STEP UP

YOUR GAME

STEP UP
YOUR GAME

Prospecting for C&D Landfill Gas and Groundwater Migration Pathways

Presented By: Tommy Goodwin, PE

St. Louis, Missouri

So, What's Up?

- Why are we concerned with this site?
- What is Electrical Resistivity Tomography (ERT)?
- How did we conduct the ERT?
- What did we learn from the ERT assessment?
- What are the next steps?

Site Background and State Regulations

1955

1966

STEP UP YOUR GAME

CEC

Site Background and State Regulations

2021

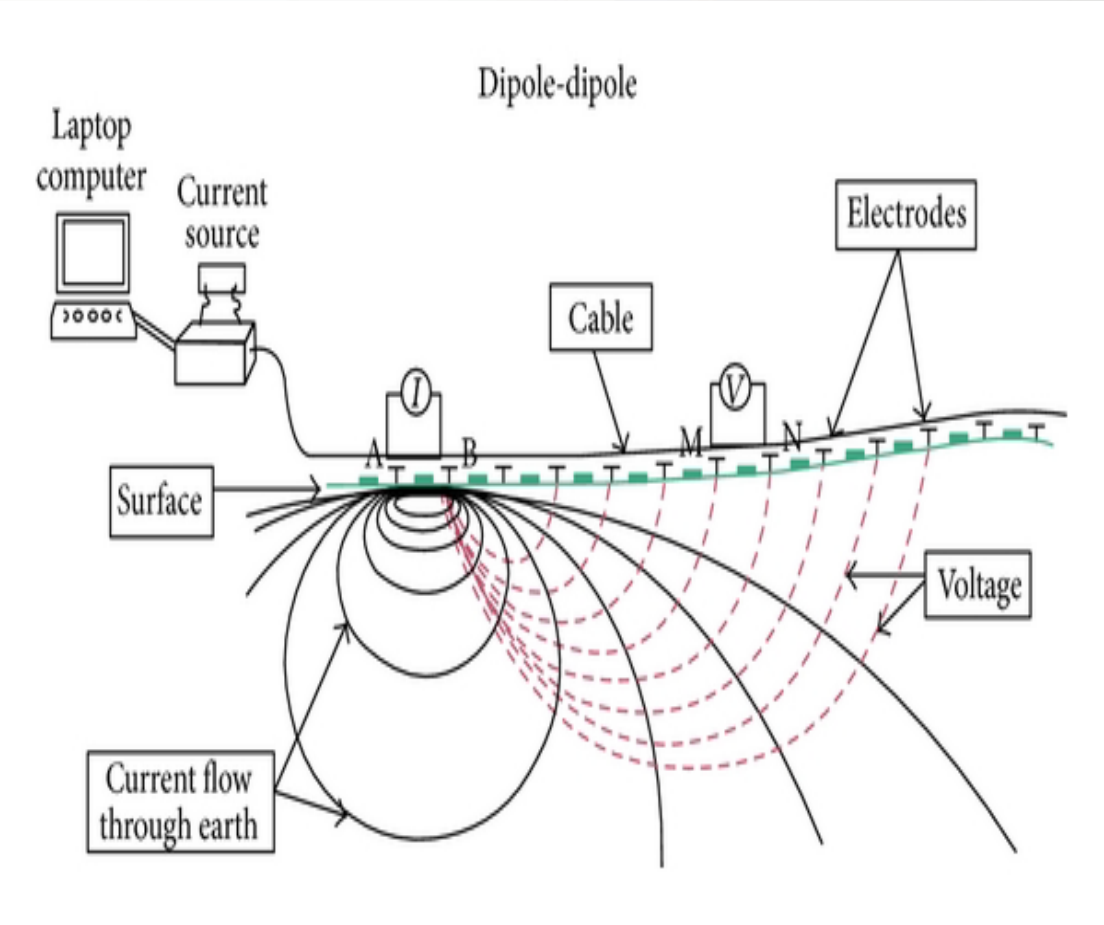
STEP UP YOUR GAME

CEC

Electrical Resistivity Tomography (ERT)

Non-destructive testing that is easy to deploy and implement; however, results need to be calibrated.

- Electrical current into ground through an electrode pair.
- Electrical current is measured between the introduction pair and another electrode pair at a set distance apart (dipole-dipole).
- Multiple sets of dipoles are measured to form a large collection of data points.
- High resistivity = competent rock or air voids
- Low resistivity = water, shale, clay, or fractured rock



STEP UP YOUR GAME

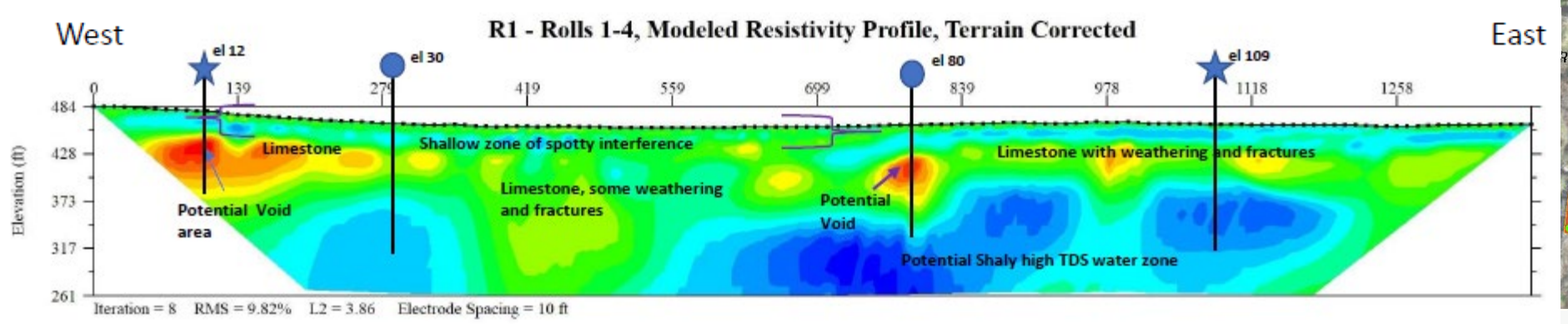
Field Methods and Obstacles

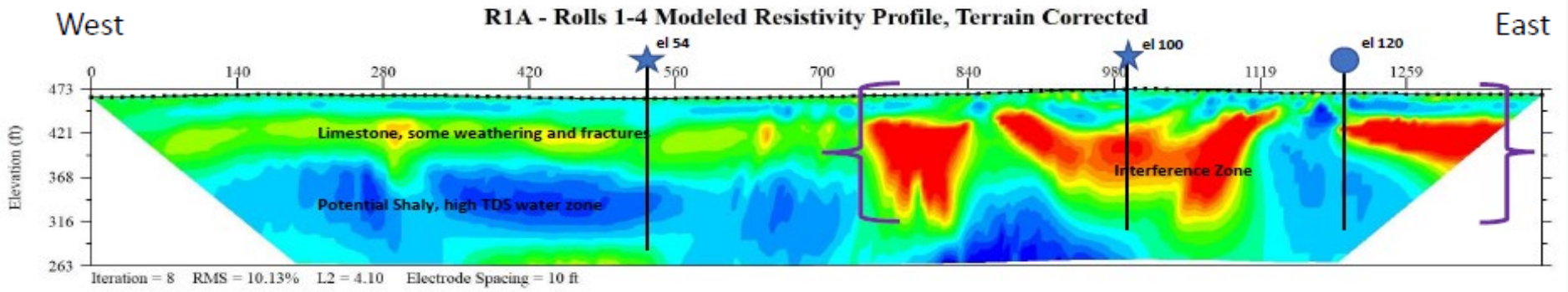
STEP UP YOUR GAME

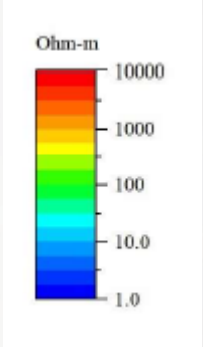
Preliminary Findings

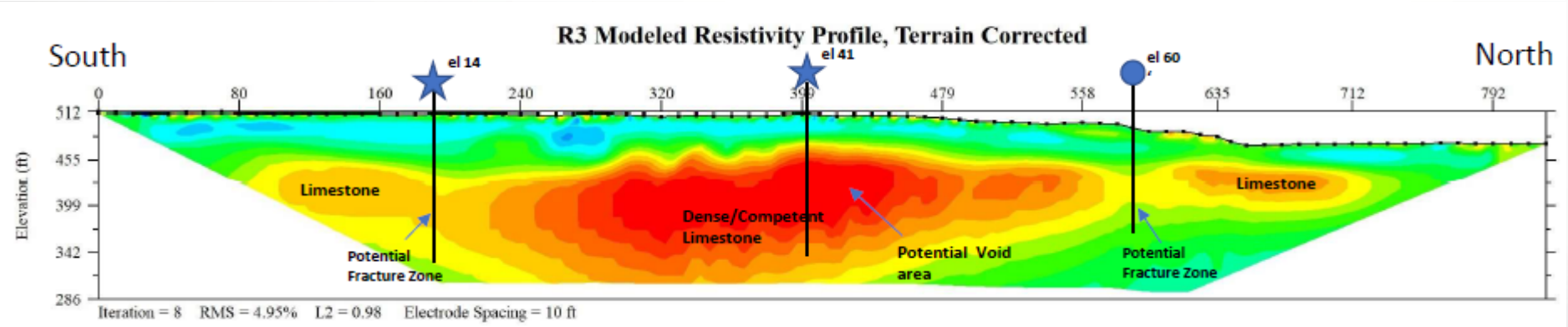
STEP UP YOUR GAME

CEC









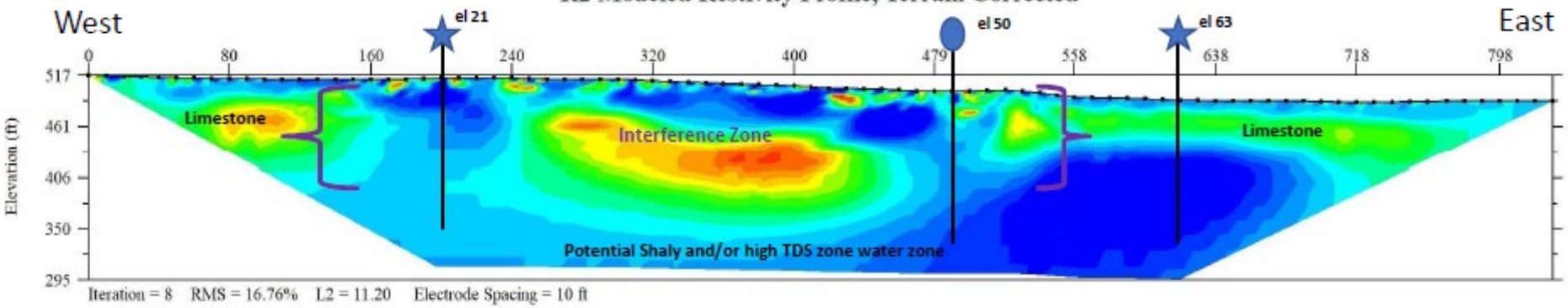
Secondary Confirmation Boring

Primary Confirmation Boring

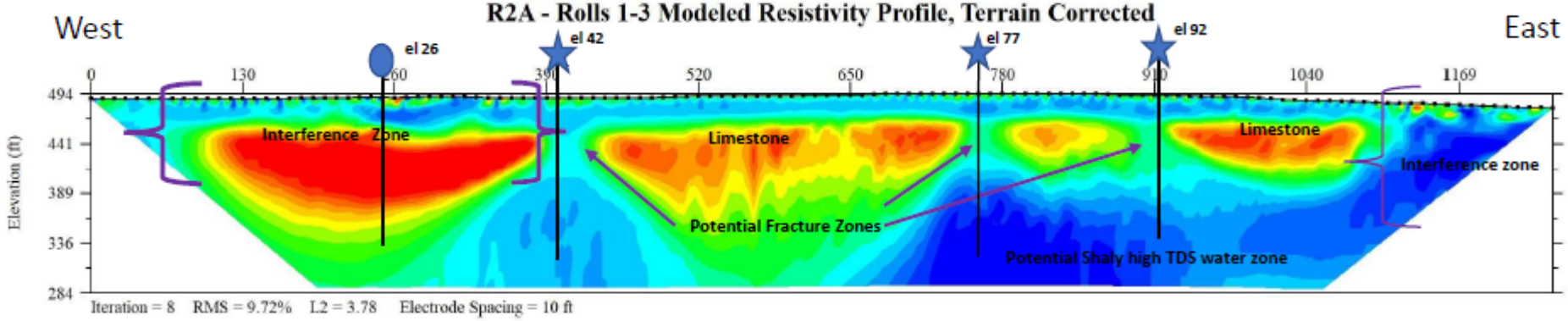
STEP UP YOUR GAME

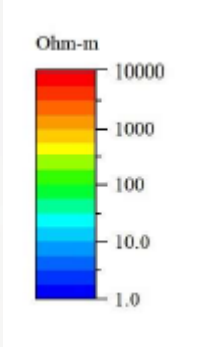
CEC

R2 Modeled Restivity Profile, Terrain Corrected

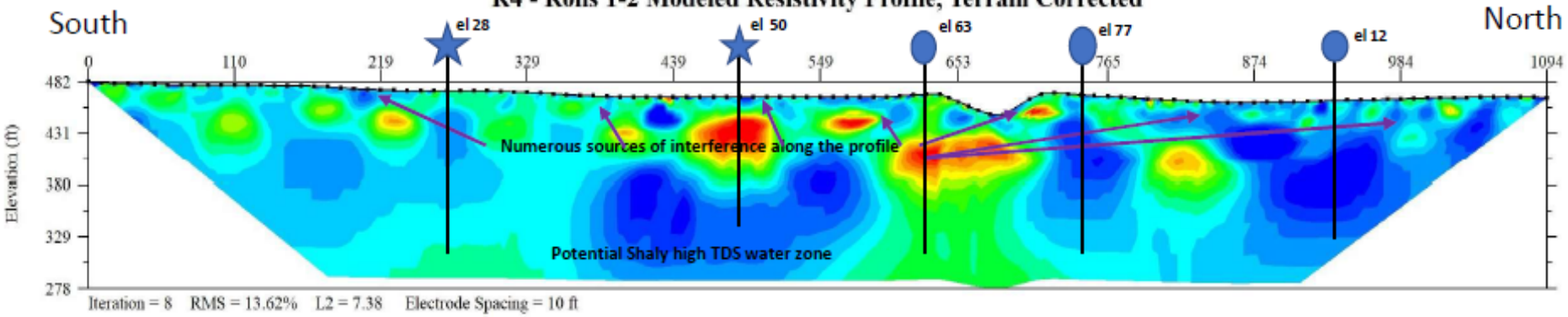


R2A - Rolls 1-3 Modeled Resistivity Profile, Terrain Corrected





R4 - Rolls 1-2 Modeled Resistivity Profile, Terrain Corrected



Secondary Confirmation Boring

Primary Confirmation Boring

STEP UP YOUR GAME

CEC

Findings Summary

- Unconsolidated soil, gravel fill or sediments from the ground surface to a few inches to possibly 10 to 15 feet below the surface;
- Weathered bedrock extends from near the ground surface to approximately 20 to 30 feet below the surface;
- Reasonably competent limestone from near the ground surface to up to 100 feet below the ground surface with some weathering and potential fractures and voids; competent limestone extends to greater depths at Transect R3 (west side) but potential fractures and voids are also present;
- Deeper zones exhibit lower resistivity materials indicative of shale zones, shaly limestone and/or groundwater with high TDS; and
- East side exhibits lower resistivity materials indicative of shale zones, shaly limestone and/or groundwater with high TDS to total depth with zones of interference.

What's Next (Currently Happening)

- Additional Data Sources
  - Deer Creek watershed geological and hydrogeological data
  - Landfill leachate analysis
  - MSD tunneling logs
  - Dye testing results
  - Route 66 TV show depicting pre-filling conditions
- Drilling/Well Installation and Sampling
  - 7 initial proposed locations
  - Groundwater depth/gradient
  - Assess COCs (methane and/or other constituents)

STEP UP YOUR GAME

CEC

Take Home Message

The performed ERT investigation successfully provided evidence for specific locations to target for further investigation and monitoring instead of relying upon the regulated maximum 500 foot intervals to encounter migration pathways for gas or groundwater from the landfill.

Proposed Drilling

Resistivity/ Seismic Line Profile	Electrode Number*	Resistivity (ohm-m)	Notes
R1	12	10,000	Potential Void Zone
R1	30	30	Potential Fracture Zone
R1	80	5,000	Potential Void Zone
R1	109	100	Potential Fracture Zone
R1A	54	100	Potential Fracture Zone
R1A	100	5,000	Interference, Potential Void Zone
R1A	120	5,000	Interference, Potential Fracture Zone
		10	High TDS Zone
R2	21	2	Interference, Potential Fracture Zone and High TDS Zone
R2	50	10	Interference, Potential Fracture Zone and High TDS Zone
R2	63	1	Potential Fracture Zone and High TDS Zone
R2A	26	10,000	Interference, Potential Void Zone
R2A	41	10	Interference, Potential Fracture Zone
R2A	77	100	Interference, Potential Fracture Zone
		1	Interference, High TDS Zone
R2A	92	100	Interference, Potential Fracture Zone
		2	Interference, High TDS
R3	14	800	Potential Fracture Zone
R3	41	10,000	Potential Void Zone
R3	60	500	Potential Fracture Zone
R4	1	NA	
R4	28	5	Interference, Potential Fracture Zone and High TDS Zone
R4	50	10,000	Interference, Potential Void Zone
		2	Interference, High TDS Zone
R4	63	5,000	Interference, Potential Void Zone
R4	77	1	Interference, Potential Fracture Zone and High TDS Zone
R4	96	1	Interference, Potential Fracture Zone and High TDS Zone

STEP UP YOUR GAME

QUESTIONS?