

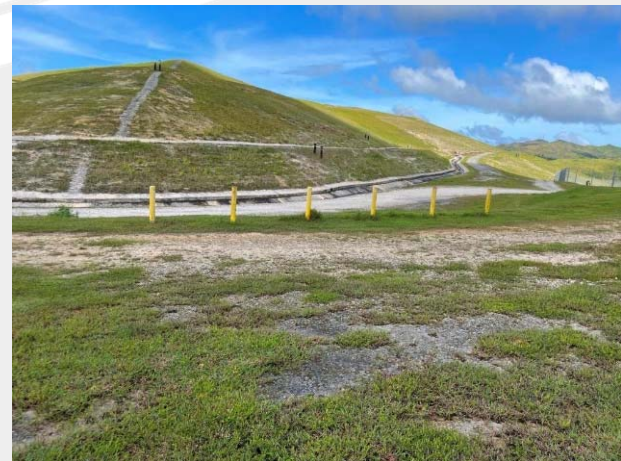
# Ordot Dump Post Closure Facility – Design Overview

November 2023



# Agenda

- Introductions
- Overview of the Team Responsible for the project
- Project Objectives
- Description of Pre-Closure Conditions at Ordot Dump
- Description of Closure Design
- Update on Leachate Flow



# Presenter Introductions

*Alan Kirschner, P.E., Vice President*

Solid Waste National Specialty Leader for Brown and Caldwell; 40+ years of experience in landfill design, investigations and closure; part of Ordot Closure team since 2011.



*Gregory Christians, P.G., Principal Hydrogeologist*

30+ years of experience in hydrogeologic and groundwater investigations for landfill design and closure; part of Ordot Closure team since 2011.





# Overview of the Team Responsible for the project



# Project Team



Established 1947, 100% environmental consulting, engineering, construction and OMM company, 2,000 employees, 50 offices (including Hagatna), projects completed at more than 100 landfills



Established 1928, global multi-disciplinary professional services firm with offices on 5 continents, Tamuning office, hundreds of landfill projects including closure of Puerto Rico Dump on Saipan



Established 1991, multi-disciplinary environmental and geotechnical engineering firm, projects completed at 300 landfills including closure of Puerto Rico Dump on Saipan

**Supported by Recognized Industry Experts:** Dr. J.P. Giroud – International pioneer in using geosynthetic materials in landfills and Richard Thiel – Recognized authority in cover systems design

**Additional Support by Local Firms:** Prudencio R. Balagtas & Assoc. Inc., Marianas Drilling, ARC Environmental, SWCA Environmental, AMPRO and M.E. Labs

# Key Stakeholders – Design Review and Oversight

- US Environmental Protection Agency
- US Army Corps of Engineers
- Guam Environmental Protection Agency
- Guam Department of Public Works
- Guam Department of Land Management

# Project Objectives



# Objective – Closure of Ordot Dump and Cessation of Unpermitted Discharges of Pollutants into the Waters of the US (Lonfit River)

*Section IV of the Consent Decree Required a Closure Plan to achieve the following:*

- Design of cover system including methods and procedures to be used to install the cover system and operational plans to implement measures to cease discharge of pollutants to the Waters of the US
- Design of perimeter surface water diversion system



# Objective – Closure of Ordot Dump and Cessation of Unpermitted Discharges of Pollutants into the Waters of the US (Lonfit River)

*Design provides the following to address Consent Decree:*

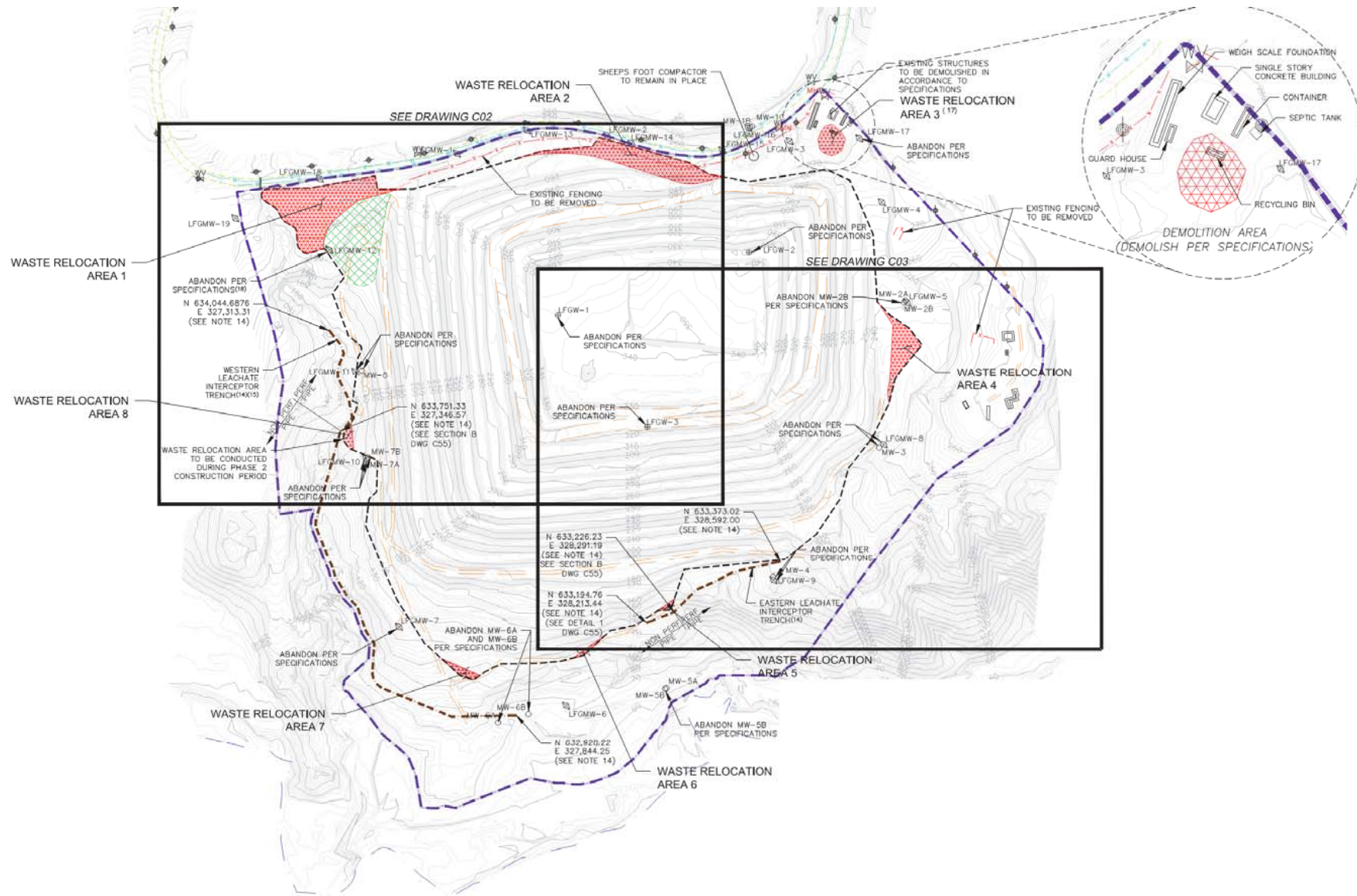
- Multi-layered cover system to cease the pre-closure rainwater infiltration that resulted in leachate seeps
- Leachate collection and removal system to manage leachate from the waste and to capture leachate impacted groundwater/seeps
- Surface water diversion system to capture and manage run-off from the cover system through four stormwater ponds



# Description of Pre-Closure Conditions at Ordot Dump



# Pre-Closure Conditions



# Pre-Closure Conditions (looking southwest - circa 2011)





# Pre-Closure Conditions (looking north - circa 2012)





# Pre-Closure Conditions (2011)





# Pre-Closure Conditions (2011)



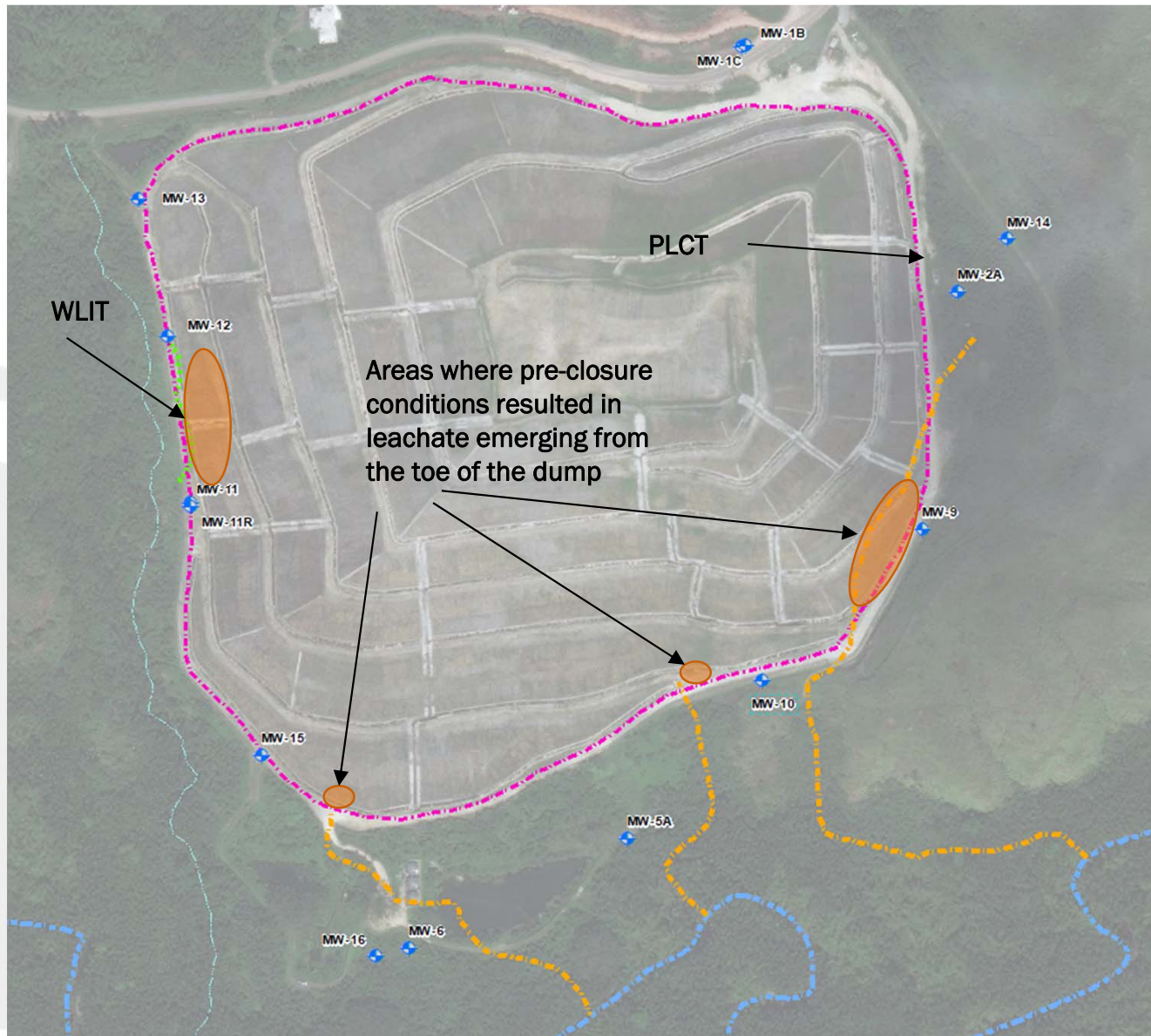


# Pre-Closure Conditions (2011)



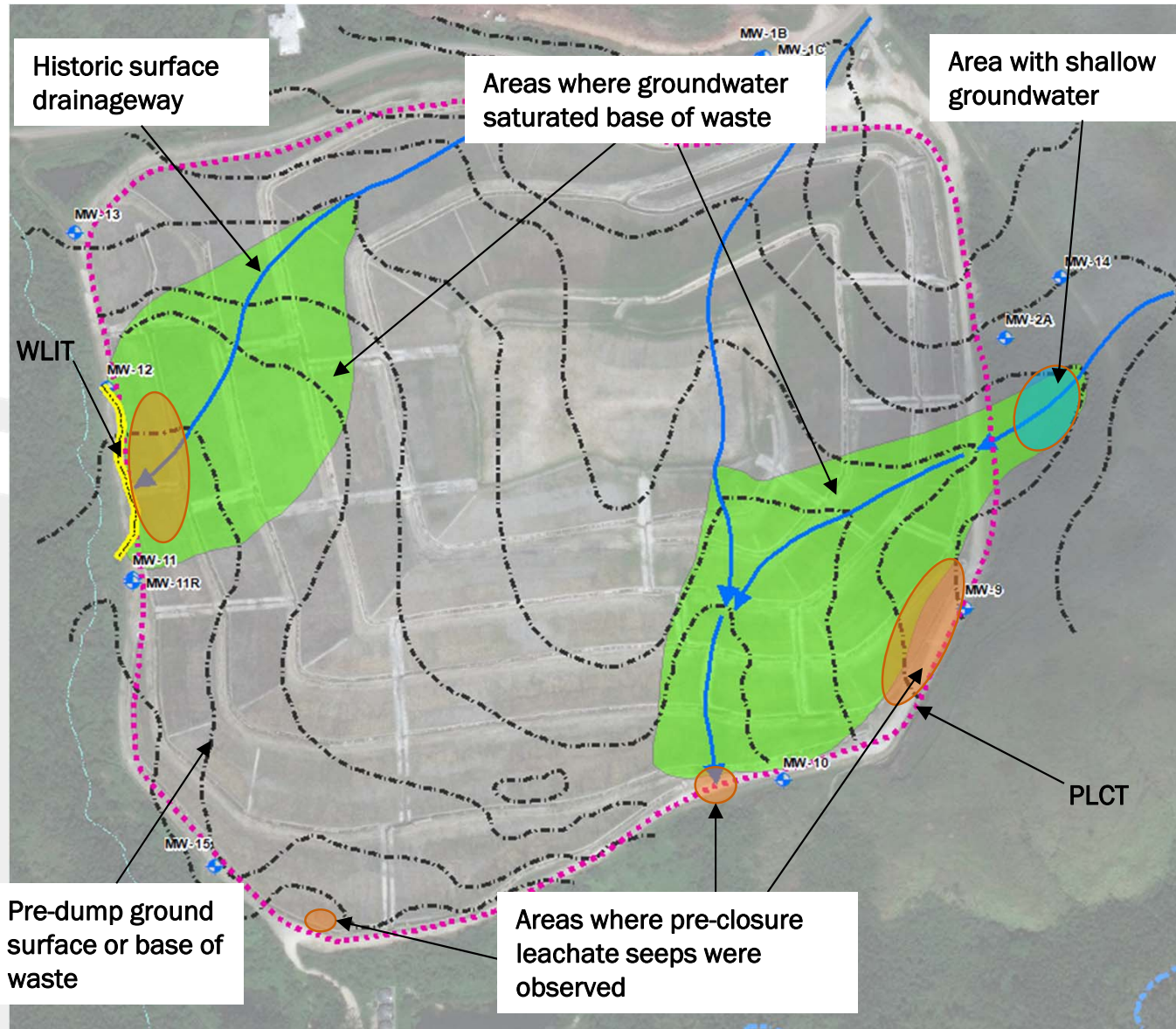


# Design Addresses Historic Leachate Flows



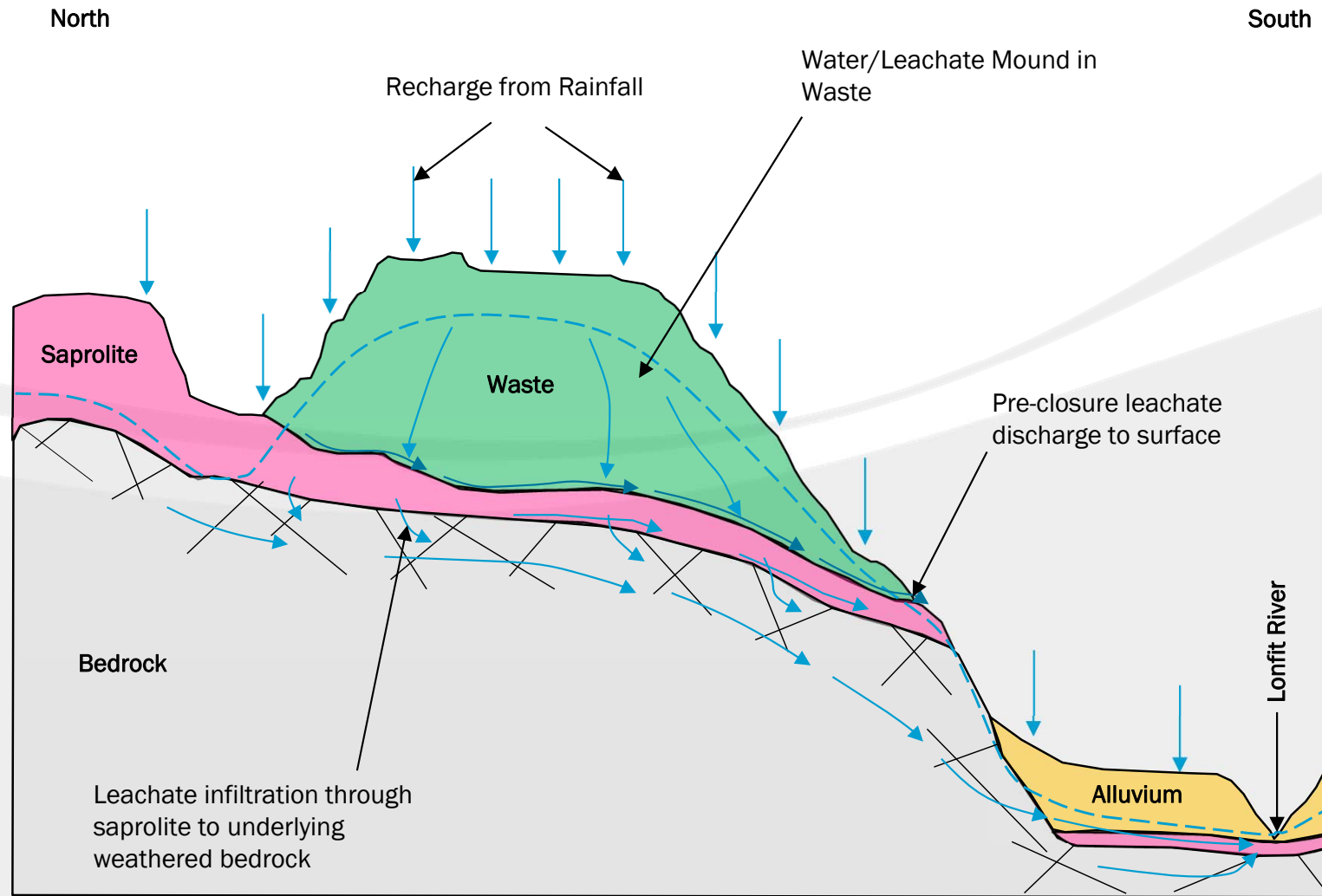
- Cover system has eliminated infiltration of rainfall into the waste
- Cover system manages surface water run-off
- The Perimeter Leachate Collection Trench (PLCT) and Western Leachate Interceptor Trench (WLIT) intercept all leachate/seeps observed emerging from the dump during pre-closure conditions
- Leachate surface seep drains were installed at several locations on side slopes

# Design Addresses Areas Leachate Seeps and Where Groundwater Saturated Waste



- The PLCT was designed to intercept leachate seeps and leachate impacted groundwater along the southern perimeter
- The WLIT was designed to intercept shallow leachate/groundwater to intercept the western leachate seeps

# Ordot Dump Pre-Closure Conditions





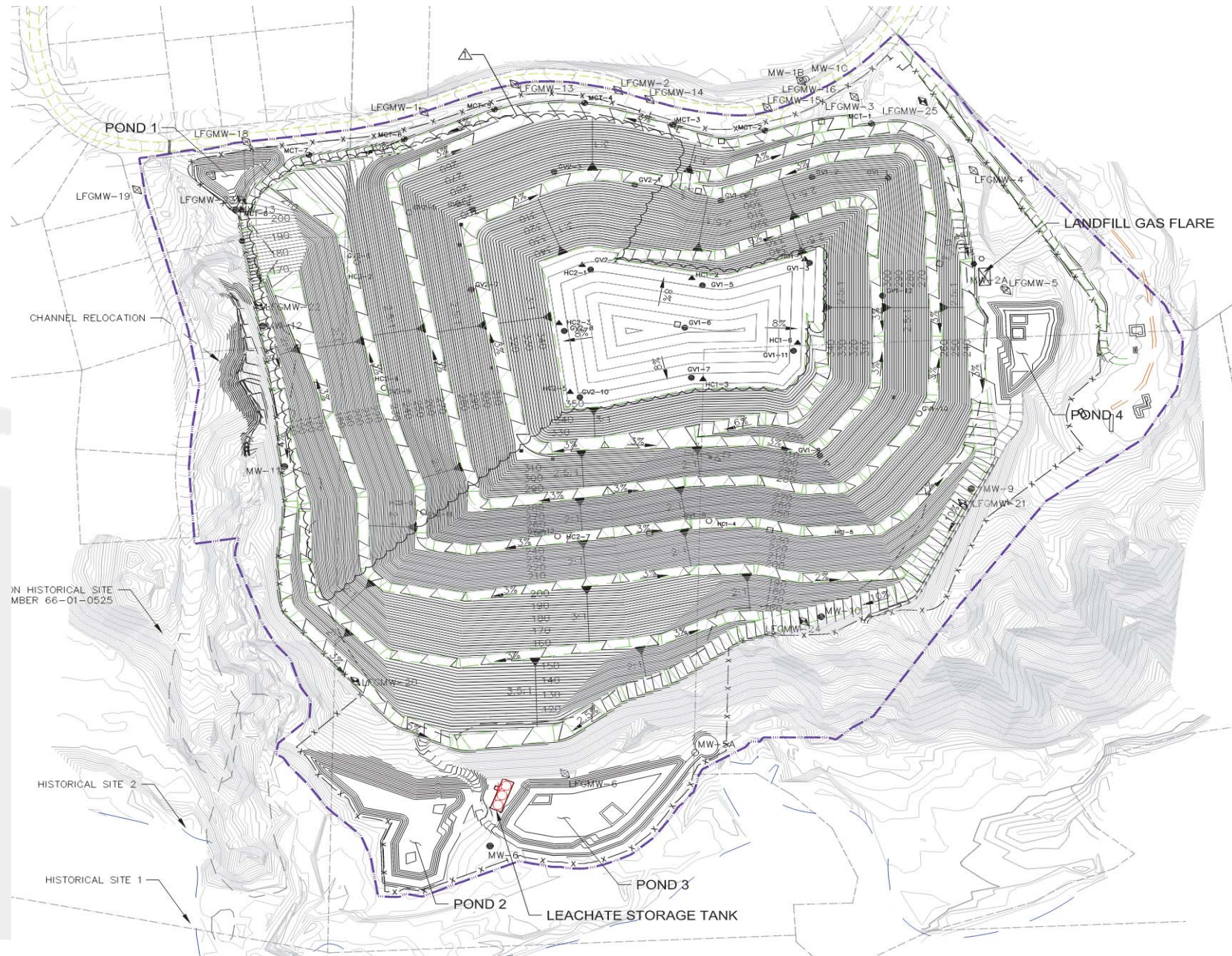
# Description of Closure Design



# Design Regulations and Reviews

- Guam Environmental Protection Agency (GEPA) Solid Waste Disposal Regulations, Title 22, Division 4, Chapter 23
- GEPA Guam Air Pollution Control Standards and Regulations
- CNMI and Guam Stormwater Management Manual
- U.S. Army Corps of Engineers – Nationwide Permit
- U.S. Environmental Protection Agency – MSGP Permit for Stormwater Discharge

# Final Cover Plan



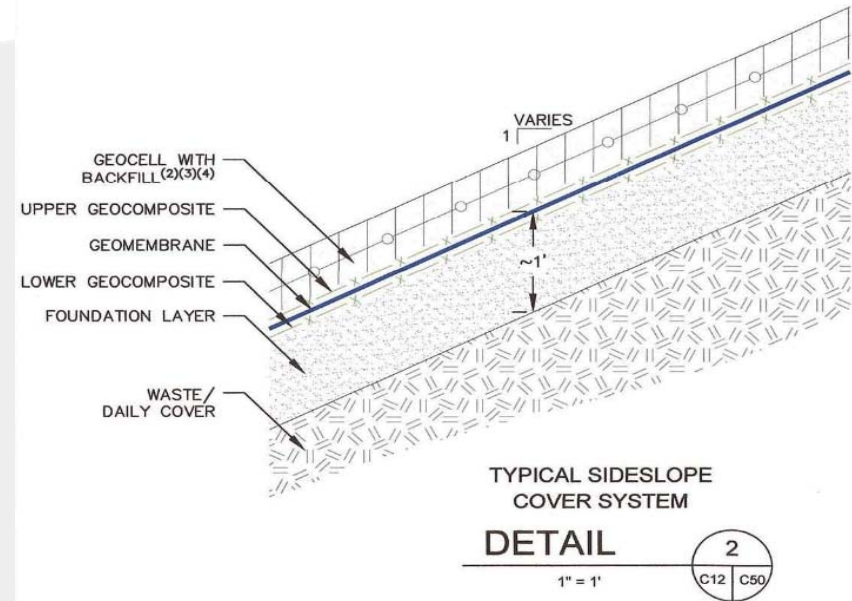
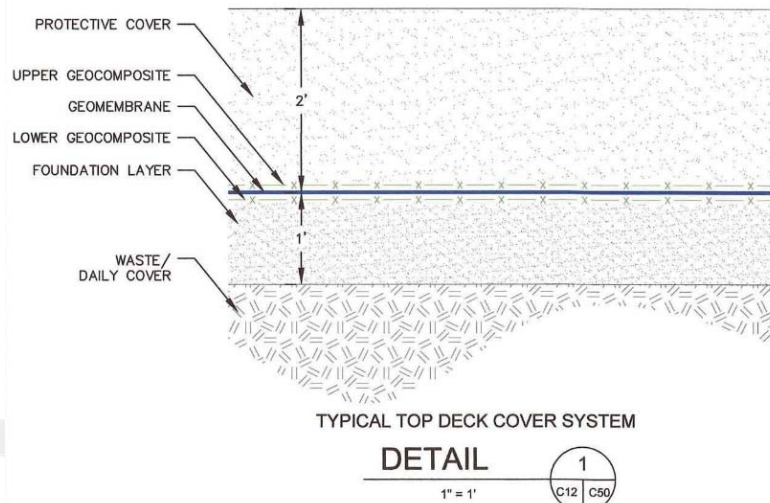


# Final Cover Image (circa 2021)



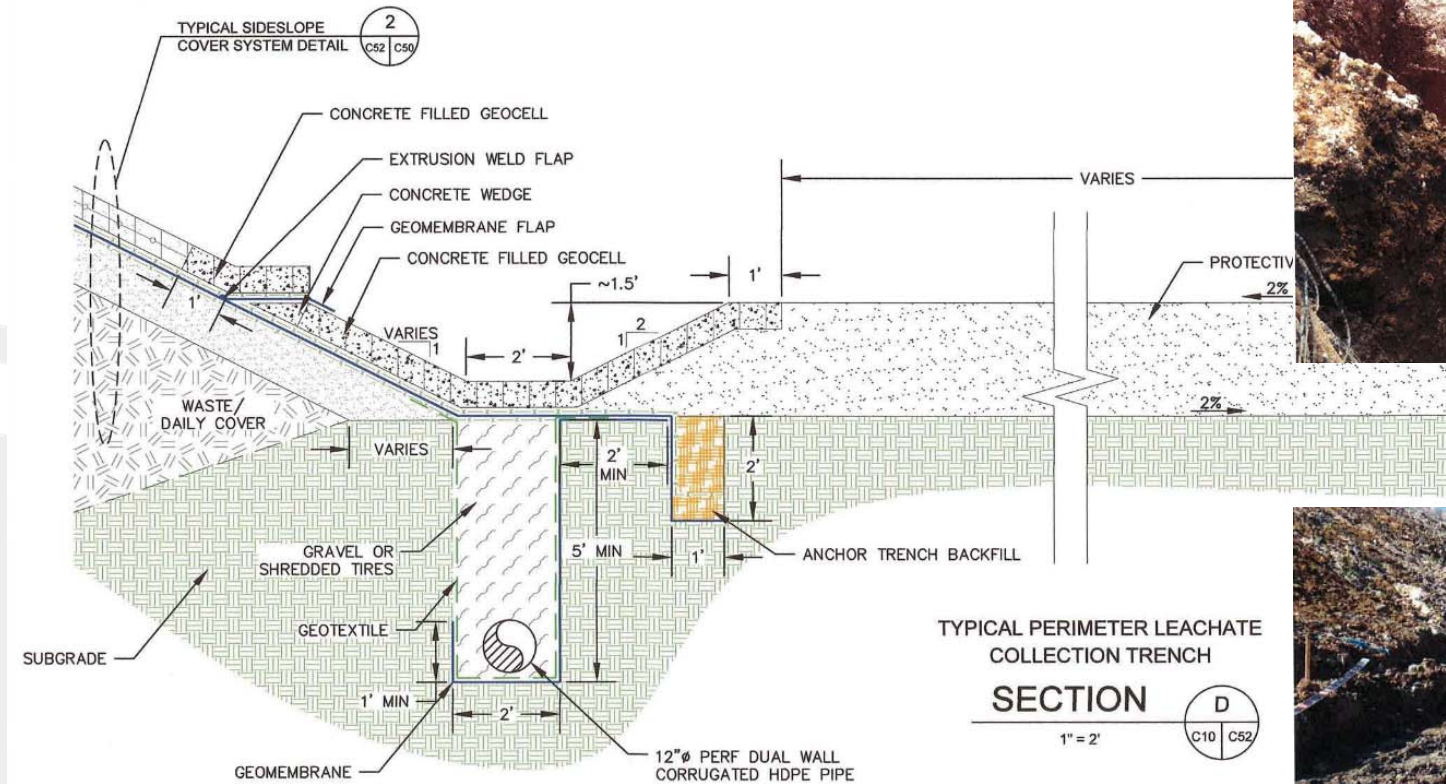


# Multi-Layered Low Permeability Capping System

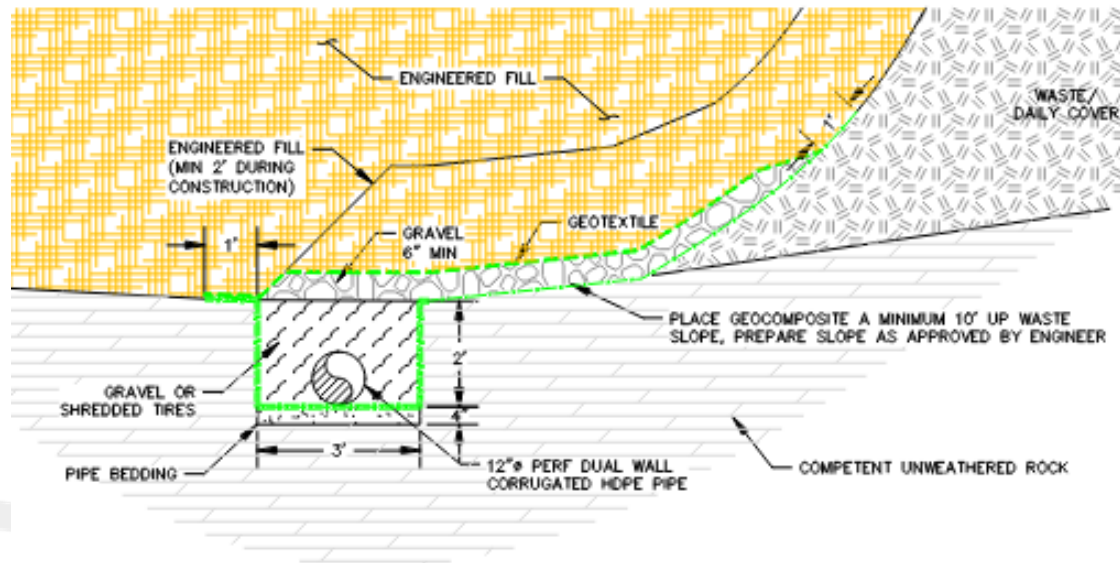




# Perimeter Leachate Collection Trench (PLCT)

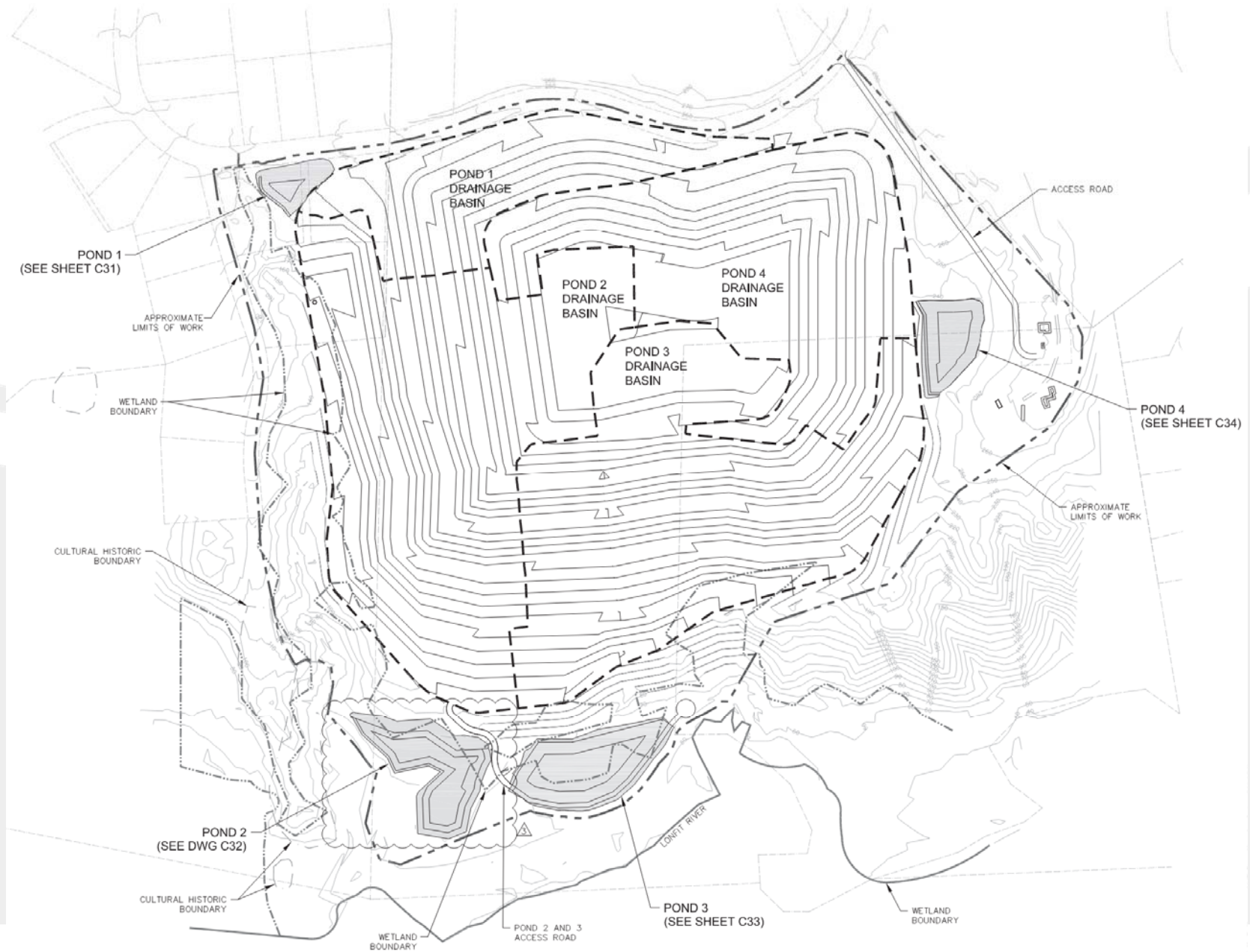


# Western Leachate Interceptor Trench (WLIT)



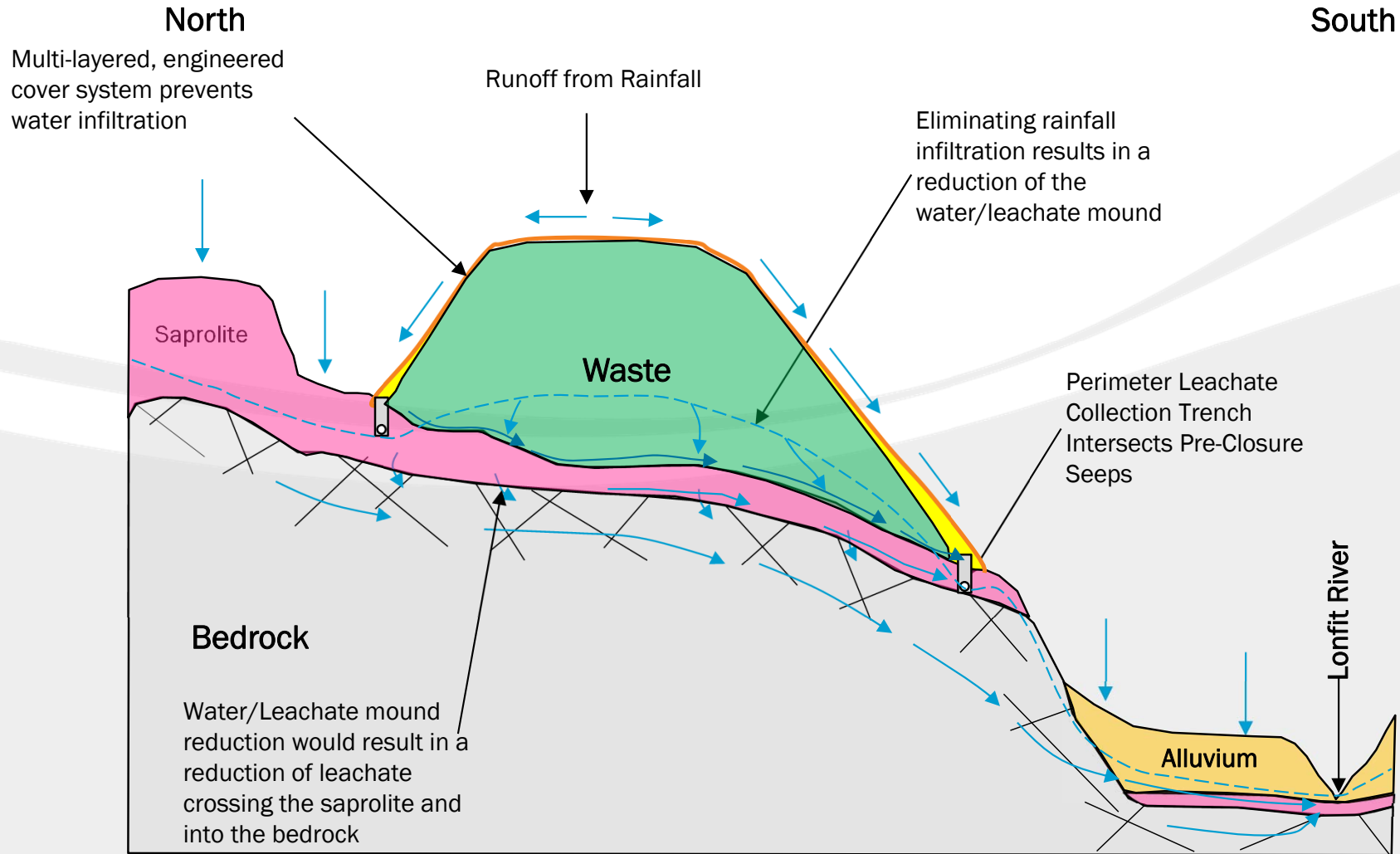


# Stormwater Management

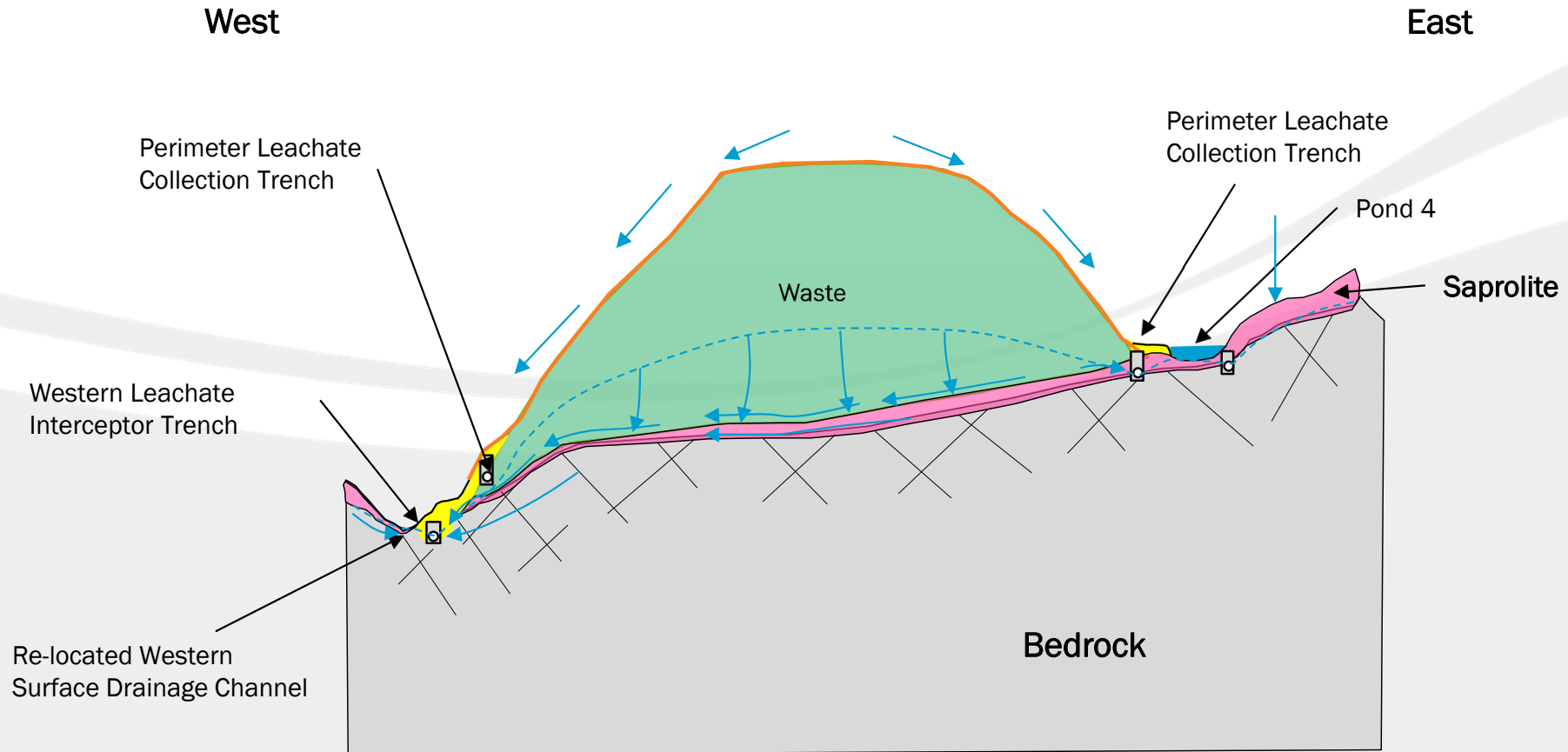




# Ordot Dump Post-Closure Conditions



# Ordot Dump Post-Closure Conditions





# Ordot Dump Comparison to Layon Municipal Sanitary Landfill

- Ordot Closure Facility
  - Unlined dump with waste placement directly on the ground surface
  - Perimeter leachate collection systems (PLCT and WLIT) capture leachate AND groundwater impacted by leachate
  - This design is more cost effective than removing all waste to a new facility
  - Design developed in consultation and under oversight of GEPA and USEPA

- Layon Municipal Landfill
  - Double liner with leak detection and secondary leachate collection (see Fig. 1 below).
  - High groundwater levels required a sub-drain system for groundwater collection under the liner to prevent groundwater flow into the waste.
  - Groundwater is physically prevented from entering the leachate collection system.

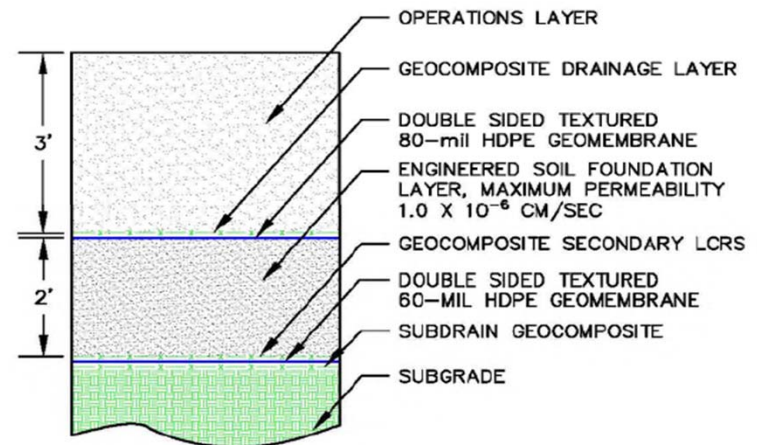


Figure 1 - Layon Liner System

# USEPA Comment in the Acceptance of Ordot Dump Closure Completion (May 12, 2017)

The Receiver has done a tremendous job in ensuring the proper design and construction of the closure of the Ordot Landfill Superfund Site. The Receiver, on behalf of the Government of Guam, has set a compliant and thorough precedent and model for other landfill closures on Guam, including for the two military landfills at AAFB and the Navy Base. The residents of Ordot Chalan-Pago and Guam have waited decades for the closure of the Ordot Landfill Superfund Site, and deserve decisions and actions that are taken in the best interest of their island community, and that ensure the protection of their health and environment. We commend the Receiver on its results.

Sincerely,

A handwritten signature in black ink, appearing to read 'Karen Ueno', with a long horizontal flourish extending to the right.

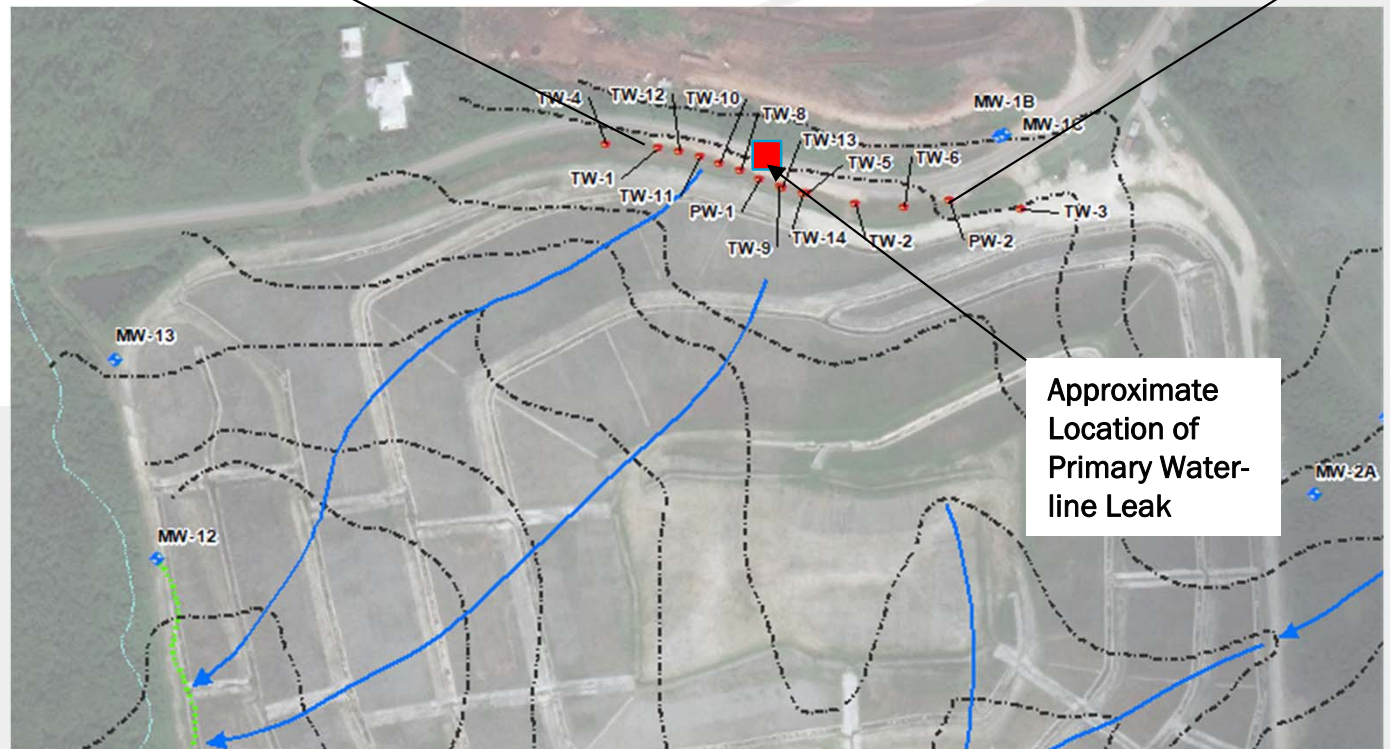
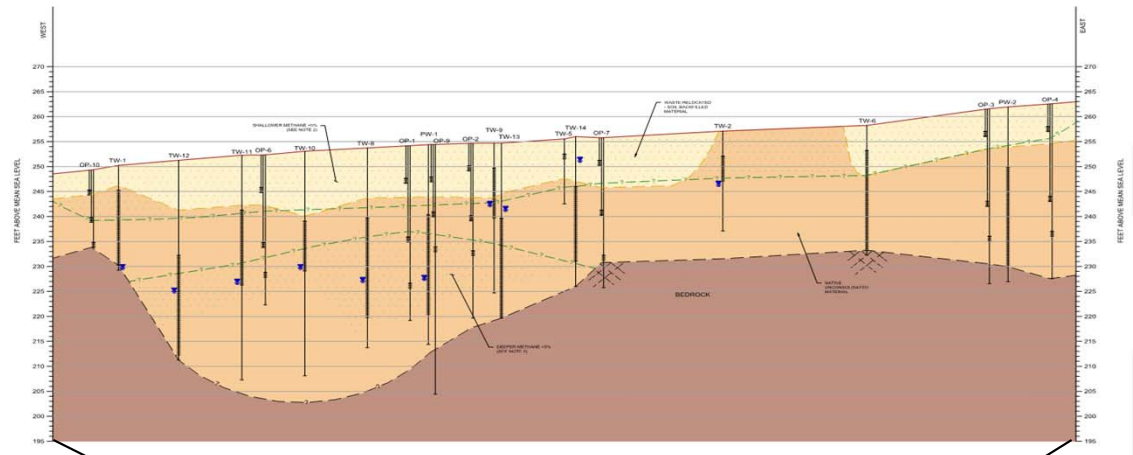
Karen Ueno  
U.S. EPA  
Region 9



# Update on Leachate Flow

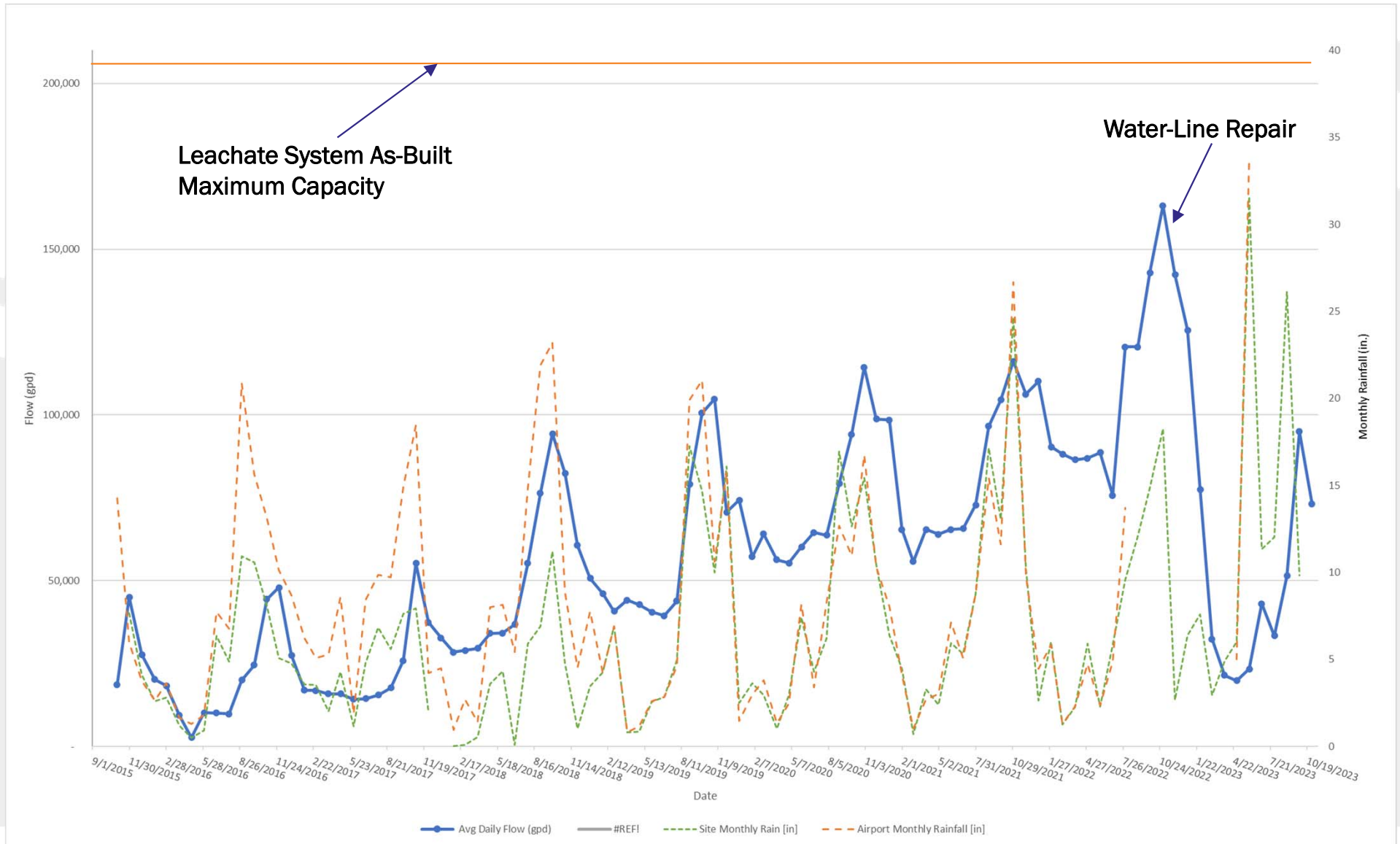
# Preferential Flow Paths Connect the Water Line Leak to the WLIT

- Valley in top of bedrock provides a preferential flow pathway
- Pre-dump surface drainageways corresponds with underlying bedrock fracture zones





# Daily Average Flow and Rainfall by Month Based on Meter Readings (Through October 2023)



# Thank you!

Alan Kirschner  
AKirschner@BrwnCald.com

Greg Christians  
GChristians@BrwnCald.com