In-Conduit Hydroelectric
renewable power generation

Crystal Springs Water District

Jordan Road - Hydroelectric Preliminary Analysis Report

April 18, 2019

NLINE ENERGY
EVERY DROP OF ENERGY

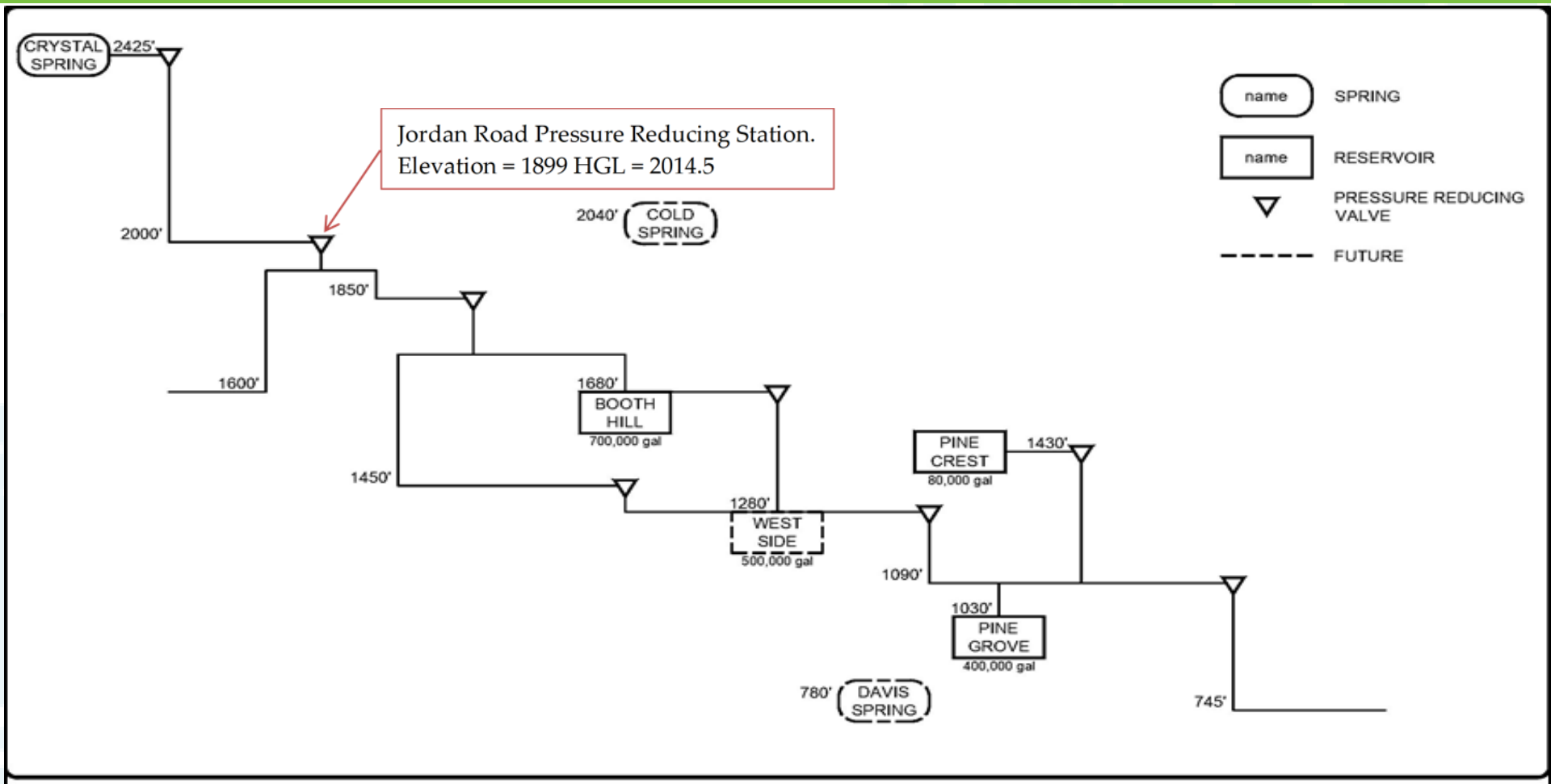
NLINE ENERGY
EVERY DROP OF ENERGY

Agenda

1. Executive Summary
2. Vicinity Overview
3. Existing Information
4. Hydraulic Analysis
5. Technology Analysis
6. Initial Layout
7. Cost Estimate
8. Reg., Leg., & Interconnection
9. Financial Analysis
10. Risks and Opportunities
11. Implementation Schedule
12. Comments and Questions

NLINE ENERGY
EVERY DROP OF ENERGY

HGL – Pressure Zone



CRYSTAL SPRINGS WATER DISTRICT

HYDRAULIC GRADE LINE / PRESSURE ZONE SCHEMATIC

PACE

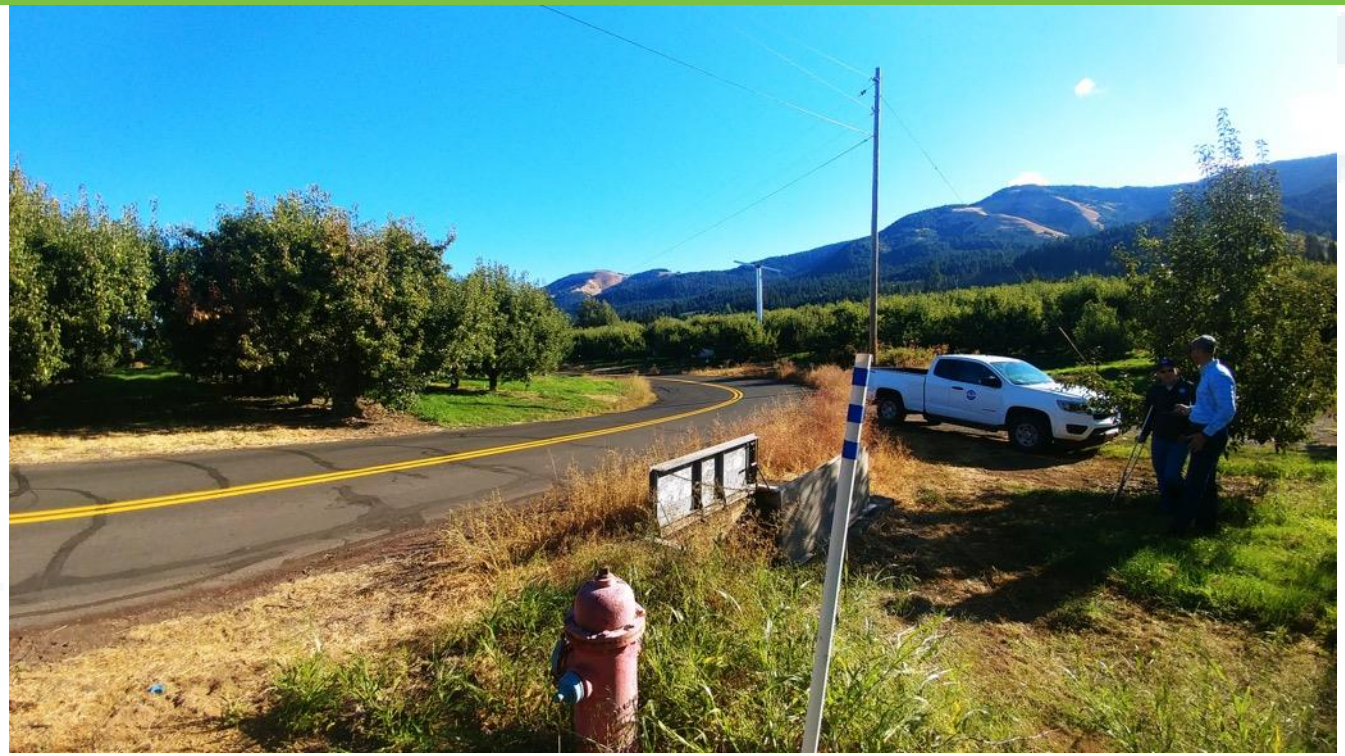
FIG. 01

NLINE ENERGY
EVERY DROP OF ENERGY

Vicinity Overview

NLINE ENERGY
EVERY DROP OF ENERGY

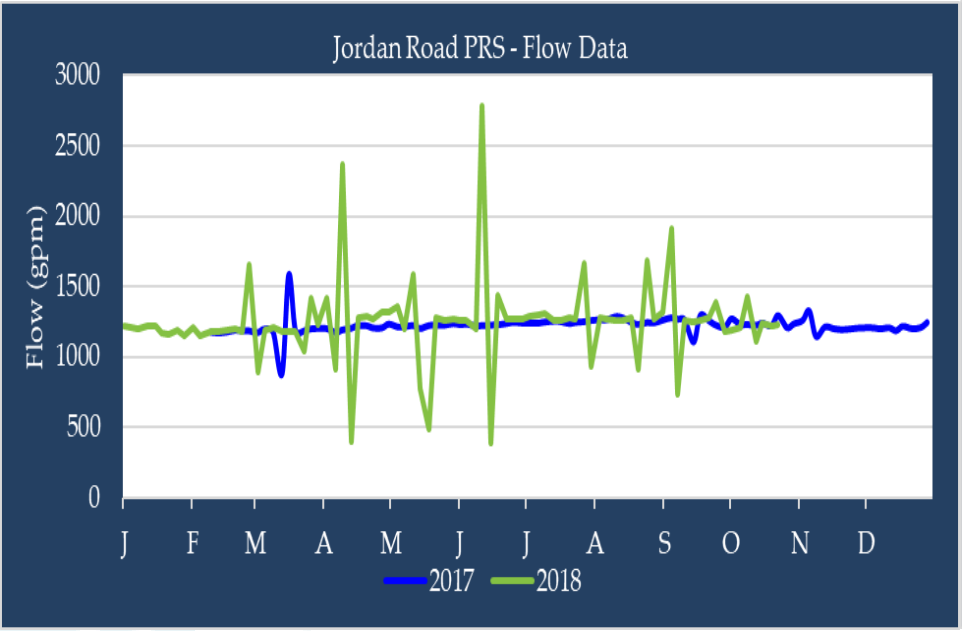
Site Features

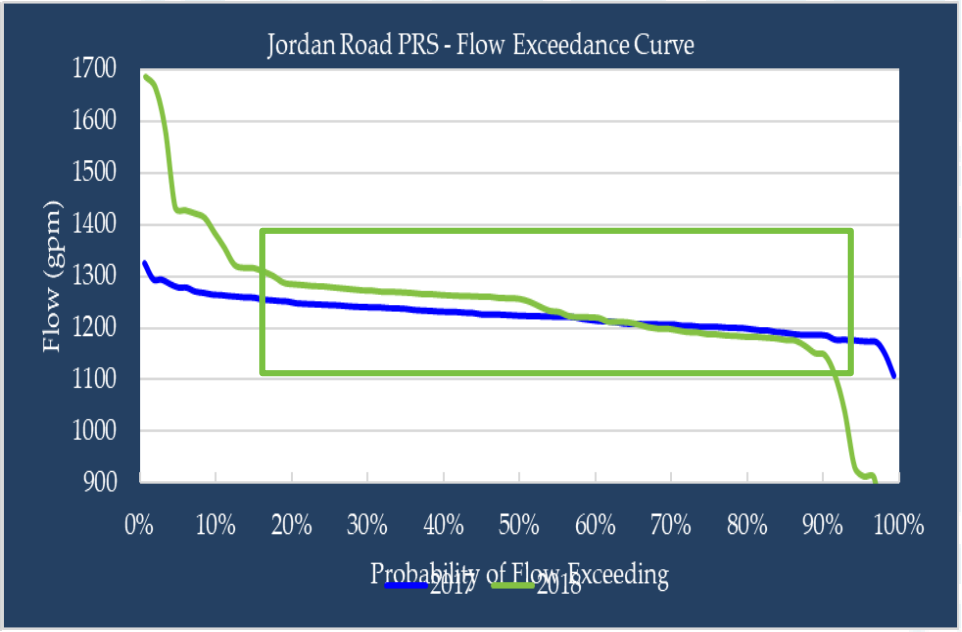


- Closest address: 8161 Jordan Rd.
- 250 psi Inlet pressure
- 50 psi Outlet pressure
- Upstream pipe is 14-inch and Downstream pipe is 12-inch
- Class 52 Cast Iron Pipe
- PRV is 8-inch Cla-Val
- Single Phase distributions lines at site.
- Vault is both on right of way and easements.
- Land surrounding vault is privately owned.
- 3,200 gpm water right
- 4,100 lf to closest 3-phase power

NLINE ENERGY
EVERY DROP OF ENERGY

Flow Profile





- 2017 and 2018 Data sparsed into 5 day increments
- Maintenance shutdowns experienced in 2013 and 2015
- Flow Range: 500 – 2,800 gpm
- Flow exceedance curve indicates probable range of 1,110 – 1,400 gpm
- CSWD Master Plan indicated peaks around 2,000 gpm

NLINE ENERGY
EVERY DROP OF ENERGY

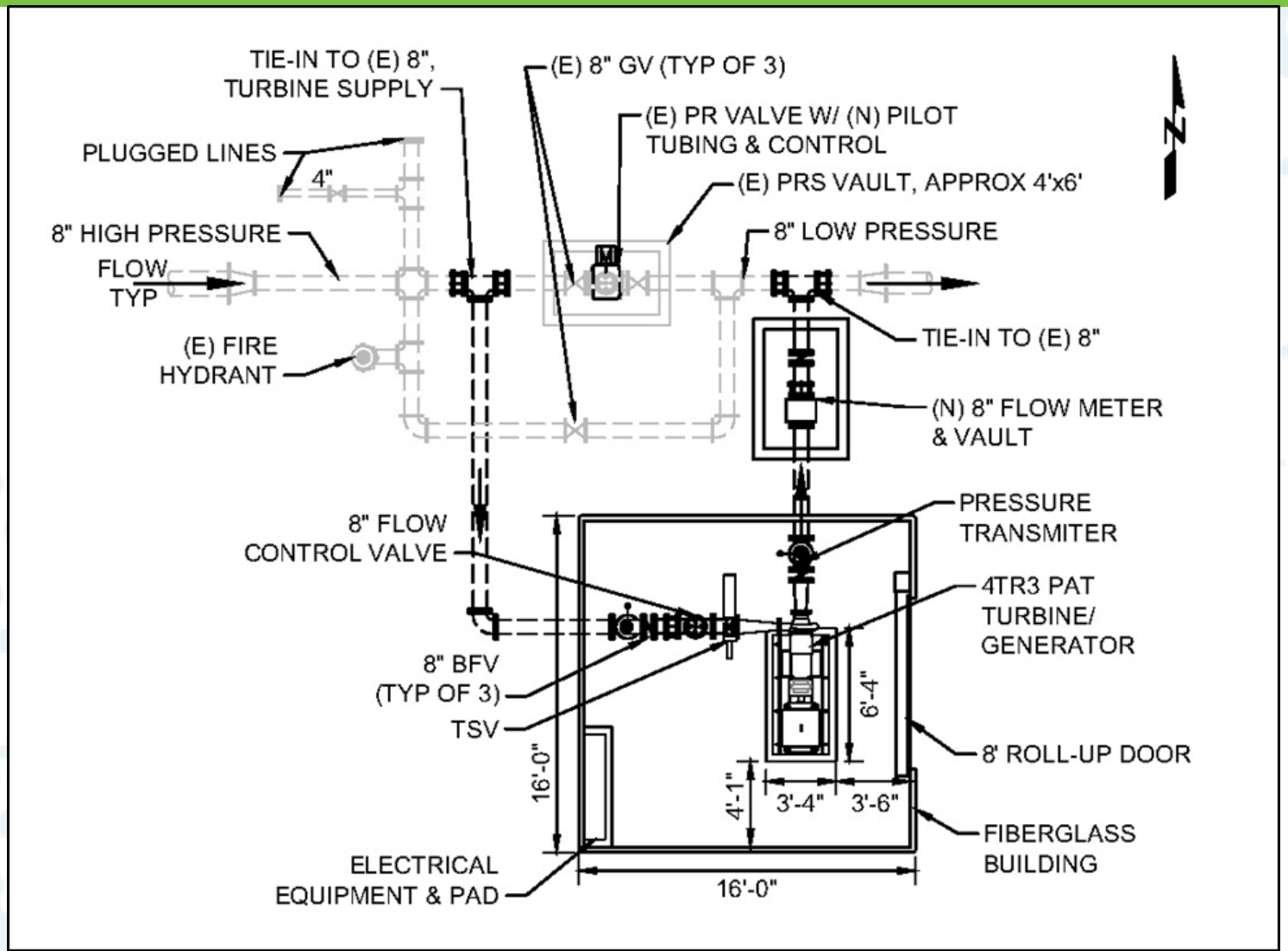
Turbine Technology Options

Option 1 – 115 kW ILT-08

Option 2 – 75 kW Pump-as-Turbine

NLINE ENERGY
EVERY DROP OF ENERGY

Option 2 – 75 kW PaT Layout



NLINE ENERGY
EVERY DROP OF ENERGY

Interconnection

- 4,100 ft away from nearest three phase power. (Copper Spur Road)
- Two-phase power available on-site
- 2-phase limiting conductor rating of 134 amps
- Primary metering, ground fault detection, and disconnect switch

NLINE ENERGY
EVERY DROP OF ENERGY

Project Cost Estimate

CSWD Jordan Road Estimate	Project Cost
Description	**75 kW Cornell PaT**
Construction	
Mobilization and site work	$ 34,600
Pipe, valves, and fittings	$ 124,300
Turbine/generator units	$ 110,000
Electrical	$ 162,600
Building and misc. structural	$ 36,000
Materials and installation subtotal	$ 467,500
25% contingency	$ 116,875
Construction costs subtotal	**$ 584,375**
Non-Construction	
Non-construction costs subtotal	**$ 350,000**
Total Estimated Project Costs	**$ 934,000**

Regulatory & Environmental

- **FERC**
  - FERC Qualifying Conduit Facility – file a Notice of Intent (NOI) to construct a qualifying conduit hydropower facility.
- **Water Rights**
  - Existing Certificated Water Right
- **Environmental**
  - NEPA Categorical Exclusion
- **ANSI/NSF**
  - Potable Water
- **Oregon Health Authority**
  - Plan Reviews Mandated
- **Land Ownership/Site Control**
  - Property Owner
- **Oregon Department of Energy**
  - RPS

NLINE ENERGY
EVERY DROP OF ENERGY

Financial Analysis

CSWD – Jordan Road Conduit Hydro - Financial Assumptions	
O&M Inflation rate	2.00%
Annual Turbine Degradation Factor	0.25%
Utility Tariff	PAC Schedule 37 & PGE Schedule 201 & HREC Avoided Cost Rates
NPV Discount Factor	4.00%
HREC Wheeling Fees	$1.97/kW-month
HREC Power Purchase Rates	$0.025 kWh escalating to $0.05/kWh in 20 years

- Project Costs = $934,000
- ETO Grant = $500,000
- ODEO RED = $200,000
- Net Project Cost = $234,000
- 30 Year Net Earnings = $538,000
- IRR = 7.8-percent

NLINE ENERGY
EVERY DROP OF ENERGY

Financial Summary

Crystal Springs - Jordan Road - Pump-as Turbine - PAC Rates

Conduit Hydroelectric Project - Estimated Savings

NLine Energy Provides TurnKey Design/Build/Maintenace Services

Net Energy Benefit to District

Estimated System Size (kWp) =	75
Budgetary Turnkey Cost ($/Wp) =	$12.45
PAC Rates 30 Yr Avg =	$0.0631
kWh Sales =	522,000
Total Energy Production (kWh) =	522,000

Cost of System Purchase

Project Cost =	$ 934,000
Energy Trust of Oregon Grant =	$ 500,000
Oregon RED Grant =	$ 200,000
Net Project Cost =	$ 234,000

Economic Benefit

30 Year:

Net Earnings =	$ 538,158
NPV =	$ 155,297

Years	Annual Energy Generation (kWh)	PAC Schedule 37 (Energy Sales)	Less: Add'l Fee or Charges	Less: Wheeling Charges Cenral Elec COOP	Less: O&M Cost	Net Energy Benefit (Revenue)	Project Cost	Grant	Net Project Cost	Annual Cash Flow	Cumulative Cash Flow
2019 - 2020							$ (934,000)	$ 700,000	$ (234,000)	$ (234,000)	$ (234,000)
2021	522,000	$ 14,385	$ -	$ (1,773)	$ (3,000)	$ 9,612	$ -	$ -	$ -	$ 9,612	$ (224,388)
2022	520,695	$ 15,241	$ -	$ (1,773)	$ (3,060)	$ 10,408	$ -	$ -	$ -	$ 10,408	$ (213,980)
2023	519,393	$ 16,079	$ -	$ (1,773)	$ (3,121)	$ 11,185	$ -	$ -	$ -	$ 11,185	$ (202,795)
2024	518,095	$ 17,253	$ -	$ (1,773)	$ (3,184)	$ 12,296	$ -	$ -	$ -	$ 12,296	$ (190,499)
2025	516,800	$ 18,686	$ -	$ (1,773)	$ (3,247)	$ 13,666	$ -	$ -	$ -	$ 13,666	$ (176,833)
2026	515,508	$ 19,280	$ -	$ (1,773)	$ (3,312)	$ 14,195	$ -	$ -	$ -	$ 14,195	$ (162,639)
2027	514,219	$ 19,827	$ -	$ (1,773)	$ (3,378)	$ 14,675	$ -	$ -	$ -	$ 14,675	$ (147,963)
2028	512,933	$ 20,766	$ -	$ (1,773)	$ (3,446)	$ 15,547	$ -	$ -	$ -	$ 15,547	$ (132,416)
2029	511,651	$ 22,615	$ -	$ (1,773)	$ (3,515)	$ 17,327	$ -	$ -	$ -	$ 17,327	$ (115,089)
2030	510,372	$ 30,994	$ -	$ (1,773)	$ (3,585)	$ 25,636	$ -	$ -	$ -	$ 25,636	$ (89,453)
2031	509,096	$ 31,171	$ -	$ (1,773)	$ (3,657)	$ 25,741	$ -	$ -	$ -	$ 25,741	$ (63,712)
2032	507,823	$ 32,660	$ -	$ (1,773)	$ (3,730)	$ 27,157	$ -	$ -	$ -	$ 27,157	$ (36,555)
2033	506,554	$ 33,845	$ -	$ (1,773)	$ (3,805)	$ 28,267	$ -	$ -	$ -	$ 28,267	$ (8,287)
2034	505,287	$ 33,732	$ -	$ (1,773)	$ (3,881)	$ 28,078	$ -	$ -	$ -	$ 28,078	$ 19,790
2035	504,024	$ 34,454	$ -	$ (1,773)	$ (3,958)	$ 28,722	$ -	$ -	$ -	$ 28,722	$ 48,513
2036	502,764	$ 34,518	$ -	$ (1,773)	$ (4,038)	$ 28,708	$ -	$ -	$ -	$ 28,708	$ 77,220
2037	501,507	$ 35,121	$ -	$ (1,773)	$ (4,118)	$ 29,229	$ -	$ -	$ -	$ 29,229	$ 106,450
2038	500,253	$ 35,734	$ -	$ (1,773)	$ (4,201)	$ 29,760	$ -	$ -	$ -	$ 29,760	$ 136,209
2039	499,003	$ 36,357	$ -	$ (1,773)	$ (4,285)	$ 30,299	$ -	$ -	$ -	$ 30,299	$ 166,509
2040	497,755	$ 36,992	$ -	$ (1,773)	$ (4,370)	$ 30,848	$ -	$ -	$ -	$ 30,848	$ 197,357
2041	496,511	$ 37,637	$ -	$ (1,773)	$ (4,458)	$ 31,406	$ -	$ -	$ -	$ 31,406	$ 228,763
2042	495,269	$ 38,294	$ -	$ (1,773)	$ (4,547)	$ 31,974	$ -	$ -	$ -	$ 31,974	$ 260,737
2043	494,031	$ 38,962	$ -	$ (1,773)	$ (4,638)	$ 32,551	$ -	$ -	$ -	$ 32,551	$ 293,288
2044	492,796	$ 39,642	$ -	$ (1,773)	$ (4,731)	$ 33,138	$ -	$ -	$ -	$ 33,138	$ 326,426
2045	491,564	$ 40,334	$ -	$ (1,773)	$ (4,825)	$ 33,735	$ -	$ -	$ -	$ 33,735	$ 360,161
2046	490,335	$ 41,037	$ -	$ (1,773)	$ (4,922)	$ 34,343	$ -	$ -	$ -	$ 34,343	$ 394,504
2047	489,109	$ 41,754	$ -	$ (1,773)	$ (5,020)	$ 34,960	$ -	$ -	$ -	$ 34,960	$ 429,464
2048	487,887	$ 42,482	$ -	$ (1,773)	$ (5,121)	$ 35,589	$ -	$ -	$ -	$ 35,589	$ 465,053
2049	486,667	$ 43,223	$ -	$ (1,773)	$ (5,223)	$ 36,227	$ -	$ -	$ -	$ 36,227	$ 501,280
2050	485,450	$ 43,978	$ -	$ (1,773)	$ (5,328)	$ 36,877	$ -	$ -	$ -	$ 36,877	$ 538,158

Implementation Schedule

CSWD – Jordan Road Conduit Hydroelectric Station Implementation Schedule		
Design & Permitting Phase		
	Initial Design	Aug-19
	50% Design	Jan-20
	Interconnection Application	Apr-20
	Environmental Categorical Exemption	Jun-20
	Interconnection Agreement Completed	Jun-20
	Final Design	Jun-20
	Power Purchase Agreement	Jul-20
Construction Phase		
	Mobilization	Jun-20
	Construction Begins	Jun-20
	Construction Complete	Oct-20
	Startup and Commissioning	Nov-20
	HREC Permission-to-Operate	Dec-20

Risks

- **Hydraulic Pressure Transients**
  - Surge Analysis
- **ILT Technology Viability**
  - Lack of commercially available data

Opportunities

- **Power Pricing**
  - PURPA enhancement legislation
    - HB 2857 (NIPPC, CREA, REC)
    - HB 3274 (OWRC)
  - Community Choice Aggregation legislation
  - Alternative Power Pricing Options
- **Renewable Energy Credits**
- **Grants**
  - Energy Trust of Oregon
  - Oregon Department of Energy RED
  - Business Oregon
  - State Drinking Water Revolving Fund
  - USDA – Rural Development
  - Bonneville Environmental Foundation
- **Project Finance**
  - State Drinking Water Revolving Fund

NLINE ENERGY
EVERY DROP OF ENERGY

Next Steps

- **Phase 1**
  - Apply for ODOE RED grant – Due April 22nd
  - Survey / Geotechnical
  - Investigate Land Acquisition
  - ***ETO co-funds up to $200,000 on development costs
- **Phase 2**
  - ODOE Grant approved
  - Design-Build Agreement
    - Design
    - Regulatory (FERC, OR Health, etc.)
    - Interconnection
    - Equipment Procurement
- **Phase 3**
  - Construction
- **Phase 4**
  - Startup and Commissioning

NLINE ENERGY
EVERY DROP OF ENERGY

Comments and Questions

EVERY DROP OF ENERGY®

NLine Energy, Inc.
5170 Golden Foothill Parkway
El Dorado Hills, CA 95762
o: 916.235.6852 | f: 866.444.4320
www.nlineenergy.com

NLINE ENERGY
EVERY DROP OF ENERGY