

Reverse Osmosis for C&D Leachate Treatment

Case Study at Interlachen Blue C&D Disposal Facility

Mike Fernandez, Waste Pro of Florida, Inc.

Pradeep Jain, Sustainable Landfill Solutions

Jim Wally, Sustainable Landfill Solutions



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— SINCE 2001 —

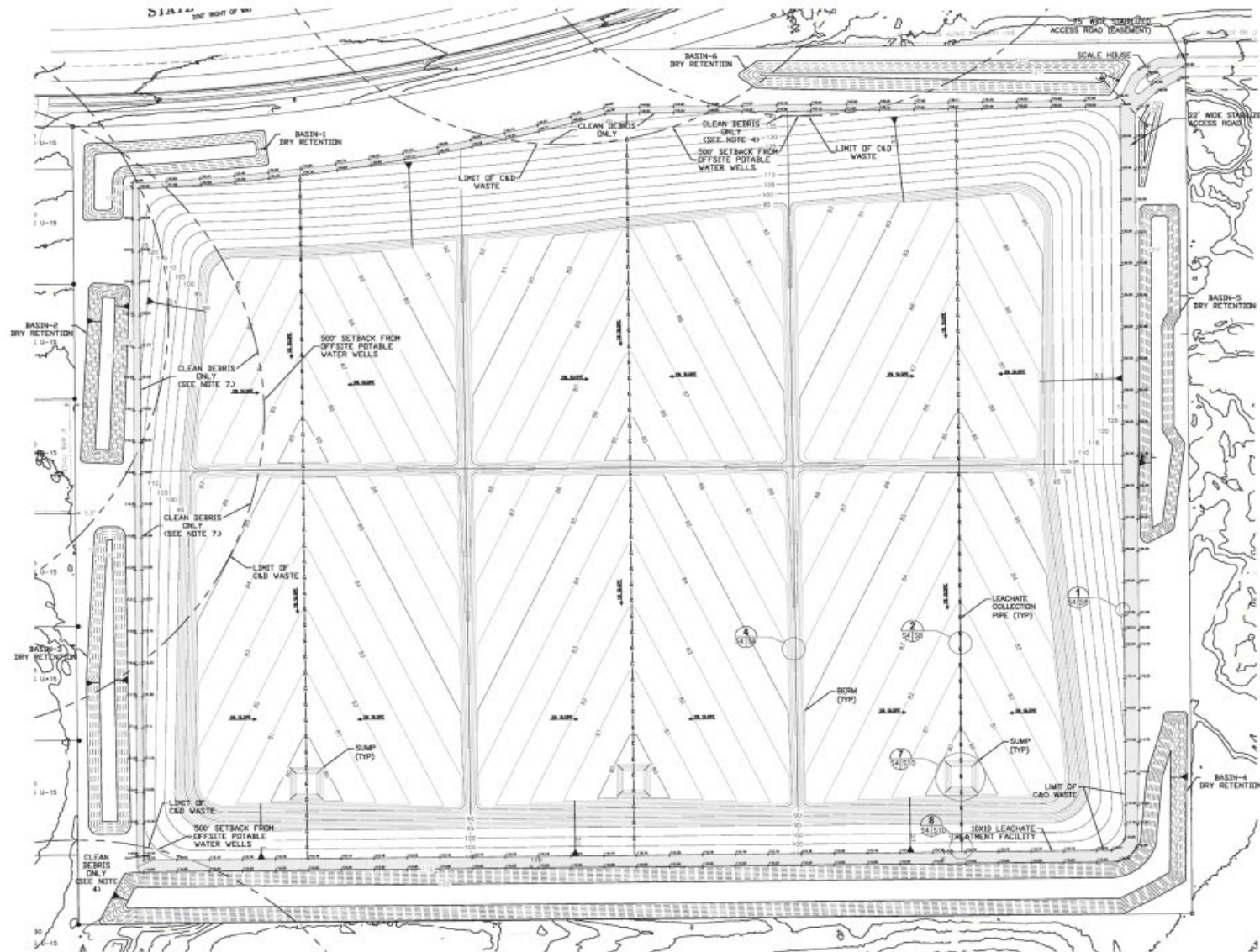
Background

- ▶ C&D Leachate and Florida
- ▶ Interlachen Blue C&D Disposal Facility
 - ▶ Site Background
 - ▶ Onsite Leachate Management Challenges
 - ▶ Scaling challenges
 - ▶ Capacity limitations
 - ▶ Permeate disposal
 - ▶ Brine disposal



Subgrade Grading Plan

ANY MODIFICATIONS TO THESE PLANS OR RE-USE OF THESE PLANS MUST BE APPROVED BY AND SIGNED BY THE ENGINEER.



GENERAL NOTES

1. COMPACT SUBGRADE TO A MINIMUM OF 95 PERCENT OF THE MODIFIED PROCTOR (ASTM D 1557) MAXIMUM DRY DENSITY.
2. INSTALL HDPE GEOMEMBRANE WITH A MINIMUM AVERAGE THICKNESS OF 60 MILS (DRI 6M13).
3. THIS SITE PLAN IS A GENERAL REPRESENTATION OF PROPOSED PLAN OF DEVELOPMENT AND MAY BE IMPACTED BY THE REQUIREMENTS OF FDEP OR OTHER JURISDICTIONS.
4. SUBGRADE TO CONSIST OF CLEAN, SUITABLE MATERIAL NOT CONTAINING ANY SIGNIFICANT AMOUNT OF ORGANIC SUBSTANCES (LESS THAN 2% BY WEIGHT) OR OTHER DELETERIOUS MATERIALS.
5. PROTECT THE LINER FROM PUNCTURE OR TEARS. DO NOT INSTALL LINER WITH FURNITURES OR TEARS.
6. SEAL LINER SEAMS IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. LINER SEAMS MUST BE INTERLOCKED.
7. CLEAN DEBRIS AS DEFINED BY CHAPTER 62-701.200 (15) F.A.C. MEMO: ANY SOLID WASTE THAT IS VIRTUALLY INERT, IS NOT A POLLUTION HAZARD TO GROUND WATER OR SURFACE WATERS, IS NOT A FIRE HAZARD, AND IS UNSUITABLE TO RETURN ITS PHYSICAL AND CHEMICAL STRUCTURE UNDER EXPECTED CONDITIONS OF DISPOSAL OR USE. THE TERM INCLUDES BRICK, GLASS, CERAMICS, AND UNCONTAMINATED CONCRETE INCLUDING EMBEDDED PIPE OR STEEL.

LEGEND

PROPERTY LINE	_____
ROAD	_____
WATER BODIES	_____
WATER CONTOUR	_____
CELL BOUNDARY	_____
DISPOSAL BOUNDARY	_____

John J. [Signature]
4-30-21



SIGNED AND SEALED BY:

PERMIT DRAWING - NOT FOR CONSTRUCTION

Rev No	Description	Date	Activity	Initials	Date
			Designed By:	CEL	4/2021
			Drawn By:	CEL	4/2021
			Checked By:		

NOVA ENVIRONMENTAL

12917 WATER POINT BLVD., SUITE 100
PHOENIX, AZ 85027-4511
WINDYBROOK, FLORIDA 34786

INTERLACHEN BLUE C&D FACILITY

WASTE PRO OF FLORIDA, INC.

PROJECT

FILE

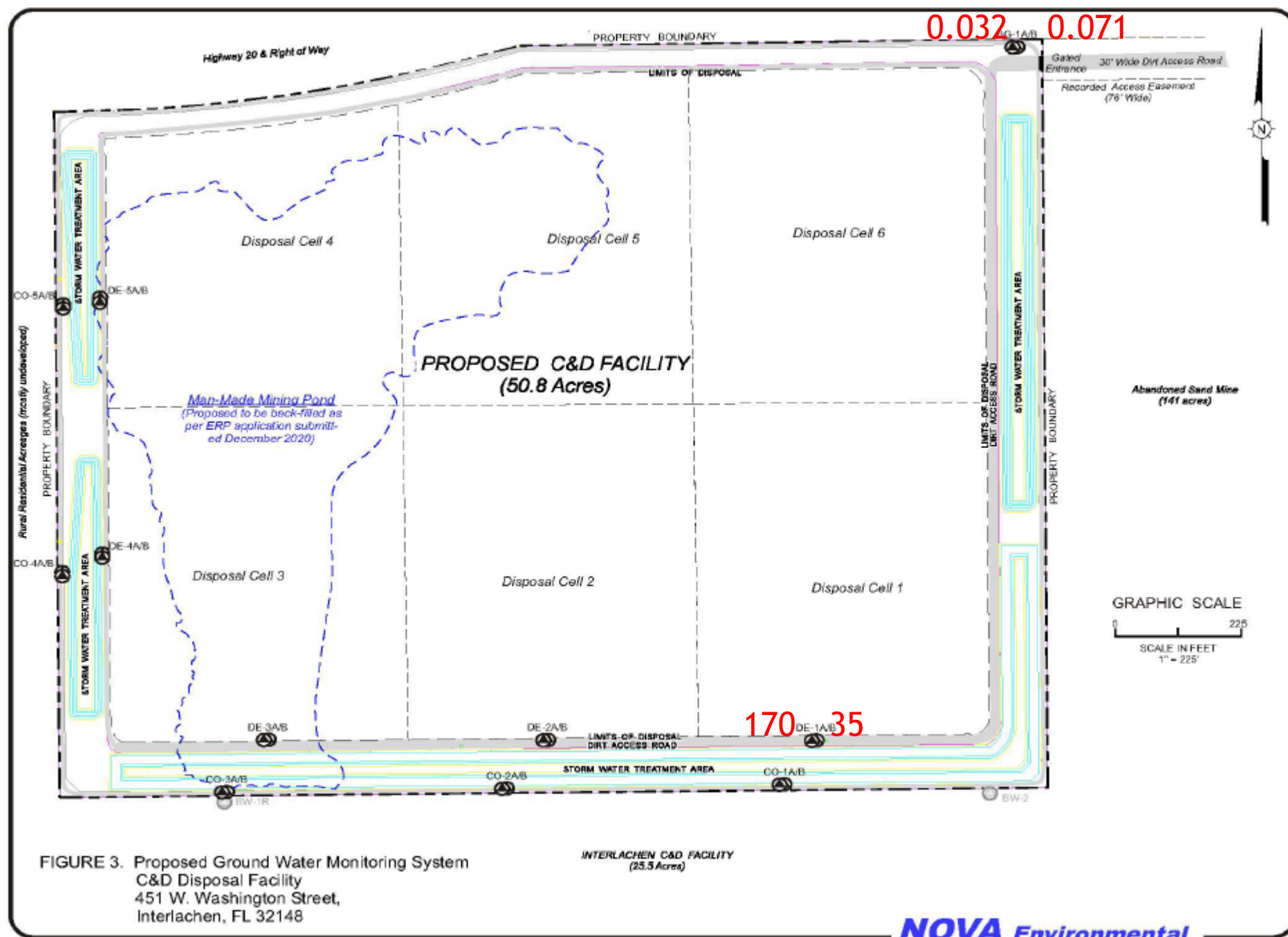
DATE

10/26/21

SUBGRADE GRADING PLAN

SHEET NO.

1 OF 12



C&D Leachate

- ▶ Leachate generated from C&D cells
- ▶ Previously unlined, new cells generally lined
- ▶ Managing leachate is a new challenge

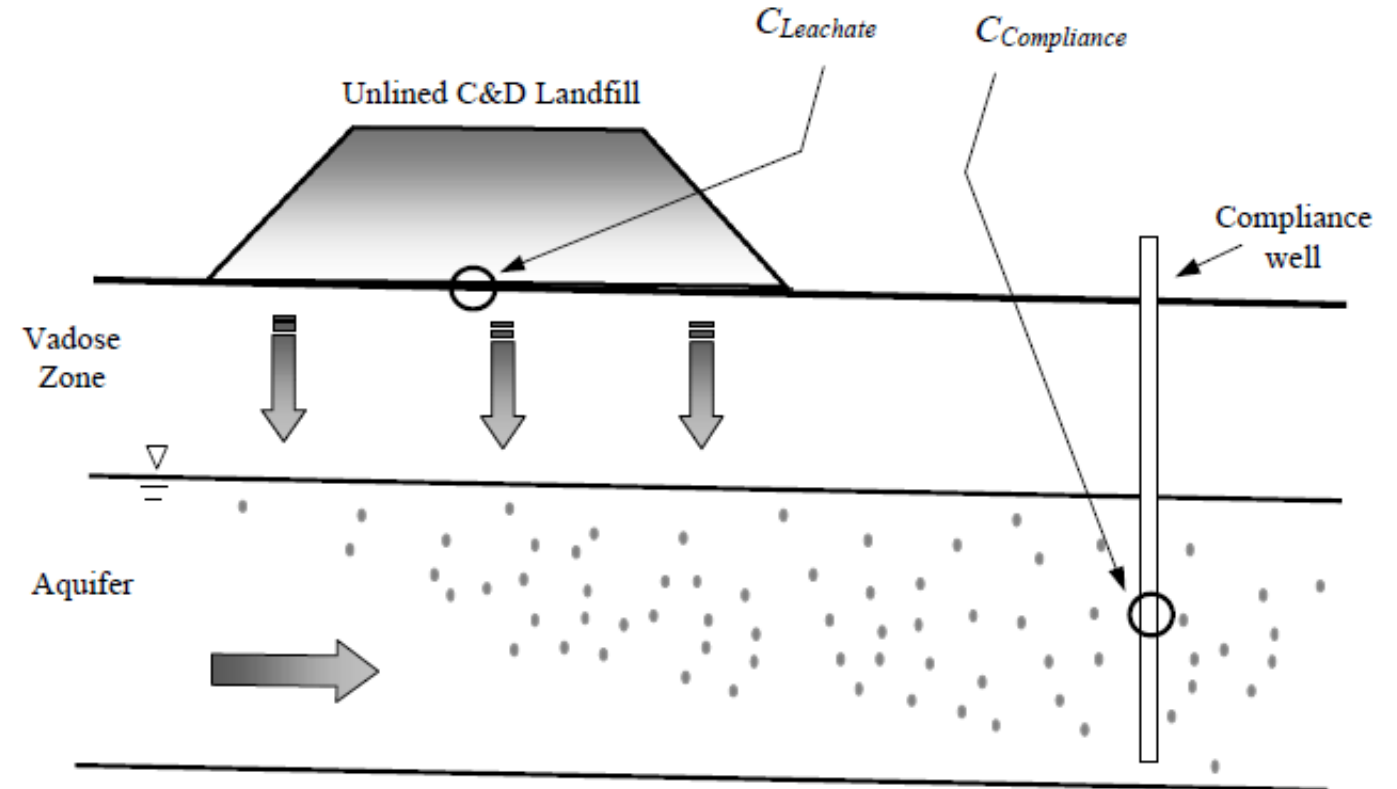


Figure 4-1 Schematic of Pollutant Migration from a C&D Landfill to a Compliance Well

Image from Townsend et al., (2000). Continued Research into the Characteristics of Leachate from Construction and Demolition Waste Landfills. Florida Center for Solid and Hazardous Waste Management Report# 00-04

C&D Leachate

- ▶ Metals, Sulfate, and TDS are primary concern
- ▶ Some VOCs are present
- ▶ Information on characteristics and treatment strategy were limited when management strategies were developed

Table 2-8 Comparison of Test Cell Leachate with Regulatory Standards

Parameters	Drinking Water Standard	Number of Samples	Number Exceeded	Total Average Concentration ^a
Aluminum (µg/L)	200	42	16	284
Arsenic (µg/L)	50	42	12	42.8
Copper (µg/L)	1000	42	1	50.6
Iron (µg/L)	300	42	41	1613
Manganese (µg/L)	50	42	42	425
Sulfate (mg/L)	250	86	86	860
TDS (mg/L)	500	86	86	2,100

a. BDL samples included at a value of one-half the detection limit.

Data from Townsend et al., (2000). Continued Research into the Characteristics of Leachate from Construction and Demolition Waste Landfills. Florida Center for Solid and Hazardous Waste Management Report# 00-04

Leachate Treatment

- ▶ Treatment at a WWTP
 - ▶ Piped directly to plant via force main
 - ▶ Trucked via tanker truck
- ▶ Treatment Onsite
 - ▶ Pre-treat and send to WWTP
 - ▶ Treat and discharge onsite
- ▶ Increasingly difficult to discharge leachate to WWTPs
 - ▶ Chlorine demand
 - ▶ UV disinfection interference

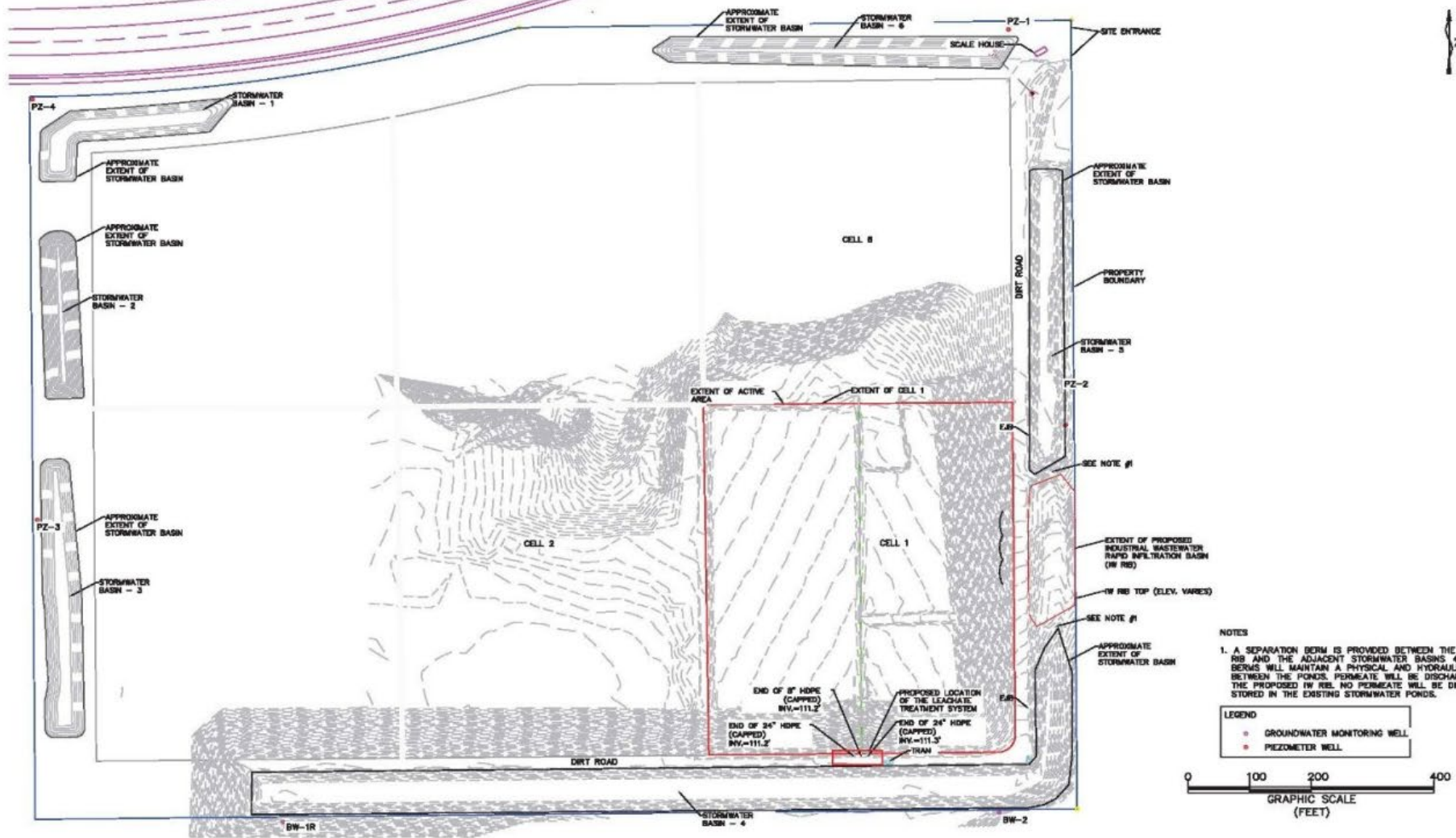


Reverse Osmosis

- ▶ Cost effective
- ▶ History of managing MSW leachate to discharge onsite
- ▶ Relatively untested on C&D leachate





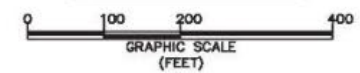


NOTES

1. A SEPARATION BERM IS PROVIDED BETWEEN THE PROPOSED IW RIB AND THE ADJACENT STORMWATER BASINS 4 AND 5. THE BERMS WILL MAINTAIN A PHYSICAL AND HYDRAULIC SEPARATION BETWEEN THE PONDS. PERMEATE WILL BE DISCHARGED ONLY TO THE PROPOSED IW RIB. NO PERMEATE WILL BE DIRECTED TO OR STORED IN THE EXISTING STORMWATER PONDS.

LEGEND

- GROUNDWATER MONITORING WELL
- PIEZOMETER WELL



LTR	DATE	REVISIONS	BY	APPROD.

DESIGNED PJ, JW
 DRAWN AK
 CHECKED PJ, JW

ROBOX
 SUSTAINABLE LANDFILL SOLUTIONS, LLC
 NEWBERRY, FL
 EMAIL: JWALLY@SUSTAINABLELANDFILLS.COM



INTERLACHEN BLUE C&D FACILITY
 451 W. WASHINGTON ST.
 INTERLACHEN, FL



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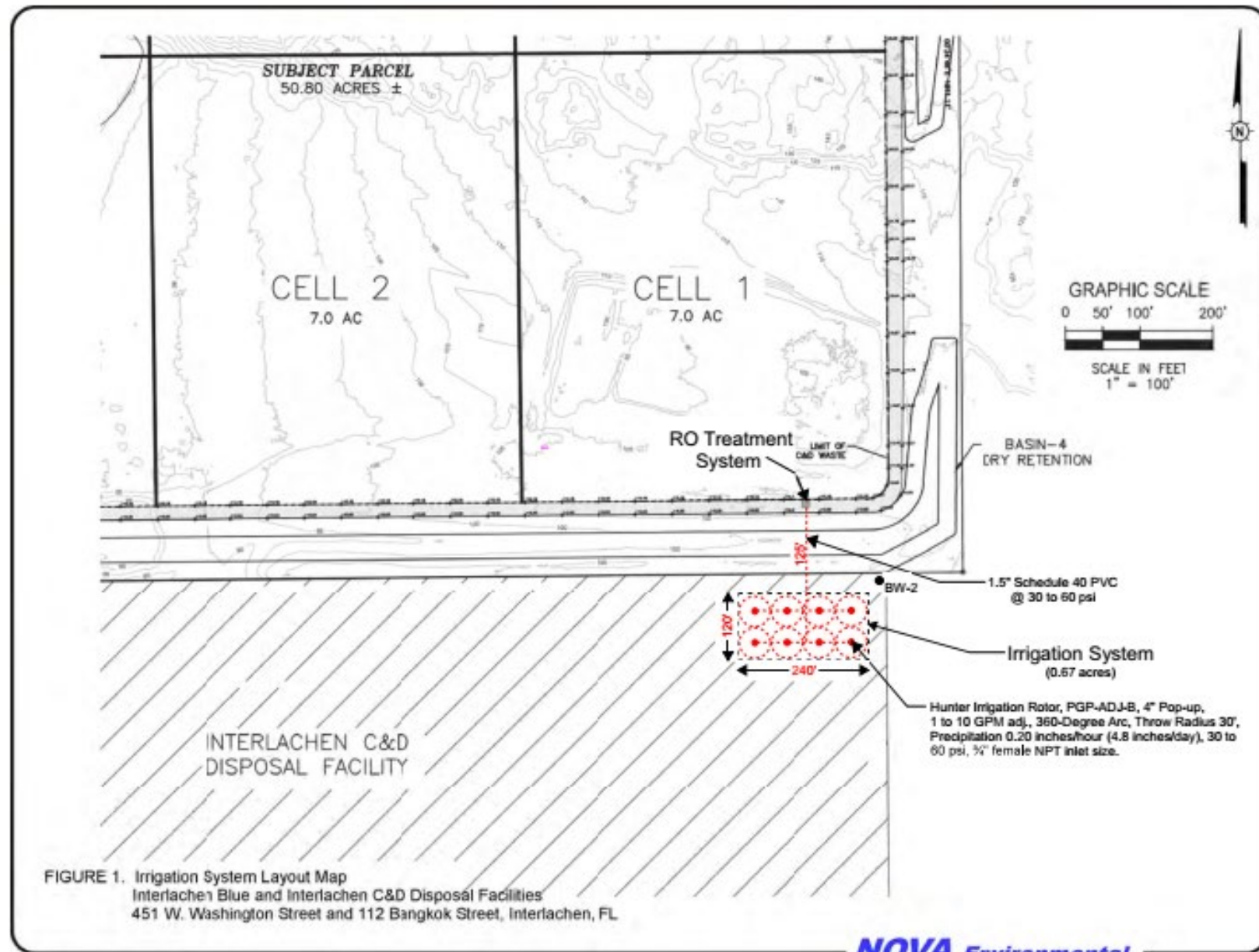
LEACHATE TREATMENT SYSTEM DESIGN DRAWINGS

PROPOSED LOCATION OF THE LEACHATE TREATMENT SYSTEM

DATE: JUNE 2025
 SCALE: AS SHOWN
 DWG NO: 3 OF 7

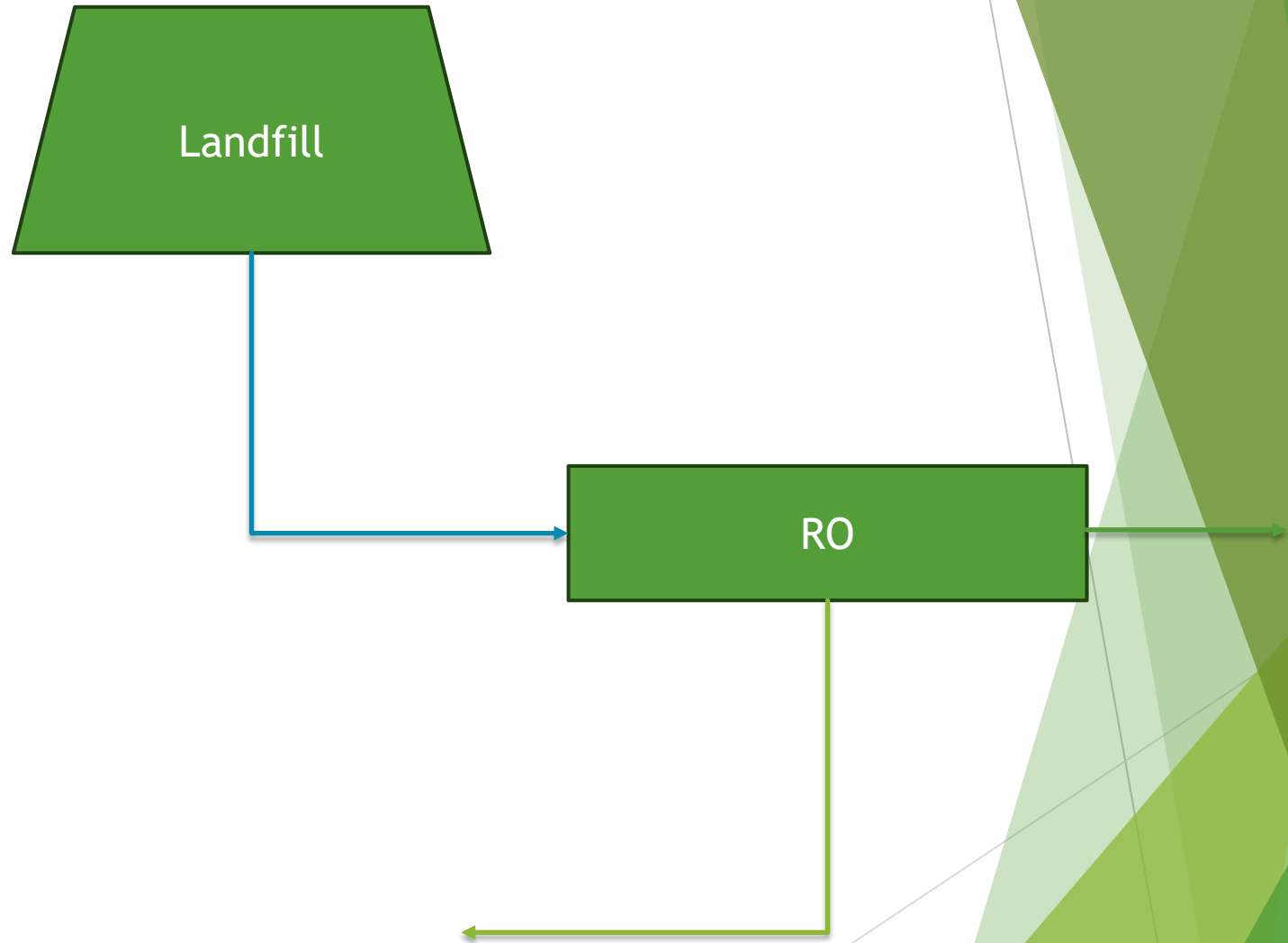
Original leachate treatment system

- RO treatment system
- Treats leachate from Cell 1
- Disposes of treated permeate in adjacent spray field
- Currently permitted for 11,520 gallons per day
- Brine recirculated into Cell 1



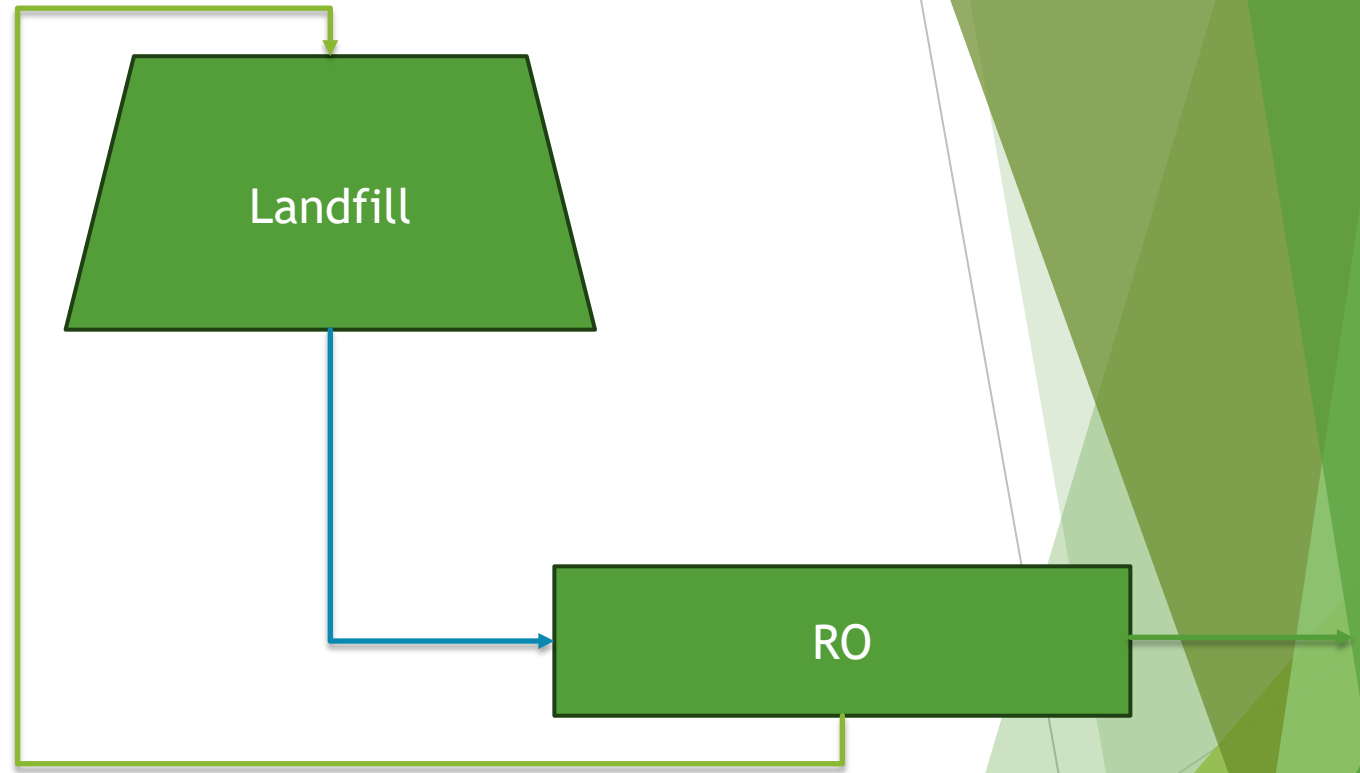
Reverse Osmosis

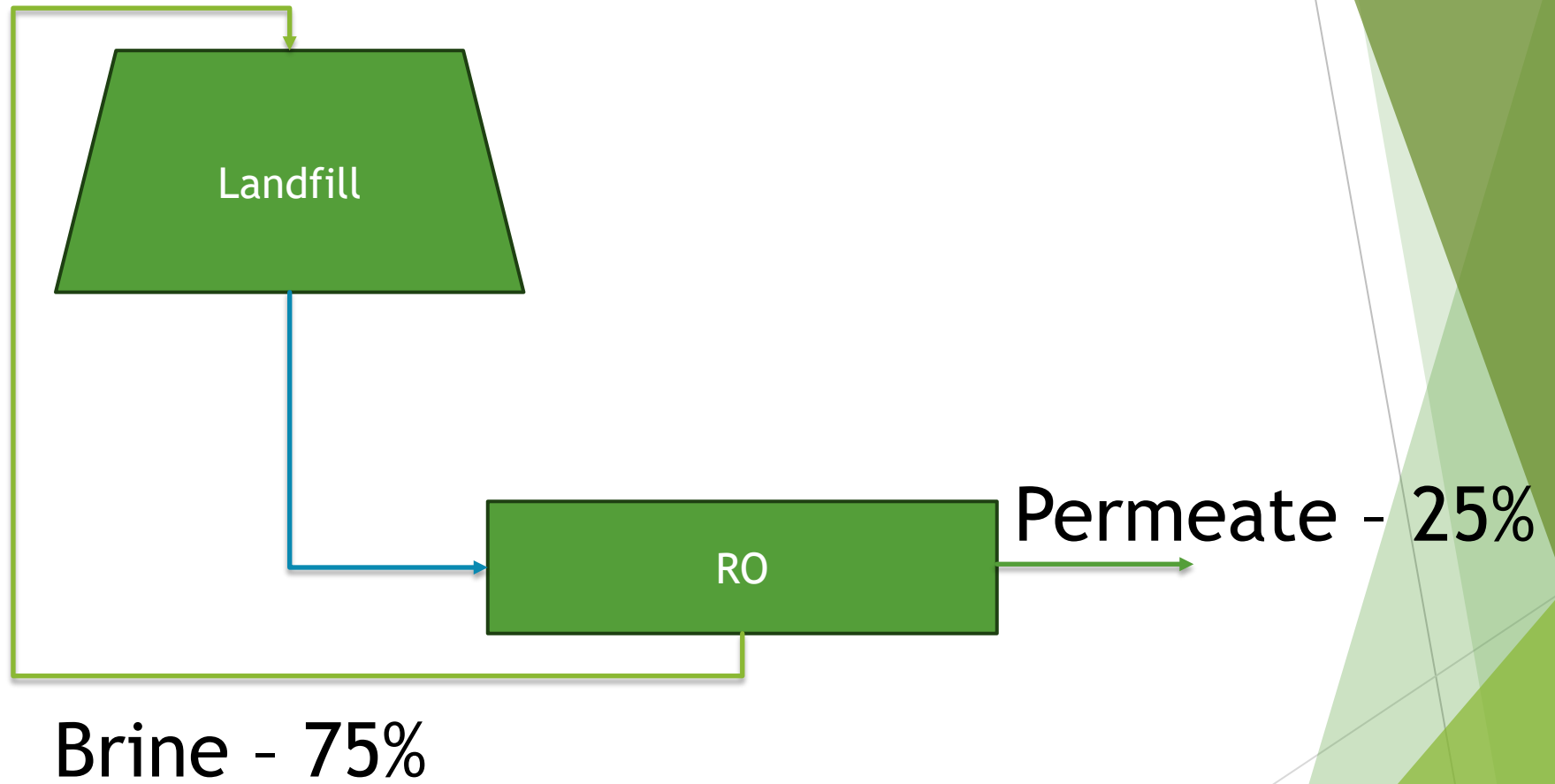
- ▶ Split leachate into two streams
 - ▶ Permeate
 - ▶ Brine



Reverse Osmosis

- ▶ Split leachate into two streams
 - ▶ Permeate
 - ▶ Brine













Challenges summary

- ▶ Downtime + capacity limits not meeting demand
- ▶ Trucking
 - ▶ high cost
 - ▶ Unreliable
- ▶ Low Recovery - When the system was running, it was producing 80% brine, 20% permeate, almost the opposite of the typical ratio
- ▶ Overall, managing the system and trucking when it was off was very costly
- ▶ Before investing in additional systems for new cells, looked for alternative management strategy.



Reverse Osmosis Landfill Leachate Treatment Service

Sustainable Landfill
Solutions

Newberry, Florida



Pilot ROBOX Project

- ▶ PO signed in March 2025
- ▶ System mobilized and operating in March-April 2025



Lab Results

- 13 Parameters exceed GCTL in leachate
- None of those parameters exceed GCTL in 1st stage permeate

Parameter	Unit	Water Quality Standard	Leachate	First Stage Permeate
Aluminum	mg/l	0.2	0.048 U - 0.25 I	0.048 U
Antimony	mg/l	0.006	0.017 - 0.023	0.00041 U
Arsenic	mg/l	0.010	0.280 - 0.360	0.0034 I - 0.0063
Benzene	mg/l	0.001	0.0028 - 0.0039	0.0007 U - 0.001
Benzo[a]anthracene	mg/l	0.00005	0.000041 U - 0.0013	0.000041 U
Chloride	mg/l	250	430 - 1000	19 - 34
Chromium	mg/l	0.1	0.19 - 0.39	0.0017 I - 0.0023
Iron	mg/l	0.3	110 U - 1.2	0.110 U
Manganese	mg/l	0.05	0.098 - 0.17	0.0084 U
Sodium	mg/l	160	0.52 - 0.56	0.033 - 0.04
Sulfate	mg/l	250	710 - 1700	13 - 23
Total Dissolved Solids	mg/l	500	3500 - 4000	190 - 200
Vanadium	mg/l	0.049	0.05 - 0.053	0.00049 U - 0.0053



Parameter not detected

Long term project

- ▶ Increase capacity to handle all 6 cells
- ▶ Increase permeate disposal capacity
- ▶ Increase brine disposal capacity



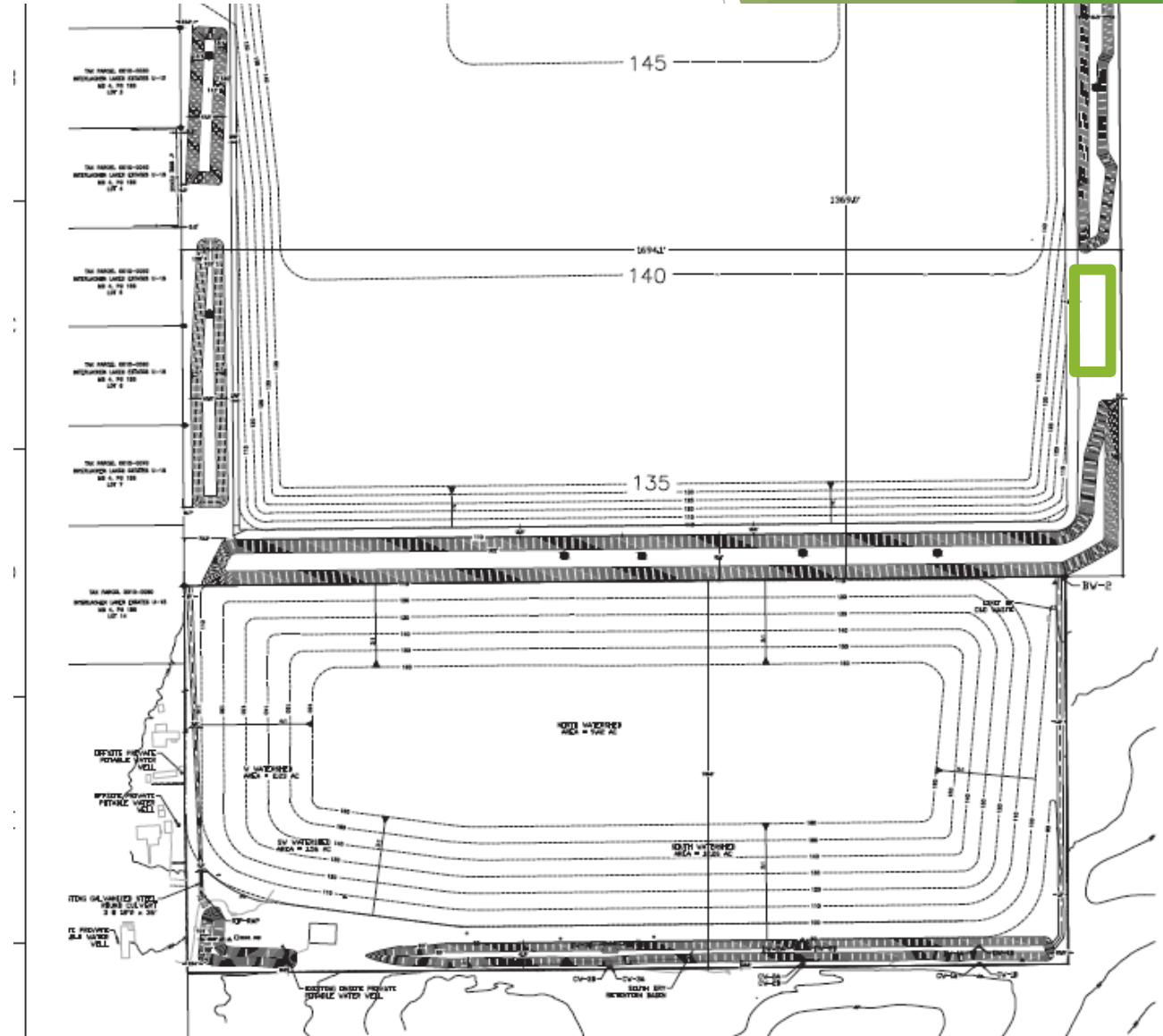


Permeate Management Options

- ▶ Permeate application on the cap of old landfill- **Solid Waste Permit**
 - ▶ Current permit
 - ▶ Alachua County SWLF
- ▶ Treated Leachate Discharge to GW - **IW Permit**
 - ▶ Polk County Landfill- Wetlands Treatment
 - ▶ Enterprise Road Landfill- Aeration



- ▶ <1/2 acre pond provides capacity for up to 50,000 gallons per day of permeate disposal
- ▶ This capacity is anticipated to be sufficient for all 6 cells



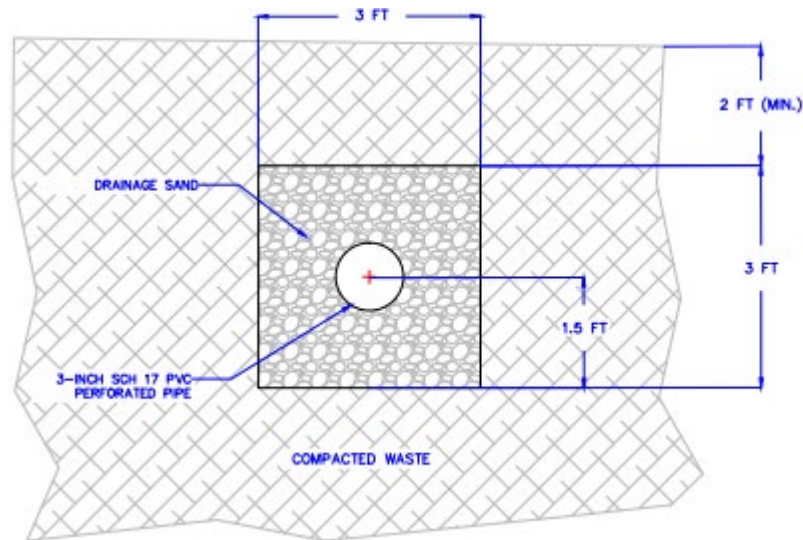




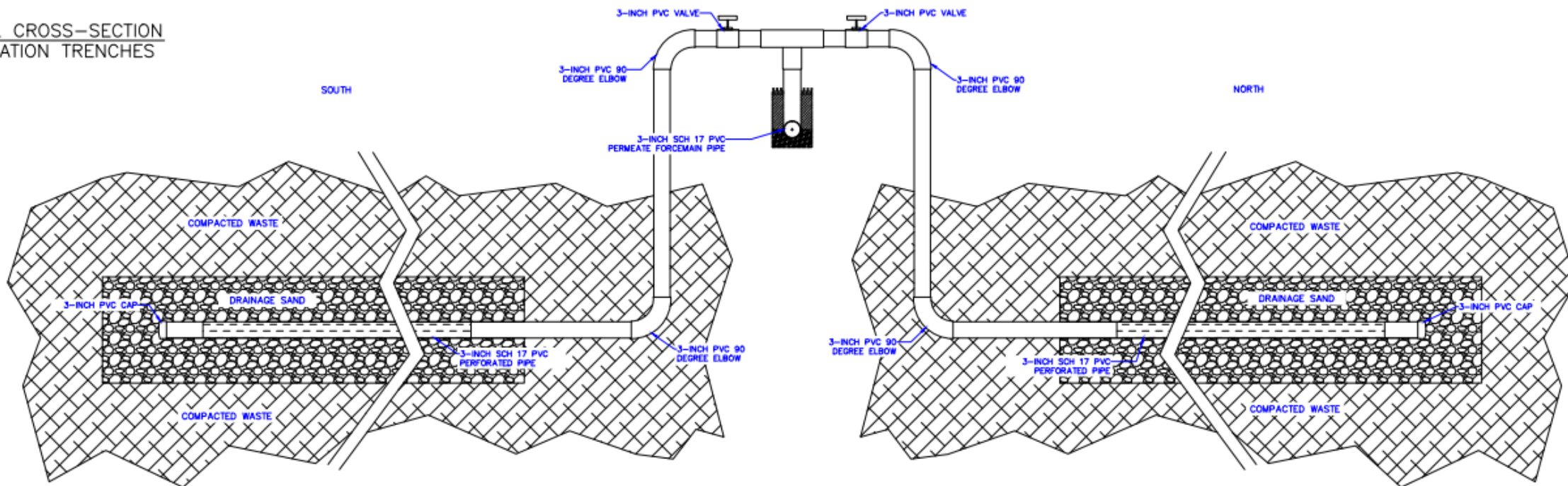


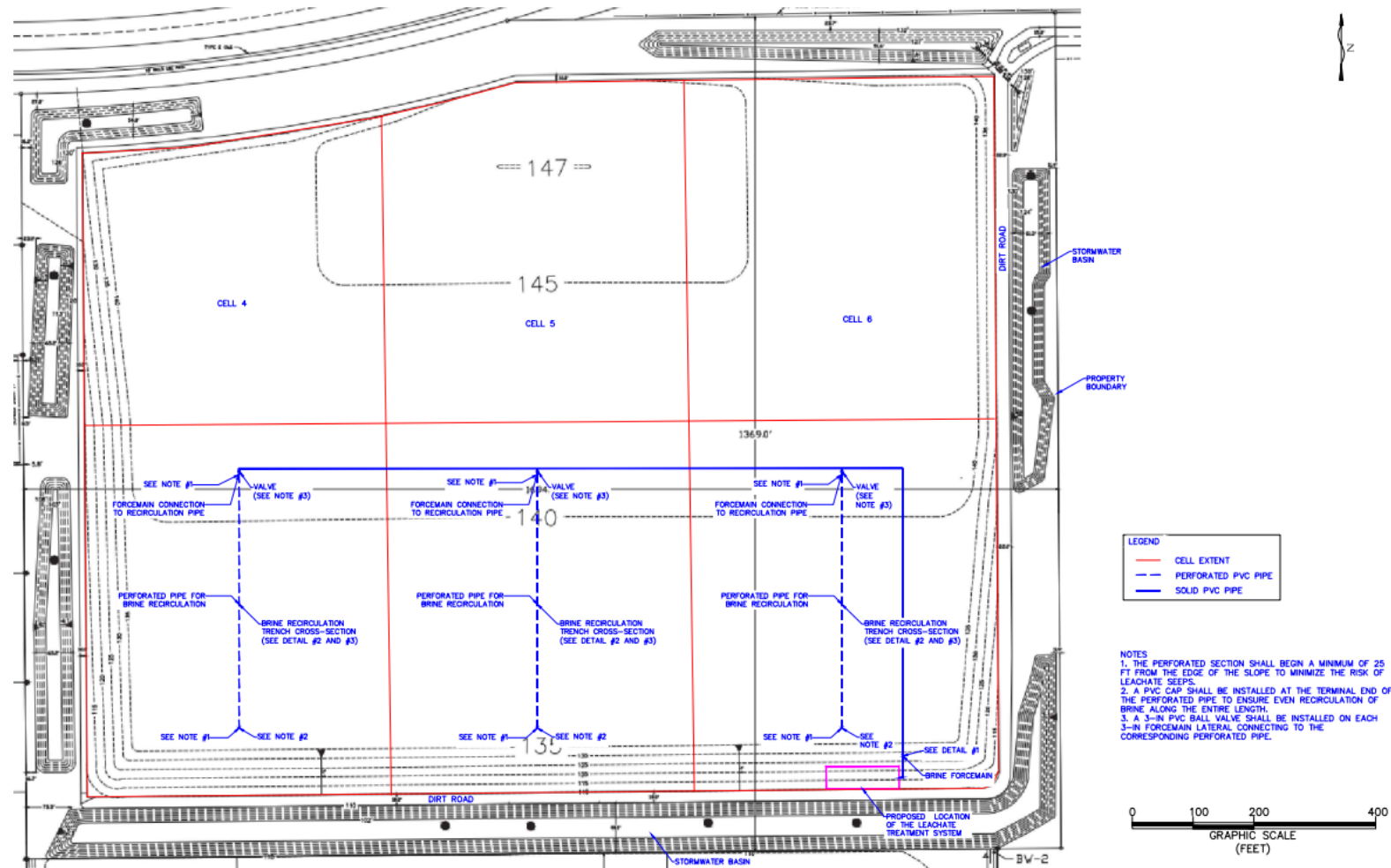
Brine Disposal

Brine disposal



3 LONGITUDINAL CROSS-SECTION
OF RECIRCULATION TRENCHES





LTR	DATE	REVISIONS	BY	APPRD.

DESIGNED **PJ, JW**
DRAWN **AK**
CHECKED **PJ, JW**



SUSTAINABLE LANDFILL
SOLUTIONS, LLC
NEWBERRY, FL
EMAIL:
JWALLY@SUSTAINABLELANDFILLS.COM



INTERLACHEN BLUE
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BRINE RECIRCULATION SYSTEM
DESIGN DRAWINGS

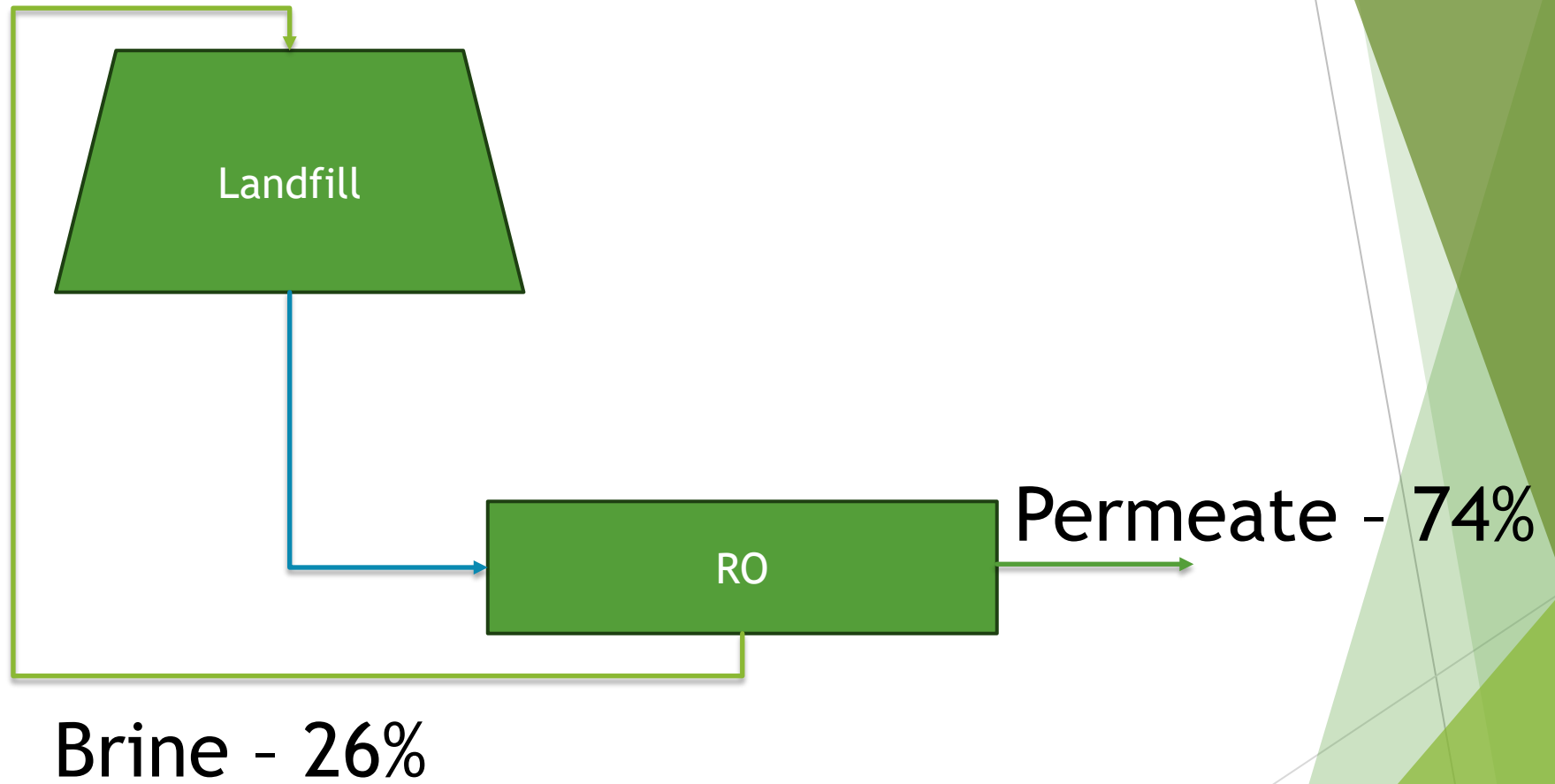
BRINE RECIRCULATION FORCEMAIN
- CELLS 1, 2, AND 3

DATE:
JUNE 2025
SCALE:
AS SHOWN
DWG No:
4 OF 6

Brine Disposal Lessons Learned

- ▶ Perforations and pipe were clear
- ▶ Scale formation on geotextile appears to be the limiting factor
- ▶ Cell 2 lines will be constructed without geotextile





Cost Savings vs Trucking

