7
70	74.9	28.0	38.5	26.6
75	80.3	30.0	41.3	28.5
80	85.6	32.0	44.0	30.4

RADIAL LOAD TANGENT TRACK

SPAN (FEET)	CONDITION AND RADIAL LOAD (LB) (R1 AND R2)		
	60°F NO WIND	OPERATING 40°F 40 MPH WIND	NON-OPERATING -40°F, 40 MPH WIND
	NO ICE	1/4" ICE	1/2" ICE
20	261.76	828.37	836.45
25	209.62	663.37	669.84
30	174.78	553.11	558.50
35	149.86	474.25	478.87
40	131.16	415.06	419.11
45	116.60	369.00	372.59
50	104.95	332.13	335.37
55	95.42	301.96	304.90
60	87.47	276.81	279.51
65	80.75	255.53	258.02
70	74.98	237.29	239.60
75	69.99	221.48	223.64
80	65.61	207.64	209.66

RADIAL LOAD BY ANGLE

ANGLE (DEGREES) θ	CONDITION AND RADIAL LOAD (LB)		
	60°F NO WIND	OPERATING 40°F 40 MPH	NON-OPERATING -40°F, 40 MPH
	NO ICE	1/4" ICE	1/2" ICE
0.5	15.27	48.33	48.80
1	30.54	96.66	97.60
1.5	45.81	144.98	146.39
2	61.08	193.30	195.19
2.5	76.35	241.62	243.98
3	91.62	289.94	292.76
4	122.15	386.55	390.32
5	152.67	483.13	487.84
6	183.18	579.67	585.33
7	213.67	676.17	682.77
8	244.15	772.62	780.16
9	274.61	869.01	877.49
10	305.05	965.34	974.75
11	335.46	1061.59	1071.94
12	365.85	1157.76	1169.05
13	396.21	1253.84	1266.06
14	426.54	1349.82	1362.99
15	456.84	1445.71	1459.80

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

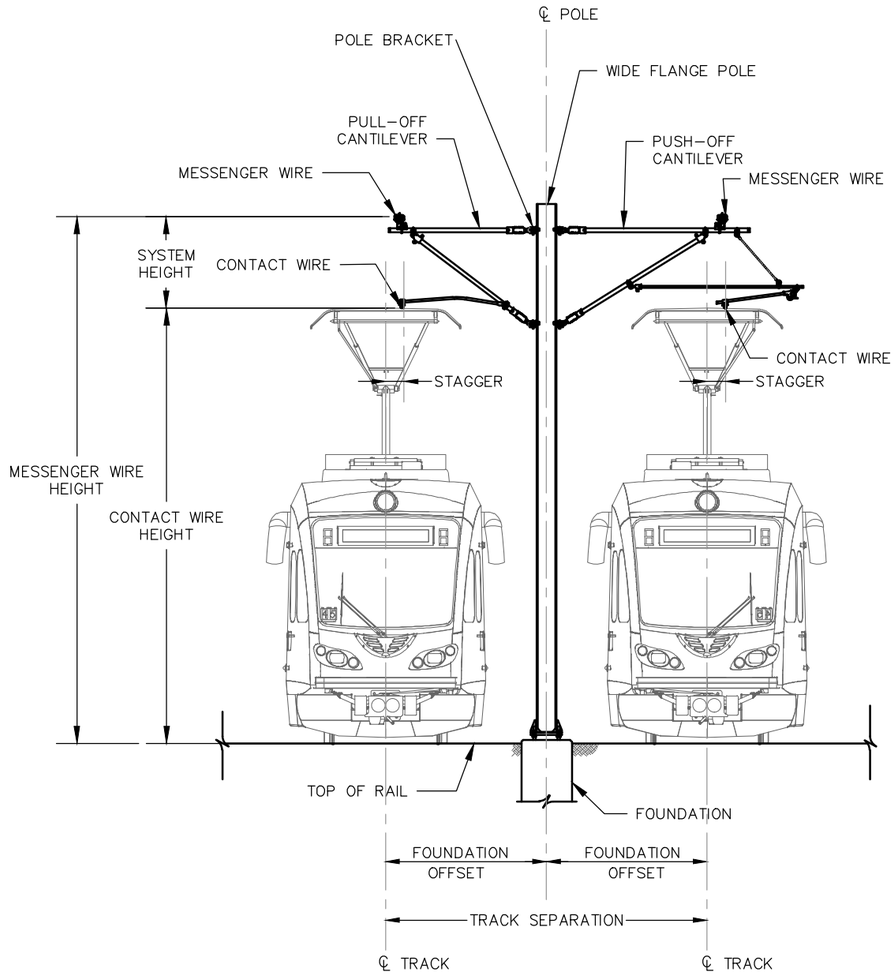
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM - DETAILS
SWFT - VERTICAL WIND & RADIAL LOADS

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-DTL-114

SHEET 116 OF 202

Jun, 26 2014 10:22 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

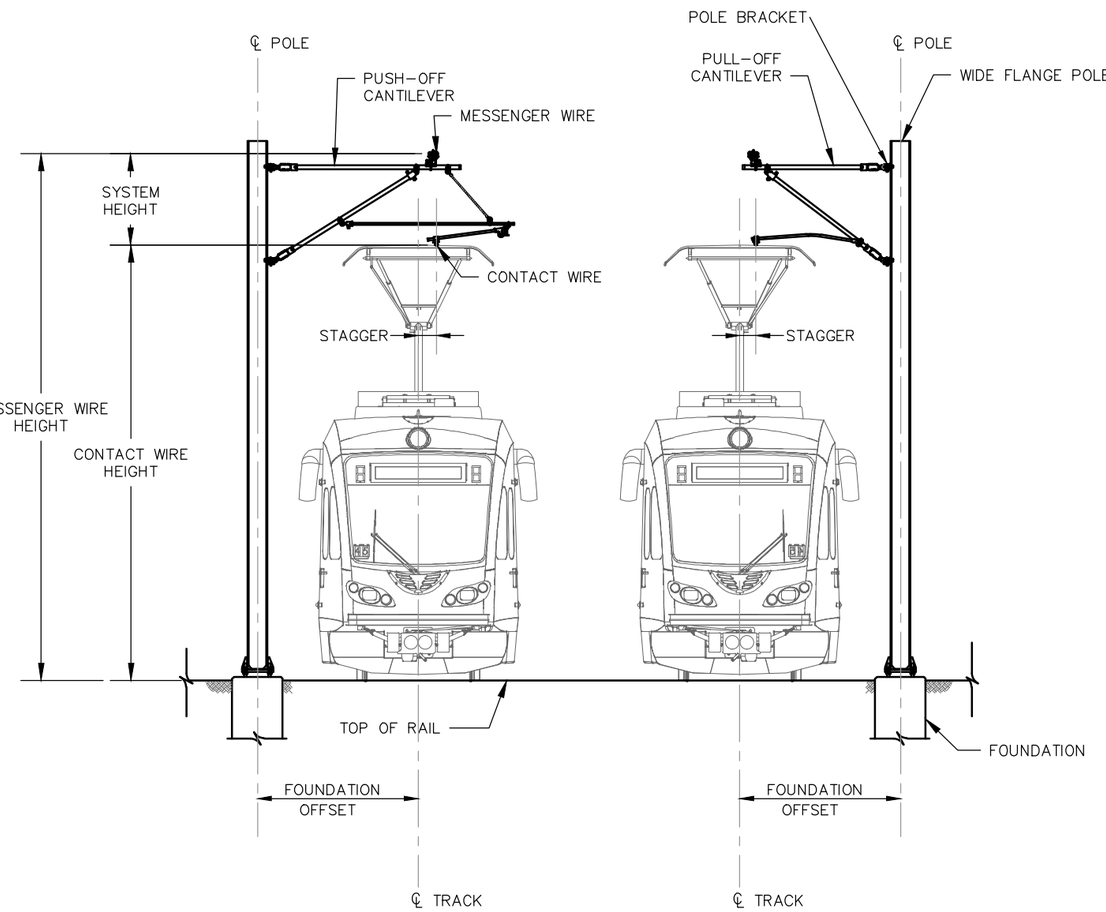
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT STRUCTURE-CENTER POLE

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-TAA-003

SHEET 117 OF 202

Jun, 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

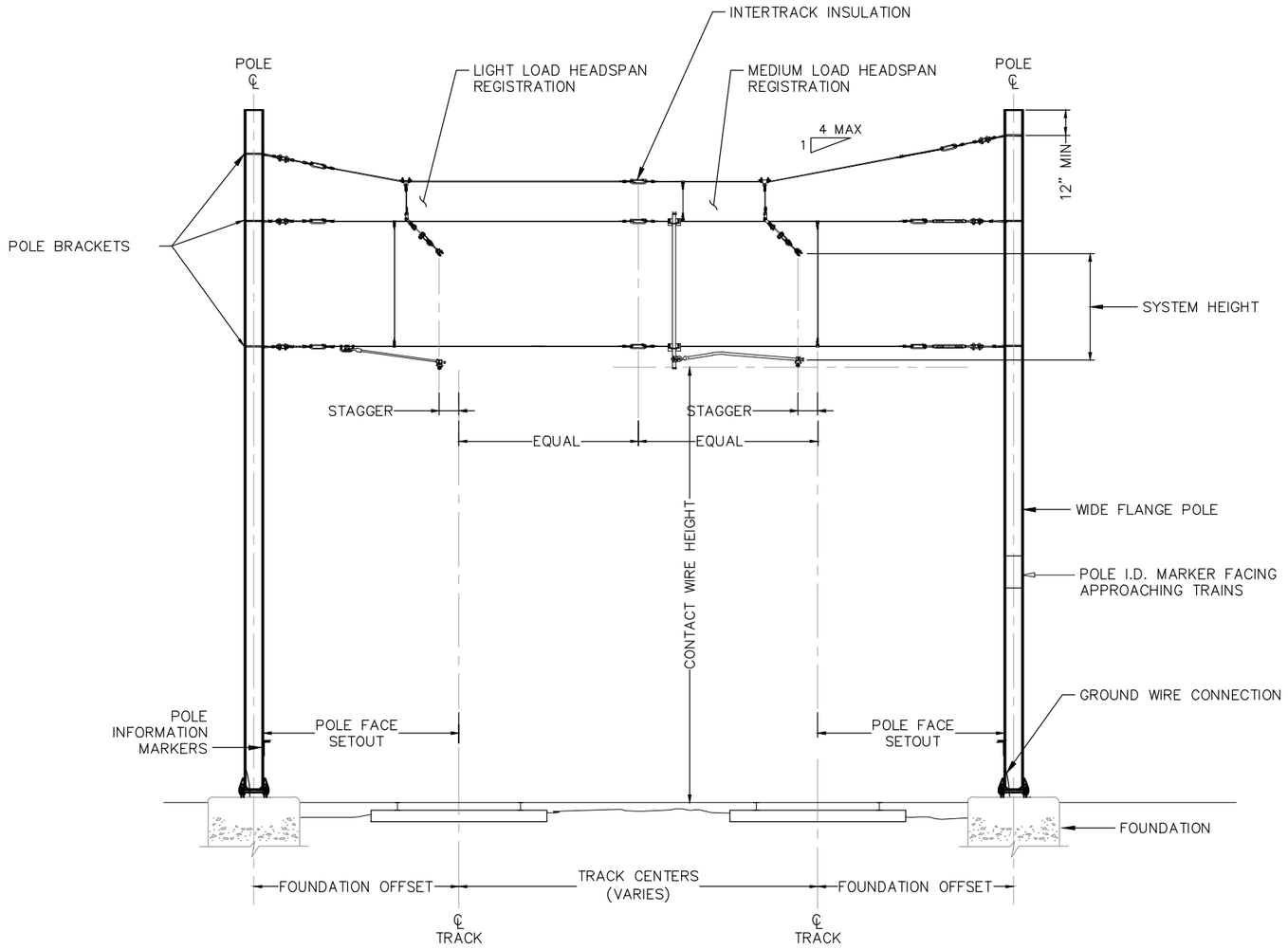
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT STRUCTURE-SIDE POLE

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-TAA-004

SHEET 118 OF 202

Jun, 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



Jun. 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE

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AECOM LTK
LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

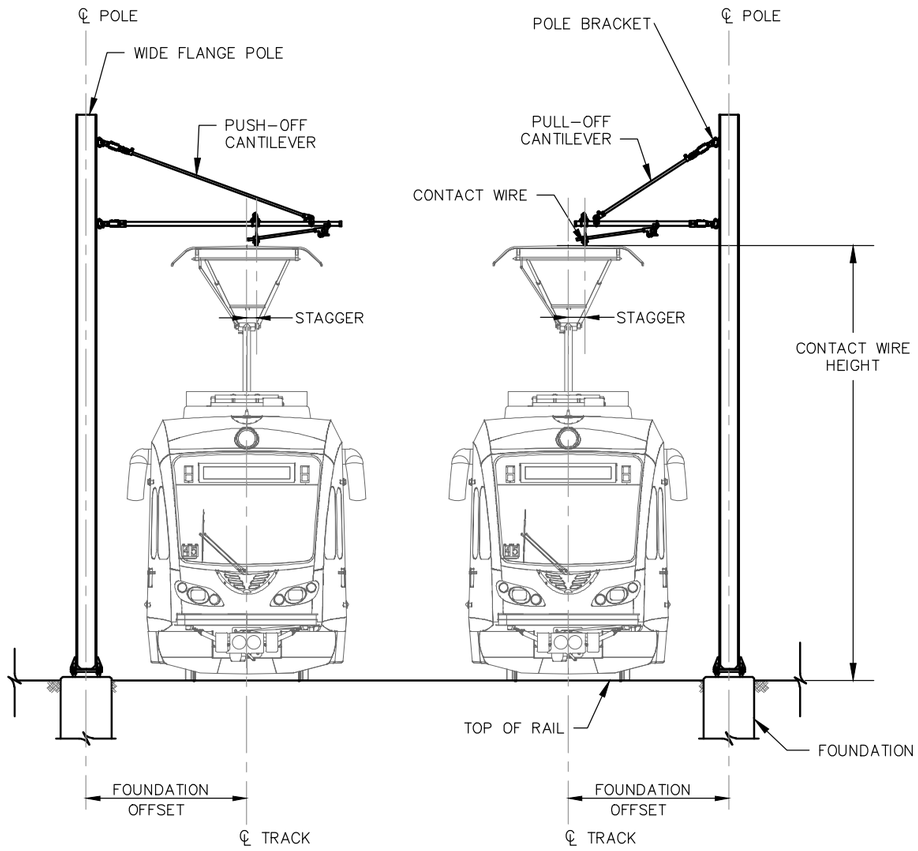
SOUTHWEST
Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT HEADSPAN

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-TAA-005

SHEET 119 OF 202



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AECOM LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

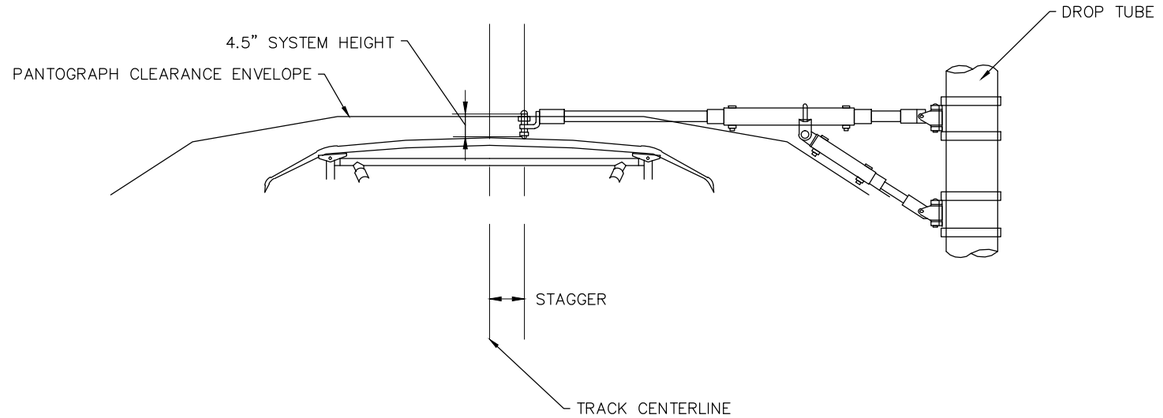
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SWFT PULL-OFF & PUSH-OFF STRUCTURE

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-TAA-006

SHEET 120 OF 202

Jun, 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



TUNNEL SUPPORT ASSEMBLY

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

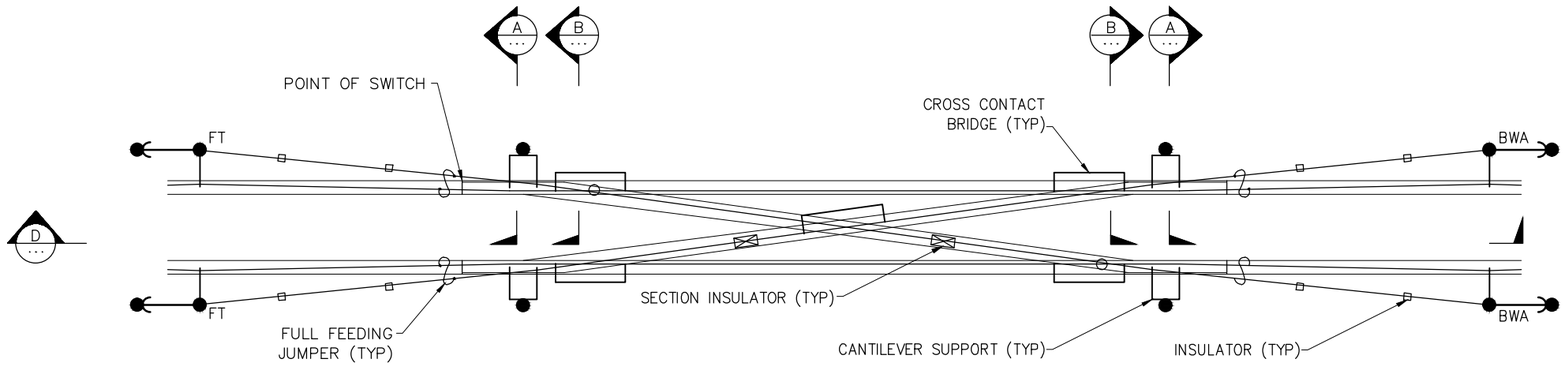
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT BRIDGE & TUNNEL ATTACHMENT

DISCIPLINE: SYSTEMS

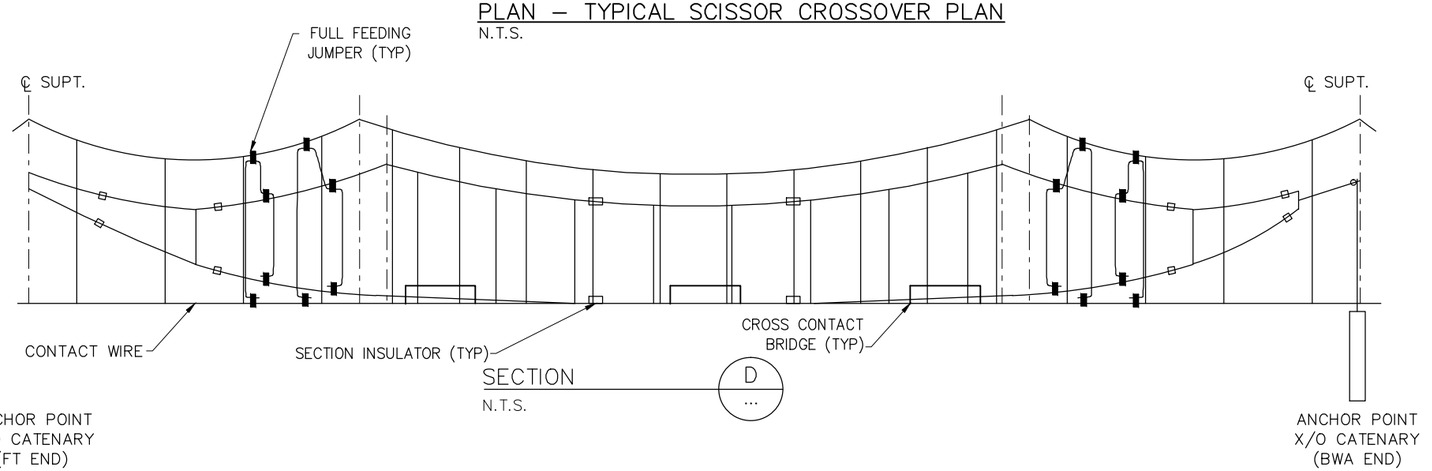
SHEET NAME: OCS-TAA-007

SHEET 121 OF 202

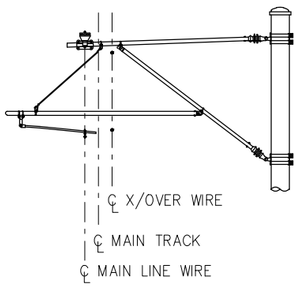
Jun. 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



PLAN – TYPICAL SCISSOR CROSSOVER PLAN
N.T.S.

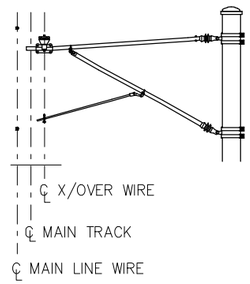


SECTION D
N.T.S.



SECTION A
N.T.S.

MAINLINE CANTILEVER



SECTION B
N.T.S.

CROSSOVER CANTILEVER

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

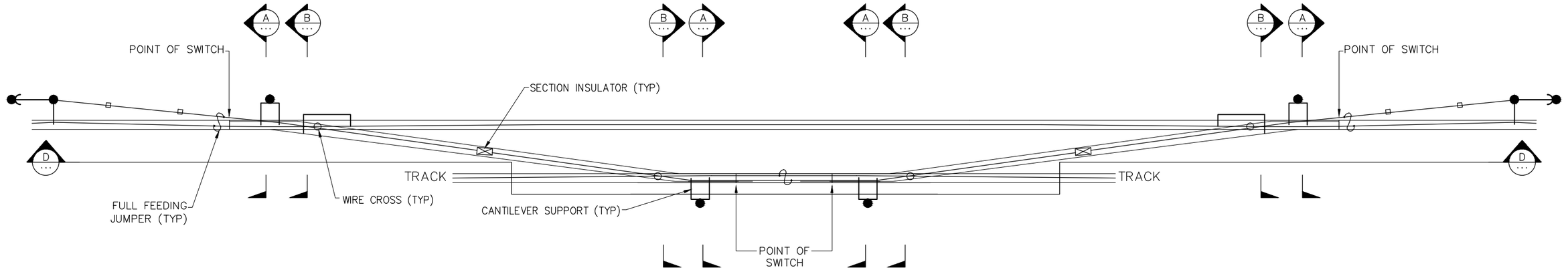
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT SCISSORS CROSSOVER

DISCIPLINE: SYSTEMS

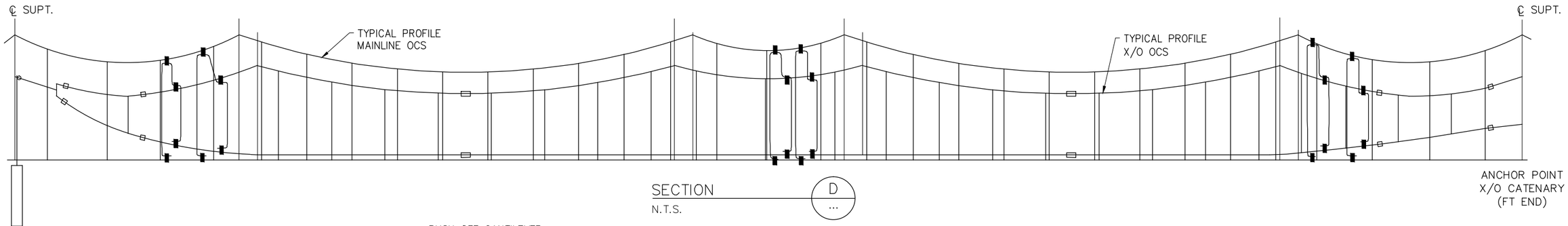
SHEET NAME: OCS-TAA-009

SHEET 122 OF 202

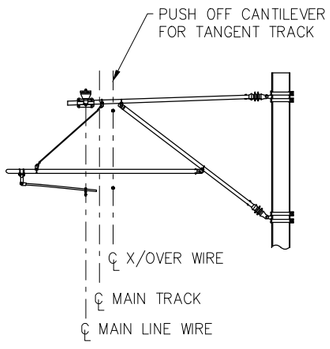
Jun, 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



PLAN – TYPICAL CROSSOVER PLAN
N.T.S.

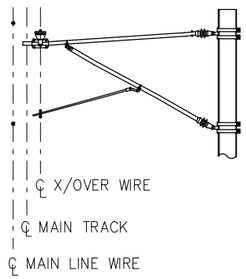


SECTION D
N.T.S.



SECTION A
N.T.S.

MAINLINE CANTILEVER



SECTION B
N.T.S.

CROSSOVER CANTILEVER

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

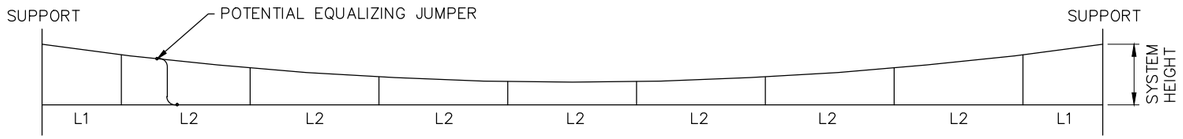
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT UNIVERSAL CROSSOVER

DISCIPLINE: SYSTEMS

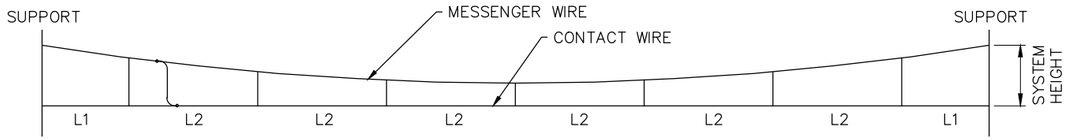
SHEET NAME: OCS-TAA-010

SHEET 123 OF 202

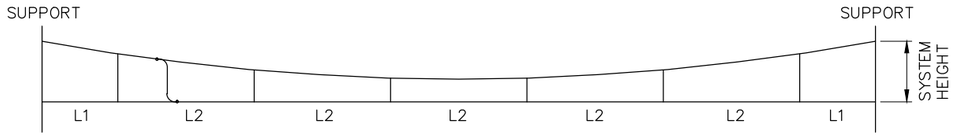
Jun. 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



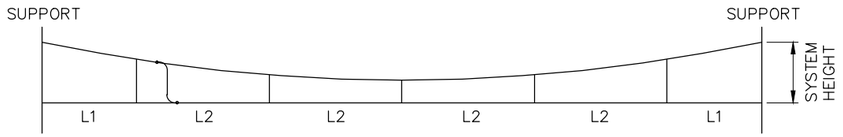
SPANS 211'–220'



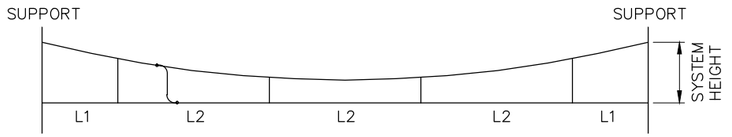
SPANS 181'–210'



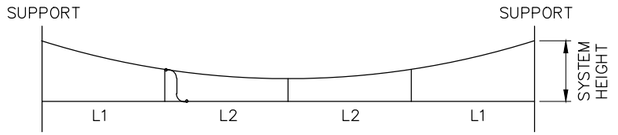
SPANS 151'–180'



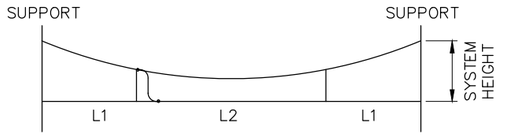
SPANS 121'–150'



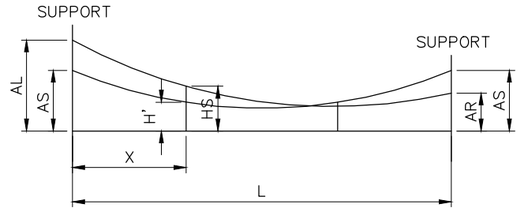
SPANS 91'–120'



SPANS 61'–90'



SPANS 30'–60'



H' = ADJUSTED HANGER LENGTH (IN)
HS = NORMAL HANGER LENGTH (IN)
AS = STANDARD SYSTEM HEIGHT (IN)
AL, AR = ADJUSTED SYSTEM HEIGHT (IN)
X = DISTANCE TO HANGER (FT)
L = SPAN LENGTH (FT)

ADJUSTMENTS FOR NON–STANDARD SYSTEM HEIGHTS

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

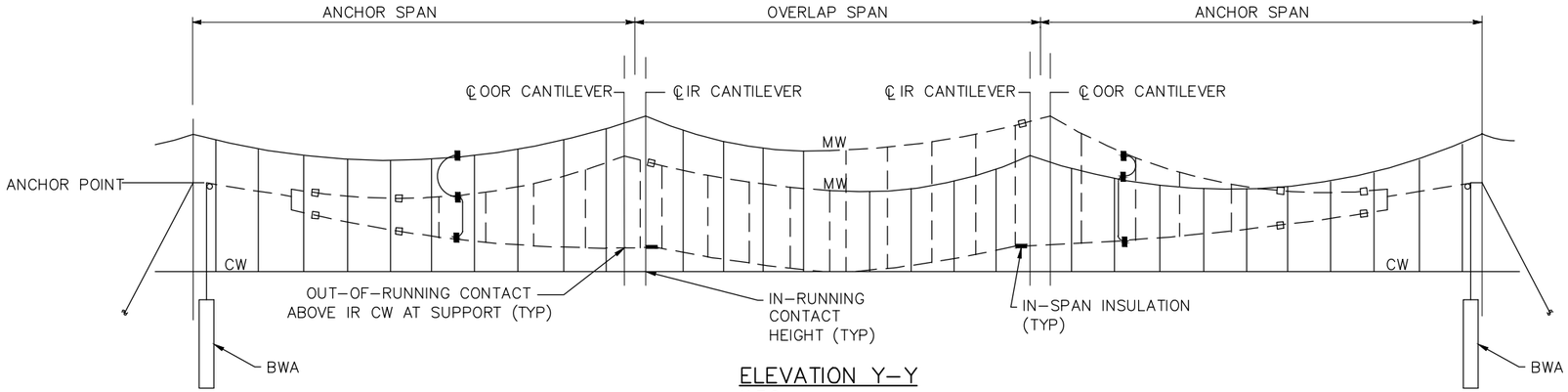
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SIMPLE CATENARY SPAN

DISCIPLINE: SYSTEMS

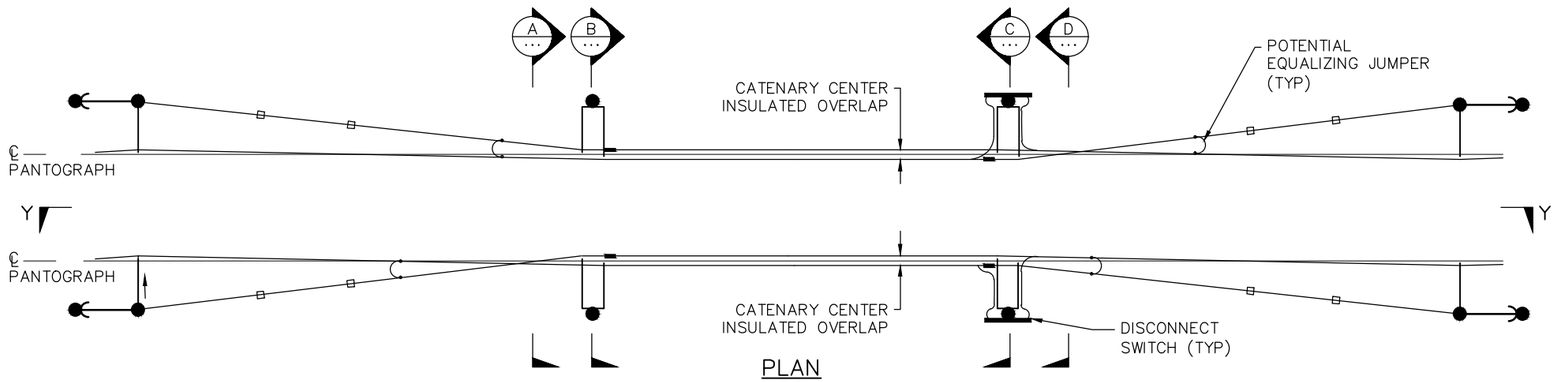
SHEET NAME: OCS-TAA-011

SHEET 124 OF 202

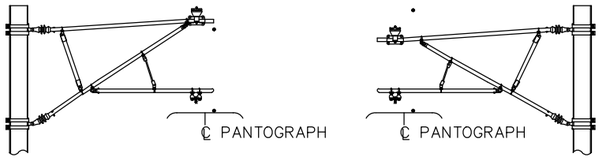
Jun, 26 2014 10:23 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



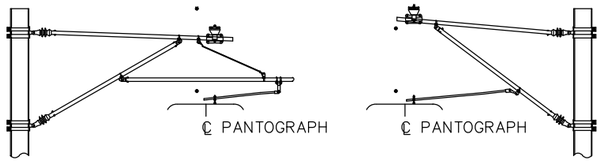
ELEVATION Y–Y
N.T.S.



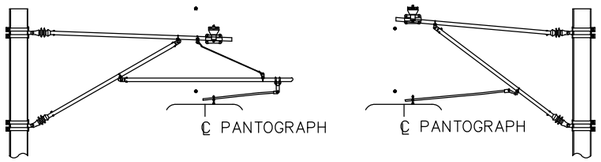
PLAN
N.T.S.



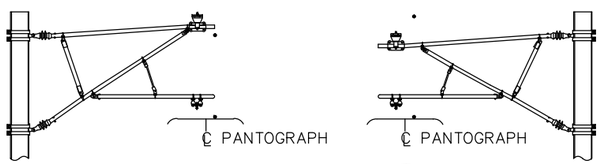
SECTION A
N.T.S.



SECTION C
N.T.S.



SECTION B
N.T.S.



SECTION D
N.T.S.

NOTES

1. STAGGERS ON CURVES MAY VARY DEPENDING ON CURVE RADIUS.
2. A.T. OVERLAPS SHOWN, F.T. ARRANGEMENTS ARE SIMILAR.
3. TRACKS NOT SHOWN FOR CLARITY.
4. DISCONNECT SWITCH SHOWN IS REPRESENTATIVE. REFER TO DETAIL DRAWINGS FOR SWITCH CONFIGURATION.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

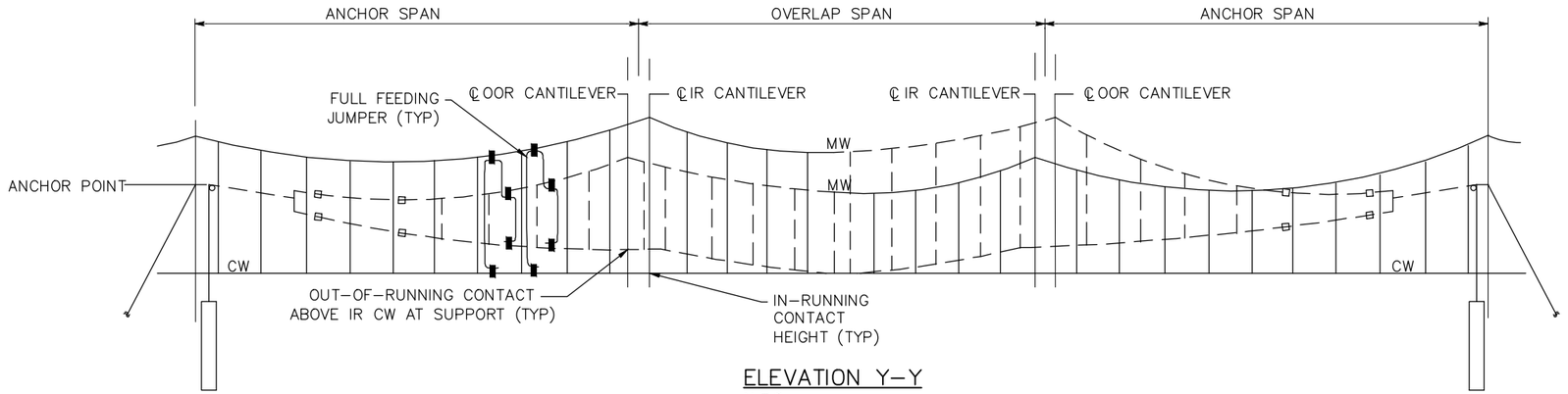
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT INSULATED OVERLAP

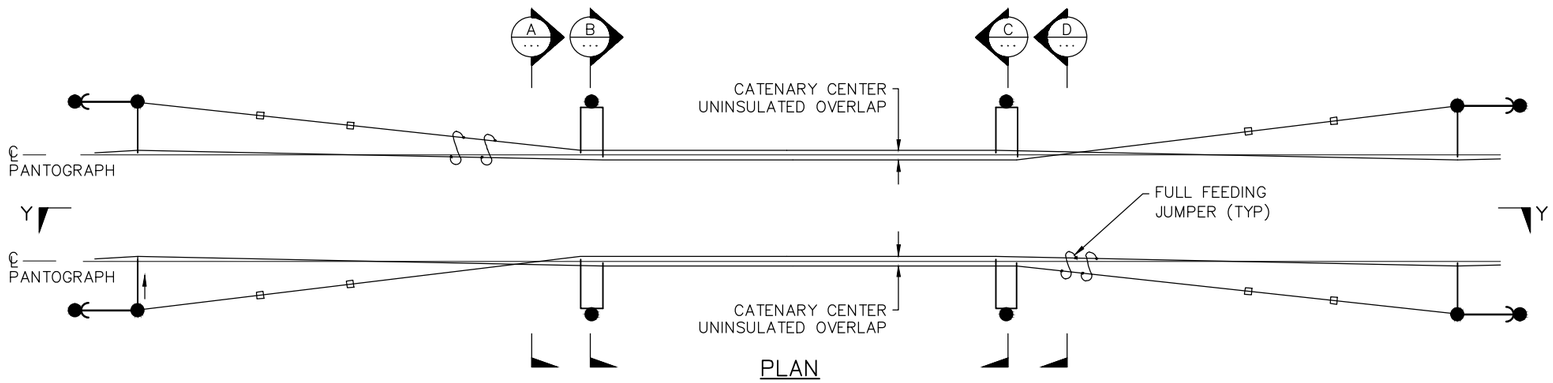
DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-001

SHEET 125 OF 202

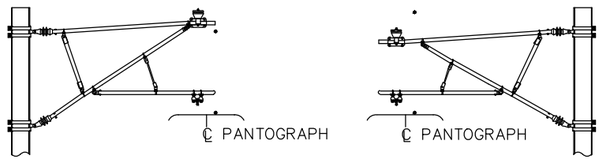
Jun, 26 2014 10:24 am v:\3200_PEC-W\CAD\OVERALL SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



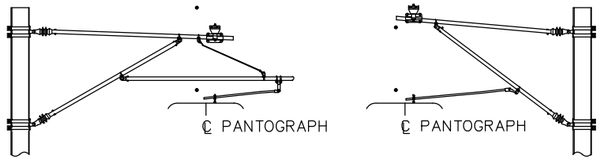
ELEVATION Y–Y
N.T.S.



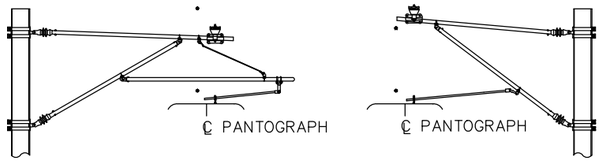
PLAN
N.T.S.



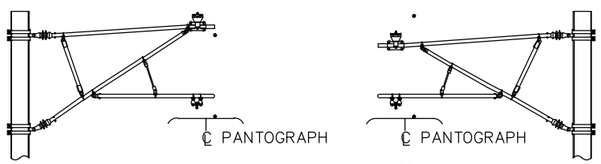
SECTION A
N.T.S.



SECTION C
N.T.S.



SECTION B
N.T.S.



SECTION D
N.T.S.

NOTES

1. STAGGERS ON CURVES MAY VARY DEPENDING ON CURVE RADIUS.
2. A.T. OVERLAPS SHOWN, F.T. ARRANGEMENTS ARE SIMILAR.
3. TRACKS NOT SHOWN FOR CLARITY.

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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

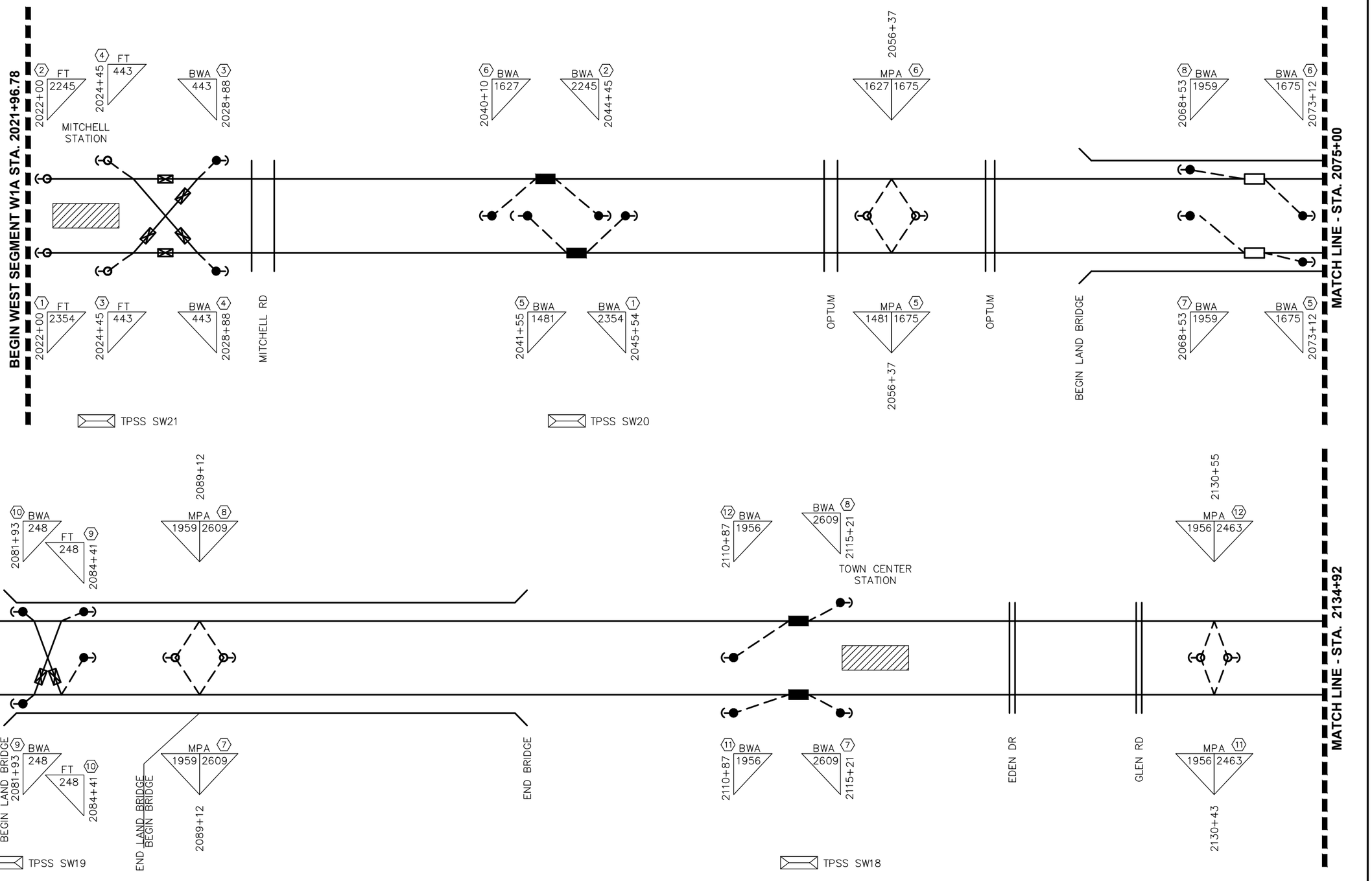
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
TYPICAL ARRANGEMENTS AND ASSEMBLIES
SCAT UNINSULATED OVERLAP

DISCIPLINE: SYSTEMS
SHEET NAME: OCS-DTL-002

SHEET 126 OF 202

Jun, 26 2014 10:24 am V:\3200_PEC-W\CAD\OVERALL SHEETS\SYSTEMS\DETAILS-OCS\WO-SYS-OCS-DTL2.dwg By: HeinEE



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

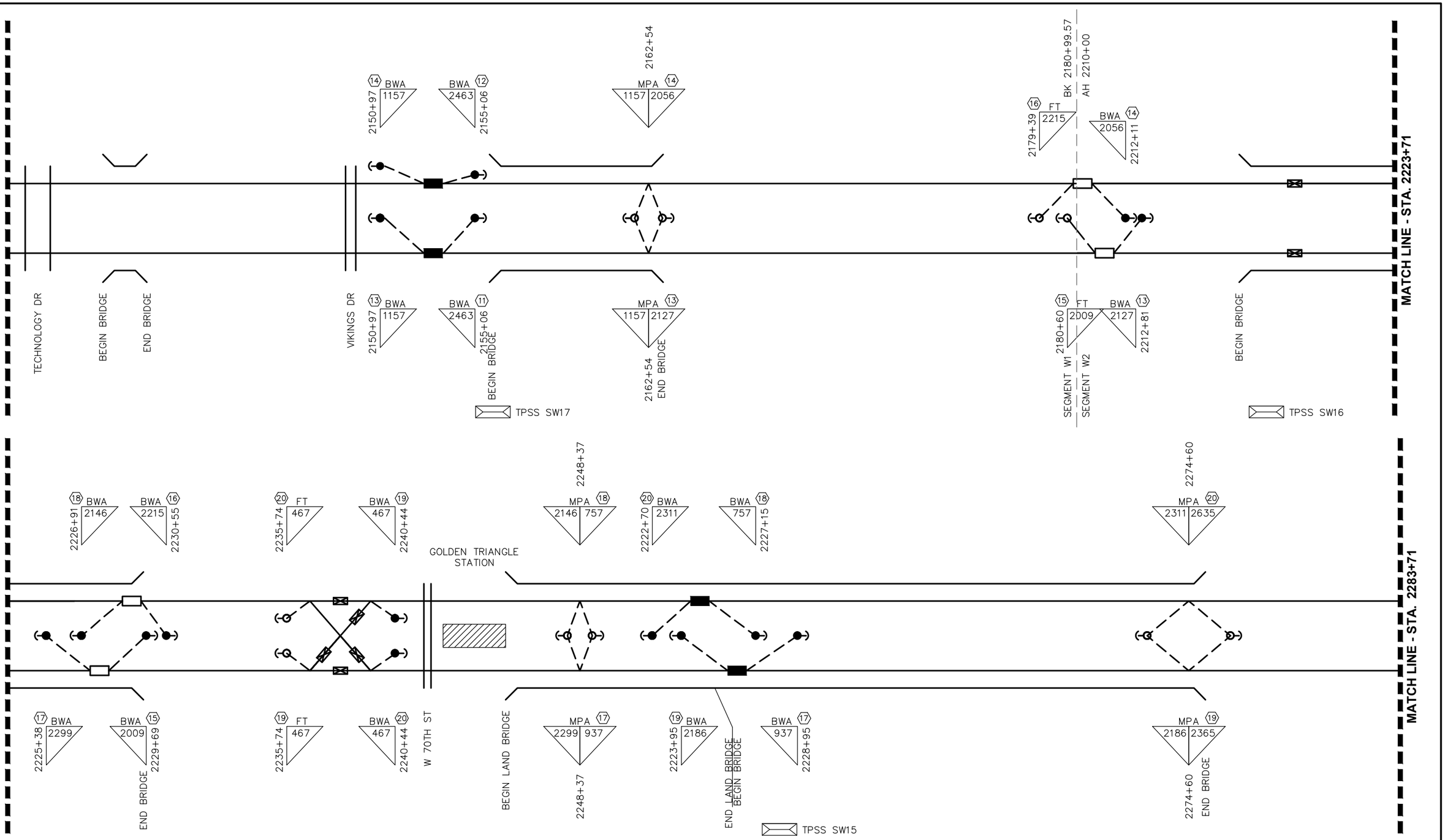
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
MASTER OVERLAP CHART
STA. 2021+96.78 TO STA. 2134+92

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-MOC-301

SHEET 127 OF 202

Aug, 28 2014 08:50 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Master Overlap Chart\OCS-MOC-301.dwg By: ehein



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

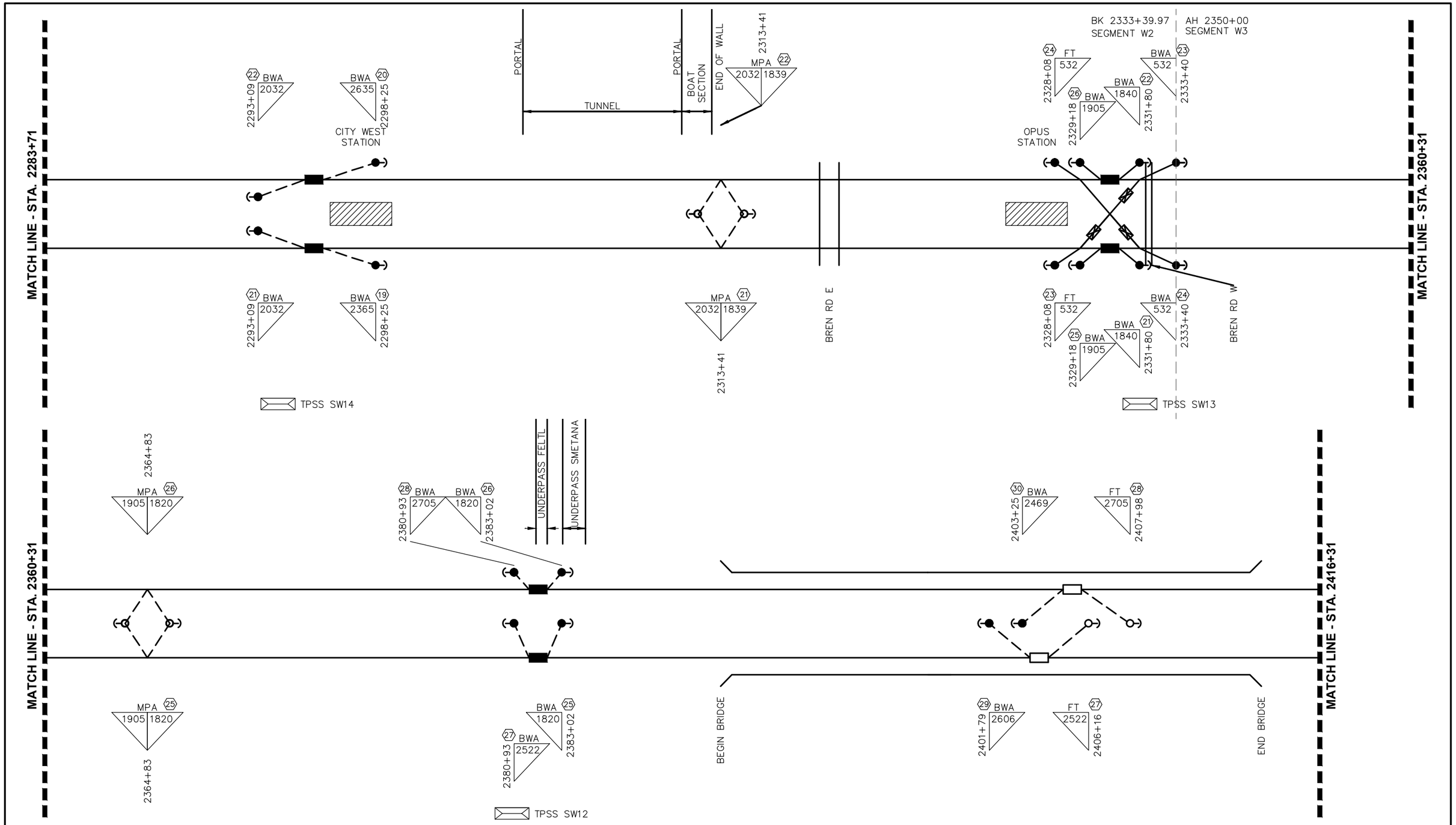
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
MASTER OVERLAP CHART
STA. 2134+92 TO STA. 2283+71

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-MOC-302

SHEET 128 OF 202

Aug, 28 2014 08:50 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Master Overlap Chart\OCS-MOC-302.dwg By: ehein



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

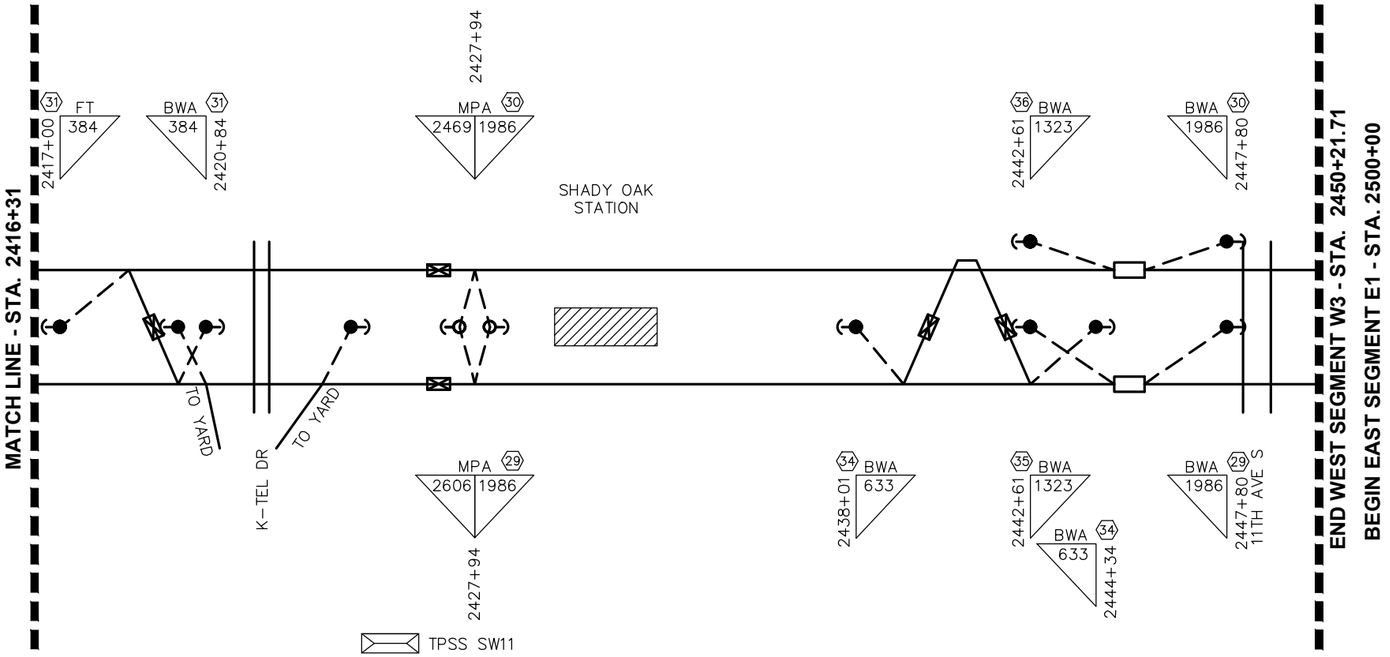
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
MASTER OVERLAP CHART
STA. 2283+71 TO STA. 2416+31

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-MOC-303

SHEET 129 OF 202

Aug, 28 2014 08:50 am V: \3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Master Overlap Chart\OCS-MOC-303.dwg By: ehein



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

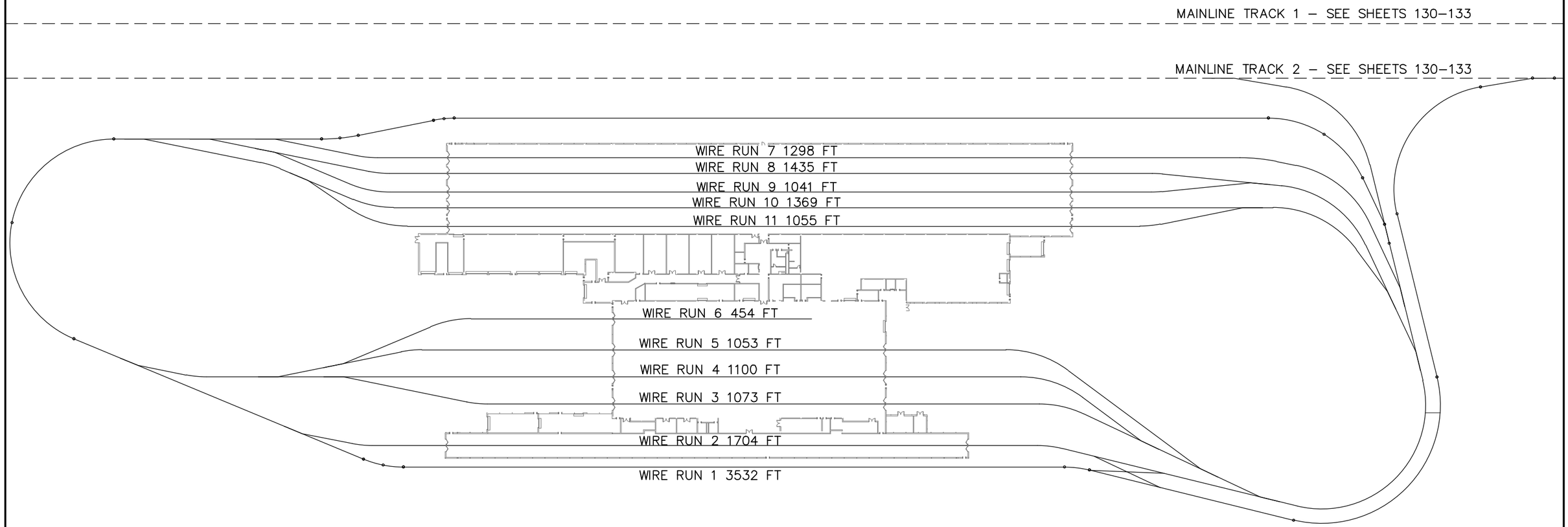
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
MASTER OVERLAP CHART
STA. 2416+31 TO STA. 2450+21.71

DISCIPLINE: SYSTEMS

SHEET NAME: OCS-MOC-304

SHEET 130 OF 202



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AECOM LTK LTK Engineering Services

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

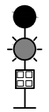
WEST-VOLUME 3 (SYSTEMS)
OVERHEAD CONTACT SYSTEM
MASTER OVERLAP CHART
OMF

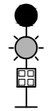
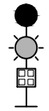
DISCIPLINE: **SYSTEMS**

SHEET NAME: **OCS-MOC-305**

SHEET **131** OF **202**

Jun. 26 2014 10:28 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\Master Overlap Chart\OCS-MOC-305.dwg By: HeinEE

NAME	ASPECT	ASPECT	INDICATION
STOP	RED		STOP
APPROACH	YELLOW		PROCEED PREPARED TO STOP AT NEXT SIGNAL / ENTERING DARK TERRITORY
APPROACH DIVERGING	FLASHING YELLOW		PROCEED TO NEXT SIGNAL, PREPARED TO ENTER DIVERGING ROUTE AT PRESCRIBED SPEED
CLEAR	GREEN		PROCEED. (NEXT SIGNAL IS PERMISSIVE)
DIVERGING CLEAR	RED OVER FLASHING GREEN		PROCEED ON DIVERGING ROUTE AT PRESCRIBED SPEED THROUGH TURNOUT. (THE NEXT SIGNAL IS PERMISSIVE.) (SEE NOTE 1)

NAME	ASPECT	ASPECT	INDICATION
DIVERGING APPROACH	RED OVER FLASHING YELLOW		PROCEED ON DIVERGING ROUTE AT PRESCRIBED SPEED THROUGH TURNOUT. BE PREPARED TO STOP AT NEXT SIGNAL / ENTER DARK TERRITORY. (SEE NOTE 1)
DIVERGING RESTRICTING	RED OVER FLASHING LUNAR		PROCEED ON DIVERGING ROUTE AT RESTRICTED SPEED THROUGH TURNOUT, ENTER EITHER AN OCCUPIED BLOCK OR YARD LIMITS (SEE NOTE 1)
RESTRICTING	LUNAR		PROCEED AT RESTRICTED SPEED INTO AN OCCUPIED BLOCK, OR WITHIN YARD LIMITS
VERTICAL BAR	LUNAR VERTICAL BAR		PROCEED THROUGH ROADWAY INTERSECTION
FLASHING VERTICAL BAR	LUNAR FLASHING VERTICAL BAR		PREPARE TO STOP AT INTERSECTION LIMIT
HORIZONTAL BAR	LUNAR HORIZONTAL BAR		STOP AT INTERSECTION LIMIT
FLASHING HORIZONTAL BAR	LUNAR FLASHING HORIZONTAL BAR		STOP. THE OPERATOR WILL SOUND TWO SHORT BLASTS OF HORN PRIOR TO MOVING, REGARDLESS OF ANY HORN PROHIBITION. WHEN IT IS TRAINS TURN, PROCEED SLOWLY INTO THE INTERSECTION UNTIL THE TRAIN FULLY OCCUPIES THE CROSSING, RING BELL CONTINUOUSLY THROUGH THE ENTIRE CROSSING. INDICATES A FOUR-WAY STOP. THE FIRST TRAIN TO ENCOUNTER SHOULD NOTIFY THE RCC.

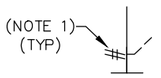
GREEN (SHOWN ON A HEAD) (NOTE 2 & 4)

YELLOW (SHOWN ON A HEAD) (NOTE 2 & 4)

RED (SHOWN ON A HEAD) (NOTE 2 & 4)

LUNAR (SHOWN ON A HEAD) (NOTE 2 & 4)

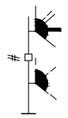
FLASHING GREEN (SHOWN ON B HEAD) (NOTE 3)



FLASHING YELLOW (SHOWN ON B HEAD) (NOTE 3)

FLASHING YELLOW (SHOWN ON A HEAD) (NOTE 3)

FLASHING LUNAR WHITE (SHOWN ON B HEAD) (NOTE 3)



CONTROLLED SIGNAL

NOTES:

1. WHERE PROVIDED, SIGNALS WITH MULTIPLE ASPECTS AND MULTIPLE DIVERGING DESTINATIONS WILL HAVE AN LED NUMBER INDICATOR ATTACHED TO PROVIDE ADDITIONAL DESTINATION INFORMATION.
2. HEAVY LINE INDICATES DISPLAY WITH SYSTEM AT REST.
3. FLASHING SIGNAL DISPLAY SHOWN BY DASHED LINE.
4. STEADY SIGNAL DISPLAY SHOWN BY SOLID LINE.

LEGEND:

- TRAIN TO WAYSIDE LOOP (TWC)
- XING BELL (DC)
- IMPEDANCE BOND (SINGLE)
- 1T — TRACK CIRCUIT LEADS
- TRACK CIRCUIT JUMPER
- NEGATIVE RETURN JUMPER
- POWER OPERATED SWITCH MACHINE (DUAL CONTROLLED)
- SNOW MELTER CASE (HS)
- SIGNAL BUNGALOW/PLATFORM HOUSE 10' X 30'
- CROSSING HOUSE (6' X 8' TYP)
- STATION — STATION PLATFORM
- INSULATED JOINT
- SIGNAL RAIL (DOUBLE LINE TRACK PLAN)
- NEGATIVE RETURN RAIL (DOUBLE LINE TRACK PLAN)
- GRADE CROSSING GATE AND FLASHERS
- 1E — TRACK 1 EASTBOUND INTERLOCKING SIGNAL (COLOR LIGHT)
- 1W — TRACK 1 WESTBOUND INTERLOCKING SIGNAL (COLOR LIGHT)
- 2541E — TRACK 1 EASTBOUND AUTOMATIC SIGNAL (COLOR LIGHT) STATIONING 2540+XX (TRK 1 – ODD NUMBER)
- 2540W — TRACK 2 WESTBOUND AUTOMATIC SIGNAL (COLOR LIGHT) STATIONING 2540+XX (TRK 2 – EVEN NUMBER)
- HIGHWAY GRADE CROSSING
- OVERLAY TRACK CIRCUIT
- PF — PEDESTRIAN FLASHERS WITH SECOND TRAIN WARNING

ABBREVIATIONS:

MPH	MILES PER HOUR
E1–201	EAST SEGMENT 1, TRACK 2 CURVE #1 (PER CIVIL PLAN)
VC	VERTICAL CURVE
↗	UPGRADE GOING EAST
↘	DOWNGRADE GOING EAST
0.6%	GRADE PERCENTAGE
AVG	AVERAGE
TBD	TO BE DETERMINED
XING	CROSSING

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
GENERAL
SYMBOLS, LEGEND AND GENERAL NOTES

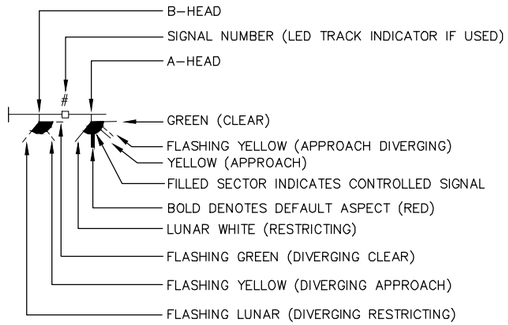
DISCIPLINE: SYSTEMS

SHEET NAME: SIG-GEN-001

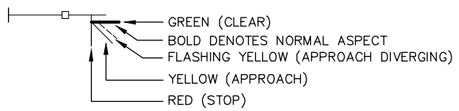
SHEET 132 OF 202

Jun, 26 2014 09:55 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-GEN.dwg By: HeinEE

INTERLOCKING SIGNAL (COLOR LIGHT)



AUTOMATIC SIGNAL (COLOR LIGHT)



SYMBOLS:

	TRAIN TO WAYSIDE LOOP (TWC)
	TRAIN
STATION	STATION PLATFORM
	INSULATED JOINT
	HIGHWAY GRADE CROSSING

SIGNAL ASPECTS:

G	GREEN (CLEAR)
FY	FLASHING YELLOW (APPROACH DIVERGING)
Y	YELLOW (APPROACH)
R	RED (STOP)
L	LUNAR (RESTRICTING)
R/FG	RED OVER FLASHING GREEN (DIVERGING CLEAR)
R/FY	RED OVER FLASHING YELLOW (DIVERGING APPROACH)
R/FL	RED OVER FLASHING LUNAR (DIVERGING RESTRICTING)

TRACK CODE ASSIGNMENT OF ELECTRONIC TRACK CIRCUITS	
TRACK CODE	ASSIGNMENT
C1	TRACK CIRCUIT – DETECTION CODE
C2	APPROACH ASPECT CONTROL CODE
C3	NOT USED
C4	APPROACH DIVERGING CONTROL CODE
C5	NON VITAL MULTIPURPOSE CODE
C6	TRAFFIC TUMBLE DOWN CODE INITIATED WHEN ROUTE ESTABLISHED AT INTERLOCKING
C7	CLEAR ASPECT CONTROL CODE
C8	NOT USED

ABBREVIATIONS:

2500+00	STATIONING
XXXX E	EASTWARD SIGNAL NUMBER
XXXX W	WESTWARD SIGNAL NUMBER
XXXX T	TRACK CIRCUIT NAME
EQ–►	EQUATED DISTANCE EAST
◄–EQ	EQUATED DISTANCE WEST
VC	VERTICAL CURVE
↗	UPGRADE GOING EAST
↘	DOWNGRADE GOING EAST
.5%	PERCENTAGE OF GRADE
TBD	TO BE DETERMINED
MPHS	MILES PER HOUR PER SECOND
MPH	MILES PER HOUR
XING	CROSING

EQUATED DISTANCE FORMULA:

(1) EQUATED DISTANCE (ASCENDING) = ACTUAL DISTANCE x $\frac{(4+G)}{4}$

(2) EQUATED DISTANCE (DESCENDING) = ACTUAL DISTANCE x $\frac{(4-G)}{4}$

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
GENERAL
SYMBOLS & LEGEND ROUTE & ASPECT

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-GEN-002

SHEET 133 OF 202

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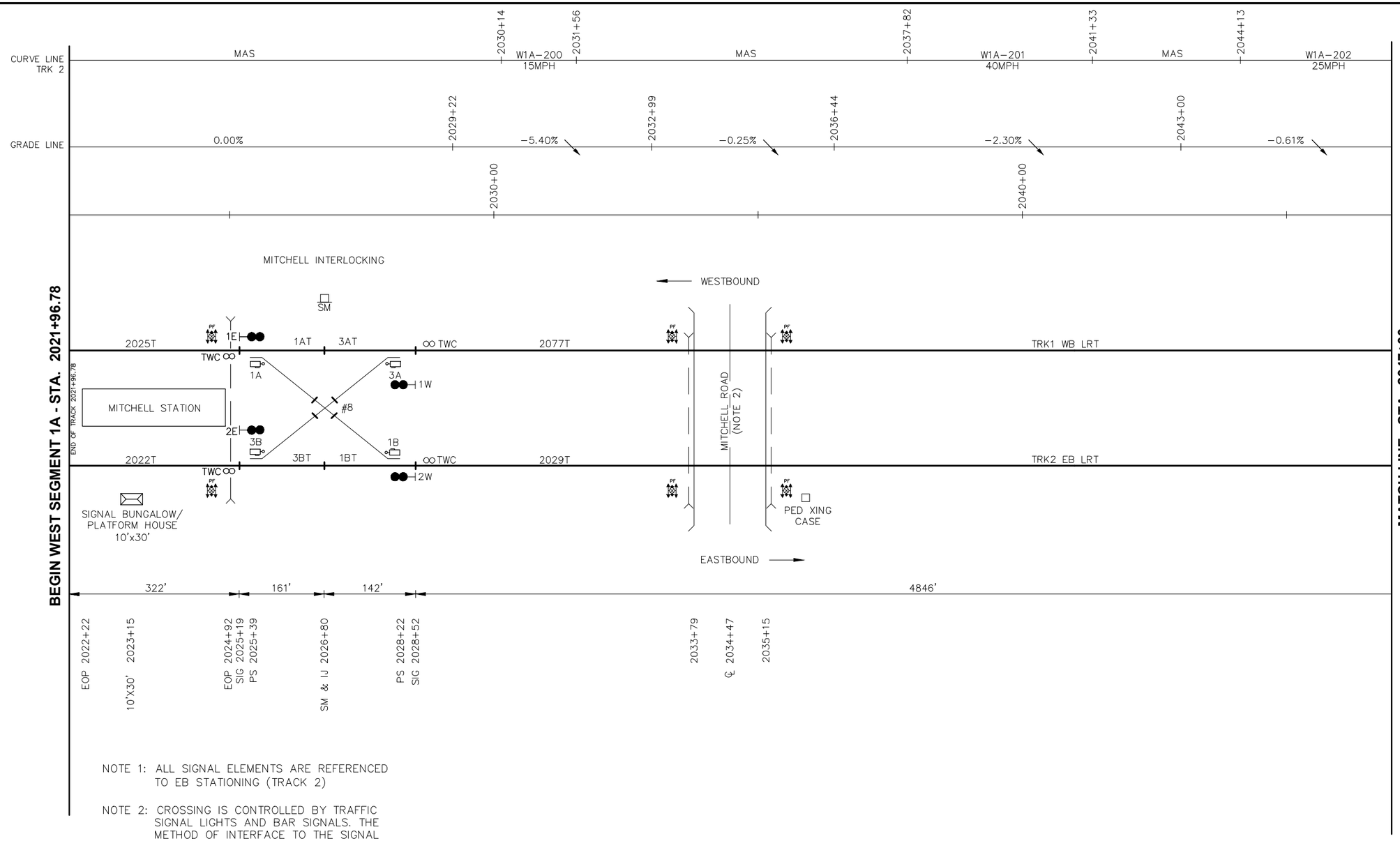

NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING IS CONTROLLED BY TRAFFIC SIGNAL LIGHTS AND BAR SIGNALS. THE METHOD OF INTERFACE TO THE SIGNAL SYSTEM IS TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: AN EASTBOUND ROUTE REQUEST FOR SIGNAL 1E OR 2E WILL ACTIVATE PEDESTRIAN FLASHERS FOR TRAINS DEPARTING THE STATION.

0 100 200 300 FT.
1" = 100'–0"

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

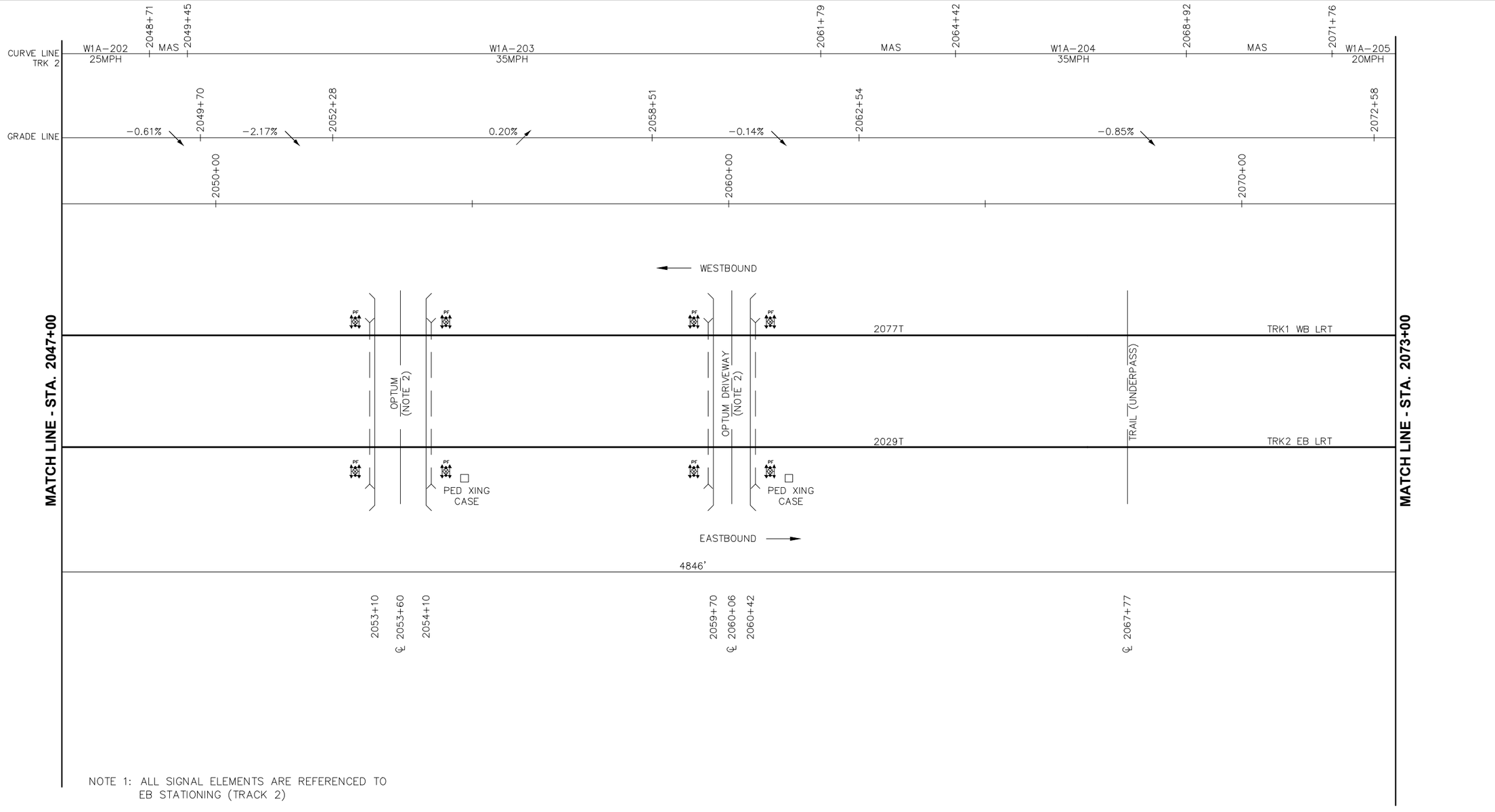
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2021+96.78 TO STA. 2047+00

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-CLD-001

SHEET 134 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING IS CONTROLLED BY TRAFFIC SIGNAL LIGHTS AND BAR SIGNALS. THE METHOD OF INTERFACE TO THE SIGNAL SYSTEM IS TO BE DETERMINED IN ADVANCED DESIGN.

0 100 200 300 FT.

1" = 100'–0"

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

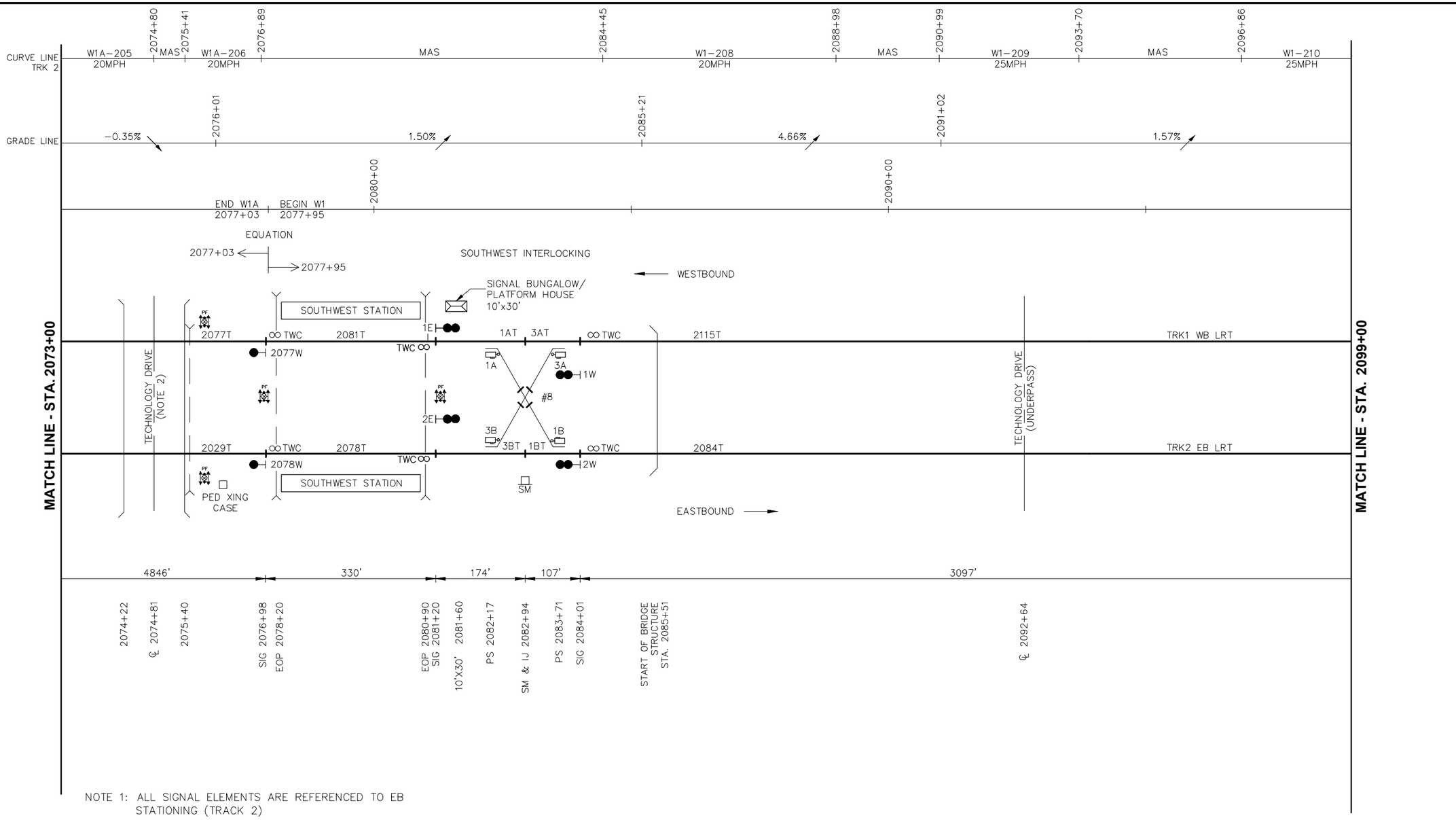
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2047+00 TO STA. 2073+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-002

SHEET 135 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING IS CONTROLLED BY TRAFFIC SIGNAL LIGHTS AND BAR SIGNALS. THE METHOD OF INTERFACE TO THE SIGNAL SYSTEM IS TO BE DETERMINED IN ADVANCED DESIGN.

0 100 200 300 FT.
1" = 100'–0"

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

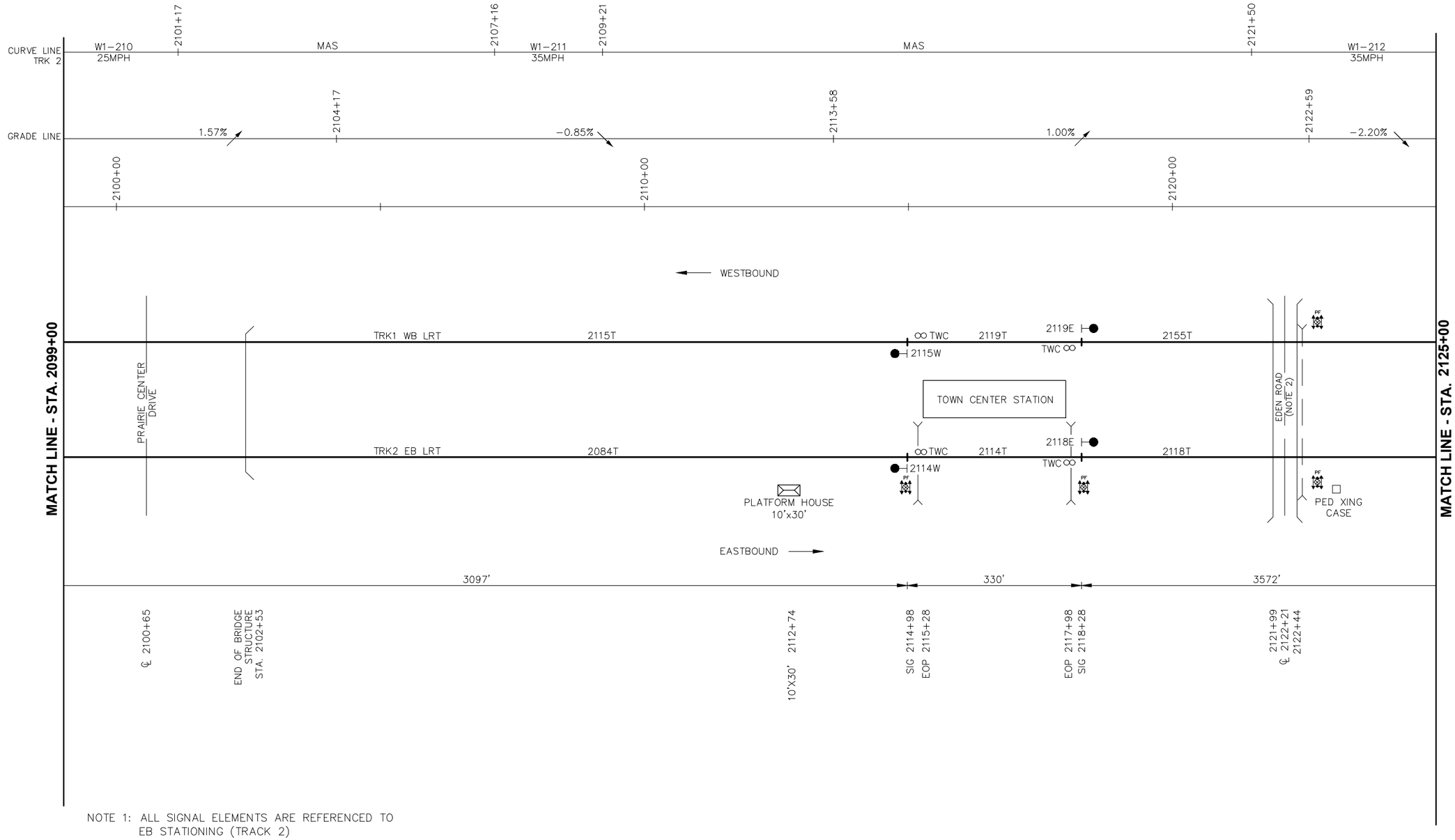
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2073+00 TO STA. 2099+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-003

SHEET 136 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING IS CONTROLLED BY TRAFFIC SIGNAL LIGHTS AND BAR SIGNALS. THE METHOD OF INTERFACE TO THE SIGNAL SYSTEM IS TO BE DETERMINED IN ADVANCED DESIGN.

0 100 200 300 FT.
1" = 100'–0"

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

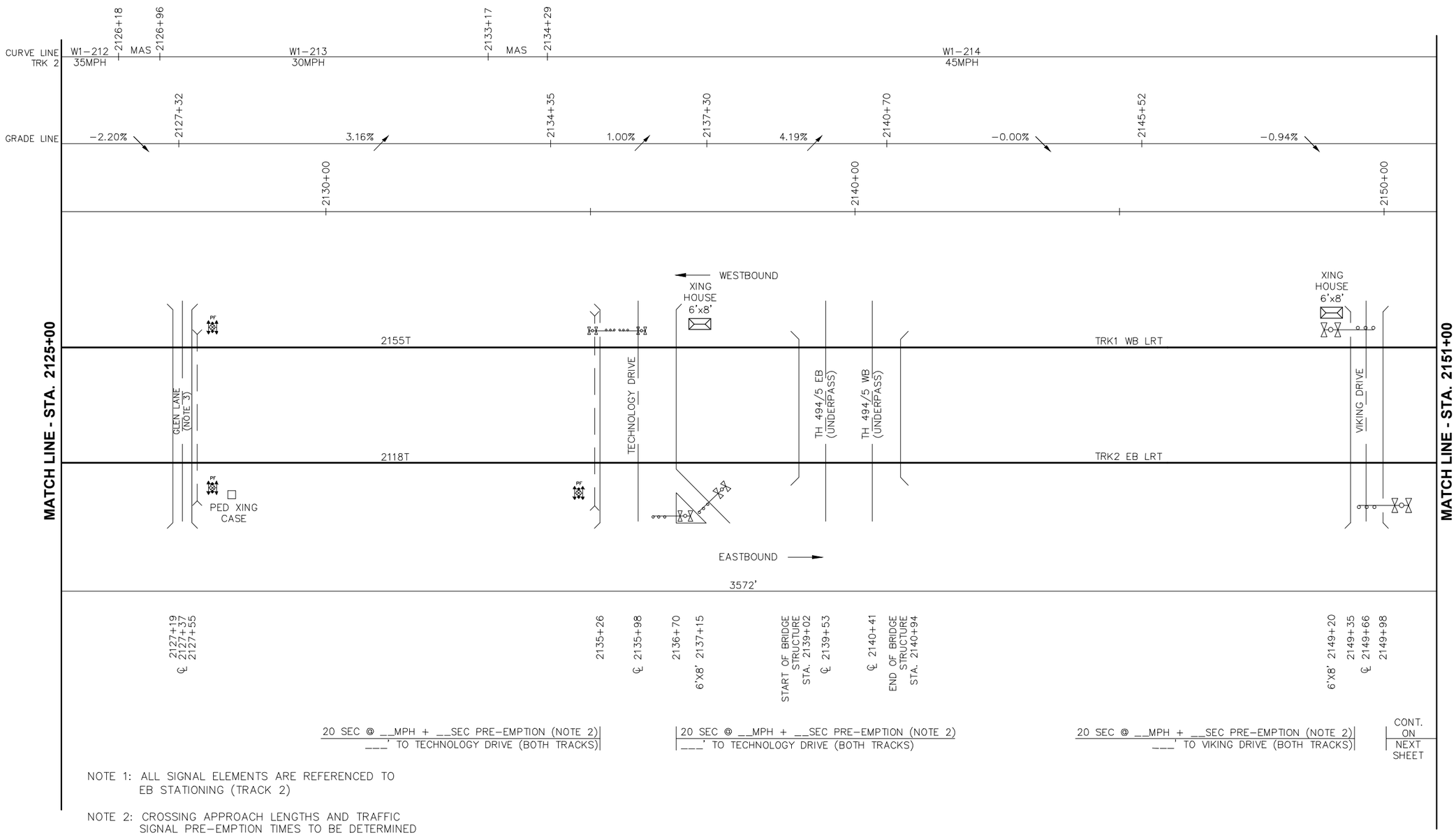
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2099+00 TO STA. 2125+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-004

SHEET 137 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS AND TRAFFIC SIGNAL PRE–EMPTION TIMES TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: CROSSING IS CONTROLLED BY TRAFFIC SIGNAL LIGHTS AND BAR SIGNALS. THE METHOD OF INTERFACE TO THE SIGNAL SYSTEM IS TO BE DETERMINED IN ADVANCED DESIGN.

0 100 200 300 FT.

1" = 100'–0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

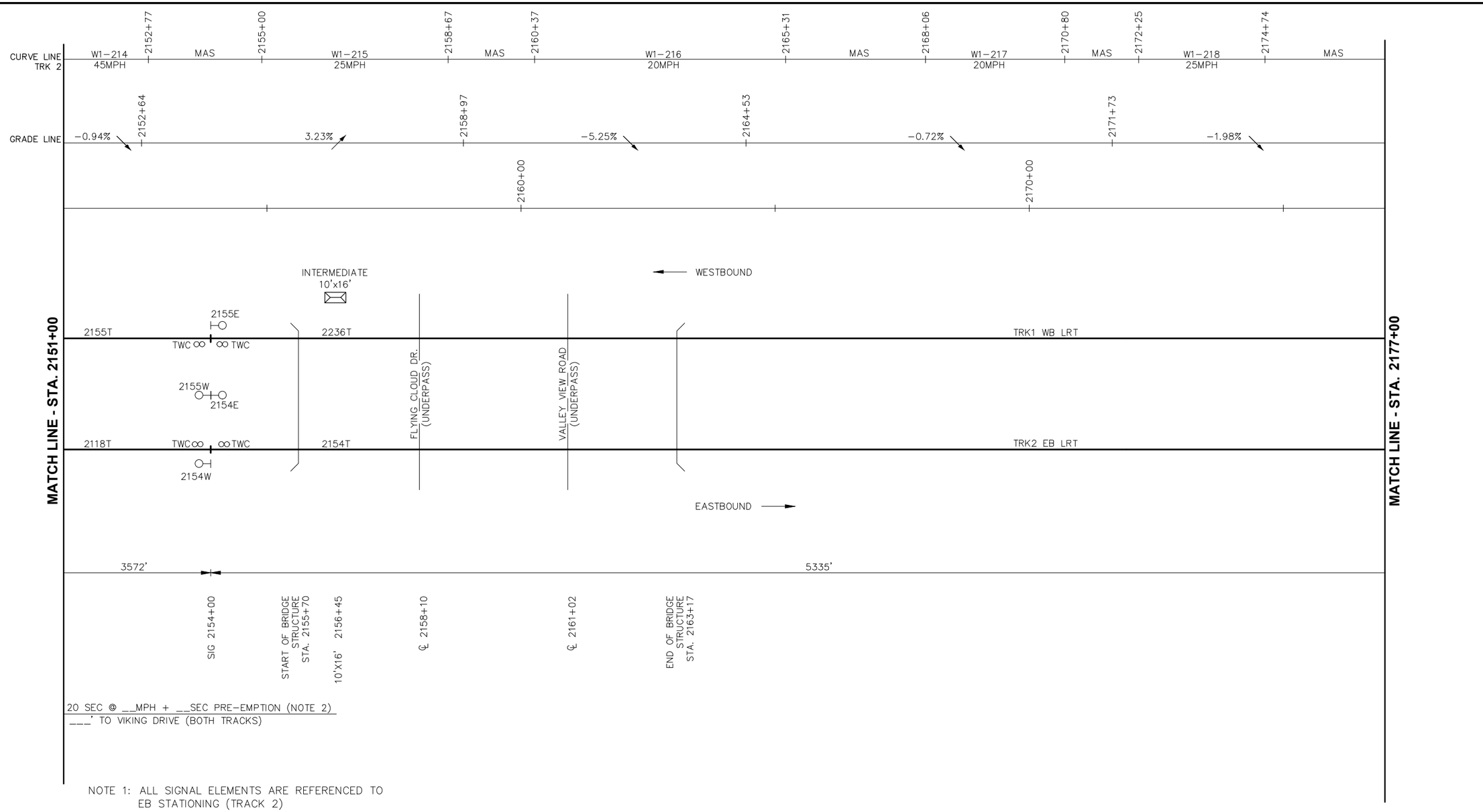
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2125+00 TO STA. 2151+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-005

SHEET 138 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

0 100 200 300 FT.

1" = 100'–0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

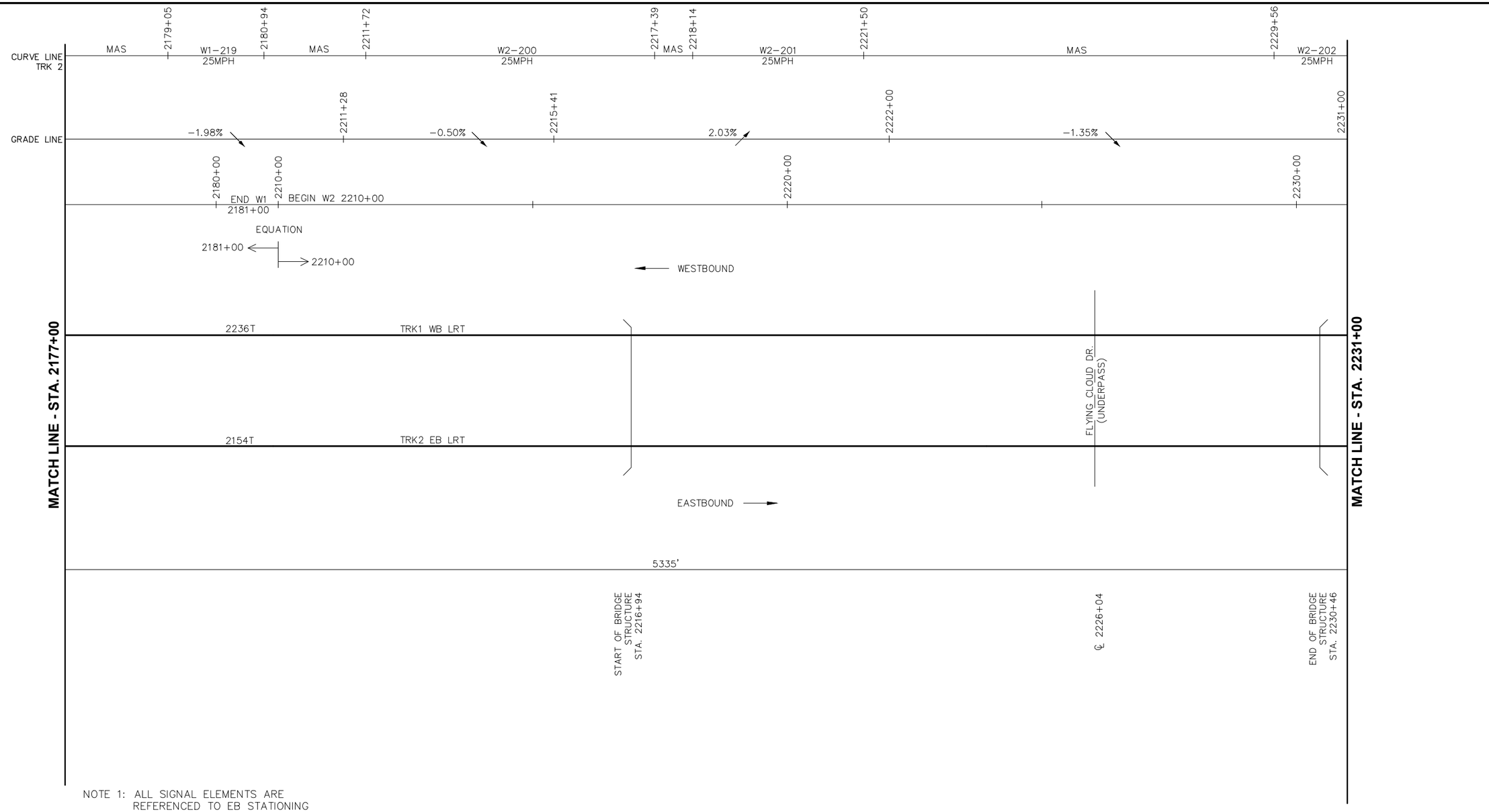
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2151+00 TO STA. 2177+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-006

SHEET 139 OF 202

Aug. 28 2014 11:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

0 100 200 300 FT.

1" = 100'–0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

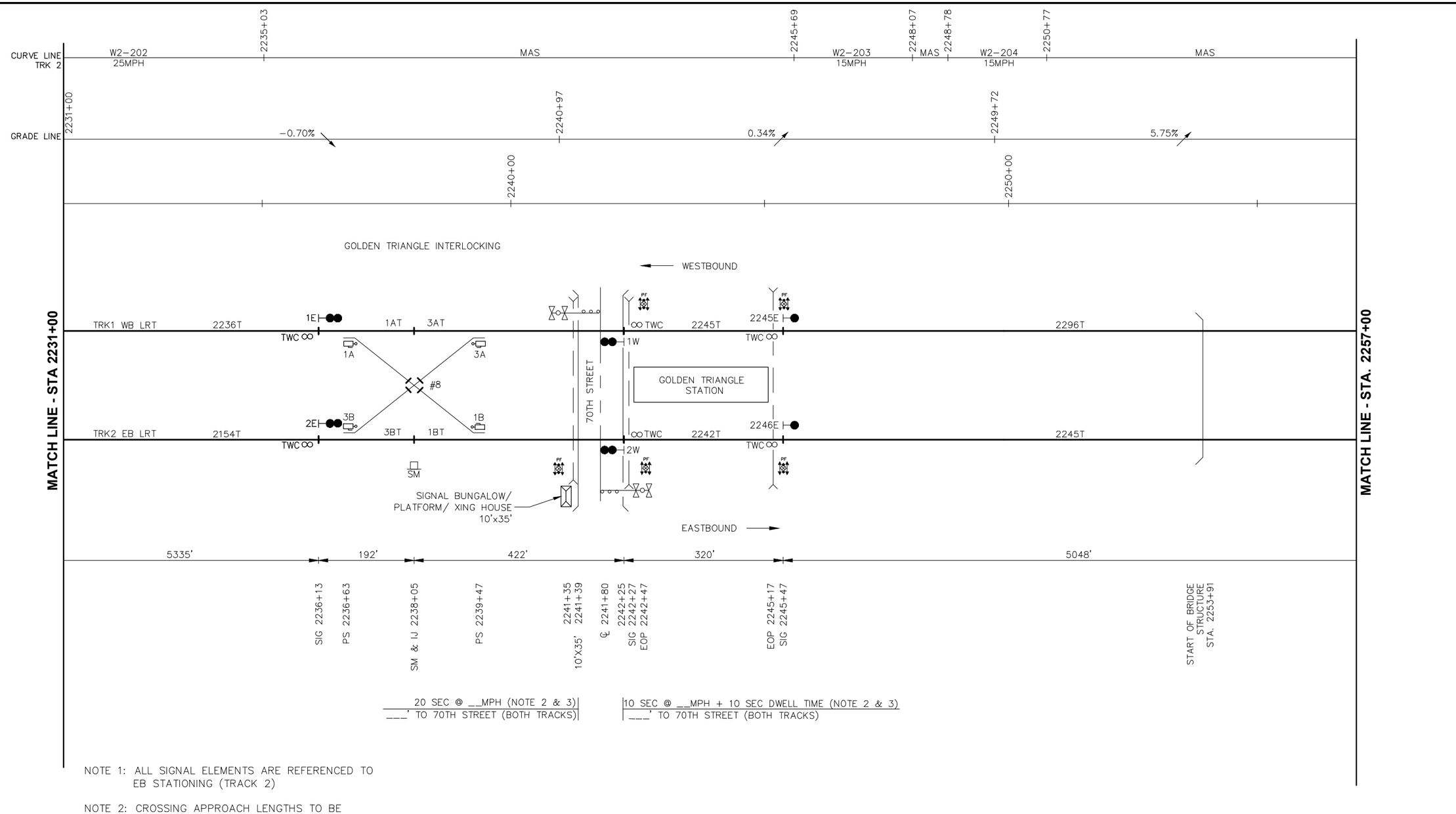
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2177+00 TO STA. 2231+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-007

SHEET 140 OF 202

Aug, 28 2014 11:03 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: INTERLOCK THE CROSSING STARTS WITH PERMISSIVE SIGNALS AT 1E, 2E, 1W, 2W. HOLD SIGNALS FOR REQUESTED ROUTES AT STOP UNTIL CROSSING HAS BEEN ACTIVE FOR 20 SECONDS.

0 100 200 300 FT.
1" = 100'–0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

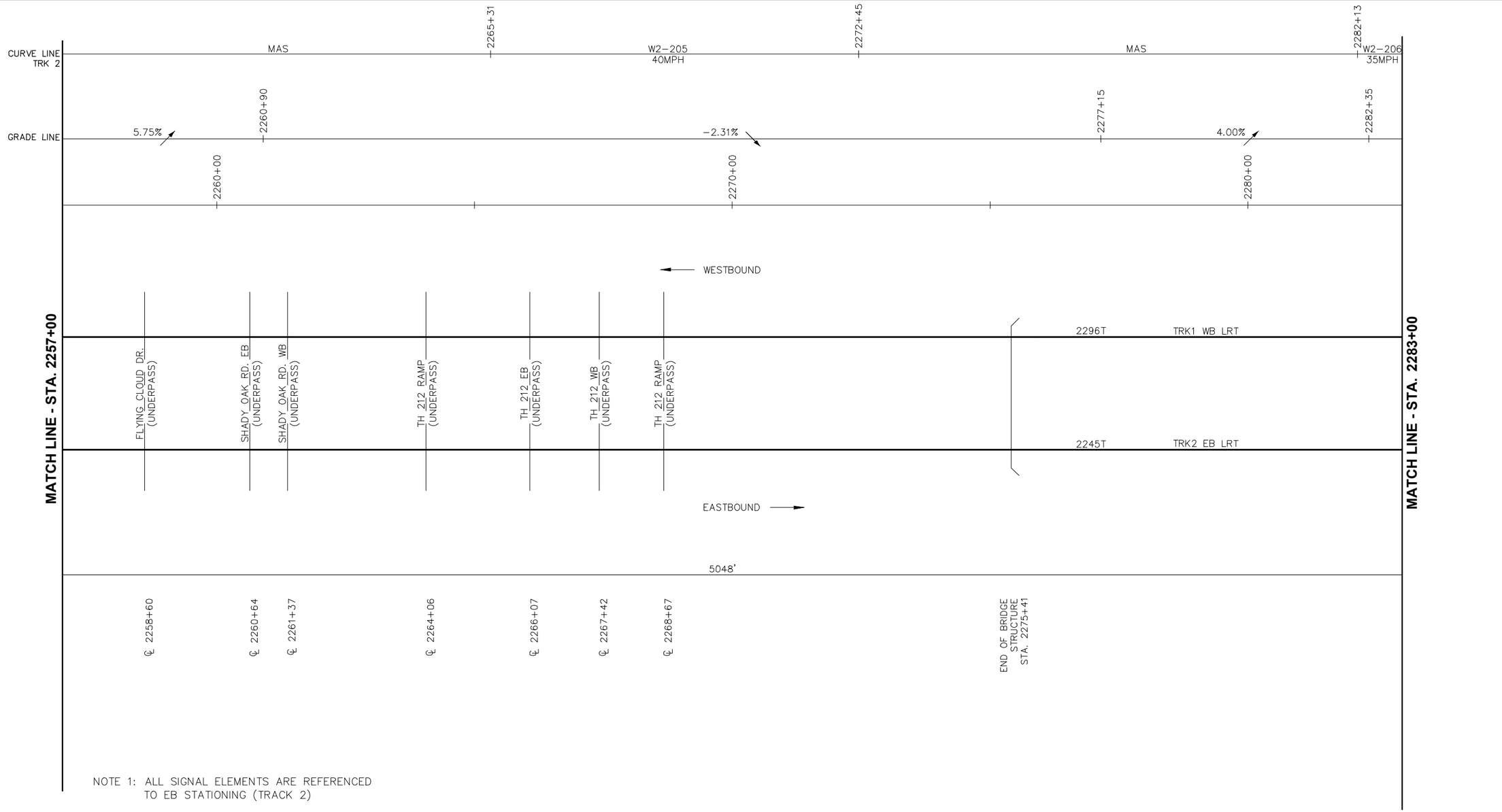
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2231+00 TO STA. 2257+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-008

SHEET 141 OF 202

Aug, 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

0 100 200 300 FT.

1" = 100'-0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

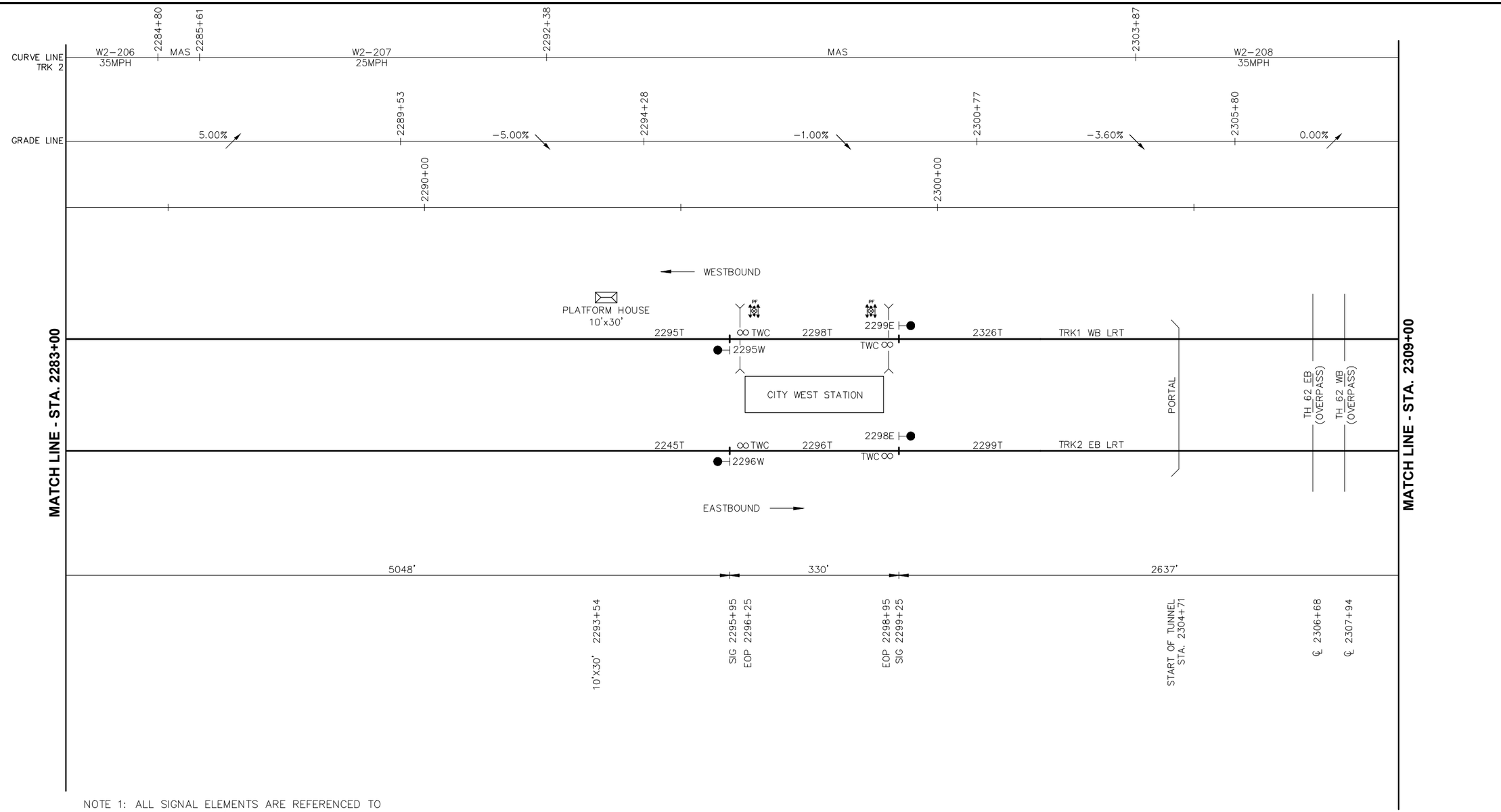
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2257+00 TO STA. 2283+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-009

SHEET 142 OF 202

Jun. 26 2014 09:56 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: HeinEE



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

0 100 200 300 FT.

1" = 100'-0"

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

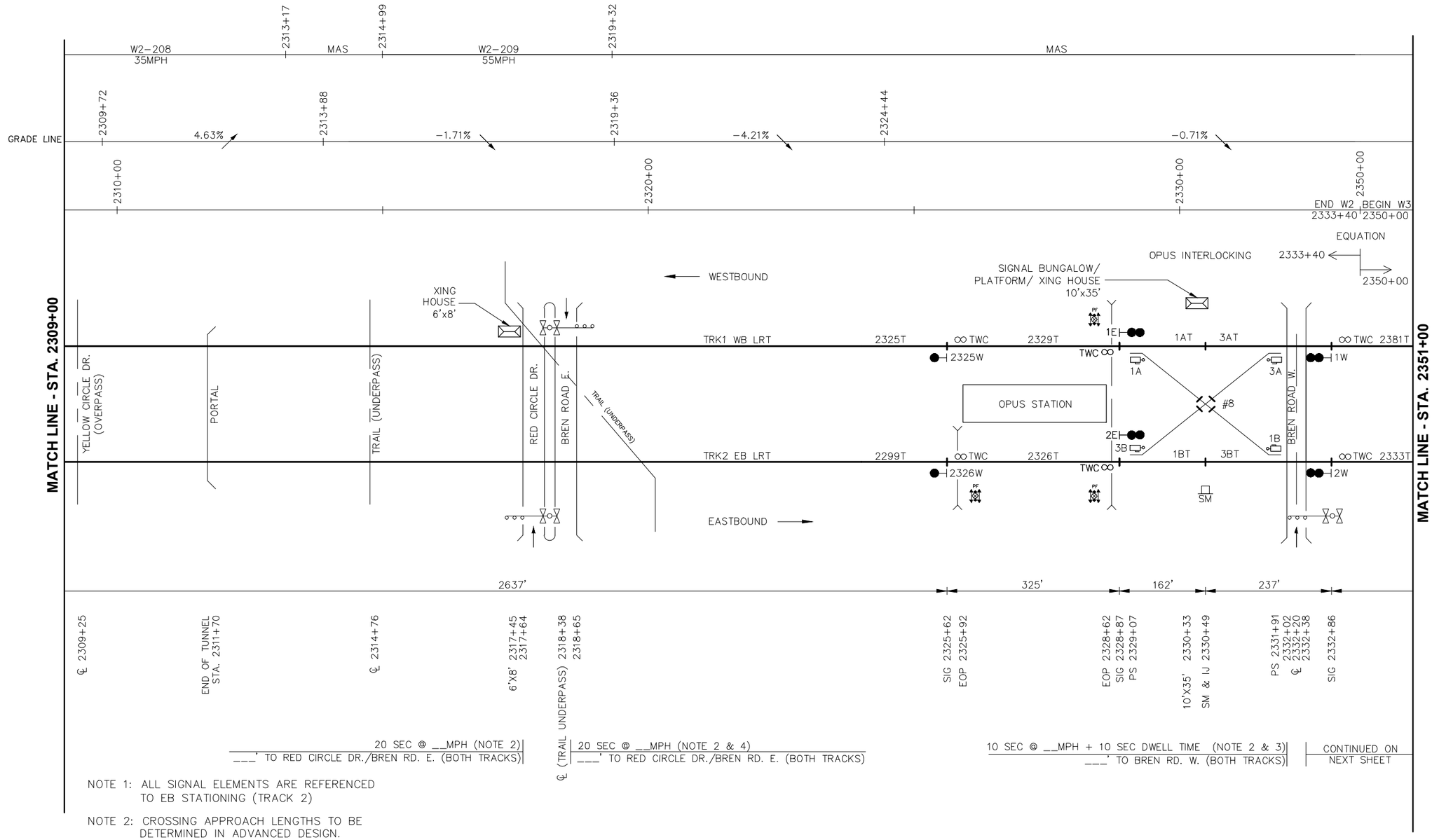
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2283+00 TO STA. 2309+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-010

SHEET 143 OF 202

Jun. 26 2014 09:56 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: HeinEE



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: INTERLOCK THE CROSSING STARTS WITH PERMISSIVE SIGNALS AT 1E, 2E, 1W, AND 2W. HOLD SIGNALS FOR REQUESTED ROUTES AT STOP UNTIL CROSSING HAS BEEN ACTIVE FOR 20 SECONDS.

NOTE 4: INTERLOCK THE CROSSING STARTS WITH PERMISSIVE SIGNALS AT 2325W AND 2326W.

0 100 200 300 FT.
1" = 100'–0"

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PRELIMINARY ENGINEERING

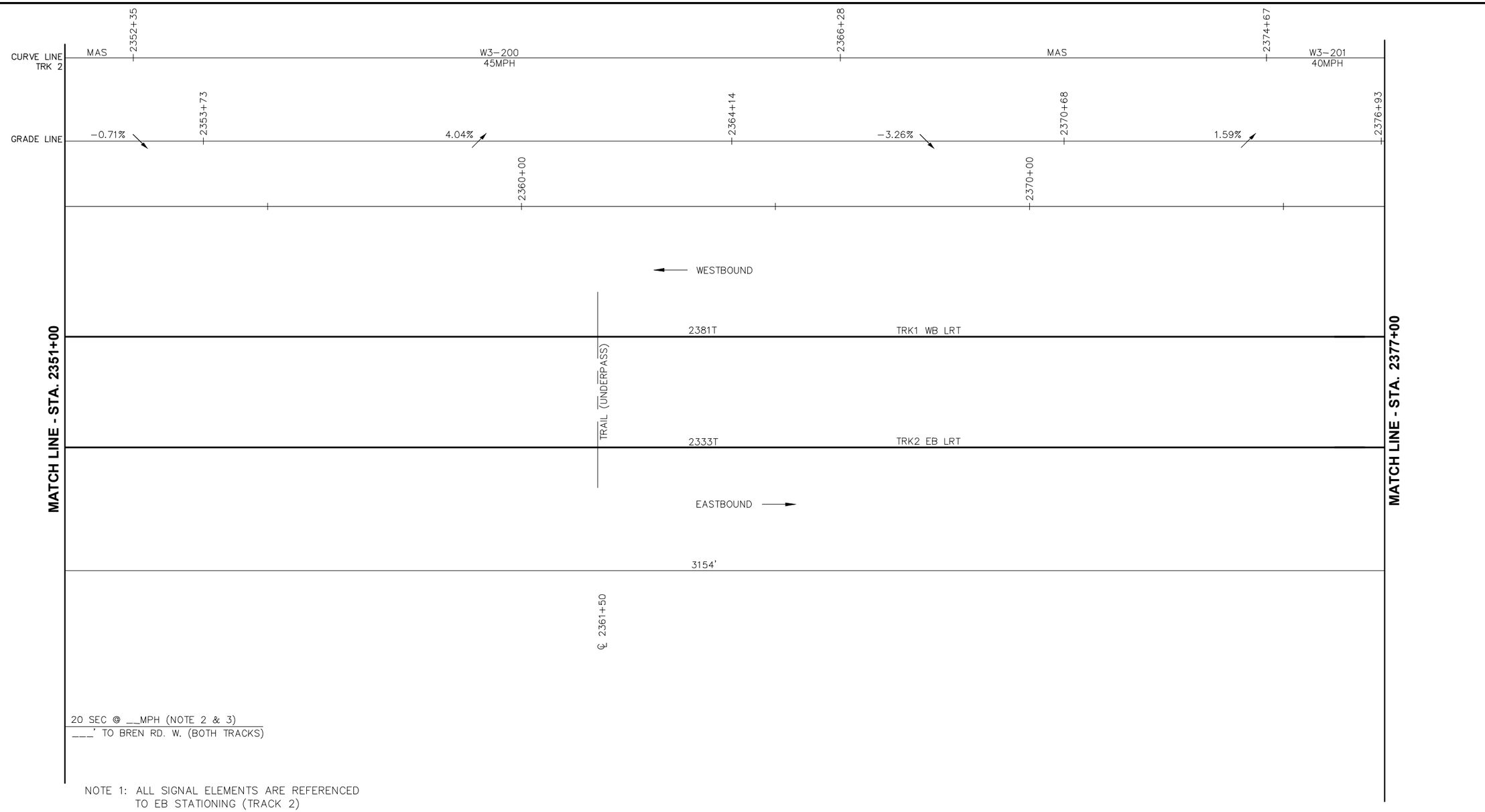
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2309+00 TO STA. 2351+00

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-CLD-011

SHEET 144 OF 202

Aug. 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: INTERLOCK THE CROSSING STARTS WITH PERMISSIVE SIGNALS AT 1E, 2E, 1W, AND 2W. HOLD SIGNALS FOR REQUESTED ROUTES AT STOP UNTIL CROSSING HAS BEEN ACTIVE FOR 20 SECONDS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

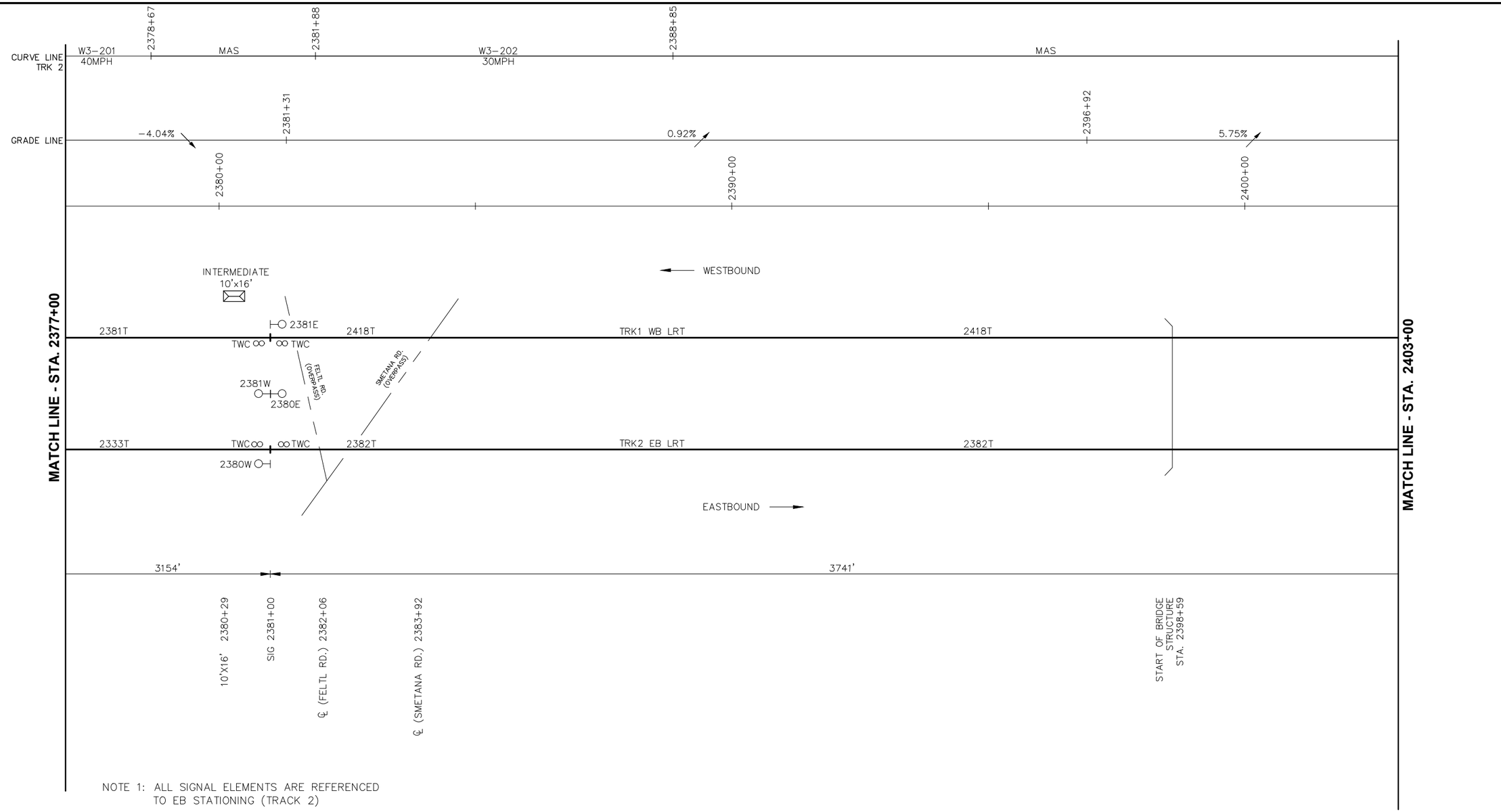
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2351+00 TO STA. 2377+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-012

SHEET 145 OF 202

Aug. 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

0 100 200 300 FT.

1" = 100'-0"

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

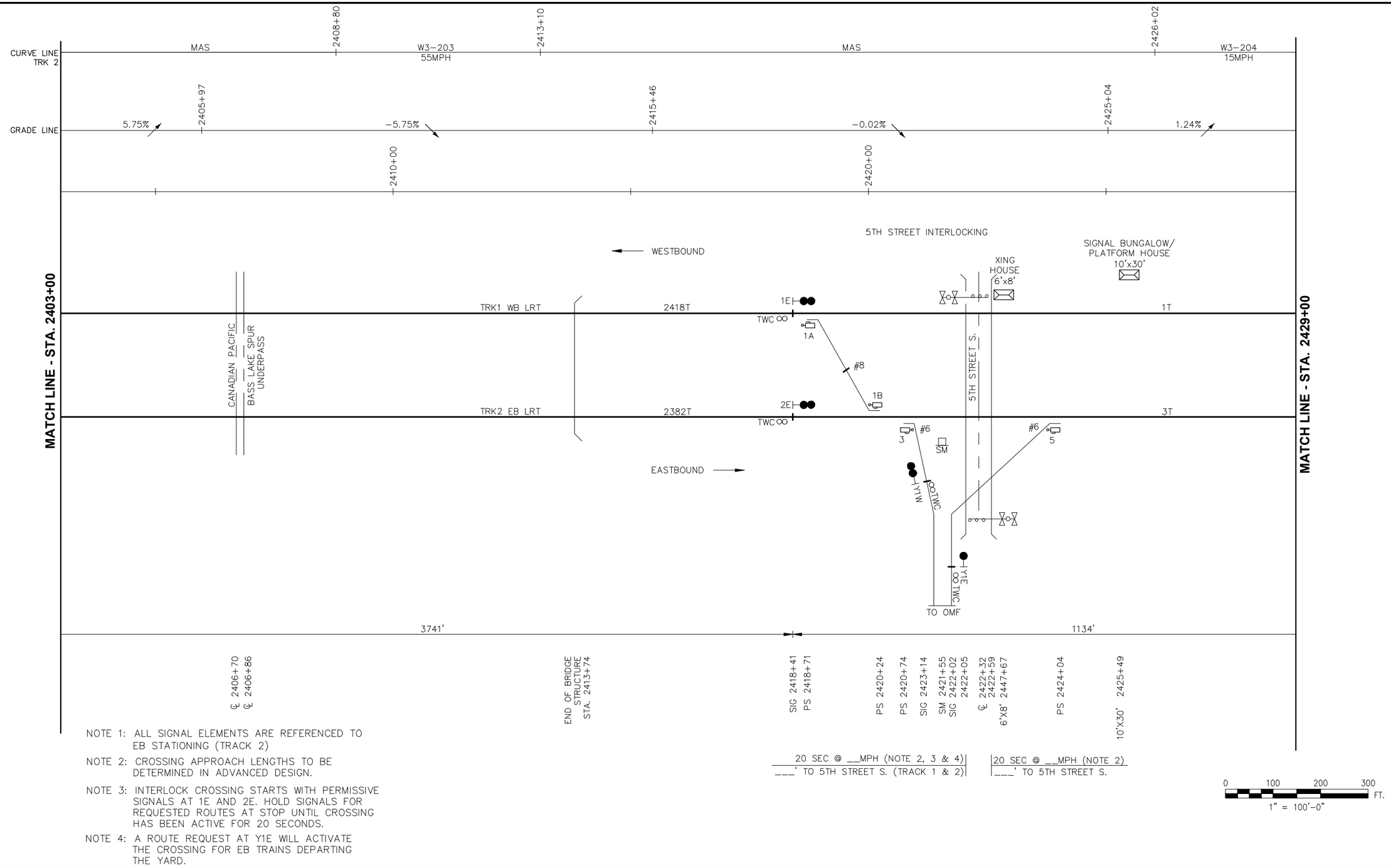
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2377+00 TO STA. 2403+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-013

SHEET 146 OF 202



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

NOTE 3: INTERLOCK CROSSING STARTS WITH PERMISSIVE SIGNALS AT 1E AND 2E. HOLD SIGNALS FOR REQUESTED ROUTES AT STOP UNTIL CROSSING HAS BEEN ACTIVE FOR 20 SECONDS.

NOTE 4: A ROUTE REQUEST AT Y1E WILL ACTIVATE THE CROSSING FOR EB TRAINS DEPARTING THE YARD.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

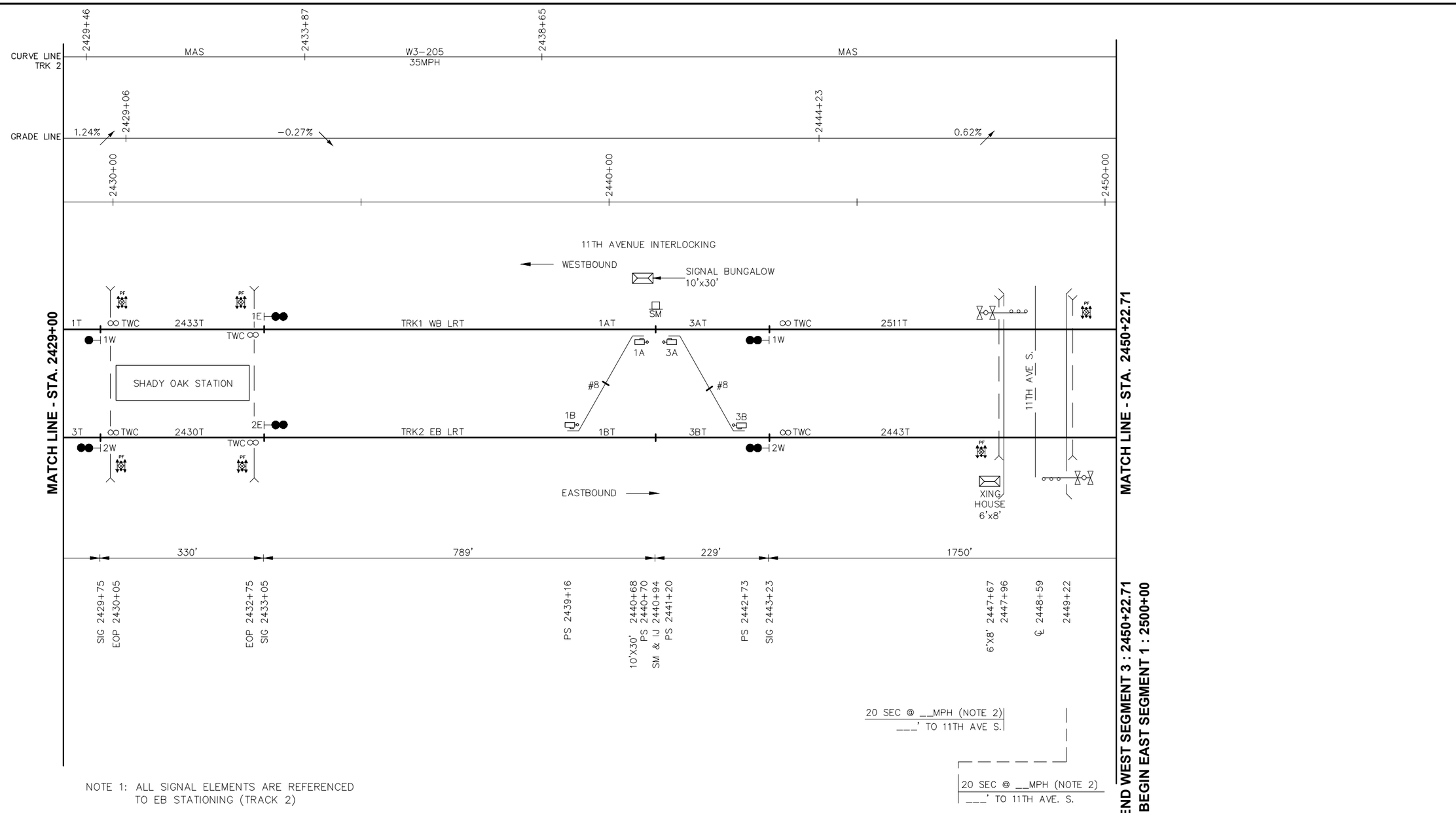
WEST-VOLUME 3 (SYSTEMS) SIGNAL SYSTEM CONTROL LINE DIAGRAM STA. 2403+00 TO STA. 2429+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-014

SHEET 147 OF 202

Aug. 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: ALL SIGNAL ELEMENTS ARE REFERENCED TO EB STATIONING (TRACK 2)

NOTE 2: CROSSING APPROACH LENGTHS TO BE DETERMINED IN ADVANCED DESIGN.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

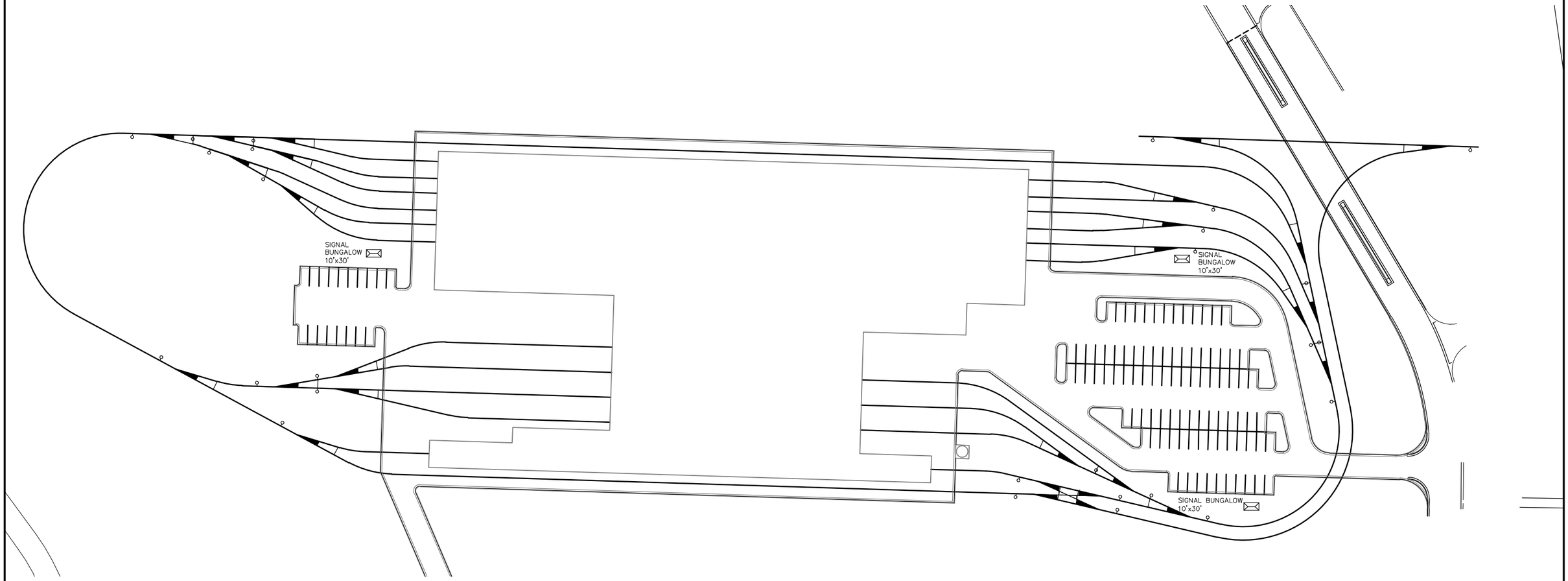
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
STA. 2429+00 TO STA. 2450+22.71

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-015

SHEET 148 OF 202

Aug, 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-CLD.dwg By: ehein



NOTE 1: NORMAL YARD OPERATION AND SWITCH POSITIONING WILL BE PERFORMED BY THE RCC. NO ROUTES AUTOMATIC OR OTHERWISE ARE REQUIRED.

NOTE 2: ALL SWITCHES IN THE OPERATIONS AND MAINTENANCE FACILITY SHALL BE POWERED AND PROVIDED WITH TRAILABLE, ELECTRIC, DUAL CONTROL SWITCH OPERATING MECHANISMS.

NOTE 3: ALL SWITCHES SHALL BE PROVIDED WITH NORMAL AND REVERSE POINT DETECTION AND SHALL BE EQUIPPED WITH COLOR LIGHT SWITCH POSITION INDICATORS.

NOTE 4: DETECTOR LOCKING SHALL BE REQUIRED FOR ALL POWERED YARD SWITCHES.

NOTE 5: TWC LOOPS WILL BE INSTALLED ON ALL ARRIVAL AND DEPARTURE TRACKS FROM THE YARD AS WELL AS ENTRANCES AND EXITS TO MAINTENANCE FACILITIES.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

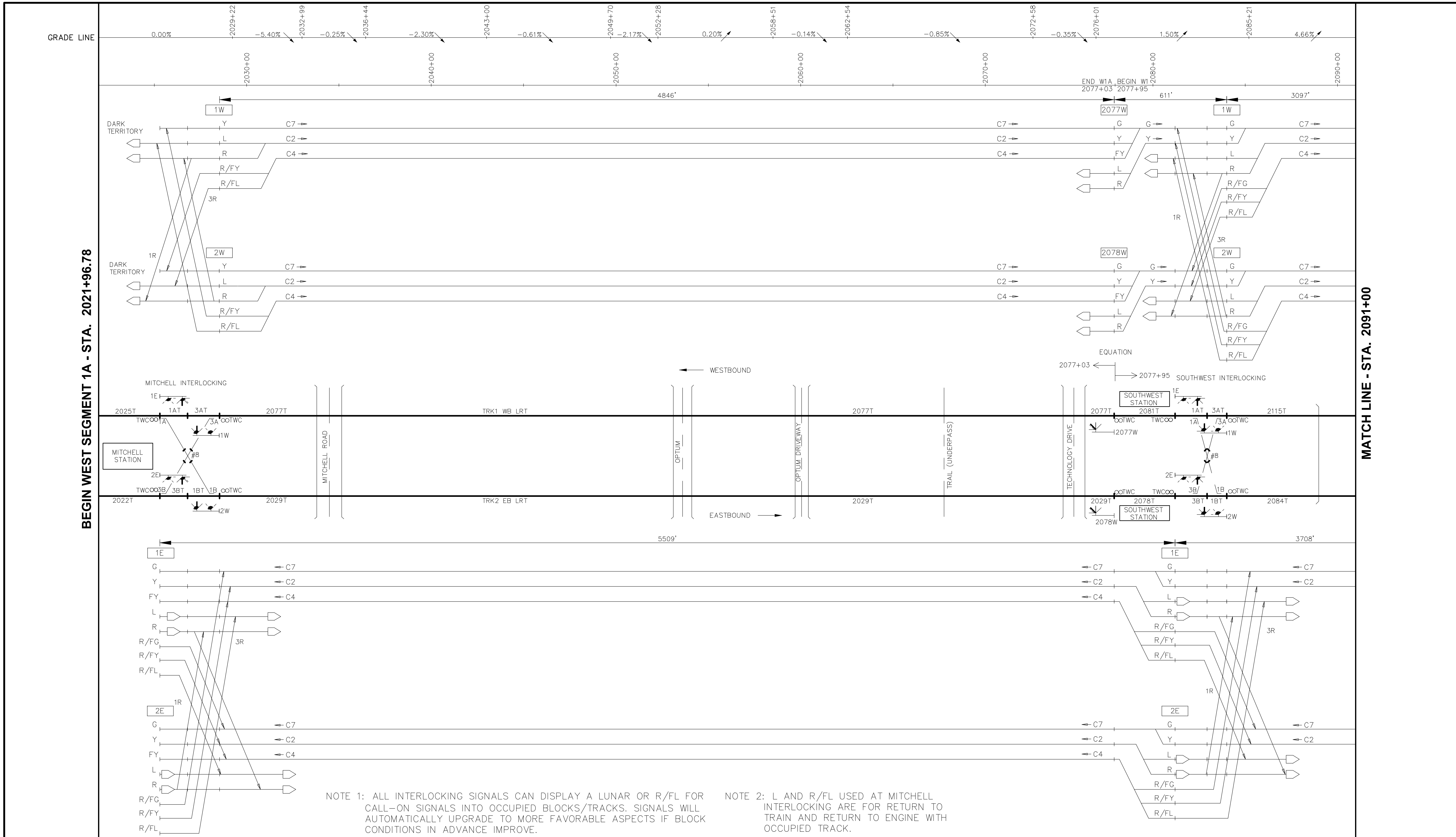
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
CONTROL LINE DIAGRAM
OMF

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-CLD-016

SHEET 149 OF 202

Jun, 26 2014 09:57 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WD-SYS-SIG-CLD.dwg By: HeinEE



NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

NOTE 2: L AND R/FL USED AT MITCHELL INTERLOCKING ARE FOR RETURN TO TRAIN AND RETURN TO ENGINE WITH OCCUPIED TRACK.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

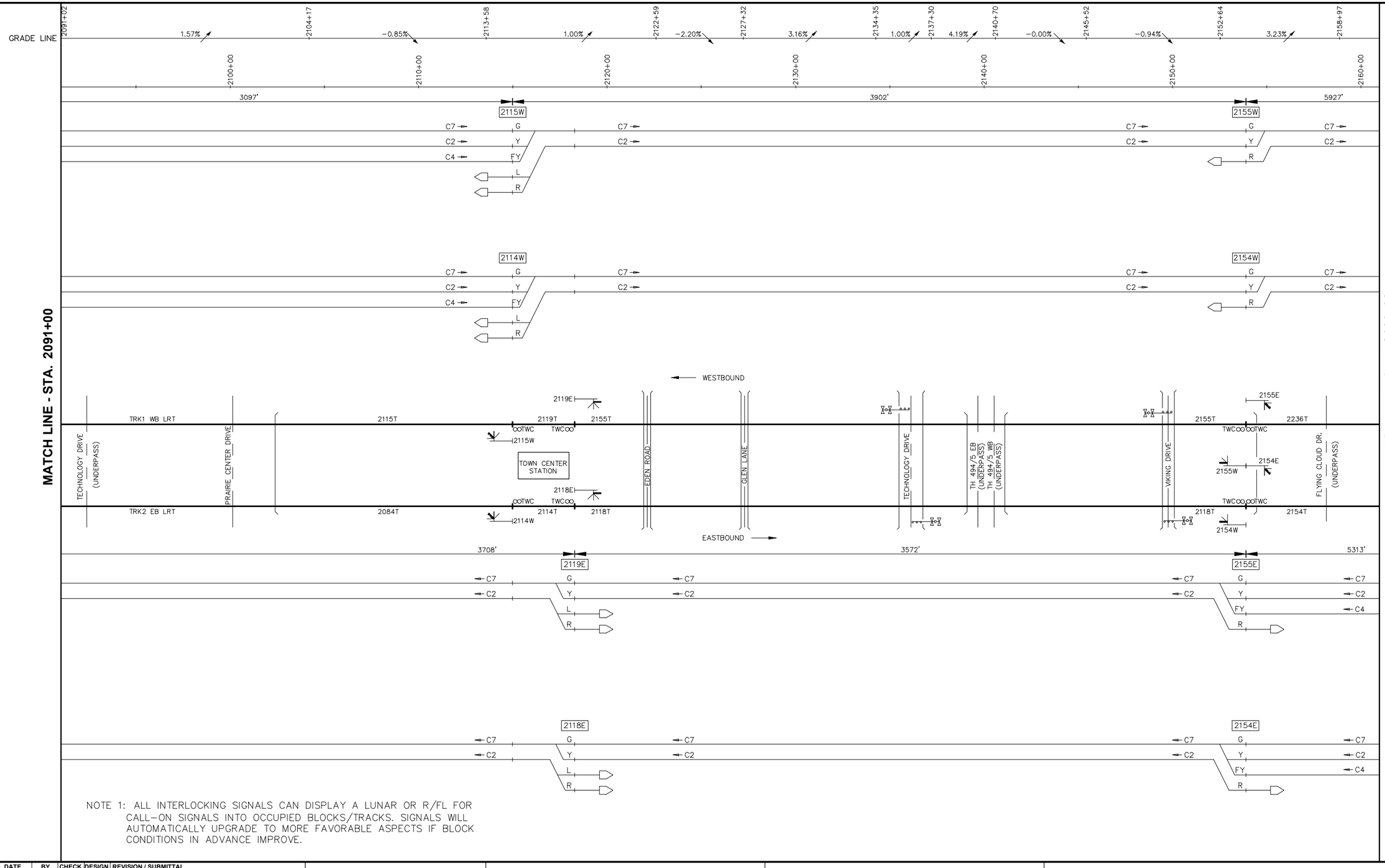
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS) SIGNAL SYSTEM ROUTE AND ASPECT CONTROL LINES STA. 2021+96.78 TO STA. 2091+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-001

Jun. 26 2014 09:57 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: HeinEE



NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

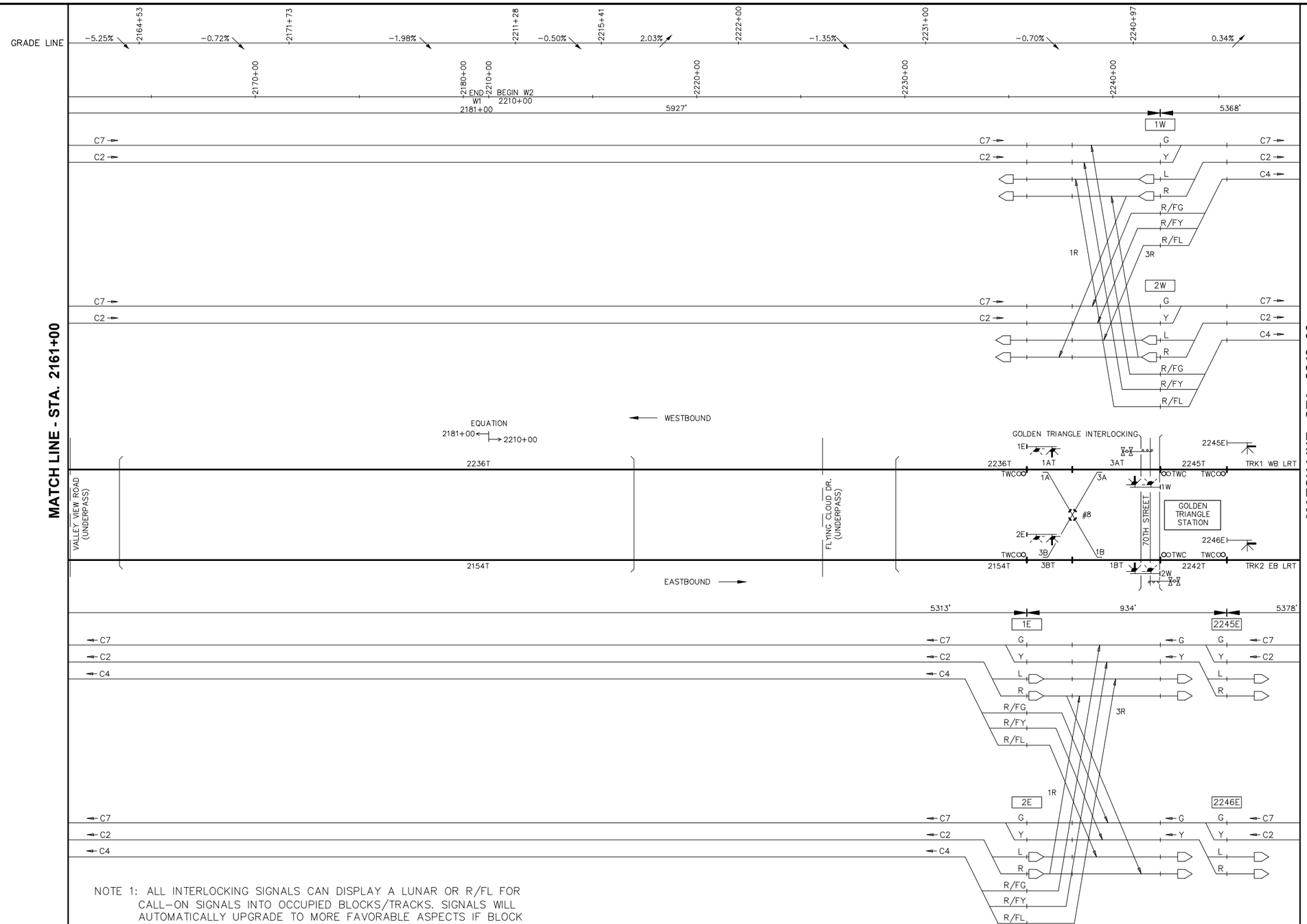
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2091+00 TO STA. 2161+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-002

SHEET 151 OF 202

Aug. 28 2014 11:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: ehein



NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

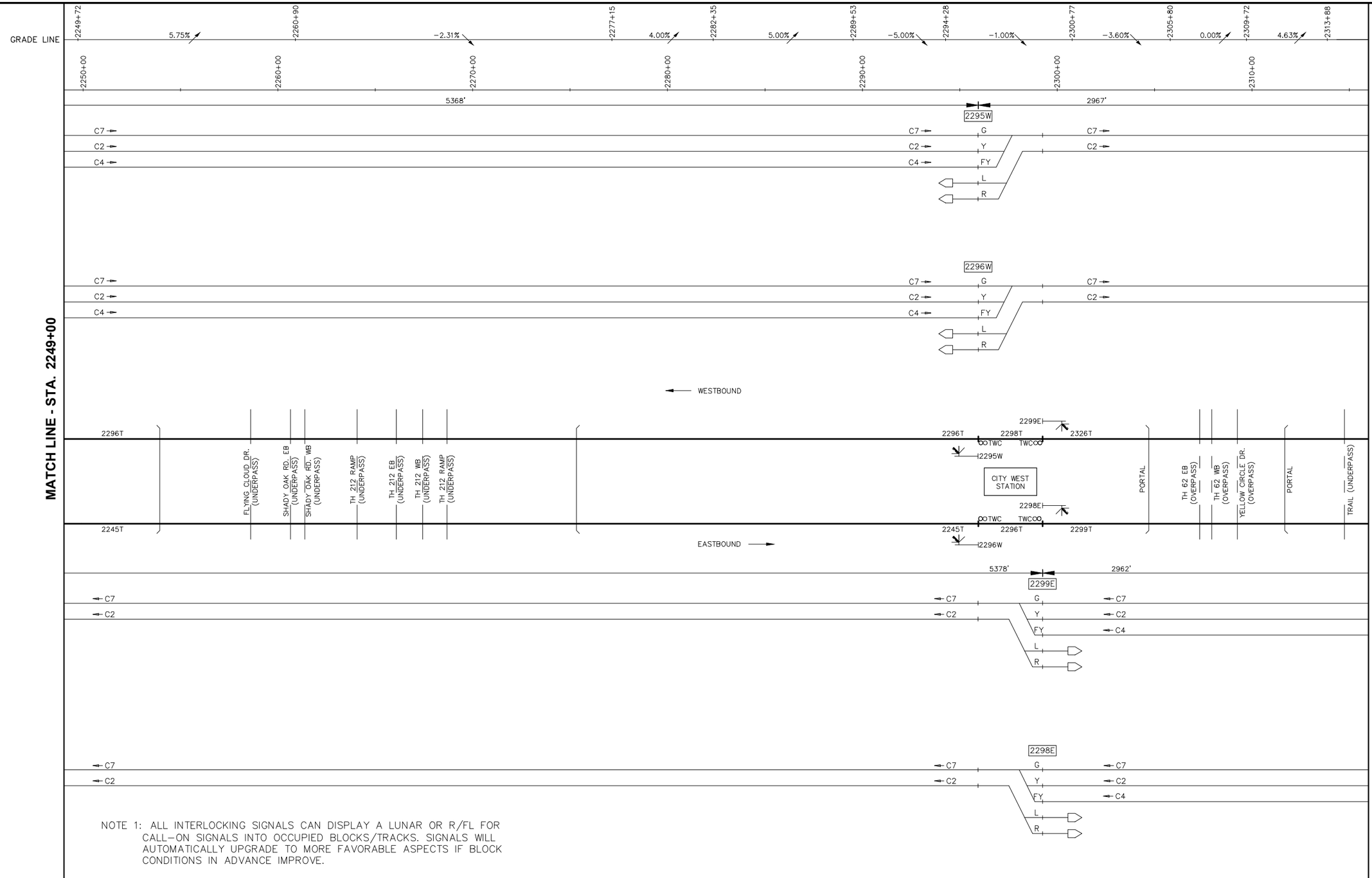
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2161+00 TO STA. 2249+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-003

SHEET 152 OF 202

Aug, 28 2014 11:05 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: ehein



NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

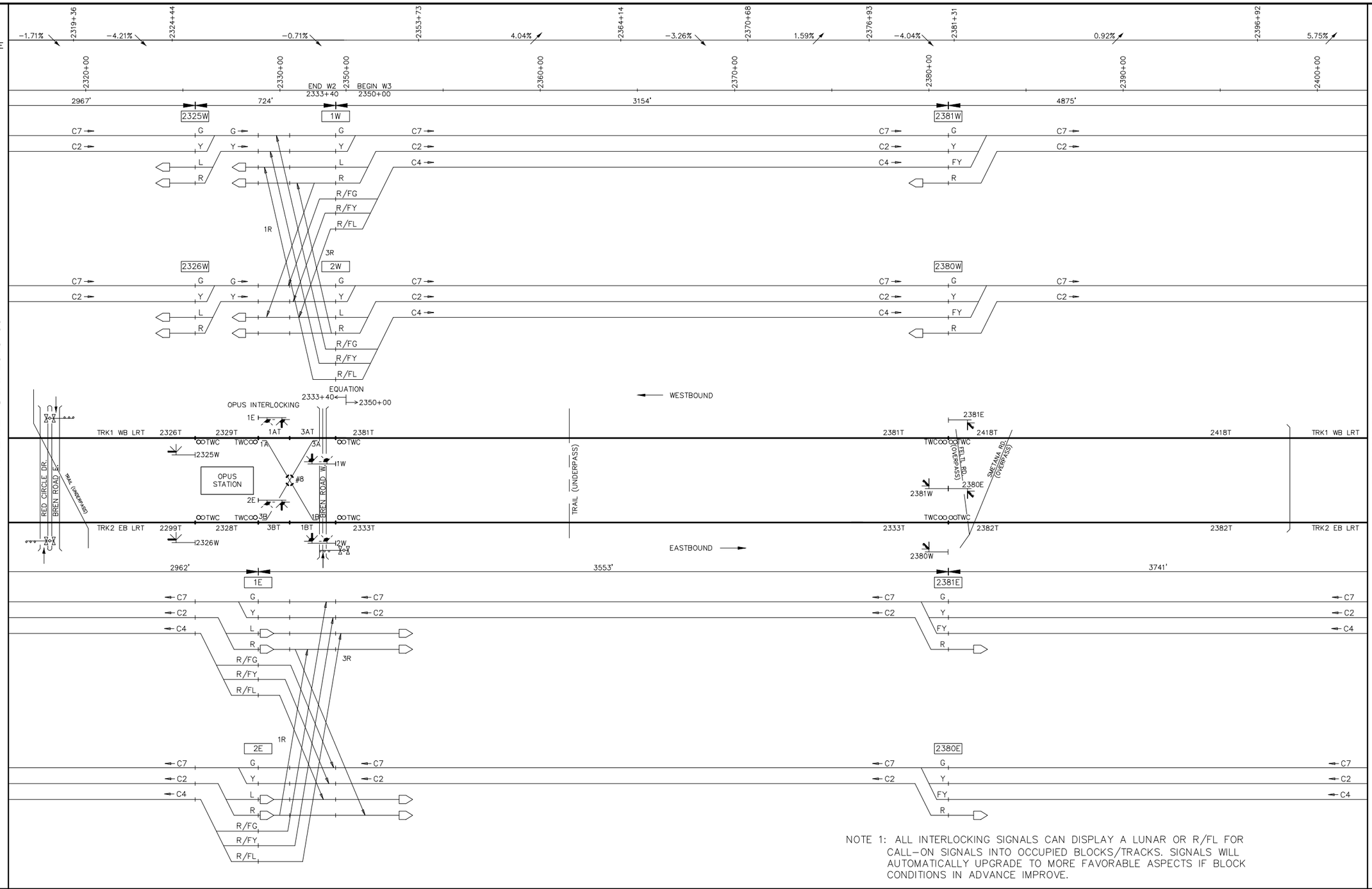
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2249+00 TO STA. 2316+00

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-004

SHEET 153 OF 202

Jun, 26 2014 09:58 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: HeinEE



NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2316+00 TO STA. 2386+00

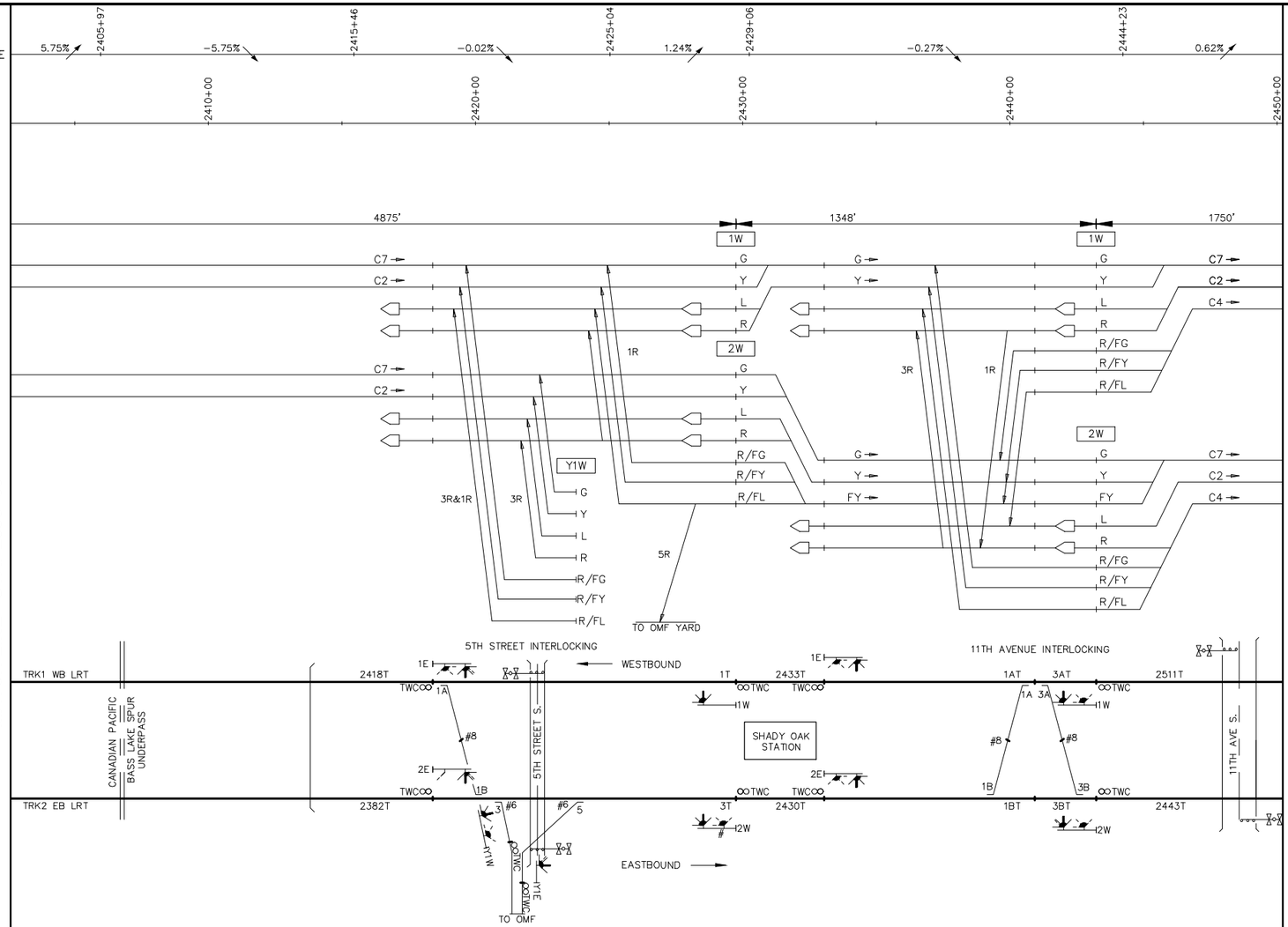
DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-005

SHEET 154 OF 202

Jun, 26 2014 09:58 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: HeinEE

MATCH LINE - STA. 2386+00



MATCH LINE - STA. 2450+22.71

END WEST SEGMENT 3 : 2450+22.71
BEGIN EAST SEGMENT 1 : 2500+00

NOTE 1: ALL INTERLOCKING SIGNALS CAN DISPLAY A LUNAR OR R/FL FOR CALL-ON SIGNALS INTO OCCUPIED BLOCKS/TRACKS. SIGNALS WILL AUTOMATICALLY UPGRADE TO MORE FAVORABLE ASPECTS IF BLOCK CONDITIONS IN ADVANCE IMPROVE.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

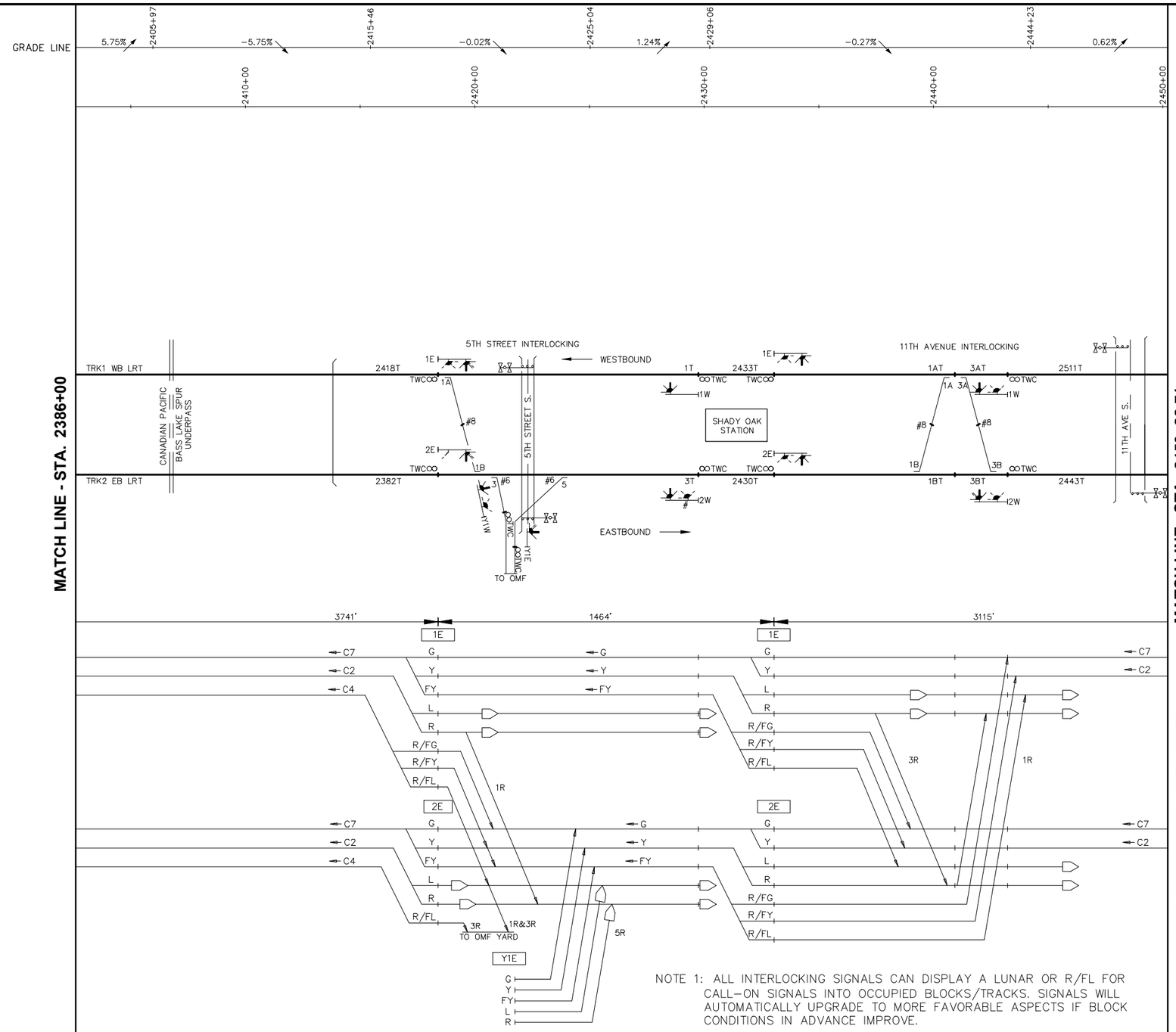
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2386+00 TO STA. 2450+22.71

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-006

SHEET 155 OF 202

Aug, 28 2014 11:05 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: ehein



END WEST SEGMENT 3 : 2450+22.71
BEGIN EAST SEGMENT 1 : 2500+00

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

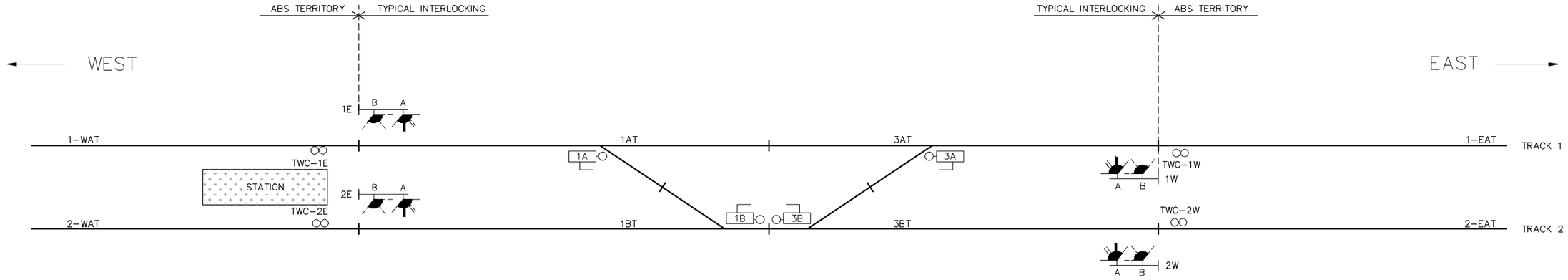
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
ROUTE AND ASPECT CONTROL LINES
STA. 2386+00 TO STA. 2450+22.71

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RAC-007

SHEET 156 OF 202

Aug. 28 2014 11:05 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RAC.dwg By: ehein



SIGNAL ROUTES	ENTRANCE SIGNAL	EXIT SIGNAL	ASPECTS	OPPOSING/ CONFLICTING ROUTES	SWITCHES LOCKED (( )) = REV.			TRACKS UNOCCUPIED	CONTROL MODE			TIME LOCKING	OPERATIONAL NOTES
									AUTO	TWC	MANUAL	TIME SETTINGS	
1EA	1E	1W	G, FY, Y	2EB, 1WA, 1WB, 2WB	1A		3A	1AT, 3AT, 1–EAT	–	X	X	TBD	1
1EB		2W	R/FG, R/FY, R/FL	2EA, 2EB, 1WA, 1WB, 2WA, 2WB	(1A)	(1B)	3B	1AT, 1BT, 3BT, 2–EAT	–	X	X	TBD	1
2EA	2E	2W	G, FY, Y	1EB, 1WB, 2WA, 2WB	1B		3B	1BT, 3BT, 2–EAT	X	X	X	TBD	1
2EB		1W	R/FG, R/FY, R/FL	1EA, 1EB, 1WA, 1WB, 2WA, 2WB	1B	(3B)	(3A)	1BT, 3BT, 3AT, 1–EAT	–	X	X	TBD	1
1WA	1W	1E	G, FY, Y	2WB, 1EA, 1EB, 2EB	3A		1A	3AT, 1AT, 1–WAT	X	X	X	TBD	1
1WB		2E	R/FG, R/FY, R/FL	2WA, 2WB, 1EA, 1EB, 2EA, 2EB	(3A)	(3B)	1B	3AT, 3BT, 1BT, 2–WAT	–	X	X	TBD	1
2WA	2W	2E	G, FY, Y	1WB, 1EB, 2EA, 2EB	3B		1B	3BT, 1BT, 2–WAT	–	X	X	TBD	1
2WB		1E	R/FG, R/FY, R/FL	1WA, 1WB, 1EA, 1EB, 2EA, 2EB	3B	(1B)	(1A)	3BT, 1BT, 1AT, 1–WAT	–	X	X	TBD	1

NOTE 2

LAMP OUT DOWNGRADES			
SIGNALS	ASPECT	LAMP OUT	DOWNGRADE
1E, 2E, 1W, 2W	G	TOP G	Y
1E, 2E, 1W, 2W	Y	TOP Y	R
1E, 2E, 1W, 2W	FY	TOP Y	R
1E, 2E, 1W, 2W	R/FG	BOTTOM G	R/FY
1E, 2E, 1W, 2W	R/FY	BOTTOM Y	R
1E, 2E, 1W, 2W	R/FL	BOTTOM L	R
1E, 2E, 1W, 2W	R/FG, R/FY, R/FL	TOP R	D/D
1E, 2E, 1W, 2W	R	TOP R	D

NOTE: ALL SIGNAL LIGHT ASPECTS (E.G. G,Y,R) DISPLAY ON "A" HEAD WITH "B" HEAD DARK.

NOTES:

1. SIGNALS CAN BE CONTROLLED VIA RCC, TWC OR LOCAL CONTROL PANEL
2. TWC ROUTING CODES TO BE ASSIGNED IN FINAL DESIGN
3. TRACK CIRCUIT NAMES OUTSIDE THE LIMITS OF THE INTERLOCKING SHALL FOLLOW METRO TRANSIT STANDARD NAMING CONVENTION

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

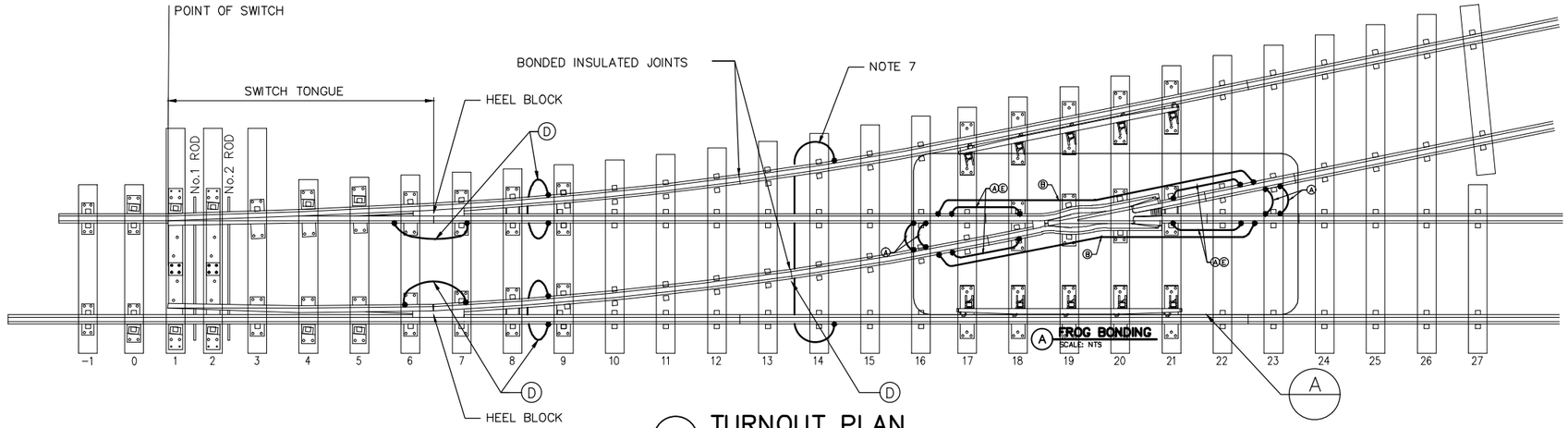
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TYPICAL ROUTE AND LOCKING TABLE

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-RLT-001

SHEET 157 OF 202

Jun, 26 2014 09:58 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RLT.dwg By: HeinEE



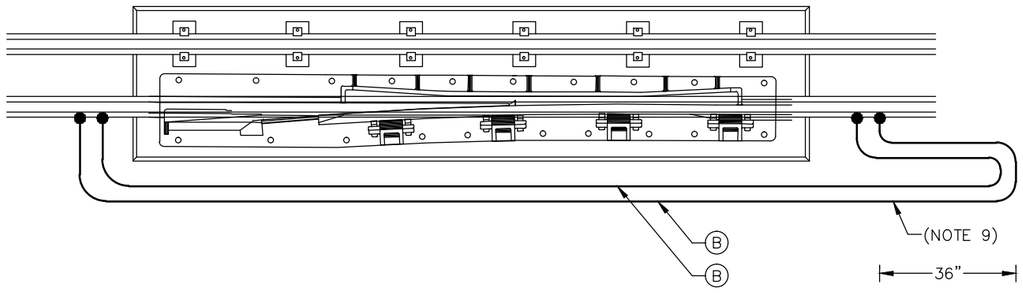
1 TURNOUT PLAN
SCALE: NTS

POWER BONDING KEY

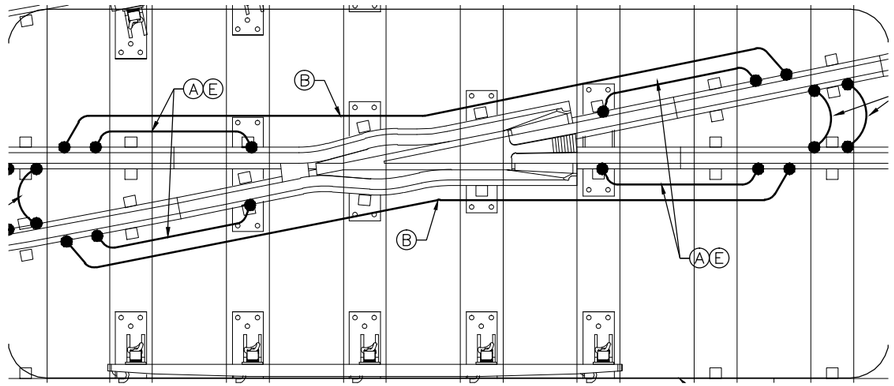
- (A) 1−250 KCM − MECHANICAL RAIL CONNECTION
- (B) 1−500 KCM − MECHANICAL RAIL CONNECTION
- (C) 2−500 KCM − MECHANICAL RAIL CONNECTION
- (D) 2−250 KCM − MECHANICAL RAIL CONNECTION
- (E) NOT REQUIRED FOR WELDED JOINTS

NOTES:

1. CROSS BONDING SHALL NOT BE COMBINED WITH NEGATIVE RETURN AT SUBSTATION.
2. ALL RAIL CONNECTIONS WILL BE MADE WITH MECHANICAL FASTENERS SUCH AS CEMBRE AR60 OR APPROVED EQUAL.
3. ACTUAL RAIL COMPONENT LENGTH AND TIE SPACING MAY VARY FROM THOSE SHOWN ON THIS DRAWING.
4. RIGHT HAND TURNOUT DETAILS SHALL BE OPPOSITE TO THAT SHOWN.
5. DRESS CABLES CLOSE TO RAIL WITHIN GAGE.
6. 250 KCMIL BOND CABLE AND 500 KCMIL BOND CABLE SHALL BE TYPE "EXTRA FLEX", "ROPELAY" TYPE OR APPROVED EQUAL.
7. RAIL CONNECTION SHALL BE PLACED AS CLOSE AS POSSIBLE TO THE INSULATED JOINT BAR, TYPICALLY NO MORE THAN 24 INCHES AWAY FROM THE ACTUAL JOINT, TO PROVIDE BROKEN RAIL PROTECTION
8. TRACK INSTALLATION SHOWN SCREENED FOR CLARITY.
9. JOINT IS DESIGNED TO ACCOMMODATE 30" OF EXPANSION / CONTRACTION. DESIGN CABLE LENGTH FOR BONDS ACCORDINGLY.



2 RAIL EXPANSION JOINT RETURN POWER BONDING
SCALE: NTS



A FROG BONDING
SCALE: NTS

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

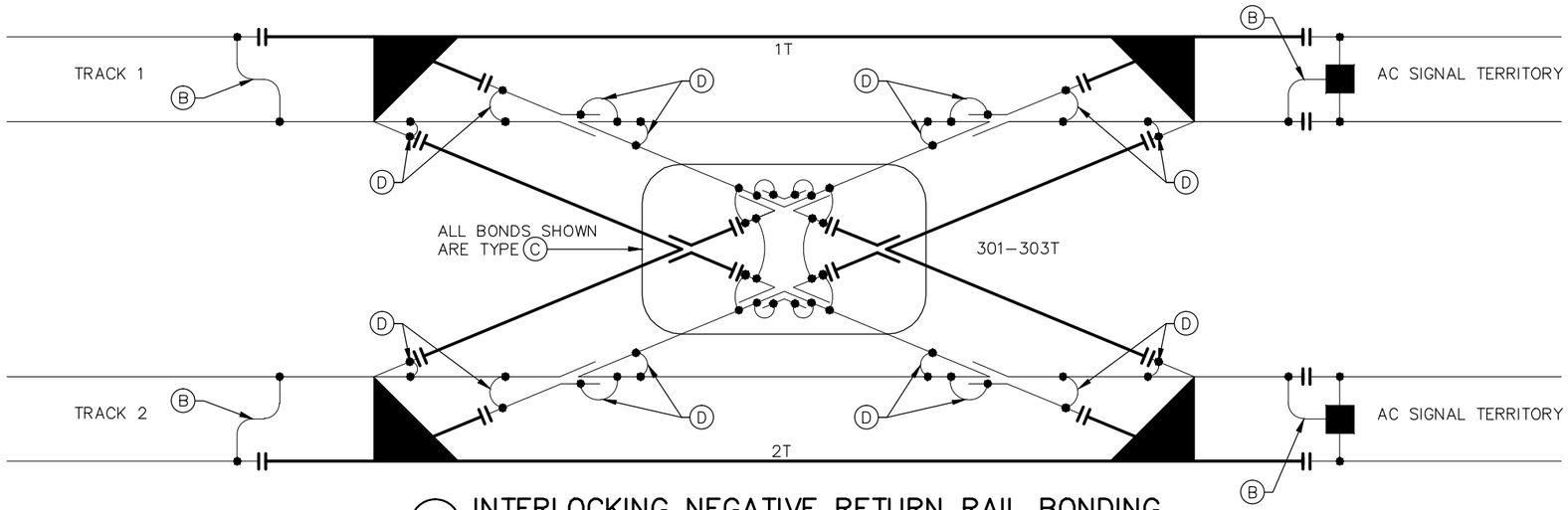
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TYPICAL RAIL BONDING DETAIL - JOINTED

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-001

SHEET 158 OF 202

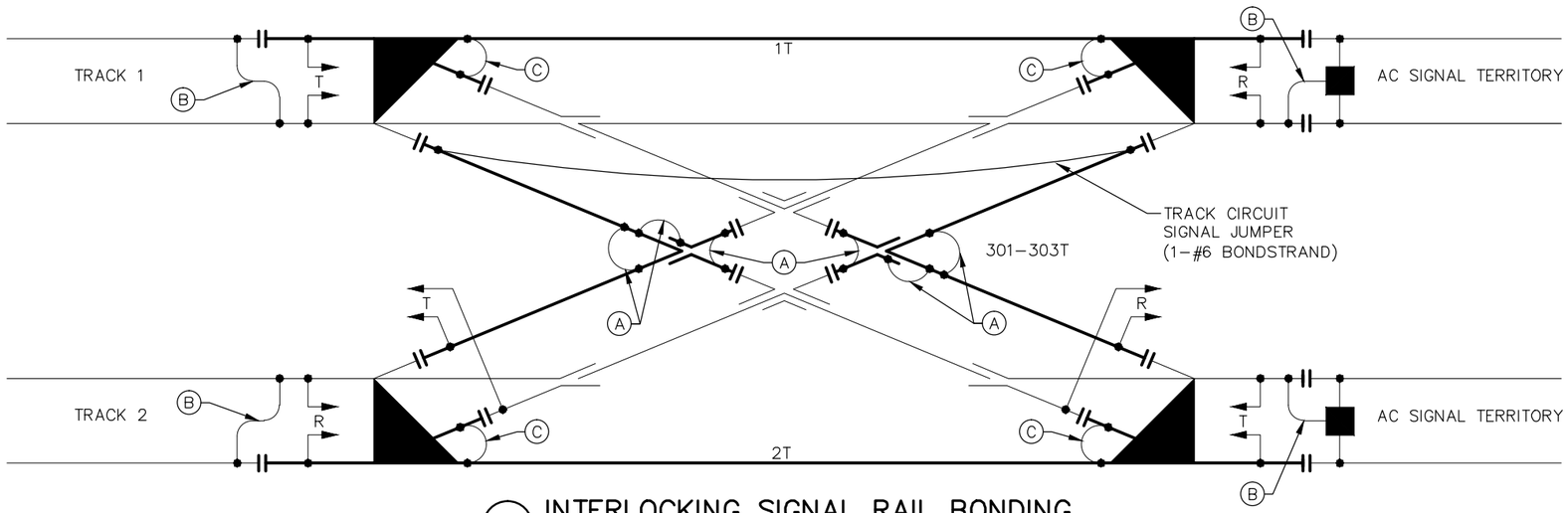
Jun, 26 2014 10:00 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SIG-DTL-001.dwg By: HeinEE



1 INTERLOCKING NEGATIVE RETURN RAIL BONDING
SCALE: NTS

NOTES:

1. RAIL BONDING SHALL BE ACCOMPLISHED WITH MECHANICAL CONNECTORS, SUCH AS CEMBRE AR60D OR APPROVED EQUAL.
2. THE CONTRACTOR SHALL PROVIDE BONDING PLANS FOR EACH SWITCH POINT LOCATION FOR APPROVAL BY THE CAR.
3. ARRANGEMENT SHOWN IS GENERAL AND IS PROVIDED TO SHOW TYPICAL ARRANGMENTS OF TRACK CIRCUITS, BONDS AND RETURN RAIL CONFIGURATIONS.
4. ALL 500 KCM CABLES ARE ROPELAY
5. CROSS BONDING SHALL NOT BE COMBINED WITH NEGATIVE RETURN AT SUBSTATION.



2 INTERLOCKING SIGNAL RAIL BONDING
SCALE: NTS

SIGNAL AND POWER BONDING KEY

- (A) 1–#6 BOND STRAND
- (B) 3–500 KCM – MECHANICAL RAIL CONNECTION
- (C) 2–250 KCM – MECHANICAL RAIL CONNECTION
- (D) 2–500 KCM – MECHANICAL RAIL CONNECTION

INSULATED JOINT
NEGATIVE RETURN RAIL
SIGNAL RAIL

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AECOM PARSONS BRINCKERHOFF
PRELIMINARY ENGINEERING

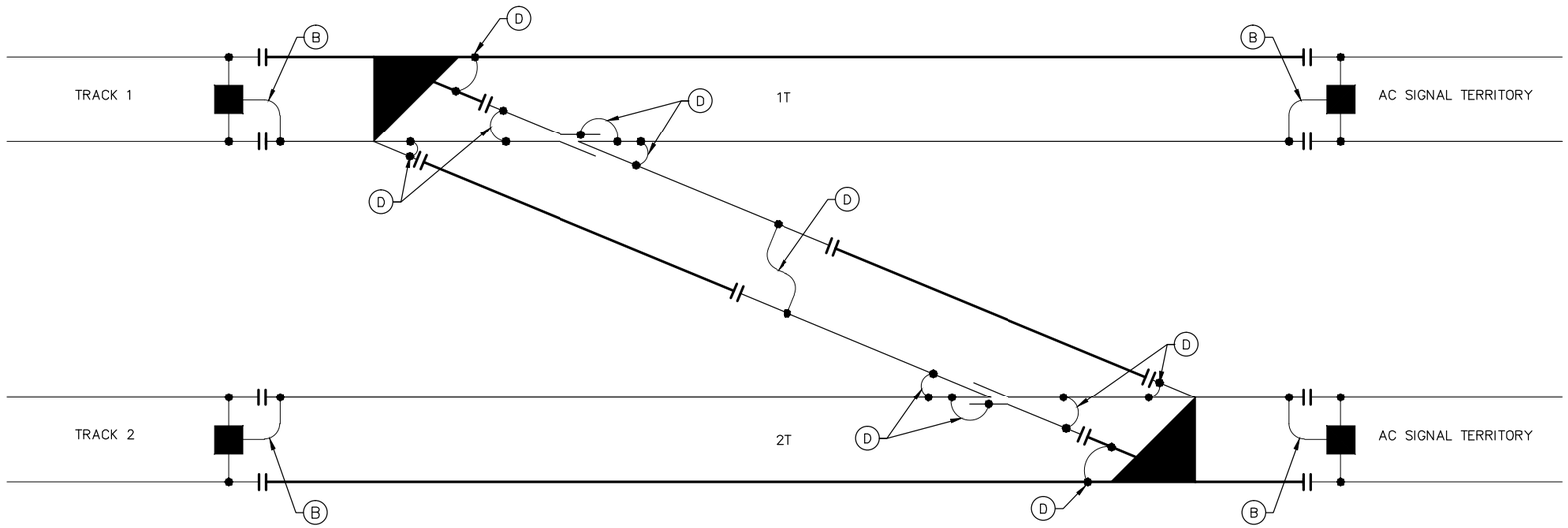
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
RAIL BONDING DETAIL - DIAMOND XOVER

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-002

SHEET 159 OF 202

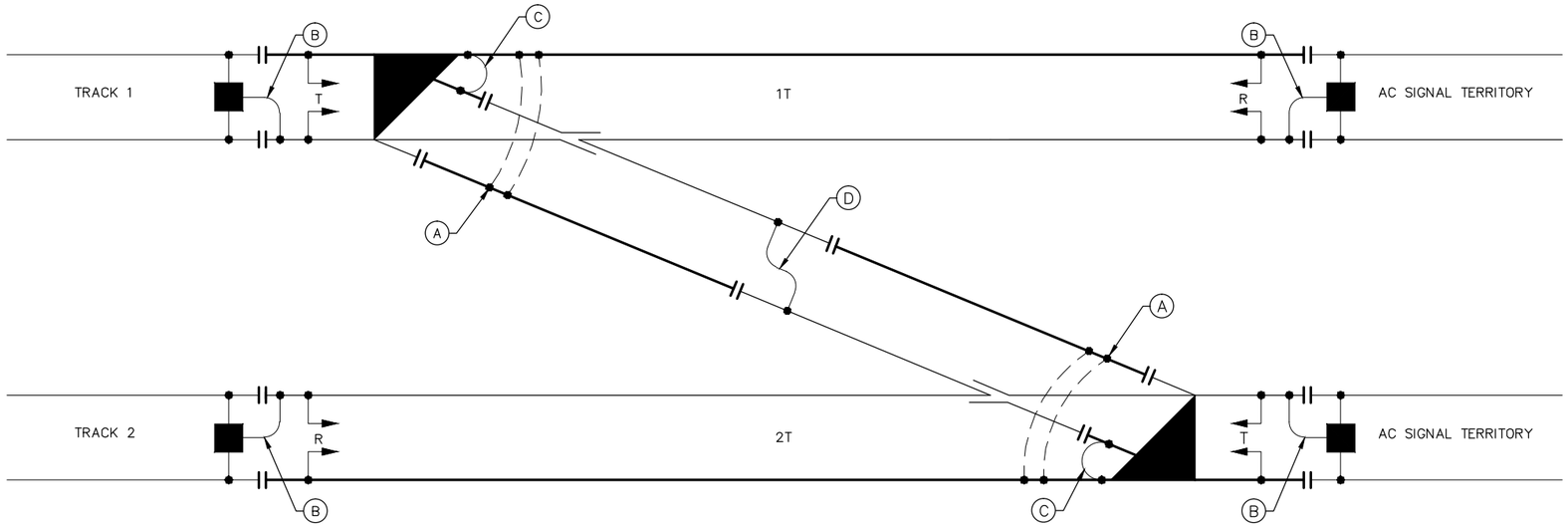
Jun, 26 2014 10:01 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE



1 INTERLOCKING NEGATIVE RETURN RAIL BONDING
SCALE: NTS

NOTES:

1. RAIL BONDING SHALL BE ACCOMPLISHED WITH MECHANICAL CONNECTORS, SUCH AS CEMBRE AR60D OR APPROVED EQUAL.
2. THE CONTRACTOR SHALL PROVIDE BONDING PLANS FOR EACH SWITCH POINT LOCATION FOR APPROVAL BY THE CAR.
3. ARRANGEMENT SHOWN IS GENERAL AND IS PROVIDED TO SHOW TYPICAL ARRANGMENTS OF TRACK CIRCUITS, BONDS AND RETURN RAIL CONFIGURATIONS.
4. ALL 500 KCM CABLES ARE ROPELAY
5. CROSS BONDING SHALL NOT BE COMBINED WITH NEGATIVE RETURN AT SUBSTATION.



2 INTERLOCKING SIGNAL RAIL BONDING
SCALE: NTS

SIGNAL AND POWER BONDING KEY

- (A) 1–#6 BOND STRAND (TRACK CIRCUIT JUMPER)
- (B) 3–500 KCM – MECHANICAL RAIL CONNECTION
- (C) 2–250 KCM – MECHANICAL RAIL CONNECTION
- (D) 2–500 KCM – MECHANICAL RAIL CONNECTION

INSULATED JOINT
NEGATIVE RETURN RAIL
SIGNAL RAIL

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
SINGLE RAIL TRACK CIRCUIT RAIL BONDING

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-003

SHEET 160 OF 202

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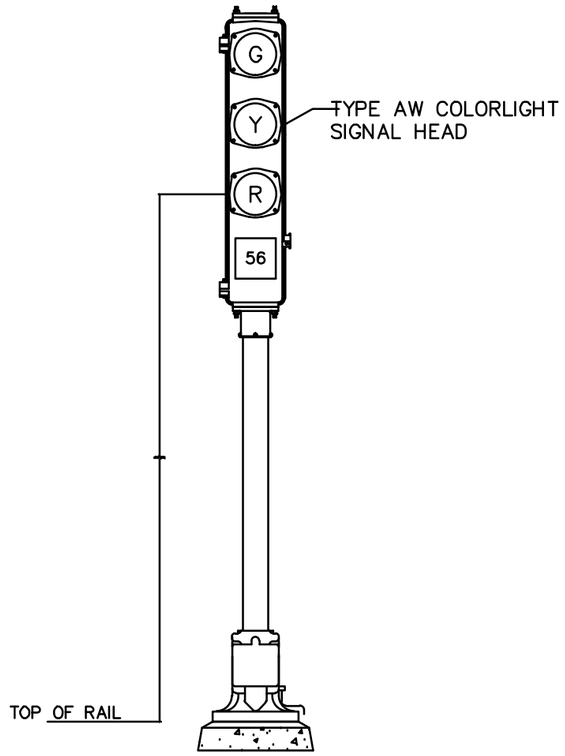
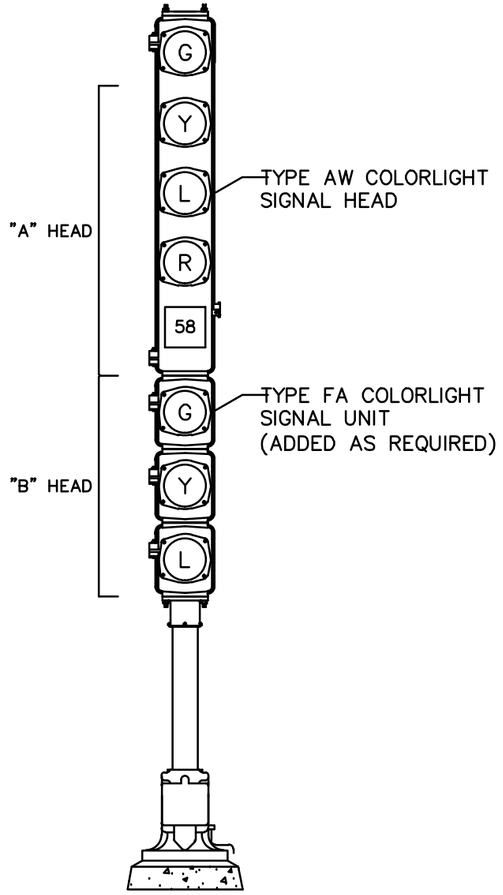
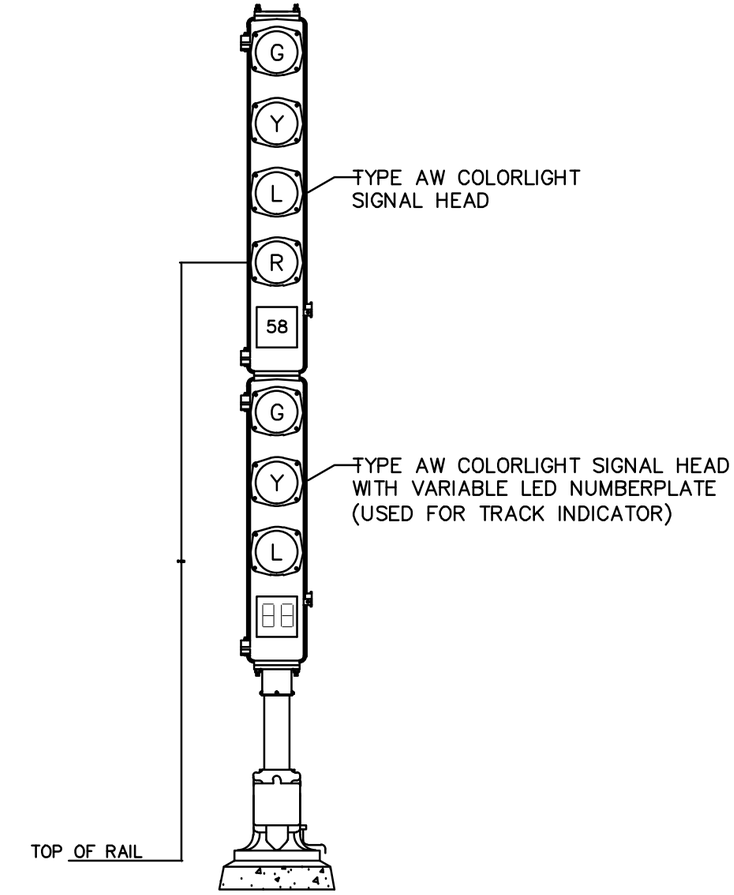
BLOCK SIGNAL



INTERLOCKING SIGNAL



INTERLOCKING SIGNAL WITH TRACK NUMBER INDICATOR



NOTES:

1. TRANSIT SIGNALS – TO BE USED ONLY IN YARDS, TUNNELS, AT STATION PLATFORMS, AND IN URBAN EMBEDDED TRACK ENVIRONMENTS WHERE MOUNTING SPACE IS A CONCERN. ALL OTHER SIGNALS TO BE HIGH SIGNALS.
2. DOUBLET SIGNAL LENSES, 6–3/8" CLEAR OUTER, 5–1/2" COLORED INNER, UNLESS LEDs SPECIFIED.
3. METAL HOODS TO BE 4" LONG.
4. HEADS TO BE PAINTED FLAT BLACK.
5. MAST AND JB TO BE ALUMINUM (NOT PAINTED).
6. LAMPS TO BE 10V/18W, SINGLE FILAMENT, UNLESS LEDs SPECIFIED.
7. PRE–CAST CONCRETE FOUNDATION.
8. SIGNAL NUMBER PLATES SHALL MEET AREMA
9. ALL SIGNALS TO BE MIN. 76" FROM CENTERLINE OF TANGENT TRACK, EXCEPT WHERE SIGNAL IS LOCATED AT END OF PLATFORM.
10. TRANSIT SIGNALS SHALL USE 4" ALUMINUM MAST.
11. DRAWING NOT TO SCALE.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TRANSIT SIGNALS

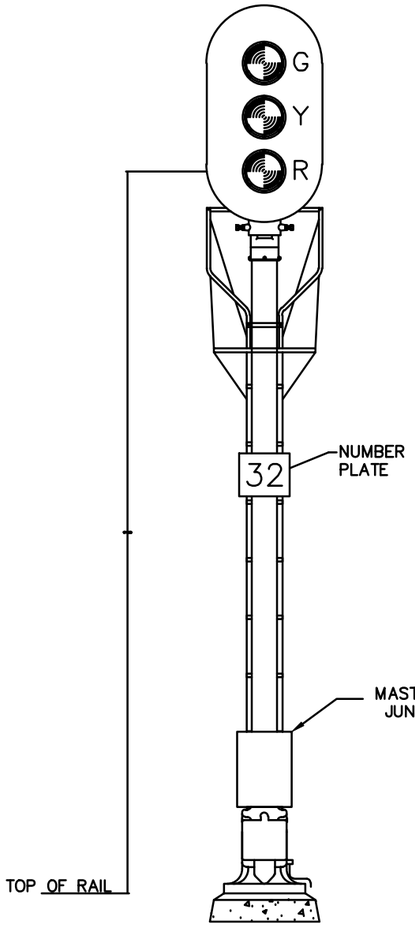
DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-004

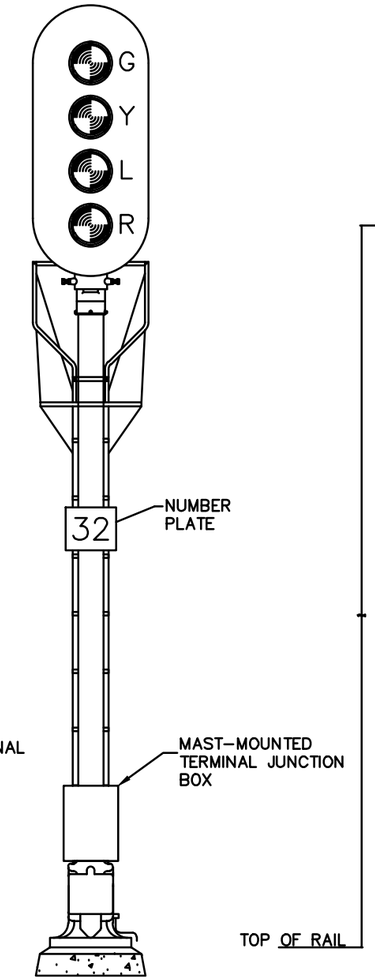
SHEET 161 OF 202

Jun, 26 2014 10:01 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE

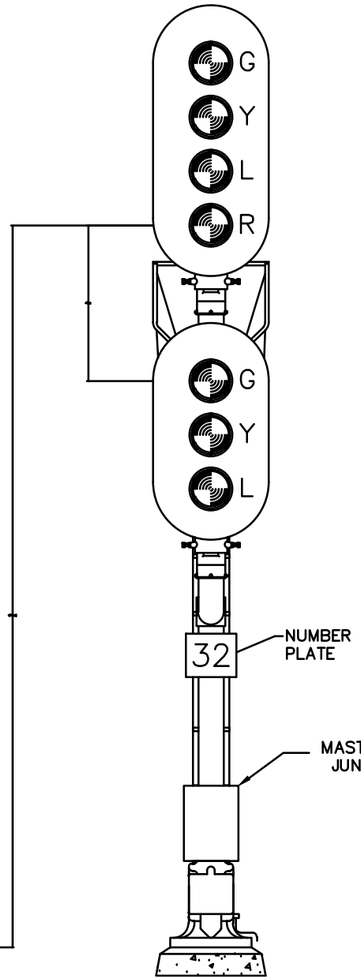
BLOCK SIGNAL



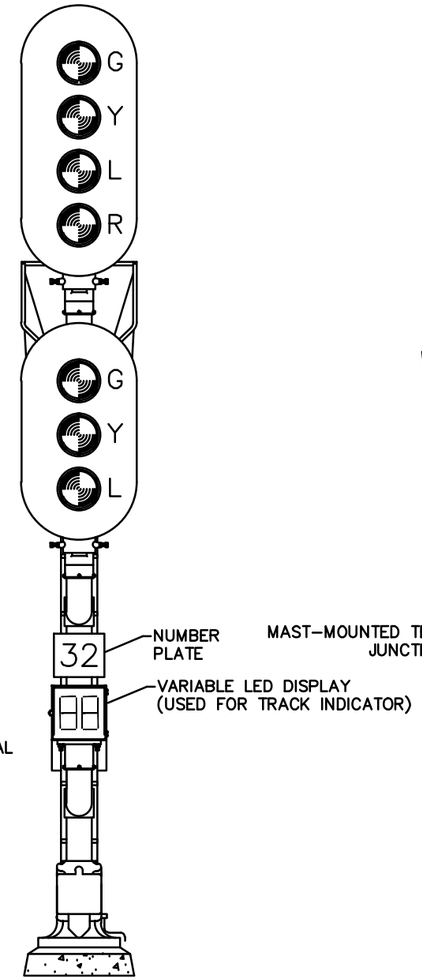
INTERLOCKING SIGNAL (ONE HEAD)

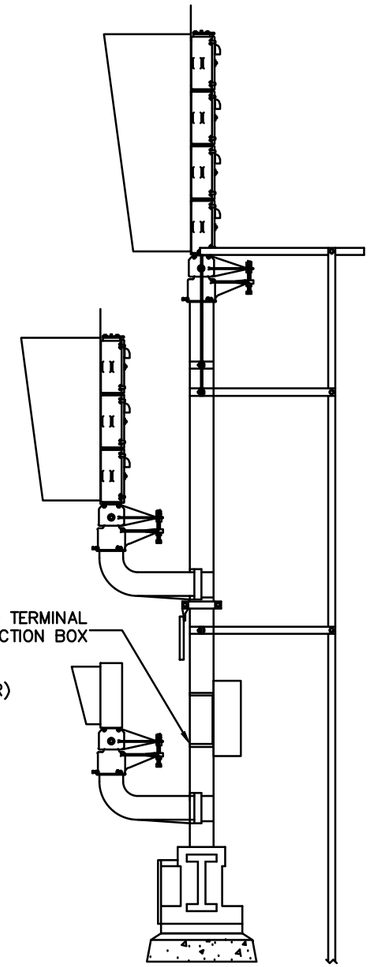


INTERLOCKING SIGNAL (TWO HEADS)



INTERLOCKING SIGNAL (TWO HEADS) WITH TRACK NUMBER INDICATOR





NOTES:

1. HIGH SIGNALS – TO BE USED AS BLOCK AND INTERLOCKING SIGNALS ON MAINLINE TRACKAGE WHERE HIGHER SPEEDS AND VISIBILITY ARE A CONCERN. TO BE USED AT ALL LOCATIONS OTHER THAN THOSE FOR WHICH TRANSIT SIGNALS ARE SPECIFIED.
2. DOUBLET SIGNAL LENSES, 8–3/8" CLEAR OUTER, 5–1/2" COLORED INNER, UNLESS LEDs SPECIFIED.
3. SNOW HOODS, BACKGROUNDS, LADDERS, AND PLATFORMS SHALL BE PROVIDED.
4. HEADS TO BE PAINTED FLAT BLACK.
5. MAST AND JB TO BE ALUMINUM (NOT PAINTED).
6. LAMPS TO BE 10V/18W, SINGLE FILAMENT, UNLESS LEDs SPECIFIED.
7. PRE–CAST CONCRETE FOUNDATION.
8. SIGNAL NUMBER PLATES SHALL MEET AREMA
9. ALL SIGNALS TO BE MIN. 76" FROM CENTERLINE OF TANGENT TRACK, EXCEPT WHERE SIGNAL IS LOCATED AT END OF PLATFORM.
10. HIGH SIGNALS SHALL USE 5" ALUMINUM MAST.
11. DRAWING NOT TO SCALE.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

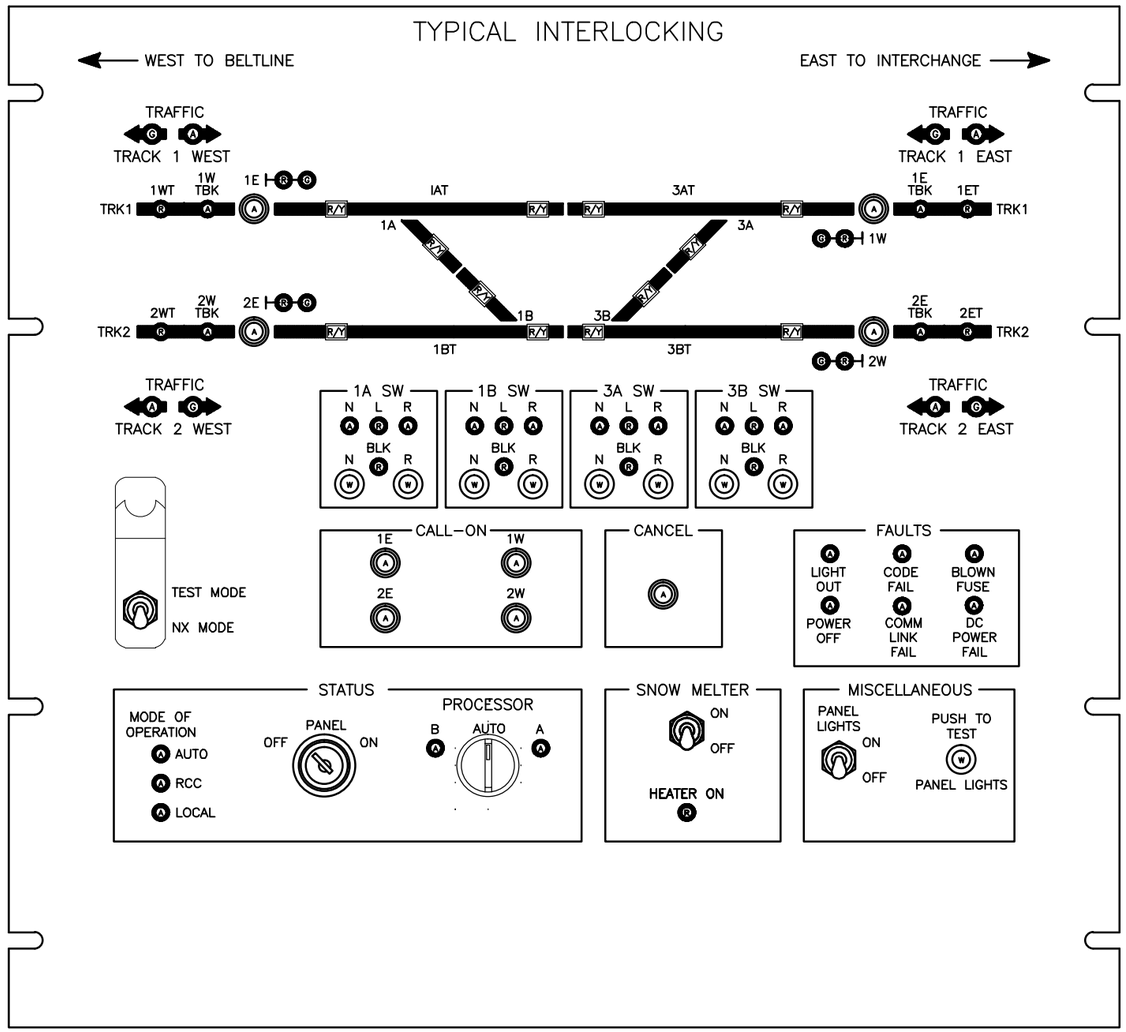
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
WAYSIDE HIGH SIGNALS

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-005

SHEET 162 OF 202

Jun, 26 2014 10:01 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE



MATERIAL:
BLACK POWDER COAT ALUMINUM WITH
LASER ENGRAVED TRACK AND LETTERING

TRACK: 5/16" WIDE
LINES: 1/32" WIDE
LETTERING: SMALL – .15" LARGE – .18"
LOCATION NAME – .31"

ROUND LEDS:
DIALIGHT 607 SERIES
- R = RED 607-2112-130F
- A = AMBER 607-2312-130F
- G = GREEN 607-2212-130F

2 COLOR LED:
- R/Y LUMEX SSI-LXH0721YW35649

PUSHBUTTON:
EAO SERIES 11
- PUSHBUTTON WITHOUT LAMP:
  PUSHBUTTON: EAO 11-271.825
  W = WHITE LENS: EAO 11-931.9
- PUSHBUTTON WITH LAMP:
  PUSHBUTTON: EAO 11-131.825
  A = AMBER LENS: EAO 11-931.4

KNURLED CONICAL MOUNTING NUT: EAO 11-937

TOGGLE SWITCH: C&K 7101TZQE

KEY SWITCH:
ACTUATOR: EAO 704.121
CONTACT MODULE: EAO 704.901.3
SHALL MATCH EXISTING METRO TRANSIT STND

3 POSITION SWITCH:
ACTUATOR: EAO 704-403.0
CONTACT MODULE: EAO 704.901.5

SWITCH GUARD: HONEYWELL
19PA184-NT

NOTE:
1. LAYOUT IS TYPICAL. CONTRACTOR SHALL PROVIDE A DETAILED LOCAL CONTROL PANEL LAYOUT FOR EACH LOCATION AND SUBMIT TO THE ENGINEER FOR APPROVAL.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TYP LOCAL CONTROL PANEL FACEPLATE

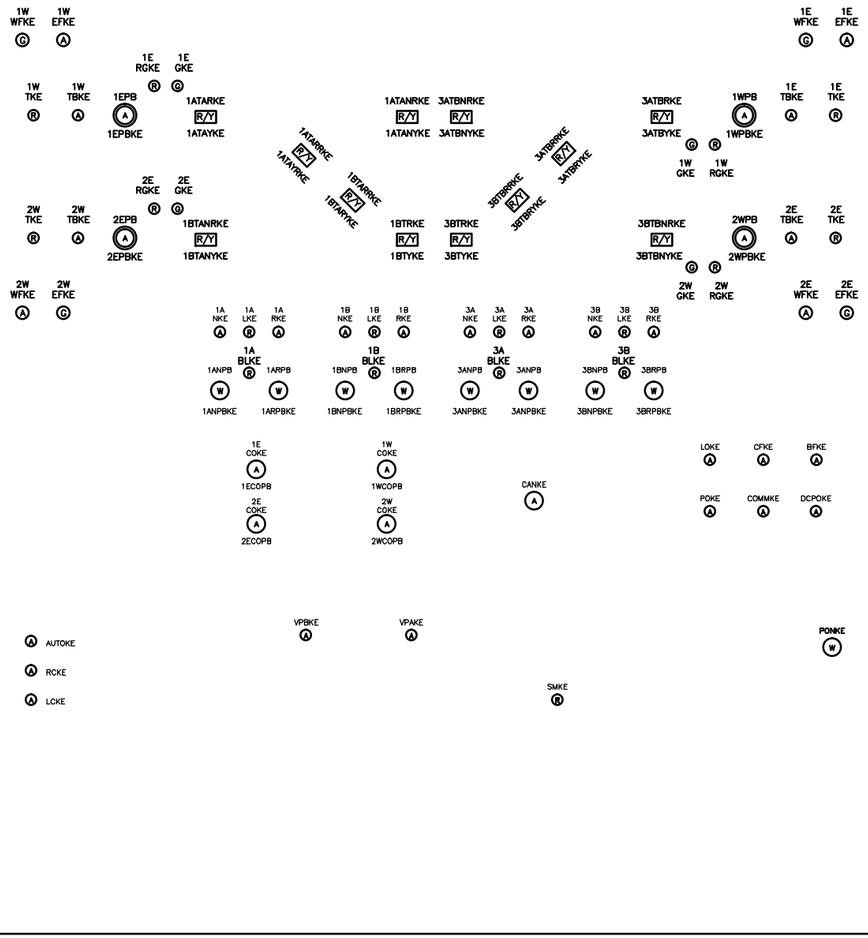
DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-006

SHEET 163 OF 202

Jun, 26 2014 10:02 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\W0-SYS-SIG-DTL.dwg By: HeinEE

TYPICAL INTERLOCKING



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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

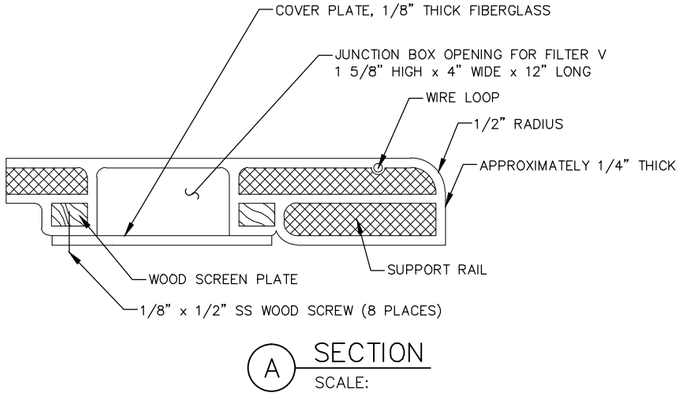
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TYP INTERLOCKING LCP NOMENCLATURE

DISCIPLINE: SYSTEMS

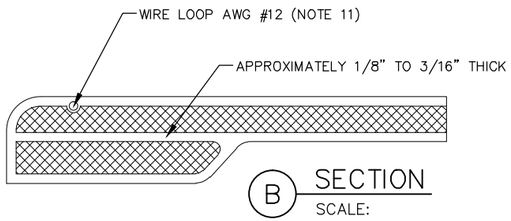
SHEET NAME: SIG-DTL-007

SHEET 164 OF 202

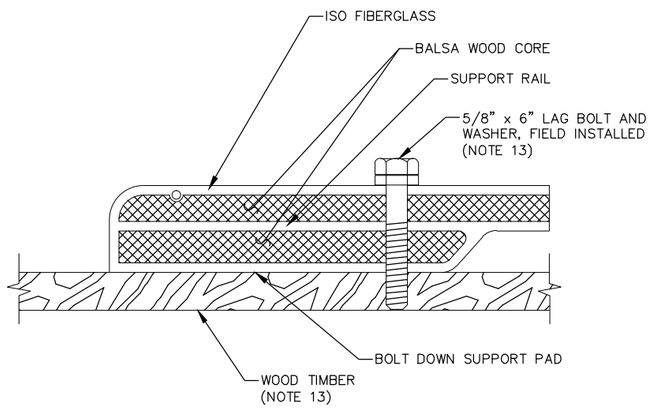
Jun, 26 2014 10:02 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE



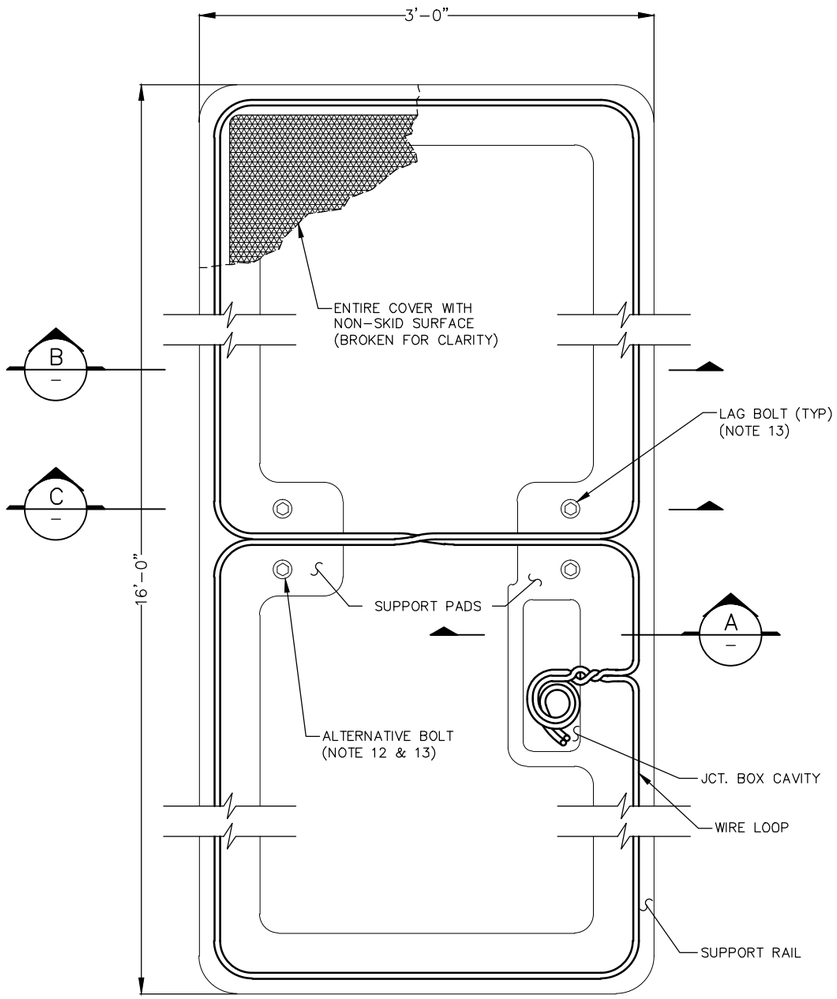
A SECTION
SCALE:



B SECTION
SCALE:



C SECTION
SCALE: NTS



PLAN VIEW

1 TWC LOOP
SCALE: NTS

NOTE:

1. TWC LOOP ANTENNAS SHALL BE 3'x16' FOR MAINLINE INSTALLATIONS.
2. LOOP ANTENNA CONSTRUCTION SHALL BE OF FIBERGLASS AND WOOD
3. METAL COMPONENTS ARE NOT PERMITTED. OTHER THAN TWC CLIPS & LAG BOLTS
4. TOTAL WEIGHT SHALL NOT EXCEED 200 LBS FOR THE 16' LOOP
5. THE LOOP ANTENNA ASSEMBLY SHALL BE ABLE TO SUPPORT 1000 LBS IN A 3' OUTSIDE SUPPORTED SPAN
6. TOP SHALL BE MOLDED WITH AN AGGRESSIVE NON-SKID TEXTURE, AS APPROVED BY ENGINEER
7. TOP TO INCLUDE 1/4" CROWN ALONG THE LONG AXIS OF THE LOOP
8. OUTSIDE FINISH SHALL BE GRAY GELCOAT OR EQUIVALENT, AS APPROVED BY ENGINEER. FINISH THICKNESS SHALL BE 20 THOUSANDS OF ONE INCH MINIMUM
9. A JUNCTION BOX CAVITY TO BE MOLDED INTO LOOP ASSEMBLY. A 1/8" THICK COVER PLATE SHALL COVER JUNCTION BOX CAVITY ATTACHED BY EIGHT (8) SS SCREWS. COVER PLATE SHALL HAVE KNOCKOUT TO ALLOW 3/4" LIQUID-TITE FLEX CONDUIT ATTACHMENT
10. LOOP WIRE TO BE PLACED 2" OFFSET FROM OUTSIDE EDGE OF ASSEMBLY. LOOP WIRE TO CROSS AT CENTER AND TERMINATE AT JUNCTION BOX CAVITY WITH 120" OF EXTRA LEAD. LEADS TO BE TWISTED FROM LOOP CLOSING TO JUNCTION BOX
11. LOOP WIRE SHALL BE AWG #12 XHHW POLYETHYLENE JACKETED TRAFFIC SIGNAL LOOP WIRE
12. SUPPORT RAILS SHALL BE MOLDED INTO ASSEMBLY OUTER EDGES. SUPPORT PADS TO ALLOW FOR FIELD INSTALLATION OF TWO 5/8" LAG BOLTS PLACED A MINIMUM OF 2" EITHER SIDE OF WIDTH CENTERLINE AND 6" FROM OUTSIDE EDGE
13. CURRENTLY THE USE OF LAG BOLTS AND WOOD TIMBER IS NOT ALLOWED WITHOUT PRIOR APPROVAL FROM THE RESIDENT ENGINEER

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AECOM PARSONS BRINCKERHOFF
PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL
SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
TWC LOOP ANTENA

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-008

SHEET 165 OF 202

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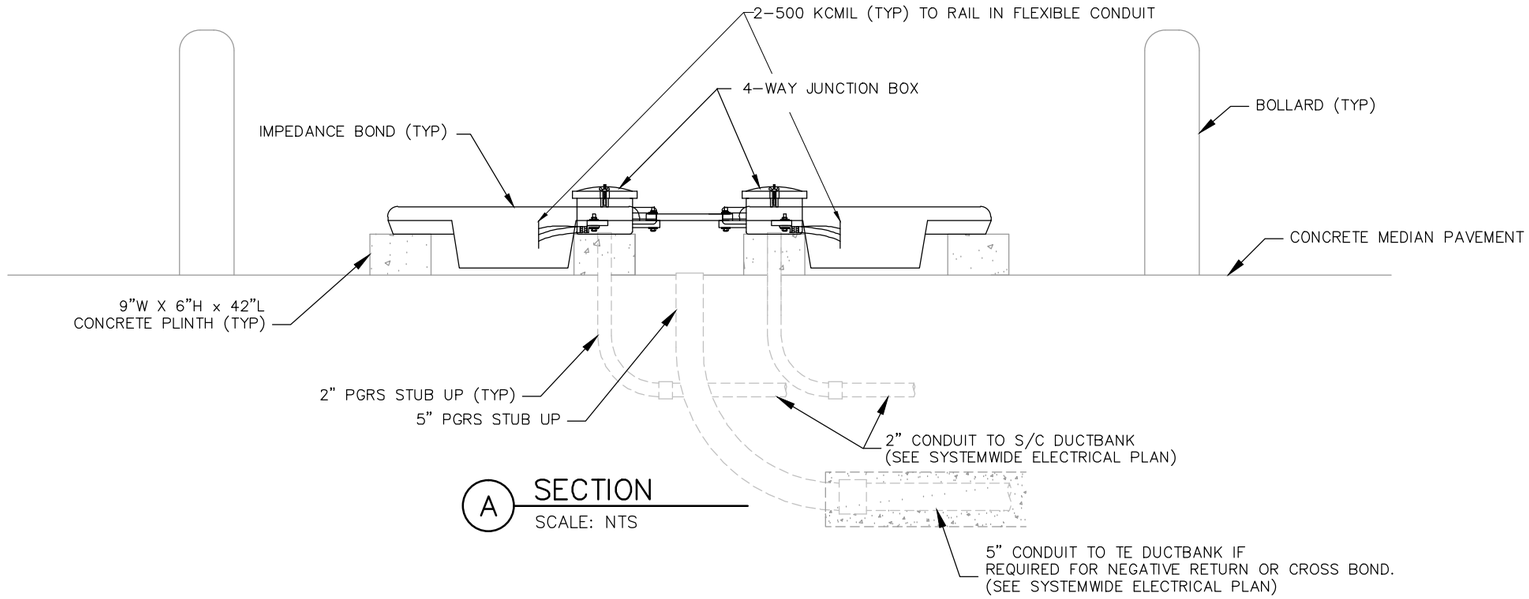

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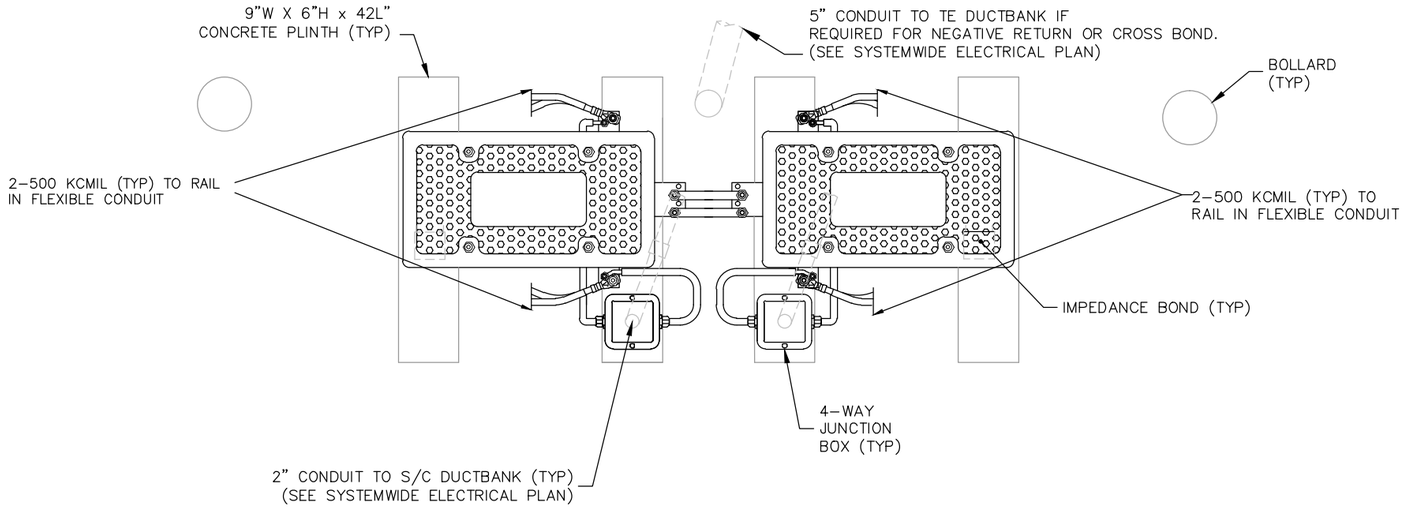

1 PLAN VIEW
SCALE: NTS

NOTES:

1. CONCRETE PLINTHS ARE ARRANGED TO ALLOW THE MOUNTING OF STANDARD RAIL IMPEDANCE BONDS SIMILAR TO STANDARD TIE MOUNTED INSTALLATIONS.
2. THE 6" PLINTH HEIGHT ACCOMMODATES A TYPICAL IMPEDANCE BOND DEPTH AND AN ADDITIONAL 2" OF CLEARANCE BELOW.

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PRELIMINARY ENGINEERING

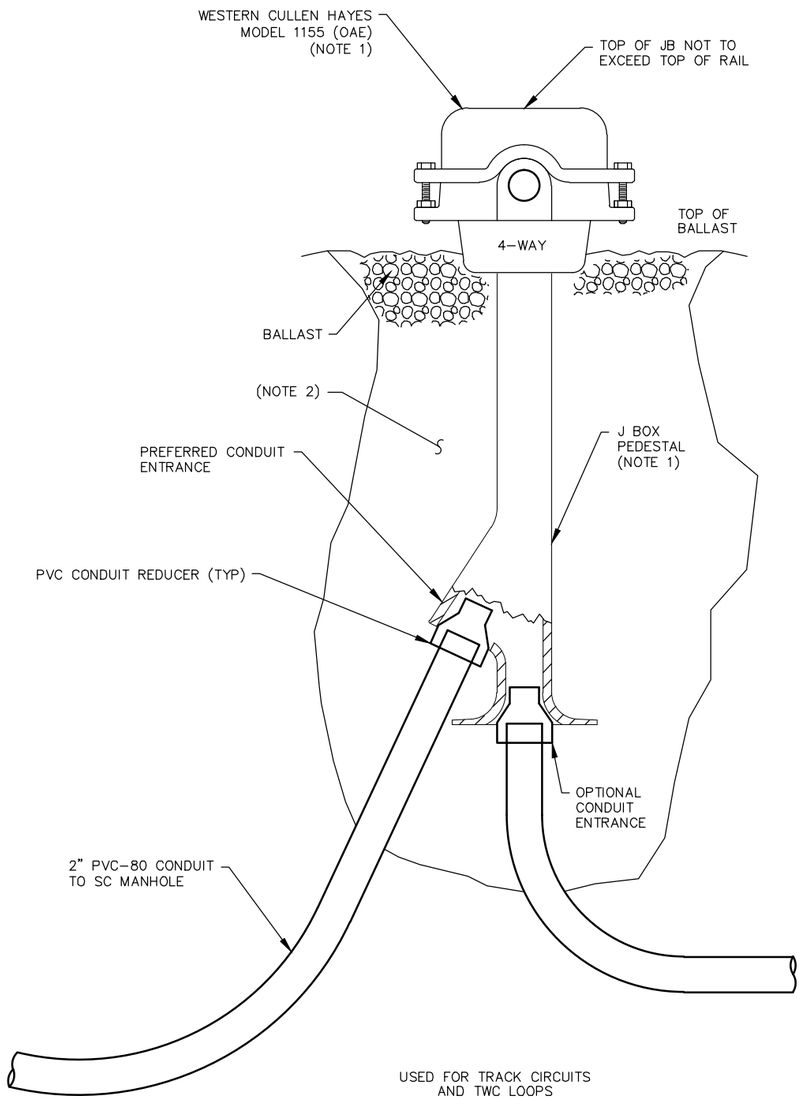
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
IMPEDANCE BOND MOUNTING - PLINTH

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-009

SHEET 166 OF 202

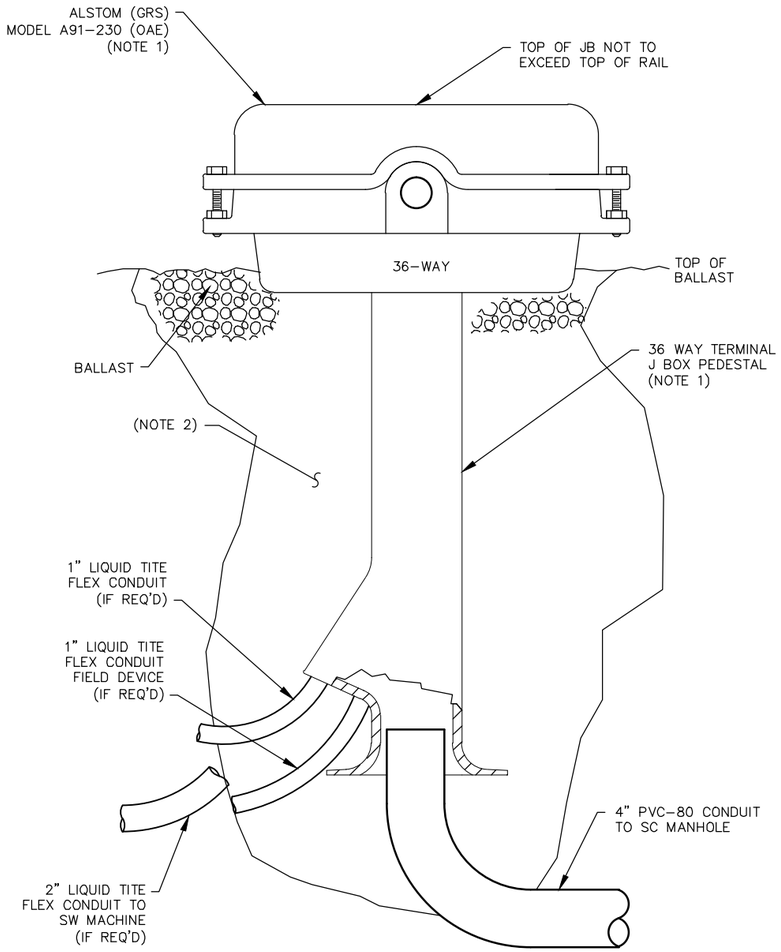
Jun. 26 2014 10:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE



USED FOR TRACK CIRCUITS
AND TWC LOOPS

1 4-WAY BOOTLEG JUNCTION BOX DETAIL

SCALE: NTS



USED FOR MAINLINE SWITCH MACHINES

2 36-WAY BOOTLEG JUNCTION BOX DETAIL

SCALE: NTS

NOTES:

1. EQUIPMENT DETAILS SHALL BE SUBMITTED FOR APPROVAL
2. EXCAVATION FOR BOOTLEG AND JUNCTION BOX INSTALLATION WILL REQUIRE REMOVAL OF BALLAST, SUB-BALLAST AND NATIVE SOIL OR BACKFILL MATERIALS. THESE MATERIALS MUST BE KEPT SEPARATED AND NOT MIXED TOGETHER WHEN BACKFILLING
3. THE CONTRACTOR SHALL EQUIP EACH JUNCTION BOX PROVIDED WITH A COMPLETE SET OF GOLD NUT TEST LINKS AND APPROPRIATE STRAPS FOR ALL TERMINALS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

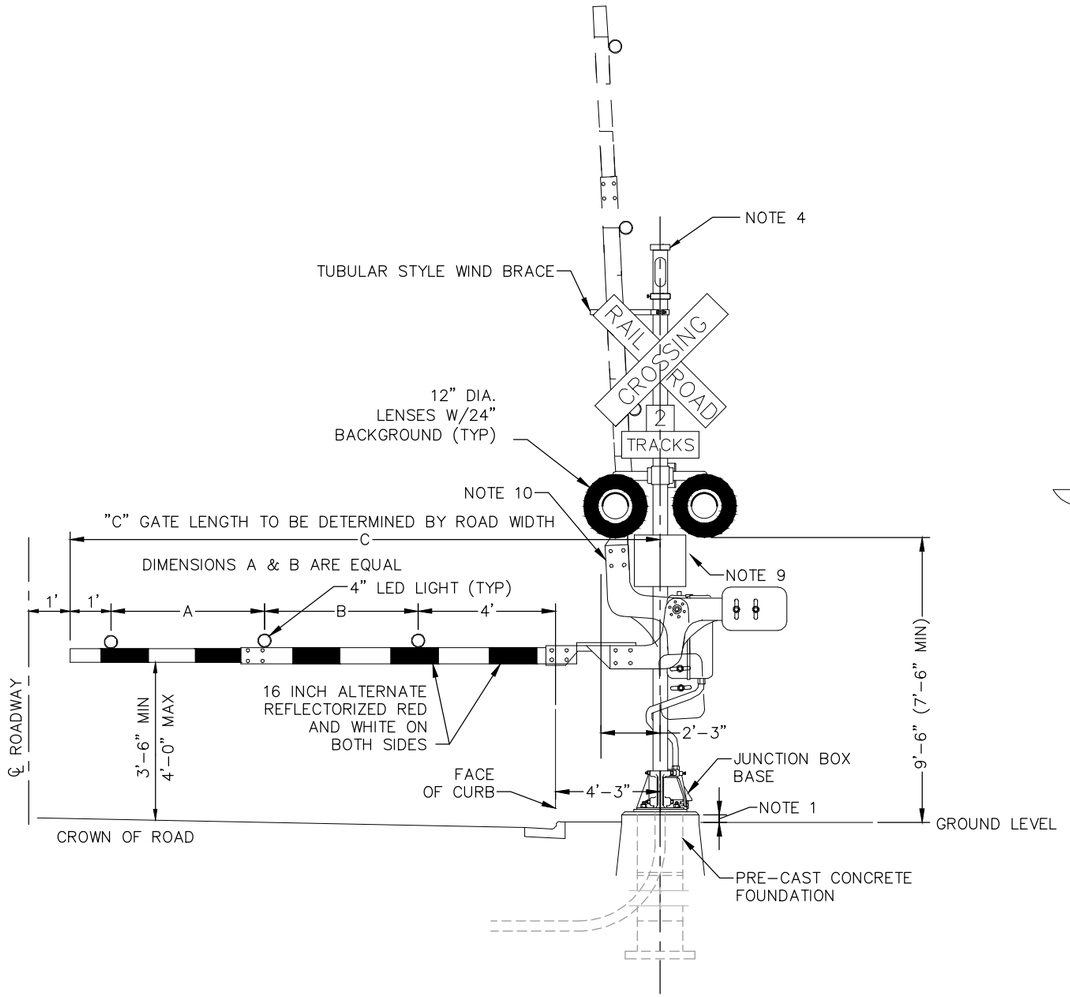
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
EQUIPMENT DETAILS
BOOTLEG JUNCTION BOX INSTALLATION

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-010

SHEET 167 OF 202

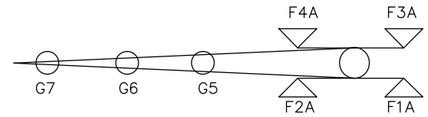
Jun. 26 2014 10:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-DTL.dwg By: HeinEE



1 TYPICAL CROSSING GATE INSTALLATION DETAIL
SCALE: NTS

NOTE:

1. TOP OF FOUNDATION TO BE NO HIGHER THAN 4" ABOVE GROUND LEVEL ADJACENT TO FOUNDATION.
2. PROVIDE CABLE ENTRANCES TO FOUNDATIONS AS REQUIRED.
3. PRE-CAST FOUNDATIONS ARE PREFERRED WHERE POSSIBLE.
4. WESTERN CULLEN HAYES MODEL WCH0777 ELECTRONIC BELL.
5. "2 TRACK" SIGN REQUIRED FOR ALL CROSSINGS. IF MORE THAN 2 TRACKS, SIGN MUST STATE NUMBER OF TRACKS.
6. SEE DETAIL 2 FOR FLASHING LIGHT NUMBERING.
7. INSTALL GROUND ROD ADJACENT TO FOUNDATION AND CONNECT GROUND WIRE TO GROUND STUD ON SIGNAL BASE. ATTACH GROUND ROD TO INTERNAL GROUND LUG WITH #2/0 GROUNDING CONDUCTOR FOR FOUNDATIONS LESS THAN 15' FROM ℄ OF TRACK. USE #6 BARE COPPER GROUNDING CONDUCTOR FOR FOUNDATIONS BEYOND 15' FROM ℄ OF TRACK.
8. SEE INDIVIDUAL CROSSING DRAWINGS FOR UNIQUE SITE INFORMATION.
9. 24"X24"X9" DEEP "SECOND TRAIN" SIGN ON GATE MAST SHALL BE INSTALLED AND MUST FACE TRACK FOR ALL CROSSINGS WHERE PEDESTRIANS ARE PRESENT.
10. GENERAL SIGNALS MODEL SK-1000-KW BI-DIRECTIONAL GATE KEEPER REQUIRED FOR EACH GATE.



2 XING LIGHTING FLASHER NAMES
SCALE: NTS

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

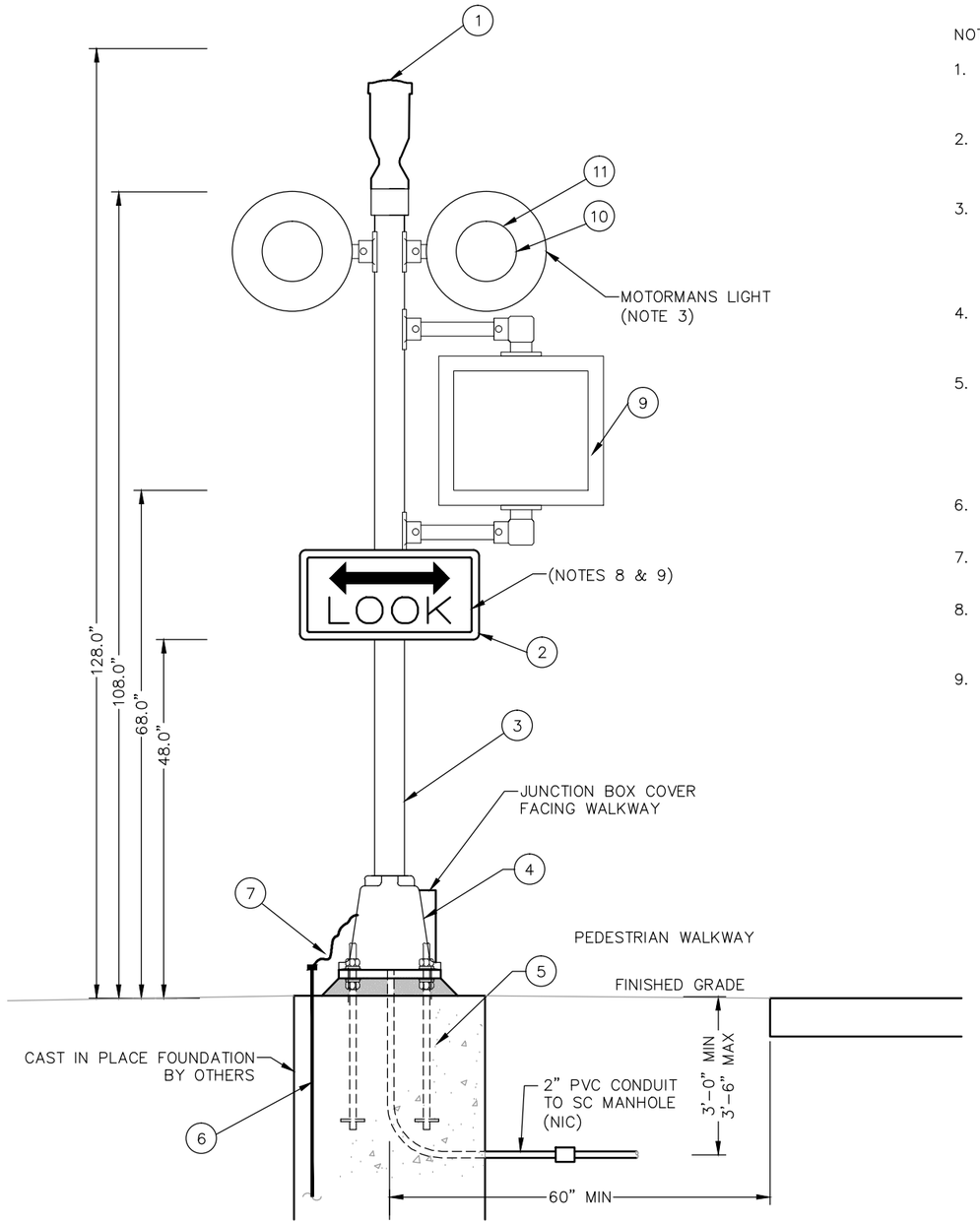
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
GRADE CROSSING EQUIPMENT
ARRANGEMENT & INSTALLATION DETAILS

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-101

SHEET 168 OF 202

Jun, 26 2014 10:03 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RLT.dwg By: HeinEE

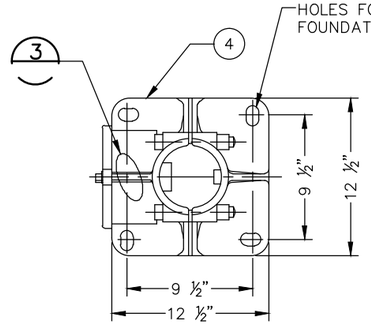


1 PEDESTRIAN FLASHER DETAIL
SCALE: NTS

NOTE:

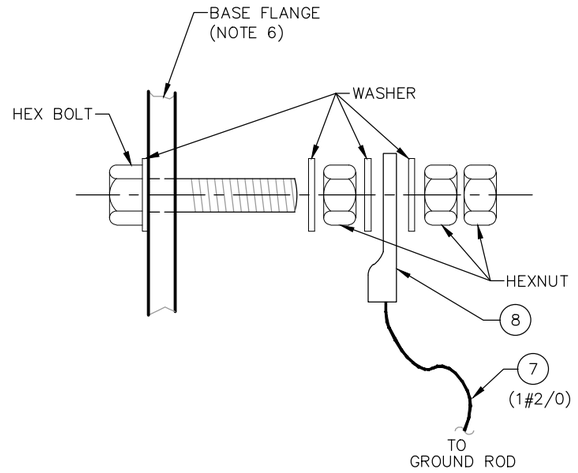
1. THE BILL OF MATERIALS ONLY INCLUDES THE MAJOR ITEMS AND DOES NOT INCLUDE ALL REQUIRED ITEMS FOR A COMPLETE INSTALLATION.
2. THIS CROSSING WARNING SIGNAL ASSEMBLY SHALL BE DOUBLE–SIDED, WITH EACH ACTIVE AND PASSIVE SIGNAL VIEWABLE FOR EACH DIRECTION.
3. EACH FLASHING UNIT SHALL INCLUDE A "MOTORMANS" SIDELIGHT BUILT INTO THE SIGNAL HOUSING UNIT. THE "MOTORMAN" SIDELIGHTS SHALL BE LOCATED TO PROVIDE A VISUAL INDICATION TO THE LRV OPERATOR THAT THE CROSSING WARNING DEVICE IS ACTIVE.
4. THE 2–SIDED LED SECOND TRAIN SIGN SHALL BE MANUFACTURED IN ACCORDANCE WITH ALL APPLICABLE SYSTEMS SPECIFICATIONS.
5. THE 2–SIDED LED SECOND TRAIN SIGN SHALL BE CONFIGURED SO THAT EACH LED PANEL CAN BE REPLACED WITHOUT REPLACING THE ENTIRE DEVICE, USING A DISCRETE POWER SUPPLY AND CABLING TO ENSURE THAT A SINGLE FAILURE WILL NOT DISABLE BOTH SIDES OF THE ACTIVE WARNING SIGN.
6. DRILL FLANGE FOR CONNECTION OF GROUND STUD TO BASE.
7. MANUFACTURERS SHALL BE SUBMITTED FOR APPROVAL BY THE CAR.
8. THE SIZE FOR THE STANDARD R15–8 SHALL BE REDUCED TO 12" X 24", SCALED FOR THE PEDESTRIAN SPECIFIC CROSSING DEVICE.
9. THE SIGN SHALL BE CONSTRUCTED TO MEET THE REQURIEMENTS OF MNDOT SPECIFICATIONS FOR MATERIALS AND REFLECTIVITY.

BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION
1	1	WESTERN CULLEN HAYES MODEL WCH0777 ELECTRONIC BELL
2	2	12" X 24" "LOOK" STATIC REFLECTIVE SIGN, MUTCD R15–8
3	1	SIGNAL MAST, ALUMINUM, 4"
4	1	SPLIT JUNCTION BOX BASE (NOTE 7)
5	1	CAST IN PLACE FOUNDATION BY OTHERS (NOTE 7
6	1	10' COPPER CLAD GROUND ROD BY OTHERS
7	AS REQ'D	#2/0 BARE STRANDED COPPER WIRE
8	1	GROUND LUG AMP #33467
9	1	18" X 16" LED 2nd TRAIN APPROACHING SIGN– 2 SIDED, (NOTES 4 & 5)
10	2	16" ALUMINUM BACKGROUND, FLAT BLACK, WITH 9" VISOR
11	2	8" LED SIGNAL ROUNDEL, RAIL OR TRANSIT APPLICATION



PLAN VIEW

2 PEDESTRIAN FLASHER BASE PLATE DETAIL
SCALE: NTS



3 PEDESTRIAN FLASHER POLE GROUNDING DETAIL
SCALE: NTS

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

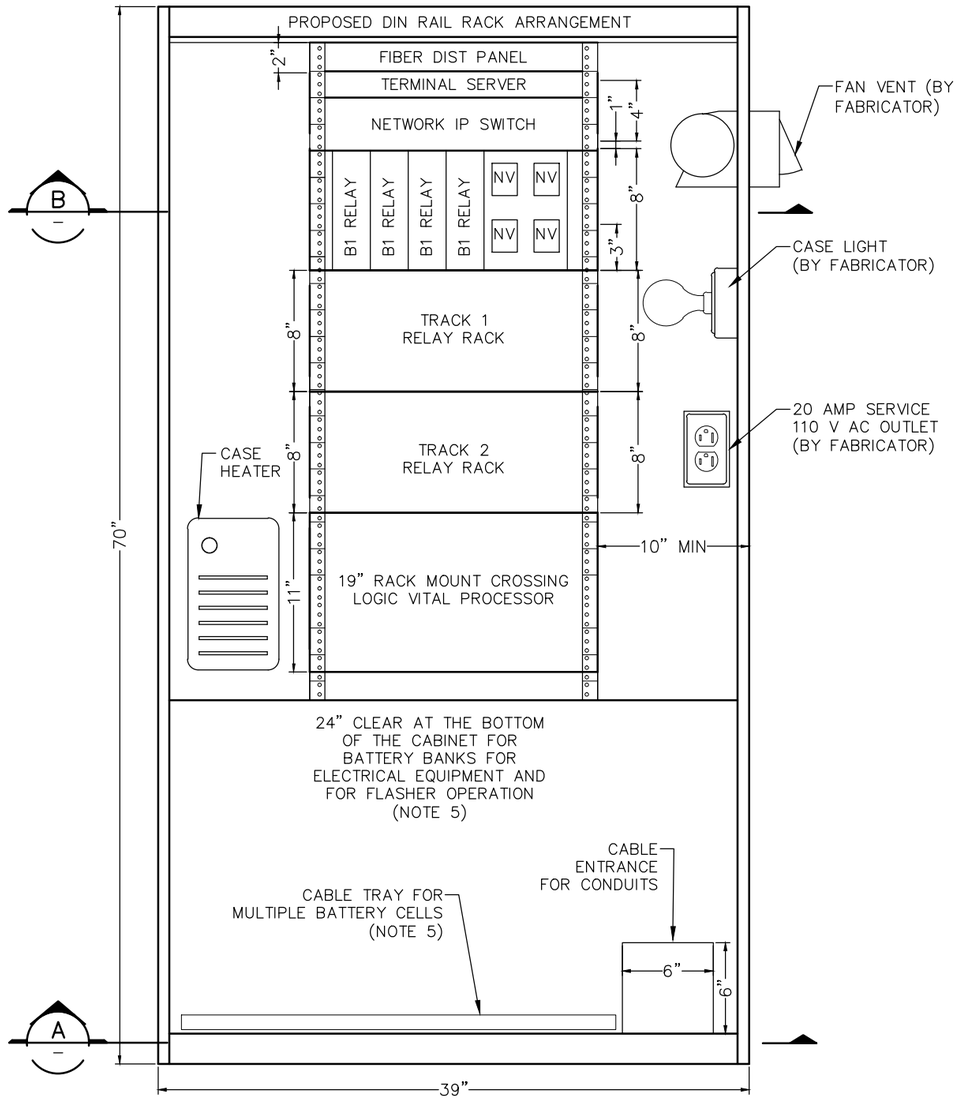
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
PEDESTRIAN CROSSING EQUIPMENT
PEDESTRIAN CROSSING BELL & FLASHER

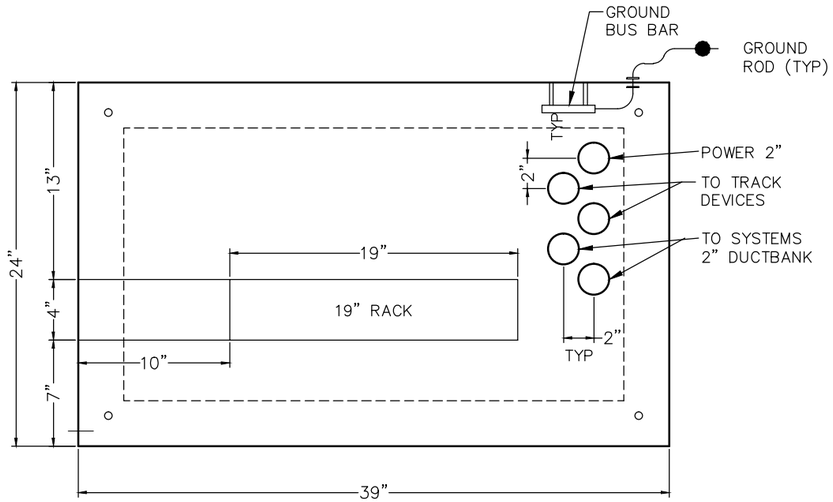
DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-201

SHEET 169 OF 202

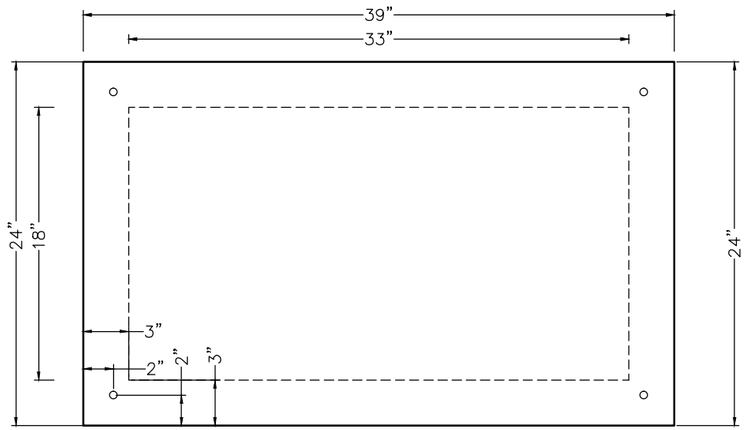
Jun. 26 2014 10:03 am V:\3200_PEC–W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS–SIG\WO–SYS–SIG–RLT.dwg By: HeinEE



1 CONTROLLER CABINET
SCALE: NTS



B BACK PANEL DIMENSIONS
SCALE: NTS



A BASE DIMENSIONS
SCALE: NTS

NOTES:

1. THIS CABINET ARRANGEMENT IS INTENDED AS A GUIDE FOR EQUIPMENT ARRANGEMENT ONLY. THE CONTRACTOR SHALL FABRICATE A CABINET DESIGNED FOR THE ACTUAL EQUIPMENT CHOSEN BY THE CONTRACTOR THAT WILL MEET THE REQUREMENTS OF THE CONTRACT AND THE FUNCTIONAL REQUIREMENTS OF A PEDESTRIAN CROSSING.

2. THE EQUIPMENT SHOWN IS FOR INFORMATION ONLY. THE ACTUAL EQUIPMENT INSTALLED SHALL BE CHOSEN BY THE CONTRACTOR TO MEET THE FUNCTIONAL NEEDS OF THE PEDESTRIAN CROSSING AND WILL BE SUBMITTED TO THE CAR FOR APPROVAL PRIOR TO FABRICATION.

3. THE CABINET WILL BE STAINLESS STEEL, WITH A FRONT AND A BACK DOOR FOR ACCESSING EQUIPMENT MOUNTED ON EACH SIDE. THE 19 INCH RACK IS SHOWN CENTERED IN THE CABINET, BUT IT MAY MOVE LEFT OR RIGHT TO MEET THE INSTALLATION NEEDS OF THE EQUIPMENT ACTUALLY CHOSEN. THE RACK MAY BE ELIMINATED IF IT IS SHOWN THAT BOARD MOUNTING IS DESIREABLE.

4. THE DIMENSIONS OF THE CABINET ARE SHOWN FOR REFERENCE ONLY, THE CABINET SHALL NOT BE HIGHER THAN 84 INCHES ABOVE THE SITE PAVING LEVEL. THE CONTRACTOR SHALL CHOOSE A DESIGN THAT IS COORDINATED WITH THE FOUNDATION THAT WILL BE INSTALLED AS PART OF A SEPARATE CONTRACT. ACTUAL DIMENSIONS SHALL BE SHOWN ON THE PEDESTRIAN CABINET DESIGN SUBMITTED TO THE CAR FOR APPROVAL.

5. THE BATTERY REQUIREMENTS FOR THIS DESIGN WILL BE DETERMINED AFTER THE EQUIPMENT IS CHOSEN BY THE CONTRACTOR FOR FABRICATION. THE SPACE AT THE BOTTOM OF THE CABINET IS RESERVED FOR MULTI-CELL BANKS OF BATTERIES THAT WILL MEET THE REQUIREMENTS OF THE FLASHER/WARNING DEVICE, WITH AN ADDITIONAL BANK FOR THE OPERATION OF THE ELECTRONICS. THIS SPACE MAY BE ADJUSTED BY THE CONTRACTOR.

6. THE CONTRACTOR SHALL POST DRILL THE ANCHOR BOLTS FOR THE CABINET AT THE TIME OF INSTALLATION, USING A CHEMICAL TYPE ANCHOR DESIGNED FOR THE SPECIFIC INSTALLATION.

7. FOR ADDITIONAL INFORMATION ON THE FUNCTIONAL REQUIREMENTS OF THE PEDESTRIAN CROSSING WARNING DEVICES, SEE TECHNICAL SPECIFICATION.

8. THE DESIGNER SHALL UTILIZE BOTH SIDES OF THE RACK FOR WIRING AND FOR EQUIPMENT MOUNTING FOR DEVICES SUCH AS 110VAC POWER DISTRIBUTION CIRCUIT BREAKERS, DIN RAIL MOUNTED TERMINALS, BATTERY CHARGERS, LIGHTNING AND SURGE PROTECTION, ETC.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

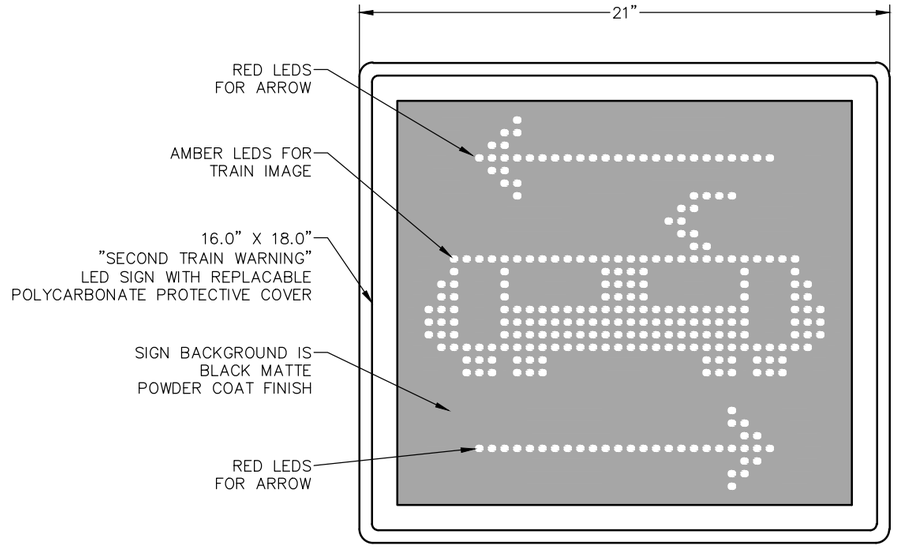
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
PEDESTRIAN CROSSING EQUIPMENT
CONTROLLER CABINET

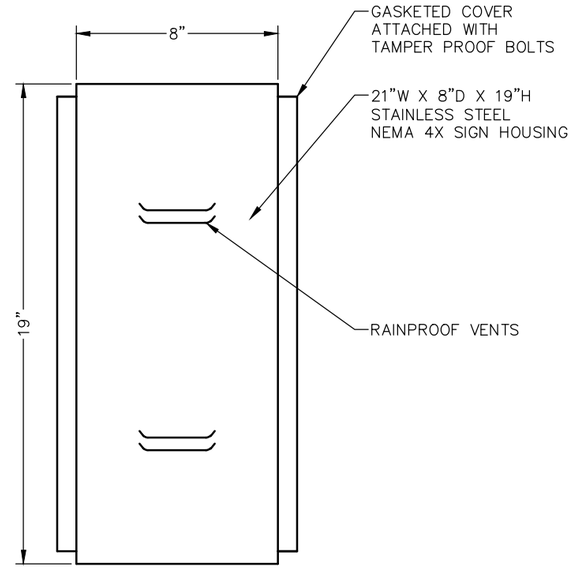
DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-202

SHEET 170 OF 202

Jun, 26 2014 11:37 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RLT.dwg By: HeinEE



FRONT VIEW
SECOND TRAIN WARNING SIGN
1 SCALE: NTS



SIDE VIEW
SECOND TRAIN WARNING SIGN
2 SCALE: NTS

NOTES:

1. THE 16" X 18" "SECOND TRAIN WARNING" PEDESTRIAN SIGN SHOWN IS TO BE USED FOR PEDESTRIAN CROSSINGS AND IS NOT DESIGNED FOR ROADWAY TRAFFIC.

2. THIS "SECOND TRAIN WARNING" PEDESTRIAN SIGN SHALL BE DOUBLE SIDED, HOUSED IN A RUGGED STAINLESS STEEL NEMA 4X CASE WITH A HINGED AND GASKETED FACE FOR ACCESS AND SERVICE. THE POLYCARBONATE PROTECTIVE COVER AND THE LED UNIT ITSELF SHALL BE EASILY SERVICED, CLEANED, REMOVED OR REPLACED AS NECESSARY FOR STANDARD MAINTENANCE THE SIGN COMPONENTS SHALL BE EASILY REMOVED FOR SERVICE OR REPLACEMENT WITH PLUG COUPLED CABLES AND EASILY ACCESSED SCREWS AND RETAINING CLIPS.

3. THE "SECOND TRAIN WARNING" PEDESTRIAN SIGN SHALL BE AN LED SIGN MANUFACTURED ACCORDING TO THE REQUIREMENTS OF THE FEDERAL HIGHWAY STANDARD HIGHWAY SIGN HANDBOOK. THE MANUFACTURER SHALL PROVIDE A RUGGED AND RELIABLE DEVICE DESIGNED FOR THE LOCAL ENVIRONMENT.

4. THE CONTRACTOR SHALL ATTACH EACH "SECOND TRAIN WARNING" PEDESTRIAN ACTIVE SIGN TO THE CROSSING EQUIPMENT ASSEMBLY. THIS INSTALLATION SHALL BE RUGGED AND WILL BE COORDINATED WITH THE NECESSARY DEVICES AND SIGNS REQUIRED ON THAT ASSEMBLY.

5. THE EQUIPMENT SHOWN IS FOR INFORMATION ONLY. THE ACTUAL EQUIPMENT INSTALLED SHALL BE CHOSEN BY THE CONTRACTOR TO MEET THE FUNCTIONAL NEEDS OF THE PEDESTRIAN CROSSING AND WILL BE SUBMITTED TO THE CAR FOR APPROVAL PRIOR TO FABRICATION.

6. THE DIMENSIONS OF THE CASE SHOWN ARE PROPOSED DIMENSIONS, ACTUAL DIMENSIONS SHALL BE SHOWN ON THE SHOP DRAWINGS AND FOR THE DESIGN SUBMITTED TO THE CAR FOR APPROVAL.

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PRELIMINARY ENGINEERING

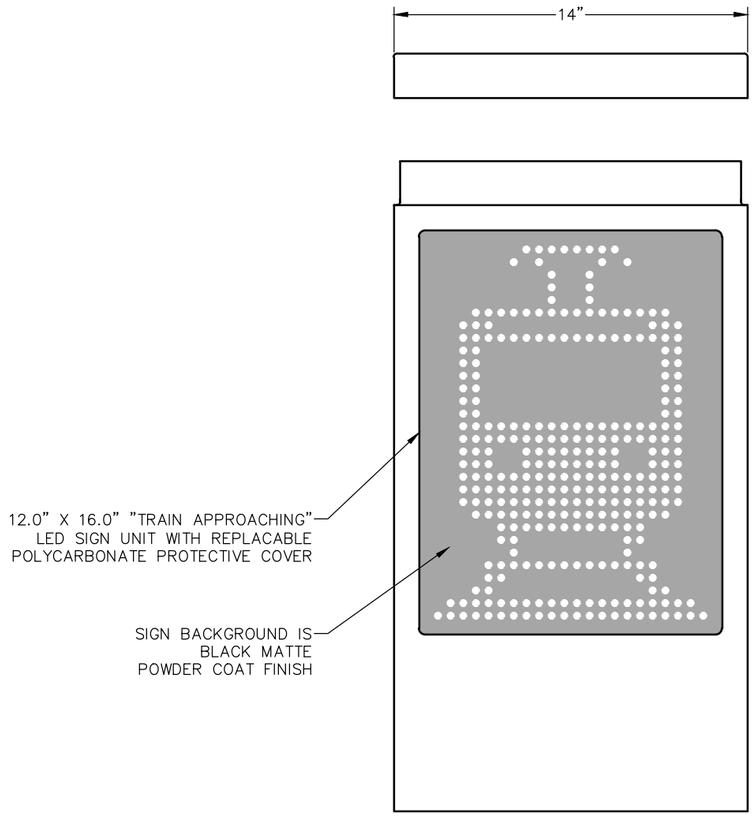
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
PEDESTRIAN CROSSING EQUIPMENT
SECOND TRAIN WARNING PEDESTRIAN SIGN

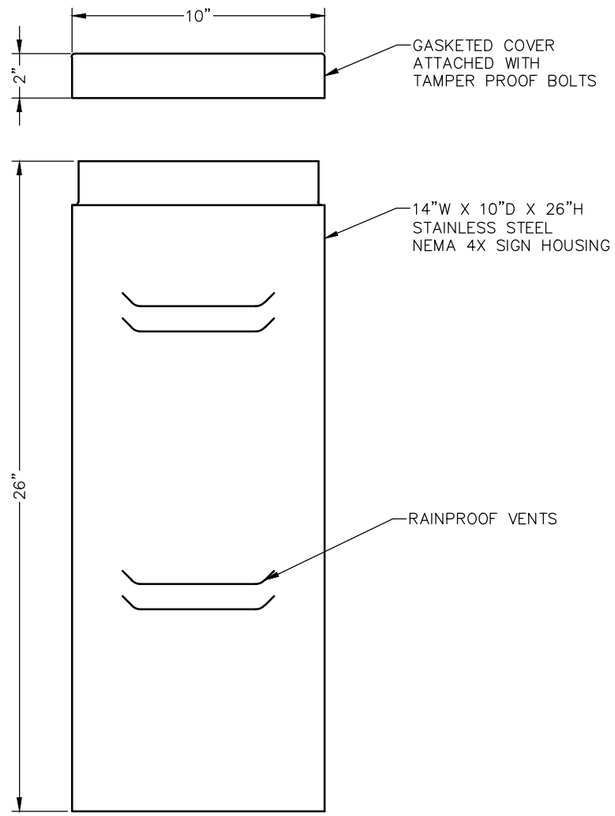
DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-203

SHEET 171 OF 202

Jun, 26 2014 10:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RLT.dwg By: HeinEE



1 FRONT VIEW
PEDESTRIAN WARNING SIGN
SCALE: NTS



2 SIDE VIEW
PEDESTRIAN WARNING SIGN
SCALE: NTS

NOTES:

1. THIS "TRAIN APPROACHING" PEDESTRIAN SIGN SHALL BE SINGLE SIDED, HOUSED IN A RUGGED STAINLESS STEEL NEMA 4X CABINET WITH A GASKETED TOP ACCESS LID. THE CABINET SHALL BE NO WIDER THAN 14 INCHES TO ACCOMODATE THE AVAILABLE MOUNTING AREA.
2. THE FUNCTIONAL OPERATION OF THE "TRAIN APPROACHING" PEDESTRIAN SIGN SHALL BE AS DESCRIBED ON THE PEDESTRIAN CROSSING TYPICAL SITE CONFIGURATION PLAN PLAN.
3. THE "TRAIN APPROACHING" PEDESTRIAN SIGN SHALL BE AN LED SIGN MANUFACTURED ACCORDING TO THE REQUIREMENTS OF THE FEDERAL HIGHWAY STANDARD HIGHWAY SIGN HANDBOOK. THE MANUFACTURER SHALL PROVIDE A RUGGED AND RELIABLE DEVICE DESIGNED FOR THE LOCAL ENVIRONMENT.
4. THE POLYCARBONATE PROTECTIVE COVER AND THE LED UNIT ITSELF SHALL BE EASILY SERVICED, CLEANED, REMOVED OR REPLACED AS NECESSARY FOR STANDARD MAINTENANCE BY REMOVING THE TOP COVER TO ACCESS THE SIGN COMPONENTS. THE SIGN COMPONENTS SHALL BE EASILY REMOVED FOR SERVICE OR REPLACEMENT WITH PLUG COUPLED CABLES AND EASILY ACCESSED SCREWS AND RETAINING CLIPS.
5. THE CONTRACTOR SHALL ATTACH EACH "TRAIN APPROACHING" PEDESTRIAN ACTIVE SIGN TO THE PEDESTRIAN CROSSING STEM WALLS WITH POST DRILLED ANCHOR BOLTS FOR THE CABINET, USING A CHEMICAL TYPE ANCHOR DESIGNED FOR EACH SPECIFIC INSTALLATION. THIS INSTALLATION WILL BE COORDINATED WITH THE CONDUIT INSTALLED FOR THE OPERATION OF THE SIGN.
6. THE EQUIPMENT SHOWN IS FOR INFORMATION ONLY. THE ACTUAL EQUIPMENT INSTALLED SHALL BE CHOSEN BY THE CONTRACTOR TO MEET THE FUNCTIONAL NEEDS OF THE PEDESTRIAN CROSSING AND WILL BE SUBMITTED TO THE CAR FOR APPROVAL PRIOR TO FABRICATION.
7. THE DIMENSIONS OF THE CABINET SHOWN ARE MAXIMUM DIMENSIONS, THE CABINET SHALL NOT BE HIGHER THAN 42 INCHES ABOVE THE SITE PAVING LEVEL. THE CONTRACTOR SHALL CHOOSE A DESIGN THAT IS COORDINATED WITH THE ARCHITECTURAL STEM WALL THAT WILL BE INSTALLED AS PART OF A SEPARATE CONTRACT. ACTUAL DIMENSIONS SHALL BE SHOWN ON THE PEDESTRIAN CABINET DESIGN SUBMITTED TO THE CAR FOR APPROVAL.
8. THE CONTRACTOR SHALL PROVIDE ALL CABLES AND TERMINATIONS REQUIRED FOR UP TO 4 DEVICES AT EACH PED CROSSING LOCATION. ALL CABLES SHALL BE CONTINOUS, WITHOUT SPLICES, FROM EACH DEVICE TO THE CROSSING CONTROLLER CABINET.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

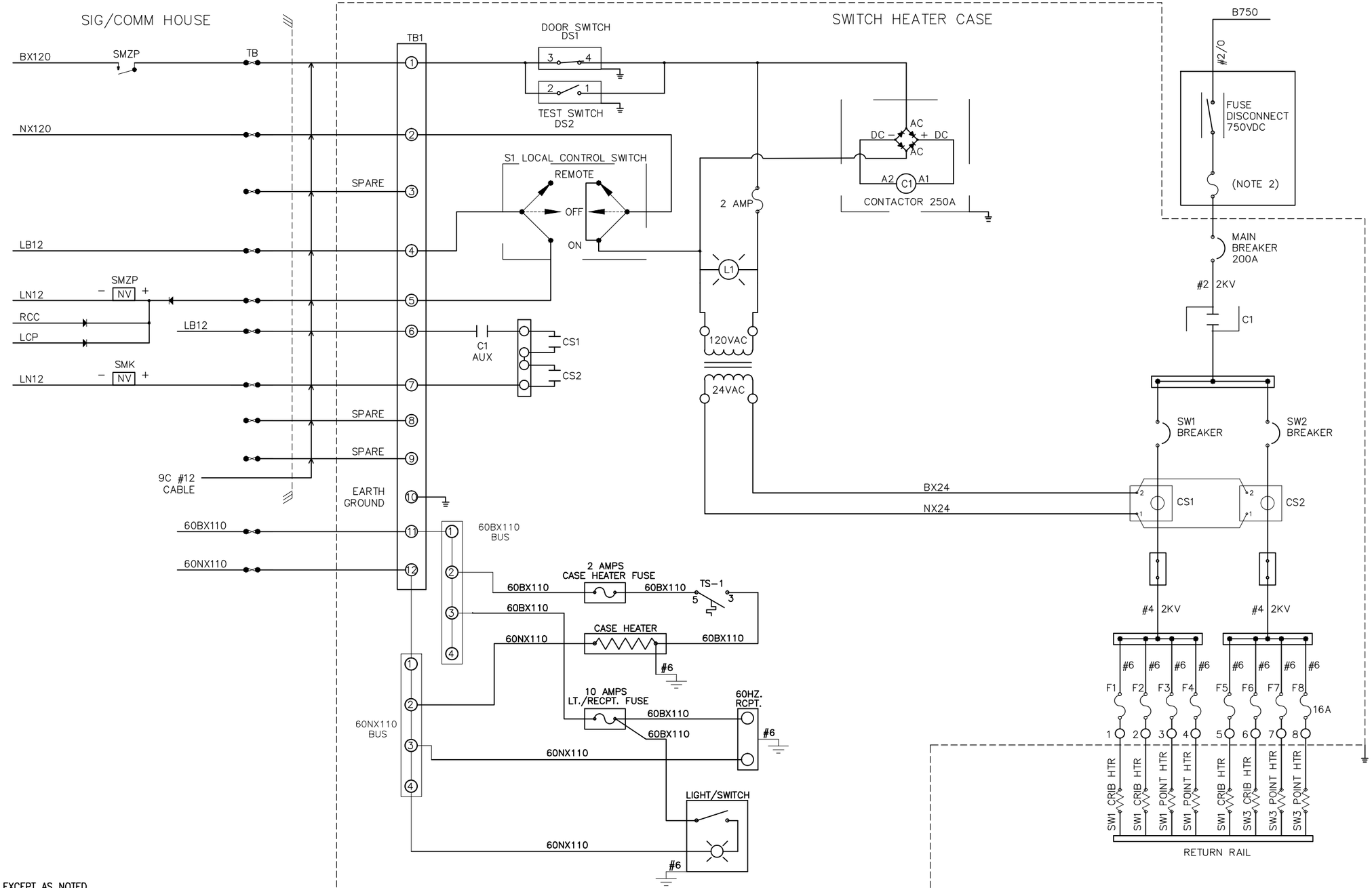
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
PEDESTRIAN CROSSING EQUIPMENT
PEDESTRIAN WARNING SIGN DETAILS

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-204

SHEET 172 OF 202

Jun, 26 2014 10:04 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-RLT.dwg By: HeinEE



NOTES:

1. ALL WIRING #14 EXCEPT AS NOTED.
2. FUSE RATING AS REQUIRED BY HEATER LENGTH CALCULATIONS.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

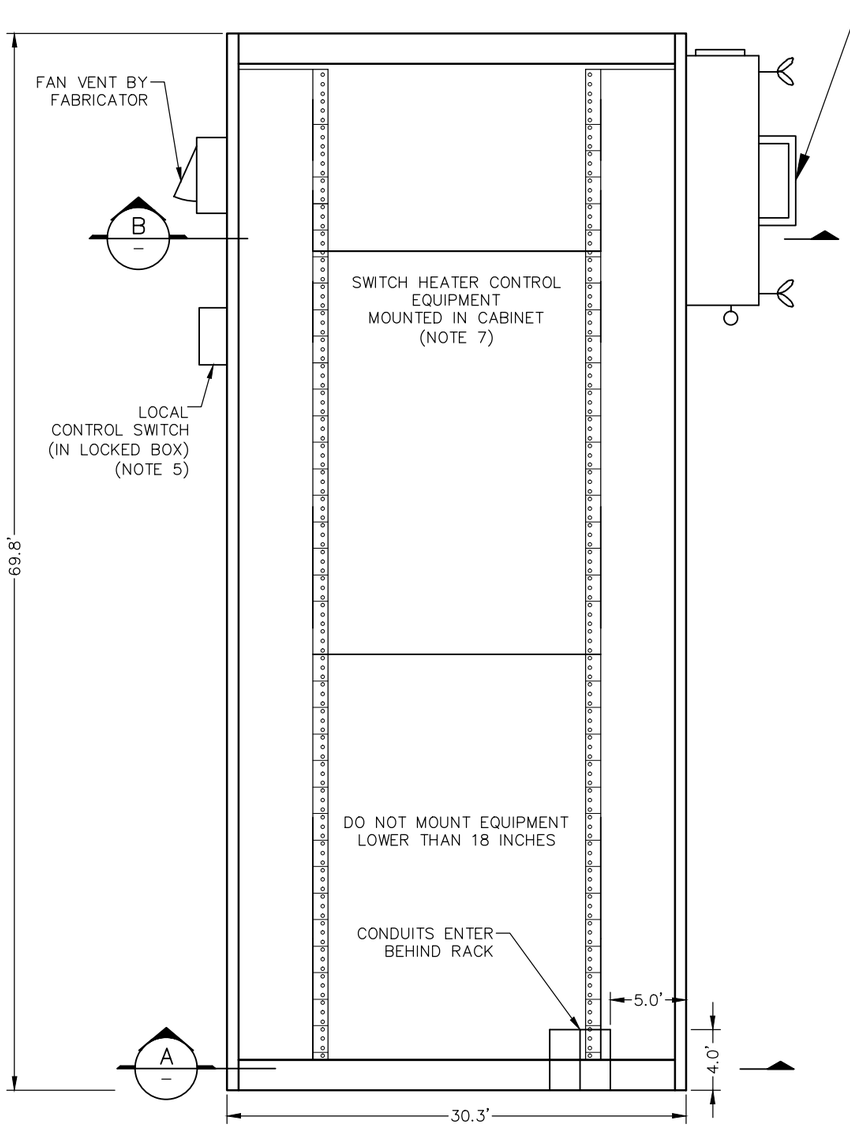
WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
750VDC SWTICH HEATER DETAILS
TYPICAL CONTROLLER CIRCUIT

DISCIPLINE: SYSTEMS

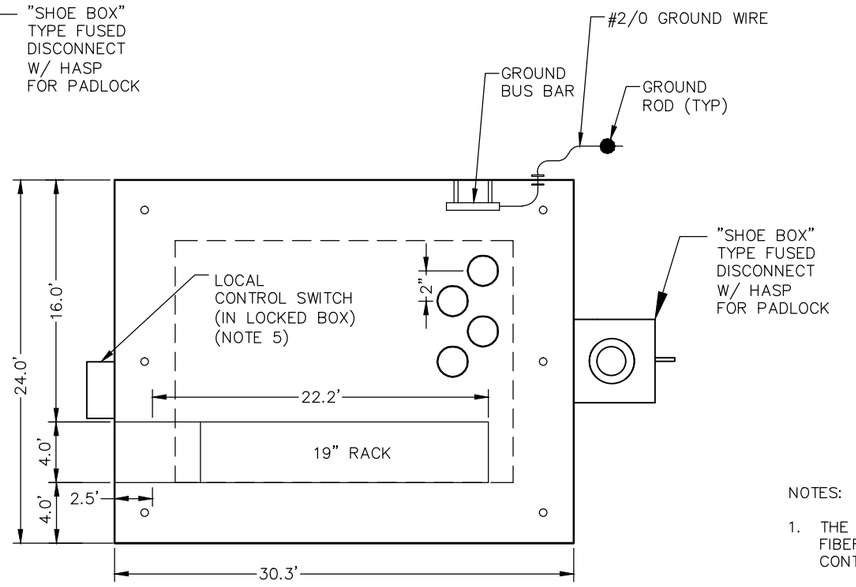
SHEET NAME: SIG-DTL-301

SHEET 173 OF 202

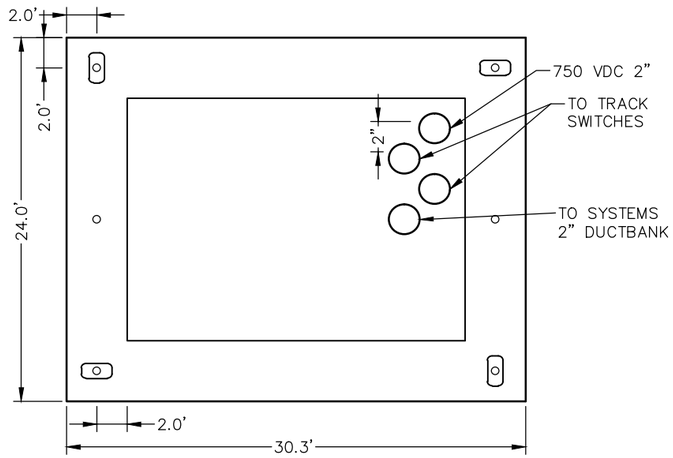
Jun, 26 2014 10:05 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-SHA.dwg By: HeinEE



1 SWITCH HEAT CONTROLLER CABINET
SCALE: NTS



B CABINET PLAN DIMENSIONS
SCALE: NTS



A BASE DIMENSIONS
SCALE: NTS

NOTES:

1. THE CABINET WILL BE NEMA 4X AND WILL BE STAINLESS STEEL FINISH WITH FIBERGLASS PROTECTIVE LINING PROVIDED FOR THE 750V DC SWITCHING CONTROLLER AND WIRING.
2. THE CASE AND LOCAL CONTROL SWITCH WILL BE SECURED WITH HIGH-SECURITY PADLOCKS AND KEYED FOR METRO TRANSIT STANDARD TRACTION POWER MAINTENANCE PERSONNEL.
3. ALL 750V DC CIRCUIT WIRING TO BE 2000 VOLT INSULATION.
4. HEATER CASES AND ALL CONTROL CIRCUITS ARE SHOWN AS EXAMPLES ONLY. THE NUMBER OF CONTACTORS AND/OR FUSED BRANCH CIRCUITS PER CASE MAY VARY. THE CONTRACTOR SHALL SUBMIT A COMPLETE SWITCH HEAT CONTROLLER CABINET DESIGN AND PRODUCT SUBMITTAL TO THE CAR FOR APPROVAL.
5. CONTRACTOR TO VERIFY SIZE AND SUITABILITY FOR ALL WIRING.
6. LOW VOLTAGE WIRING TO BE 14 GAUGE, 1000V, BLACK UNLESS OTHERWISE NOTED.
7. HEATER CASES AND ALL CONTROL CIRCUITS ARE SHOWN AS EXAMPLES ONLY. THE NUMBER OF CONTACTORS AND/OR FUSED BRANCH CIRCUITS PER CASE MAY VARY. THE CONTRACTOR SHALL SUBMIT A COMPLETE SWITCH HEAT CONTROLLER CABINET DESIGN AND PRODUCT SUBMITTAL TO THE CAR FOR APPROVAL.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
750VDC SWTICH HEATER DETAILS
WAYSIDE CONTROL CABINET

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-302

SHEET 174 OF 202

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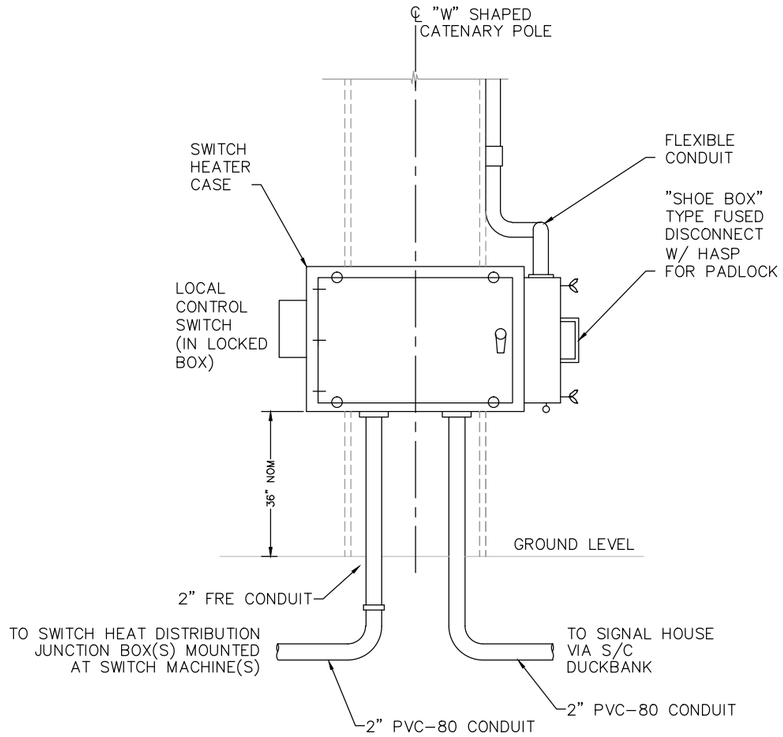
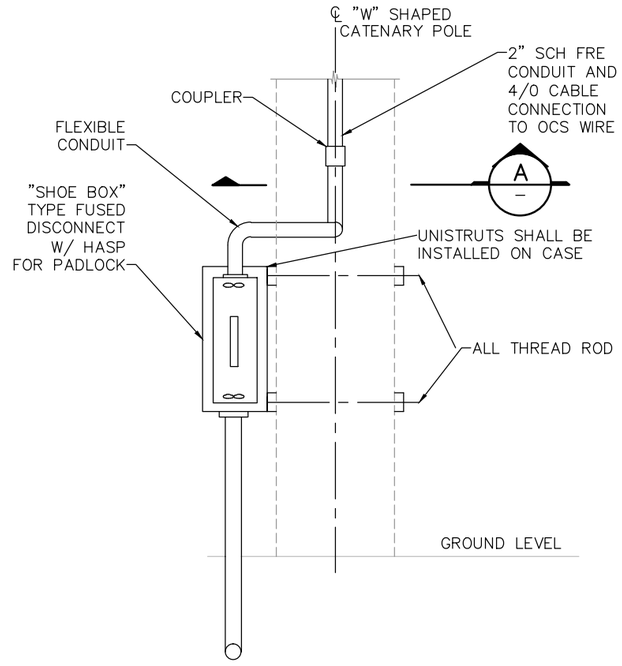
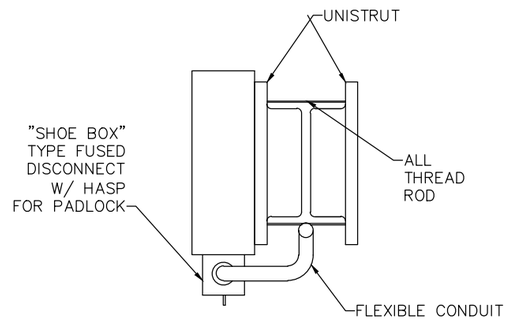


1 ELEVATION
SCALE: NTS



2 SIDE VIEW
SCALE: NTS



A SECTION
SCALE: NTS

NOTES:

1. THE CONTRACTOR SHALL SUPPLY AND INSTALL AN OCS POLE MOUNTED SWITCH HEATER CONTROL CASE AND EQUIPMENT IF GEOGRAPHIC CONSTRAINTS PRECLUDE MOUNTING CONTROL CABINET OUTSIDE OF THE GUIDEWAY.
2. CABINET MOUNTED SWITCH HEATER CONTROL EQUIPMENT WILL RECEIVE 750VDC FROM THE 750V DC OVERHEAD CONTACT WIRE ROUTED THROUGH THE "SHOE BOX" TYPE FUSED DISCONNECT.
3. THE CASE WILL BE SECURED WITH HIGH-SECURITY PADLOCKS AND KEYED FOR METRO TRANSIT STANDARD TRACTION POWER MAINTENANCE PERSONNEL.
4. ALL 750V DC CIRCUIT WIRING TO BE 2000 VOLT INSULATION.
5. HEATER CASES AND ALL CONTROL CIRCUITS ARE SHOWN AS EXAMPLES ONLY. THE NUMBER OF CONTACTORS AND/OR FUSED BRANCH CIRCUITS PER CASE MAY VARY. THE CONTRACTOR SHALL SUBMIT A COMPLETE SWITCH HEAT CONTROLLER CASE DESIGN FOR EACH INSTALLATION WITH A DESIGN AND PRODUCT SUBMITTAL TO THE CAR FOR APPROVAL.
6. CONTRACTOR TO VERIFY SIZE AND SUITABILITY FOR ALL WIRING.
7. LOW VOLTAGE WIRING TO BE 14 GAUGE, 1000V, BLACK UNLESS OTHERWISE NOTED.
8. GROUND WIRING TO BE 14 GA., 600V, GREEN, UNLESS OTHERWISE NOTED.
9. CASE TO BE MOUNTED PARALLEL TO TRACK, NOT PERPENDICULAR.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

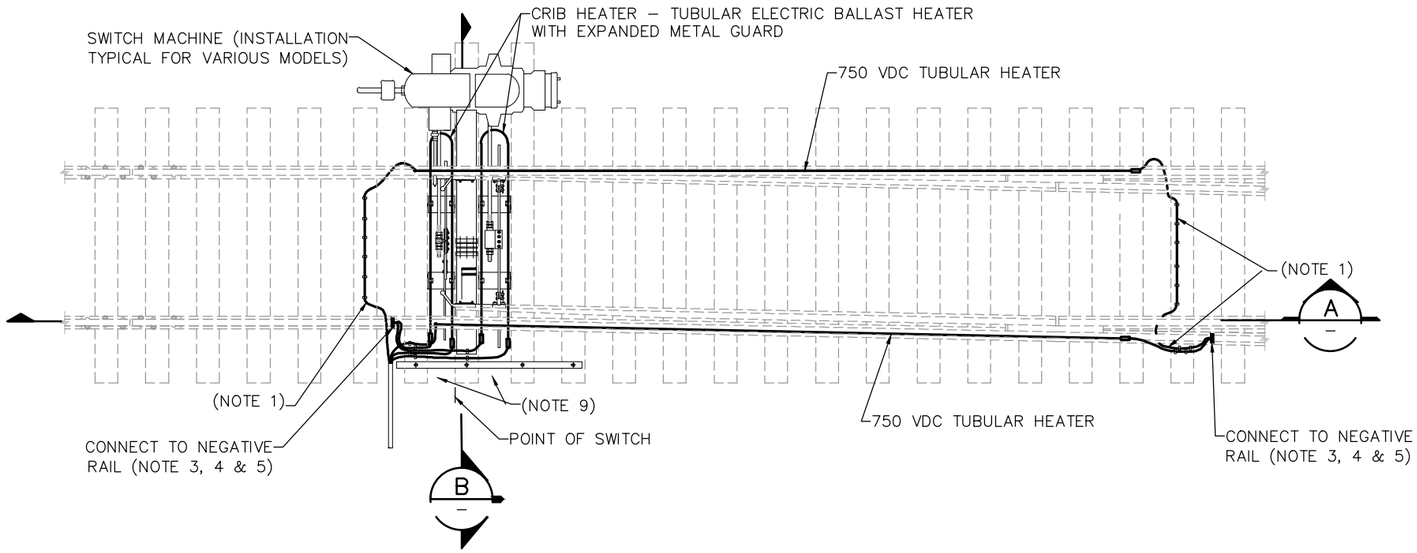
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
750VDC SWTICH HEATER DETAILS
TYPICAL POLE MOUNTED CASE LAYOUT

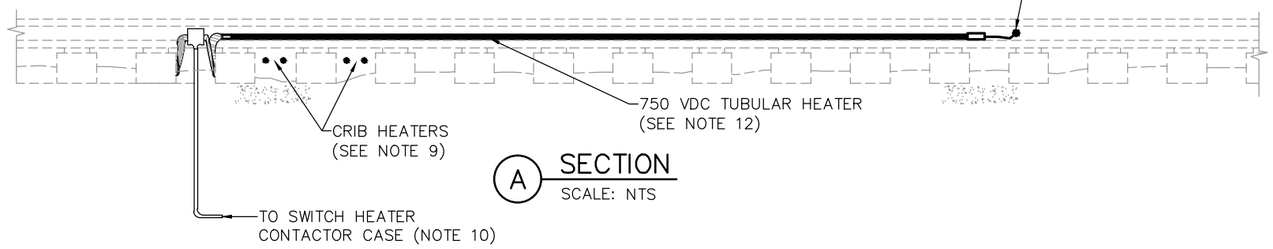
DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-303

SHEET 175 OF 202

Jun. 26 2014 10:05 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\W0-SYS-SIG-SHA.dwg By: HeinEE



1 PLAN FOR BALLASTED OR DF SWITCH HEAT EQUIPMENT
SCALE: NTS



A SECTION
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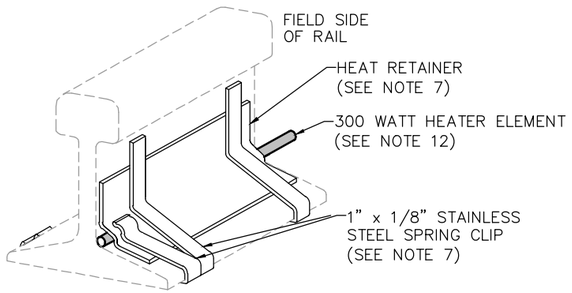
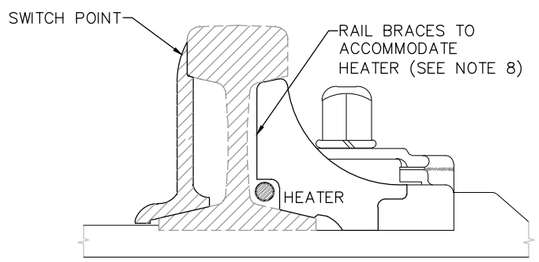


3 HEATER DETAIL
SCALE: NTS



B SECTION
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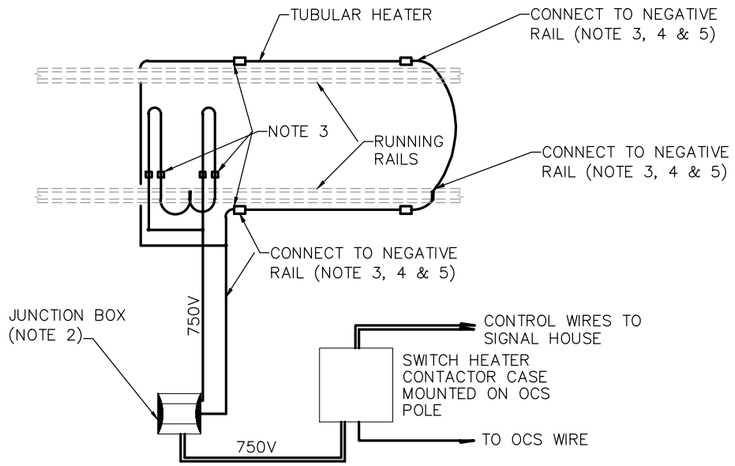

2 LAYOUT DETAIL
SCALE: NTS

NOTE:

1. NO.6 AWG, 2KV INSULATED COPPER WIRE IN ORANGE LIQUID TIGHT CONDUIT.
2. JUNCTION BOX SHALL BE NON–METALLIC, U.V RESISTANT, MOUNTED SOLIDLY TO AN ADJUSTABLE PEDESTAL OR MOUNTED TO THE CONCRETE IN DIRECT FIXATION INSTALLATIONS.
3. CONNECT EACH HEATER LEAD TO #6, 2KV FEED WIRE WITH COMPRESSION SLEEVES AND INSULATE WITH RUBBER TAPE, THEN COMPLETE WITH A 2KV HEAT SHRINK SLEEVE FOR ADDITIONAL PROTECTION.
4. MAKE EACH CONNECTION FOR NEGATIVE SIDE OF SWITCH HEATERS TO NEGATIVE RETURN RAIL ONLY IN SINGLE RAIL TRACK CIRCUITS.
5. CONNECT NEGATIVE ELEMENT LEAD TO THE RAIL WEB WITH A CEMBRE MODEL AR60D OR APPROVED EQUAL.
6. ORANGE LIQUID–TIGHT OR PVC–40 CONDUIT TO HOUSE HEATER LEAD WIRES FOR THE ENTIRE RUN.
7. INSTALL STAINLESS STEEL SPRING CLIPS BETWEEN RAIL BRACES, TO HOLD HEATER AND RETAINER.
8. SLIDE HEATER ELEMENT THROUGH MILLED PORTION OF RAIL BRACES .
9. CRIB HEATERS SHALL BE INSTALLED TO EXTEND 4" PAST THE THE ENDS OF THE OPERATING RODS IN NUMBER 1 + 2 TIE SPACES TO FULLY HEAT THE ENTIRE CRIB AND ALL ASSOCIATED HARDWARE. INSTALL FULL LENGTH STAINLESS STEEL CRIB HEATER MOUNTING PANELS TO PROTECT THE TIES FOR EACH CRIB WITH A CRIB HEATER. EACH CRIB WITH AN OEPRATING SWITCH ROD SHALL HAVE A CRIB HEATING ELEMENT AND A MOUNTING PANEL INSTALLED.
10. PROTECT CABLES FOR SWITCH HEAT FEEDS WITH A FLEXIBLE ORANGE LIQUID TIGHT CONDUIT AND ATTACHED TO THE JUNCTION BOX WITH STRAIN RELIEF FITTINGS.
11. STAINLESS STEEL HEAT RETAINERS MOUNTED ON FIELD SIDE BETWEEN RAIL BRACES. ALL RETAINING CLIPS, PANELS AND RAIL MOUNTED SWITCH HEAT EQUIPMENT SHALL BE STAINLESS STEEL UNLESS OTHERWISE SPECIFIED.
12. HEATING ELEMENT TO BE 300 WATT/FOOT, WITH THE CAPACITY OF THE SYSTEM TO SUPPORT 400 WATT/FOOT AS AN OPTION.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
750VDC SWTICH HEATER DETAILS
BALLASTED AND DIRECT FIXATION DETAIL

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-304

SHEET 176 OF 202

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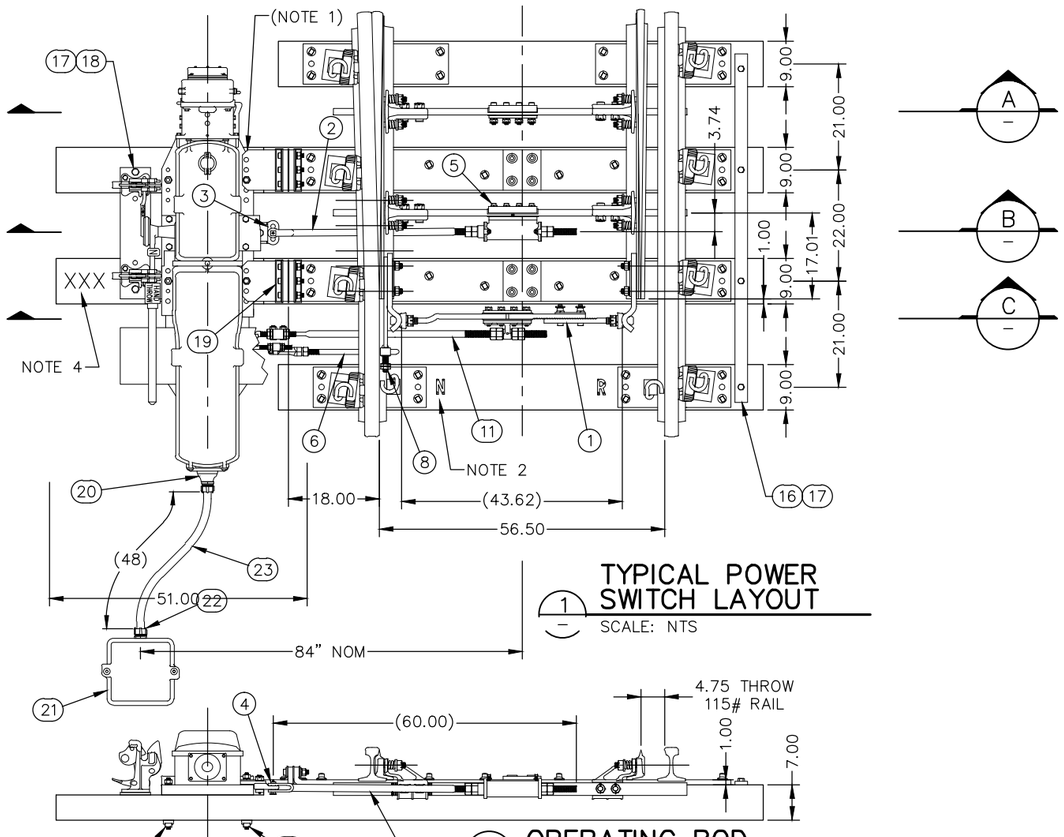


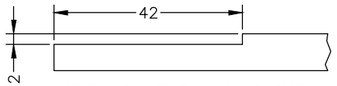
A — OPERATING ROD
SCALE: NTS

B — NEAR POINT DETECTOR ROD
SCALE: NTS

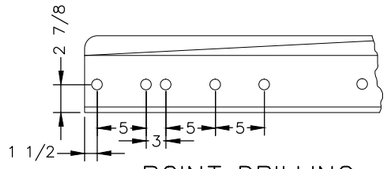
C — LOCK CONN. ROD
SCALE: NTS

1 — TYPICAL POWER SWITCH LAYOUT
SCALE: NTS

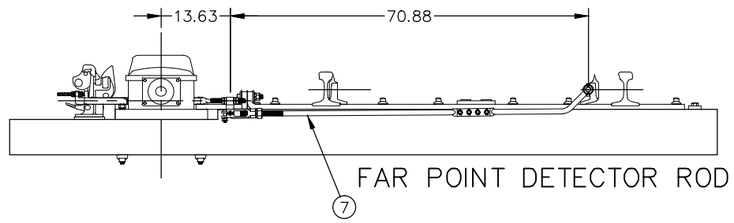
ITEM#	PART NUMBER	DESCRIPTION	999550X QTY	999550-001X QTY
1	802005-001X	FRONT ROD ASSY, SWIVEL	1	1
2	840120-050-01	ROD ASSY, OPERATING	1	1
3	941153-000-01	COUPLING ASSY, GRS MODEL-5	1	1
4	890590-005X	PIN ASSEMBLY, JAW	1	1
5	950143-001-11	BASKET ASSEMBLY	1	1
6	830570-006-01X	ROD ASSY, POINT DET. NEAR POINT	1	0
7	931130-050-01	ROD ASSY, POINT DET. FAR POINT	0	1
8	920560-007X	LUG, POINT DETECTOR POINT	1	1
9	920400-001X	LUG ASSY, DROP BALL STUD	1	1
10	990330-075-02	NUT, 0.750 HVY HEX JAM Z/Y	4	4
11	910109-082-01	ROD ASSY, LOCK CONNECTING	1	1
12	920530-002-01	LUG ASSY	1	1
13	990330-100-02	NUT, 1.000 HVY HEX JAM Z/Y	4	4
14	910922-037-02	STUD ASSY, 0.750 X 10.000	2	2
15	910922-036-01	STUD ASSY, 0.750 X 11.000	2	2
16	860004-007	TIE STRAP	1	1
17	990130-500-02	SCREW, LAG 0.750 X 5.000 Z/Y	6	6
18	950794-000-01X	LATCH STAND ASSY	1	1
19	860105-008-01	PLATE ASSEMBLY, GAGE EXTENSION	2	2
20	998192	COUPLING	1	1
21	998918-003-07	BOX ASSY, JUNCTION W/PEDESTAL 36 TER.	1	1
22	998687-034	CONNECTOR, 1.500 STRAIGHT	2	2
23	998231-048	CONDUIT, 1 1/2" LIQUIDTITE	1	1



TIE DAPPING DETAIL



POINT DRILLING



FAR POINT DETECTOR ROD

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

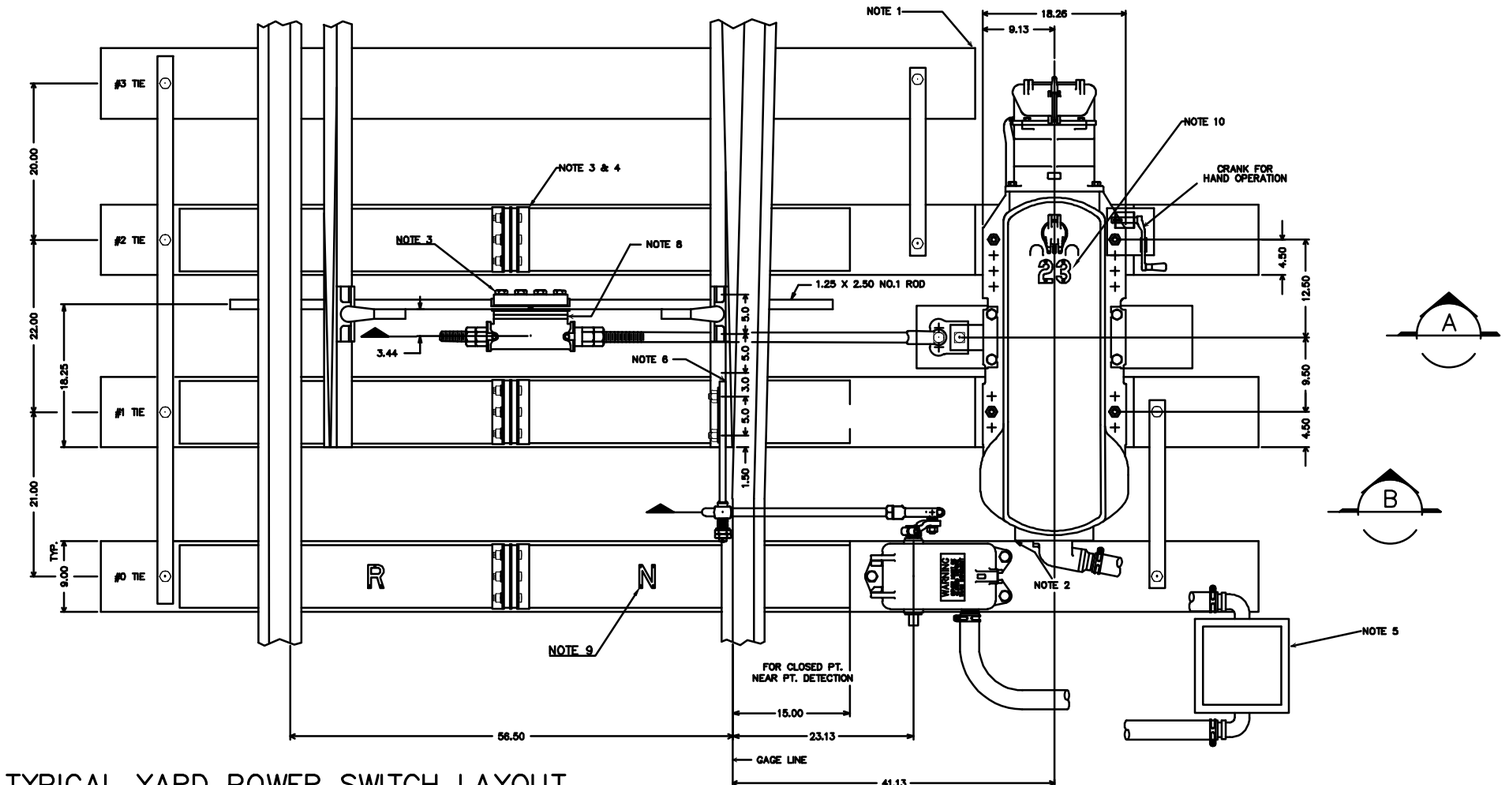
METROPOLITAN COUNCIL — SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
SWITCH MACHINE DETAILS
5F POWER SWITCH MACHINE

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-401

SHEET 177 OF 202

Jun, 26 2014 10:06 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-SHA.dwg By: HeinEE



TYPICAL YARD POWER SWITCH LAYOUT WITH CIRCUIT CONTROLLER

1 SCALE: NTS

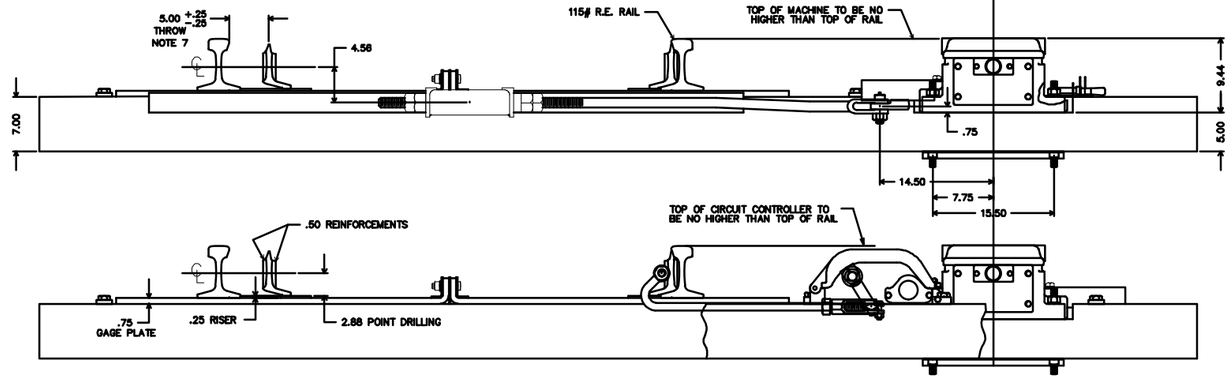


FIG.1
WITHOUT GUARDED SWITCH POINTS
WITH 5.00 THROW

NOTE 1: CUT NO. 3 TIE TO BE EVEN WITH TIE #4 TO PROVIDE CLEARANCE FOR MOTOR OF SWITCH MACHINE.

NOTE 2: DAP NO. 0 TIE AS REQUIRED TO PROVIDE CLEARANCE AROUND END OF SWITCH MACHINE.

NOTE 3: AT INSULATION FOR SWITCH ADJUSTMENT BRACKET AND AT GAGE PLATE INSULATION, PAINT ALL MATERIAL COMING IN CONTACT WITH INSULATING METAL PARTS WITH ONE COAT OF GLYPTAL INC'S. RED ALKYD 1201B AND ALLOW TO DRY. THEN ASSEMBLE. THEN PAINT INSULATED AREA PLUS ONE INCH BEYOND INSULATED AREA WITH THE SAME PAINT.

NOTE 4: APPLY 1500 VAC, 3 SECONDS MIN., ACROSS EACH SET OF INSULATION IN GAGE PLATES.

NOTE 5: JUNCTION BOX TO BE SUPPLIED BY INSTALLATION CONTRACTOR AND LOCATED WITHIN 60.00" OF SWITCH MACHINE.

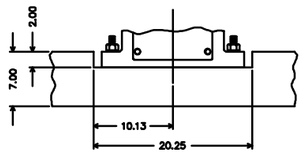
NOTE 6: REMOVE FIRST THREE BOLTS AND NUTS PROVIDED WITH POINTS AS REQ'D. TO PROPERLY INSTALL POINT LUG.

NOTE 7: THE DEFINED THROW OF THE SWITCH IS TO BE MEASURED AT THE THROW ROD POSITION.

NOTE 8: USE .50" THICK PLATE PROVIDED WITH TRACK ROD.

NOTE 9: 6" CAST LETTERS PAINTED WHITE, N AND R, TO BE APPLIED.

NOTE 10: SWITCH LETTERING AND IDENTIFICATION TO BE COMPLIANT WITH METRO TRANSIT SPECIFICATION.



DAP MACHINE TIES AS SHOWN

A OPERATING ROD

SCALE: NTS

B POINT DETECTOR ROD

SCALE: NTS

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

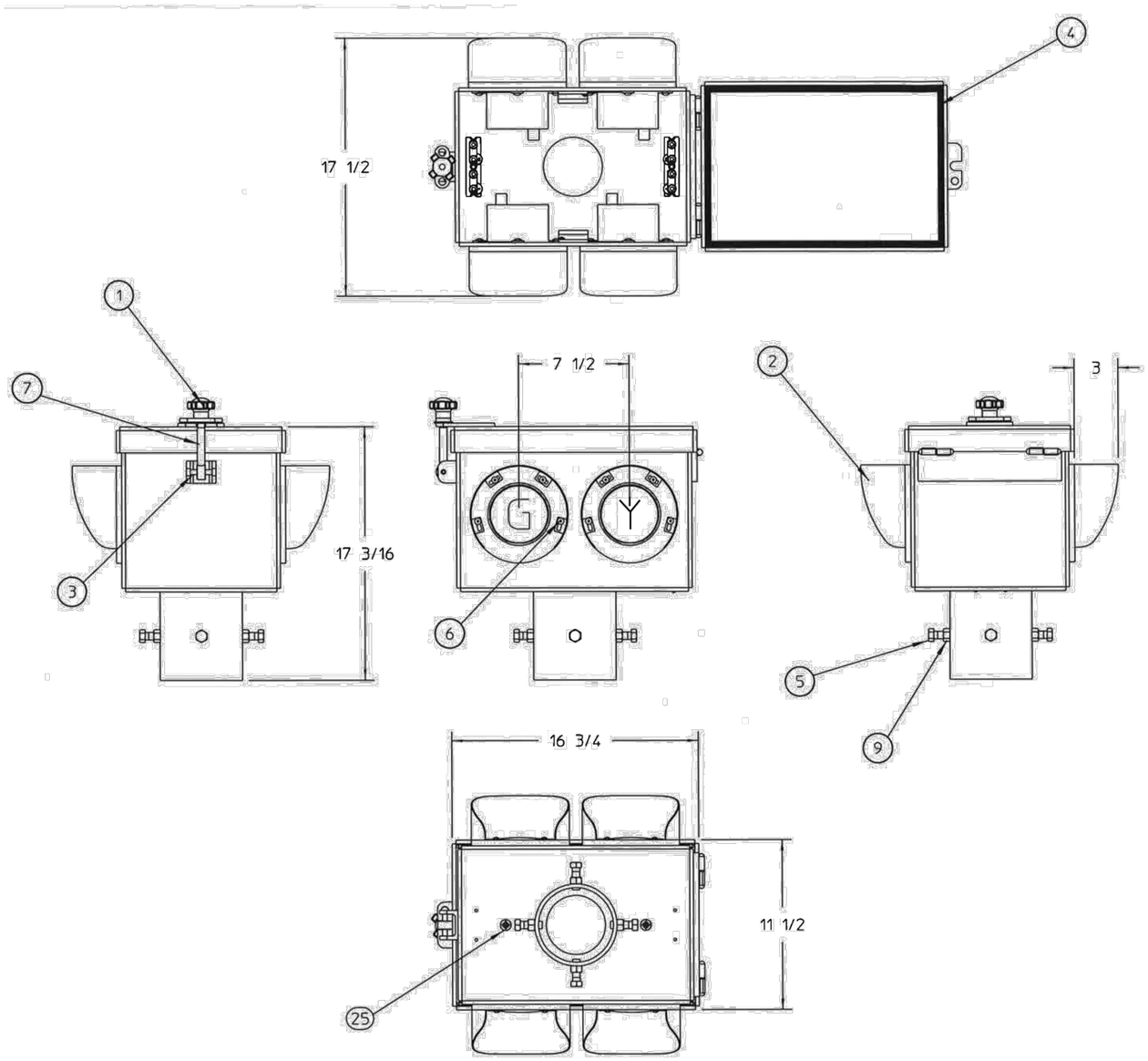
METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
SWITCH MACHINE DETAILS
MODEL 6 SWITCH MACHINE

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-402

SHEET 178 OF 202

Jun, 26 2014 10:06 am v:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-SHA.dwg By: HeinEE



ITEM	PART NUMBER	QTY	DESCRIPTION
1	3M7005-4-7	1	BOX TERM HAND KNOB W/LOCK PLATE
2	5M801061-7	4	HOOD, AL, 3" F/SWITCH INDICATOR
3	KH99888	1	ROLL PIN, 5/16 X 2, SS
4	JR70627	4.54'	GASKET CORD RD 3/8" DIA BLACK CLOSED CELL NEOPRENE
5	KA95558	4	BOLT, HH CUP PT, 1/2-13 X 1-1/2, SS
6	KB955600	16	MACH SCR, PHIL TRUSS HD, 10-32 X 3/8, SS
7	KS97467	1	SOLID ROD END, TREADED, SS, PART #625K41
8	KE97445	1	WASHER, FLAT, 1/2, SS
9	KD96158	4	NUT, HEX, 1/2-13, SS
10	5M801061-018	4	GASKET, NEOPRENE, 5.5 LED GE
11	801024-041	12	LENS CLIP FOR COLORLIGHT HOUSING
12	9A2200	4	CONNECTOR 1" CENTERS
13	9A2203	16	WASHER BVLD FLAT AAR10708 1/4" STUD
14	9A2204	16	NUT BNDG BRASS NKL PLT #14-24 AAR #10706 CROWN NUT
15	AA2125	2	TAG PERMATAGE 3/4"DIA DISC TAG 1/4"HOLE MARKED ENX
16	AA2126G	1	TAG PERMATAG GREEN 3/4" DISC TAG 1/4" HOLE
17	AA2126R	1	TAG PERMATAG 3/4" DISC TAG 1/4" HOLE MARKED RED
18	KB955670	4	MACH SCR, PHIL RD HD, 10-32 X 5/8, SS
19	KB95611	8	MACH SCR, PHIL RD HD, 4-40 X 1/4, SS
20	KB95612	12	MACH SCR, PHIL TRUSS HD, 1/4-20 X 3/8, SS
21	ZATR3GCFB501B92	2	LED ARRAY 5.5" GREEN GELCORE 10VDC W/LGT OUT
22	ZATR3RCFB501B92	2	LED ARRAY 5.5" YELLOW GELCORE 10VDC W/LGT OUT
23	5M801061-40	1	SWITCH INDICATOR WELDMENT
24	9A2230-4	2	BLOCK TERMINAL 4 POST 1" CTR W/FLAT NUT ONLY
25	KS5831	2	VENT, TYPE K 35 MESH, 3/4, BRASS

NOTES:

1. SECURE DOOR GASKET (JR70627 WITH GASKET ADHESIVE (NA70077).
2. CLOSE LID AND TIGHTEN KNOB. THEN OPEN AND CHECK FOR PROPER LID SEAL.
3. MATERIAL:
   - HOUSING, 1/4" AL 6061–T6.
   - HOODS, .063" AL 5052–H32.
4. HARDWARE: STAINLESS STEEL.
5. LIGHTS: 5.5 GE GELCORE LED 10V.
6. FINISH: NATURAL.
7. ALL PART NUMBERS LISTED REFERENCE L&W CATALOGUE NUMBERS.
8. THE CENTERLINE OF SWITCH INDICATOR NOT TO BE INSTALLED LESS THAN 44" FROM NEAR GAUGE. COORDINATE LOCATION BEFORE INSTALLATION.
9. CENTER OF LENS TO BE LEVELED TO 3" ABOVE TOP OF RAIL.
10. SWITCH INDICATORS SHALL DISPLAY THE GREEN ASPECT IN THE POSITION CLOSEST TO THE RAILS WHEN THE NORMAL POINT IS BOTH CLOSED AND LOCKED. THE YELLOW ASPECT SHALL BE DISPLAYED FURTHEST FROM THE RAILS WHEN THE REVERSE POINT IS BOTH CLOSED AND LOCKED.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
SWITCH MACHINE DETAILS
SWITCH POINT INDICATOR

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-403

SHEET 179 OF 202

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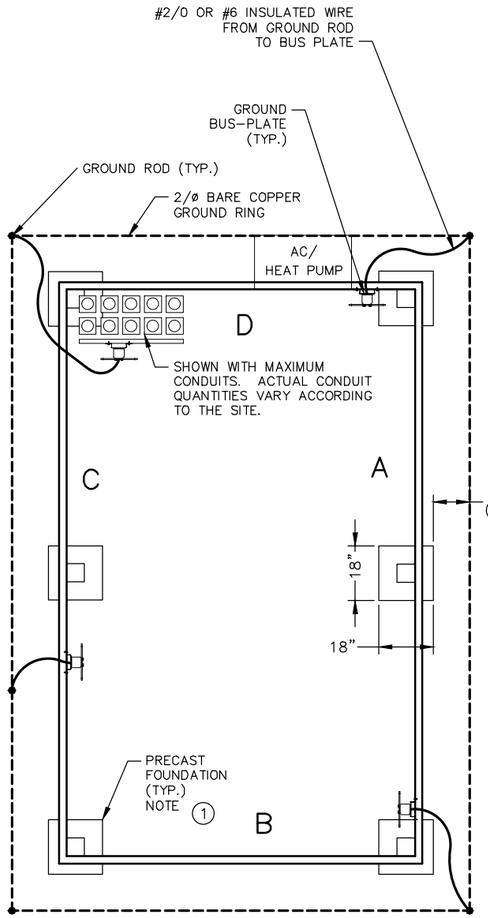
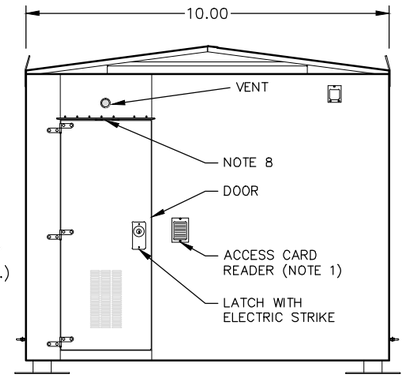
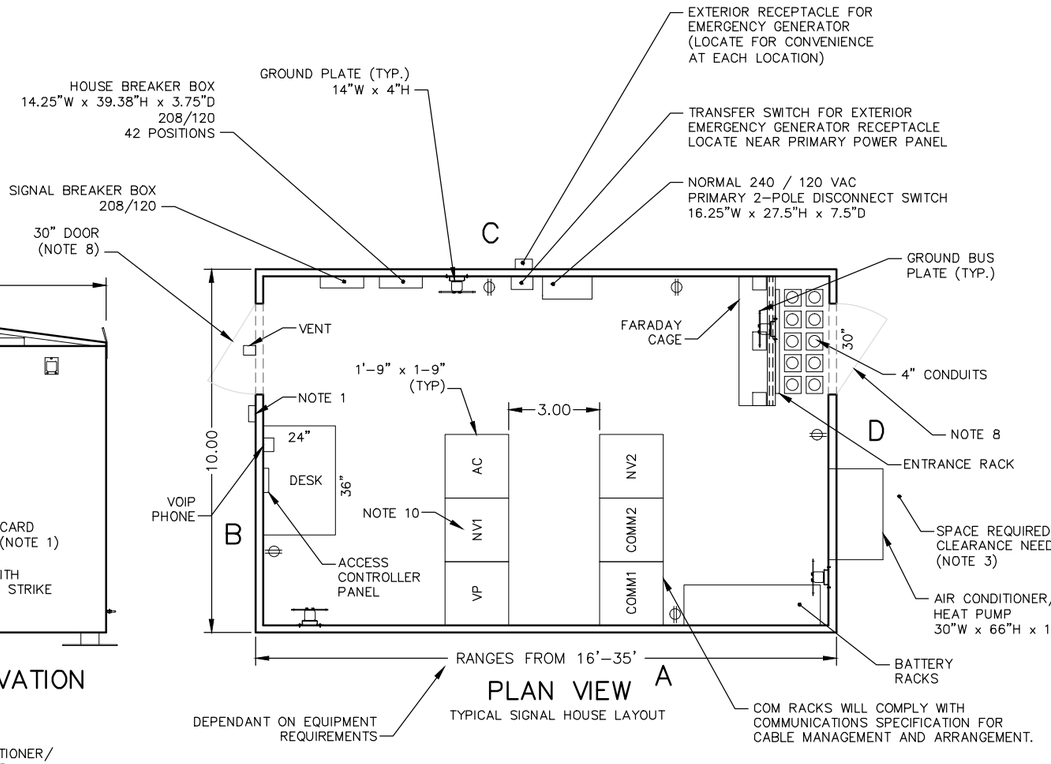


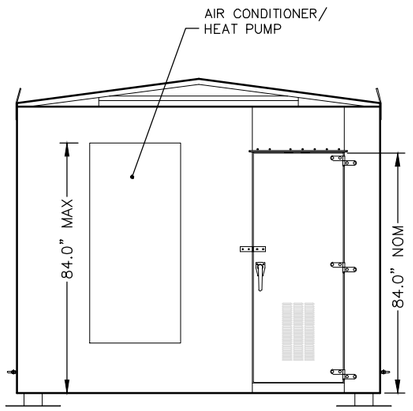
GROUNDING SCHEME



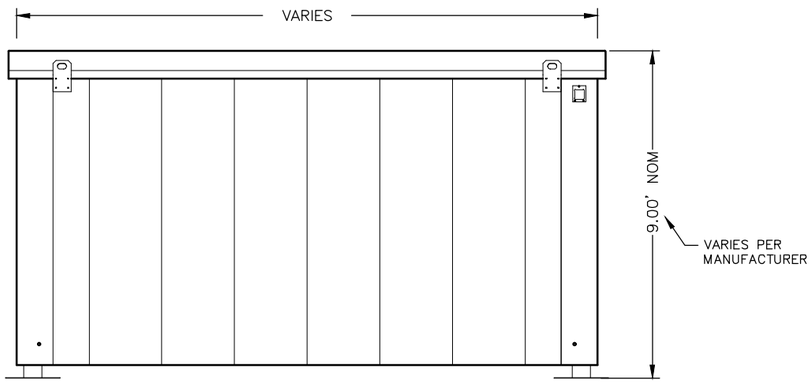
B – WALL ELEVATION



PLAN VIEW
TYPICAL SIGNAL HOUSE LAYOUT



D – WALL ELEVATION



A – WALL ELEVATION

LEGEND:

⌽	=	DUPLEX OUTLET
VP	=	VITAL MICROPROCESSOR RACK
COM	=	FIBER COMM EQUIPMENT
NV	=	NON-VITAL MICROPROCESSOR RACK

1. ACCESS CARD READER WILL BE COMPATIBLE WITH METRO TRANSIT SECURITY PROTOCOL AND STANDARD EQUIPMENT, SEE TECHNICAL SPECIFICATIONS FOR EQUIPMENT DETAILS.
2. LOCATE HOUSE ON A CONCRETE PIERS TO ACCOMMODATE FINAL HOUSE SIZE AND ARRANGEMENT.
3. ARRANGE HOUSE ON EACH SITE TO MINIMIZE NOISE AND AIR ON SURROUNDING ENVIRONMENT AND TO CONSIDER HEAT PUMP LOCATION, IF POSSIBLE
4. ALL HOUSES TO BE MAXIMUM 10FT. WIDE. LENGTH SHALL BE AS REQUIRED.
5. ALL WIRING TO OUTLETS, LIGHT SWITCH, LIGHTS, THERMOSTAT, FAN, HEATER, AIR CONDITIONER AND CIRCUIT BREAKER PANEL SHALL BE IN CONDUIT
6. GROUND MAT TO PROVIDE MAXIMUM RESISTANCE TO GROUND OF 15 OHMS
7. HOUSE LAYOUT IS TYPICAL, FINAL DESIGNER TO PROVIDE DETAILED LAYOUT FOR EACH LOCATION
8. EACH DOOR WILL HAVE A LIMIT SWITCH DOOR POSITION SCADA DETECTOR MICROSWITCH LSA1A OR APPROVED EQUAL
9. HOUSE DOOR, STRIKE PLATE AND CASEMENT WITH EQUIPMENT COMPATIBLE WITH TECHNICAL SPECIFICATIONS.
10. FOR COMPLEX LOCATIONS, WALL MOUNT THE LCP NEAR THE DOOR. FOR ALL OTHER LOCATIONS, LOCATE THE LCP ON THE NV1 RACK NO LOWER THAN 48" TO TOP OF LCP.
11. CONTRACTOR SHALL DETERMINE AMOUNT AND SIZE OF RELAY RACKS AND CABLE TERMINATION UPON FINAL DETAILED DESIGN.
12. LENGTH OF SIGNAL HOUSE SHALL BE AS INDICATED ON LAYOUT PLANS.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
SIGNAL HOUSE DETAIL
TYPICAL SIGNAL HOUSE

DISCIPLINE: SYSTEMS
SHEET NAME: SIG-DTL-501

SHEET 180 OF 202

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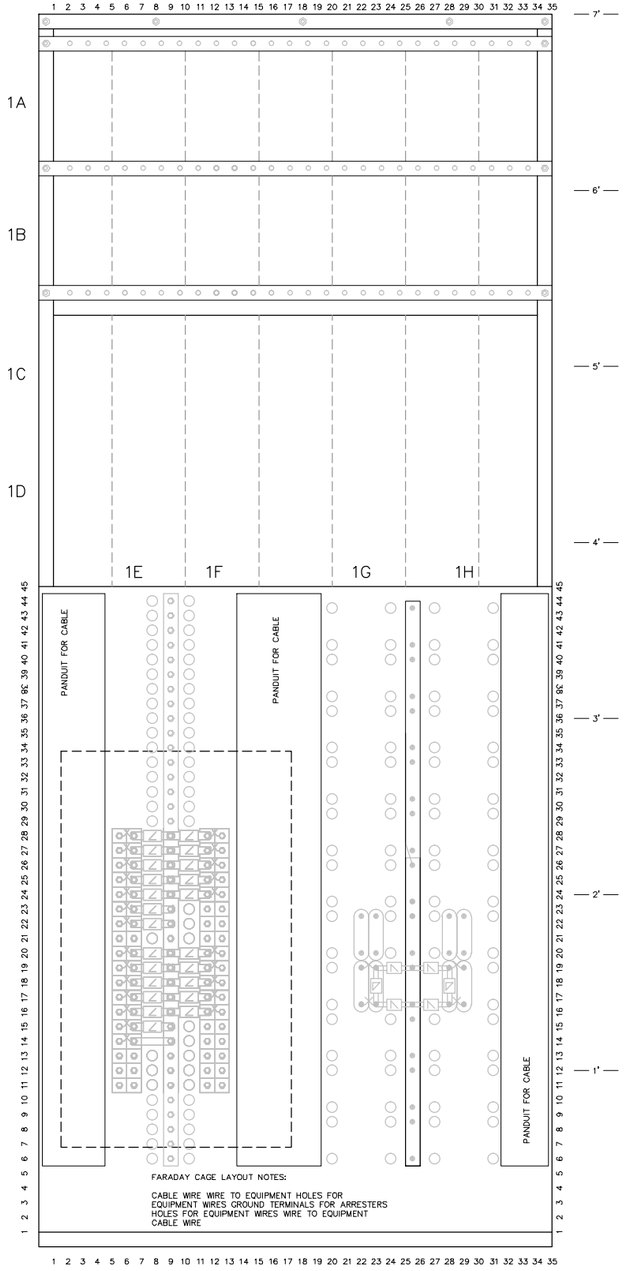
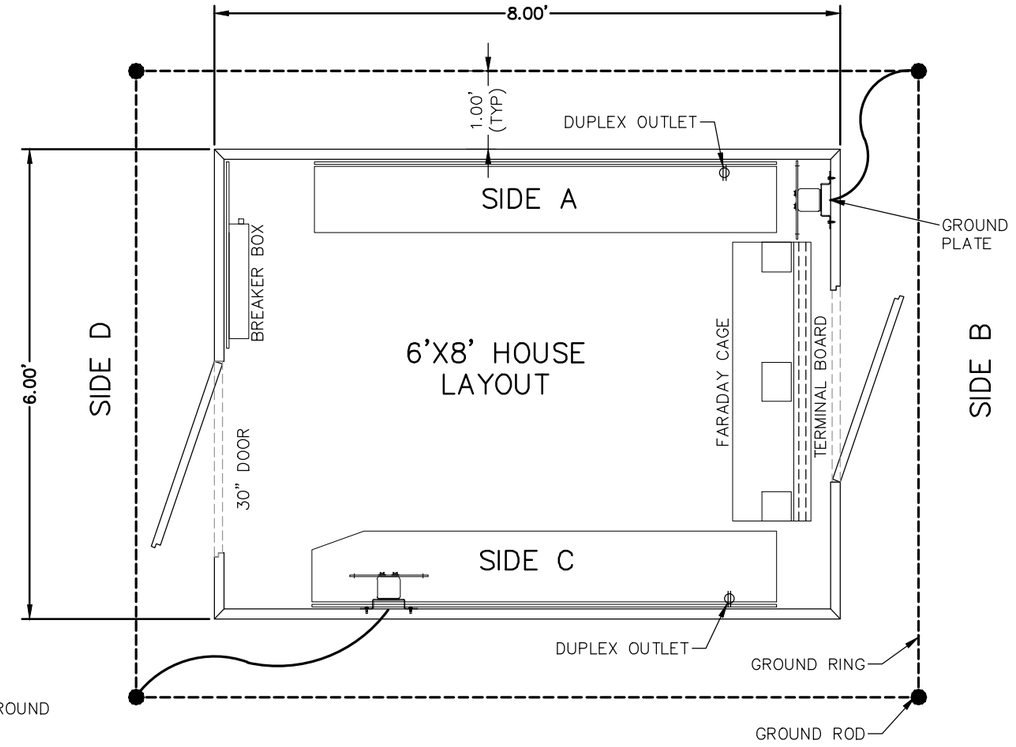


7'0" X 35" TERMINAL BOARD (TYP)

CABLE SHIELDS ARE TO BE WIRED TO GROUND
SPARE CABLE CONDUCTORS ARE TO BE
CONNECTED TO GROUND

NOTES:

1. AN IP MAINTENANCE PHONE WILL BE MOUNTED ON SIDE "A". THIS PHONE WILL BE COMPLIANT WITH THE COMMUNICATION SYSTEM USED BY THE RCC FOR METRO TRANSIT MAINTENANCE.
2. THE ENTRANCE RACK SHALL BE CONFIGURED IN A FARADAY CAGE DESIGN TO PROVIDE LIGHTNING PROTECTION. THE DESIGN FOR THIS FARADAY CAGE WILL BE SUBMITTED TO THE CAR FOR APPROVAL PRIOR TO PROCUREMENT OR INSTALLATION.
3. THE CONTRACTOR SHALL PROVIDE A VENTILATION FAN AND RESISTIVE HEATER SIZED SPECIFICALLY FOR THE NEEDS OF THIS EQUIPMENT HOUSING AND FOR THIS CLIMATE. THE CLIMATE CONTROL SYSTEM WILL BE OPERATED BY A SINGLE THERMOSTAT. "OVERTEMP" AND "UNDERTEMP" ALARMS WILL BE GENERATED AND TRANSMITTED TO THE RCC VIA SCADA.



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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
SIGNAL HOUSE DETAIL
TYPICAL 6'X8' GRADE CROSSING HOUSE

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-502

SHEET 181 OF 202

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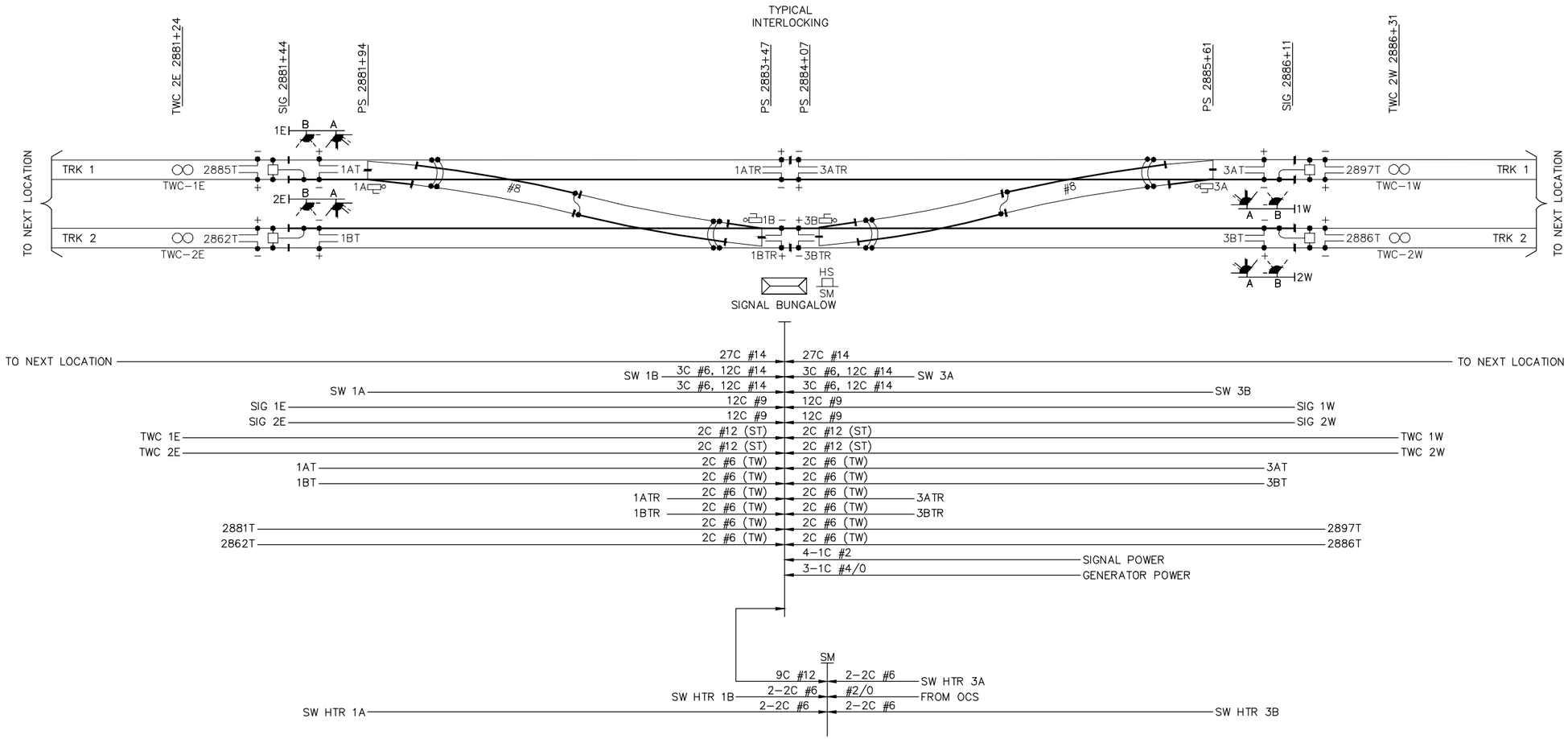

NOTES:

1. THIS DRAWING SHOWS PROPOSED CABLE LAYOUT AND IS INCLUDED FOR DESIGN DEVELOPMENT PURPOSES. FINAL CABLE DESIGN SELECTION WILL BE DETERMINED BY CONTRACTOR AND WILL BE IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS.

2. FOR ADDITIONAL INFORMATION REGARDING COMMUNICATION CABLE, SEE COMMUNICATION SYSTEM NETWORK AND CABLE PLANS FOR TYPICAL LAYOUT.

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AECOM PARSONS BRINCKERHOFF

PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
TYPICAL CABLE PLANS
INTERLOCKING

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-601

SHEET 182 OF 202

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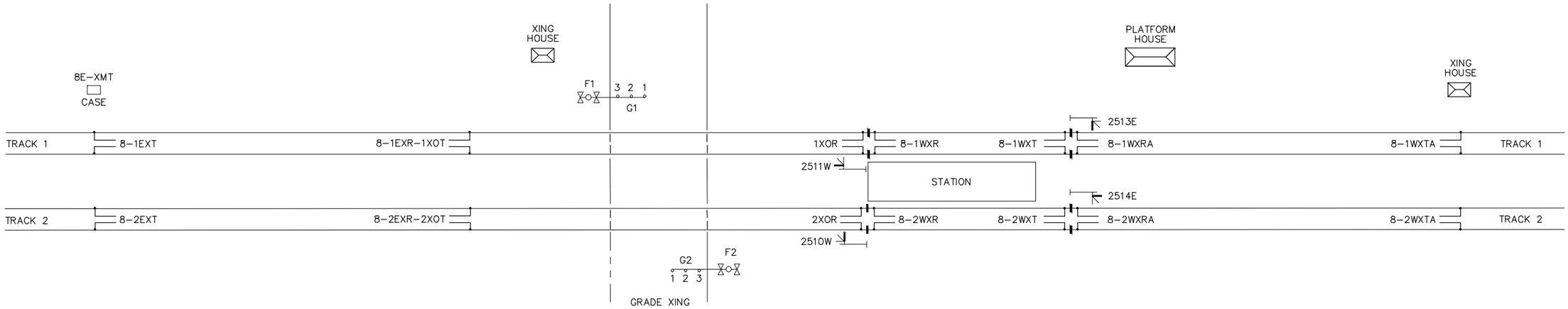

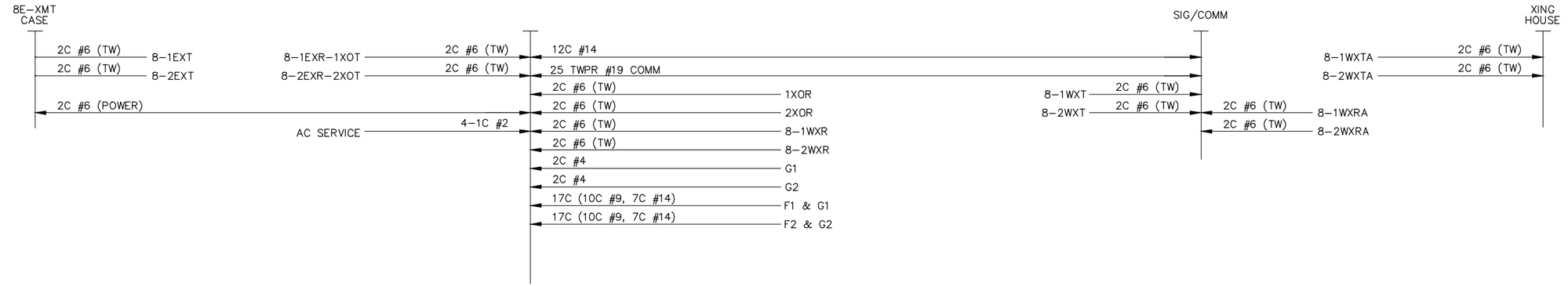

NOTES:

1. THIS DRAWING SHOWS PROPOSED CABLE LAYOUT AND IS INCLUDED FOR DESIGN DEVELOPMENT PURPOSES. FINAL CABLE DESIGN SELECTION WILL BE DETERMINED BY CONTRACTOR AND WILL BE IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS.
2. FOR ADDITIONAL INFORMATION REGARDING COMMUNICATION CABLE, SEE COMMUNICATION SYSTEM NETWORK AND CABLE PLANS FOR TYPICAL LAYOUT.

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PRELIMINARY ENGINEERING

METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
TYPICAL CABLE PLANS
GRADE CROSSING

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-602

SHEET 183 OF 202

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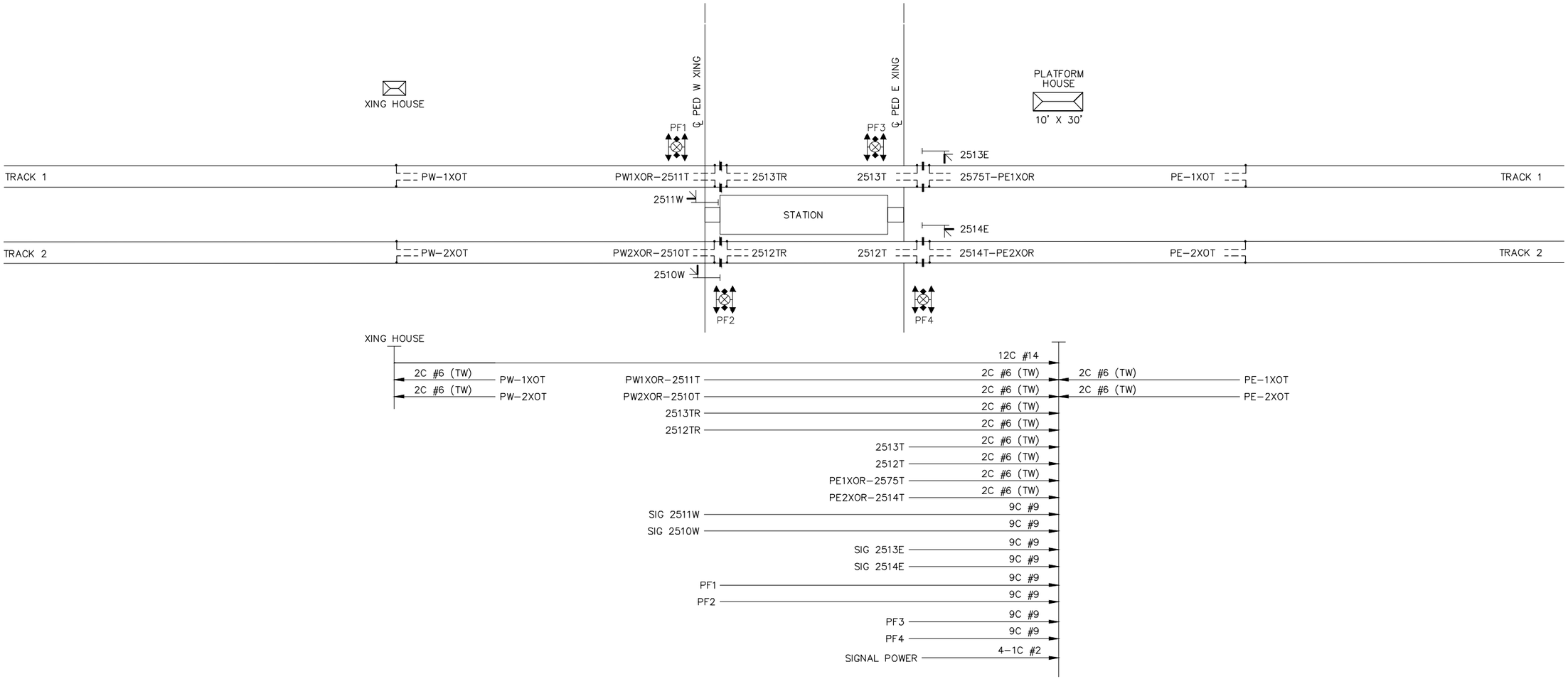

NOTES:

1. THIS DRAWING SHOWS PROPOSED CABLE LAYOUT AND IS INCLUDED FOR DESIGN DEVELOPMENT PURPOSES. FINAL CABLE DESIGN SELECTION WILL BE DETERMINED BY CONTRACTOR AND WILL BE IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS.
2. FOR ADDITIONAL INFORMATION REGARDING COMMUNICATION CABLE, SEE COMMUNICATION SYSTEM NETWORK AND CABLE PLANS FOR TYPICAL LAYOUT.

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METROPOLITAN COUNCIL SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
TYPICAL CABLE PLANS
STATION PLATFORM

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-603

SHEET 184 OF 202

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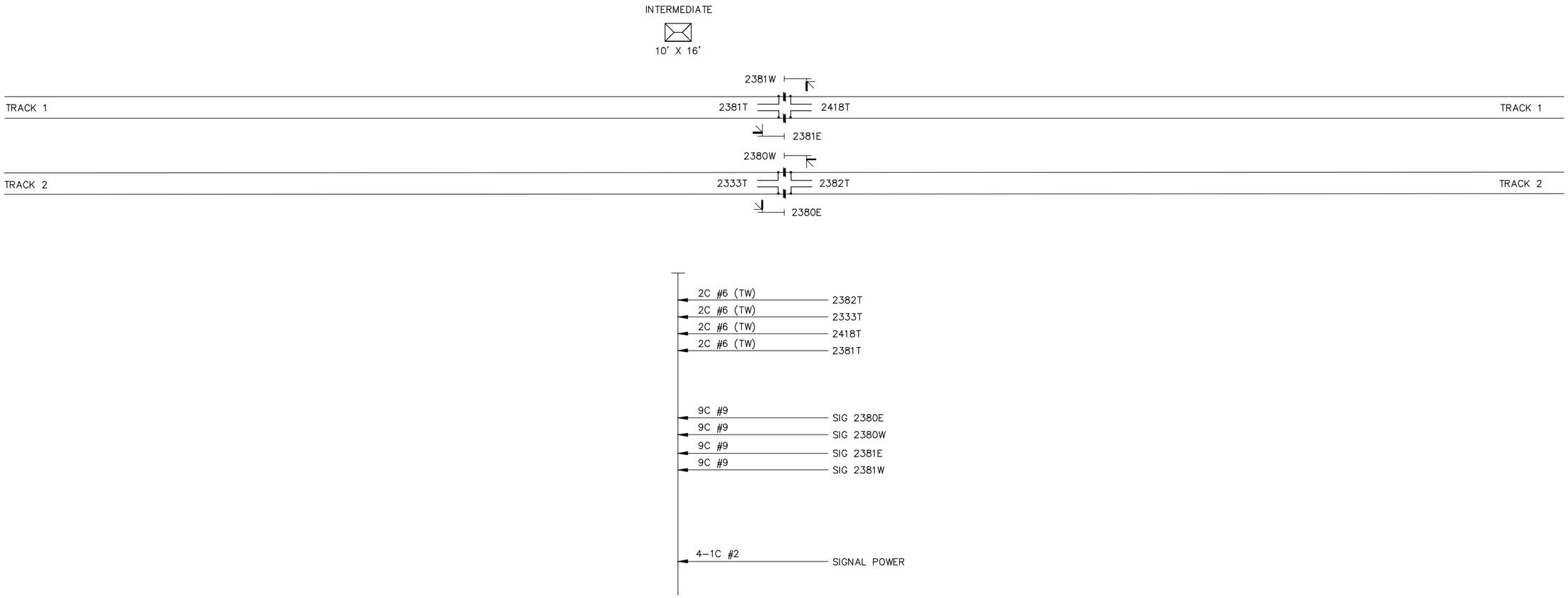

NOTES:

1. THIS DRAWING SHOWS PROPOSED CABLE LAYOUT AND IS INCLUDED FOR DESIGN DEVELOPMENT PURPOSES. FINAL CABLE DESIGN SELECTION WILL BE DETERMINED BY CONTRACTOR AND WILL BE IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS.
2. FOR ADDITIONAL INFORMATION REGARDING COMMUNICATION CABLE, SEE COMMUNICATION SYSTEM NETWORK AND CABLE PLANS FOR TYPICAL LAYOUT.

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METROPOLITAN COUNCIL

SOUTHWEST Green Line LRT Extension

WEST-VOLUME 3 (SYSTEMS)
SIGNAL SYSTEM
TYPICAL CABLE PLANS
INTERMEDIATE SIGNAL LOCATION

DISCIPLINE: SYSTEMS

SHEET NAME: SIG-DTL-604

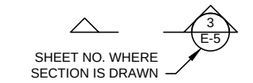
SHEET 185 OF 202

Jun, 26 2014 10:09 am V:\3200_PEC-W\CAD\OVERALL\SHEETS\SYSTEMS\DETAILS-SIG\WO-SYS-SIG-TCP.dwg By: HeinEE

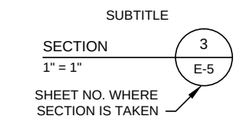
ABBREVIATIONS

AC	ALTERNATING CURRENT	MIN	MINIMUM
ACR	ACCESS CARD READER	MTG	MOUNTING
AFF	ABOVE FINISHED FLOOR	MTD	MOUNTED
AFG	ABOVE FINISHED GRADE	NC	NORMALLY CLOSED
A, AMP	AMPERE	NO	NORMALLY OPEN OR NUMBER
AUTO	AUTOMATIC	NTS	NOT TO SCALE
AUX	AUXILIARY	OB	OUTBOUND
AWG	AMERICAN WIRE GAUGE	OC	ON CENTER
C	CONDUIT	ODU	OUTDOOR UNIT
CAT6	CATEGORY 6 CABLE	OL	OVERLOAD
CCTV	CLOSED CIRCUIT TELEVISION	PA	PUBLIC ADDRESS
CKT	CIRCUIT	PCC	PLATFORM COMMUNICATION CABINET
COMM	COMMUNICATION(S)	PH	PHASE
CPT	CONTROL POWER TRANSFORMER	PLC	PROGRAMMABLE LOGICAL CONTROLLER
CR	CONTROL RELAY	PP	POWER PANEL
CS	CONTROL SWITCH	PR	PAIR
CT	CURRENT TRANSFORMER	PT	POTENTIAL TRANSFORMER
CU	COPPER	PTT	PUSH-TO-TALK
DN	DOWN	PTZ	PAN-TILT-ZOOM CAMERA
DSP	DIGITAL SIGNAL PROCESSOR	PVC	POLYVINYL CHLORIDE
ELEC	ELECTRICAL	QTY	QUANTITY
ELEV	ELEVATION	SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
EM	EMERGENCY		
ETEL	EMERGENCY TELEPHONE	SCU	STATION CONTROL UNIT
FBO	FURNISHED BY OTHERS	SEC	SECONDS OR SECONDARY
FDP	FIBER DISTRIBUTION PANEL	SH	SHIELDED OR SHEET
FO	FIBER OPTIC	SMFO	SINGLE MODE FIBER OPTIC
FRP	FIBERGLASS REINFORCED POLYESTER	SN	SOLID NEUTRAL
FU	FUSE	SPKR	SPEAKER
FUT	FUTURE	SS	STAINLESS STEEL
G, GRD	GROUND	SVV	STORED VALUE VALIDATOR
GF	GROUND FAULT INTERRUPTER	SW	SWITCH
GRS	GALVANIZED RIGID STEEL	TC	TIME DELAY ON CLOSING
HH	HANDHOLE	TCC	TRANSIT CONTROL CENTER
HT	HEIGHT	TEL	TELEPHONE
HZ	HERTZ	TO	TIME DELAY ON OPENING
IB	INBOUND	TVM	TICKET VENDING MACHINE
INST	INSTANTANEOUS	TWP	TWISTED PAIR
INSTR	INSTRUMENT	TYP	TYPICAL
ITC	INTERFACE TERMINAL CABINET	UG	UNDERGROUND
KAIC	KILO AMPERE INTERRUPTING CAPACITY	UPS	UNINTERRUPTABLE POWER SUPPLY
KVA	KILOVOLT AMPERE	V	VOLTS
LA	LIGHTNING ARRESTER	VOIP	VOICE OVER IP
LP	LIGHTING PANEL	VMS	VARIABLE MESSAGE SIGN
MCC	MAIN COMMUNCATION CABINET	W	WIRE
MFR	MANUFACTURER	WP	WEATHERPROOF
MH	MANHOLE	XFMR	TRANSFORMER
MIC	MICROPHONE		

SYMBOL	DESCRIPTION
	COMMUNICATION SYSTEMS
R	SECURITY SYSTEM CARD ACCESS READER
CCTV	CLOSED CIRCUIT TV CAMERA
DS	SECURITY ALARM DOOR SWITCH
SA	SECURITY ALARM PANEL
E	EMERGENCY TELEPHONE HANDSET
H S	PAGING SPEAKER, POLE MOUNTED, BI-DIRECTIONAL
S	PA SPEAKER, SURFACE MOUNTED CEILING TYPE
	MICROPHONE
	ADA DOOR OPERATOR
HH	HANDHOLE
MH	MANHOLE

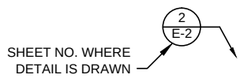


SYMBOL WHERE THERE IS A SECTION

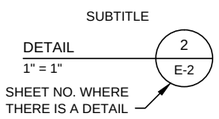


SYMBOL WHERE SECTION IS DRAWN

SECTION SYMBOL



SYMBOL WHERE THERE IS A DETAIL



SYMBOL WHERE DETAIL IS DRAWN

DETAIL SYMBOL

NOTES:

1. THE BLOCK DIAGRAMS, QUANTITY AND SIZE OF DEVICES REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF COMMUNICATIONS EQUIPMENT. MODIFICATIONS ACCEPTABLE TO THE ENGINEER MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE FUNCTION AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND/OR SPECIFICATIONS.

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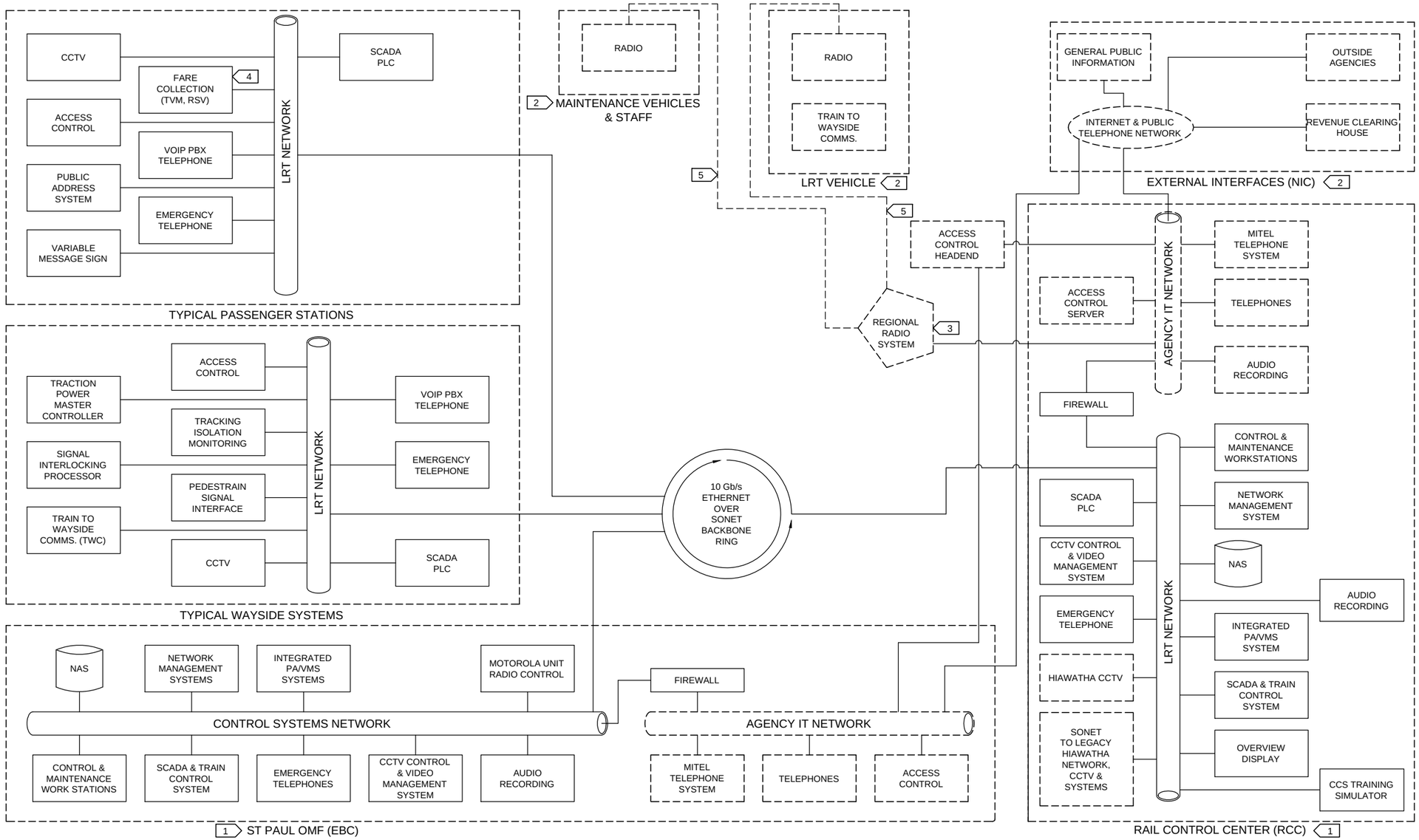
METROPOLITAN COUNCIL
SOUTHWEST Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
GENERAL
SYMBOLS, LEGEND AND GENERAL NOTES

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SYM-000

SHEET 186 OF 202

Jun, 26 2014 08:25 am V:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COM-SYM-000.dwg By: fergtk



1 COMMUNICATIONS OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF GREEN LINE COMMUNICATION SYSTEMS AS TYPICALLY INSTALLED AND IN CURRENT OPERATION; INDIVIDUAL SITES MAY VARY SOMEWHAT.
2. THIS DRAWING IS A LOGICAL SCHEMATIC DIAGRAM AND IS NOT INTENDED TO SHOW INDIVIDUAL COMPONENTS, CABLE RUNS, ETC.

KEYNOTES:

1. SITE AND ALL COMPONENTS WITHIN ARE EXISTING; CONTRACTOR SHALL EXPAND AND/OR PROVIDE LICENSES, PROGRAMMING, ETC. NECESSARY TO INCORPORATE ALL NEW FIELD SUBSYSTEMS AND DEVICES.
2. EXISTING FACILITIES AND SUBSYSTEMS.
3. RADIO SYSTEM CONSISTS OF EXISTING 800-MHz REGIONAL RADIO (ARMER) SYSTEM, ON WHICH METRO TRANSIT HAS TALK GROUPS FOR OPERATIONAL SERVICE.
4. NEW ITEMS TO BE PROVIDED BY OTHERS.
5. WIRELESS 800-MHz RADIO LINKS.

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WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
COMMUNICATIONS OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SWB-001

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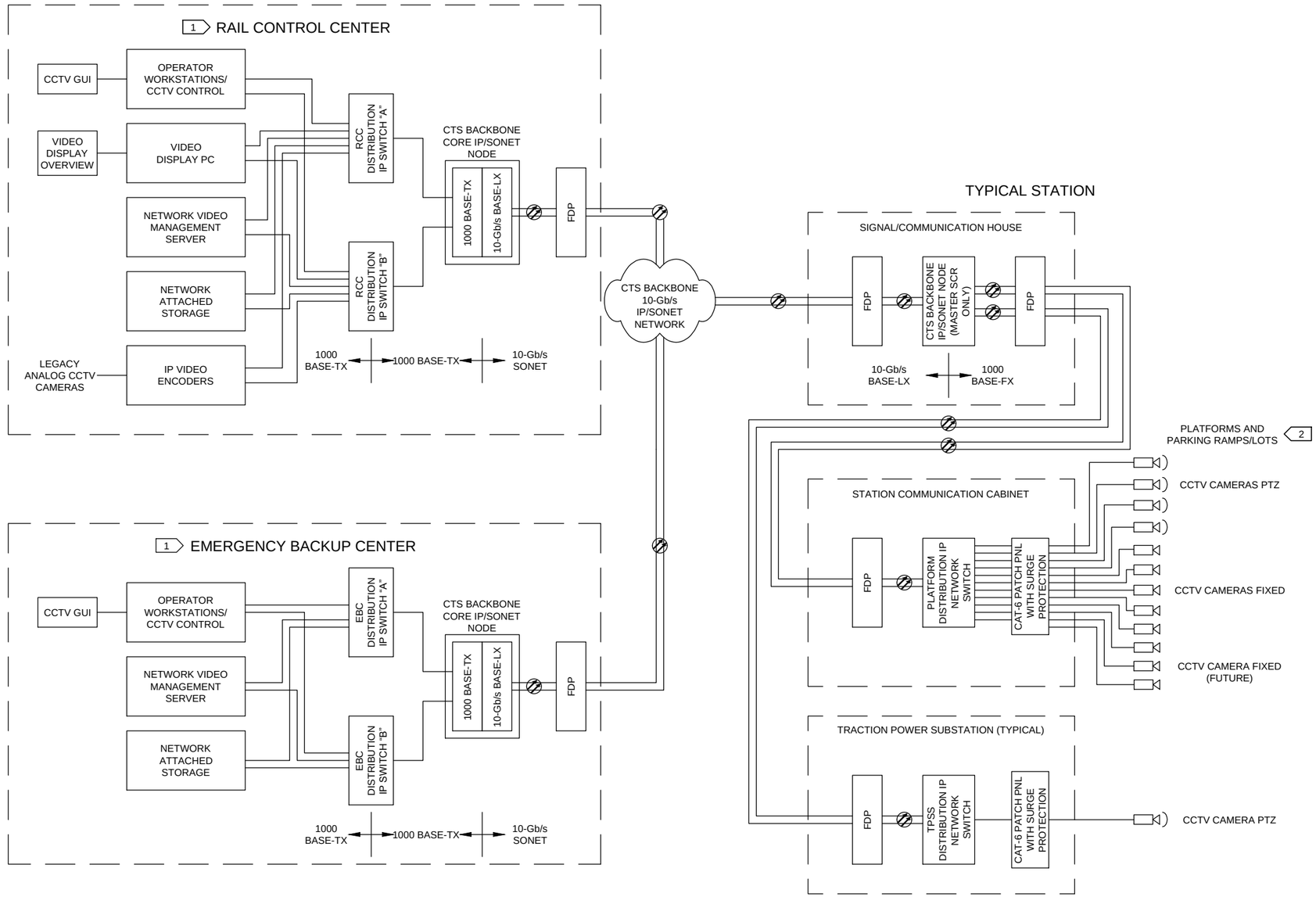

1 CCTV SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHOULD NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE CCTV SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.
4. NOT ALL LOCATIONS WHERE CCTV CAMERAS WILL BE INSTALLED ARE SHOWN IN THIS DIAGRAM.

KEYNOTES:

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL EXPAND HEAD END SYSTEMS TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT CAMERAS ON CCTV HEADEND SYSTEM, AND FURNISH ADDITIONAL NVR STORAGE TO ACCOMMODATE ALL NEW SWLRT CAMERAS.
2. PARKING RAMPS AND LOTS MAY REQUIRE A SEPARATE CABINET AND NETWORK SWITCH TO ACCOMMODATE MINIMUM CABLE LENGTHS; THESE CABINETS ARE NOT SHOWN ON THIS DRAWING.

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WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
CCTV SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SWB-002

SHEET 188 OF 202

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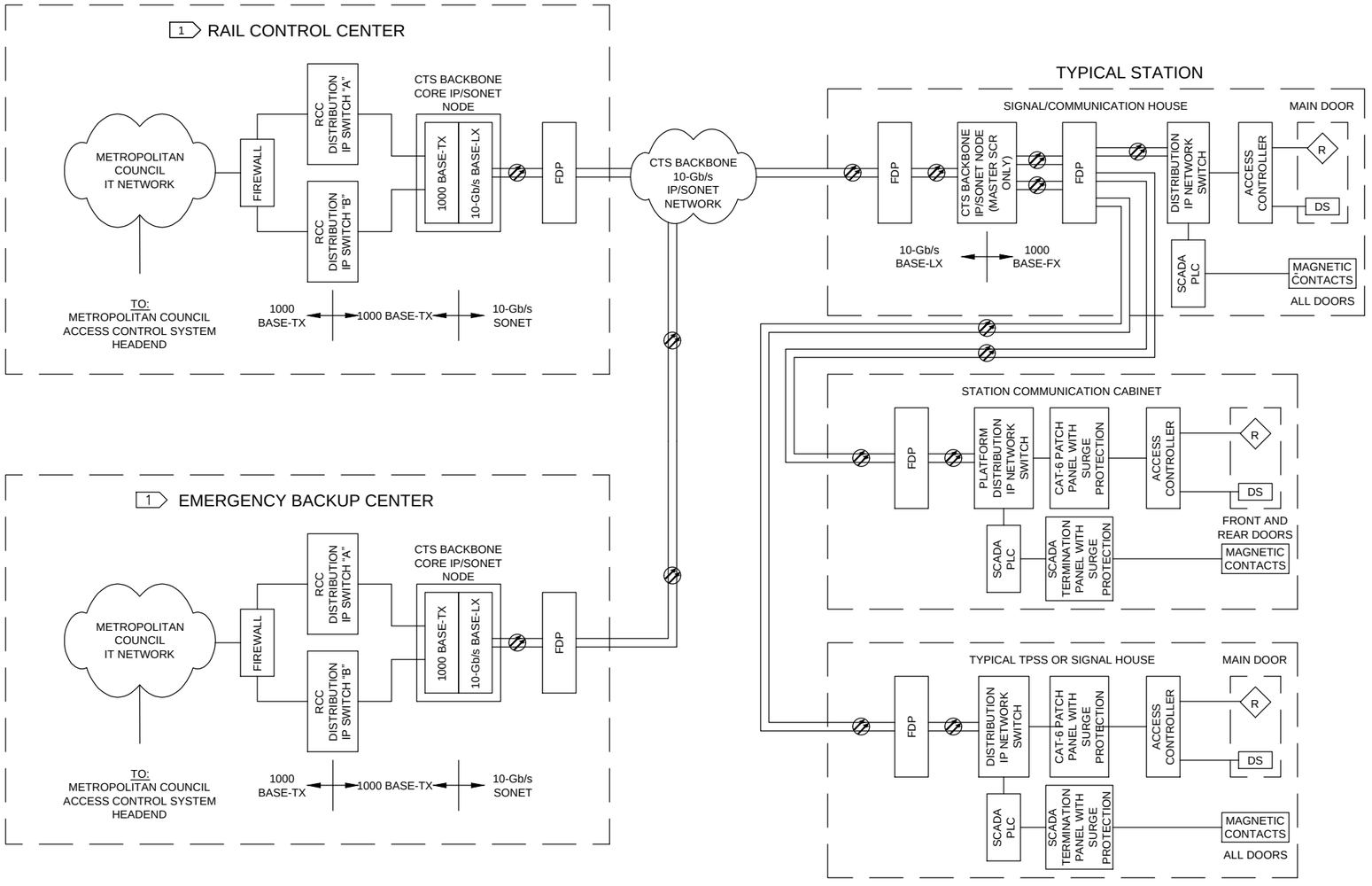

1 ACCESS CONTROL SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE ACCESS CONTROL SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.

KEYNOTES:

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL PROVIDE PROGRAMMING FOR ALL NEW ACCESS CONTROLLERS AND ACCESS CARD READERS, AND WORK WITH MET COUNCIL TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT STATION ACCESS CARD READERS ON EXISTING GE FACILITY COMMANDER SYSTEM.

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Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
ACCESS CONTROL SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SWB-003

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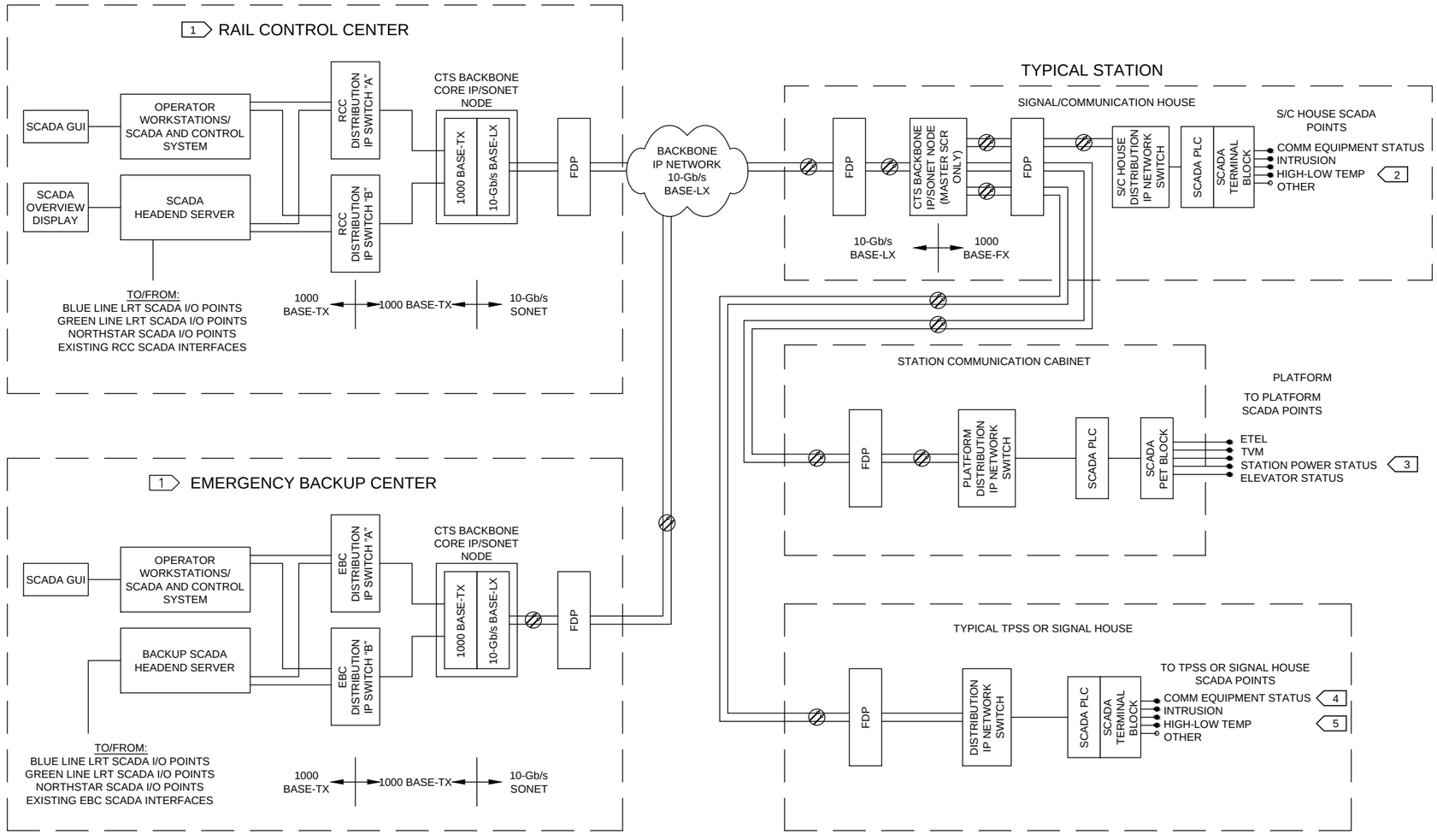

1 SCADA SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE FARE COLLECTION SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.
4. SCADA POINTS SHOWN ON THIS DRAWING ARE AN ARBITRARY SAMPLE OF POINTS; SEE SPECIFCATION DOCUMENTS FOR ACTUAL REQUIRED LIST OF SCADA POINTS.

KEYNOTES:

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL EXPAND HEAD END SYSTEMS AND PROVIDE SCADA PROGRAMMING TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT SCADA POINTS, ALARMS AND CONTROLS ON SCS CENTRAL CONTROL SYSTEM.
2. TYPICAL SIGNAL-COMMUNICATION HOUSE CONTAINS 15-20 DISCREET AND 3 ANALOG I/O SCADA POINTS.
3. TYPICAL STATION COMMUNICATION CABINET CONTAINS 25-30 DISCREET AND 1-2 ANALOG I/O SCADA POINTS.
4. TYPICAL SIGNAL HOUSE CONTAINS 10-15 DISCREET AND 1-2 ANALOG SCADA POINTS.
5. TYPICAL TPSS CONTAINS 140 DISCREET SCADA I/O POINTS, (10 OF WHICH ARE CONTROLS, THE REST ARE INDICATIONS) AND 10 ANALOG SCADA INDICATIONS.

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WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
SCADA SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS

SHEET NAME: COM-SWB-004

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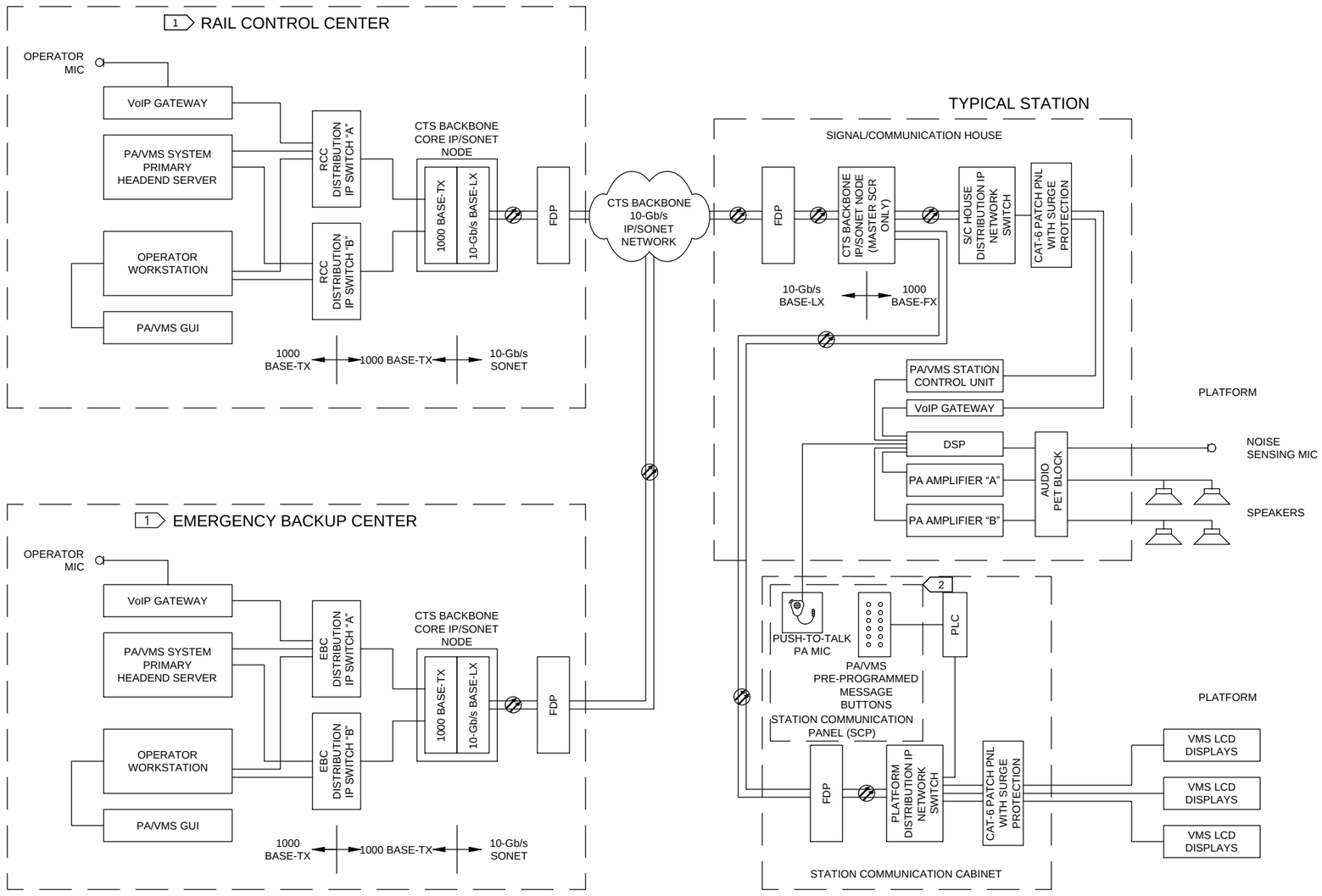

1 PA/VMS SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE PA/VMS SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.

KEYNOTES:

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL EXPAND HEAD END SYSTEMS AND PROVIDE PROGRAMMING TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT STATION PA/VMS SYSTEMS ON PA/VMS HEADEND SYSTEM.
2. STATION CONTROL PANEL SHALL BE PROVIDED WITH LOCKABLE DOOR SET INTO COMMUNICATION CABINET ON PLATFORMS; KEYING SHALL MATCH EXISTING METRO TRANSIT LRT SCP LOCKS.

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WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
PA/VMS SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SWB-005

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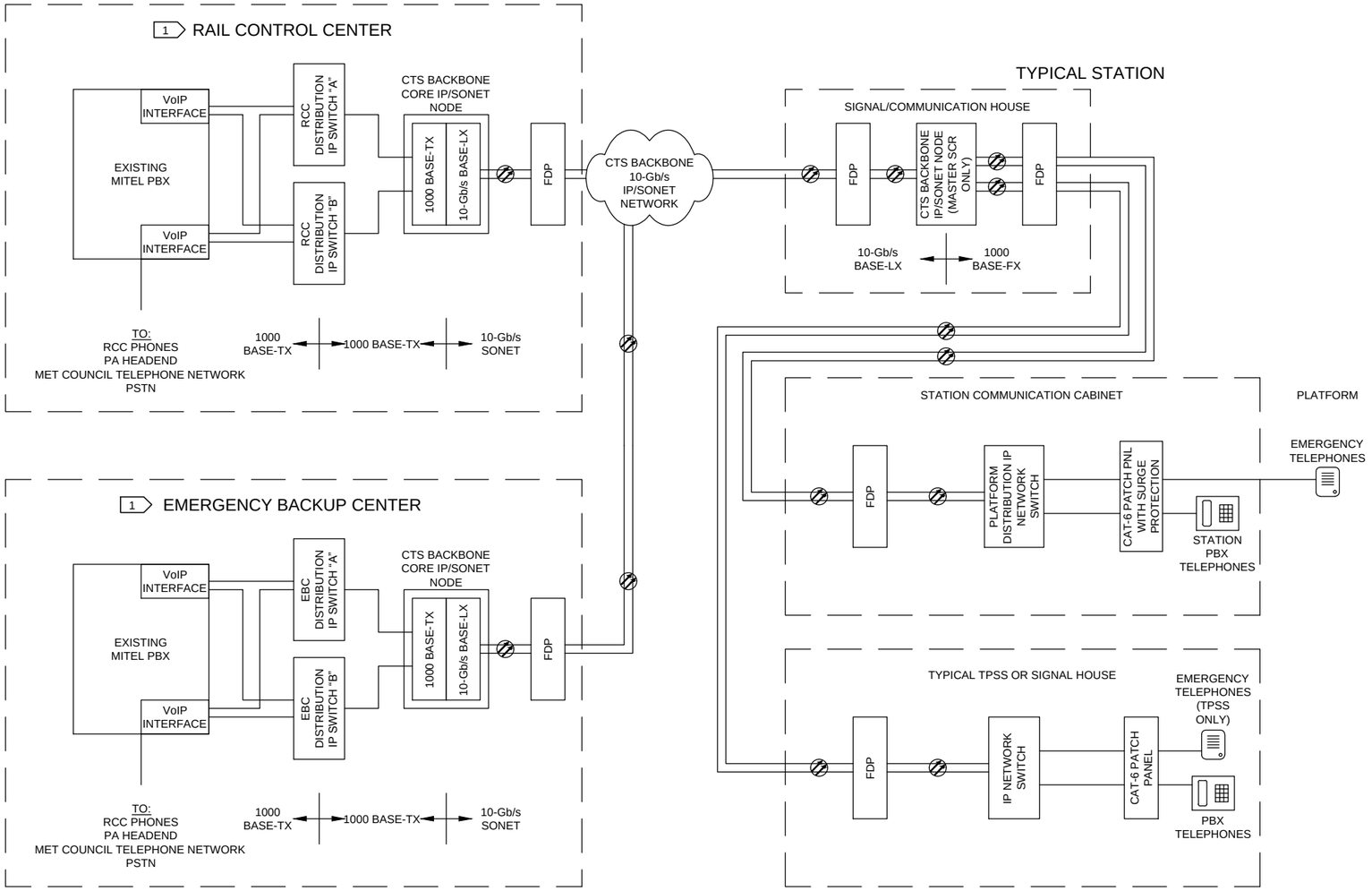

1 TELEPHONE SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE TELEPHONE SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.

KEYNOTES: ⬠

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL PROVIDE LICENSES FOR ALL NEW PHONES, AND WORK WITH MET COUNCIL TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT STATION TELEPHONES ON EXISTING MITEL PHONE SYSTEM.

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METROPOLITAN COUNCIL
SOUTHWEST Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
TELEPHONE SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SWB-006

SHEET 192 OF 202

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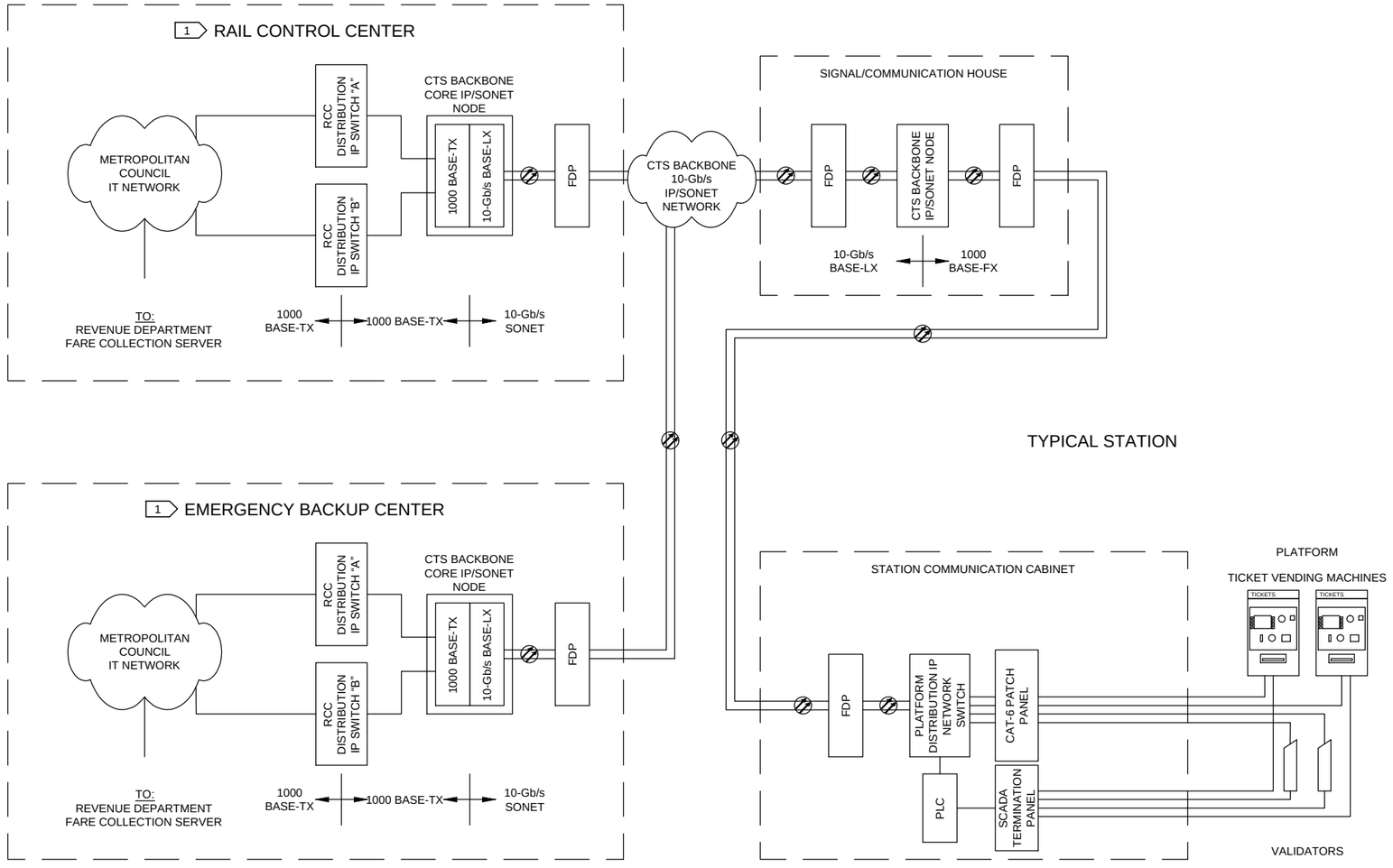

1 FARE COLLECTION SYSTEM OVERVIEW

SCALE: NTS

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE FARE COLLECTION SYSTEM WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION; REFERENCE INDIVIDUAL STATION DRAWINGS AND DETAIL SHEETS FOR MORE DETAILED INSTALLATION AND CONFIGURATION INFORMATION.

KEYNOTES: 1

1. ALL ITEMS AT RCC AND EBC ARE EXISTING. CONTRACTOR SHALL EXPAND HEAD END SYSTEMS AND PROVIDE SCADA PROGRAMMING TO THE EXTENT NECESSARY TO PROVISION ALL NEW SWLRT FARE COLLECTION POINTS ON SCADA HEADEND SYSTEM.

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METROPOLITAN COUNCIL
SOUTHWEST Green Line LRT Extension

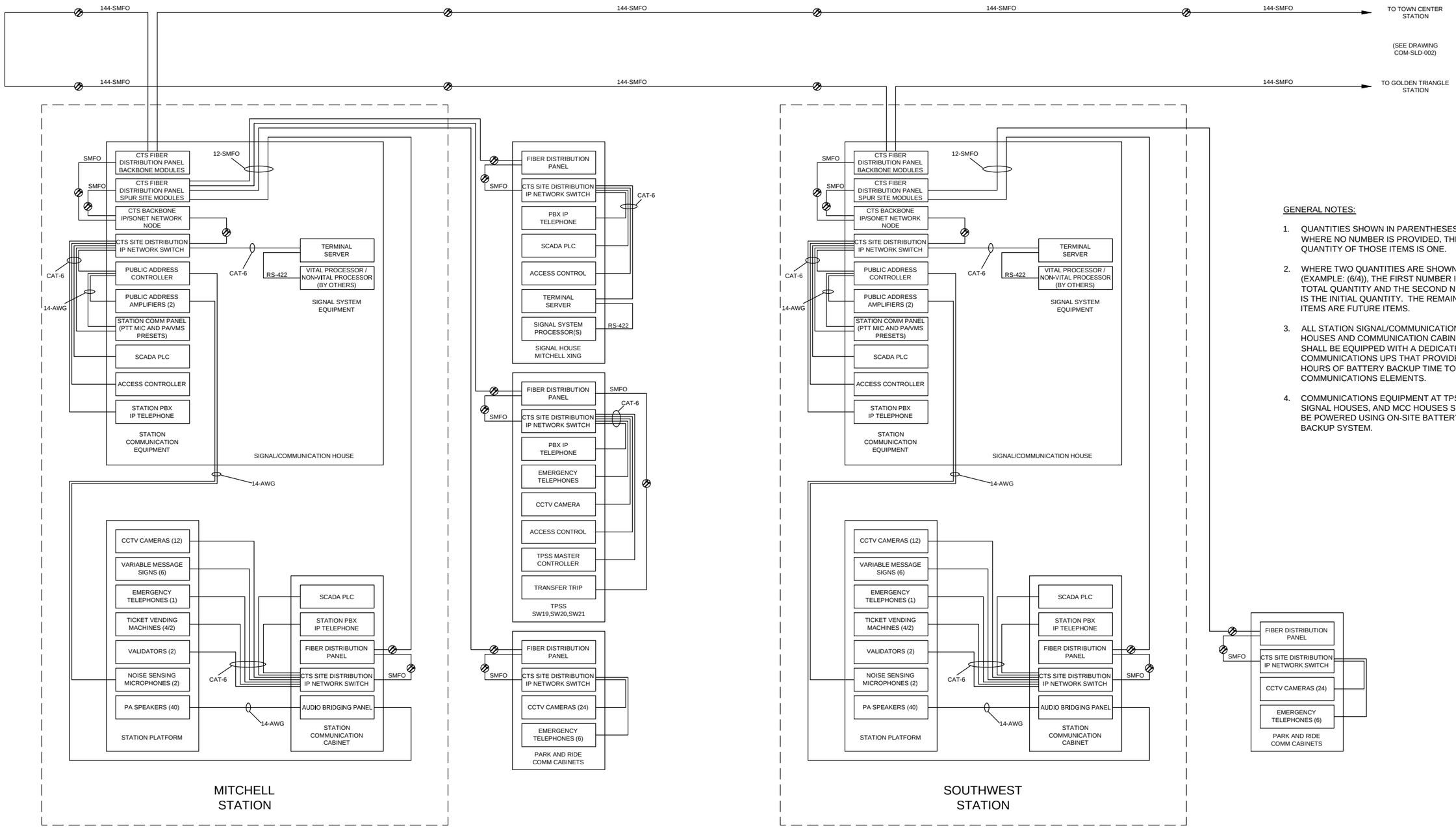
WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SYSTEMWIDE BLOCK DIAGRAMS
FARE COLLECTIONS SYSTEM OVERVIEW

DISCIPLINE: SYSTEMS

SHEET NAME: COM-SWB-007

SHEET 193 OF 202

Jun, 26 2014 08:26 am V:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-SWB-007.dwg By: fergtk



GENERAL NOTES:

1. QUANTITIES SHOWN IN PARENTHESES (); WHERE NO NUMBER IS PROVIDED, THE QUANTITY OF THOSE ITEMS IS ONE.
2. WHERE TWO QUANTITIES ARE SHOWN (EXAMPLE: (6/4)), THE FIRST NUMBER IS THE TOTAL QUANTITY AND THE SECOND NUMBER IS THE INITIAL QUANTITY. THE REMAINING ITEMS ARE FUTURE ITEMS.
3. ALL STATION SIGNAL/COMMUNICATION HOUSES AND COMMUNICATION CABINETS SHALL BE EQUIPPED WITH A DEDICATED COMMUNICATIONS UPS THAT PROVIDES 4 HOURS OF BATTERY BACKUP TIME TO ALL COMMUNICATIONS ELEMENTS.
4. COMMUNICATIONS EQUIPMENT AT TPSS, SIGNAL HOUSES, AND MCC HOUSES SHALL BE POWERED USING ON-SITE BATTERY BACKUP SYSTEM.

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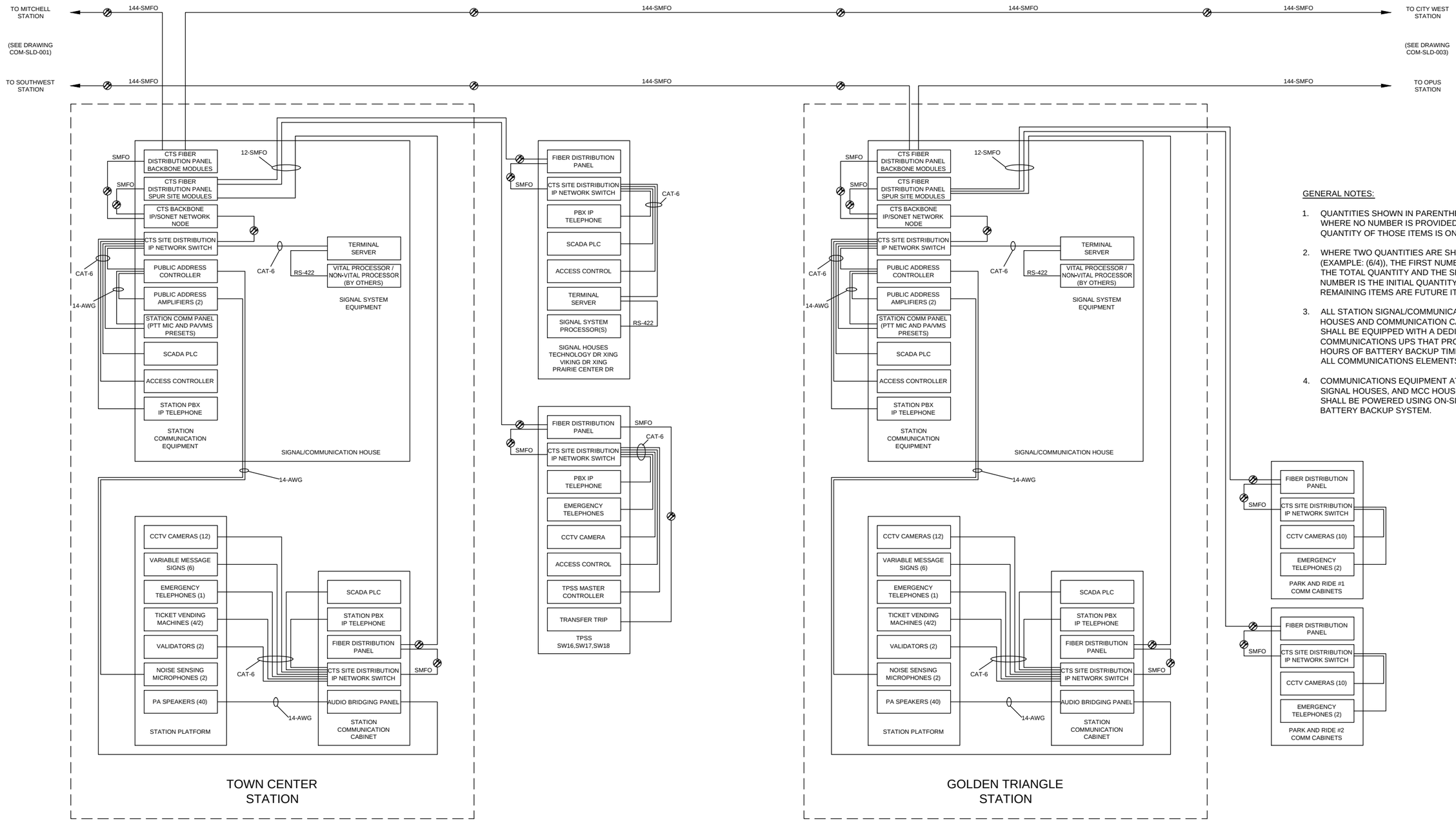
WEST - VOLUME 3 (SYSTEMS) COMMUNICATIONS SYSTEM SINGLE LINE DIAGRAMS SHEET 1 OF 4

DISCIPLINE: SYSTEMS

SHEET NAME: COM-SLD-001

SHEET 194 OF 202

Jun, 26 2014 08:26 am v:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-SLD-001.dwg By: fergtk



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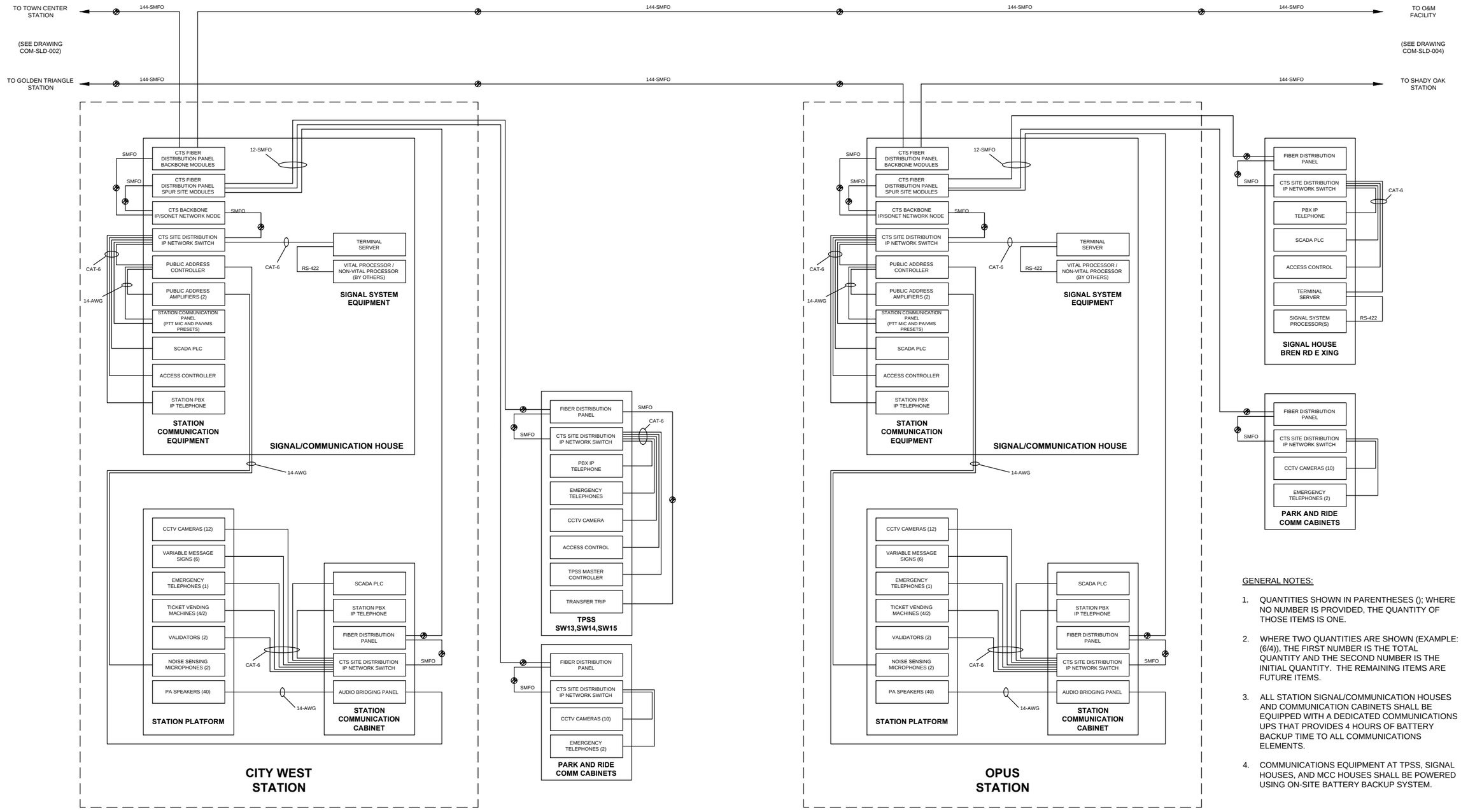
WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SINGLE LINE DIAGRAMS
SHEET 2 OF 4

DISCIPLINE: SYSTEMS
SHEET NAME: COM-SLD-002

SHEET 195 OF 202

Jun, 26 2014 08:26 am v:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-SLD-002.dwg By: fergtk



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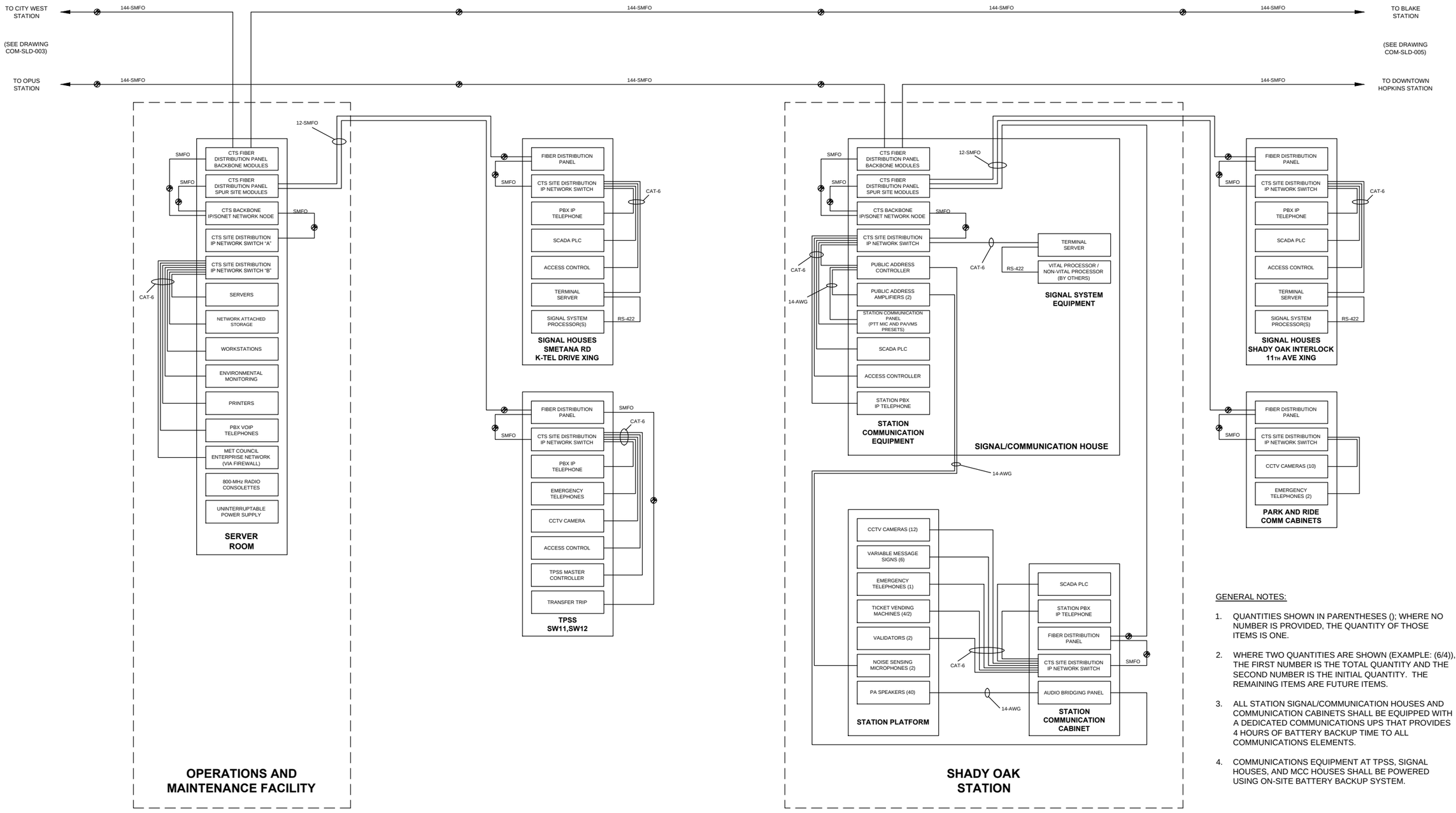
WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SINGLE LINE DIAGRAMS
SHEET 3 OF 4

DISCIPLINE: SYSTEMS

SHEET NAME: COM-SLD-003

SHEET 196 OF 202

Jun, 26 2014 08:27 am V:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-SLD-003.dwg By: fergtk



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SOUTHWEST Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
SINGLE LINE DIAGRAMS
SHEET 4 OF 4

DISCIPLINE: SYSTEMS

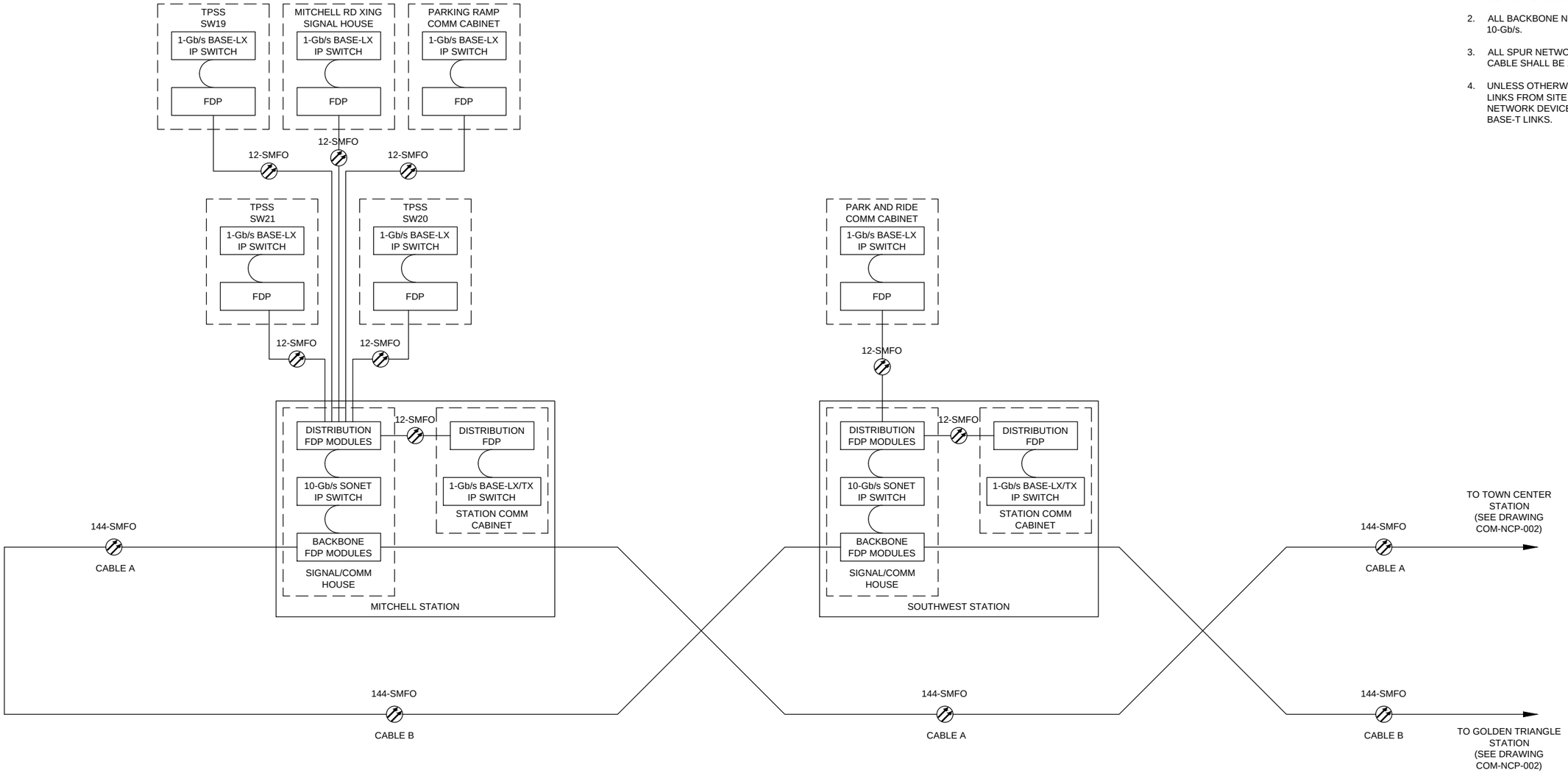
SHEET NAME: COM-SLD-004

SHEET 197 OF 202

Jun, 26 2014 08:27 am V:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-SLD-004.dwg By: fergtk

GENERAL NOTES:

1. 144-SMFO BACKBONE CABLE SHALL BE ROUTED DIVERSELY IN ALL INSTANCES; ROUTE 'A' AND 'B' CABLES IN SEPARATE DUCTS OF S/C DUCTBANK, AND PROVIDE ENTRANCES/EXITS OF 'A' AND 'B' CABLES INTO HOUSES AND ENCLOSURES VIA SEPARATE CONDUITS.
2. ALL BACKBONE NETWORK LINKS SHALL BE 10-Gb/s.
3. ALL SPUR NETWORK LINKS OVER 12-SMFO CABLE SHALL BE 1-Gb/s.
4. UNLESS OTHERWISE NOTED, COPPER NETWORK LINKS FROM SITE ACCESS SWITCHES TO NETWORK DEVICES SHALL BE 1000/100/10 BASE-T LINKS.



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SOUTHWEST Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS) COMMUNICATIONS SYSTEM NETWORK AND CABLE PLANS SHEET 1 OF 4

DISCIPLINE: SYSTEMS
SHEET NAME: COM-NCP-001

SHEET 198 OF 202

Jun. 26 2014 08:27 am v:\3200_pec-w\CAD\OVERALL\SHEETS\ELEC\COMM-NCP-001.dwg By: fergtk

GENERAL NOTES:

1. 144-SMFO BACKBONE CABLE SHALL BE ROUTED DIVERSELY IN ALL INSTANCES; ROUTE 'A' AND 'B' CABLES IN SEPARATE DUCTS OF S/C DUCTBANK, AND PROVIDE ENTRANCES/EXITS OF 'A' AND 'B' CABLES INTO HOUSES AND ENCLOSURES VIA SEPARATE CONDUITS.
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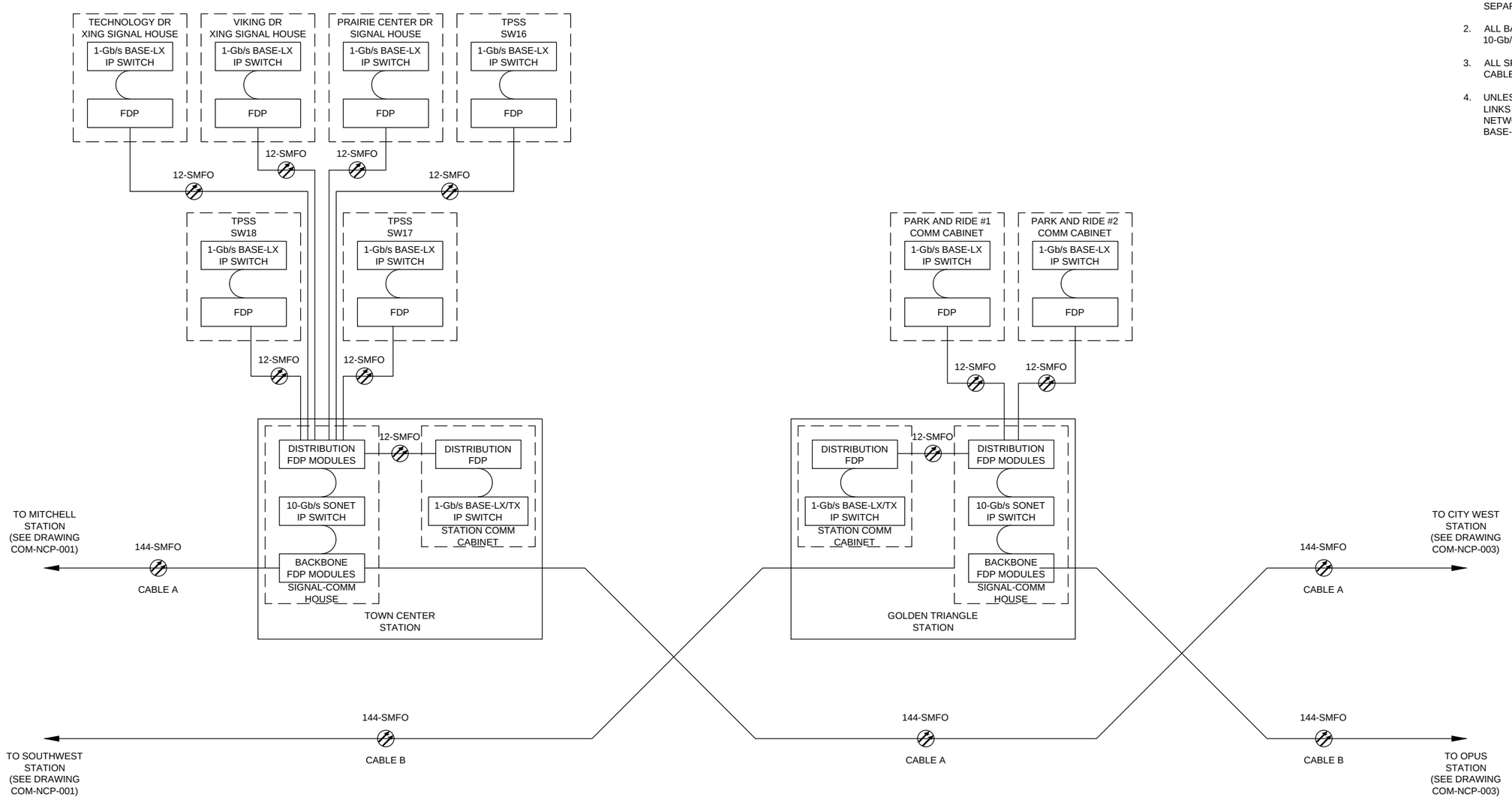

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WEST - VOLUME 3 (SYSTEMS) COMMUNICATIONS SYSTEM NETWORK AND CABLE PLANS SHEET 2 OF 4

DISCIPLINE: SYSTEMS

SHEET NAME: COM-NCP-002

SHEET 199 OF 202

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GENERAL NOTES:

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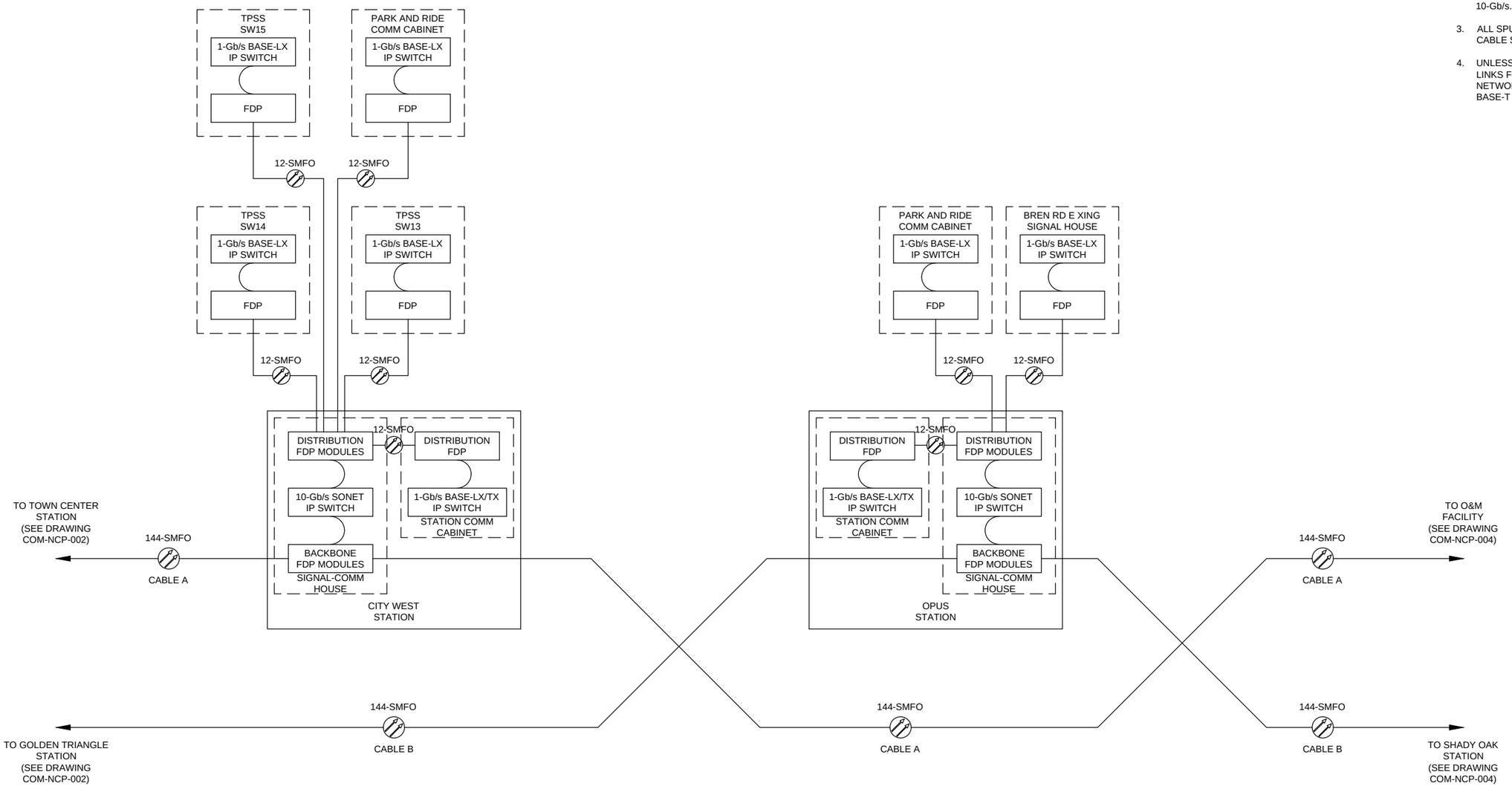

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SOUTHWEST Green Line LRT Extension

WEST - VOLUME 3 (SYSTEMS) COMMUNICATIONS SYSTEM NETWORK AND CABLE PLANS SHEET 3 OF 4

DISCIPLINE: SYSTEMS
SHEET NAME: COM-NCP-003

SHEET 200 OF 202

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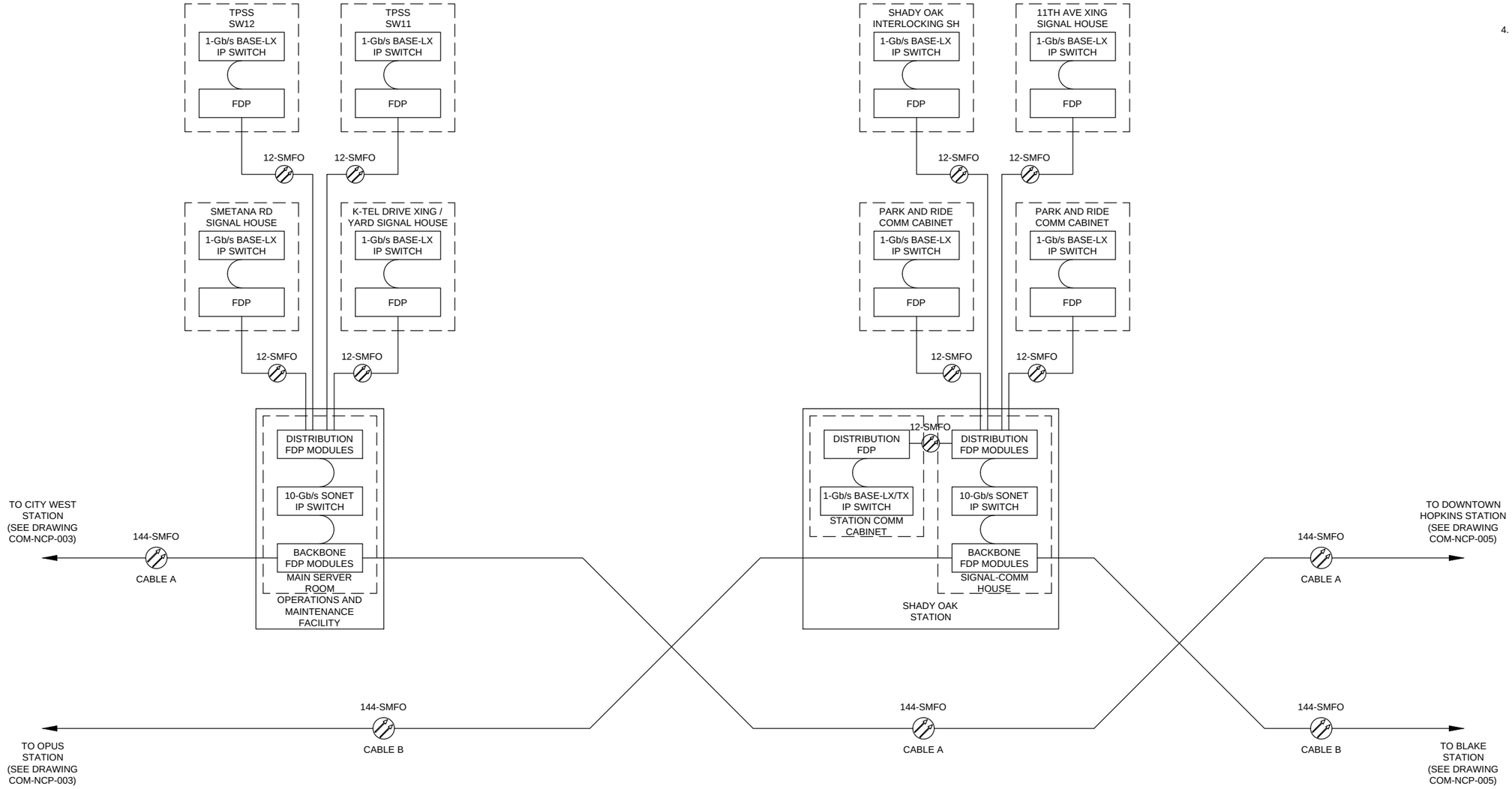

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WEST - VOLUME 3 (SYSTEMS) COMMUNICATIONS SYSTEM NETWORK AND CABLE PLAN 4 OF 4

DISCIPLINE: SYSTEMS
SHEET NAME: COM-NCP-004

SHEET 201 OF 202

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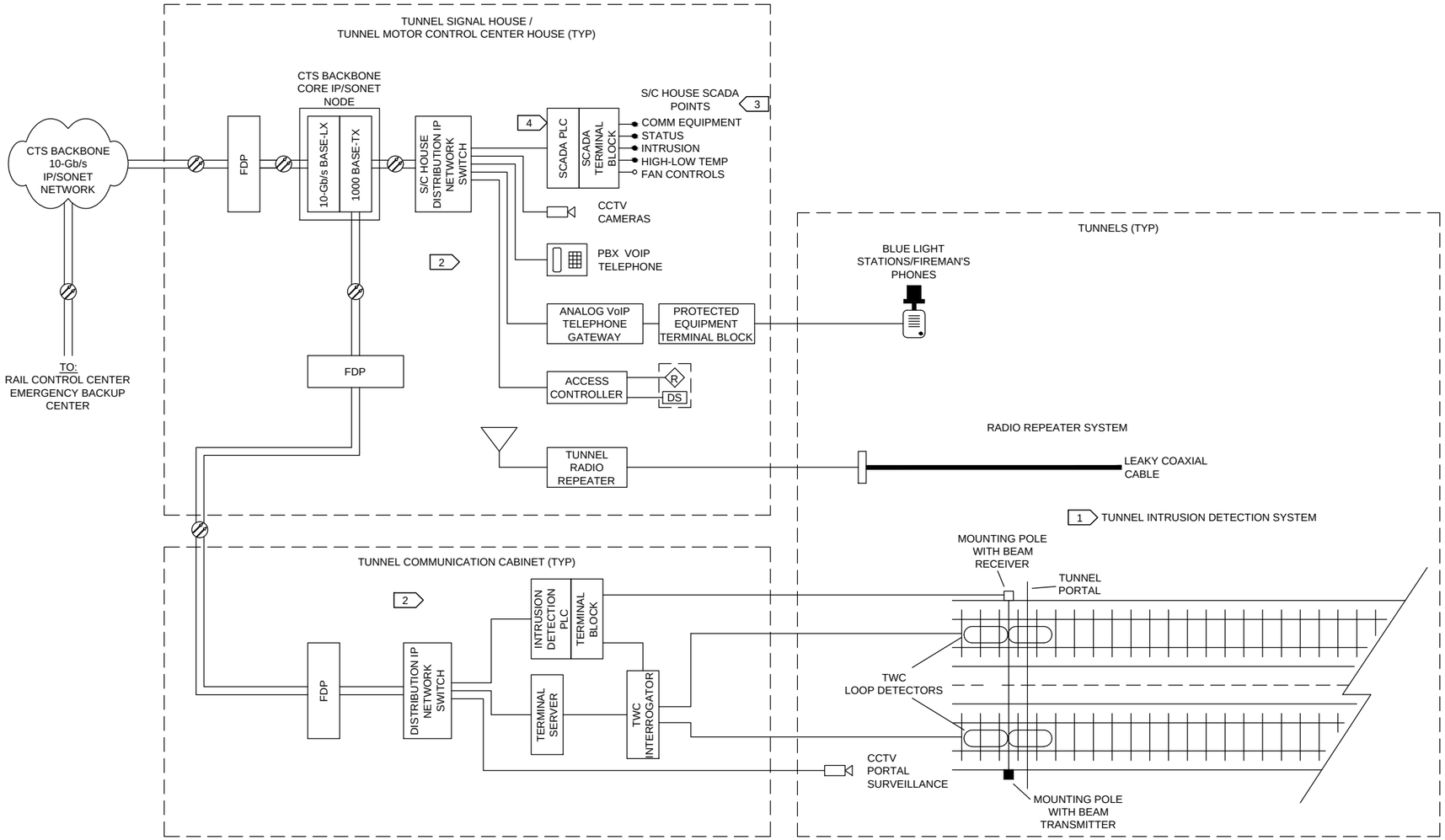

GENERAL NOTES:

1. DRAWING IS MEANT AS A GUIDELINE FOR CONTRACTOR'S DESIGN, WHICH SHALL BE SUBMITTED THROUGH SHOP DRAWING REVIEW PROCESS; SYSTEM AND COMPONENTS SHALL NOT BE CONSTRUCTED DIRECTLY FROM THIS DRAWING.
2. DRAWING NOT TO SCALE; EXACT QUANTITIES AND LOCATIONS OF DEVICES SHOWN ON STATION PLATFORM AND CANOPY PLAN DRAWINGS.
3. THIS DIAGRAM PROVIDES A GENERAL OVERVIEW OF THE TUNNEL COMMUNICATION SYSTEMS WITH FIELD SITES SHOWN IN TYPICAL CONFIGURATION.

KEYNOTES:

1. A HORN AND STROBE SHALL BE INSTALLED AT TUNNEL PORTALS FOR INTRUSION DETECTION. STROBE SHALL BE MOUNTED IN LOCATION VISIBLE TO TRAIN OPERATOR; HORN SHALL BE MOUNTED IN LOCATION AUDIBLE TO INTRUDERS.
2. UPS/BATTERY BACKUP SHALL BE PROVIDED FOR EACH LOCATION NOTED; BATTERY RUNTIME SHALL BE 8 HOURS MINIMUM.
3. TYPICAL TUNNEL MCC HOUSE WILL CONTAIN 50-75 DISCREET (10-15 CONTROLS, THE REST INDICATIONS) AND 5-10 ANALOG SCADA I/O POINTS.
4. SCADA SYSTEM SHALL INTERFACE WITH FIRE MANAGEMENT INFORMATION SYSTEM.

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WEST - VOLUME 3 (SYSTEMS)
COMMUNICATIONS SYSTEM
TUNNEL SYSTEM
TUNNEL COMMUNICATIONS OVERVIEW

DISCIPLINE: SYSTEMS
SHEET NAME: COM-TUN-001

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