BANNER ENVIRONMENTAL ENGINEERING CONSULTANTS LTD.

HUSKY SLATER RIVER

GROUP 1A2 PILE DESIGN

PROJECT #136-1-1A

PERMIT TO PRACTICE
BANNER ENVIRONMENTAL ENGINEERING CONSULTANTS LTD.
Signature
Date FEB 10/14
PERMIT NUMBER: P 7187
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER JAMES B. MARR FEB 10/14

PROFESSIONAL ENGINEER PURU SHRESTHA FEB 10, 2014

APEGA PERMIT #: 7187

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JAN.17/14	KDM	JM/PS	DRAFT
FEB. 6/14	KDM	JM/PS	IFR
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DRAWING: 136-1-1A2-D01

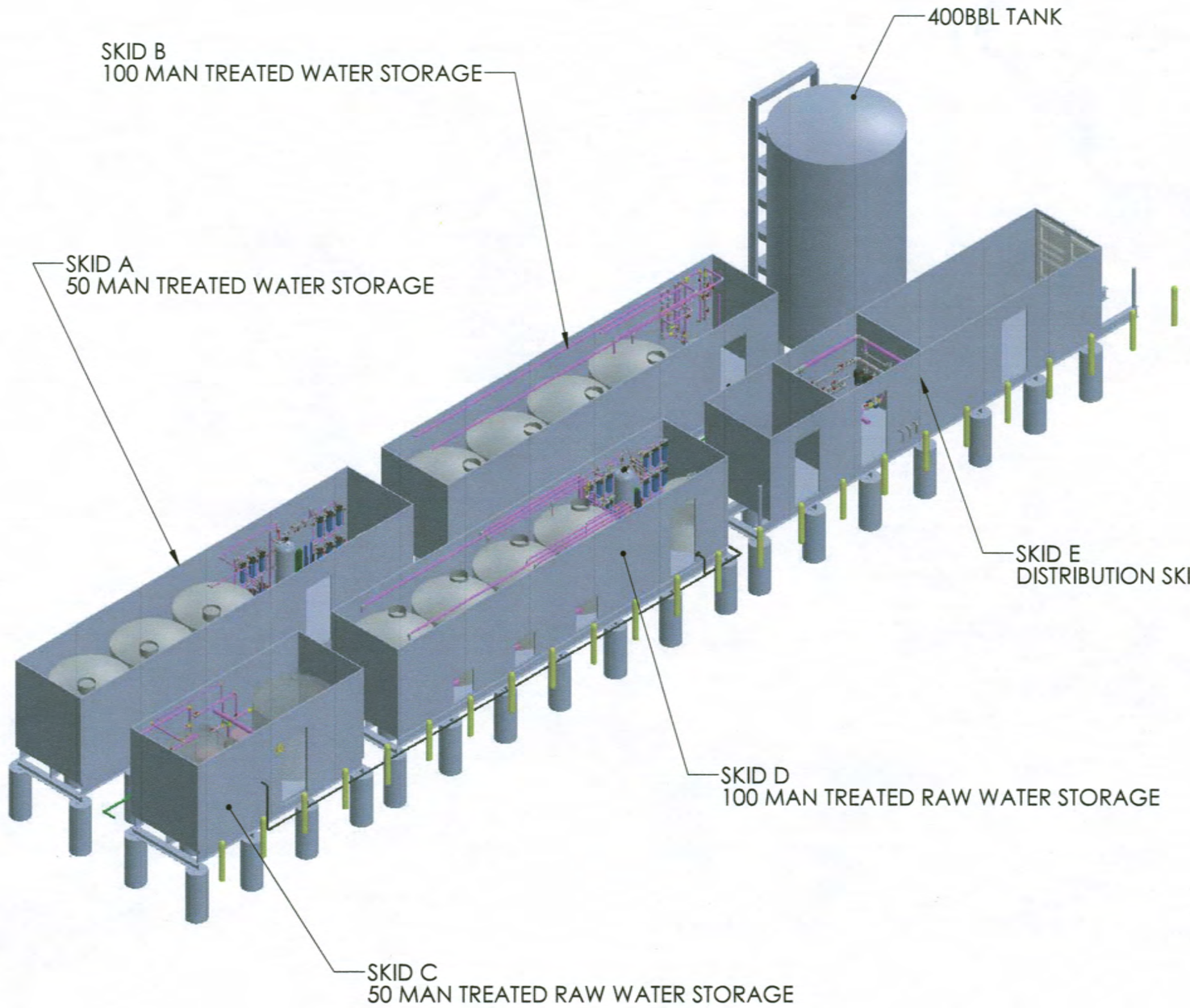
CNRL PROJECT: **SLATER RIVER**

DESCRIPTION: **TITLE PAGE**

Husky Energy

BANNER environmental engineering consultants ltd.

SCALE: 1:128 | SIZE: B | PAGE 1 OF 8



PROFESSIONAL ENGINEER ALBERTA
PURU SHRESTHA
Feb 10, 2014

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6. PILES SHOULD BE CAPPED PRIOR TO WELDING ON IBEAMS

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FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D02

CNRL PROJECT:
SLATER RIVER

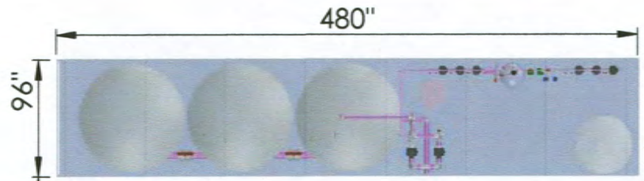
DESCRIPTION:
OVERVIEW OF LAYOUT

Husky Energy

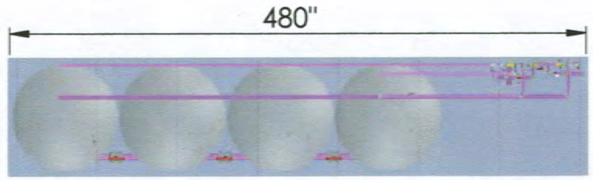
BANNER
environmental engineering consultants ltd.

SCALE: 1:125 | SIZE: B | PAGE 2 OF 8

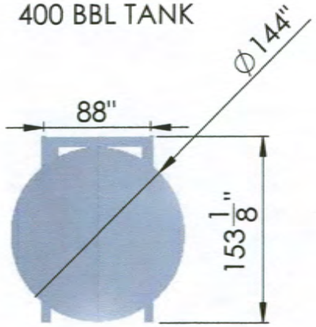
SKID A -50 MAN TREATED WATER



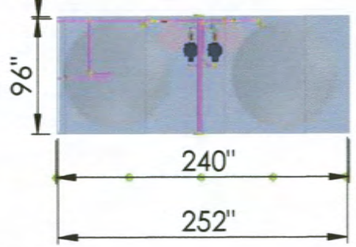
SKID B- 100 MAN TREATED WATER



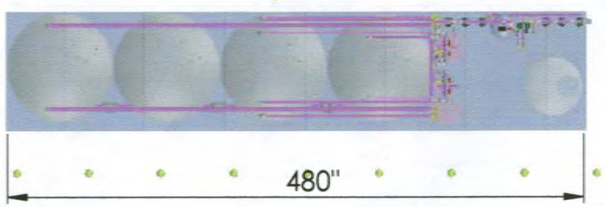
400 BBL TANK



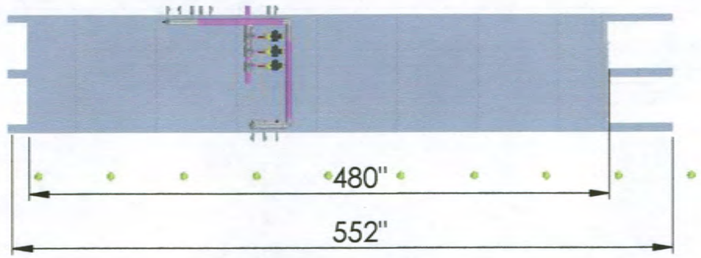
SKID C- 50 MAN RAW WATER



SKID D- 100 MAN RAW WATER



SKID E- DISTRIBUTION SKID



TOP VIEW

SKID DESIGN ASSUMPTIONS

	SKID		I-BEAM					END PIPE			INTERCONNECTING PIPE			
	Length (ft)	Width (ft)	NO. of Runners	Height (in.)	Flange Width (in.)	Wt. (lb/ft)	SIZE	Pipe Diameter (in.)	Length (in.)	Wt. (lb/ft)	Pipe Diameter (in.)	Length (in.)	Wt. (lb/ft)	Quantity
Skid A	40	8	3	12.5	6.56	35	W12x35	6	104	28.6	4	88	14.9	4
Skid B	40	8	3	8.06	6.535	28	W8x28	6	104	28.6	4	88	14.9	4
Skid C	21	8	3	12.5	6.56	35	W12x35	6	104	28.6	4	88	14.9	2
Skid D	40	8	3	8.06	6.535	28	W8x28	6	104	28.6	4	88	14.9	4
Skid E	46	8	3	9.73	7.96	33	W10x33	6	104	28.6	4	88	14.9	4
400BBL Skid	12.76	7.4	3	8.14	5.25	18	W8x18	*W6x15	95	15	4	82.75	14.9	1

GENERAL ASSUMPTIONS:
1. SEACANS WEIGHT IS APPROXIMATLY 100LB/FT.
2. ASSUME EMPTY WEIGHT OF 500IMP GALLON TANK IS 70KG.
3. ASSUME EMPTY WEIGHT OF 1750 IMP GALLON TANK IS 240KG.
4. FIELD CONFIRMATION OF SKID DIMENSIONS ARE RECOMMENDED INCLUDING WEB AND FLANGE THICKNESS.

PROFESSIONAL ENGINEER ALBERTA
PURU SHRESTHA
Feb 10, 2014

APEGA PERMIT #:
7187

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JAN.17/14	KDM	JM/PS	DRAFT
FEB. 6/14	KDM	JM/PS	IFR
FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D03

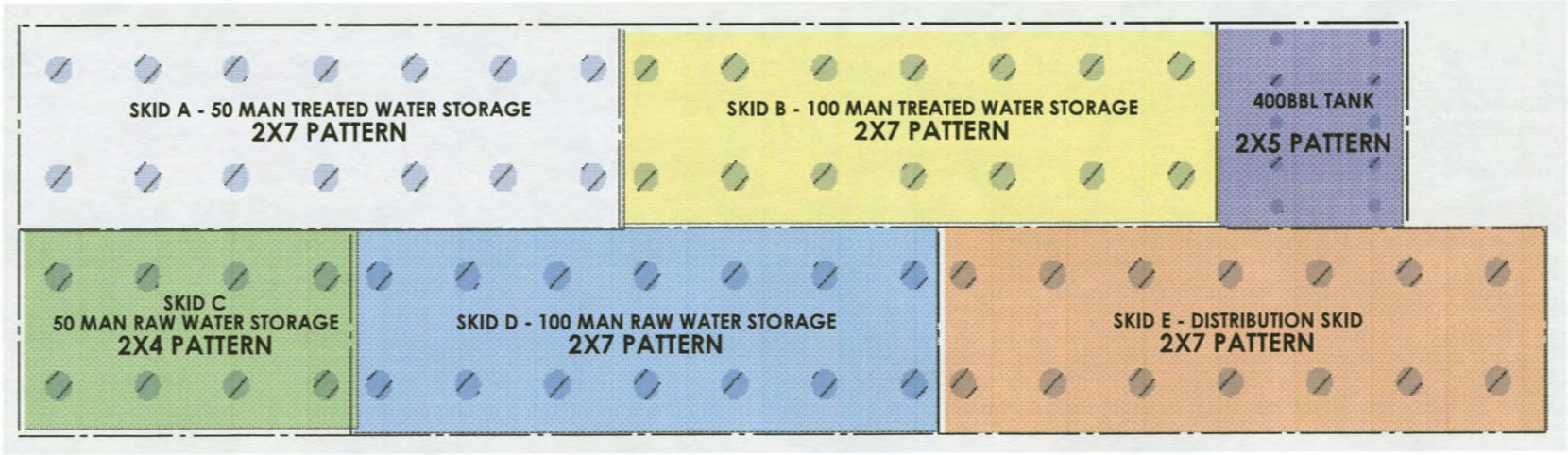
CNRL PROJECT:
SLATER RIVER

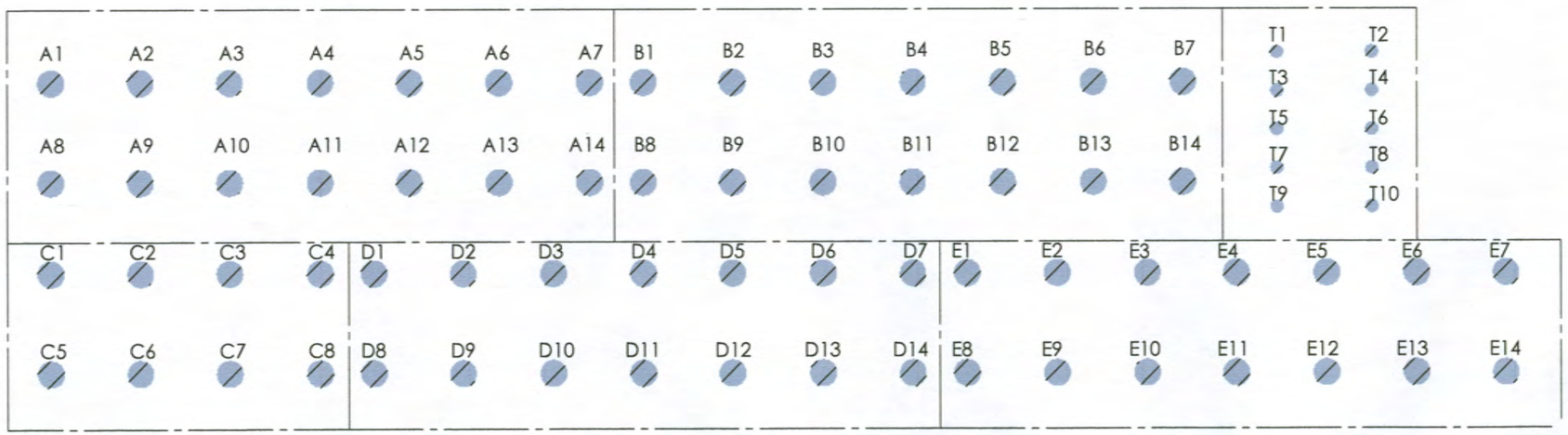
DESCRIPTION:
SEACAN AND SKID DIMENSIONS AND ASSUMPTIONS

Husky Energy

BANNER
environmental engineering consultants ltd.

SCALE: 1:125 | SIZE: B |





SKID	*MAXIMUM TOTAL LOAD (LBS)*	*MAXIMUM TOTAL LOAD (KG)*	*MAXIMUM LOAD PER PILE(LBS)*	*MAXIMUM LOAD PER PILE(KG)*
A	*103857*	*47109*	19450	8822
B	*118278*	*53650*	19460	8827
C	*99928*	*45327*	19890	9022
D	*123944*	*56220*	19475	8834
E	*41911*	*19011*	4030	1828
TANK-400BBL	*182515*	*82787*	23800	10795

*NOTE: MAXIMUM TOTAL LOAD DOES NOT INCLUDE A SAFETY FACTOR. SEE SUMMARY OF LOADS FOR MORE INFORMATION.

TOP VIEW

PROFESSIONAL ENGINEER ALBERTA
PURU SHRESTHA
Feb10, 2014

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JAN.17/14	KDM	JM/PS	DRAFT
FEB. 6/14	KDM	JM/PS	IFR
FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D04

CNRL PROJECT:
SLATER RIVER

DESCRIPTION:
OPTION 1
PILE LAYOUT OVERVIEW

Husky Energy

BANNER
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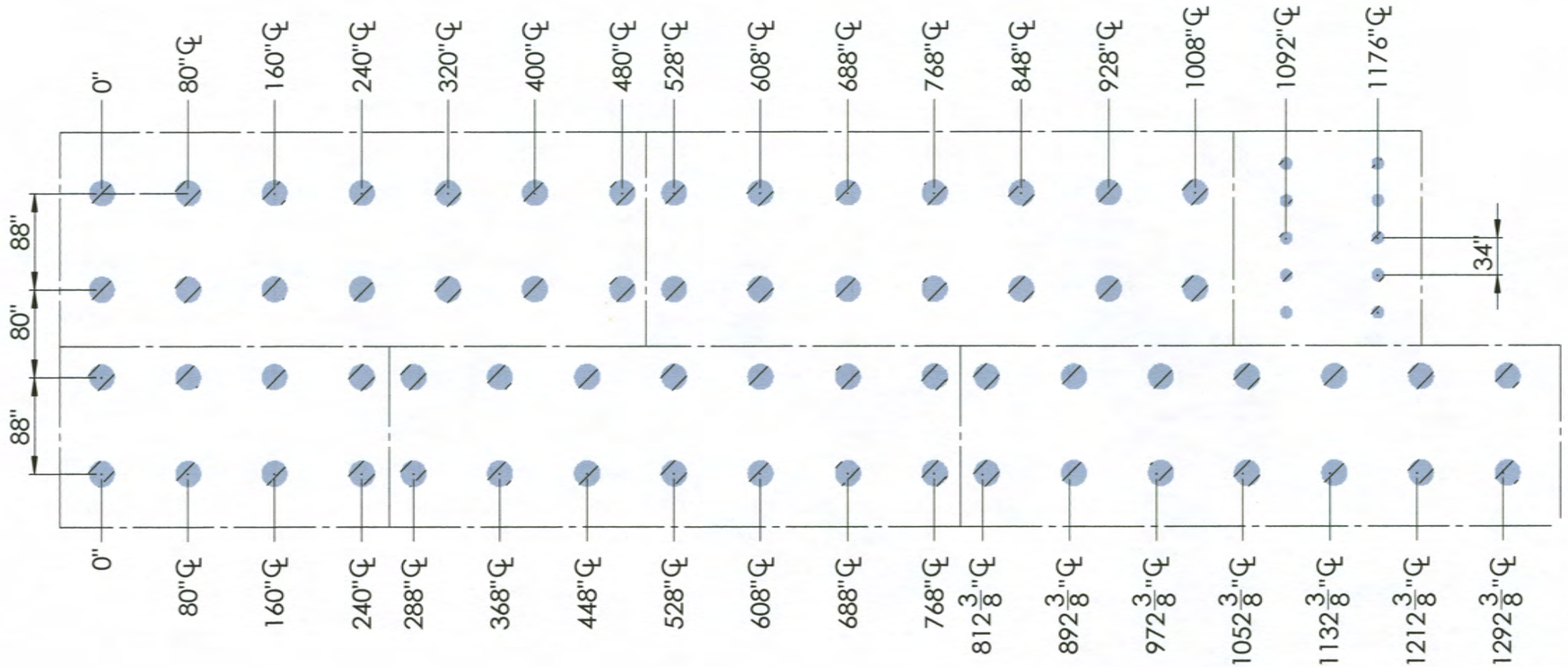
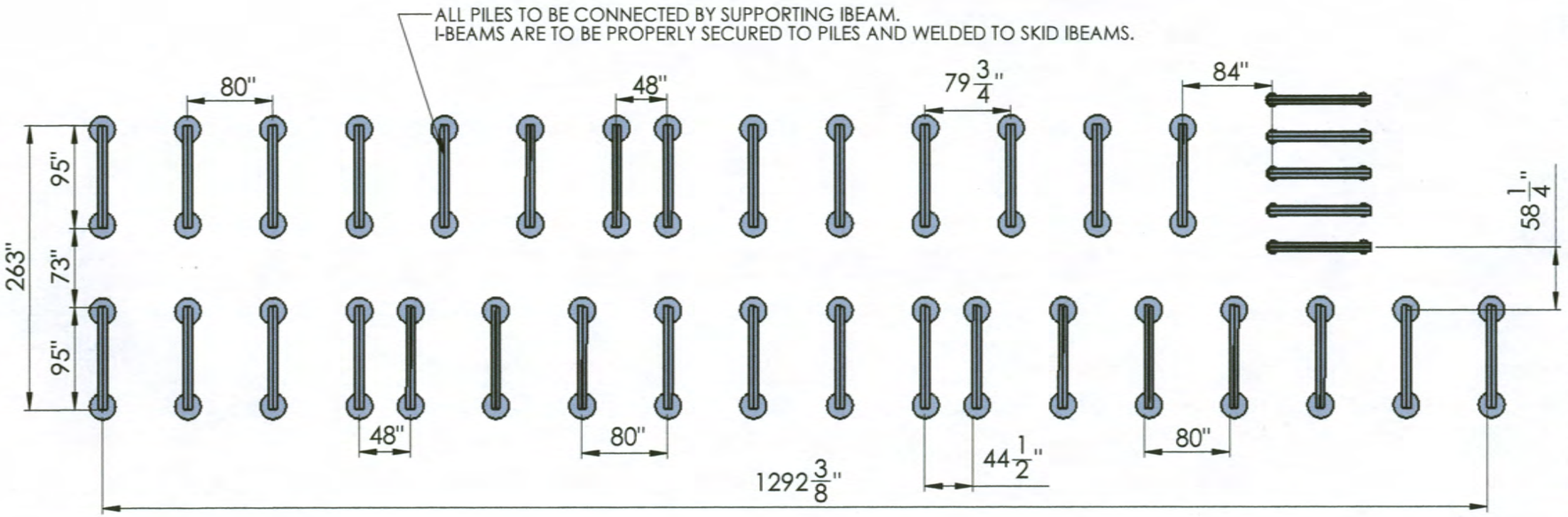
SCALE: 1:125 | SIZE: B | PAGE 4 OF 8





TOP VIEW

PROFESSIONAL ENGINEER
PURU SHRESTHA
ALBERTA
Feb 10, 2014

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JAN.17/14	KDM	JM/PS	DRAFT
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FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D05

CNRL PROJECT:
SLATER RIVER

DESCRIPTION: **OPTION 1**
PILE LAYOUT DIMENSIONS AND SUPPORTS

Husky Energy

BANNER
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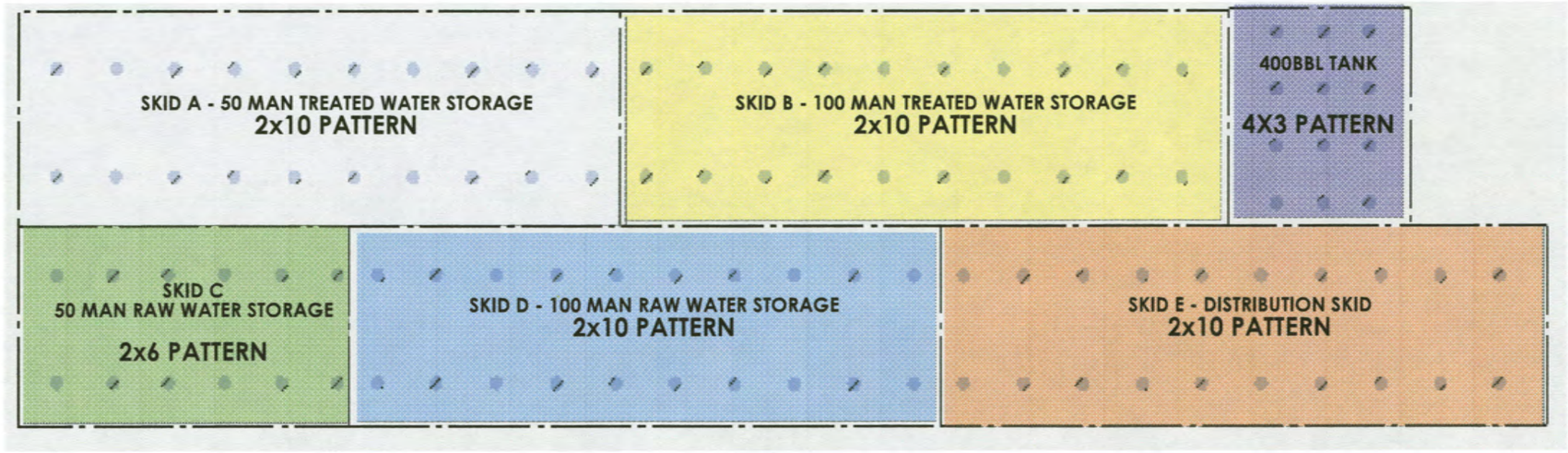
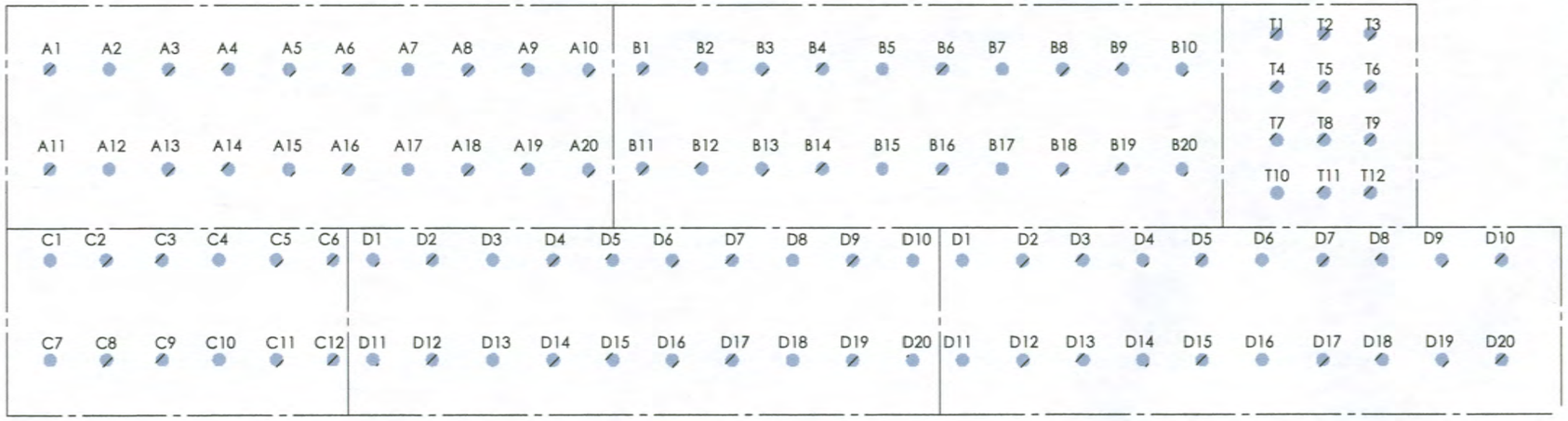
SCALE: 1:125 | SIZE: B | PAGE 5 OF 8





SKID	*MAXIMUM TOTAL LOAD (LBS)*	*MAXIMUM TOTAL LOAD (KG)*	*MAXIMUM LOAD PER PILE(LBS)*	*MAXIMUM LOAD PER PILE(KG)*
A	*103857*	*47109*	13000	5897
B	*118278*	*53650*	13000	5897
C	*99928*	*45327*	12550	5693
D	*123944*	*56220*	13000	5897
E	*41911*	*19011*	2700	1225
TANK-400BBL	*182515*	*82787*	29600	13426

*NOTE: MAXIMUM TOTAL LOAD DOES NOT INCLUDE A SAFETY FACTOR. SEE SUMMARY OF LOADS FOR MORE INFORMATION.

TOP VIEW

PROFESSIONAL ENGINEER ALBERTA
PURU SHRESTHA
Feb 10, 2014

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JAN.17/14	KDM	JM/PS	DRAFT
FEB. 6/14	KDM	JM/PS	IFR
FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D06

CNRL PROJECT:
SLATER RIVER

DESCRIPTION:
OPTION 2
PILE LAYOUT OVERVIEW

Husky Energy

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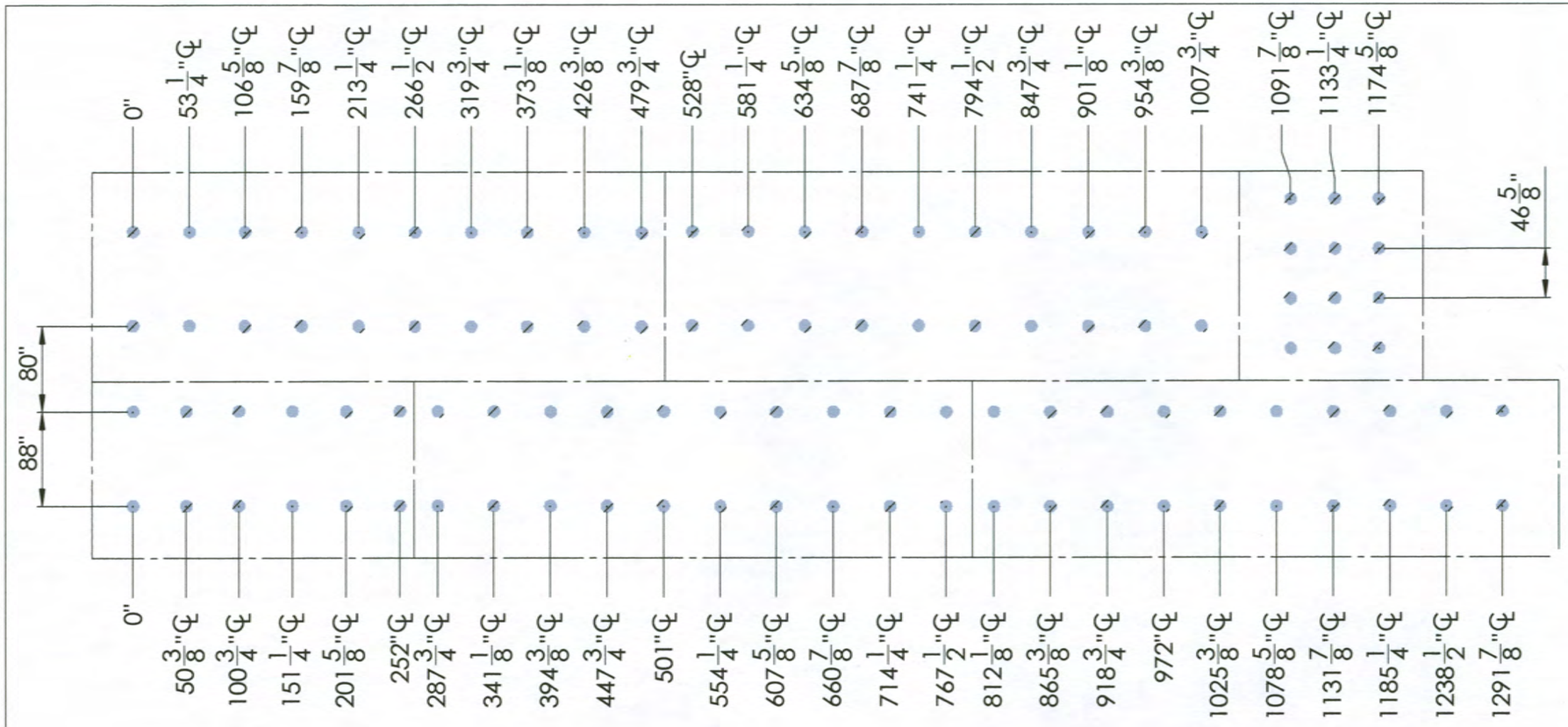
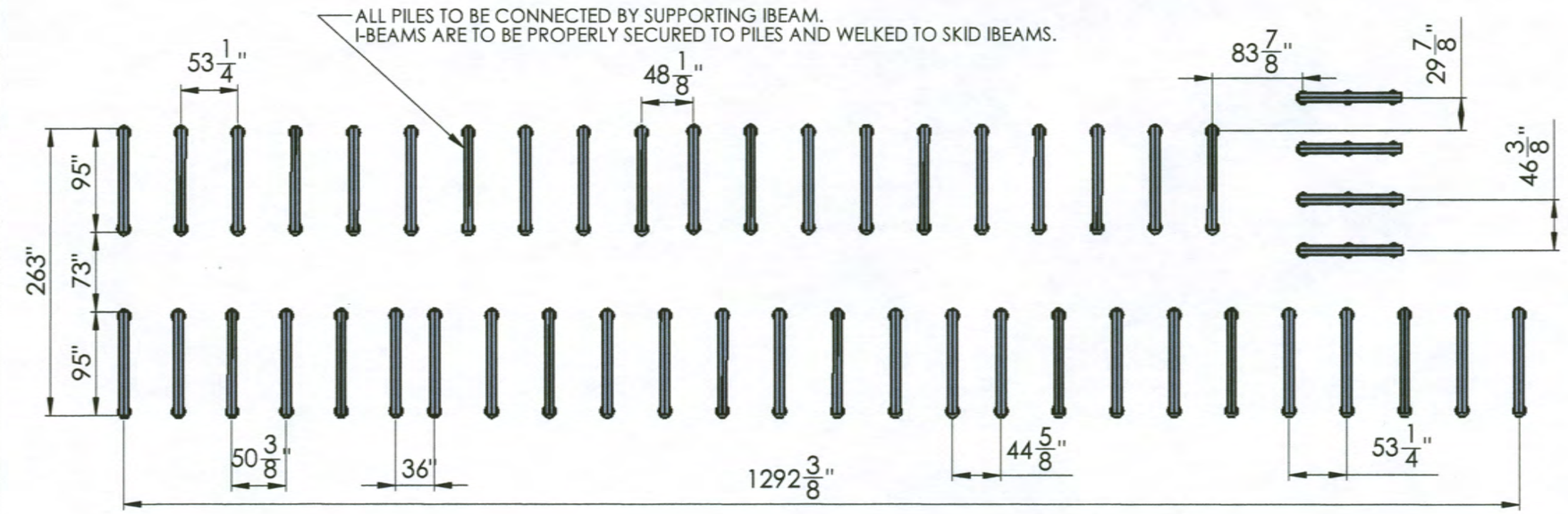
environmental engineering consultants ltd.

SCALE: 1:125 | SIZE: B |





TOP VIEW

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Feb 10, 2014

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FEB. 6/14	KDM	JM/PS	IFR
FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D07

CNRL PROJECT:
SLATER RIVER

DESCRIPTION:
OPTION 2
PILE LAYOUT DIMENSIONS AND SUPPORTS

Husky Energy

BANNER
environmental engineering consultants ltd.

SCALE: 1:125 | SIZE: B | PAGE 7 OF 8

SUMMARY OF LOADS

	TOTAL DEAD LOAD (LBS)	TOTAL LIVE LOAD (LBS)	U.L.S SNOW LOAD (LBS)	U.L.S WIND LOAD (PSI)	SEISMIC LOAD (LBF)	TOTAL LOAD (LBS)	TOTAL LOAD (PSI)	LIMIT STATE DESIGN WORST CASE LOAD (PSI)
SKID A - 50 MAN TREATED WATER STORAGE	17492	63387	0.41	0.08	5508	95612	2.254	5.523
SKID B- 100 MAN TREATED WATER STORAGE	18133	77166	0.41	0.08	6487	110033	2.567	5.526
SKID C- 50 MAN RAW WATER STORAGE	11273	7166	0.41	0.08	6019	95805	4.330	5.646
SKID D- 100 MAN RAW WATER STORAGE	18288	82678	0.41	0.08	6872	115700	2.689	5.530
SKID E - DISTRIBUTION SKID	18313	0	0.41	0.08	1247	33529	0.909	1.142
400BBL TANK	18878	154221	0.41	0.08	11781	180964	11.210	15.904

NOTES:

1. SNOW, WIND, AND SEISMIC LOADS ARE BASED ON THE LOCATION OF NORMAN WELLS, NWT.
2. SNOW, WIND, AND SEISMIC LOADS ARE BASED ON THE IMPORTANCE CATEGORY OF POST DISASTER AS DEFINED BY NBCC.
3. SEISMIC LOADS WERE CALCULATED USING THE WEIGHT OF THE SUM OF THE DEAD AND LIVE LOADS FOR EACH SKID OR 400BBL TANK.
4. LIMIT STATE DESIGN USES FIVE DIFFERENT COMBINATIONS TO DETERMINE THE WORST CASE OR MAXIMUM LOAD TO BE USED.

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FEB. 10/14	KDM	JM/PS	IFC

DRAWING:
136-1-1A2-D08

HUSKY PROJECT:
SLATER RIVER

DESCRIPTION:
SUMMARY OF LOADS

Husky Energy

BANNER
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SCALE: 1:125 | SIZE: B | PAGE 8 OF 8