Sargent & Lundy LLC

Warren E. Vahle
Vice President
Phone: (312) 269-3635
FAX: (312) 269-9733
E-Mail: warren.e.vahle@sargentlundy.com

VIA EMAIL: edward.j.smith@xcelenergy.com

October 28, 2009
Project No.12617-001
Letter No. SL-XCEL-HIA-09-0002

Xcel Energy
Hiawatha Underground Substation

Study Paper - Final

Mr. Edward Smith
Principal Engineer, Substation Engineering
Ecel Energy
414 Nicollet Mall, (MP 8)
Minneapolis, Minnesota 55401

Dear Mr. Smith:

Enclosed please find the final Hiawatha Underground Substation Study Paper for your use. This Study Paper is being sent to you in response to Xcel Energy's request that Sargent & Lundy[LLC] (S&L) perform an initial evaluation of the substation, transmission and distribution facilities to be built at the site. This document is in support of developing the site for the underground substation.

The enclosed document includes the following: a description of the, scope of work, assumptions and clarifications, cost estimate, and schedule for the project, as well as attachments, including associated conceptual drawings for your use.

We look forward to discussing the enclosed documents and how we can best serve your needs. If you have any questions or concerns, please do not hesitate to contact me directly.

Yours very truly,

FOR WEV

Warren E. Vahle
Project Director

WEV/mas
Enclosures
Copies:
J. Moss (1/1)
B. Kelley (1/1)
E. Crockett (1/1)
F. Shainauskis (1/1)
File
\\SUBSTATION\XCEL\12617-001 - HIAWATHA\2.0 DOC. DATA RECORDS CONTROL\2.03 CORRESPONDENCE\SL-XCEL-HIA-09-0002.DOC

XCEL ENERGY

STUDY PAPER

HIAWATHA 115-13.8-kV UNDERGROUND TRANSMISSION SUBSTATION

ISSUE: FINAL

OCTOBER 28, 2009

Project No. 12617-001

APPROVAL PAGE FOR

HIAWATHA STUDY PAPER

XCEL ENERGY

This is to confirm that this Specification has been prepared, reviewed and approved in accordance with Sargent and Lundy's Quality program.

Prepared by:	Joseph Moss	10/28/09 Date
Reviewed By:	Frank Shainuskas	10/28/09 Date
Approved by	Frank Shainuskas	10/28/09 Date

Table of Contents

1 Executive Summary

1.1 The Hiawatha West Site is the site under consideration for the proposed underground Hiawatha Substation, and the one discussed in this paper. In support of developing this site for the underground substation, Xcel Energy has requested that Sargent & Lundy^{LLC} (S&L) perform an initial evaluation of the substation, transmission and distribution facilities to be built at the site.

1.2 The new Xcel Energy 115-13.8-kV Hiawatha Substation is to be built underground with a "park-like" treatment on top of it. The ultimate substation design will consist of a 115-kV four-bay breaker-and-a-half Gas Insulated Substation (GIS), four 115-kV transmission lines, three 115-13.8-kV 30/40/50MVA transformers and three lineups of 13.8-kV switchgear, each lineup will consist of 13 cubicles of switchgear.

1.3 The new Hiawatha substation enclosure will consist of a cast-in-place, reinforced, concrete underground enclosure of approximately 38,000 square feet. The enclosure will include separate equipment areas or rooms as follows:

- One area for the 115-kV GIS, associated local control cabinets (LCCs) and station auxiliary power transformers.
- One room (vault) for each of the 115-13.8-kV transformers
- One room for each of the 13.8-kV switchgear lineups
- One control room for the protective relaying and control panels, communication panels, ac and dc panels and automatic transfer equipment.
- One battery room
- Two mechanical equipment rooms/areas (one shall contain the CO2 tank).
- One substation office and fire response area to contain the miscellaneous fire protection/detection panels.
- One 115-kV cable vault to contain the cable racking clamping and support of the 115-kV XLPE cables.
- One 13.8-kV (15-kV nominal) cable vault to contain the cable racking clamping and support of the 15-kV distribution feeder cables.

1.4 The preliminary advantages of a GIS in an urban area are the reduced land space requirements, enhanced aesthetics, and enhanced reliability and security associated with having major equipment located indoors.

1.5 Preliminary cost estimates and schedules were prepared for this approach. Based on starting the detailed engineering and procurement activates upon contract approval (12/4/09), the estimated in-service date for the complete substation is April 2, 2012. The schedule is presently a 28-month schedule for completion of the substation from project authorization, including a 24-month construction period. The largest improvement of the project schedule would be a partial release of up-front activities including engineering and procurement. The preliminary cost estimate for this recommended approach is $86 million.

2 Sargent & Lundy Project Experience

2.1 S&L Project Experience

Sargent & Lundy is currently providing engineering and design, construction surveillance and testing and commissioning services under several General Services Agreements. Examples include agreements with the American Transmission Company (ATC), Baltimore Gas & Electric, City Public Service of San Antonio, Conectiv, Consolidated Edison, Exelon, National Grid USA, PacifiCorp, Public Service Electric & Gas, San Diego Gas & Electric, Southern California Edison and Tennessee Valley Authority (TVA).

For indoor and/or GIS substations we have been involved with 20 projects over the last 20 years. Below is a list of selected Sargent and Lundy Gas-Insulated Substation Experience.

2.1.1 ComEd

- 345-kV GIS Taylor Street Substation – Completed 1980
- 138-kV GIS for Kingsbury Substation* – Completed 2001
- 132-kV GIS for State Street Substation – Completed 2002
- 138-kV GIS for Madison Substation – Completed 2004
- 138-kV GIS for Ohio Substation* – Completed 2004
- 345-kV GIS for West Loop Substation – Completion 2009
- In addition to the above, the 138-kV ComEd Kingsbury and Ohio Substations also include 138-13.8-kV substations that are not GIS but are examples of urban enclosed substations.

2.1.2 BP (Amoco) Oil Company

- Three – 138-kV GIS for the Whiting Refinery (RB-1, RB-2 & RB-4-) – Completed 1980's
- BP Whiting Refinery (RB-3) – Completed in 2009

2.1.3 Commonwealth Electric (Cambridge, Massachusetts)

- 115-kV GIS for the Putnam Substation – Completed 1984

2.1.4 Hawaiian Electric

- 115-kV GIS Archer Substation – Completed 1984

2.1.5 Huaeneng International Power Development Corporation (HIPDC)

- 220-kV GIS Dalian Power Station – Completed 1996
- 220-kV GIS Dandong Power Station – Completed 1996

2.1.6 City of Anaheim

- 230-kV and 69-kV GIS for Lewis Substation Expansion – Complete 2006
- 69-kV GIS for Park Substation – Completed 2006
- 69-kV GIS for Anaheim Substation – Completed 2008

2.1.7 Louisville Gas & Electric

- 138-kV Waterside West Substation – Completed 2009

2.1.8 National Grid (Philadelphia, Pennsylvania)

- 69-kV GIS for Waverly Substation – Completed 2007

2.1.9 Nevada Power (Las Vegas, Nevada)

- 138-kV GIS for Collman Substation – Design Completed 2008

3 Scope of Work

3.1 This paper provides an initial evaluation, preliminary cost estimates and schedules, and other pertinent information related to the development of the Hiawatha Substation. The primary criteria used in the evaluating the site are:

- Cost
- Schedule
- Reliability
- Security
- Constructability

3.2 Other criteria used in the evaluation included: access, maintenance, aesthetics, hazards, environmental, and project risk factors such as safety, construction, operations, etc. The following attachments are included:

- Attachment 7-1 HIA West Circuit Diagram (Prepared by Xcel Energy)
- Attachment 7-2 Site physical layout and section drawings
- Attachment 7-3 A High Level Cost Estimate
- Attachment 7-4 A Level 1 Schedule

3.3 Ultimate Configuration: The station will be designed for the following ultimate configuration:

3.3.1 115-kV four bay breaker-and-a-half GIS

3.3.2 Four 115-kV transmission lines (one to the Southtown [SOU] substation, one to the Elliot Park [ELP] substation and two to the new Midtown [MDT] substation) and a 115-kV line position for a mobile transformer connection under emergency conditions. This mobile line position may eventually be replaced by a fifth 115-kV line.

3.3.3 Three 115-13.8-kV 30/40/50MVA transformers.

3.3.4 Three lineups of 13.8-kV switchgear with seven feeder circuit breakers, two main circuit breakers, two bus-tie circuit breakers and two potential transformer cubicles per lineup.

3.4 Initial Configuration: The station will be designed for the following initial configuration:

3.4.1 115-kV GIS five breaker ring bus.

3.4.2 Four 115-kV transmission lines (one to the Southtown [SOU] substation, one to the Elliot Park [ELP] substation and two to the new Midtown [MDT] substation)

3.4.3 One 115 - 3.8-kV 30/40/50MVA transformer.

3.4.4 One lineup of 13.8-kV switchgear with seven feeder circuit breakers, two main circuit breakers, two bus-tie circuit breakers and two potential transformer cubicles.

3.5 Project Description: The new Hiawatha 115-13.8-kV Substation will be built on the site located east of Hiawatha Avenue and bordered on the north by E 28th Street and on the south by E 29th Street in Minneapolis, Minnesota. The Hiawatha Substation shall be located in a three-story building (including the cable vaults) located completely underground (approximately 60 feet) below grade. The following major equipment is included on each floor.

3.5.1 Cable Vault Area Floor (Elevation -52'-6")

3.5.1.1 There is one cable vault area located under the 115-kV GIS equipment and one cable vault area located under the 15-kV switchgear equipment which are connected to one another in an "L" shaped configuration. There is no vault area underneath the 115-13.8-kV transformers as the 115-kV XLPE primary cables to these transformers exit the GIS equipment and are routed in concrete encased PVC conduits (under the transformers) to 115-kV potheads (cable terminations) located in each respective transformer vault. This area shall contain:

3.5.1.1.1 The 115-kV XLPE cables and the 15-kV feeder distribution feeders which will exit the respective equipment and be supported on racks and routed to vertical cable risers within the building and exit the building to manholes located just outside the Hiawatha station.

3.5.1.1.2 A concrete oil containment vault will be designed to hold approximately 130% of the volume of one 115-13.8-kV transformer with a sump for removing the oil after a transformer failure. All three transformers will have oil piping routed to this same containment vault.

3.5.1.1.3 The freight elevator equipment room (properly ventilated, heated, and illuminated).

3.5.1.1.4 The electrical auxiliary equipment in this area shall consist of unit heaters, sump pumps (for water seepage) and area lighting.

3.5.1.1.5 Aluminum ladder and solid bottom cable trays associated with the power, control and instrumentation cables will be used for the equipment located on the first floor and the vault areas(Elevation - 38'-0").

3.5.1.1.6 A fire detection and water suppression system.

3.5.1.1.7 The vault area will be designed with two personnel entrances via two stair ways, one on the northeast and the other on the southwest of the building.

3.5.2 First Floor Area (Elevation -38'- 0"): This is the main equipment area of the substation and shall contain the following equipment rooms or areas:

3.5.2.1 115-kV GIS Area

3.5.2.1.1 This area shall include the 115-kV GIS, associated local control cabinets (LCCs) and the two station auxiliary power transformers. Cables shall exit all of the equipment through the floor and be routed via cable trays located in the GIS cable vault.

3.5.2.1.2 This area shall be serviced by two overhead electrical 6 ton capacity bridge cranes. There shall also be a removable 10' x 10' floor hatch in this area so that equipment can be lowered down into the vault area utilizing the overhead crane.

3.5.2.1.3 This area shall include unit heaters and area lighting. Lights shall be mounted on the side walls to allow for accessibility without hindering movement of the overhead crane.

3.5.2.1.4 This area shall include a laser beam fire detection and water fire suppression system. Floor drains shall be provided within this area and routed to the sump system within the GIS area vault.

3.5.2.1.5 This area shall be accessed from the transformer and 15-kV switchgear areas, one stair way in the northeast corner, and one freight elevator.

3.5.2.1.6 The freight elevator shall be a hydraulic design rated for 8000 pounds capacity.

3.5.2.2 115-13.8-kV transformers: One room (vault) for each of the three 115-13.8-kV transformers. Each room shall include:

3.5.2.2.1 A transformer protection monitoring equipment system.

3.5.2.2.2 Air supply and return ducts with appropriate fire dampers.

3.5.2.2.3 115-kV XLPE cable potheads for the transformer primaries.

3.5.2.2.4 15-kV non-segregated phase bus duct for the transformer secondaries.

3.5.2.2.5 Cables shall exit this area through the floor and be routed via concrete-encased PVC conduits to the cable trays located in the 15-kV cable vault.

3.5.2.2.6 A ceiling mounted "I" beam located above each transformer to facilitate bushing removal and pulling eyes at floor level to facilitate transformer installation and removal.

3.5.2.2.7 Each vault will be provided with slightly sloped floors to facilitate oil collection via piping which is routed to an oil containment vault in the GIS cable vault.

3.5.2.2.8 Area lighting.

3.5.2.2.9 A fire detection and CO_2 fire suppression system.

3.5.2.2.10 Access/egress to each transformer vault shall be provided by three personnel doors and one 15' wide by 20' high overhead, fire-rated door (to close on fire detection) for transformer installation and removal.

3.5.2.3 15-kV Switchgear: One room for each of the three 13.8-kV switchgear lineups. Each room shall include:

3.5.2.3.1 One lineup of 15-kV, one high, arc-resistant switchgear including associated plenum and exhaust duct.

3.5.2.3.2 Air supply and return ducts with appropriate fire dampers.

3.5.2.3.3 15-kV non-segregated phase bus duct between 15-kV switchgear lineups and the respective 115-13.8-kV transformer secondary.

3.5.2.3.4 Cables shall exit all of the equipment through the floor and be routed via cable trays located in the 15-kV cable vault.

3.5.2.3.5 Area lighting.

3.5.2.3.6 A fire detection and CO_2 fire suppression system.

3.5.2.3.7 Access/egress to each switchgear room shall include one personnel door and one double-wide equipment door. Switchgear Room 3 also provides access to the south west stairway. Circuit breakers or a single (approximately 3 feet wide) vertical section of switchgear may be installed or removed from the substation utilizing the 8000 lb. capacity freight elevator.

3.5.2.4 Two mechanical equipment rooms (A and B). These rooms shall include:

3.5.2.4.1 Ventilation fans, associated equipment and controls for the entire substation.

3.5.2.4.2 Air supply and return ducts with appropriate fire dampers.

3.5.2.4.3 Cables shall exit this area through the floor and be routed via concrete-encased PVC conduits to the cable trays located in the 15-kV cable vault.

3.5.2.4.4 Unit heaters and area lighting.

3.5.2.4.5 A fire detection and CO_2 fire suppression system.

3.5.2.4.6 One of the two rooms shall include the CO_2 tank.

3.5.2.4.7 Access/egress to each mechanical room shall be provided by one personnel door and one double-wide equipment door. Access to Room B shall also be available via the southwest stair way.

3.5.2.5 One Major Equipment Installation and Removal Corridor and Hatchway:

3.5.2.5.1 This area is located between the 115-13.8-kV transformers and the 15-kV Switchgear rooms, is approximately 180' long by 30' wide by 20' high and is accessed by removable roof panels with a total hatchway opening of 30 feet long by 20 feet wide. All equipment for the substation shall be installed or removed via this corridor and hatchway system by use of a leased crane on the surface (grade level) of the substation.

3.5.2.5.2 This area shall include non-segregated phase bus duct between the transformer vaults and the 15-kV switchgear rooms, unit heaters, area lighting and a fire detection and water suppression system. Floor drains shall be provided within this area and routed to the sump system within the 15-kV area vault.

3.5.2.5.3 Access/egress to this area shall be provided via each mechanical room, each transformer vault, the GIS area, and a stairway to the control and relay room located on Elevation -18'-0".

3.5.3 Second Floor Area (Elevation -18'-0"): This floor area is above the 15-kV Switchgear Rooms and shall contain the following equipment rooms or areas:

3.5.3.1 One Control and Relay Room to include the following:

3.5.3.1.1 Control, relay, protection and communication panels.

3.5.3.1.2 AC, DC panels automatic transfer switch equipment.

3.5.3.1.3 Air supply and return ducts with appropriate fire dampers.

3.5.3.1.4 Cables shall exit all of the equipment through the top and be routed via cable trays located over the panels and equipment. Cable tray risers shall connect these cable trays to the balance of the station cable tray systems in the 15-kV cable vault area.

3.5.3.1.5 This area shall include unit heaters and area lighting.

3.5.3.1.6 A fire detection and CO_2 fire suppression system.

3.5.3.1.7 Access/egress to the room shall include one personnel door and two double-wide equipment doors. Panels or other equipment within this room may be installed or removed from this area via a corridor which leads to the 8000 lb. capacity freight elevator.

3.5.3.2 One Battery Room to contain the following:

3.5.3.2.1 One 125 Vdc battery, rack, and spill tray system.

3.5.3.2.2 Positive and negative DC switches.

3.5.3.2.3 One eye-wash system.

3.5.3.2.4 100% redundant exhaust fans, ducts, and fire dampers.

3.5.3.2.5 A unit heater and area lighting.

3.5.3.2.6 Cables from the positive and negative poles of the battery shall be routed in separate aluminum conduits to the DC panels located in the Control and Relay Room.

3.5.3.2.7 A fire detection and CO_2 fire suppression system.

3.5.3.2.8 Access/egress to the room shall include one personnel door and one double-wide equipment door. The battery cells and equipment within this room may be installed or removed from this area via a corridor which leads to the 8000 lb. capacity freight elevator via the Control and Relay Room.

3.5.3.3 One Office and Fire Response Room to contain the following:

3.5.3.3.1 All fire detection and suppression control panels associated with the substation.

3.5.3.3.2 Office space for Xcel Energy Operations personnel.

3.5.3.3.3 Unit heaters and area lighting.

3.5.3.3.4 A fire detection and water suppression system.

3.5.3.3.5 Access/egress to the room shall include two personnel doors with one of these doors leading directly to the southwest stair way. This stair way shall be designated via signage as the “Fire Response Entry” meaning that when fire department personnel respond to a fire alarm for the station they shall enter the substation via this stairway as it leads to this fire response room which contains all of the fire system indication and control panels. This stair way and all stair ways will be sprinkled for fire suppression and no CO_2 will be used in these areas.

4 Assumptions and Clarifications

4.1 Engineering, design and procurement : The following assumptions and or clarifications apply for the engineering, design and procurement aspects of the project:

4.1.1 The monetary exchange rate for equipment manufactured overseas (e.g., the 115-kV GIS equipment) remains stable and does not result in a significant increase in the cost of the equipment.

4.1.2 Material and equipment will be procured in an expeditious manner so that it is on site when required to support construction.

4.1.3 Equipment lead times are based on current experience and could be impacted by prevalent business conditions at the time of order.

4.1.4 Labor, equipment, and materials will be bid and awarded on an expedited basis.

4.1.5 Vendor drawings will be available three weeks after award.

4.1.6 One-line diagrams and general arrangement drawings are finalized as early as possible in the project sequencing.

4.1.7 Ultimate design is for three 115-13.8-kV transformers, each with a top rating of 50MVA. Transformers will have conventional oil to air 115-kV bushings and 13.8-kV bushings for throat connection to the non-segregated phase bus duct. Each transformer will be air cooled.

4.1.8 The 115-kV GIS ultimate layout of 12 breakers in a breaker-and-a-half arrangement requires various sized footprints depending on the GIS Vendor's design; some are more compact than others. The building layout shown in this study assumes a medium sized footprint and includes two overhead cranes for erection and maintenance of the GIS equipment. Should the final GIS Vendor design be more compact than shown here, there will be some reductions to the overall size of the substation building.

4.1.8.1 The design of the building is based on utilizing removable roof panels with a total hatchway opening of 30 feet by 20 feet and an equipment installation and removal corridor approximately 180' long by 30' wide by 20' high, located between the 115-13.8-kV transformers and the 13.8-kV Switchgear rooms. All equipment to the substation shall be installed or removed via this corridor and hatchway system by use of a leased crane on the surface (i.e. at grade level) of the substation.

4.1.9 The substation enclosure shall be provided with a hydraulic type, 8000 lb capacity freight elevator for movement of equipment between substation floor levels and access above ground. The freight elevator equipment room shall be located in the GIS cable vault area.

4.1.10 115-kV primary connections to the new 115-13.8-kV transformers will be made via XLPE cable and potheads. 13.8-kV connections to the secondaries will be made via non-segregated phase bus duct or insulated ("Duresca") bus bar.

4.1.11 All connections to the 115-kV GIS will be made with XLPE cable. There will not be any open air 115-kV transmission line connections to the GIS.

4.1.12 Air conditioning will only be provided for the specific control and relay equipment cabinets that are heat sensitive.

4.1.13 Forced ventilation will be provided for the entire substation enclosure. Fresh intake air shall be drawn from the two air intake shafts located on the southeast and southwest of the station and routed through the various rooms and areas via metal ductwork and fire dampers and exhausted through three air exhaust shafts located on the north of the station.

4.1.14 Transformer oil containment shall be provided via a concrete oil containment vault located in the GIS cable vault and designed to hold approximately 130% of the volume of one 115-13.8-kV transformer. A sump for shall be provided to facilitate oil removal following a transformer failure. All three transformers will have oil piping routed to this same containment vault.

4.1.15 There will be one cable vault area located under the 115-kV GIS equipment and one cable vault area located under the 15-kV switchgear equipment which are connected to one another in an "L" shaped configuration. There is no vault area underneath the 115-13.8-kV transformers.

4.1.16 A Fire detection and suppression system shall be provided for the entire station and shall include CO_2 fire suppression and water suppression. CO_2 shall be provided via one CO_2 tank located in Mechanical Room A that is distributed to the various rooms (zones) via CO_2 piping. The fire response room (area) will be located at Elevation -18'-0" and accessible via the southwest stair way.

4.1.17 The substation enclosure will be designed for connection of a mobile transformer, not a mobile substation. The transformer connection would be made above ground via 115-kV XLPE cable potheads.

4.1.18 The substation property will be purchased by Xcel Energy and is not included in the overall project cost.

4.1.19 The design and construction of the 13.8-kV distribution system is assumed to end at the first manhole outside of the Hiawatha Substation.

4.2 Construction and Testing : The following assumptions and or clarifications apply for the construction and testing aspects of the project:

4.2.1 Sheet piling will be used to perform the substation site excavation and no large rocks will be encountered that hinder excavation in any way. A neighborhood relations program will be established prior to driving sheet piling and excavation.

4.2.2 We assume that there will be no environmental issues encountered during excavation and a minimum of de-watering will be required (e.g., no high water level).

4.2.3 We assume that all required backfill can be obtained and re-used from excavation of the site and all spoil materials removed from the site will be non-contaminated and can be properly disposed within ten miles of the site. Station will have a minimum ground cover of 8" to 12" of top soil. There will be very limited laydown area on the site for storage of spoil materials.

4.2.4 Site construction access to the site will be via Hiawatha Ave just north of E 29th Street. We assume that we can rent some construction trailer space from the nearby Target Store property (parking lot).

4.2.5 There will be minimum weather delays.

4.2.6 The schedule is based on working five 10-hour days per week. Overtime beyond 10 hours per day will be worked for critical path items, for accessibility, or to make up for weather delays. Shift work for electricians will begin upon building enclosure.

4.2.7 All work on streets will be done on off-shifts before or after the rush hour and no outdoor substation work will be performed prior to 7 a.m. or after 8 p.m.

4.2.8 Due to the station being entirely underground, all building ventilation, lighting and fire protection services must be installed and functional prior to beginning the major building electrical work.

4.2.9 We assume that skilled construction labor will be available to support construction when required.

4.2.10 Site laydown space will be very limited. We assume that major equipment will utilize "just in time" delivery to minimize the site space resources and that Xcel Energy will have some outdoor storage/laydown space available nearby to store what cannot be stored on site or installed upon delivery e.g. the 115-kV GIS equipment.

4.2.11 We assume that the major equipment will utilize the nearby railway system for equipment delivery.

4.2.12 We assume that the required 115-kV and 13.8-kV outages can be obtained from Xcel Energy when required, to support construction.

5 Cost Estimate

5.1 The preliminary cost estimate for this configuration is $86,000,000; see Attachment 7-3 for a high level cost breakdown. This cost estimate was created using, as a baseline, the costs associated with an in-city, below grade, 115-kV GIS with 13.8-kV switchgear housed in a GIS building which has a similar electrical configuration as the proposed Hiawatha Substation. This baseline was adjusted in accordance with the relative scope of this configuration and a 20% contingency was added to the overall project cost based on assumptions and clarifications listed above.

5.2 Drivers of Building Cost

- Square footage
- Depth of building
- 1200 tons of reinforcing steel/rebar
- 15,000 yd3 of concrete
- 100,000 yd3 of earthwork

6 Schedule

6.1 The preliminary schedule for this configuration is provided as Attachment 7-4. The schedule is based on the following assumed milestone dates:

6.1.1	Regulatory Approval	December 4, 2009
6.1.2	Engineering Approval	December 4, 2009

6.2 Key time frames as shown in the schedule include:

6.2.1	Total time from authorization to substation completion	28 months
6.2.2	Substation Construction	22 months

6.3 Key dates as shown in the schedule include:

6.3.1	Award engineering contract	December 4, 2009
6.3.2	Award GIS, Switchgear, and Transformers	Feb.12, 2010 - March 26, 2010
6.3.3	Start Site Excavation	June 14, 2010
6.3.4	Start Foundation Installation and Building Construction	August 17, 2010
6.3.5	Start 115-kV GIS Installation	September 19, 2011
6.3.6	Start 115/13.8kV Testing	January 3, 2012
6.3.7	Station In-Service	April 2, 2012

6.4 Any delay in authorizing or funding the project will result in a corresponding delay in the overall schedule.

6.5 Activities to consider in order to improve upon this date include early start dates for engineering and procurement and additional use of overtime during construction. The largest improvement (advancement) of the project schedule would be partial release of up-front actives including engineering and procurement.

7 Attachments

7.1 The following attachments are included with this study:

7.1.1	Attachment7-1	HIA West Circuit Diagram (Prepared by Xcel Energy)
7.1.2	Attachment 7-2	Site Physical Layout and Section Drawings
7.1.3	Attachment 7-3	High Level Cost Estimate
7.1.4	Attachment 7-4	Level 1 Schedule

Attachment 7–1 – HIA West Circuit Diagram (Prepared by Xcel Energy)

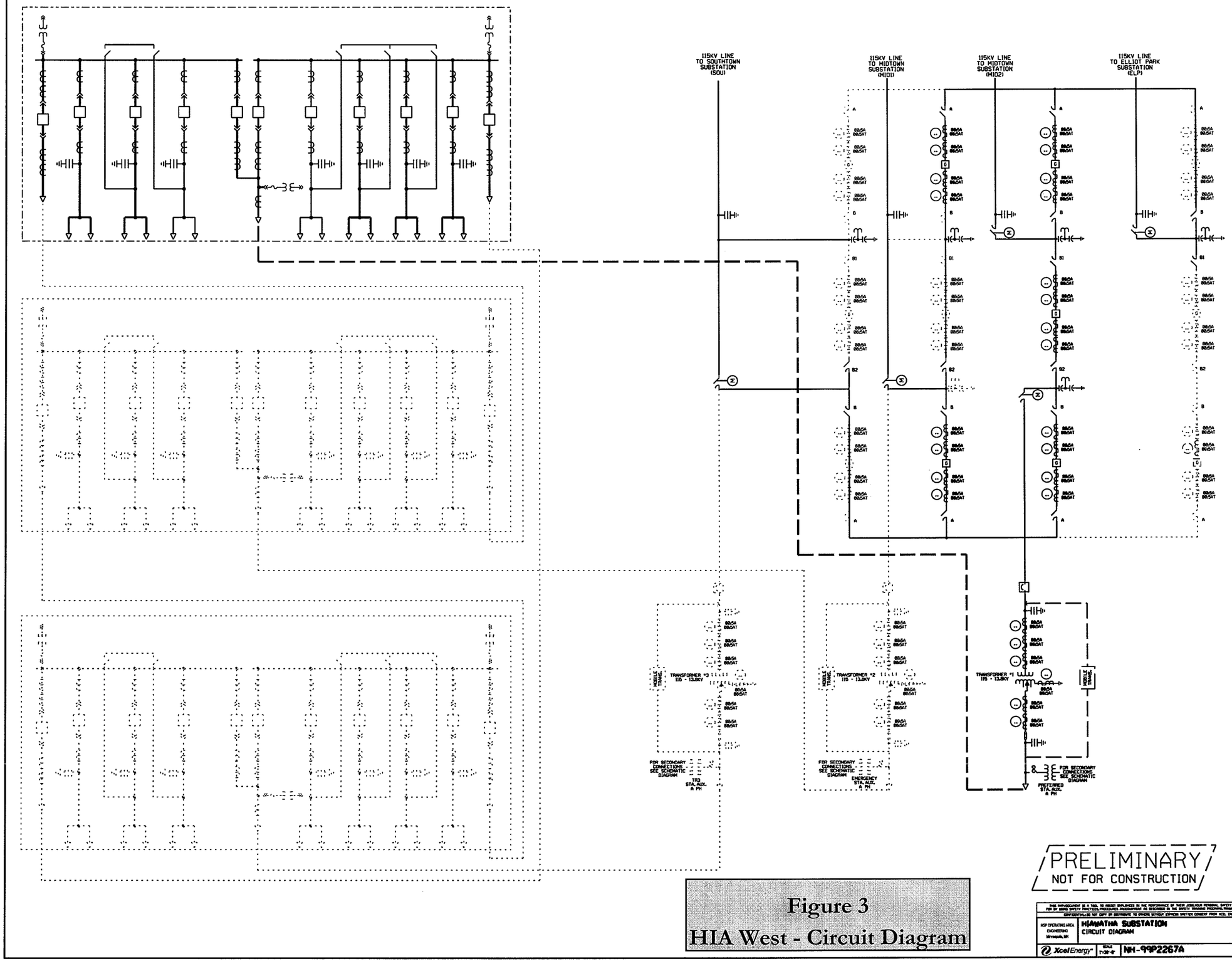
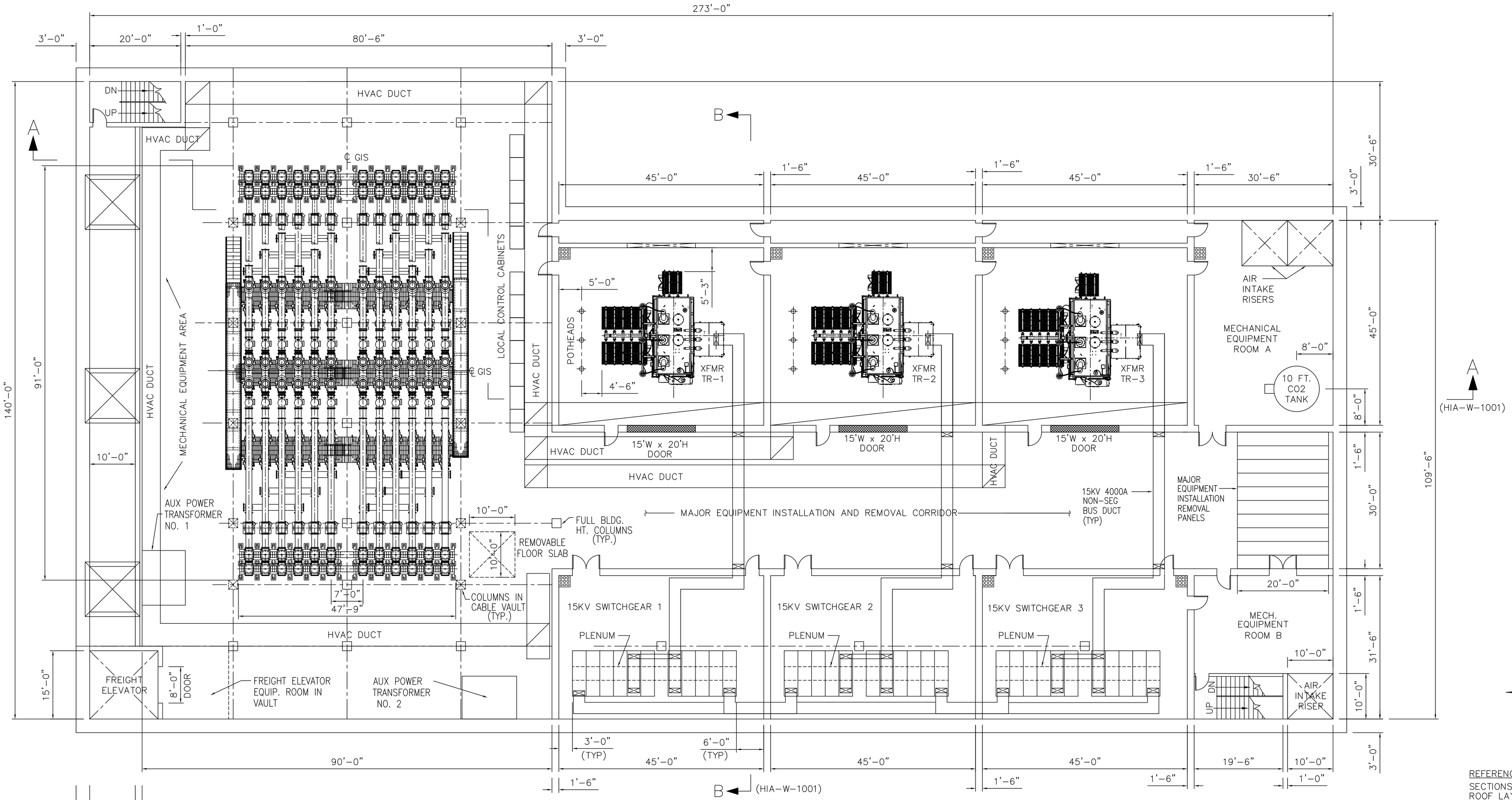


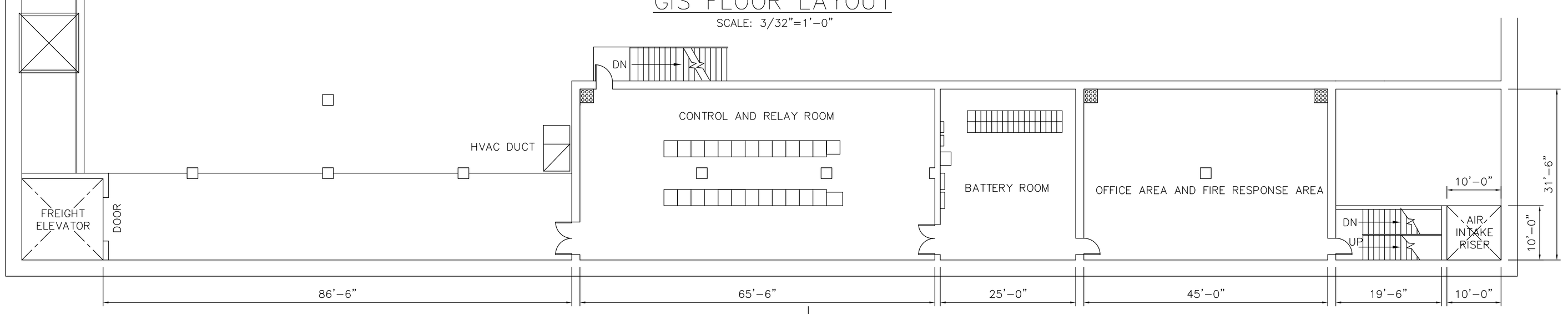
Figure 3
HIA West - Circuit Diagram

Attachment 7–2 – Site Physical Layout and Section Drawings



GIS FLOOR LAYOUT

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



CONTROL AND RELAY ROOM LAYOUT

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

REFERENCE DRAWINGS

SECTIONS OF SUBSTATION	HIA-W-1001
ROOF LAYOUT PLAN AND SECTIONS	HIA-W-1002
LOCATION OF SITE ON TOPO	HIA-W-1003

REV.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
A	10/20/09	ISSUED FOR CLIENT REVIEW	AVD	ELC	ELC

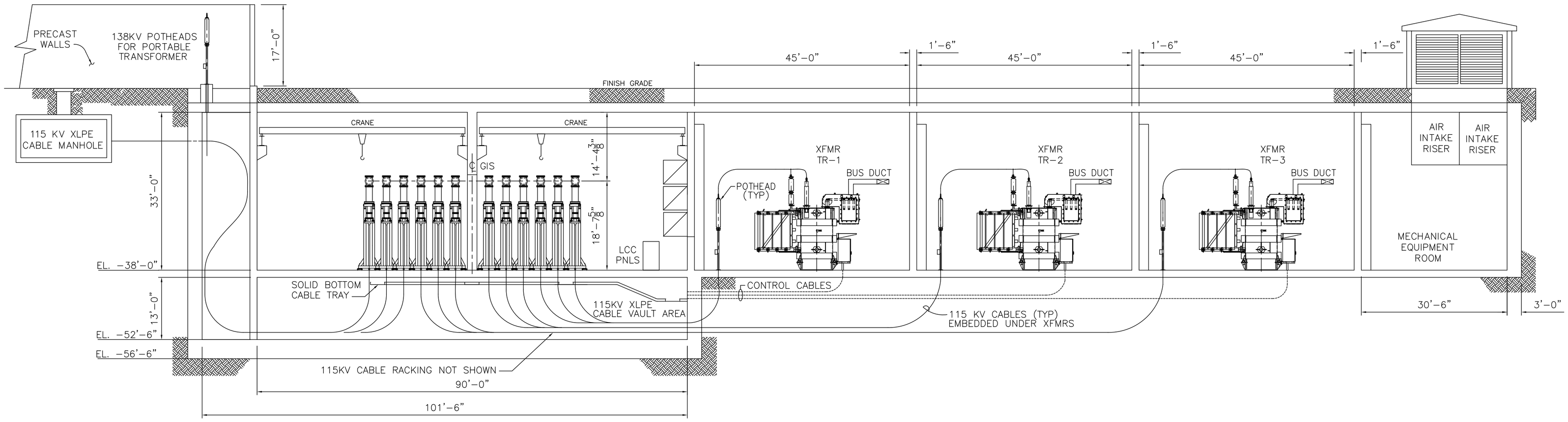
Sargent & Lundy LLC
55 EAST MONROE ST., CHICAGO, ILL.

PROJ. No. 12617-001

XCEL ENERGY

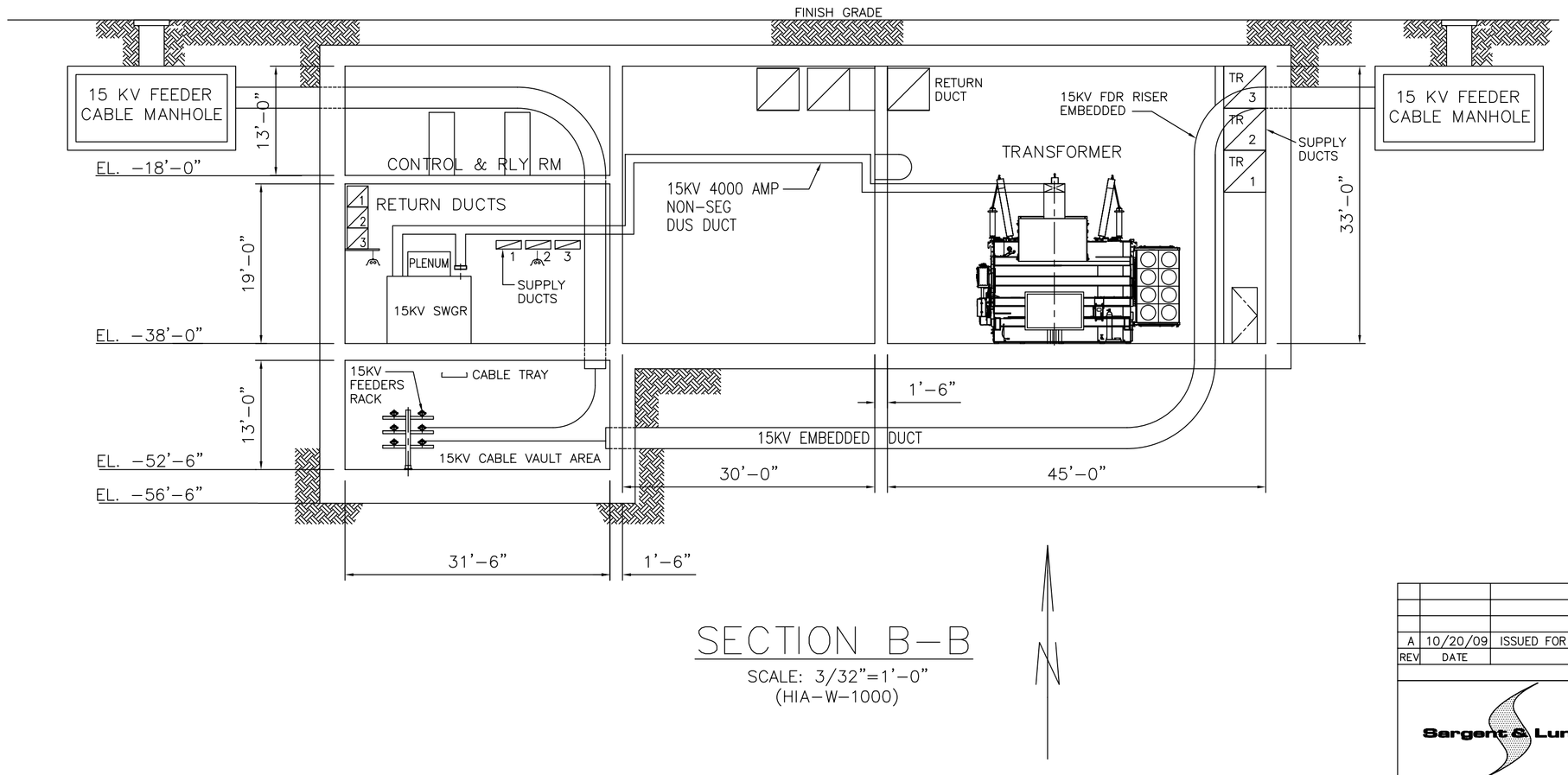
HIAWATHA WEST SITE PLAN OF SUBSTATION

DWG. NO.:	HIA-W-1000
REV.: 0	DATE: 10/20/09



SECTION A-A

SCALE: 3/32"=1'-0"
(HIA-W-1000)



SECTION B-B

SCALE: 3/32"=1'-0"
(HIA-W-1000)

REFERENCE DRAWINGS

PLAN OF SUBSTATION	HIA-W-1000
ROOF LAYOUT PLAN AND SECTIONS	HIA-W-1002
LOCATION OF SITE ON TOPO	HIA-W-1003

REV	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
A	10/20/09	ISSUED FOR CLIENT REVIEW	AVD	ELC	ELC

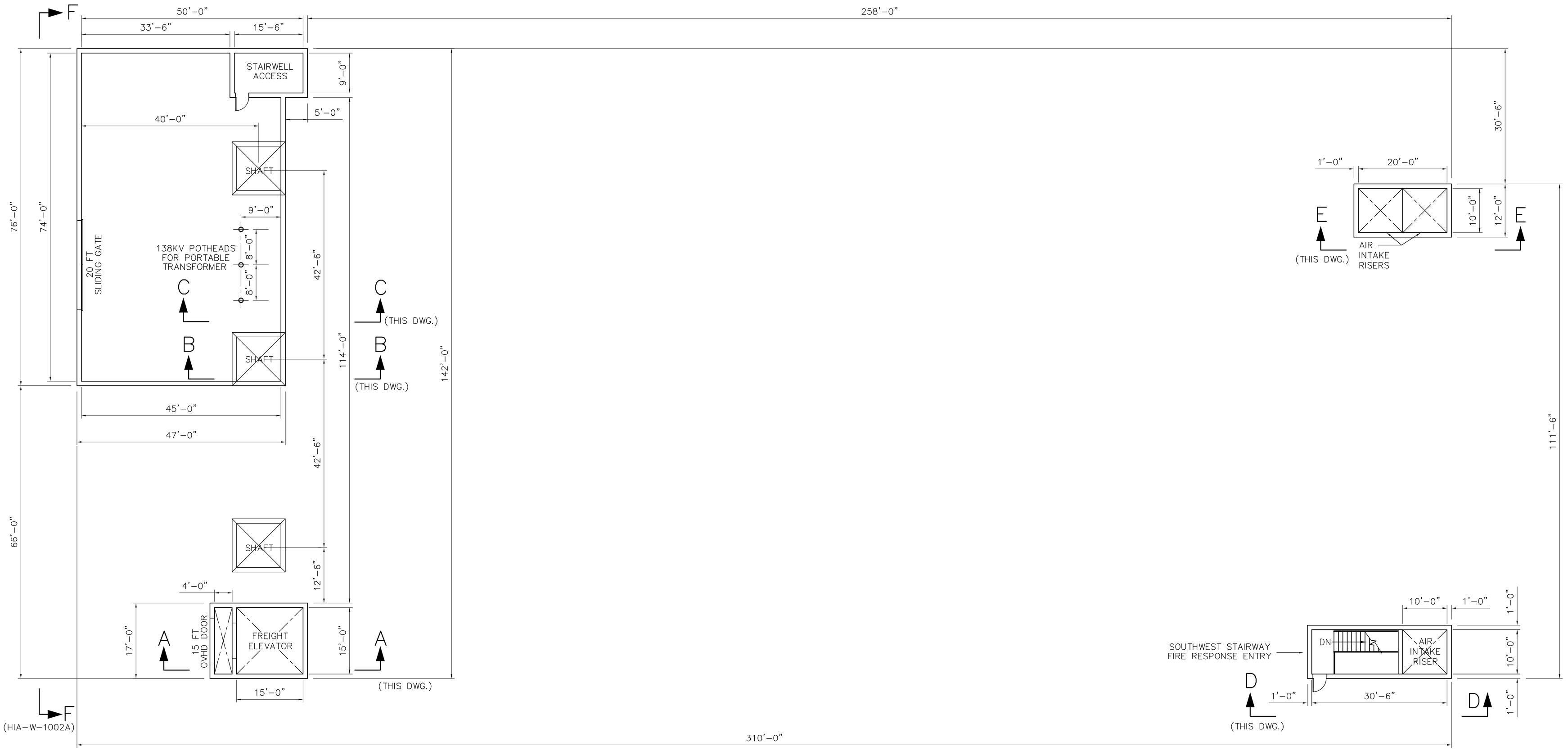
Sargent & Lundy
55 EAST MONROE ST., CHICAGO, ILL.

PROJ. No. 12617-001

XCEL ENERGY

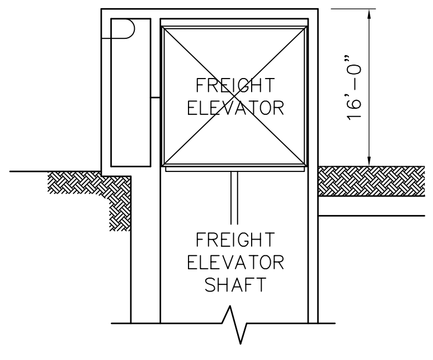
HIAWATHA WEST SITE SECTIONS OF SUBSTATION

DWG. NO.: HIA-W-1001
REV.: 0 DATE: 10/20/09

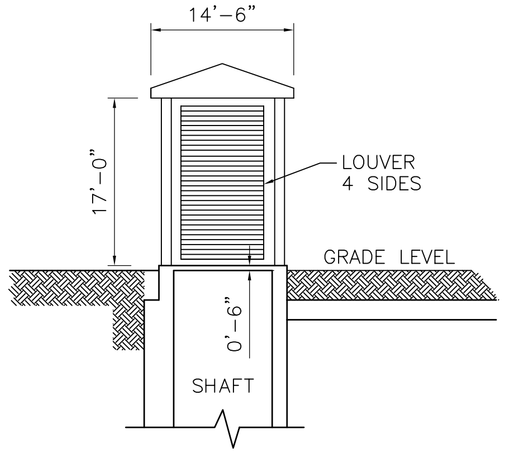


ROOF LAYOUT

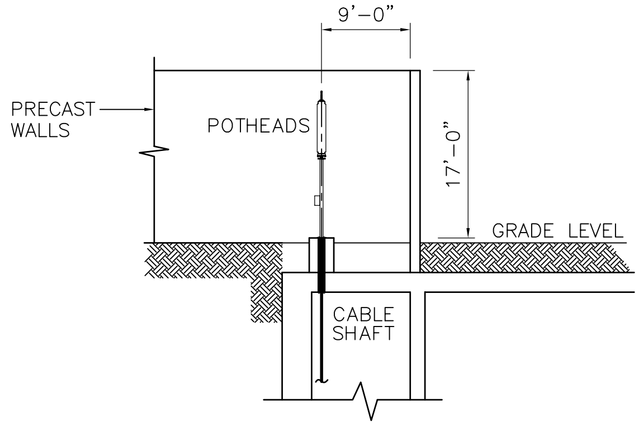
SCALE: 3/32"=1'-0"



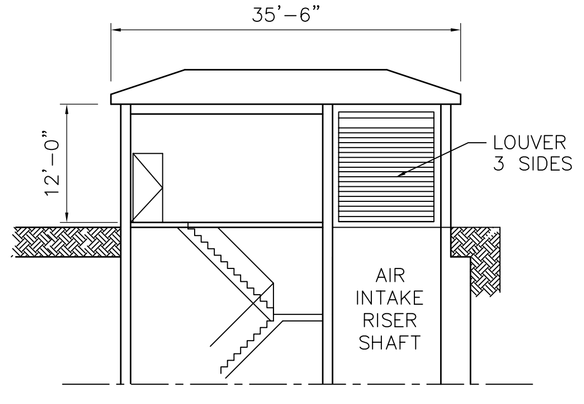
SECTION A-A



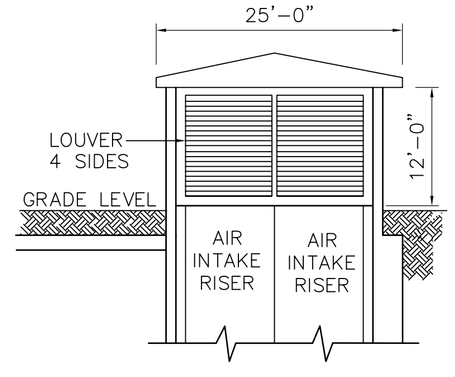
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

REFERENCE DRAWINGS

PLAN OF SUBSTATION	HIA-W-1000
SECTIONS OF SUBSTATION	HIA-W-1001
LOCATION OF SITE ON TOPO	HIA-W-1003

REV.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
B	10/28/09	ISSUED FOR CLIENT REVIEW	AVD	JMM	JMM
A	10/20/09	ISSUED FOR CLIENT REVIEW	AVD	ELC	ELC

Sargent & Lundy LLC
55 EAST MONROE ST., CHICAGO, ILL.

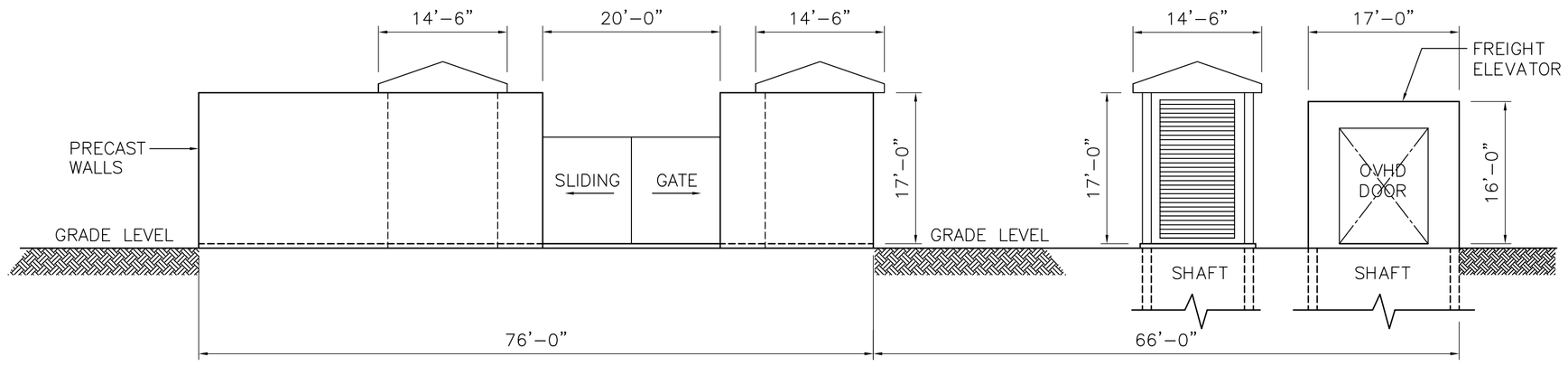
PROJ. No. 12617-001

XCEL ENERGY

HIAWATHA WEST SITE ROOF LAYOUT PLAN AND SECTIONS

DWG. NO.: HIA-W-1002

REV.: 0 DATE: 10/28/09



SECTION F-F

REFERENCE DRAWINGS

PLAN OF SUBSTATION	HIA-W-1000
SECTIONS OF SUBSTATION	HIA-W-1001
ROOF LAYOUT PLAN & SECTIONS	HIA-W-1002
LOCATION OF SITE ON TOPO	HIA-W-1003

REV	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
-					
A	10/28/09	ISSUED FOR CLIENT REVIEW	AVD	JMM	JMM

Sargent & Lundy LLC
55 EAST MONROE ST., CHICAGO, ILL.

PROJ. No. 12617-001

XCEL ENERGY

HIAWATHA WEST SITE SECTION

DWG. NO.: HIA-W-1002A

REV.: 0 DATE: 10/28/09

HIAWATHA SUBSTATION
W.O.# 10994953 SURVEY LOG# 8202 / 9002
MINNEAPOLIS, MN
HENNEPIN COUNTY
SECTION 36 TOWNSHIP 29 RANGE 24

SURVEY PERFORMED ON HENNEPIN COUNTY
COORDINATES AND PROJECTIONS
HORIZONTAL NAD 83 (1986 ADJUSTMENT)
VERTICAL NAVD 88

SURVEY DONE BY G.HUBER, D.KELM, S.KARAS, J.LARSON
1-21-2009
FIELD BOOKS 347 P.55, 400 P.58

NOTE: 1-28-2009
FURTHER BOUNDARY WORK NEEDED TO
ESTABLISH ACCURATE PLAT BOUNDARIES

LOT 4
MINNEHAHA INDUSTRIAL PARK
OUTLOT C
LOT 5 PARCEL 2700
LOT 1
LOT 2
COMMONS AT HIAWATHA
HIAWATHA WEST SUBSTATION
BIKE PATH
LIGHT POLES
#47
LIGHT POLE
SIGNS
SANITARY MANHOLE
EMERGENCY CALL BOX
MCI UG FIBER OPTIC
LEVEL 3 COMM. UG FIBER OPTIC
UG AT&T
UG QWEST
BEGIN UG AT&T
COMCAST CABLE
CHAINLINK FENCE
UG ELECTRIC
LEVEL 3 & CALNET UG FIBER OPTIC
RAILROAD BUILDING
NSP
FIBER OPTIC SIGN
RAILROAD
RAILROAD FIBER OPTIC SIGNS
CALNET UG FIBER OPTIC
HIAWATHA AVE (T.H. 55)
#48
RETAINING WALL AROUND STRUCTURE #48
BELOW GROUND REMOVABLE PANELS FOR EQUIPMENT INSTALLATION
ABANDONED POLES
GRAVEL ACCESS ROAD
SIGN
CATCH BASIN
HYDRANT SURROUNDED BY GUARD POSTS
#49
GAS VENT
CENTERPOINT ENERGY UG GAS LINE
UG GAS SIGN
HYDRANT SURROUNDED BY GUARD POSTS

REFERENCE DRAWINGS

PLAN OF SUBSTATION	HIA-W-1000
SECTIONS OF SUBSTATION	HIA-W-1001
ROOF LAYOUT PLANS AND SECTIONS	HIA-W-1002

REV	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
B	10/28/09	ISSUED FOR CLIENT REVIEW	AVD	JMM	JMM
A	10/20/09	ISSUED FOR CLIENT REVIEW	AVD	ELC	ELC

Sargent & Lundy
55 EAST MONROE ST., CHICAGO, ILL

PROJ. No. 12617-001

XCEL ENERGY

HIAWATHA WEST SITE LOCATION OF SITE ON TOPO

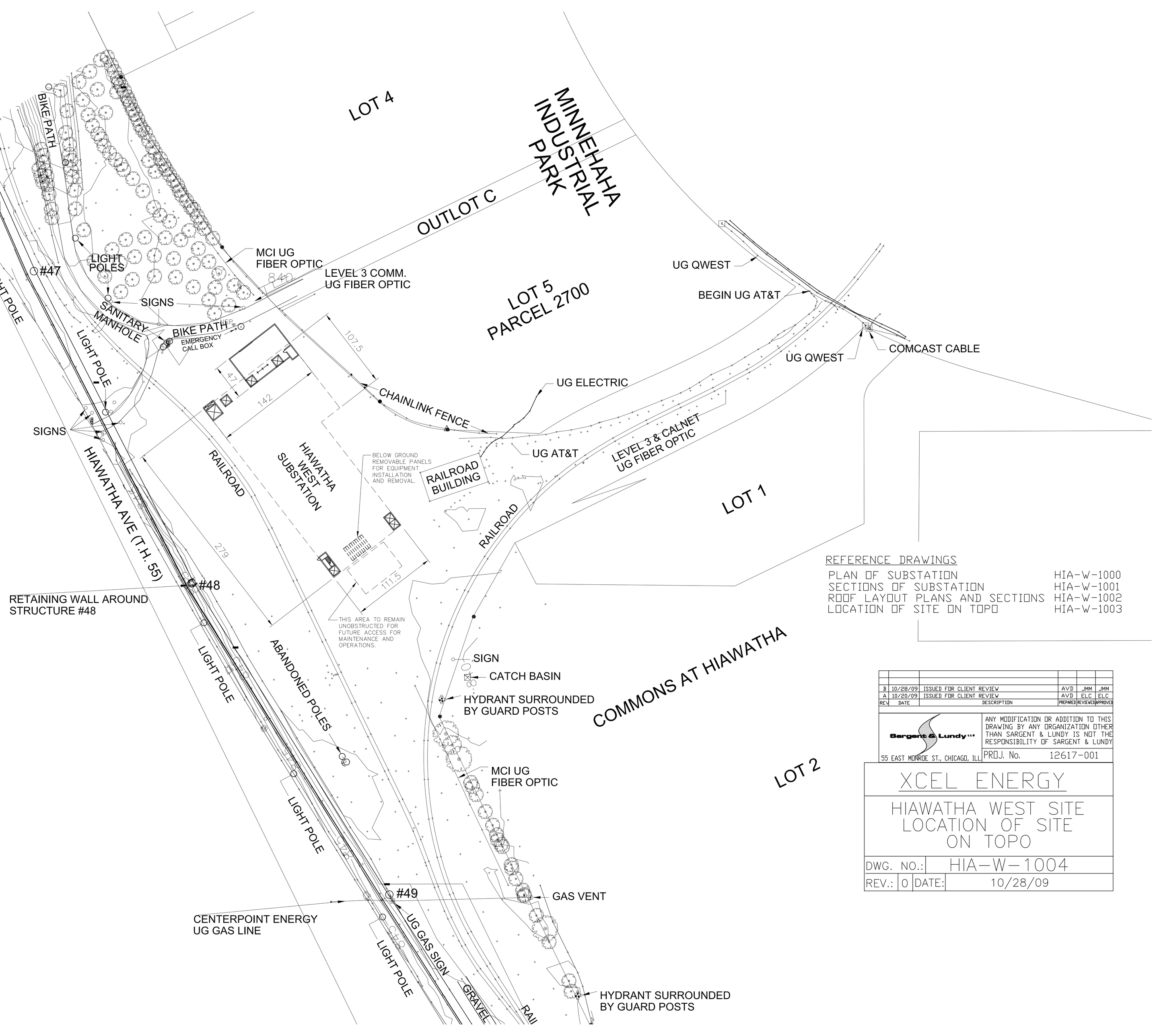
DWG. NO.:	HIA-W-1003		
REV.:	0	DATE:	10/28/09

HIAWATHA SUBSTATION
W.O.# 10994953 SURVEY LOG# 8202 / 9002
MINNEAPOLIS, MN
HENNEPIN COUNTY
SECTION 36 TOWNSHIP 29 RANGE 24

SURVEY PERFORMED ON HENNEPIN COUNTY
COORDINATES AND PROJECTIONS
HORIZONTAL NAD 83 (1986 ADJUSTMENT)
VERTICAL NAVD 88

SURVEY DONE BY G.HUBER, D.KELM, S.KARAS, J.LARSON
1-21-2009
FIELD BOOKS 347 P.55, 400 P.58

NOTE: 1-28-2009
FURTHER BOUNDARY WORK NEEDED TO
ESTABLISH ACCURATE PLAT BOUNDARIES



REFERENCE DRAWINGS

PLAN OF SUBSTATION	HIA-W-1000
SECTIONS OF SUBSTATION	HIA-W-1001
ROOF LAYOUT PLANS AND SECTIONS	HIA-W-1002
LOCATION OF SITE ON TOPO	HIA-W-1003

REV	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
B	10/28/09	ISSUED FOR CLIENT REVIEW	AVD	JMM	JMM
A	10/20/09	ISSUED FOR CLIENT REVIEW	AVD	ELC	ELC

PROJ. No. 12617-001

XCEL ENERGY

HIAWATHA WEST SITE
LOCATION OF SITE ON TOPO

DWG. NO.: HIA-W-1004
REV.: 0 DATE: 10/28/09

Attachment 7–3 – High Level Cost Estimate

ESTIMATE NO. : 24869A HIAWATHA 138KV SUBSTA
PROJECT NO. : 12617-001
ISSUE DATE : 20OCT09
PREP/REV :PAG / BJD
APPROVED :

SARGENT & LUNDY

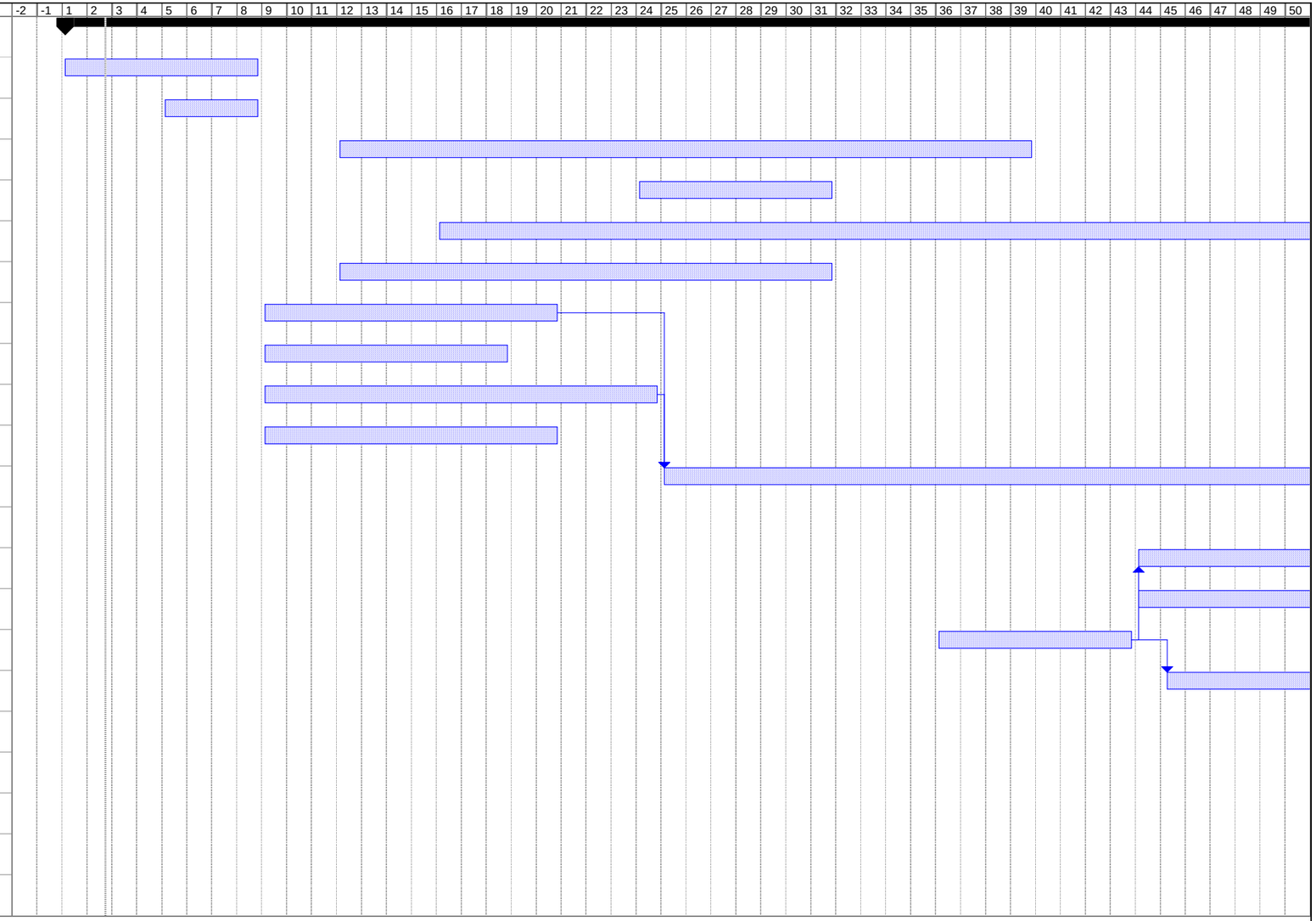
CLIENT XCEL ENERGY
STATION HIAWATHA SUBSTATION
TITLE INITIAL 138KV TRANSMISSION SUBSTATION (GIS) AND 13.8KV DISTRIBUTION SYSTEM
CONCEPTUAL COST ESTIMATE SPECIFICATION SUMMARY REPORT

SPEC. NO.	DESCRIPTION	EQUIPMENT COST	MATERIAL COST	LABOR COST	OTHER DIRECT COST	INDIRECT COST	ESCALATION	CONTINGENCY	TOTAL COST
01A	LARGE POWER TRANSFORMER (1)	1,400,000			105,000			301,000	1,806,000
01B	138KV GAS INSULATED SWITCHGEAR (5 BREAKERS)	6,000,000			450,000			1,290,000	7,740,000
01C	13.8KV METAL CLAD SWITCHGEAR	900,000			68,000			194,000	1,162,000
01D	OTHER ELECTRICAL EQUIPMENT	725,000			54,000			156,000	935,000
03A1	BUILDING CONSTRUCTION - EARTHWORK		95,000	2,879,000	933,000			781,000	4,688,000
03A2	BUILDING CONSTRUCTION - CONCRETE AND REBAR	100,000	3,174,000	7,384,000	3,361,000			2,804,000	16,823,000
03A3	BUILDING CONSTRUCTION - FORMWORK, SHEET PILING AND DECKING		2,300,000	5,784,000	2,565,000			2,129,000	12,778,000
03A4	BUILDING CONSTRUCTION - ARCHITECTURAL	900,000	821,000	2,698,000	1,186,000			1,121,000	6,726,000
03B	ELECTRICAL CONSTRUCTION	1,632,000	1,653,000	7,683,000	3,130,000			2,820,000	16,918,000
03C	MECH CONSTR INCLUDING FIRE PROTECTION AND HVAC	1,350,000	100,000	1,435,000	591,000			695,000	4,171,000
2	ENGINEERING, PROCUREMENT, & PROJECT SERVICES					6,269,000		1,253,800	7,523,000
5	CONSTRUCTION MANAGEMENT/FIELD ENGINEERING					2,458,000		491,600	2,950,000
4	S-U/COMMISSIONING					615,000		123,000	738,000
6	TFA					615,000		123,000	738,000
	TOTAL CONSTRUCTION COST	13,007,000	8,143,000	27,863,000	12,443,000	9,957,000		14,282,400	85,696,000
	INTEREST DURING CONSTRUCTION (COMPOUNDED MONTHLY)								0
	TOTAL PROJECT COST								85,696,000

H:\PCSD-270\INFODIV\PROJECTS\XCEL Energy\HIAWATHA 138KV GIS\[24869A HIAWATHA 138KC GIS 27OCT09 as final issue.xls]Detail Report

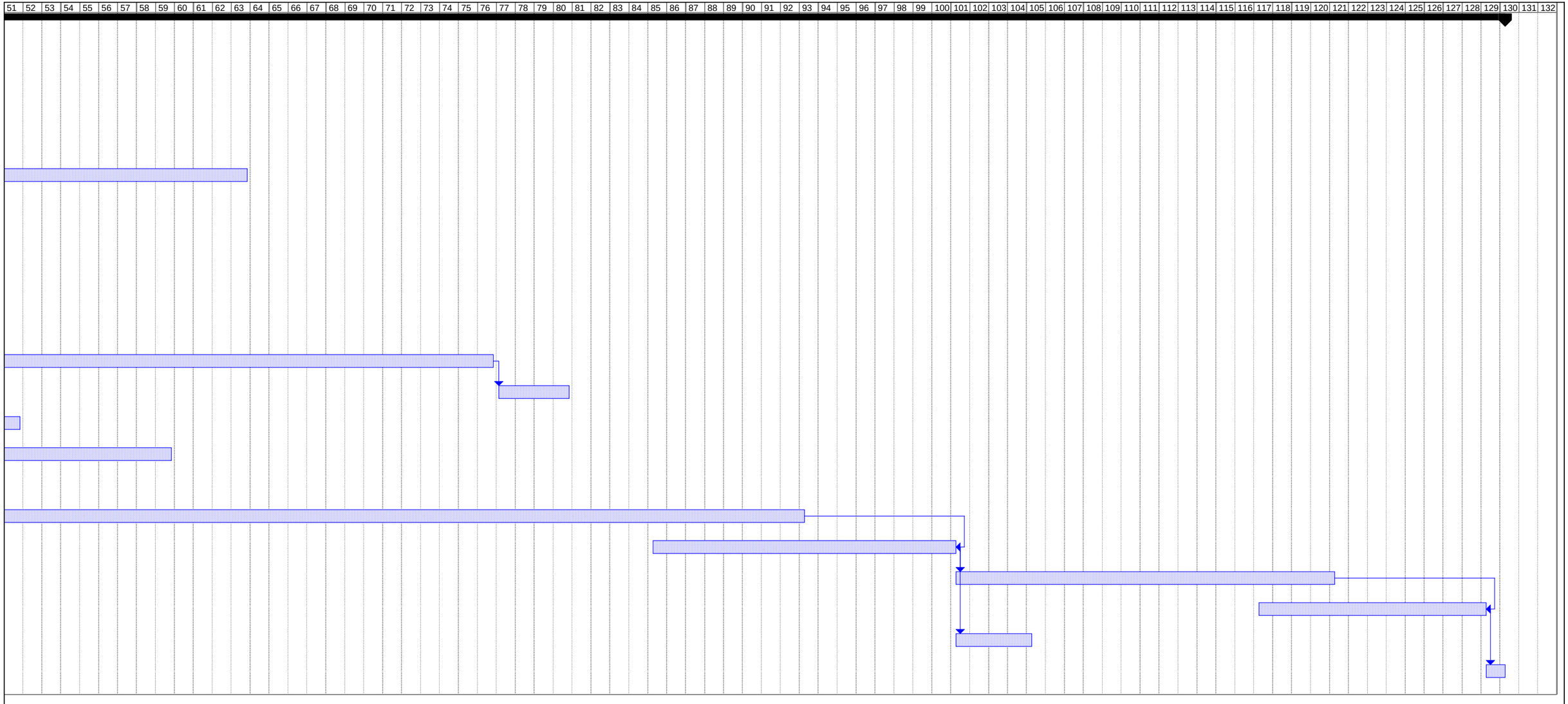
Attachment 7–4 – Level 1 Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Project**	**646 days**	**Mon 10/12/09**	**Mon 4/2/12**	
2	Commence / Regulatory Approval	8 wks	Mon 10/12/09	Fri 12/4/09	
3	Engineering Authorization	4 wks	Mon 11/9/09	Fri 12/4/09	
4	Civil / Structural / Arch Engineering	7 mons	Mon 12/28/09	Fri 7/9/10	
5	Permit	2 mons	Mon 3/22/10	Fri 5/14/10	
6	Electrical Engineering	12 mons	Mon 1/25/10	Fri 12/24/10	
7	T-Line Engineering	5 mons	Mon 12/28/09	Fri 5/14/10	
8	GIS Procurement	3 mons	Mon 12/7/09	Fri 2/26/10	
9	Transformer Procurement	2.5 mons	Mon 12/7/09	Fri 2/12/10	
10	Switchgear Procurement	4 mons	Mon 12/7/09	Fri 3/26/10	
11	138kV Cable Procurement	3 mons	Mon 12/7/09	Fri 2/26/10	
12	Major Equipment Fabrication	52 wks	Mon 3/29/10	Fri 3/25/11	8,10
13	Major Equipment Delivery	4 wks	Mon 3/28/11	Fri 4/22/11	12
14	Building Contractor Procurement	2 mons	Mon 8/9/10	Fri 10/1/10	16
15	Electrical Contractor	4 mons	Mon 8/9/10	Fri 11/26/10	
16	Excavation	8 wks	Mon 6/14/10	Fri 8/6/10	
17	Building Mobilize/Enclosed	12 mons	Tue 8/17/10	Mon 7/18/11	16
18	HVAC / Electrical	4 mons	Tue 5/24/11	Mon 9/12/11	17FF+2 mons
19	Start High Voltage Electrical Work	5 mons	Tue 9/13/11	Mon 1/30/12	18
20	Test 138/13.8kV Systems	3 mons	Tue 1/3/12	Mon 3/26/12	19FF+2 mons
21	Landscape	1 mon	Tue 9/13/11	Mon 10/10/11	18
22	Station In-Service	5 days	Tue 3/27/12	Mon 4/2/12	20



Project: Hiawatha Substation, rev 1
Date: Fri 10/23/09

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline



Project: Hiawatha Substation, rev 1
Date: Fri 10/23/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone