



HiTEST SILICON



NEWPORT NOVEMBER 29, 2017



Table of Contents

- I. Project Overview**
- II. Environment**
 - I. Air**
 - II. Water**
 - III. Silica / Coal Dust**
 - IV. Light / Sight Lines**
- III. Comparable Plants and Proximity to Local Residences**
 - I. Norway**
 - II. Germany**
 - III. Mississippi**
 - IV. Niagara Falls**
- IV. What we are not**
 - I. Iceland**
 - II. REC**

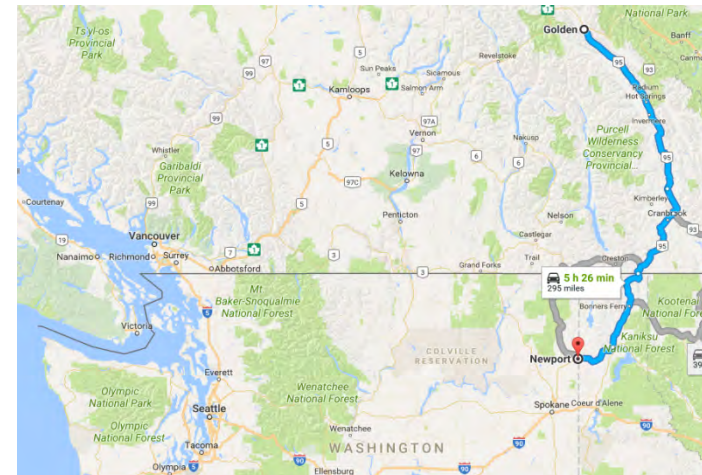
I. Project Overview

Who is HiTest Silicon

Company Background

- HiTest Silicon first came to the State of Washington as HiTest Sand just over a year ago.
- HiTest Sand is a Canadian Company
 - ▶ Own a fully permitted quartz deposit in Golden BC
 - 81 million tonnes of proven and probable reserves
 - High purity Quartz of 99.82% to 99.9% silica content
 - Very rare and unique resource
 - Ideally Suited for manufacturing Silicon Metal
- We were looking to build a plant to manufacture Silicon Metal
- We looked at numerous sites throughout Western Canada and North Western United States
- Governor Inslee and the State of Washington's Commerce Department did an excellent job of promoting the benefits of doing business in Washington
- We chose to build our plant south of Newport Washington and incorporate HiTest Silicon as a new Washington State business

Horse Creek Quartz Mine





Project Overview

Conversion of Quartz to Silicon Metal

- Silicon is one the most useful elements, with an environmentally friendly manufacturing process and use in many critical applications
 - Standard manufacturing requires six tonnes of raw materials to produce one tonne of silicon metal

Raw Materials

High Purity, Hard Rock Quartz
(2.5 tonnes per tonne of Si metal)



Metallurgical Coal
(0.8 tonnes per tonne of Si metal)



Woodchips
(2.0 tonnes per tonne of Si metal)

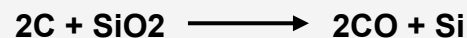


Manufacturing Process

Materials are heated to temperatures in excess of 3,000 F in a submerged arc furnace



Chemical Reaction:



Finished Product





Project Overview

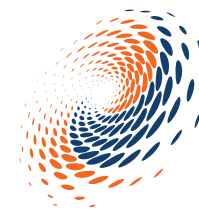
Silicon Metal Plant Project

- 60,000 tonne per year silicon metal production capacity
- Direct employment: 150+ workers
 - Additional indirect employment: 750+ workers
- Two year construction period with \$325 million of capital remaining, requiring an estimated 250 - 400 construction workers
- Production process does not require or produce any heavy metals or hazardous chemicals as by-products
 - All materials required during production process and consumed leave the plant as a saleable product
 - Closed loop system for water, that only consumes 8000 gallons per day (evaporation), plus sanitary water for workers
 - Water fogging/misting system for dust containment at all drop and discharge points
 - Coal and charcoal material stored in covered area
 - Water sprays utilized to keep wood chips saturated
 - Due to the extremely high quality of the quartz resource and state-of-the-art plant, HiTest will have the unmatched capability to produce all grades of silicon metal to unique specifications

Example Silicon Metal Plant



HiTest is building the most modern and efficient silicon metal plant to serve the North American market



Project Overview

Newport Job Opportunities at Plant Site

<u>Plant Operations</u>	<u>Number</u>	<u>Min Req's</u>
Shift Leaders	11	Assoc. degree 2 yr
Furnace Operators	8	Technical degree 2 yr
Tappers	12	High School/GED
Equipment Operators	47	High School/GED
Maintenance	11	High School/GED
Laboratory		
Technicians	3	High School/GED
Warehouse Personnel	2	High School/GED
Site Supervisors	5	High School/GED
General Labor	31	High School/GED
TOTAL	<u>130</u>	

Plant Operations

- **130 Jobs**
- **Wage of \$40,000 - \$100,000 /yr**
- **HS/GED – 2 year Associate Degrees**

Plant Management

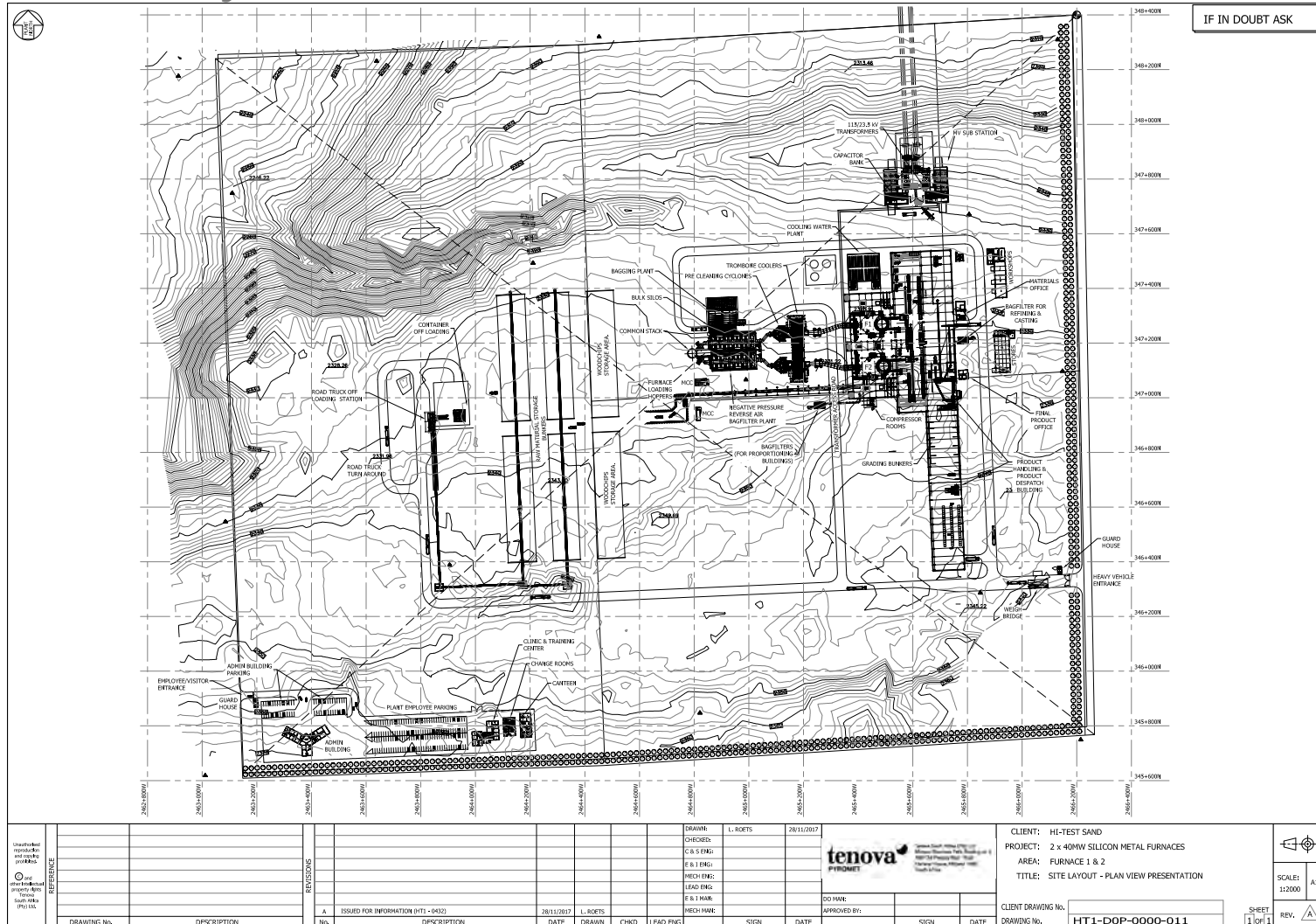
- **20 Jobs**
- **Wage of \$60,000 - \$150,000+ /yr**
- **HS/GED – University Degree**

<u>Plant Management</u>	<u>Number</u>	<u>Min Req's</u>
Senior Administrative Manager	1	BA/BS/Bcom
Sales/Marketing Manager	1	BA/BS/Bcom
Plant Manager	1	BA/BS/Bcom
Plant Accountant	1	BA/BS/Bcom
Process Manager	1	BA/BS/Bcom
EHS Manager	1	BA/BS/Bcom
Plant Engineering Manager	1	BA/BS/Bcom
Human Resources Manager	1	BA/BS/Bcom
Office Support	1	2 Yr Associate Degree
Yard Support	1	2 Yr Associate Degree
Finished Goods Support	1	2 Yr Associate Degree
Maintenance Support	1	2 Yr Associate Degree
Lab Manager	1	2 Yr Associate Degree
IT Manager	1	2 Yr Associate Degree
Electrical/Instrumentation Engineer	1	2 Yr Associate Degree
Personnel Clerk	1	High School/GED
Executive Assistant	1	High School/GED
Accounting Clerk	1	High School/GED
Sales Clerk	1	High School/GED
Purchasing Assistant	1	High School/GED
TOTAL	<u>20</u>	

Project Overview



Proposed Site Layout



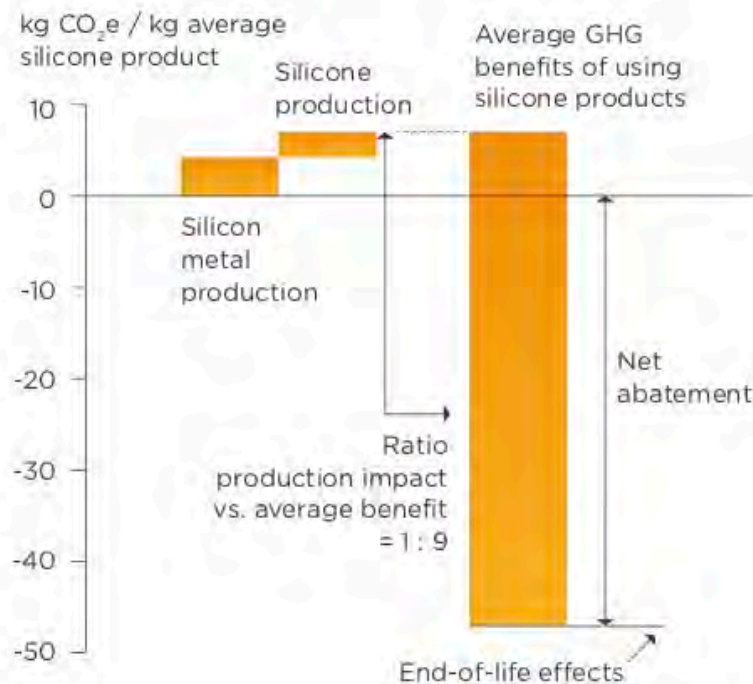


Environment

LIFE CYCLE

Using silicones and silane (solar) products generates greenhouse-gas emission reductions that outweigh the impacts of production and end-of-life disposal by a factor of 9. In other words, for every ton of CO₂ emitted, the use of silicones allows for savings 9 times greater. This is at the top of the range of previous estimates made for chemistry applications across the board. (cf. ICCA, 2009.)

50% of HiTest's Production will be sold into the Solar Energy Market





Permitting Overview

We are just beginning going through a rigorous Local, State and Federal regulatory permitting process over the next year. As we proceed through this, we will keep all stakeholders informed as we are required to by State and Federal laws. Additionally, to show our commitment to the community we will be publishing all progress.

I. PSD / NOC AIR PERMIT

II. NPDES CONSTRUCTION STORM WATER PERMIT

III. SEPA DETERMINATION

II. Environment

Environment

AIR Quality Permits and Regulations

- Air Quality Permits being sought now:
 - ▶ Federal Prevention of Significant Deterioration (PSD)
 - Issued by Washington Dept. of Ecology
 - Reviewed by EPA and Federal Land Managers: US Forest Service, National Park Service, Fish & Wildlife Service
 - ▶ Notice of Construction (NOC)
 - Issued by Washington Dept. of Ecology
- Federal Standards/Regulations
 - ▶ National Ambient Air Quality Standards (NAAQS): to protect human health and ecological health
 - CO, NO₂, O₃, SO₂, PM₁₀, PM_{2.5}, Pb
 - ▶ Hazardous Air Pollutants (HAPs), based on health risks. 187 substances like Acetaldehyde and Benzene
 - ▶ Regional haze visibility degradation
 - ▶ Acid rain (nitrogen and sulfur deposition to Class I areas)
 - ▶ New Source Performance Standards (NSPS)
 - ▶ National Emission Standards for Hazardous Air Pollutants (NESHAPs)
- State Regulations
 - ▶ Toxic Air Pollutants (TAPs)
 - Both Washington and Oregon regulate TAPs, based on health risks. ~400 substances
 - ▶ Washington State Environmental Policy Act (SEPA)
 - Process starts with a SEPA checklist, which determines if an Environmental Impact Statement is needed

Environment

Sources of Air Pollution and Pollution Control Methods

- Main furnaces: particulate matter **controlled by a baghouse** (filter)
 - ▶ Working with engineering, assessing dry scrubbers for SO₂
- Smaller **baghouses reducing particulate matter** emissions:
 - ▶ Raw material handling and off-loading
 - ▶ Raw material storage – also controlled by using covered sheds
 - ▶ Crushing and screening
 - ▶ Refining and casting
- Ladle pre-heaters – no controls, but relatively small propane-fired units that are indoors
- Emergency generator and Fire pump – **modern Tier 4 engines** (NSPS)
- Dust from on-site roadways – roads will be **paved**, and kept **snow-free** in winter

- Truck and rail exhaust will be covered under SEPA process, not part of the PSD process



Environment

COAL Parts Per Million Chemical Breakdown

ppm	Bituminous	Metalurgical	Blue Gem
Arsenic	170	12.22	0.30-0.35
Boron	100	33	2-18
Chlorine	2,000	1,162	79-220
Mercury	0.44	0.09	0.02-0.04
Flourine	160	93	50-60
Lead	90	7.8	2.65-3.00
Sulphur	73,000	45,000	10,000

Environment



SILICA

THE PROCESS OF MAKING SILICON METAL DOES NOT LEAD TO SILICOSIS

THE DUST CREATED THROUGH THE PROCESS IS AMORPHOUS (ROUNDED NOT ANGULAR) WHICH DOES NOT LEAD TO SILICOSIS

	<u>GOLDEN, BC</u>	<u>NEWPORT, WA</u>
•Chipping, sawing, grinding, hammering, and drilling of rock	GOLDEN, BC	N/A
•Crushing	GOLDEN, BC	N/A
•Loading	GOLDEN, BC	N/A
•Hauling	GOLDEN, BC	N/A
•Unloading of rock		NEWPORT, WA
•Sawing, hammering, drilling, grinding, and chipping of concrete or masonry structures	N/A	N/A
•Demolition of concrete or masonry structures	N/A	N/A
•Power cutting or dressing stone	N/A	N/A
•Facade renovation, including tuckpoint work	N/A	N/A
•Abrasive blasting and hydroblasting of concrete	N/A	N/A
•Clean-up activities such as dry sweeping or pressurized air blowing of concrete or sand dust	N/A	N/A
•Tunneling, excavation, and earth moving of soils with high silica content	N/A	N/A

HiTest and REC Comparison



REC Silicon (Top) Similar Plant to HiTest (Bottom)



REC Comparison with HiTest



RECSiLICON

Plant Site

300 Acres

Plant Footprint

200 Acres

Water Consumption

1,800,000 gal/day

Chemicals Used

Methanol

Hydrochloric Acid (HCl)

Trichlorosilane

Dimethyldichlorosilane

Silane gas

Methylchloride



HiTESTSiLICON

Responsibly supplying Hi-quality silica

Plant Site

189 Acres

Plant Footprint

40 Acres

Water Consumption

8,000 gal/day

Chemicals Used

None

HiTest and Iceland (United Silicon) Comparison

Iceland Comparison to HiTest



- No experienced engineering or operating personnel hired in advance of commissioning and startup
- No hands on training of key operating personnel prior to startup
- Did not operate the equipment according to industry standards
- Operated at below 85% of rated power for extended periods causing odor issues and excessive dust generation
- Improperly cured furnace lining and electrodes causing premature failures and major outages and permanent damage that has not been fixed



- Has experienced team of 12 process engineering and technology experts with over 200 years combined experience
- HTS Team has successfully designed, commissioned and started up over 20 silicon plants without one failure
- Our engineers have worked closely with the equipment manufacturer and construction company for over 2 years to ensure the optimize the HTS system for the best employee health and safety, environmental performance and operational efficiency achievable
- HTS will provide key operators at least 2 weeks of hands-on training at an operating silicon plant prior to hot commissioning for the furnaces to ensure a smooth startup.



Environment

Light

Obtrusive light is broken down into three components:

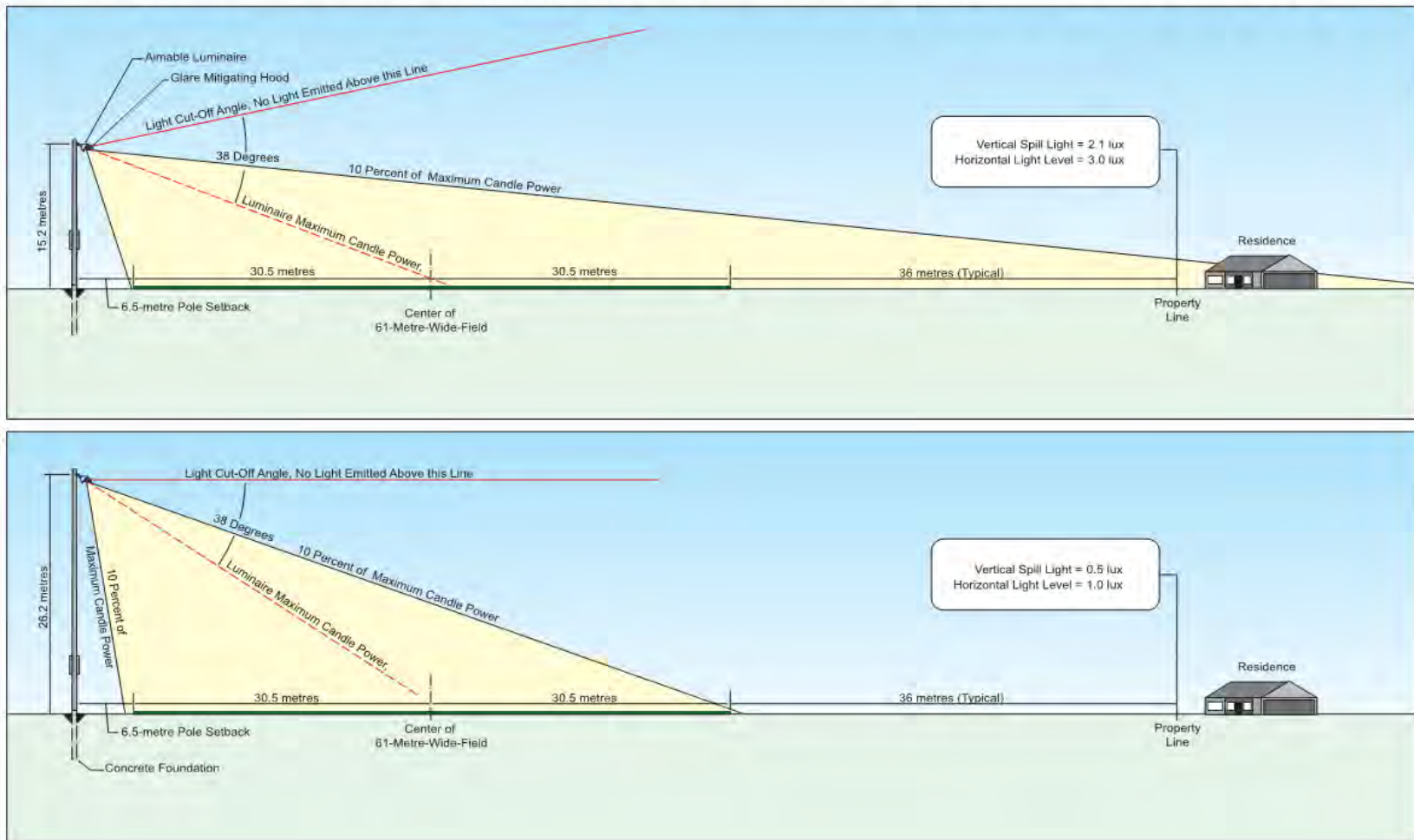
- **Glare – Light that hinders or bothers the human eye**
- **Spill Light – Illuminance falling beyond the area illuminated**
- **Sky Glow – The visible haze or glow of light seen above a lighting installation that reduces the ability to see the night sky**
- **LED lighting fixtures reduce all forms obtrusive light when compared to other lighting fixtures. LED's reduce sky glow by preventing “uplight”, which is a contributing factor to sky glow.**
- **Glare mitigating hoods help to control spill light and glare for the area surrounding a lighting installation.**
- **Taller light poles equipped with adjustable fixtures insures light is confined to where it is needed most, and pointed downward to reduce all components of obtrusive light.**

Environment

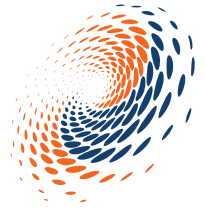


Light

Taller poles can reduce impacts off site, including spill light, glare and sky glow.



Environment



Light



Urban soccer field with 4th generation spill and glare control fixtures illuminated to 200 lux. Photo taken approximately 50 metres from the edge of the field.



- Fixture A – Second Generation Sports Light
- Fixture B – Third Generation Sports Light
- Fixture C – Fourth Generation Sports Light (most current technology)
- Fixture D – First Generation Sports Light



SITE PLAN
SCALE: 1" = 200'

REVISION HISTORY

REV.	REVISION DESCRIPTION	DATE	DRN	CHKD	APPD
1	ISSUED FOR REVIEW (IN PROGRESS)	2017 MM DD	XXX	XXX	XXX
2	ISSUED FOR REVIEW (IN PROGRESS)	2017 MM DD	XXX	XXX	XXX

PROJECT DETAILS

PROJECT NAME	LOCATION	DRAWING NUMBER
NEW SILICON PRODUCTION FACILITY	SILICON VALLEY, CALIFORNIA	6010

DESIGNED
X.XXXX
DATE
2017 04 30

DRAWN
X.XXXX
DATE
2017 04 30

CHECKED
X.XXXX
DATE
2017 04 30

APPROVED
X.XXXX
DATE
2017 04 30

PROJECT ENG.
X.XXXX
DATE
2017 04 30

SCALE
1" = 200'

PROJECT NO.
6010

DRAWING NO.
XXXX-XXXX-XXXX-XXXX

PROJECT NAME
NEW SILICON PRODUCTION FACILITY

LOCATION
SILICON VALLEY, CALIFORNIA

DRAWING NUMBER
6010

PROJECT NO.
XXXX-XXXX-XXXX-XXXX

PROJECT NAME
NEW SILICON PRODUCTION FACILITY

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PROJECT NAME
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LOCATION
SILICON VALLEY, CALIFORNIA

DRAWING NUMBER
6010

PROJECT NO.
XXXX-XXXX-XXXX-XXXX

Comparable Facilities and Proximity to Local Residences



Burnsville, Mississippi

- Located 3.7 miles from the center of Burnsville
- Plant is located within the city limits
- 400 jobs created during construction
- 100 permanent jobs created
- HiTest emissions (tons/year) will be less than 50% of Mississippi emissions by using best control technologies
- HiTest particulate emissions will be less than 50% of Mississippi emissions by using special dust control technologies
- Burnsville stack is 300 feet ours will be 150 feet





Burnsville, Mississippi

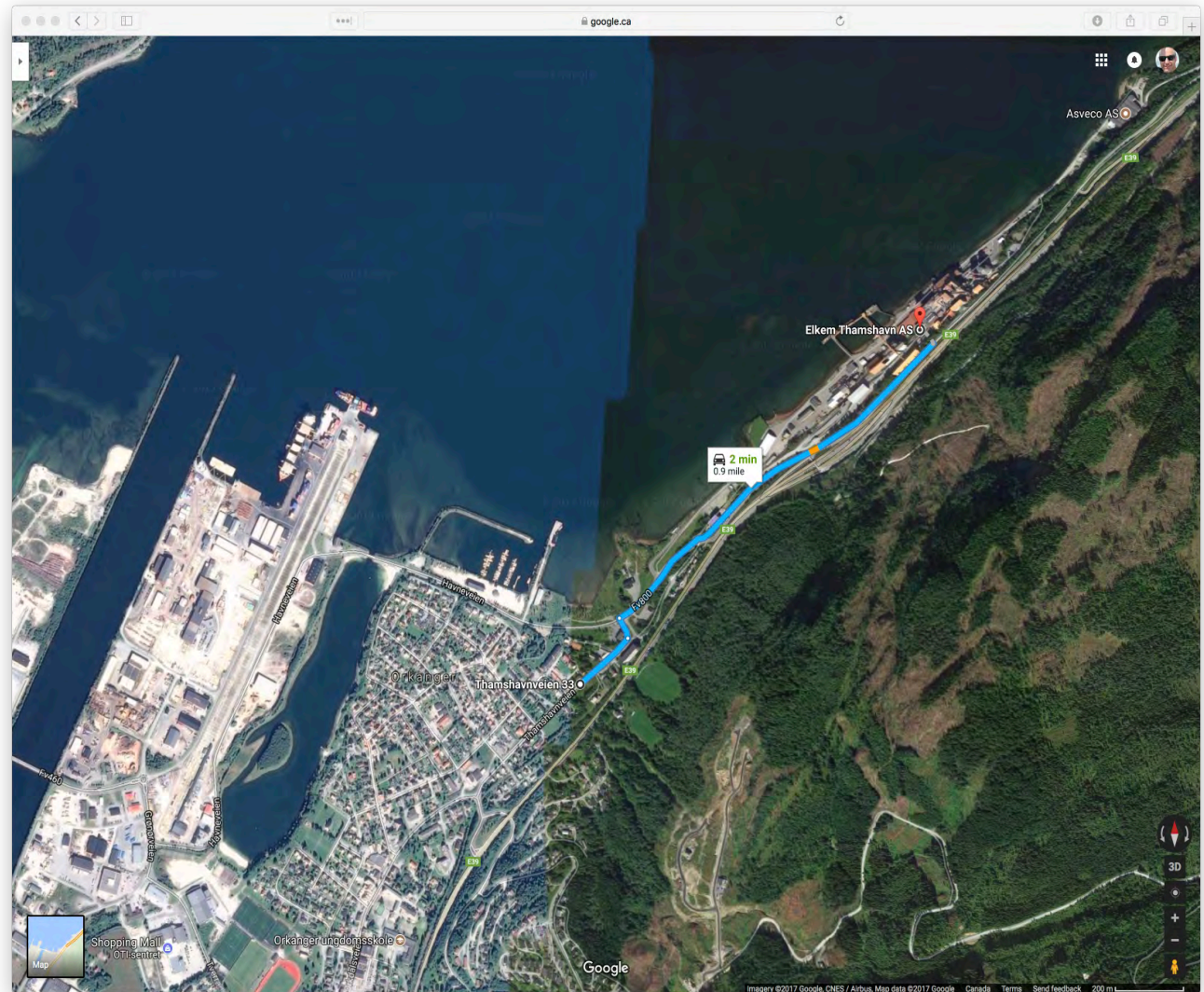
- HiTest CO and CO₂ emissions will be 10% less than Mississippi emissions by using more efficient raw materials and operating technologies
- HiTest = 8,000 gal/day with closed-loop cooling system
- Mississippi uses over 13,000,000 gal/day with open-loop cooling system
- Mississippi Silicon has an onsite wood chipper significantly increasing their sound pollution



Norway



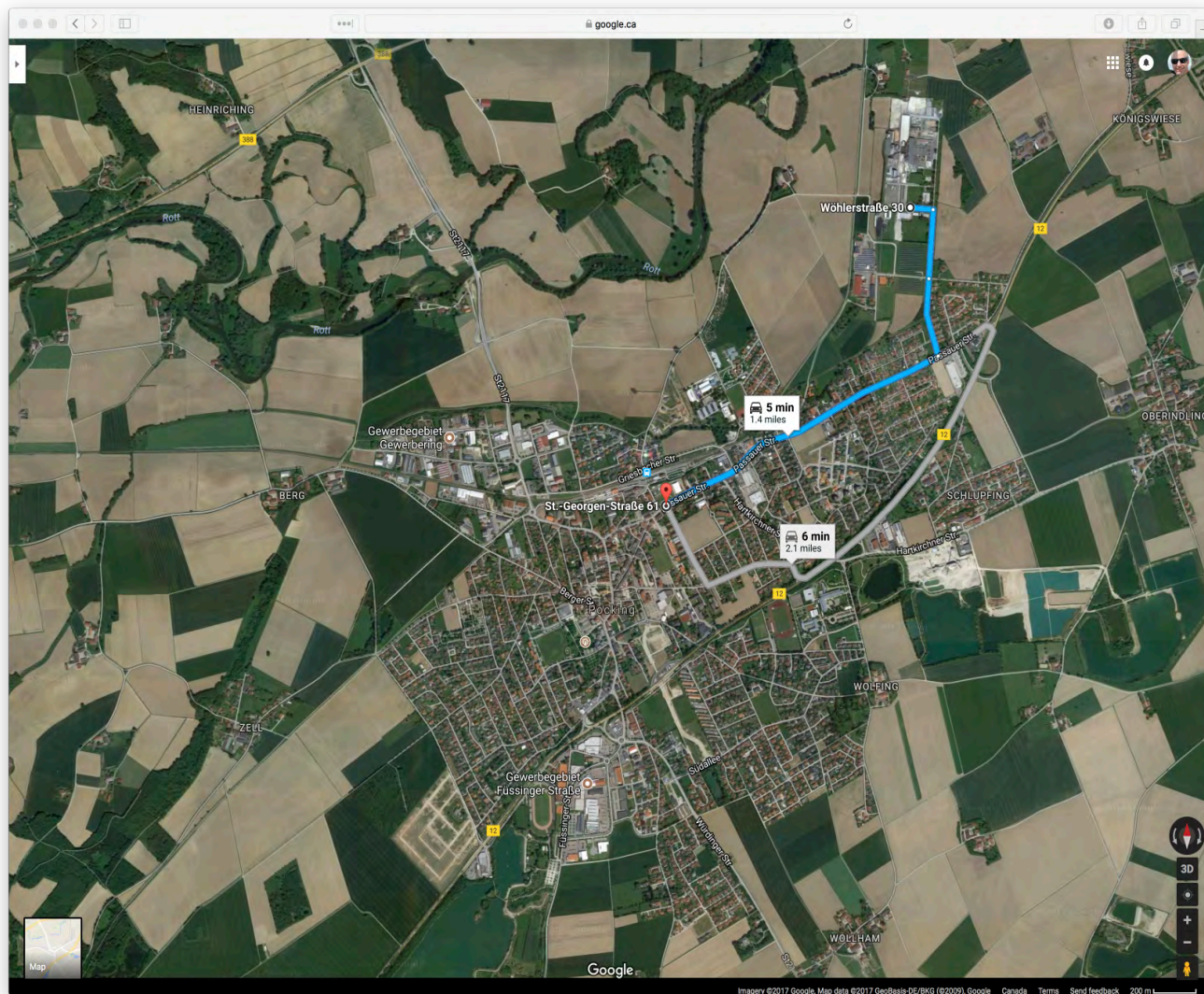
- Norway has the 10th strictest environmental regulations in the World (US is 33rd)
- Norway has the highest per capita Silicon Metal production in the world
- This plant pictured is less than 1 mile from the City of Orkanger
- Population 7,812



Germany



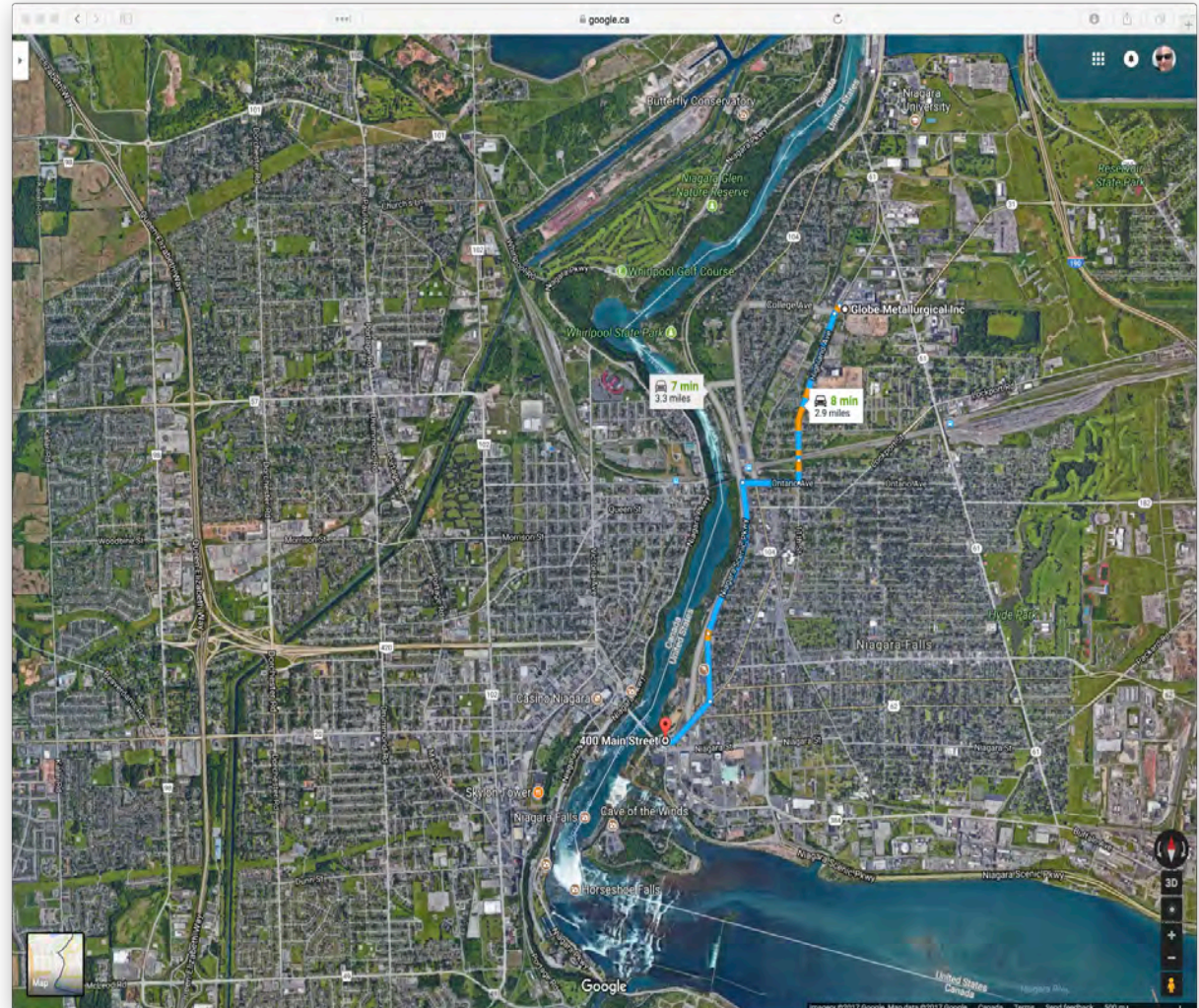
- Germany has the 6th strictest environmental regulations in the World
- This plant pictured is less than 1.4 mile from Pocking, Germany (same as Newport)
- 0.2 miles from the nearest residence
- Population 14,938



Niagara Falls, U.S.A.



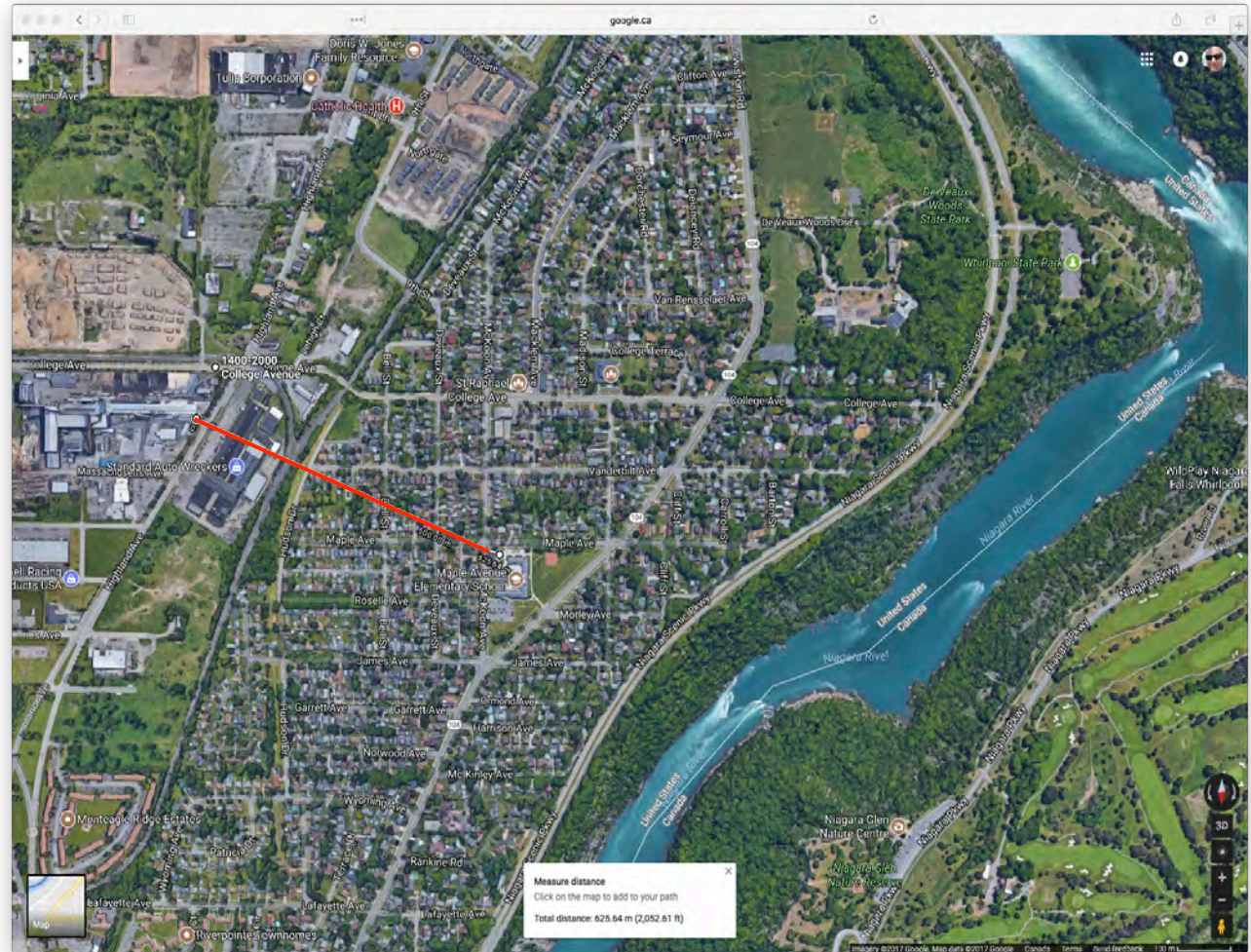
- Located close to the center of Niagara Falls, NY
- Main industry in Niagara Falls is Tourism
- The Plant is 2.9 miles from Niagara Falls State Park
- 10,000,000 tourist visit Niagara Falls State Park every year
- Population of Niagara Falls NY is 49,468
- Population of the region surrounding plant is 132,465



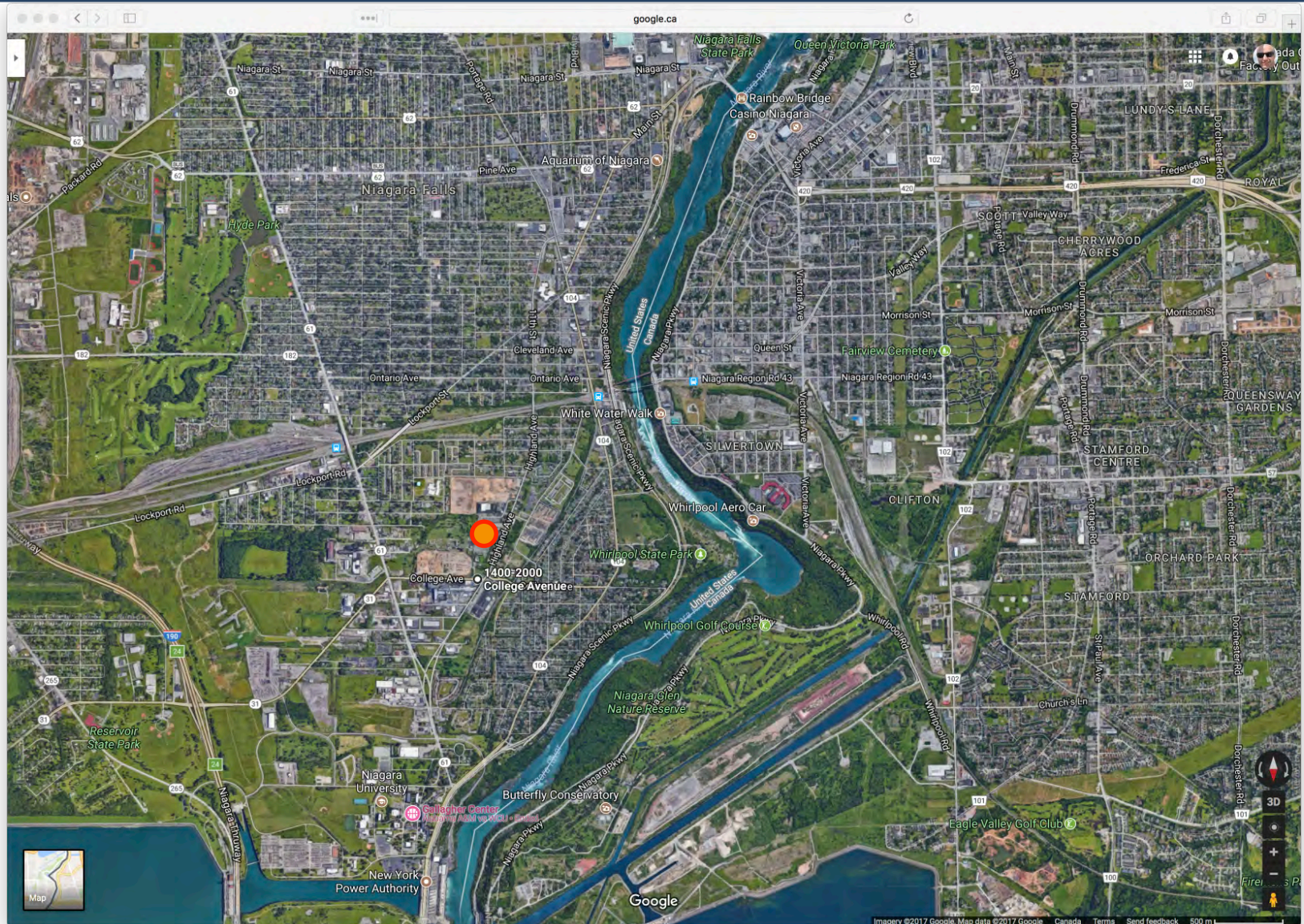


Niagara Falls, U.S.A.

- 0.1 mile (528 feet) to residences
- 0.39 miles (2,059 feet) to Elementary School
- (Red Line)
- 0.39 miles (2,059 feet) to the High School
- Population of 48,632



Niagara Falls, U.S.A.



Other Plants

