



Feasibility Report for Off-Grid Power Supply Using Solar, Batteries, and a Generator

Introduction

This report demonstrates the feasibility of powering a residential property using solar panels, battery storage, and a propane-powered generator. The system eliminates dependency on Idaho Power, providing energy independence and resilience. The design ensures redundancy, with solar energy as the primary power source, battery storage for backup, and a generator for redundancy during periods of low solar production.

System Components

1. Solar Panels

Model: Panasonic EVERVOLT PK Black Series

- **Rated Power:** 370W per panel
- **Efficiency:** 20.3%
- **Degradation Rate:** 0.5% annually, with 86% output after 25 years
- **Performance in Low Light:** Maintains output in shaded areas.

2. Battery Storage

Model: Fortress eVault 18.5

- **Capacity:** 18.5 kWh per unit
- **Scalability:** Up to 12 units in parallel, achieving 222 kWh

- **Efficiency:** >98%
- **Cycle Life:** 6,000 cycles at 100% depth of discharge
- **Communication:** CAN/RS485 for system integration.

3. Hybrid Inverter

Model: Sol-Ark 15K

- **Max Solar Input:** 19,500W
- **Output Power:** 15,000W continuous, 24,000VA peak
- **Backup Capabilities:** 5ms transfer time, integrates with batteries and generator.

4. Generator

Model: Generac Guardian Series (24kW)

- **Rated Power:** 24,000W (propane)
 - **Fuel Consumption:** ~130 ft³/hr at full load
 - **Features:** Automatic start, Wi-Fi monitoring, sound-attenuated enclosure.
-

System Design

Solar Energy Generation

The solar panels will generate electricity during daylight hours, charging the batteries and directly supplying household loads. Each panel provides 370W, with a typical daily production of 4-5 kWh per panel, depending on solar irradiance in the area.

Battery Storage

The Fortress eVault 18.5 battery system stores surplus solar energy for use during nighttime or cloudy days. The batteries can operate at 100% depth of discharge, maximizing usable energy. With scalability up to 222 kWh, the system can meet higher energy demands if required.

Generator Backup

The Generac 24kW generator ensures energy supply during extended periods of low solar production, such as winter months. It charges the batteries directly and powers critical loads, operating on propane for clean and efficient energy.

Redundancy and Load Management

1. **Primary Source: Solar Panels**
 - Provides clean, renewable energy for daytime loads and battery charging.
 2. **Secondary Source: Batteries**
 - Supplies power when solar production is insufficient.
 - System is designed to cover typical household usage for 1-3 days without solar input.
 3. **Tertiary Source: Generator**
 - Automatically activates when battery charge drops below a set threshold (e.g., 30%).
 - Charges batteries and powers loads simultaneously.
-

Performance and Reliability

1. **System Monitoring and Control**
 - The Sol-Ark inverter integrates all components, managing power flow between solar, batteries, and generator.
 - Real-time monitoring via Wi-Fi ensures operational transparency.
 2. **Durability**
 - All components are rated for residential use, with extended warranties:
 - Solar panels: 25 years
 - Batteries: 10 years
 - Generator: 5 years
 3. **Compliance**
 - All equipment meets UL and local code standards, ensuring safety and reliability.
-

Conclusion

The proposed off-grid system design is sufficient to meet residential power needs, offering sustainability, reliability, and energy independence. By combining solar panels, advanced battery storage, and a propane-powered generator, the system provides continuous power with built-in redundancy.

Tyler Grange- Owner

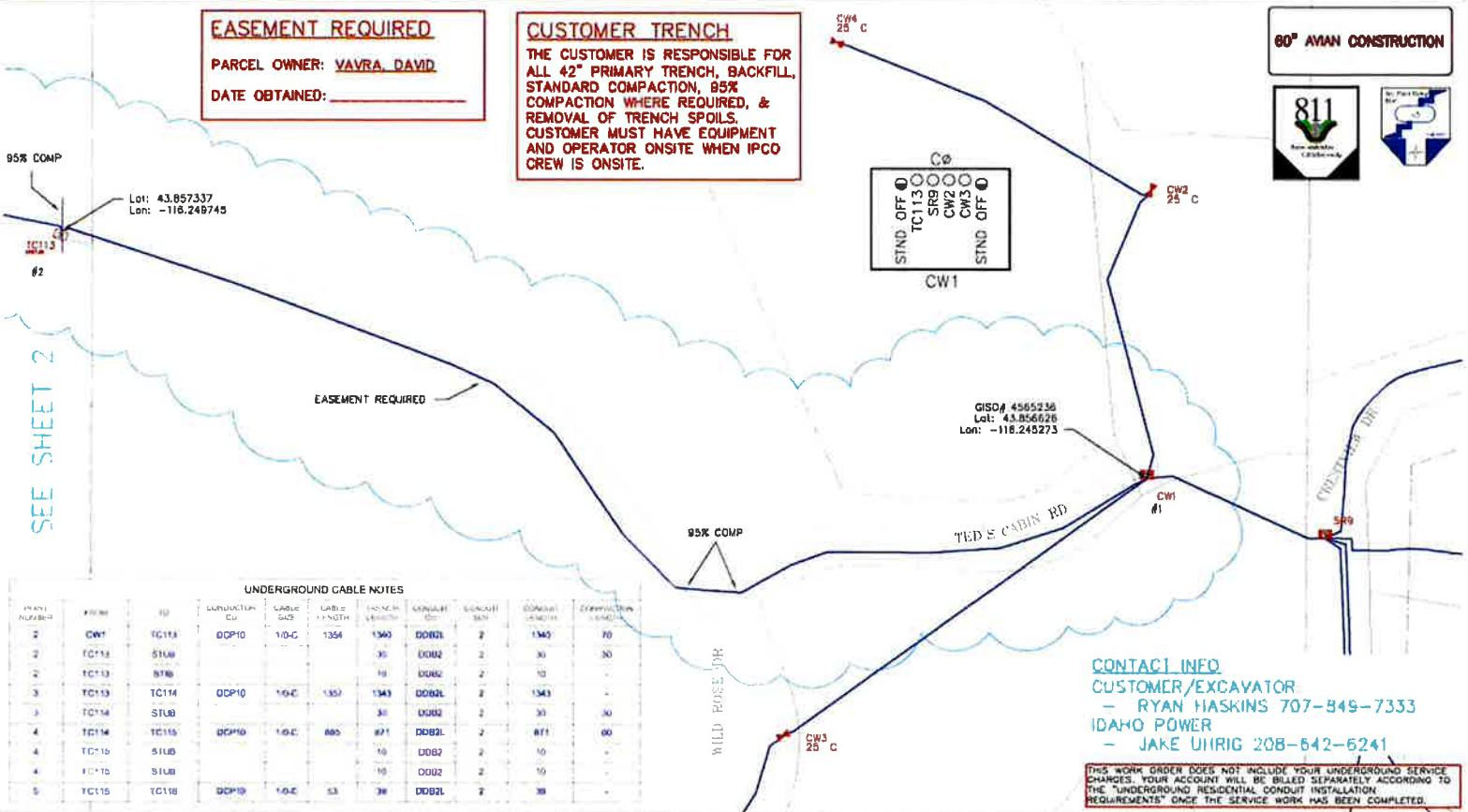
208-810-8459 Tyler@idahomeenergy.com

EASEMENT REQUIRED
 PARCEL OWNER: VAVRA, DAVID
 DATE OBTAINED: _____

CUSTOMER TRENCH
 THE CUSTOMER IS RESPONSIBLE FOR ALL 42" PRIMARY TRENCH, BACKFILL, STANDARD COMPACTION, 85% COMPACTION WHERE REQUIRED, & REMOVAL OF TRENCH SPOILS. CUSTOMER MUST HAVE EQUIPMENT AND OPERATOR ONSITE WHEN IPCO CREW IS ONSITE.

80° AVIAN CONSTRUCTION





UNDERGROUND CABLE NOTES

LINE NUMBER	FROM	TO	CONDUIT	CONDUIT SIZE	CONDUIT LENGTH	CONDUIT WEIGHT	CONDUIT WEIGHT PER FOOT	CONDUIT WEIGHT PER LINEAL FOOT	CONDUIT WEIGHT PER LINEAL FOOT	CONDUIT WEIGHT PER LINEAL FOOT
1	CW1	TC113	DDP10	1.0-C	1354	1360	0.002	2	1360	70
2	TC113	STUB				30	0.002	2	30	30
2	TC113	STUB				10	0.002	2	10	
3	TC113	TC114	DDP10	1.0-C	1357	1363	0.002	2	1363	
3	TC114	STUB				30	0.002	2	30	30
4	TC114	TC115	DDP10	1.0-C	885	891	0.002	2	891	60
4	TC115	STUB				10	0.002	2	10	
4	TC115	STUB				10	0.002	2	10	
5	TC115	TC116	DDP10	1.0-C	53	59	0.002	2	59	

CONTACT INFO
 CUSTOMER/EXCAVATOR
 - RYAN HASKINS 707-849-7333
 IDAHO POWER
 - JAKE UHRIG 208-642-6241

THIS WORK ORDER DOES NOT INCLUDE YOUR UNDERGROUND SERVICE CHARGES. YOUR ACCOUNT WILL BE BILLED SEPARATELY ACCORDING TO THE UNDERGROUND RESIDENTIAL CONDUIT INSTALLATION REQUIREMENTS ONCE THE SERVICE WORK HAS BEEN COMPLETED.

JOB TITLE: HASKINS, RYAN - UG LINE EXTENSION FOR NEW HOME		Customer: SWPP CT		Date:	
JOB DESCRIPTION: CUSTOMER TRENCH, 400 AMP PANEL		Folio Map File Name: HBND4201		Surveyed or GPS: NONE	
JOB ADDRESS: TEDS CABIN RD, HORSESHOE BEND		City: ORN		Joint Use Attachment: NO	
		County: BOISE		Pre-Built Date: 2/24/2020	
		State: ID		Built as Designed: YES	
				Construction Date: 5-15-2020	
				Operating Voltage: 7.2kV	
				FDR By: KSW	
				Date: 10-29-2020	
				Design: JCU0266	
				Date: 10-29-2020	
				Design No: 0000140250	
				Work Order No: 27546893	
				SCALE: 1" = 100'	
				Sheet 1 of 3	

SEE SHEET 2

CONTACT INFO:
CUSTOMER/EXCAVATOR:
 - RYAN HASKINS 707-849-7333
IDaho POWER
 - JAKE UHRIG 208-842-8241

CUSTOMER TRENCH
 THE CUSTOMER IS RESPONSIBLE FOR ALL 42" PRIMARY TRENCH, BACKFILL, STANDARD COMPACTION, 95% COMPACTION WHERE REQUIRED, & REMOVAL OF TRENCH SPOILS. CUSTOMER MUST HAVE EQUIPMENT AND OPERATOR ONSITE WHEN IPCO CREW IS ONSITE.

80° AMAN CONSTRUCTION



Co
 STND OFF
 SPARE
 DW1
 TC114
 SPARE
 STND OFF

TC113

SEE SHEET 1

SEE SHEET 3

EASEMENT REQUIRED

95% COMP

Lot: 43.857337
 Lon: -116.249745

TC113
 #2

UNDERGROUND CABLE NOTES

PLAN NUMBER	FROM	TO	CABLE TYPE	CABLE SIZE	CABLE LENGTH	SPIN/NEUT	CUN/BL	W/INSUL	CONDUCTOR LENGTH	SPACING
2	DW1	TC113	DCPM10	10-G	1364	340	DOB2	2	1360	75
2	TC113	STUB			30		DOB2	2	30	30
2	TC113	STUB			10		DOB2	2	10	
3	TC113	TC114	DCPM10	10-G	1307	343	DOB2	2	1303	
3	TC114	STUB			30		DOB2	2	30	30
4	TC114	TC116	DCPM10	10-G	885	871	DOB2	2	871	60
4	TC116	STUB			10		DOB2	2	10	
4	TC116	STUB			10		DOB2	2	10	
5	TC116	TC118	DCPM10	10-G	63	39	DOB2	2	39	

EASEMENT REQUIRED

PARCEL OWNER: _____
 DATE OBTAINED: _____

SWM CT		Cakmer		Date	
File: HASKINS, RYAN - UG LINE EXTENSION FOR NEW HOME Additional Description: CUSTOMER TRENCH, 400 AMP PANEL Additional Description: TEDS CABIN RD, HORSESHOE BEND		Feeder Map File Name: HBND4201 Date: 10/29/2020 Time: 02:17 User: BM County: Boise		Surveyed or GPS: NONE Joint Use Attachment: NO Pre-Draw Date: 2/24/2020 Built as Designed: YES Construction Date: 5-15-2020 Operating Voltage: 7.2kV	
Designer: JCU0266 Design No: 0000140250 Work Order No: 27546693		I DIT by: KSW Date: 10-29-2020 Audit M by: KSW Date: 10-29-2020		SCALE: 1" = 100' Sheet 2 of 3	

IDaho POWER Co WORK ORDER MAP

SCALE: 1" = 100'

Sheet 2 of 3

90° AVIAN CONSTRUCTION

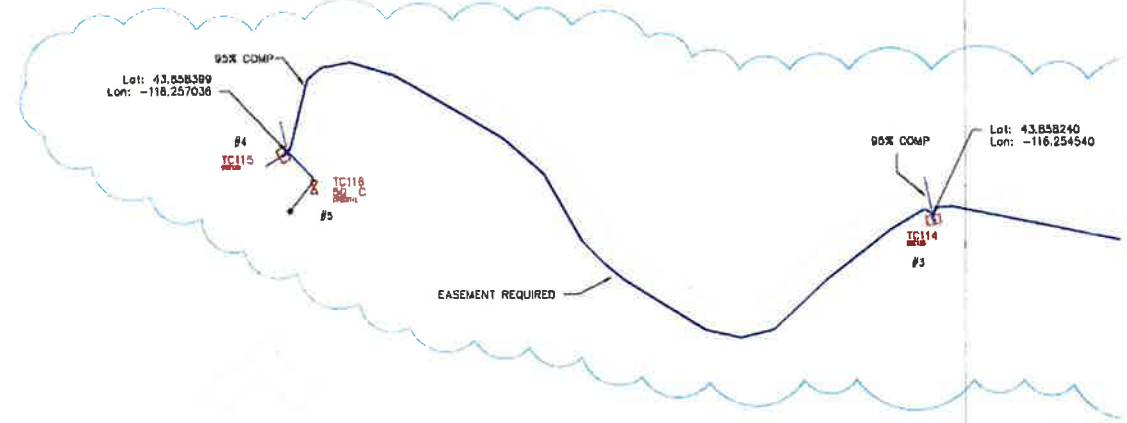


STND OFF
SPARE
TC113
TC115
SPARE
STND OFF

TC114

STND OFF
SPARE
TC116
TC114
SPARE
STND OFF

TC115



CUSTOMER TRENCH
THE CUSTOMER IS RESPONSIBLE FOR ALL 42" PRIMARY TRENCH, BACKFILL, STANDARD COMPACTION, 95% COMPACTION WHERE REQUIRED, & REMOVAL OF TRENCH SPOILS. CUSTOMER MUST HAVE EQUIPMENT AND OPERATOR ONSITE WHEN IPCO CREW IS ONSITE.

CONTACT INFO
CUSTOMER/EXCAVATOR:
- RYAN HASKINS 707-849-7333
IDAHO POWER
- JAKE UHRIG 208-642-6241

LINE NUMBER	ITEM	ID	CONDUCTOR	TYPE	CABLE LENGTH	OVERHEAD LENGTH	LOGICAL CU	CONDUIT SIZE	CONDUIT LENGTH	CONDUIT FEET
2	CW1	TC113	DDP10	10G	130	130	DDBL	2	140	70
2	TC113	STUB			30		DDBL	2	30	30
2	TC113	STUB			10		DDBL	2	10	10
3	TC113	TC114	DDP10	10G	130	133	DDBL	2	143	70
3	TC114	STUB			30		DDBL	2	30	30
4	TC114	TC115	DDP10	10G	871	871	DDBL	2	871	871
4	TC115	STUB			30		DDBL	2	30	30
4	TC115	STUB			30		DDBL	2	30	30
5	TC115	TC116	DDP10	10G	53	53	DDBL	2	53	53

EASEMENT REQUIRED
PARCEL OWNER: _____
DATE OBTAINED: _____

THIS WORK ORDER DOES NOT INCLUDE YOUR UNDERGROUND SERVICE CHARGES. YOUR ACCOUNT WILL BE BILLED SEPARATELY ACCORDING TO THE "UNDERGROUND RESIDENTIAL CONDUIT INSTALLATION REQUIREMENTS" ONCE THE SERVICE WORK HAS BEEN COMPLETED.

SEE SHEET 2

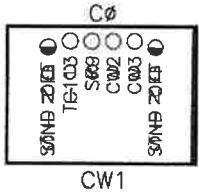
SWAY CT		Customer		Date	
Title: HASKINS, RYAN - UG LINE EXTENSION FOR NEW HOME		Map File Name: HBND4201		Surveyed or GPS: NONE	
Additional Description: CUSTOMER TRENCH, 400 AMP PANEL		Date: 10-29-2020		Pre-Build Date: 2/24/2020	
Address Description: EDS CABIN RD, HORSESHOE BEND		Date: 10-29-2020		Built as Designed: YES	
Scale: ID		Date: 10-29-2020		Construction Date: 5-15-2020	
County: BLM		Date: 10-29-2020		Operating Voltage: 7.2kV	
IDaho POWER Co. WORK ORDER MAP		SCALE: 1" = 100'		Sheet 3 of 3	

EASEMENT REQUIRED
 PARCEL OWNER: VAVA, DAVID
 DATE OBTAINED:

CUSTOMER TRENCH
 THE CUSTOMER IS RESPONSIBLE FOR ALL NECESSARY PERMITS AND EASEMENTS TO BE OBTAINED FROM THE LOCAL JURISDICTIONS AND AGENCIES. THE CUSTOMER MUST HAVE ALL NECESSARY PERMITS AND EASEMENTS OBTAINED PRIOR TO THE START OF CONSTRUCTION. THE CUSTOMER IS RESPONSIBLE FOR ALL NECESSARY PERMITS AND EASEMENTS TO BE OBTAINED FROM THE LOCAL JURISDICTIONS AND AGENCIES.



95% COMP
 TC113
 #2
 Lat: 43.857337
 Lon: -116.249743



0:50# 45652.16
 Lat: 43.856525
 Lon: -116.245273

CONTACT INFO: CUSTOMER/EXCAVATOR: RYAN HASKINS 707-849-7333 RYAN HASKINS 707-849-7333 IDAHO POWER - JAKE UHRIG 208-642-6241 JAKE UHRIG 208-642-6241

THIS WORK ORDER DOES NOT INCLUDE UNAPPROVED SERVICE CHARGES. THE USER ACCEPTS ALL RISKS AND ASSUMES ALL RESPONSIBILITIES ONCE THE SERVICE WORK HAS BEEN COMPLETED.

UNDERGROUND CABLE NOTES

CONDUCTOR #	FROM	TO	CONDUCTOR #	CABLE SIZE	CABLE LENGTH	TRENCH DEPTH	DEPTH	DEPTH	DEPTH	DEPTH	DEPTH
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Job Title: SWPP

Feeder Map File Name: HBND4201

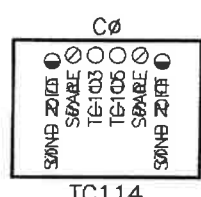
Surveyed or GPS: []
 Joint Use Attachment: []
 Pre-Built Date: []
 Built as Designed: []
 Construction Date: []
 Operating Voltage: []

FDR By: [Signature]
 Date: 2/19/20
 ArcFM By: []
 Date: []

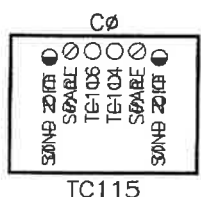
Designer: [Signature]
 Design No: 27546693
 Work Order No: 27546693

SCALE: 1" = 100
 Sheet 1 of 3

60" AVIAN CONSTRUCTION

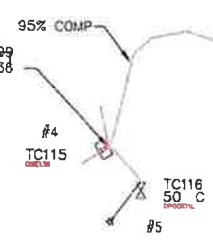


TC114



TC115

Lat: 43.855199
Lon: -116.257038

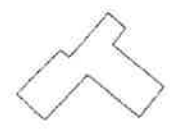


95% COMP

Lat: 43.858240
Lon: -116.254540



EASEMENT REQUIRED



CUSTOMER TRENCH
 THE CUSTOMER IS RESPONSIBLE FOR ALL NECESSARY PERMITS AND EASEMENTS FOR THE TRENCH AND FOR THE REMOVAL OF ANY EXISTING UTILITIES OR STRUCTURES THAT MAY BE IN THE TRENCH. THE CUSTOMER SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES THAT ARE NOT TO BE REMOVED. THE CUSTOMER SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES THAT ARE NOT TO BE REMOVED. THE CUSTOMER SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES THAT ARE NOT TO BE REMOVED.

CONTACT INFO: CUSTOMER/EXCAVATOR - RYAN HASKINS 707-849-7333 IDAHO POWER - JAKE UHRIG 707-849-7333 IDAHO POWER - JAKE UHRIG 208-642-6241 JAKE UHRIG 208-642-6241

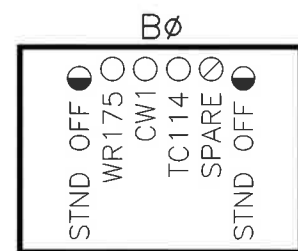
UNDERGROUND CABLE NOTES										
POINT NUMBER	FROM	TO	CONDUIT SIZE	CABLE SIZE	CABLE DEPTH	TRENCH WIDTH	CONDUIT ID	CONDUIT SIZE	CONDUIT LENGTH	CONDUIT WEIGHT
1	TC114	TC115	2"	1/2"	18"	18"	1000	2"	1000	1000
2	TC115	TC116	2"	1/2"	18"	18"	1000	2"	1000	1000
3	TC116	TC114	2"	1/2"	18"	18"	1000	2"	1000	1000
4	TC114	TC115	2"	1/2"	18"	18"	1000	2"	1000	1000
5	TC115	TC116	2"	1/2"	18"	18"	1000	2"	1000	1000
6	TC116	TC114	2"	1/2"	18"	18"	1000	2"	1000	1000

EASEMENT REQUIRED
 PARCEL OWNER: _____
 DATE OBTAINED: _____
 PARCEL OWNER: _____
 DATE OBTAINED: _____

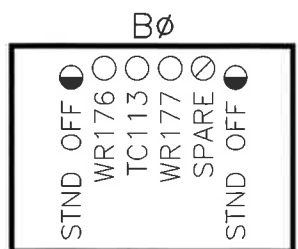
THIS WORK ORDER DOES NOT INCLUDE THE COST OF PERMITS OR EASEMENTS. THE CUSTOMER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND EASEMENTS. THE CUSTOMER SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES THAT ARE NOT TO BE REMOVED.

Job Title	SWPP:	Feeder Map File Name: HBND4201	Surveyed or GPS Joint Use Attachment	FDR By: [Signature]	Designer: [Signature]
Additional Description:	State: _____ County: _____	Pre-Built Date	Built as Designed	Date: 2/19/20	Design No: 20191142250
Additional Description:	Operating Voltage	Construction Date	Work Order No: 27546693	SCALE: 1" = 100' Sheet 3 of 3	

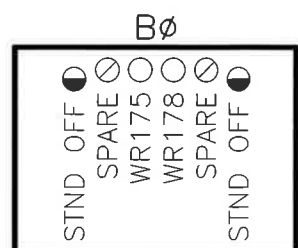
27546693



TC113



WR175



WR176



60" AVIAN CONSTRUCTION



UNDERGROUND CABLE NOTES

POINT NUMBER	FROM	TO	CONDUCTOR CU	CABLE SIZE	CABLE LENGTH	TRENCH LENGTH	CONDUIT CU	CONDUIT SIZE	CONDUIT LENGTH	COMPACTION LENGTH
3	WR177	STUB				5	DDB2	2	5	-
2	TC113	WR175	DCP10	1/0-B	1218	1193	DDB2	2	1193	60
3	WR175	WR177	DCP10	1/0-B	20	5	DDB2	2	10	-
4	WR175	WR176	DCP10	1/0-B	1213	1188	DDB2	2	1188	-
4	WR176	STUB				5	DDB2	2	5	-
5	WR176	WR178	DCP10	1/0-B	78	63	DDB2	2	63	-

EASEMENT REQUIRED

DATE OBTAINED: PRIOR TO CONSTRUCTION
 TO BE OBTAINED BY IDAHO POWER FOR PAT
 FROM RYAN HASKINS

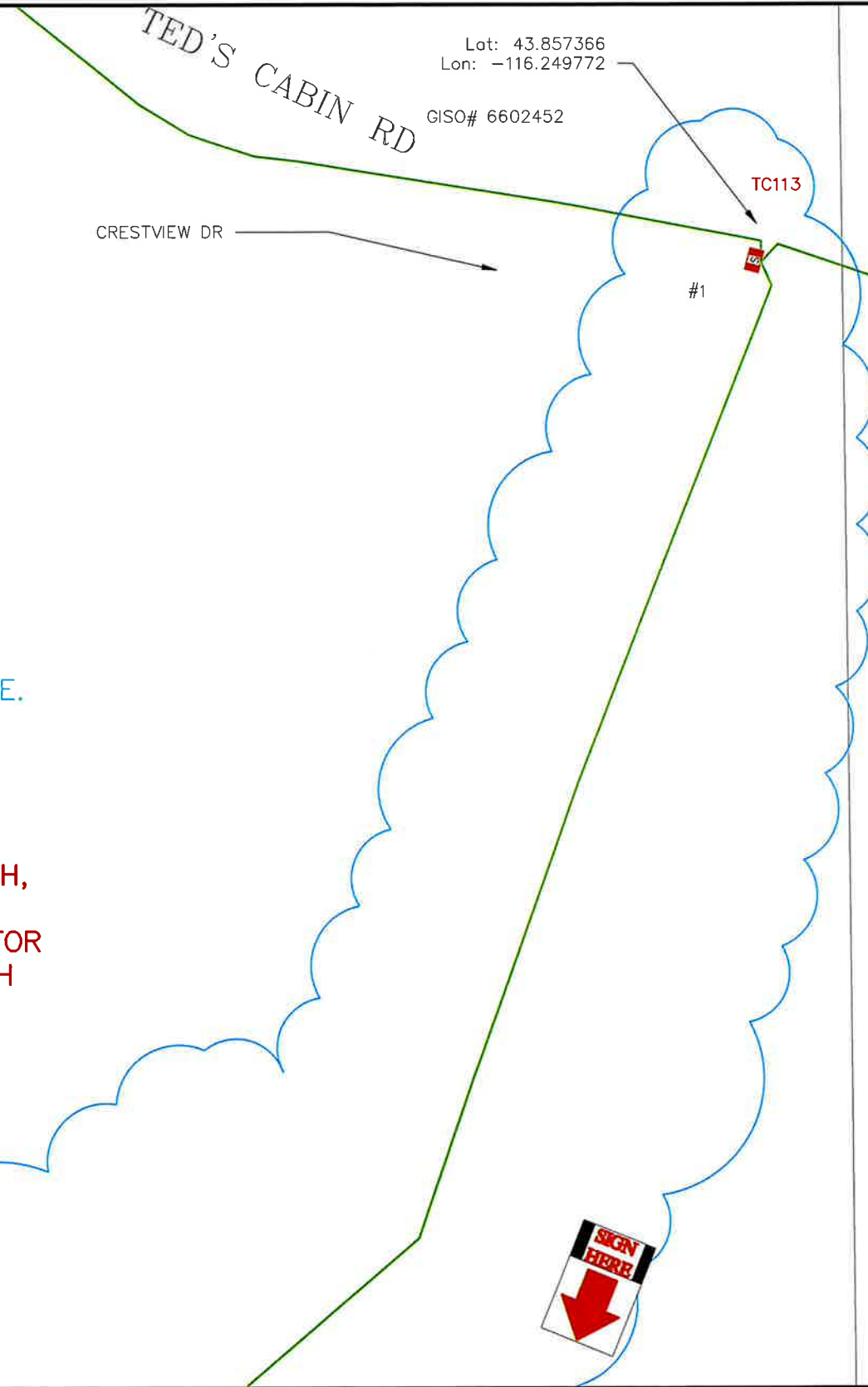
CREW NOTES: CUSTOMER DUG TRENCH, IPCO TO INSTALL CONDUIT & WIRE. CALL AHEAD TO MAKE SURE READY, PAT HASKINS 707-217-0166. SEE NOTES ON PAGE 2 OF MAP FOR DIRECTIONS.

CUSTOMER TRENCH: CUSTOMER IS RESPONSIBLE FOR ALL 42" PRIMARY TRENCH, BACKFILL, STANDARD COMPACTION, 95% COMPACTION WHERE REQUIRED AND REMOVAL OF TRENCH SPOILS. CUSTOMER MUST HAVE EQUIPMENT AND OPERATOR ONSITE WHEN IPCO CREW IS ONSITE. CUSTOMER RESPONSIBLE FOR ALL TRENCH SETTLING AND ROAD REPAIRS.

DEVELOPER TO STAKE RUNNING LINE, FINAL GRADE AND DEVICE LOCATIONS.

ALL TRENCH SPOILS TO BE LEFT ON SITE.

THIS WORK ORDER DOES NOT INCLUDE YOUR UNDERGROUND SERVICE CHARGES. YOUR ACCOUNT WILL BE BILLED SEPARATELY ACCORDING TO THE "UNDERGROUND RESIDENTIAL CONDUIT INSTALLATION REQUIREMENTS" ONCE THE SERVICE WORK HAS BEEN COMPLETED.



SWPP: Pending

Job Title: PAT HASKINS - POWER TO 4 LOT SUB

Additional Description: SINGLE PHASE UG LINE EXTENSION FOR 4 HOMES - CUSTOMER DUG TRENCH

Additional Description: TAKE OFF SECTER 6602452; EASEMENT REQUIRED

Feeder Map File Name: HBND4205

Qua 1 TwN 06N Rng 02E 17 BM

State ID County Boise

Surveyed or GPS: GPS
 Joint Use Attachment: NO
 Pre-Built Date: 3/30/2022
 Built as Designed: —
 Construction Date: —
 Operating Voltage: 7.2kV

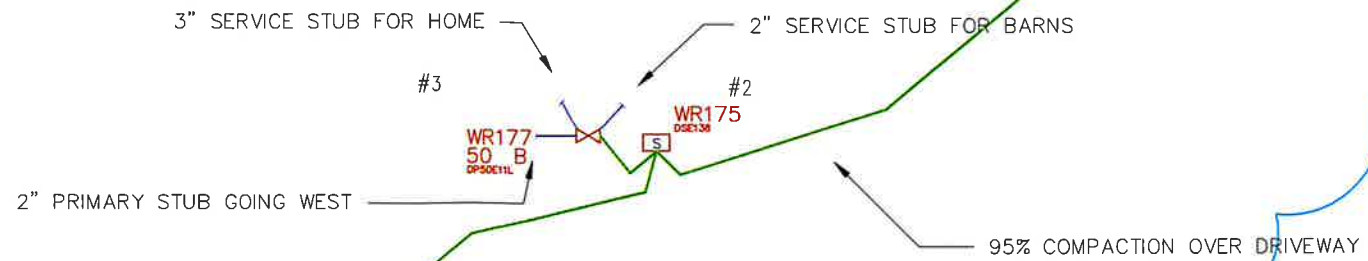


FDR By: _____
 Date: _____
 ArcFM By: _____
 Date: _____

Designer: WHB8098
 Design No: 0000156309
 Work Order No: 27601451



60" AVIAN CONSTRUCTION



CREW NOTES: BEST ACCESS TO PROPERTY IS FROM MILE MARKER 57 OFF HWY 55 ONTO SUMMIT RIDGE RD. 1/2 MILE UP SUMMIT RIDGE OFF HIGHWAY 55 IS WILD ROSE ON THE LEFT. GATE CODE IS 1102. AT "Y" STAY TO THE LEFT TO TOP OF THE HILL. ACCESS TO POINT 1 WILL BE FROM CRESTVIEW DR.

PT 2 – INSTALL SECTER WR175
 PT 3 – INSTALL XFMR WR177 W/ 1 – 3" SERVICE STUB AND 1 – 2" SERVICE STUB AND 1 – 2" PRIMARY STUB HEADING WEST.
 PT 4 – INSTALL SECTER WR176 W/ 2" PRIMARY STUB GOING SOUTH
 PT 5 – INSTALL XFMR WR178 W/ 1 – 3" SERVICE STUB GOING EAST.



SWPP: Pending

TIME SCALE

Customer:

Date:

Job Title:
PAT HASKINS - POWER TO 4 LOT SUB

Feeder Map File Name: **HBND4205**

Surveyed or GPS: **GPS**
 Joint Use Attachment: **NO**
 Pre-Built Date: **3/30/2022**
 Built as Designed: **---**
 Construction Date: **---**
 Operating Voltage: **7.2kV**



FDR By: **----**
 Date: **----**
 ArcFM By: **----**
 Date: **----**

Designer: **WHB8098**
 Design No: **0000156309**
 Work Order No: **27601451**

Additional Description:
SINGLE PHASE UG LINE EXTENSION FOR 4 HOMES - CUSTOMER DUG TRENCH

Qua	Twn	Rng	Sec	
1	06N	02E	17	BM

Additional Description:
TAKE OFF SECTER 6602452; EASEMENT REQUIRED

State ID	County
	Boise