MCWRA Small Hydro Workshop

March 22, 2013

Ron Skaggs, PE, GE
Vice President
Condor Earth Technologies, Inc.

Outline for a Friendly Conversation

- The Need for Good Quality Subsurface Information.
- Meeting the Need Through Project Approach and Implementation.
- Project Examples of Good Practice, and………not so good.
- Your good questions followed by my average answers (please give me opportunities to prove it).

The need for good quality subsurface information – Why?

- Better facility design from better quality subsurface information.
- Better quality bids due to fewer unknowns (by designers and bidders).
- Better claim risk management through better baseline data and more defensible positioning.
- More predictable outcomes with better known conditions.

The need for good quality subsurface information – Why?

- Better facility design from better quality subsurface information.
  - Better definition of geologic contacts
  - Better engineering design parameters of each geologic unit
  - Better subsurface data includes:
    - High quality field. lab, and other investigation data
    - Past construction experience in similar materials
    - Past bidding and claims experience in similar materials

The need for good quality subsurface information - Why

- Better quality bids resulting from better definition of site conditions.
  - Poorly understood site conditions lead to conservative "typical values" that cost your project more $$ *(designers are a nervous bunch!)*
  - Or…Designers assume better/best case scenarios that lead to construction claims
  - The Alternative: Well understood site conditions that are reasonable, supported upon challenge, and best utilize your site.

The need for good quality subsurface information – Why?

Sounds Expensive!

- Better risk management through better baseline data and more defensible positioning.
- More predictable outcomes with better known conditions.

Project Approach

- Feasibility Review – is this the best site given the hydraulic and property constraints?

- Conceptual Design Site Investigation –
  - Preliminary exploration to confirm feasibility review
  - Identify foundation type for final design needs
  - Likely construction sequence and constraints

Project Approach (cont.)

- Final Design Geotechnical Needs –
  - Final exploration as needed
  - Final design of structural members
  - Detailed recommendations for major construction impacts, e.g.,
    - irrigation/generation outage schedule
    - construction dewatering
    - temporary stability of excavations
    - site access constraints
    - storm water management

Project Approach (cont.)

- Value Engineering – given the various inputs and project constraints…
  - Is where we ended up the place we want to be?
  - What did we miss?
  - Where can the contractor take advantage of a weakness in our project approach or bid documents?
  - Does the owner have the ability to manage the project as now established?

Project Approach (cont.)

- Construction QA –
  - Monitoring includes verification of predicted ground condition
- As-built documentation –
  - Your project's ground data will be your best future exploration program!

Project Examples

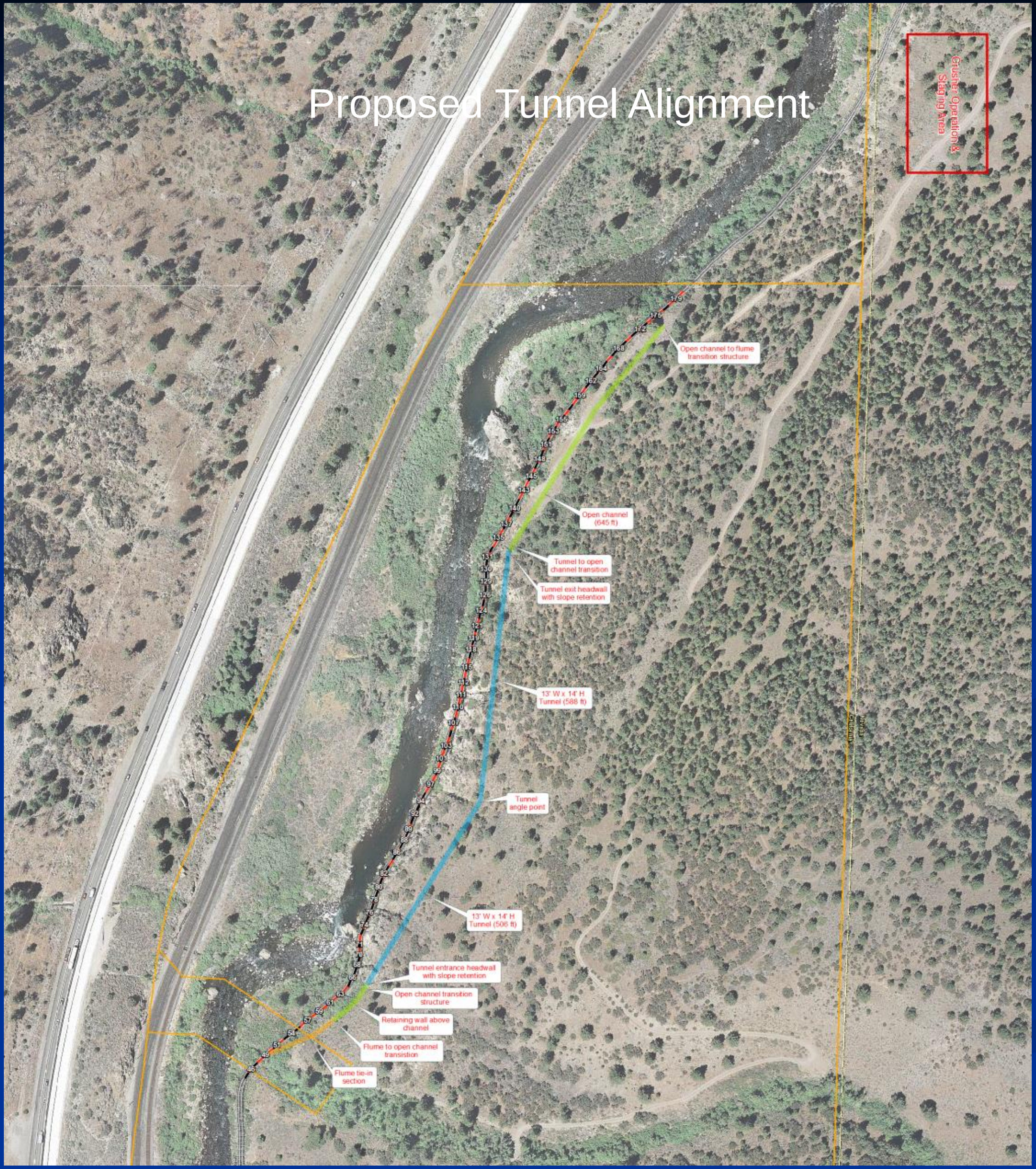
- Example #1 - Small Hydro Flume Realignment
  - Good project background review by water authority and justification for flume replacement with tunnel
  - Recommended phased approach to begin with field geologic mapping in Spring 2013

Tunnel Replacement Section

2003 Slide Event

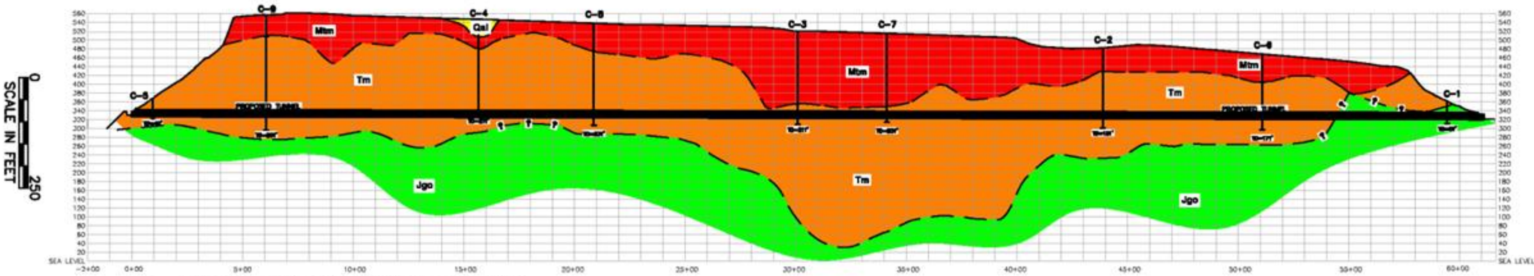
Flood Prone Alignment

Proposed Tunnel Alignment



Project Examples (cont'd)

- Example #2 - Tunnel Realignment
  - New 6000-ft tunnel for re-routing of district main canal around a high geotechnical hazard area
  - Utilized phased exploration and design approach
  - Final design in progress
- Progress results required district participation in construction constraint mitigation during conceptual design



A
01
PROPOSED TUNNEL PROFILE

Scale: 1" = 500'

0 500
SCALE IN FEET

SCALE
HORIZONTAL – 1" = 500'
VERTICAL – 1" = 250'

LEGEND

—— TEM (TRANSIENT ELECTROMAGNETIC) CONTACT, DASHED WHERE APPROXIMATE

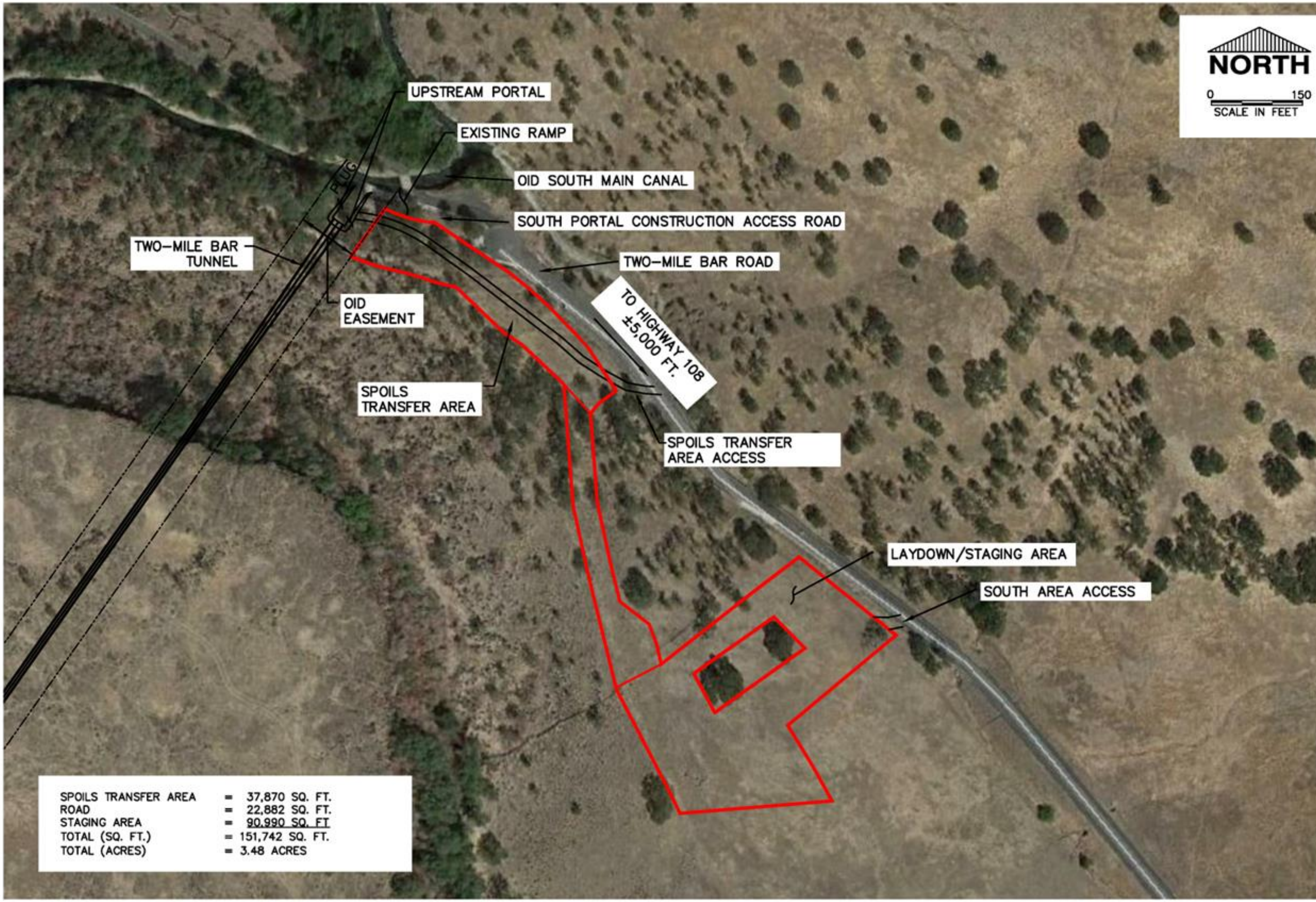
Qal ALLUVIUM

Mtm TABLE MOUNTAIN LATITE - PROMINENT FLOWS OF DARK LATITE CHARACTERIZED BY ABUNDANT LABRADORITE PHENOCRYSTS.

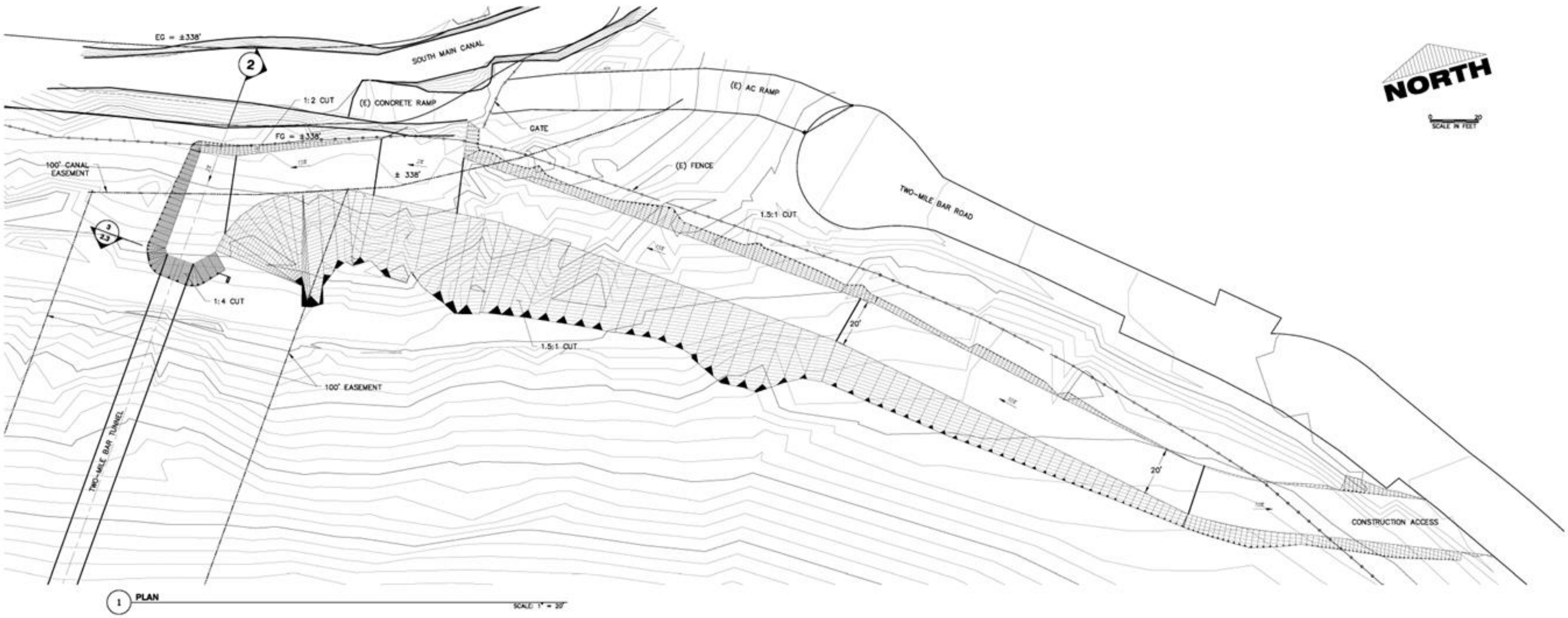
Tm MEHRTEN FORMATION - ANDESITIC CONGLOMORATE, TUFFACEOUS SANDSTONE, AND MUDFLOW BRECCIA (LAHAR); SOME TUFF AND RHYOLITE

Jgo GOPHER RIDGE VOLCANICS

NOTE: STRUCTURAL INTERPRETATION BETWEEN CORE HOLES BASED IN PART ON GEOPHYSICAL TEM DATA.



NORTH
0
150
SCALE IN FEET
UPSTREAM PORTAL
EXISTING RAMP
PLUG
OID SOUTH MAIN CANAL
SOUTH PORTAL CONSTRUCTION ACCESS ROAD
TWO-MILE BAR TUNNEL
TWO-MILE BAR ROAD
OID EASEMENT
TO HIGHWAY 108 ±5,000 FT.
SPOILS TRANSFER AREA
SPOILS TRANSFER AREA ACCESS
LAYDOWN/STAGING AREA
SOUTH AREA ACCESS
SPOILS TRANSFER AREA = 37,870 SQ. FT.
ROAD = 22,882 SQ. FT.
STAGING AREA = 90,990 SQ. FT
TOTAL (SQ. FT.) = 151,742 SQ. FT.
TOTAL (ACRES) = 3.48 ACRES



EG = ±338'
SOUTH MAIN CANAL
2
1:2 CUT
(E) CONCRETE RAMP
(E) AC RAMP
GATE
FG = ±338'
± 338'
(E) FENCE
100' CANAL EASEMENT
1.5:1 CUT
TWO-MILE BAR ROAD
1:4 CUT
20'
1.5:1 CUT
100' EASEMENT
TWO-MILE BAR TUNNEL
CONSTRUCTION ACCESS
NORTH
SCALE IN FEET
1 PLAN
SCALE: 1" = 20'

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