Canadian Consulting Engineering Awards Application

Cogen Project Summary:

The Region of Waterloo in Ontario operates several conventional wastewater treatment plants which produce digester gas as waste byproduct. CH2M HILL Canada Limited, a Jacobs Company, along with teammates CIMA+ and Eramosa Engineering Inc. led the design and services during construction for the installation of Cogeneration Facilities at the Region's three largest plants: Waterloo, Kitchener, and Galt. These facilities combust digester gas producing electricity and heat which reduces carbon dioxide emissions while providing green energy.

Q1: Innovation (40%)

The Region retained the Jacobs Team to complete the approvals, design, equipment pre-selection, tendering, and services during construction for the Cogeneration Facilities project. The Region completed this project simultaneously at three different sites: Waterloo Wastewater Treatment Plant (WWTP), Kitchener WWTP, and Galt WWTP. By capturing the energy in digester gas and using it to generate both electricity and heat, the Region took a substantial step towards a greener future.

The Jacobs Team completed the following scope of work for all three sites:

- Completed conceptual and preliminary design of Cogeneration Facilities
- Completed necessary effort for obtaining regulatory approvals and permits
- Coordinated with three Utility Companies and provincial agencies to secure funding incentives
- Completed detailed design with Region reviews to facilitate input from operations staff
- Completed two pre-selections for all three sites: the cogeneration engine supply, and one for the gas conditioning system supply
- Provided tender period assistance, project management, contract administration and site inspection services during the two-year construction period
- Participated in commissioning and training of the Region's Operations staff for each of the major systems
- Provided post construction services such as record drawings, addressing deficiencies and transfer the operation to the Region

This project used innovative green technology to deliver an environmentally significant project in the Region that aligned with its goals to become a sustainable community, as outlined in the Region's Greenhouse Gas Inventory and Action Plan. The Jacobs team delivered a practical and innovative design that offered economic and environmental benefits to the Region and its residents. These economic benefits include offsetting electricity costs for the sites and reducing the greenhouse gas (GHG) emissions to the atmosphere.

Jacobs included innovative flexible features into the design. For example, if digester gas production at a site is low or unavailable, the cogeneration facilities have the capability to run on natural gas or a natural gas-digester gas blend.

A delivery approach that allowed the project to succeed was through the pre-purchasing process. This allowed the Jacobs Team and the Region to develop emission and efficiency goals for the cogeneration engines and put them out for tender. The successful bidder was a vendor that supplied the CHP units from Germany. A proven technology from a reliable manufacturer was provided as a result since biogas utilization is much more common in Europe than in North America.

Q2: Complexity (20%)

The project had a high level of complexity due to the fact that there were three different sites, all with different existing conditions, and consequently, design parameters. These conditions had to be evaluated in the approval and conceptual design phases so that the detailed design would provide a constructable and cost effective solution at each site. For example, all structures involved had to be flood-proof due to their proximity to watercourses. Additionally, the gas quality and quantity varied, which needed to be considered from a process perspective to size the generator engines appropriately and obtain Technical Standards and Safety Authority (TSSA) Digester Gas Installation Approvals.

Construction management was also complicated due to the number of sites and different parties involved. Each of the three sites had different operational staff and operated under different Natural Gas authorities and Electrical Local Distribution Companies (LDCs). These hurdles were overcome through diligent and frequent communications both within the team and with the various project stakeholders that placed an emphasis on schedule, identification of upcoming challenges, and development of solutions.

Another layer of complexity was delivering the project in time to meet the deadlines set by the provincial and federal governments for the Region to secure project funding. Due to the global pandemic, equipment and material deliveries were delayed, impeding these deadlines. This was overcome through the proactive actions taken by the project team (Region, Jacobs Team, Contractor, Suppliers) to identify and secure critical path items as soon as the pandemic was announced.

Q3: Social and/or Economic Benefits

The cogeneration facilities generate electricity and heat from digester gas. The resulting energy is used on site, and means that both electrical energy consumption and natural gas consumption are greatly reduced.

The Galt and Waterloo WWTP cogeneration facilities each generate an electrical capacity of 600 kilowatt-electric (kWe), while the Kitchener WWTP cogeneration facility generates 800 kWe. Each of the Galt and Waterloo cogeneration facilities deliver more than 33 percent of their respective WWTP's electrical load, and the Kitchener cogeneration facility delivers more than 70 percent of the Kitchener WWTP electrical load.

The generated heat is transferred to the plants' hot water systems, which is then used to heat buildings and digester sludge. By using this thermal energy, the natural gas load to the boilers is reduced.

This production of electricity and heat reduces energy consumption at each of the three largest plants in the Region, which reduces electricity and natural gas costs for the Region.

A secondary societal benefit which the Region is exploring is to use the facilities for educational and awareness purposes with various technical and stakeholder groups and members of the public.

Q4: Environmental Benefits

Before the installation of the cogeneration facilities, digester gas was inefficiently used in boilers with the excess digester gas sent to flare. The complete combustion of digester gas releases carbon dioxide, a GHG, into the atmosphere. Incomplete combustion results in the emission of methane, a GHG with 25 times more global warming potential than carbon dioxide. As a result, the implementation of cogeneration facilities reduces the GHG emissions from each of the wastewater treatment plants.

This reduction, when compared to pre-construction WWTP emission levels, equates to 934 tonnes of CO_2 equivalent per year at Waterloo WWTP, 425 tonnes of CO_2 equivalent per year at Kitchener WWTP, and 554 tonnes of CO_2 equivalent per year at Galt WWTP when the Cogeneration facilities are running at 100% on biogas.

Additionally, the cogeneration facilities include gas conditioning upstream of the engine generators and exhaust treatment equipment downstream of the engine generators. Before the blend of digester gas and natural gas is combusted in the engine generator, it is dried, filtered and cooled by a gas conditioning system to remove constituents that may hinder the efficiency of the combustion process. Exhaust from the generator engine is treated with urea to lower the concentration of harmful constituents emitted to the atmosphere.

Typical energy recovery of the cogeneration facilities is 70 percent of digester gas energy value, with 35 percent as electricity and 35 percent as heat. The cogeneration facilities not only reduce GHG emissions but reduce the Region's reliance on electricity and natural gas.

Q5: Meeting the Client's Needs

This project aligns with the Region's goals of becoming a sustainable community. This is outlined in the Region's GHG Inventory and Action Plan, which includes a statement to reduce 10% of 2009 emission levels by the year 2019. While this project was completed after 2019, it shows continuing improvement by the Region to achieve its goal to optimize the use of renewable energy resources. The economic feasibility of this project was made possible by government and utility incentive programs to reduce electricity consumption and carbon footprint.

The Jacobs Team successfully delivered this project for the Region by securing these grants and incentives while delivering a facility design that met long term performance goals. This was

achieved by incorporating operation and maintenance, technology, and previous design lessons from other municipal cogeneration installations. Operations staff were also key members of the project team during design, procurement, installation, and technology. As end users, their experience and input on design and installation procedures was invaluable.

The Jacobs Team worked closely and successfully with the General Contractor (W.A. Stephenson Mechanical Contractors Ltd.) during construction to manage schedule and budget. Schedule was of critical importance as there was a deadline for when the facilities had to be operational to secure funding and incentives. During construction, in-house project management tools were used to keep the project on schedule and meet milestones.

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2018-104

Region of Waterloo

DESIGN AND CONSTRUCTION
DIVISION

DIGESTER GAS COGENERATION FACILITIES

AT THE

WATERLOO, GALT & KITCHENER WWTPs

ISSUED FOR TENDER

CONTRACT No: T2018-104

JACOBS

CIMA

ERAMOSA
ENGINEERING INC.

KEN SEILING REGIONAL CHAIR

T. SCHMIDT, P. ENG.
COMMISSIONER OF TRANSPORTATION AND
ENVIRONMENTAL SERVICES

c:\users\rboyd\nuk\documents\projects\874816 - row wwtps ogen facilities\18.09.25\xxxxog-001.dwg

2018-104

MATCHLINE, SEE PLAN THIS SHEET

EXISTING BLOWER BUILDING AND ENERGY CENTRE

PROJECT LIMITS

PROJECT LIMITS

MH.D

EX.ELMH

MH.G1

MH1

EXISTING RAS AERATION TANKS

MH2

EX.ELMH

MH.G2

X.MH

EXISTING SECONDARY DIGESTER

EXISTING PRIMARY CLARIFIER

EXISTING PRIMARY CLARIFIER

A — DETAIL — 1:250

20m HANDRAIL ALONG TOP OF PRIMARY CLARIFIER CHAMBER, REFER TO SPECIFICATION SECTION 05510

METAL STAIRS, TOP STAIR EL 318.65±, BOTTOM STAIR EL 316.69±, REFER TO SPECIFICATION SECTION 05510

TEMPORARY 1800mm HIGH CHAINLINK FENCE

SEE DWGS C-102-W TO C-105-W FOR DETAILED PLANS

50m LONG x 1200mm WIDE CONCRETE SIDEWALK. MATCH EXISTING GRADES AT SIDEWALK EDGES. PROVIDE POSITIVE DRAINAGE ALONG PROFILE AND SECTION OF SIDEWALK TO AVOID PONDING AND RUNOFF TOWARDS BUILDINGS, NOTE 1

EXISTING DIGESTER CONTROL BUILDING

EX.YHD

YHD

CONTRACTOR LAYDOWN AND STAGING AREA

MH.H2

EXISTING PRIMARY CLARIFIER

EXISTING ENCLOSED WASTE GAS BURNER

ASPHALT PAVED ACCESS ROAD

EXISTING PRIMARY CLARIFIER

WORK AREA SIGNAGE, TYP SEE DETAIL THIS SHEET

OVERHEAD DIGESTER GAS PIPING

ELECTRICAL TRANSFORMER

ELECTRICAL PANEL

EXISTING PRIMARY DIGESTER

GAS COMPRESSOR / DRYER

SILOXANE REMOVAL SYSTEM

CHP EXHAUST STACK

EXISTING BOILER EXHAUST STACKS

EXISTING BOILER BUILDING

EX.STUMP

ASPHALT PAVED ACCESS ROAD

GLYCOL CHILLER

CHP SYSTEM

EQUIPMENT BASE

TEMPORARY 1800mm HIGH CHAINLINK FENCE

EX.MH_A

MH_A

ASPHALT PAVED ACCESS ROAD

EXISTING HEADWORKS

TEMPORARY 1800mm HIGH CHAINLINK FENCE

WORK AREA SIGNAGE, TYP SEE DETAIL THIS SHEET

0 5 10 12.5m

MATCHLINE, SEE DETAIL 'A' THIS SHEET

PROJECT LIMITS

EMH15

ASPHALT PAVED ACCESS ROAD

WORK AREA SIGNAGE, TYP SEE DETAIL THIS SHEET

TEMPORARY 1800mm HIGH CHAINLINK FENCE

EX.MH

EX.M

CBMH2

HYDANT

CBMH3

CONTRACTOR LAYDOWN AND STAGING AREA

MH.H2

CBMH4

ASPHALT PAVED ACCESS ROAD

EXISTING HEADWORKS

EX.ELMH

HYDANT

MH.K3

x3.0m-ø1350mm CONC. PIPE @ 0.50%

CBMH6

CB21

TEMPORARY 1800mm HIGH CHAINLINK FENCE

WORK AREA SIGNAGE, TYP SEE DETAIL THIS SHEET

ASPHALT PAVED ACCESS ROAD

MH.K1

MH.K2

WHITE REFLECTIVE BACKGROUND, TYP

300

450

ENTERING T2018-104 WORK ZONE CONTRACTOR NAME	LEAVING T2018-104 WORK ZONE CONTRACTOR NAME
LEAVING T2018-104 WORK ZONE ONTARIO CLEAN WATER AGENCY	ENTERING T2018-104 WORK ZONE ONTARIO CLEAN WATER AGENCY

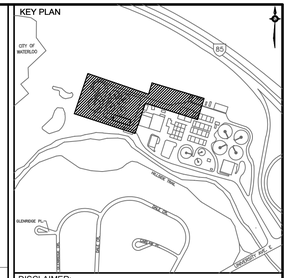
BLACK LETTERING, TYP

SIGN POSTED OUTSIDE PROJECT FENCE LIMITS

SIGN POSTED INSIDE PROJECT FENCE LIMITS

STD 1 — WORK AREA SIGNAGE — NTS

KEY PLAN



DISCLAIMER:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTES:

1. CONTRACTOR TO SURVEY EXISTING GRADES AT NEW SIDEWALK AND METAL STAIR AREA AND SURROUNDING GRADES AT EXISTING TANKS AND BUILDINGS. PROVIDE DETAILED GRADING LAYOUT OF SIDEWALK AND METAL STAIR AREA FOR APPROVAL BY ENGINEER.

JACOBS CIMA ERAMOSA ENGINEERING INC.

Region of Waterloo

CONTROLLING B.M.

FIELD BOOK No.

No.	ISSUE/REVISION	BY	DATE
0	ISSUED FOR TENDER	AR	09/27/2018

WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

WATERLOO WWTP CIVIL GENERAL SITE PLAN

LICENSED PROFESSIONAL ENGINEER A. GHAJAREH SEPANLOU 100170044 PROVINCE OF ONTARIO

DRAWN BY: A. RIOLO	CONTRACT No. T2018-104
CHECKED BY: A. SEPANLOU	FILE No.
DATE: 09/27/2018	DRAWING No. C-101-W
SCALE 1:250	SHEET 015 OF 126
CADD FILE: XXXXXC-101-W.dwg	

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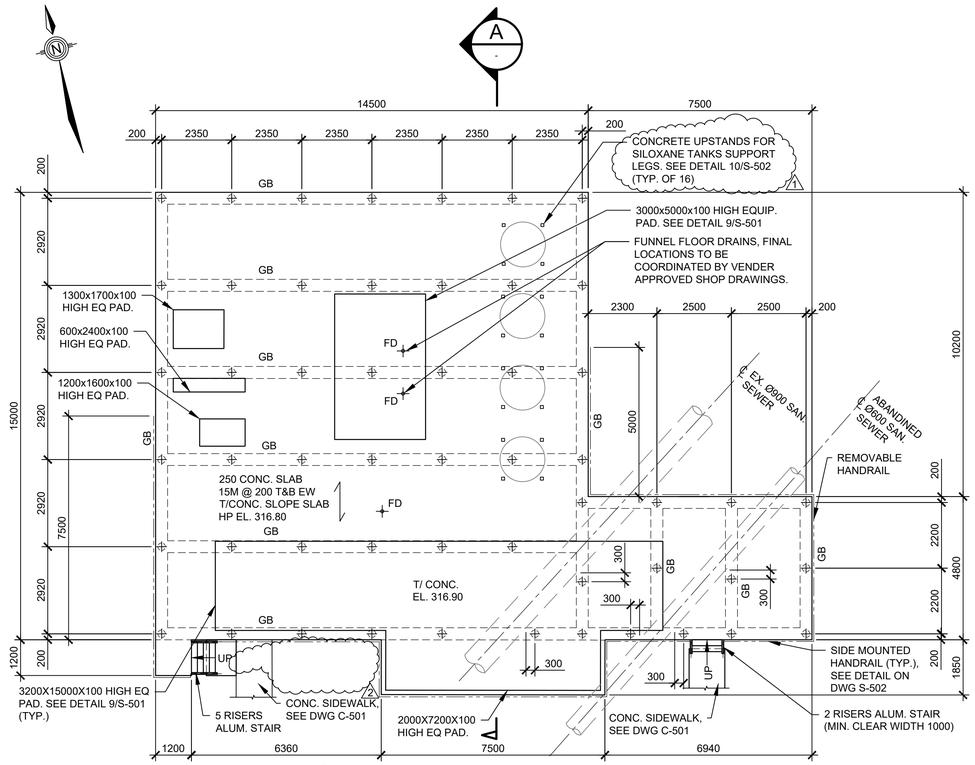
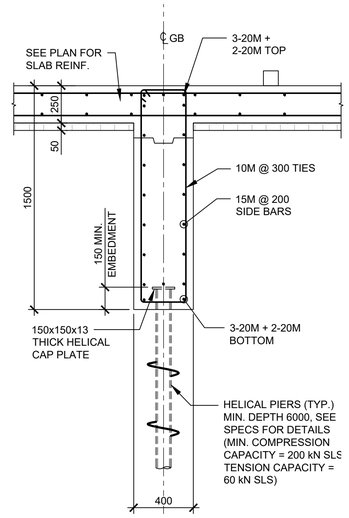


1 EQUIPMENT CONCRETE PAD PLAN
SCALE: 1:100
GB = GRADE BEAM (400x1500)



B DETAIL OF GB
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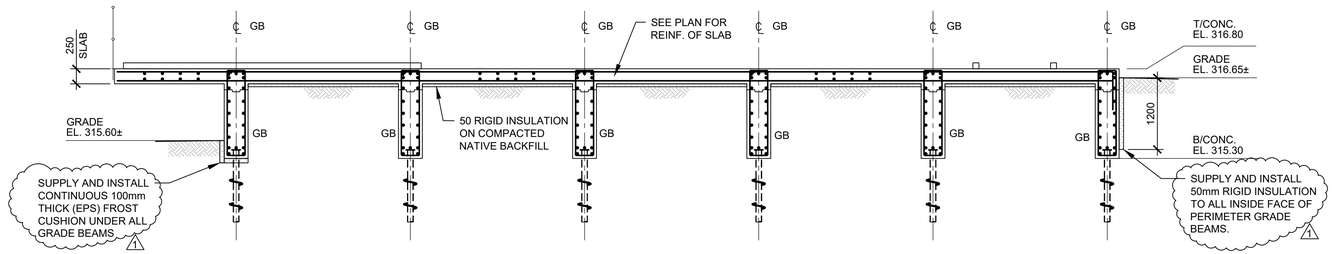
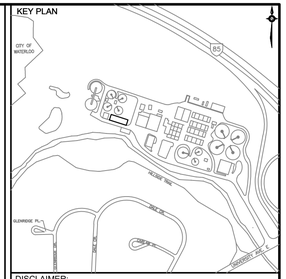


A SECTION
SCALE: 1:50

KEY PLAN



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NOTES:
1. SLOPE CONCRETE SLAB MINIMUM 1% TO FLOOR DRAINS. SEE CIVIL DRAWINGS FOR LOCATIONS.
2. HIGH POINT CONCRETE SLAB ELEVATION SHALL BE AT THE EDGE OF THE CONCRETE SLAB.
2. FOR IN SLAB HEATING ELEMENTS, SEE ELECTRICAL DRAWINGS.
3. CONCRETE ENCASE ALL DRAIN PIPES UNDER CONCRETE SLAB. SEE DETAIL 10/S-501. PROVIDE SLEEVES FOR CONDUITS THROUGH CONCRETE BEAMS PRIOR TO CONCRETING. DO NOT CONNECT CONDUIT CONCRETE ENCASEMENT TO STRUCTURAL SLAB. 1
4. GENERAL CONTRACTOR TO COORDINATE FINAL EQUIPMENT EQUIPMENT PAD AND CONCRETE UPSTANDS LOCATIONS WITH VENDOR APPROVED SHOP DRAWINGS.
5. PROVIDE DRIP EDGE FOR ALL SLABS WITHOUT PERIMETER BEAMS.
6. GENERAL CONTRACTOR TO COORDINATE ALL CABLES, CONDUITS, PIPING TO ENSURE NO INTERFERENCES WITH CAISSONS, COLUMNS OR HELICAL PIERS. ARRANGEMENT SHOWN ON DRAWINGS IS SCHEMATIC ONLY. FINAL ARRANGEMENT OF ENCASED CONDUITS, PIPES AND CONCRETE ENCASEMENT TO BE REVIEWED BY STRUCTURAL ENGINEER PRIOR TO INSTALLATION. 1
7. CONTRACTOR SHALL FIELD LOCATE EXISTING 9000 SANITARY SEWER APPROX. INV. EL. 311.26 AND ABANDONED 6000 SANITARY SEWER PRIOR TO HELICAL PIER INSTALLATION.

DESIGN LOADING:
LIVE LOAD ON CONCRETE PAD: 12 kPa
LIVE LOAD ON STAIRS: 4.8 kPa
SNOW LOAD:
WATERLOO AND KITCHENER: 1.8 kPa (SLS) 2.5 kPa (ULS)
GALT: 1.5 kPa (SLS), 2.1 kPa (ULS)

JACOBS CIMA ERAMOSA ENGINEERING INC.
Region of Waterloo

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FIELD BOOK No.

No.	ISSUE/REVISION	BY	DATE
2	ISSUED FOR ADDENDUM 6	ARP	10/29/2018
1	ISSUED FOR ADDENDUM 4	ARP	10/24/2018
0	ISSUE.FOR TENDER	ARP	09/27/2018

WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

WATERLOO WWTP STRUCTURAL EQUIPMENT CONCRETE PAD - PLAN SECTION AND DETAILS

LICENSED PROFESSIONAL ENGINEER
11/22/2018
M. AU
100077796
PROVINCE OF ONTARIO

DRAWN BY: E. ZHANG	CONTRACT No. T2018-104
CHECKED BY: A. PRINGLEMEIR	FILE No.
DATE: 09/27/2018	DRAWING No. S-101-W
SCALE 1:50	SHEET 021 OF 126
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2018-11-22 10:37 AM By: GLENN GERMAN

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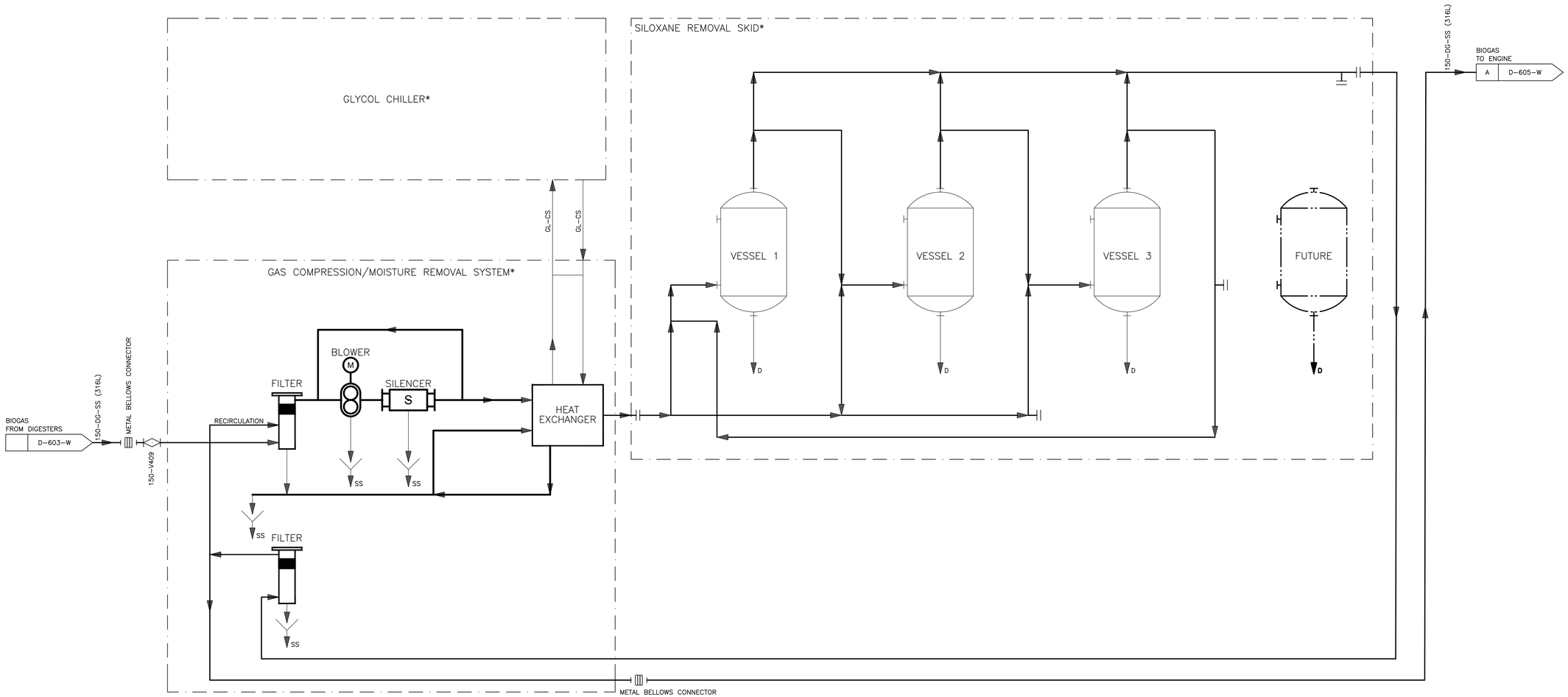


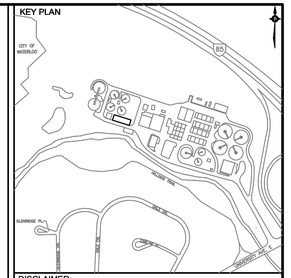
LEGENDS:

- FUTURE
- VENDOR SUPPLIED
- PROCESS LINES
- ELECTRICAL LINES

NOTE

* THE GAS CONDITIONING EQUIPMENT SHALL COMPLY WITH SPECIFICATION SECTION 11390 GAS CONDITIONING SYSTEM AND ITS RELATED SPECIFICATION SECTIONS. THE EQUIPMENT AND PIPING SHOWN ON THIS DRAWING IS ONLY SHOWN SCHEMATICALLY AND SHALL NOT BE CONSIDERED COMPLETE.

KEY PLAN



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NOTES:

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Region of Waterloo

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

WATERLOO WWTP GAS CONDITIONING SYSTEM P&ID

26/Sept/2018

LICENSED PROFESSIONAL ENGINEER F.J. ABSI PROVINCE OF ONTARIO

DRAWN BY: A. KANDA	CONTRACT No. T2018-104
CHECKED BY: F. ABSI	FILE No.
DATE: 09/27/2018	DRAWING No. D-604-W
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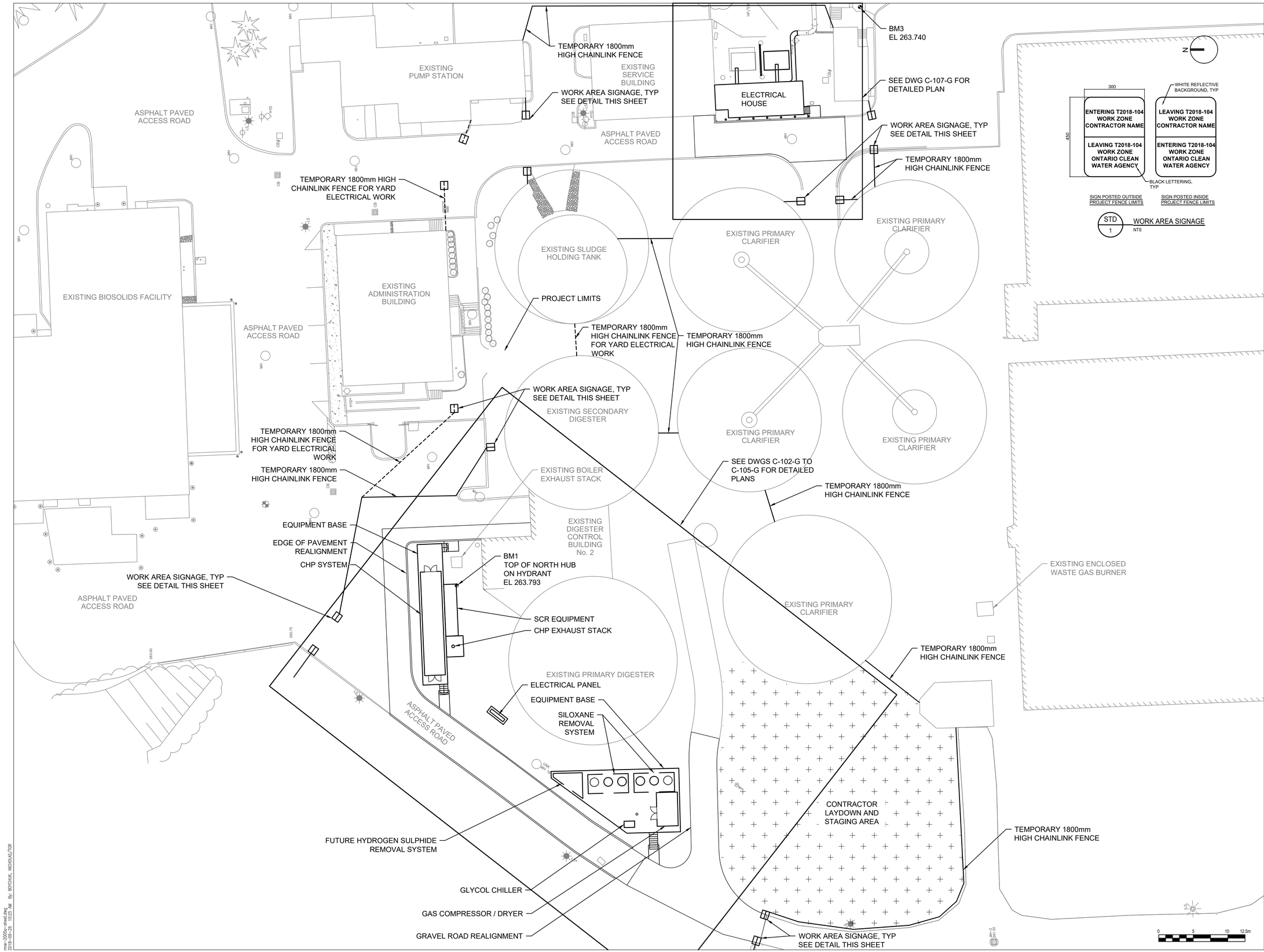

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WHITE REFLECTIVE BACKGROUND, TYP

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LEAVING T2018-104 WORK ZONE ONTARIO CLEAN WATER AGENCY	ENTERING T2018-104 WORK ZONE ONTARIO CLEAN WATER AGENCY

450

BLACK LETTERING, TYP

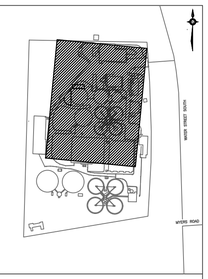
SIGN POSTED OUTSIDE PROJECT FENCE LIMITS

SIGN POSTED INSIDE PROJECT FENCE LIMITS

STD 1 WORK AREA SIGNAGE

NTS

KEY PLAN



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Region of Waterloo

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0	ISSUED FOR TENDER	AR	09/27/2018

WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP CIVIL GENERAL SITE PLAN

LICENSED PROFESSIONAL ENGINEER
A. GHAJARIEH SEPANLOU
100170044
ONTARIO
PROVINCE OF ONTARIO

DRAWN BY: A. RIOLO	CONTRACT No. T2018-104
CHECKED BY: A. SEPANLOU	FILE No.
DATE: 09/27/2018	DRAWING No. C-101-G
SCALE 1:250	SHEET 049 OF 126
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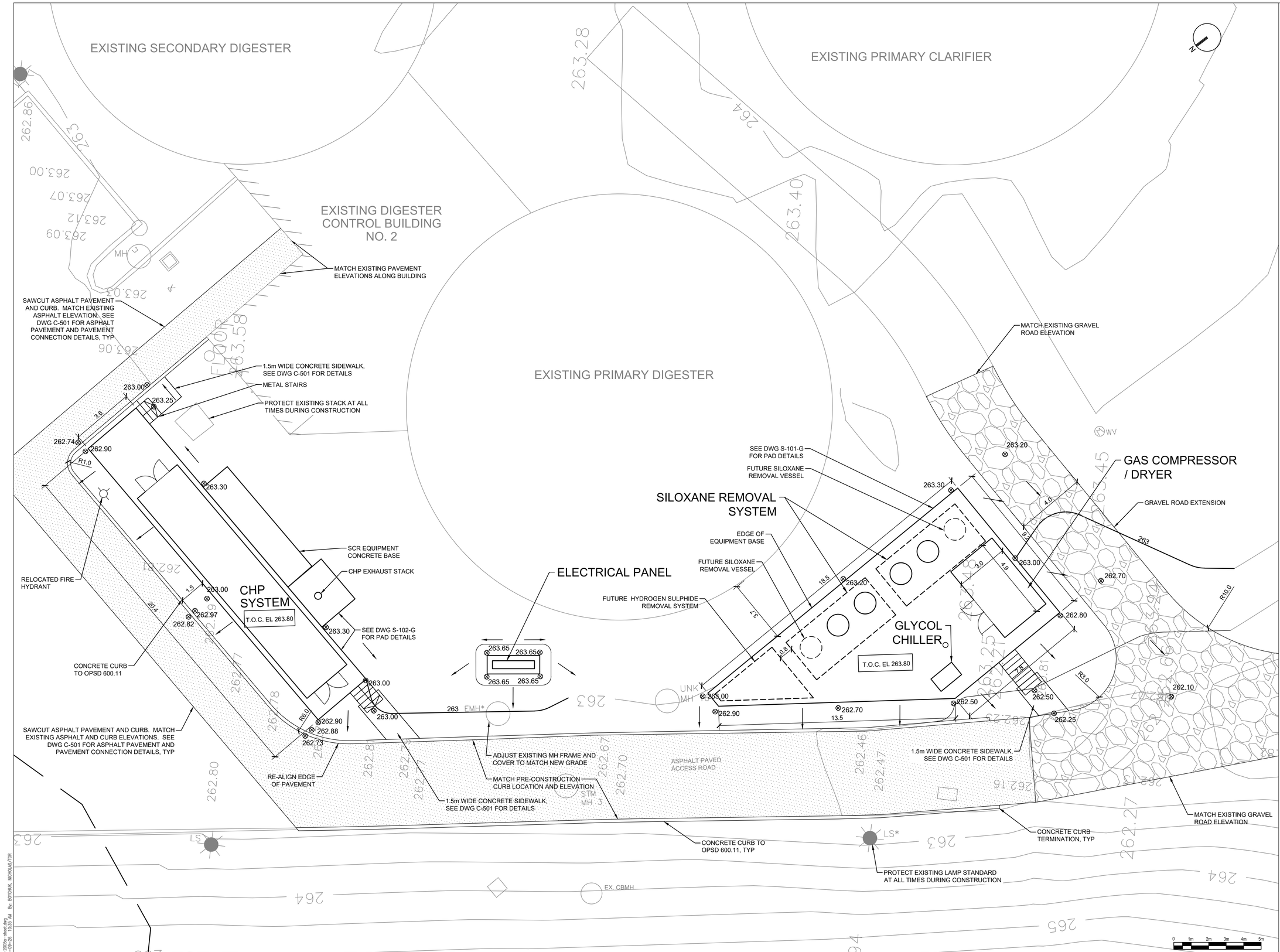

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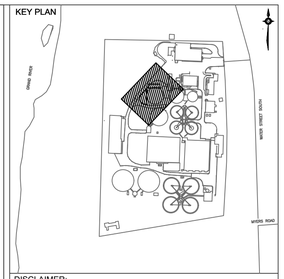

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NOTES:

1. RESTORE ALL DISTURBED UN-PAVED AREAS WITH 150mm TOPSOIL AND SOD. RESTORE ALL HARD PAVED AREAS WITH MATERIALS SIMILAR TO EXISTING CONDITION. MATCH EXISTING THICKNESS, ELEVATIONS AND COLOURS.
2. REFER TO DWG C-106-G FOR SEDIMENTATION CONTROL NOTES, DETAILS AND REQUIREMENTS.
3. CONFIRM EXISTING GRADES AND CONTOURS PRIOR TO COMMENCING CONSTRUCTION. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
4. GRCA FLOODPLAIN LIMITS ARE LOCATED OUTSIDE OF THE SHEET BOUNDARY. REFER TO DWG C-106-G FOR GRCA FLOODPLAIN LIMITS.

JACOBS CIMA ERAMOSA ENGINEERING INC.

Region of Waterloo

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP CIVIL GRADING PLAN

LICENSED PROFESSIONAL ENGINEER
A. GHAJARIEH SEPANLOU
100170044
09/26/2018
PROVINCE OF ONTARIO

DRAWN BY: A. RIOLO	CONTRACT No. T2018-104
CHECKED BY: A. SEPANLOU	FILE No.
DATE: 09/27/2018	DRAWING No. C-104-G
SCALE 1:100	SHEET 052 OF 126
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2018-09-26 10:35 AM By: BOYCHUK, NICHOLAS/TOR

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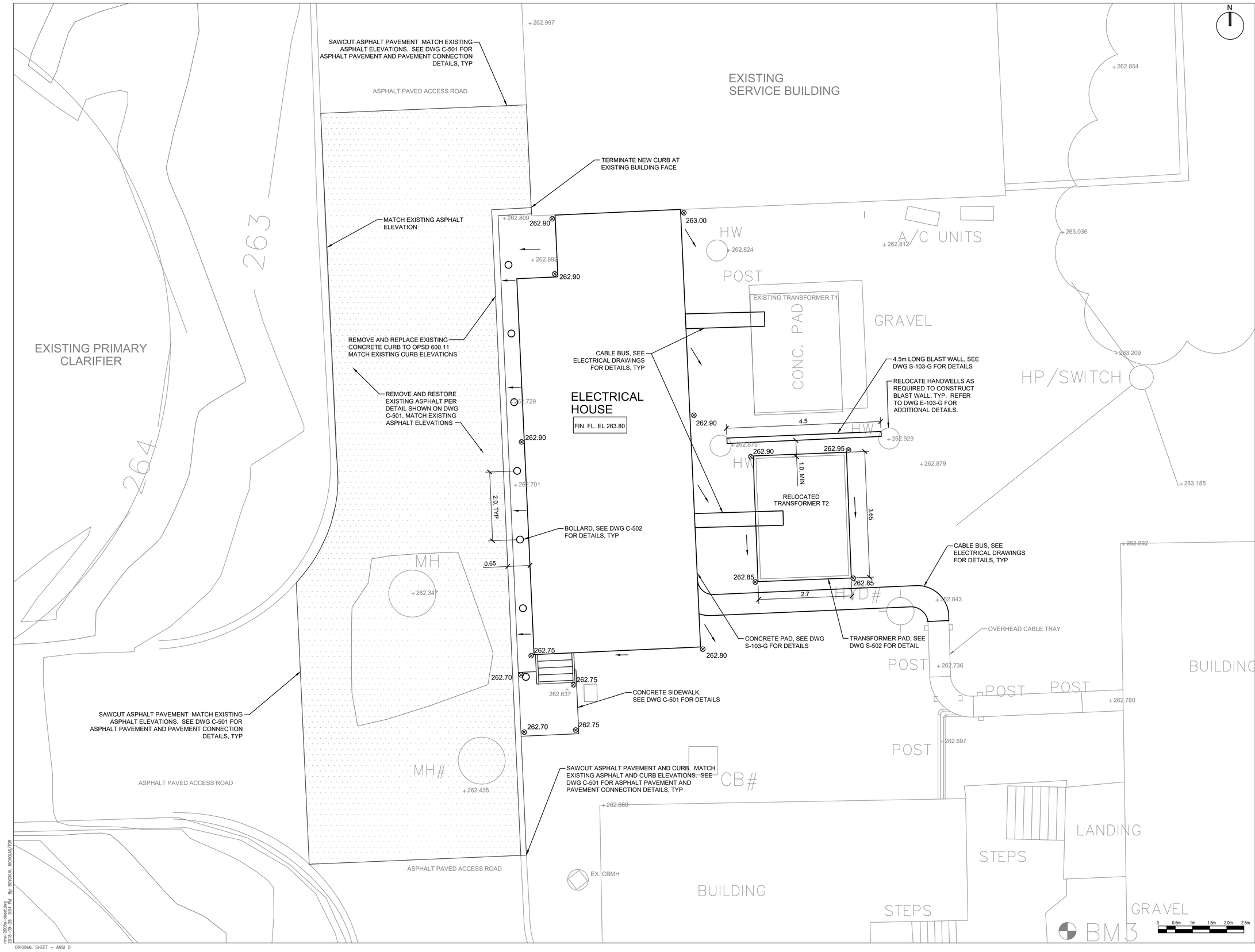

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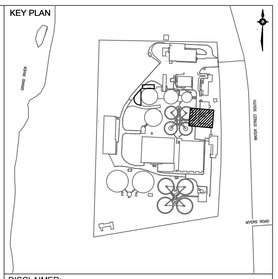

DISCLAIMER:

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NOTES:

1. RESTORE ALL DISTURBED UN-PAVED AREAS WITH 150mm TOPSOIL AND SOD. RESTORE ALL HARD PAVED AREAS WITH MATERIALS SIMILAR TO EXISTING CONDITION. MATCH EXISTING THICKNESS, ELEVATIONS AND COLOURS.
2. REFER TO DWG C-106-G FOR SEDIMENTATION CONTROL NOTES, DETAILS AND REQUIREMENTS.
3. CONFIRM EXISTING GRADES AND CONTOURS PRIOR TO COMMENCING CONSTRUCTION. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
4. GRCA FLOODPLAIN LIMITS ARE LOCATED OUTSIDE OF THE SHEET BOUNDARY. REFER TO DWG C-106-G FOR GRCA FLOODPLAIN LIMITS.
5. REFER TO DWG E-101-G FOR REMOVALS.
6. REFER TO DWG E-103-G FOR ELECTRICAL EQUIPMENT AND LAYOUT DETAILS.

JACOBS CIMA ERAMOSA ENGINEERING INC.

Region of Waterloo

CONTROLLING B.M.

FIELD BOOK No.

No.	ISSUE/REVISION	BY	DATE
0	ISSUED FOR TENDER	AR	09/27/2018

WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP CIVIL ELECTRICAL HOUSE GRADING PLAN

LICENSED PROFESSIONAL ENGINEER
A. GHAJAREH SEPANLOU
100170044
09/26/2018
PROVINCE OF ONTARIO

DRAWN BY: A. RIOLO	CONTRACT No. T2018-104
CHECKED BY: A. SEPANLOU	FILE No.
DATE: 09/27/2018	DRAWING No. C-107-G
SCALE 1:50	SHEET 055 OF 126
CADD FILE: XXXXXC-107-G.dwg	

rtmx-2000a-sheet.dwg 2018-09-26 3:04 PM By: BOYCHUK, NICHOLAS/TOR

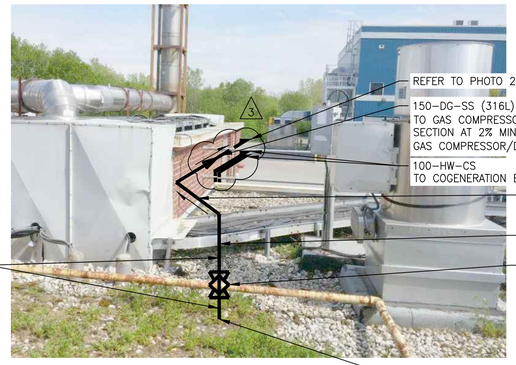
ORIGINAL SHEET – ANSI D

UP THROUGH ROOF (REFER TO ROOF PENETRATION DETAIL ON DWG D-501-E. REFER TO PHOTO 2 FOR CONTINUATION)

150-DG-SS (316L) TO GAS COMPRESSOR

CONNECT TO EXISTING 200-DG PIPE AND ROUTE UP THROUGH EXISTING ROOF

PHOTO 1



REFER TO PHOTO 2 FOR CONTINUATION

150-DG-SS (316L) TO GAS COMPRESSOR (HORIZONTAL SECTION AT 2% MIN SLOPE TO GAS COMPRESSOR/DRYER

100-HW-CS TO COGENERATION ENGINE

2% MIN SLOPE TO GAS COMPRESSOR/DRYER

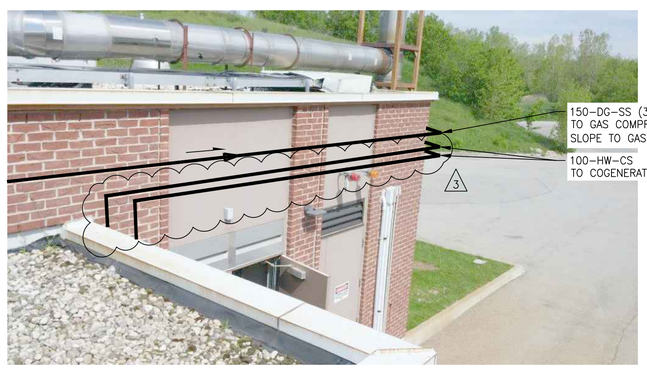
PURGE POINT (15mm SST BALL VALVE, CAPPED)

90° ELBOW

150-V409

150-DG-SS (316L) (UP FROM CONTROL BUILDING BELOW) REFER TO ROOF PENETRATION DETAIL ON DWG D-501-G

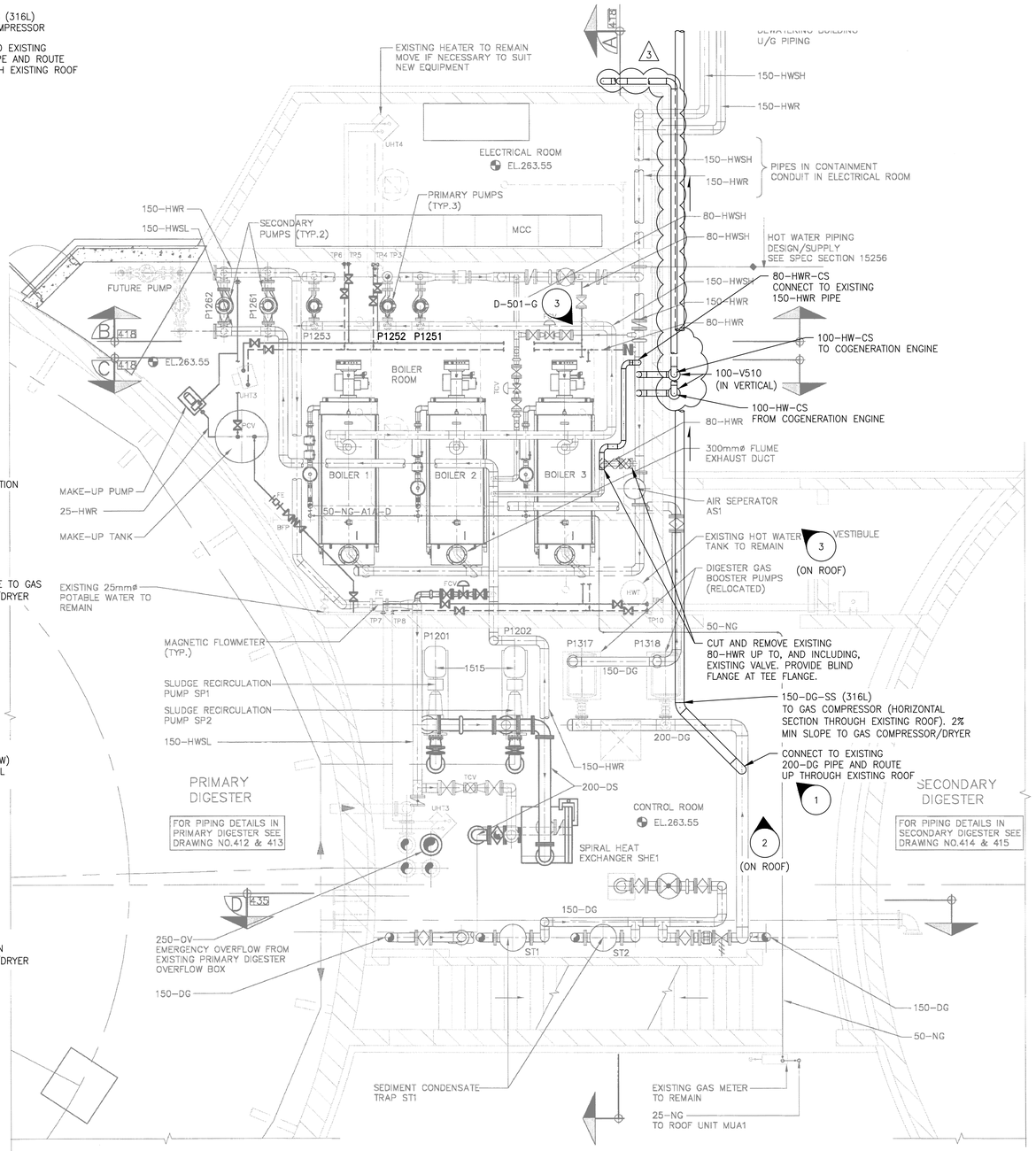
PHOTO 2



150-DG-SS (316L) TO GAS COMPRESSOR. 2% MIN SLOPE TO GAS COMPRESSOR/DRYER

100-HW-CS TO COGENERATION ENGINE

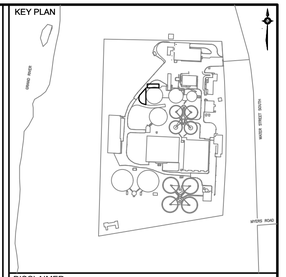
PHOTO 3



PART PLAN ABOVE GROUND LEVEL

NTS

KEY PLAN



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NOTES:

JACOBS' CIMA ERAMOSA ENGINEERING INC.

Region of Waterloo

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0	ISSUED FOR TENDER	AK	09.27.2018

WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP
BOILER AND CONTROL ROOM
PIPING TIE-INS
PART PLAN ABOVE GROUND

LICENSED PROFESSIONAL ENGINEER
22 Oct 2018
F.J. ABSI
PROVINCE OF ONTARIO

DRAWN BY: A. KANDA	CONTRACT No. T2018-104
CHECKED BY: F. ABSI	FILE No.
DATE: 09.27.2018	DRAWING No. D-101-G
SCALE NTS	SHEET 059 OF 126
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2018-10-22 11:05 AM By: BOYCHUK, NICHOLAS/TOR

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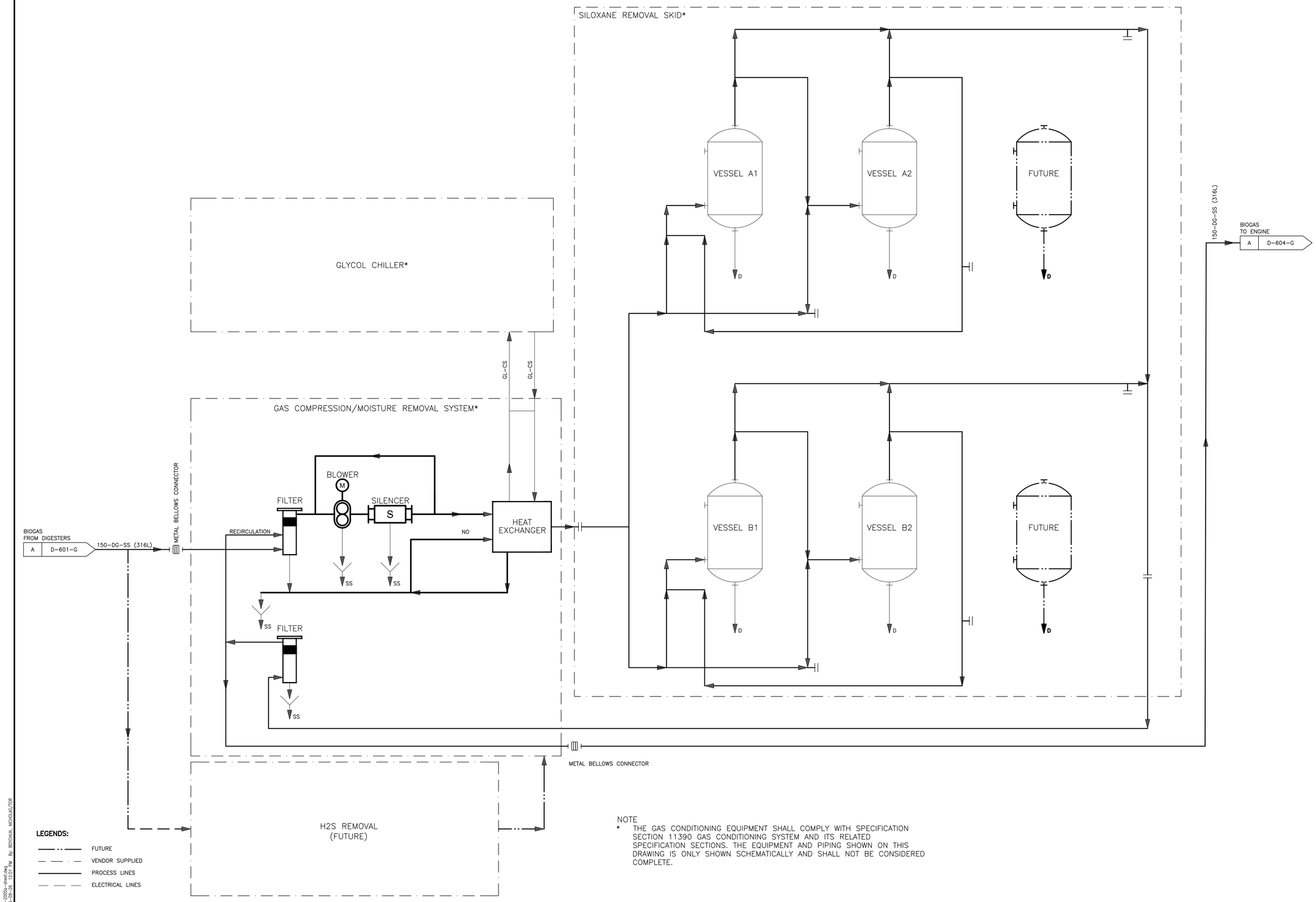
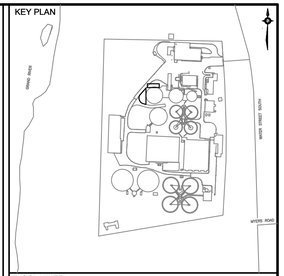


NOTE
* THE GAS CONDITIONING EQUIPMENT SHALL COMPLY WITH SPECIFICATION SECTION 11390 GAS CONDITIONING SYSTEM AND ITS RELATED SPECIFICATION SECTIONS. THE EQUIPMENT AND PIPING SHOWN ON THIS DRAWING IS ONLY SHOWN SCHEMATICALLY AND SHALL NOT BE CONSIDERED COMPLETE.

KEY PLAN



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NOTES:

JACOBS
CIMA
ERAMOSA ENGINEERING INC.
Region of Waterloo

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP GAS CONDITIONING SYSTEM P&ID

26/Sept/2018
LICENSED PROFESSIONAL ENGINEER
F.J. ABSI
PROVINCE OF ONTARIO

DRAWN BY: A. KANDA	CONTRACT No. T2018-104
CHECKED BY: F. ABSI	FILE No.
DATE: 09/27/2018	DRAWING No. D-603-G
SCALE NTS	SHEET 063 OF 126
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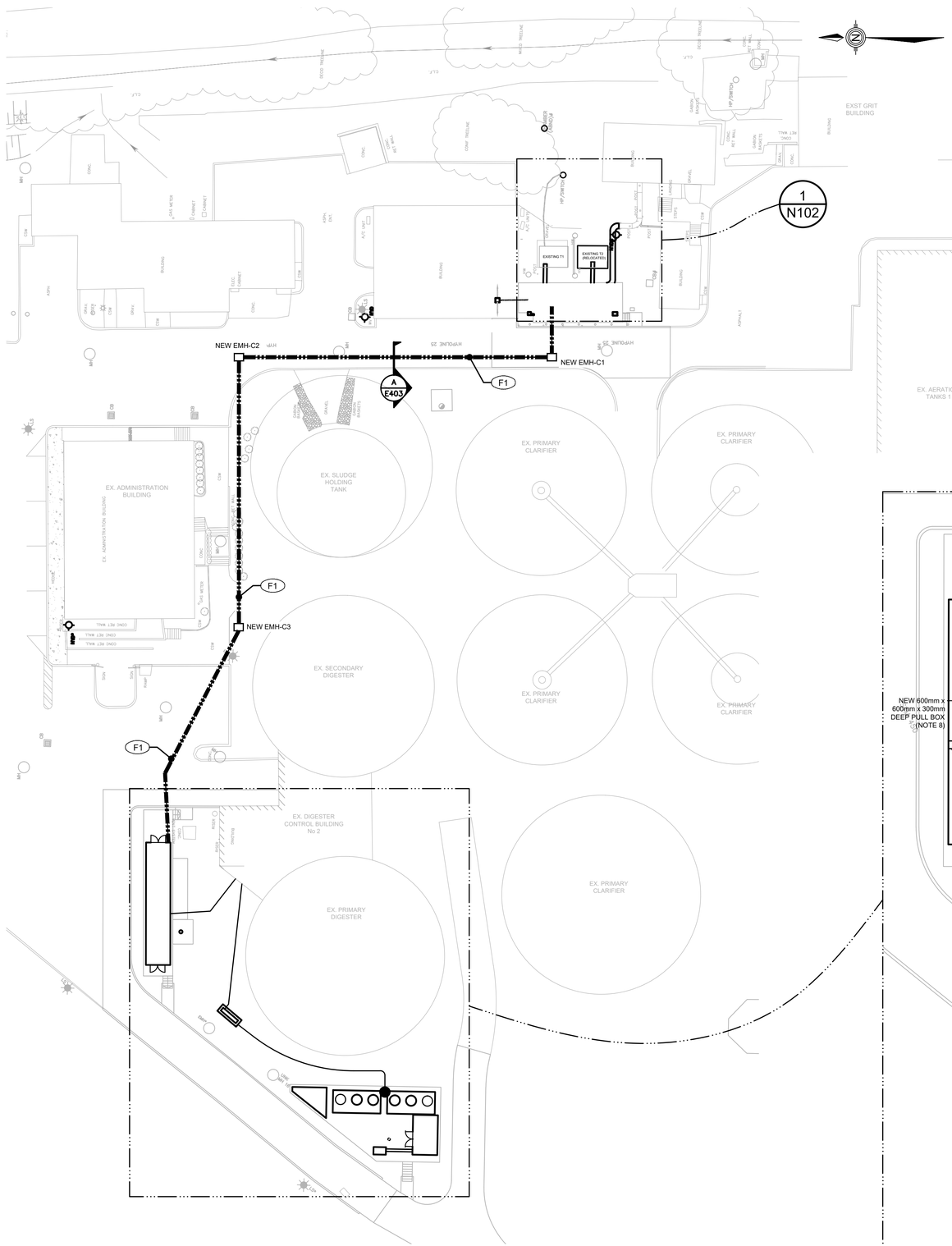
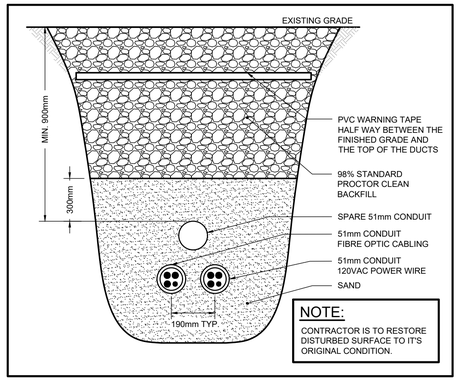


LEGEND

- SURFACE MOUNTED CONDUITS INSIDE BASEMENT
- UNDERGROUND CONDUITS

1 ELECTRICAL SITE PLAN - PROPOSED

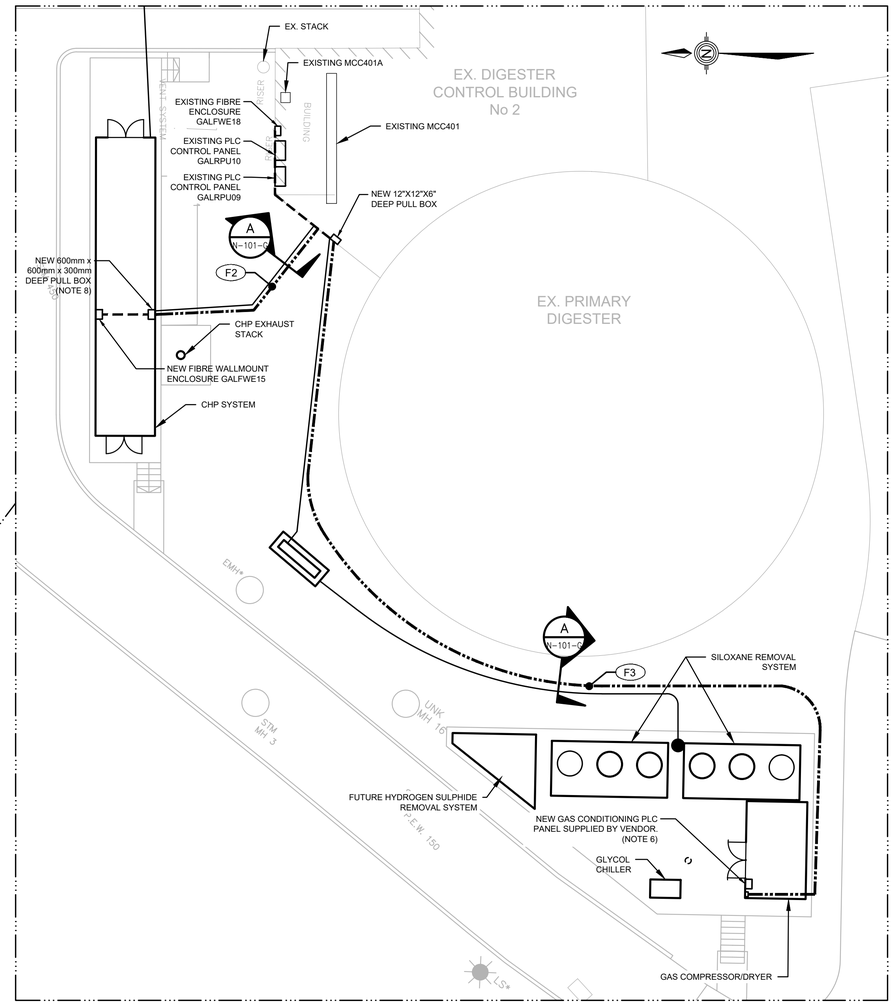
SCALE: 1:300



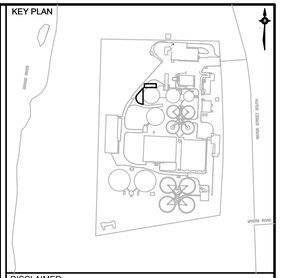
TYPICAL DIRECT BURIED CABLE DETAIL

NTS

A N-101-G



KEY PLAN



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NOTES:

1. FIBRE OPTIC CABLE IN RIGID STEEL CONDUIT FROM FIBRE WALL MOUNT ENCLOSURE GALFWE TO PULL BOX.
2. CONTRACTOR TO SUPPLY AND INSTALL NEW CONDUITS IN BUILDINGS TO ROUTE CABLING.
3. PROVIDE ALL X-RAYING PRIOR TO CORING.
4. ALL RESTORATIONS TO RESTORE TO CURRENT CONDITIONS INCLUDING ASPHALT, GRASS, SIDEWALKS, ETC. BY THE CONTRACTOR.
5. OBTAIN ALL LOCATES PRIOR TO EXCAVATIONS. ALL EXCAVATIONS BY HYDROVAC.
6. NETWORK DESIGN WAS BASED ON THE CONDITIONING SYSTEM FROM BIOSPARK, COORDINATE AND PROVIDE ALL REQUIREMENTS TO MEET THE INTENT OF THE UPGRADES FOR A COMPLETE AND FULLY FUNCTIONAL SYSTEM.
7. ALL CONDUITS ENTERING CLASSIFIED AREAS TO INCLUDE EYS SEALS.
8. PULL BOX LOCATION ON DRAWINGS IS APPROXIMATE CONTRACTOR TO INSTALL PULL BOX IN SUITABLE LOCATION BASED ON SITE CONDITIONS.

JACOBS / CIMA / ERAMOSA ENGINEERING INC. — Region of Waterloo

CONTROLLING B.M.

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

GALT WWTP NETWORK SITE PLAN MODIFICATIONS (1)

LICENSED PROFESSIONAL ENGINEER — D. G. CHAMBERLAIN — PROVINCE OF ONTARIO

DRAWN BY: M.KAUTESK	CONTRACT No. T2018-104
CHECKED BY: D. MURRAY	FILE No.
DATE: 05/16/2018	DRAWING No. N-101-G
SCALE NTS	SHEET 78 OF 126
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2018-09-26 2:01 PM By: MIKE KAUTESK

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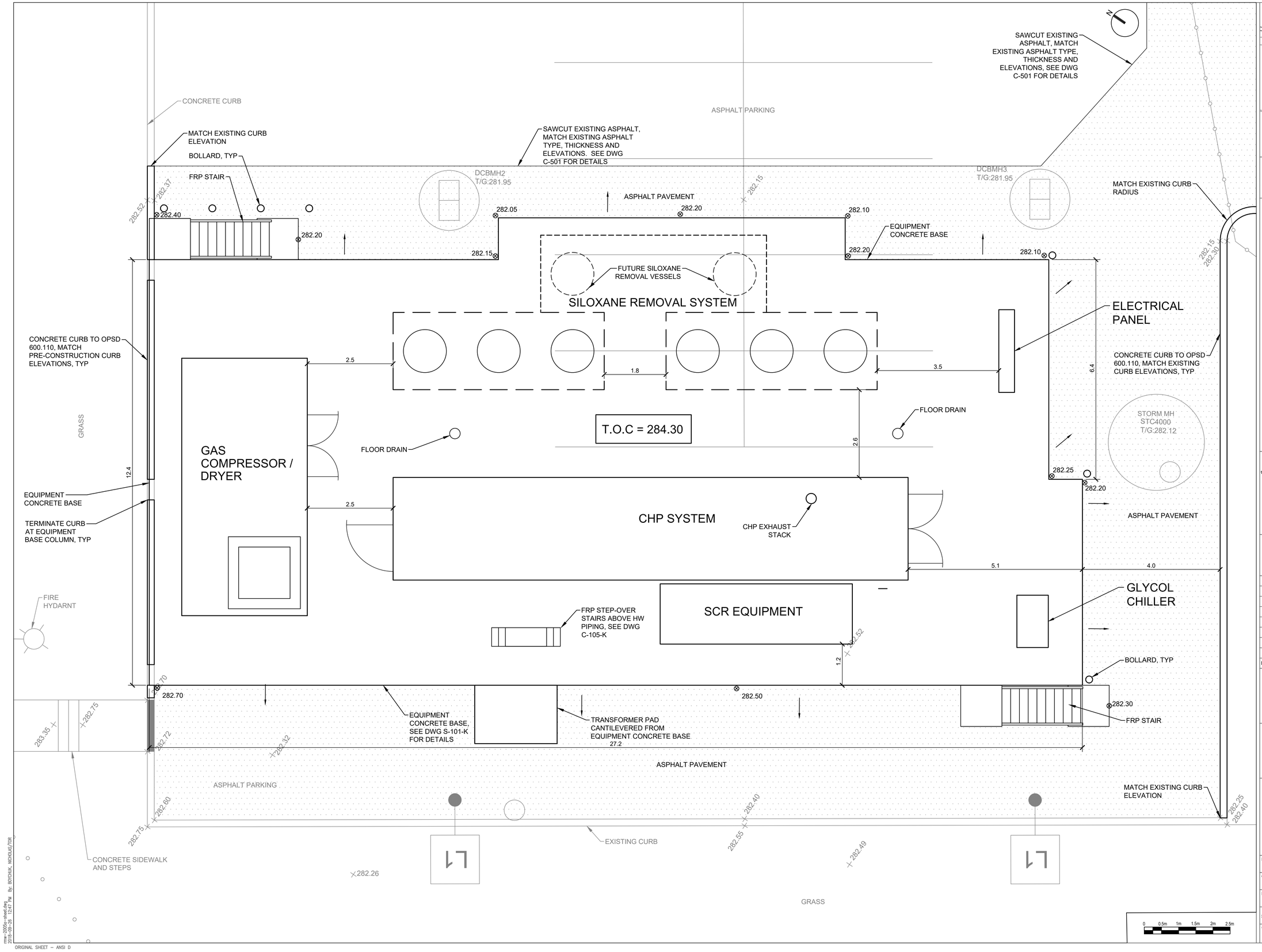

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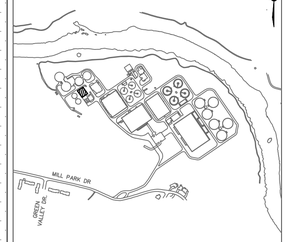

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NOTES:

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2. REFER TO DWG C-106-K FOR SEDIMENTATION CONTROL NOTES, DETAILS AND REQUIREMENTS.
3. CONFIRM EXISTING GRADES AND CONTOURS PRIOR TO COMMENCING CONSTRUCTION. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
4. GRCA FLOODPLAIN LIMITS ARE LOCATED OUTSIDE OF THE SHEET BOUNDARY. REFER TO DWG C-106-K FOR GRCA FLOODPLAIN LIMITS.

JACOBS CIMA ERAMOSA ENGINEERING INC.

Region of Waterloo

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

KITCHENER WWTP CIVIL GRADING PLAN

LICENSED PROFESSIONAL ENGINEER
A. GHAJARIEH SEPANLOU
100170044
09/28/2018
PROVINCE OF ONTARIO

DRAWN BY: A. RIOLO	CONTRACT No. T2018-104
CHECKED BY: A. SEPANLOU	FILE No.
DATE: 09/27/2018	DRAWING No. C-104-K
SCALE 1:50	SHEET 098 OF 126
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2018-09-26 12:47 PM By: BOYCHUK, NICHOLAS/TOR

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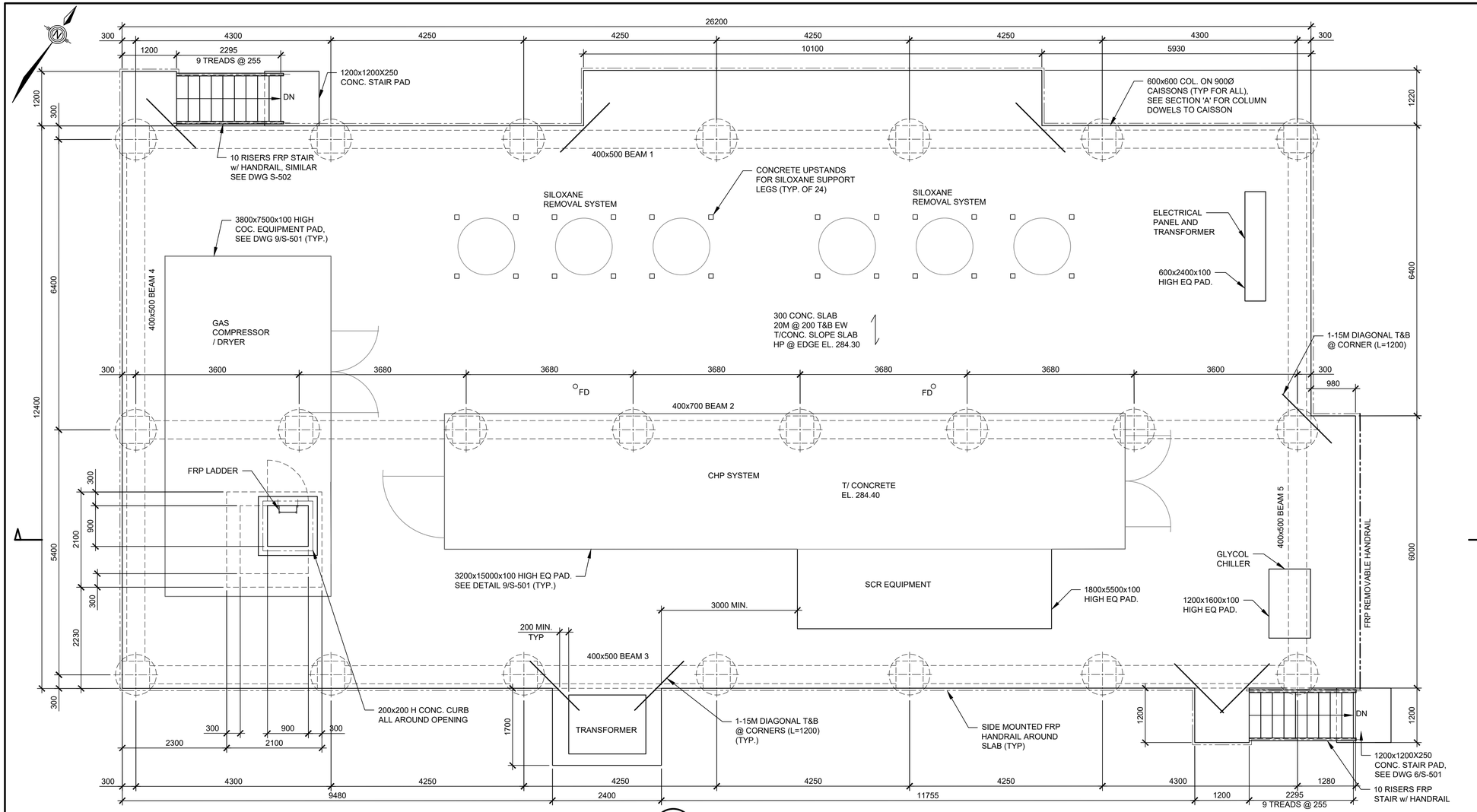

1 EQUIPMENT CONCRETE PAD PLAN
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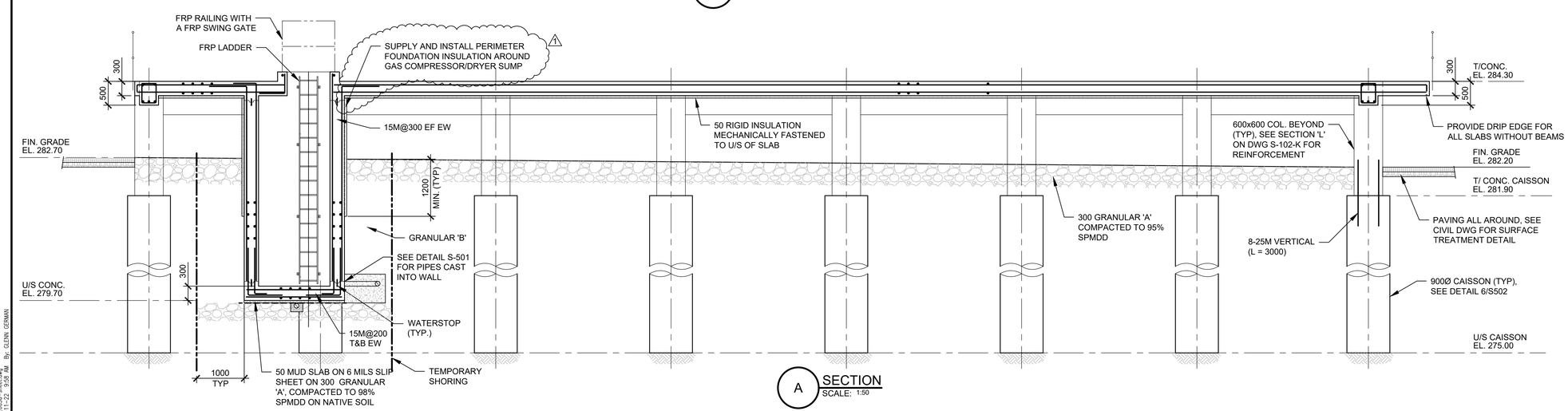

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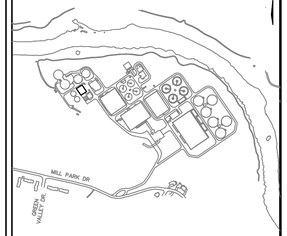
KEY PLAN



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NOTES:

1. FOR GENERAL CONCRETE SLAB CONSTRUCTION NOTES, REFER TO NOTES 1 TO 6 ON DRAWING S-101-W.
2. FOR DESIGN LOADING REFER TO DRAWING S-101-W.

JACOBS CIMA FERAMOSA ENGINEERING INC. — Region of Waterloo

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

KITCHENER WWTP STRUCTURAL EQUIPMENT CONCRETE PAD - PLAN AND SECTION

LICENSED PROFESSIONAL ENGINEER
11/22/2018
M. AU
100077796
PROVINCE OF ONTARIO

DRAWN BY: E. ZHANG	CONTRACT No. T2018-104
CHECKED BY: A. PRINGLEMEIR	FILE No.
DATE: 09/27/2018	DRAWING No. S-101-K
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2018-11-22 9:58 AM By: GLENN GERMAN

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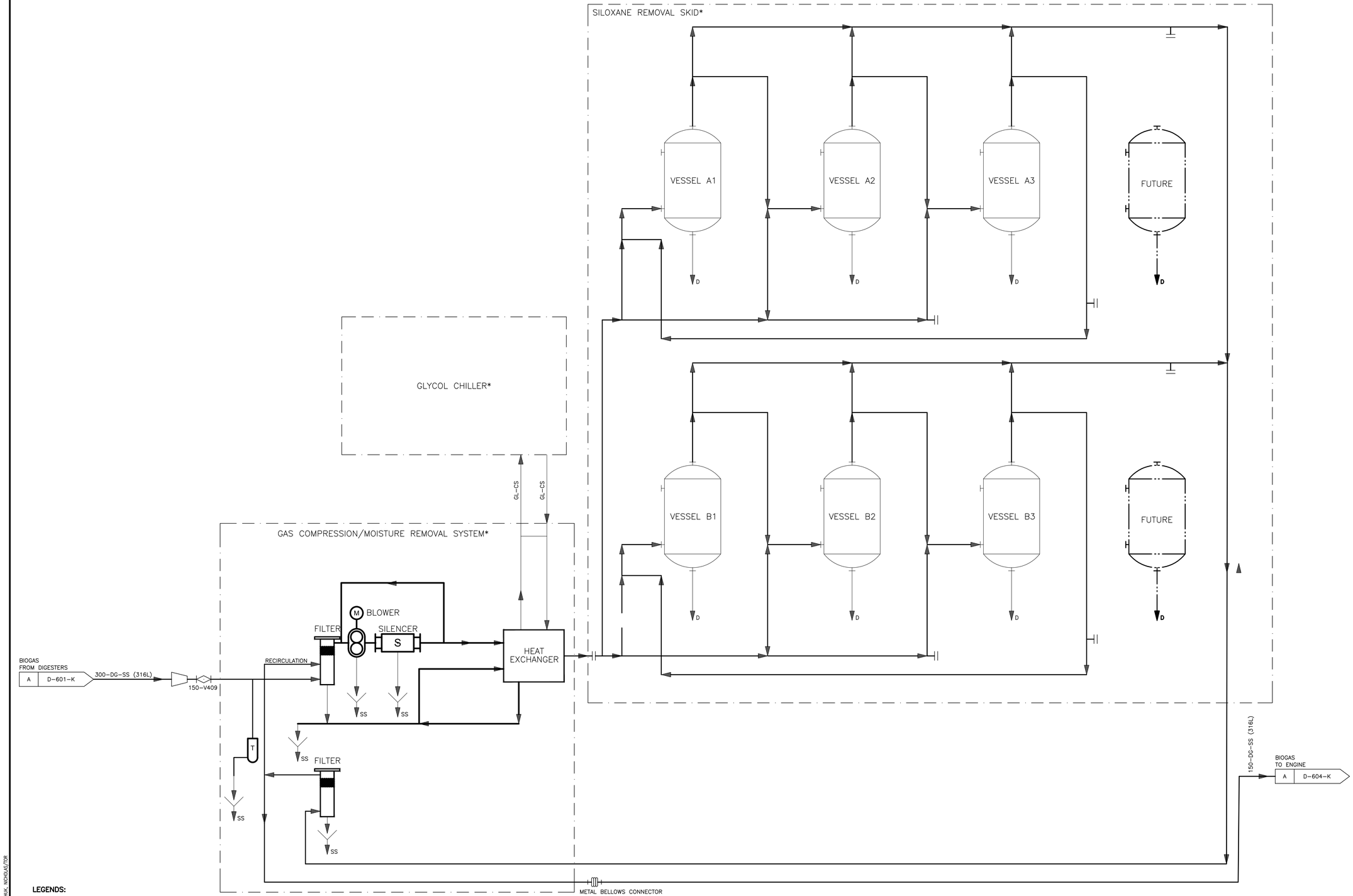


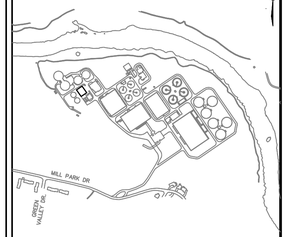
LEGENDS:

- FUTURE
- VENDOR SUPPLIED
- PROCESS LINES
- ELECTRICAL LINES

NOTE

* THE GAS CONDITIONING EQUIPMENT SHALL COMPLY WITH SPECIFICATION SECTION 11390 GAS CONDITIONING SYSTEM AND ITS RELATED SPECIFICATION SECTIONS. THE EQUIPMENT AND PIPING SHOWN ON THIS DRAWING IS ONLY SHOWN SCHEMATICALLY AND SHALL NOT BE CONSIDERED COMPLETE.

KEY PLAN



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NOTES:

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WATERLOO, GALT AND KITCHENER WWTP DIGESTER GAS COGENERATION FACILITIES

KITCHENER WWTP GAS CONDITIONING SYSTEM P&ID

26/Sept/2018
LICENSED PROFESSIONAL ENGINEER
F.J. ABSI
PROVINCE OF ONTARIO

DRAWN BY: A. KANDA	CONTRACT No. T2018-104
CHECKED BY: F. ABSI	FILE No.
DATE: 09/27/2018	DRAWING No. D-603-K
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