TESTIMONY OF

RAYMOND M. SNYDER

IN SUPPORT OF PGW'S PETITION FILED SEPTEMBER 20, 2018
REGARDING AN LNG P3 PROJECT AT PASSYUNK PLANT

BEFORE THE PHILADELPHIA GAS COMMISSION
PUBLIC HEARING - OCTOBER 29, 2018

INTRODUCTION

Good morning, my name is Raymond Snyder. I am the Senior Vice President – Gas Management for Philadelphia Gas Works ("PGW" or "Company"). I am appearing today in support of PGW's LNG Project at Passyunk Plant, as described in the Petition (defined below) recently filed with the Philadelphia Gas Commission ("Commission" or "PGC").[1]

This project, though small in terms of its physical scale, is a significant one for PGW and for the almost 500,000 homes and businesses right here in Philadelphia that depend upon us for warmth, for cooking, for power generation and for hot water.

While PGW's experience with LNG goes back 50 years, and our expertise is second-to-none, this project represents a new model for us. Developed at the urging of certain stakeholders, it allows us to release more of the positive socio-economic potential inherent to PGW, while protecting the interests of ratepayers.

We assessed this project in terms of its financial implications, its operational impact, its legal structure and safeguards, its environmental impact and its role in PGW's strategic plan.

As PGW's General Counsel, Raquel N. Guzmán explains in her testimony, this project presents no financial risk to ratepayers while generating between $1.35 million and $4.0 million in new net revenue annually. Over the lifetime of the agreement, that means as much as $100 million in revenue.

That money is important for a number of reasons. Better building practices, more efficient appliances and changing customer behavior mean that even though natural gas is more popular than ever, our traditional markets here in Philadelphia need less of it to achieve the same benefit.

[1] PGW and the Philadelphia Facilities Management Corporation filed the Petition for Approval and Recommendation for Approval of Certain Transactions and Contracts for the Purchase, Storage, Distribution and/or Transmission of Natural Gas and also Certain Transactions and Contracts Respecting Real Property Owned by the City of Philadelphia and Operated by Philadelphia Gas Works (the "Petition") with the Philadelphia Gas Commission ("PGC" and "Commission") on September 20, 2018.

At the same time, operational costs outside of our control continue to rise. Our strategy to deal with these twin challenges of declining demand and increasing costs includes constantly improving our own efficiency, striving to identify new ways to control costs, and pursuing new sources of revenue. We do these things because the only alternative is to adjust our base rates upwards.

So, whether it is $1.35 million or $4.0 million in potential new revenues annually, this is real money that we can use to bend the cost curve and further delay future base rate adjustments. When you combine that with the facts that there are no upfront costs for PGW, and that any incremental operating costs will be reimbursed, it starts to become clear why this is a good project.

Operationally, this project takes advantage of a core area of expertise at PGW and puts it to good use. We have stored LNG in our tank at Passyunk for decades, so that along with our tanks at Port Richmond, we can protect our customers from the impact of winter pricing. To date, our work with LNG has saved PGW's ratepayers almost $4 billion. Now, on a small plot of land within our Passyunk Plant PGW will gain access to a new liquefier and new loading facilities that will allow us to add making money with LGN to the way we already save money with LNG.

Beyond that, this project will also further reinforce our system reliability and add additional redundancy.

We also considered the environmental implications of this project. The negative environmental impacts are negligible and the positive impacts are clear.

Right now, PGW transports LNG from its facility in Port Richmond to its Passyunk Plant by truck. Once the new project is completed, that transportation will cease, largely negating the small level of emissions generated on-site at the Passyunk Plant during the liquefaction process.

And if the Passyunk Energy Center is successful in selling all the LNG by truck, it will add less than 0.01% to the annual daily traffic volume in that section of the city.

That is our assessment, but we wanted to check to make sure we were right. That is why we contracted with Langan Engineering and Environmental Service, Inc. Langan has submitted testimony and a representative is here today.

PGW contracted with Langan to undertake an environmental review of PGW's Passyunk Plant, in order to identify and evaluate the potential environmental and regulatory impacts of proposed new equipment and operations associated with a liquefaction enhancement project. Their environmental review determined that the proposed project will have minimal impact on air emissions.

The final question, for PGW, in assessing whether this was a project worth pursuing was whether it fits in with our strategic plan and our newly adopted company vision to "provide a pathway to a thriving and cleaner future through innovative energy solutions." We find that it does fit.

This project capitalizes on our core expertise to deliver new and tangible benefits, without limiting our potential for diversification in the future. It helps to sustain family-supporting jobs right here in Philadelphia, has a negligible environmental impact and offers neighboring, capacity-constrained regions the option to move away from dirtier alternative fuels.

For those reasons, and the others to be detailed in the testimony to follow, the Company requests that this project and associated transactions be approved by the Commission and receive a favorable recommendation for final approval by Philadelphia City Council ("City Council").

The above benefits will be realized when PGW is authorized to enter into certain identified agreements with PEC, a special purpose entity formed by Liberty Energy Trust, to construct an LNG liquefier, connect the new LNG liquefier to the plant's existing infrastructure and update PGW's existing truck loading/unloading system at Passyunk Plant in order to more effectively utilize same.

PGW expects to produce revenue by providing on-system services to PEC at tariffed rates, selling LNG to PEC via trailer for PEC to sell to end users or utilize the LNG on PGW's system during cold days, or other times when there is a price advantage, to substitute pipeline supply. In addition, the new facilities will add another source of LNG that could be utilized in an emergency, and will obviate the need to annually transport LNG by truck from Richmond Plant to the Passyunk Plant.

After PEC constructs the LNG liquefier and new truck loading station, PGW will lease the facilities over a twenty-five year term and operate same in exchange for various tariffed service fees from PEC (or others if PEC does not fully utilize throughput), while PEC continues to directly pay or reimburse PGW for the cost of (i) day-to-day operations; (ii) replacements and improvements; and (iii) any required maintenance to the facilities. At the end of the lease term, PGW will have the option to take ownership of the facilities at a nominal cost (one dollar). See also, Testimony of Raquel N. Guzmán.

HISTORY OF THE PROJECT

As the Commission is aware, PGW has been examining the feasibility of expanding the liquefaction capacity at its Richmond and Passyunk Plants for a number of years.[2] In 2015, PGW

[2] During 2013-2015, PGW leveraged its underutilized LNG capacity by developing a pilot interruptible LNG sales supply business for excess LNG. The program sold over 1.7 Bcf resulting in $8.0 million total margin, even though

solicited non-binding expressions of interest from potential LNG buyers as to their interest in purchasing LNG in year-round direct sales from the above plants.[3] Based on the non-binding expressions of interest and subsequent analysis, in April 2016, PGW issued a Request for Proposals ("RFP") seeking, among other things, a public-private partnership to optimize Richmond and Passyunk LNG sales and assets. Liberty Energy Trust GP, LLC ("LET") submitted a proposal in response to the RFP setting forth liquefaction development and utilization plans and suggesting possible commercial opportunities with respect to the development, sale and purchase of LNG liquefaction and related services. Effective July 5, 2017, PGW and LET entered into a Memorandum of Understanding ("MOU") relating to the expansion of liquefaction capacity at Passyunk Plant and contemplating the negotiation of future agreements. The MOU anticipated the transactional agreements for which authorization is requested in the Petition filed with the Commission in connection with the LNG project.

PROJECT CONSTRUCTION

The project will consist of proposed LNG liquefaction additions and truck loading modifications at the PGW Passyunk LNG facility. The foregoing additions/modifications can be broken down into five major sub-systems (1) a Natural Gas Metering and Regulating System, (2) a Natural Gas Pretreatment System, (3) an LNG Liquefaction System, (4) a Motor Control and Distributed Control Center and (5) an LNG Truck Loading/Unloading System. PEC will fund the cost of construction of the new LNG liquefier and the modifications required to the truck loading/unloading facility at the Passyunk Plant (including the design, engineering, procurement and permitting) which is estimated to be $60 million. PEC will also be responsible for all costs related to connecting the new LNG liquefier to PGW's existing plant infrastructure. The LNG liquefaction additions (Items 1-4) and truck loading modifications (Item 5) that PEC will build are described below:

1. **Natural Gas Metering/Regulating System** will be designed to provide volumetric measurement for 13,800 Dekatherms per day of gas supply into the new liquefier from one of PGW's existing interconnects to the interstate pipeline. PEC will transport its gas to the interconnection point and pay PGW to transport that gas into the Passyunk Plant over existing facilities. PGW will not add any natural gas supply capacity to its supply portfolio and there will be no new construction of natural gas pipelines. This project will only optimize its existing LNG and natural gas assets.

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actual LNG sales were less than fifty percent of contracted levels. A cold winter, during this period, required PGW to interrupt sales in connection with the above pilot program to preserve sales for its firm customers. The current LNG project will allow for firm sales which will add more value.

[3] It is noteworthy that the exploration of LNG opportunities was of interest to Philadelphia City Council as well as PGW. This project is very much the fulfillment of that expression of interest.

2. **Natural Gas Pretreatment System** will consist of three molecular sieve beds to remove components that would freeze when cooled, filters, air-coolers, a valve switching skid, and a gas heater.

3. **Natural Gas Liquefaction System** will utilize nitrogen, an inert, non-hazardous gas. It includes a recycle refrigeration system with an electric motor driven nitrogen compressor and a pair of turbo expanders that provide the cryogenic refrigerant required to liquefy the feed gas stream. Make-up nitrogen is supplied from a liquid nitrogen storage tank and ambient vaporizer. A circulating glycol/water system removes the heat of compression from the nitrogen refrigerant. There will be a skid containing three after-coolers, one for each stage of compression, an air fin cooling module, and two pumps: each capable of handling the entire flowrate required. A cold box where most of the liquefaction occurs, close-coupled to the turbo expanders, houses the main heat exchanger.

4. **Motor Control and Distributed Control Center** will consist of a two room enclosure. One room includes the electrical distribution and motor controls for the new facilities. The second room includes the distributed control system which provides process control. Both will interface with the main LNG control center. Additional equipment for measuring gas quality, power back-up systems and Hazard Detection systems are located in this room.

5. **LNG Truck Loading System** will be accomplished by using a new, dedicated LNG transfer pump installed near the base of the LNG tank. The truck loading system includes custody transfer scale and gas quality measurement as well as a local operator enclosure with controls and bill of laden production.[4]

A simplified illustration of the project is set forth in Exhibit A hereto together with a brief project summary.

PROJECT CONSTRUCTION MILESTONES/TIMELINE

The proposed milestones for project construction and performance testing are outlined in the table below and will be referenced in the final Turnkey Lease Agreement.

[4] The balance of plant additions/improvements not specifically identified above include fire protection, hazard detection, and all other appurtenances required. All new equipment added for the pretreatment, liquefaction, and truck loading systems shall be designed, fabricated and installed per 49 CFR §193.2401.

LNG Project Time Table

Milestones	**Timeline**
Turnkey Lease Goes Into Effect	Pending Gas Commission and City Council Approval
Construction Period	
Process and Instrumentation Diagrams Completed	Within 3 months after Effective Date of Turnkey Lease
Material Balance Sheets Completed	Within 3 months after Effective Date of Turnkey Lease
Design Document Specifications Completed	Within 3 months after Effective Date of Turnkey Lease
Long-Lead Equipment Ordered	Within 6 months after Effective Date of Turnkey Lease
Construction Begins	Within 6 months after Effective Date of Turnkey Lease
Construction Completed	Within 24 months after Effective Date of Turnkey Lease
Performance Testing Period	
Performance Testing Period Completed	Within 3 months after Construction Period Ends

LNG SALES/SERVICE

Once operational, the LNG sales/service phase begins. During the LNG sales/services phase, PGW will collect fixed fees[5] to:

- Provide on-system transport of natural gas to the new liquefier via existing PGW infrastructure;
- Liquefy the LNG and place it into PGW's existing LNG tank; and
- Convert the LNG back into a vapor and re-odorize it (vaporization) for use on the PGW distribution system or load the LNG directly onto a trailer for transport to end-use customers.

PGW will also share in the net annual earnings of the project. Annual fixed revenues of $1.35 million (PGW share of net annual earnings) with the potential of $4.0 million new annual revenues (including fixed fees identified above) are projected. In addition, PGW will realize savings in not having to transport LNG from Richmond Plant to Passyunk Plant at an estimated cost of $100,000-$150,000 per year. Taken together, this project will produce revenue in Year 1 of operation.

PROJECT BENEFITS

As alluded to above**,** declining sales/revenues and rising costs represent a fundamental challenge facing PGW. Drivers of this phenomenon include shrinking load due to appliance efficiency and conservation as well as competition from other energy sources. The proposed LNG project allows PGW to offset the negative impact of the foregoing with significant new revenues all while placing no

[5] These fees will be subject to increase using a CPI escalator.

additional burdens on gas customers. This an over-arching benefit of the project. In addition, specific benefits derived from the construction and operation of the new LNG facilities include following:

- Guaranteed annual revenue of $1.35 million;
- Estimated potential revenues of $4.0 million annually (25-year term);
- No upfront costs or debt incurred by PGW or gas customers;
- Incremental and other costs reimbursed;
- Richmond to Passyunk trucking costs eliminated;
- Risk mitigation measures including bonding and step-in rights;[6]
- System redundancy and reliability; and
- Optimization of existing storage and vaporization assets at Passyunk.

PGW seeks project approval with a favorable recommendation to City Council given all of the foregoing with particular emphasis on the guaranteed revenue provision, reimbursed costs and managed risk profile.[7] PGW believes that this project is critical developmental milestone as PGW pursues innovative new revenue sources. Revenues derived from this project equate to the load of 8,000 new residential customers.

SALES ASSUMPTIONS

The financial benefits to PGW are projected based upon the following sales assumptions.

LNG Project Sales Assumptions

Annual Production (275 days)	
Liquid Sales Volumes	1,800,000 mmbtu
Vapor Sales Volumes	900,000 mmbtu
Total Volume	2,700,000 mmbtu

In connection with the proposed project, PGW will collect throughput fees for on-system pipeline transportation, liquefaction, truck loading, vaporization and storage. Typically, PGW will be paid $.60 for each dekatherm produced. PGW will also be reimbursed for all incremental operating costs that it incurs

[6] Risk mitigation measures to protect PGW and ratepayers include the following – (i) PGW will bear no costs to construct the plant; (ii) PGW will not procure gas for sales; (iii) PGW will not release pipeline capacity to PEC; (iv) PGW will receive 100% performance and payment security during construction; (v) PGW will have a second position security interest in new facilities; (vi) PEC will provide performance security during the contract term, among other measures. See also, testimony of Raquel N. Guzmán.

[7] In short, the project offers a floor payment with little risk to PGW or its ratepayers, but with a potential upside. While the upside may not be realized in every year, it could be realized or exceeded in many years, thereby increasing the value to PGW.

to run the new facilities and PEC will directly pay for or perform capital repairs. In addition, PGW will be paid 50% of all net revenues from PEC sales, less payments made as fees for service. In this context, the new facilities cost to PGW will be zero dollars.

SITE PLAN

The diagram provided in Exhibit B is a site plan drawn to show the location of major components and piping of a liquefaction system at the Passyunk Plant LNG facility. Notably, the footprint of the project is small – occupying less than 2 acres of the fifty-nine acre site at Passyunk Plant. The location of the facility is attractive because of PGW's history of safe, reliable and well-managed LNG operations there and its ideal proximity to the I-95 and I-76 corridors.

BUILDER'S RISK AND ENVIRONMENTAL INSURANCE

As a part of the instant request, PGW asks, upon project approval, that the PGC release conditional funding associated with this project for Builder's Risk and Environmental insurance coverage. Such coverage has been conditionally approved as a part of the FY 2019 Operating Budget proceeding.

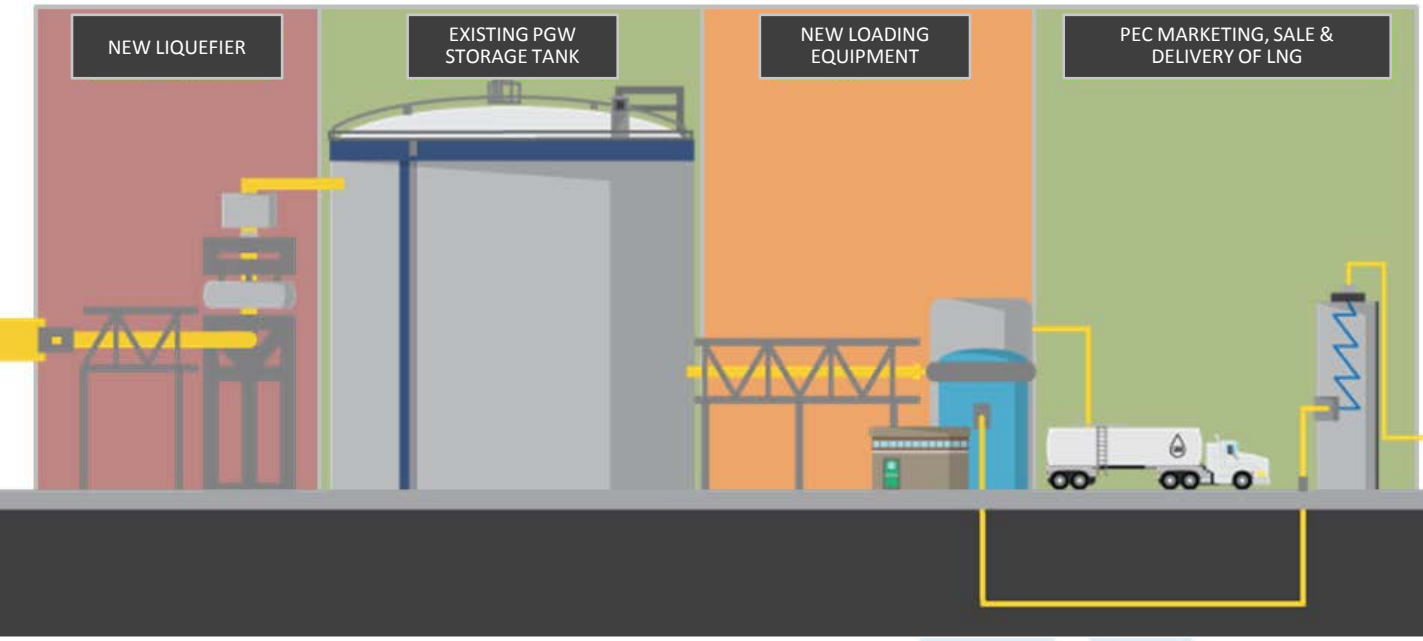
CONCLUSION

In view of the increased revenue and enhanced value created by the project with no cost or risk to ratepayers, the Company requests that the Commission approve this project and associated transactions and provide a favorable recommendation by the Commission for final approval by Philadelphia City Council. This concludes my testimony.

EXHIBIT A

PASSYUNK PLANT P3 LNG PROJECT

Passyunk Energy Center, LLC (PEC) will build – and PGW will then lease for 25 years – new liquefaction and truck loading facilities. At the end of the lease, PGW may take ownership of the facilities – at a cost of $1.



LICENSE

The City (PGW), through PMA, will license to PEC the site for a new liquefier and associated upgrades

DEVELOP

PEC will design, finance and build new facilities on site - at no cost to PGW

LEASE

PGW will lease the new facilities from PEC, via PMA, for $10 a year

PGW will operate the new equipment and will sell services to PEC.

PASSYUNK PLANT P3 LNG PROJECT

INCREASED REVENUE & ENHANCED VALUE

- The new facilities have the potential to generate an estimated **$4 million dollars of new revenue** for PGW, every year for the next 25 years.
- Improving the utilization of PGW's LNG operations at Passyunk will **increase the value** of this key city-owned asset.

NO COST & NO RISK FOR RATEPAYERS, PGW OR THE CITY

- PEC, the P3 partner, **is responsible for ALL costs** in developing the new facilities at PGW's Passyunk Plant.
- This P3 deal is structured with **no cost impact on PGW ratepayers.**

INDUSTRY-LEADING EXPERTISE & EXPERIENCED P3 PARTNERS

- PGW has 50 years of experience working with LNG and is **one of the most qualified utilities in the country** operating and managing a LNG facility.
- The small-scale facility will likely be constructed by Northstar, which has **20+ years in the energy infrastructure space** and has built facilities in every region of the country.

THE RIGHT PROJECT & THE RIGHT LOCATION

- The new limited footprint LNG facility, **built completely within PGW's Passyunk Plant,** is the right project for Philadelphia, right now.
- PGW's Passyunk location is attractive to P3 partners because of PGW's history of safe, reliable and well-managed LNG operations there, and **its ideal proximity to the I-95 corridor**. It is a win-win.

NO NEW PIPELINE & A NET POSITIVE ENVIRONMENTAL IMPACT

- **No new pipeline is required** for this P3 project.
- Selling LNG **offers a cleaner fuel option to regional, large-scale customers that currently rely on fuel oil and coal** to conduct business.
- PGW's P3 project **supports Philadelphia's commitment to a clean, affordable and healthy energy future.**

PASSYUNK PLANT P3 LNG PROJECT

PRIMARY ELEMENTS OF PROPOSED P3 LNG PROJECT

1	New LNG liquefier and loading facilities at Passyunk Plant
2	No upfront development costs or debt for PGW
3	Guaranteed annual fee income through the sale of services to PEC
4	Additional fee income derived from net revenues
5	Reimbursement for all capital and operating costs
6	Reduction (or elimination) of trucking costs to PGW
7	Additional system redundancy & reliability
8	Optimization of existing local storage and vaporization capacity

P3 PARTNERS: THE LIBERTY ENTITIES

Liberty Energy Trust: Conshohocken-based energy infrastructure development and investment company.

Permit Capital Advisors, LLC: Directs project investments. SEC registered Investment advisor managing assets over $870M.

Northstar Industries: Engineering and manufacturing firm specializing in natural gas infrastructure engineering, fabrication, and project execution.

Liberty Energy Trust

PCA PERMIT CAPITAL ADVISORS, LLC

NORTHSTAR INDUSTRIES
Excellence In All We Do

ENVIRONMENTAL IMPACT

- New liquefier and loading facilities are primarily electrically-driven
- No anticipated modification of existing environmental permits at Passyunk
- No new pipeline is required for this P3 project.
- Project air emissions fall significantly below the minimum permitting limits.
- The project requires no new water supplies and no new sewer connections.
- The number of trucks entering and exiting the plant each day will not increase significantly.

EXHIBIT B

APPROXIMATE AREA OF LNG FEED GAS TIE-IN

INSTRUMENT AIR, WATER, POWER, & COMMUNICATION TIE-IN POINTS AT RACK

LNG FEED TO TANK

BOILER BUILDING

CONTROL BUILDING

PROPANE VAPORIZERS

APPROXIMATE AREA OF LNG TIE-IN AND 100 PSIG TIE-IN

LOCATION OF 35 PSIG TIE -IN

LNG TRUCK AND CONSTRUCTION VEHICLE ACCESS

LNG VAPORIZERS

PARKING LOT 28TH & PORTER CSD STATION

GAS HOLDER (6)

EQUIPMENT PARKING AREA

CONTRACTOR'S PARKING LOT

PASSYUNK AVENUE FRONTAGE ROAD

LEGAL LIMIT OF SLOPE LINE

PROPERTY LINE

SCHUYKILL AVENUE

PORTER ST.

28TH ST.

WATER STREET

RIVER STREET

NEWORK STREET

ERNST STREET

PLANT NORTH

LEGEND

PROPOSED EQUIPMENT

LNG TRUCK ROUTE

NOTES

1. PLAN DRAWN TO SHOW CONCEPTUAL LAYOUT OF MAJOR COMPONENTS AND PIPING OF A LIQUEFACTION SYSTEM AT PHILADELPHIA GAS WORKS LNG FACILITY.
2. PLAN REFERENCES:

   DRAWING # 1-A-0, TITLED: PASSYUNK PLANT, PROVIDED BY PHILADELPHIA GAS WORKS (PGW)

SCALE, FEET

SHEET 1 OF 2

FOR INFORMATION ONLY

ISSUED FOR REVIEW

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ISSUED TO CLIENT

FACILITY OVERVIEW AND TRAFFIC FLOW

LIBERTY ENERGY TRUST PASSYUNK PLANT PHILADELPHIA GAS WORKS PHILADELPHIA, PENNSYLVANIA

PROJECT NO. LET-001

BY B.LEBRUN DATE 8/15/17

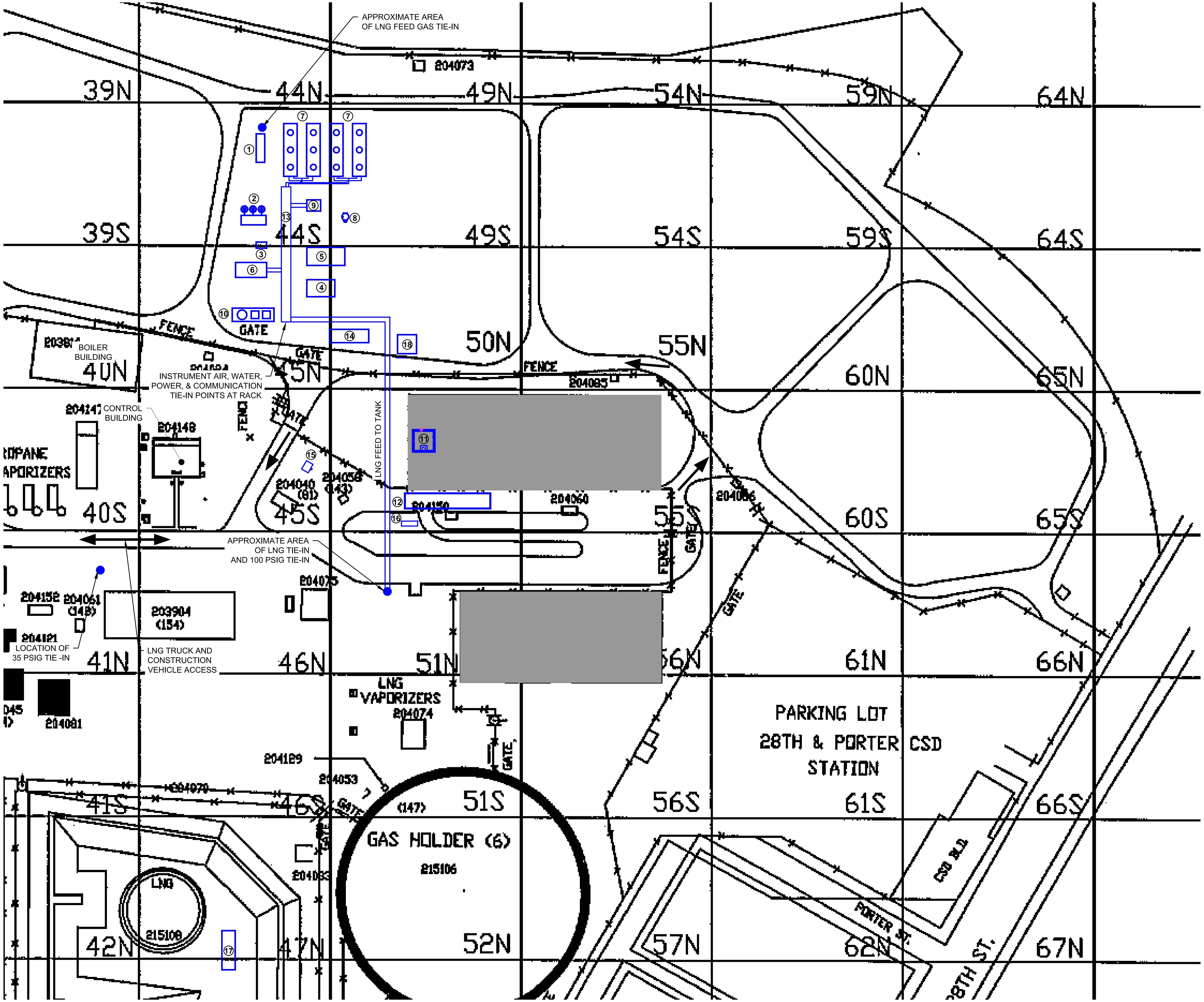
CHK'D E. BORDEN DATE 9/28/18

T. QUINE PROJECT MANAGER

DWG NO. LET-001-SS2 REV. H

SCALE: 1" = 80'

NORTHSTAR INDUSTRIES, LLC



PLANT NORTH

LEGEND

(blue line)	PROPOSED EQUIPMENT
(arrow)	LNG TRUCK ROUTE

LNG FACILITY EQUIPMENT INVENTORY

1. NATURAL GAS METERING SKID
2. ADSORBER VESSELS AND VALVE SKID
3. REGENERATION GAS COOLER
4. COLD BOX AND TURBO EXPANDER SKID
5. AFTERCOOLER/HEAT EXCHANGER SKID
6. NITROGEN RECYCLE COMPRESSOR SKID
7. FIN–COIL HEAT EXCHANGER (4 UNITS)
8. REGENERATION GAS HEATER
9. GLYCOL PUMP SKID
10. LIQUID NITROGEN STORAGE TANK
11. TRUCK FILL IMPOUNDMENT
12. TRUCK SCALE
13. PIPE RACK
14. MCC BUILDING
15. TRUCK LOAD SHELTER
16. LNG TRUCK LOADING SKID
17. TRUCK LOADING PUMP SKID (NEW)
18. TRANSFORMER

NOTES

1. PLAN DRAWN TO SHOW CONCEPTUAL LAYOUT OF MAJOR COMPONENTS AND PIPING OF A LIQUEFACTION SYSTEM AT PHILADELPHIA GAS WORKS LNG FACILITY.
2. PLAN REFERENCES:

   DRAWING # 1–A–0, TITLED: PASSYUNK PLANT, PROVIDED BY PHILADELPHIA GAS WORKS (PGW)

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SCALE, FEET

SHEET 2 OF 2

FILENAME: LET001SS2.DWG LAST UPDATE: 2/21/18 TIME: 11:15A CMAGUIRE

REVISIONS	REMARKS	DESIGN APPROVAL	REVISIONS	REMARKS	DESIGN APPROVAL	REVISIONS	REMARKS	DESIGN APPROVAL
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CONCEPTUAL LAYOUT
MAJOR COMPONENTS

LIBERTY ENERGY TRUST
PASSYUNK PLANT
PHILADELPHIA GAS WORKS
PHILADELPHIA, PENNSYLVANIA

PROJECT NO. LET–001
BY B.LEBRUN DATE 8/15/17
CHK'D E. BORDEN DATE 9/28/18
T. QUINE
PROJECT MANAGER

NORTHSTAR INDUSTRIES, LLC
128 MERRIMACK STREET * METHUEN, MA 01844

DWG NO. LET–001–SS2 REV. H
SCALE: 1" = 50'