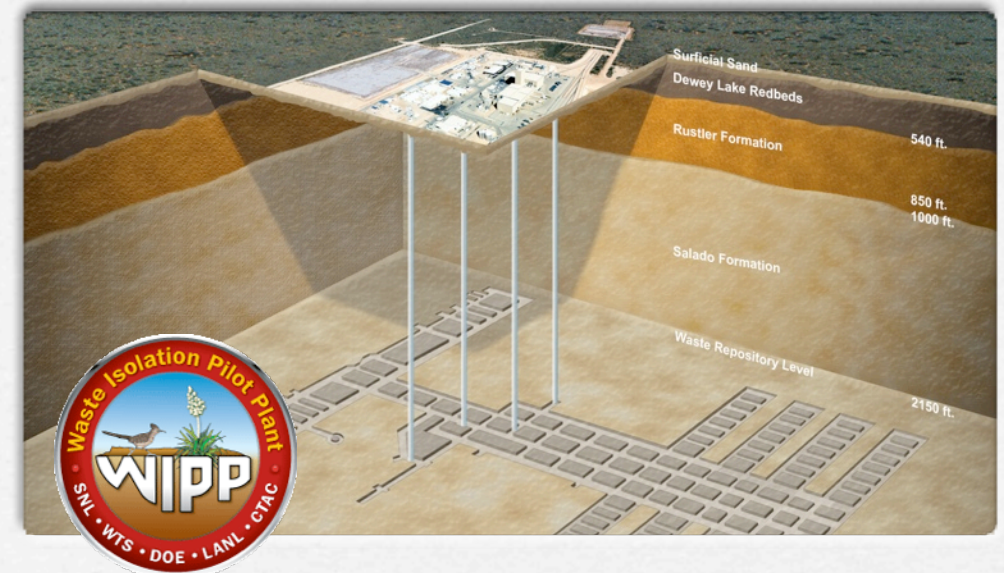
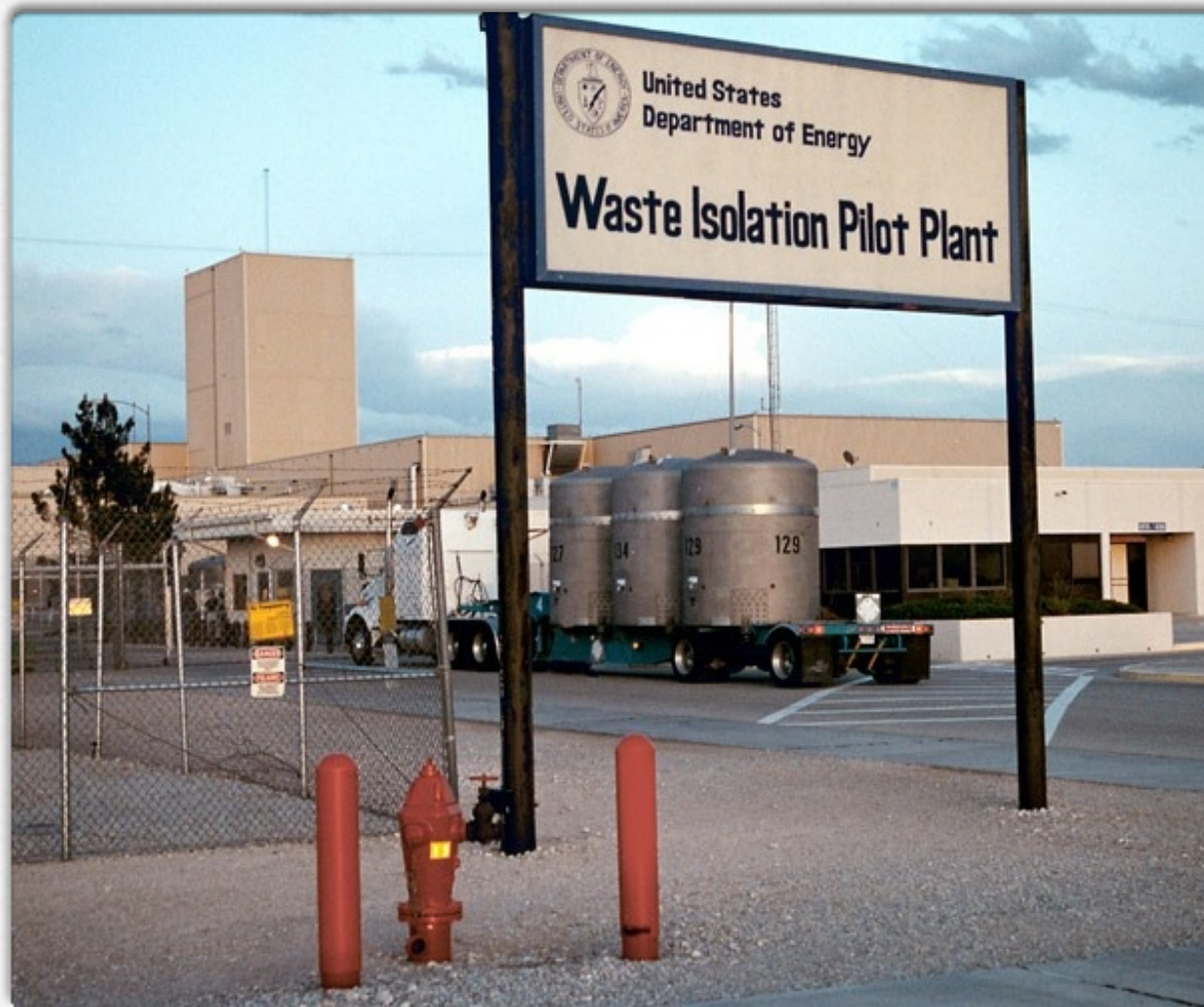




**US
GROUT**

**Ultrafine and Microfine
Cementitious Grouts**

DESIGNED AND MANUFACTURED IN THE USA



GROUT DEVELOPED for the
U.S. Department of Energy
 by SANDIA NATIONAL LABORATORIES

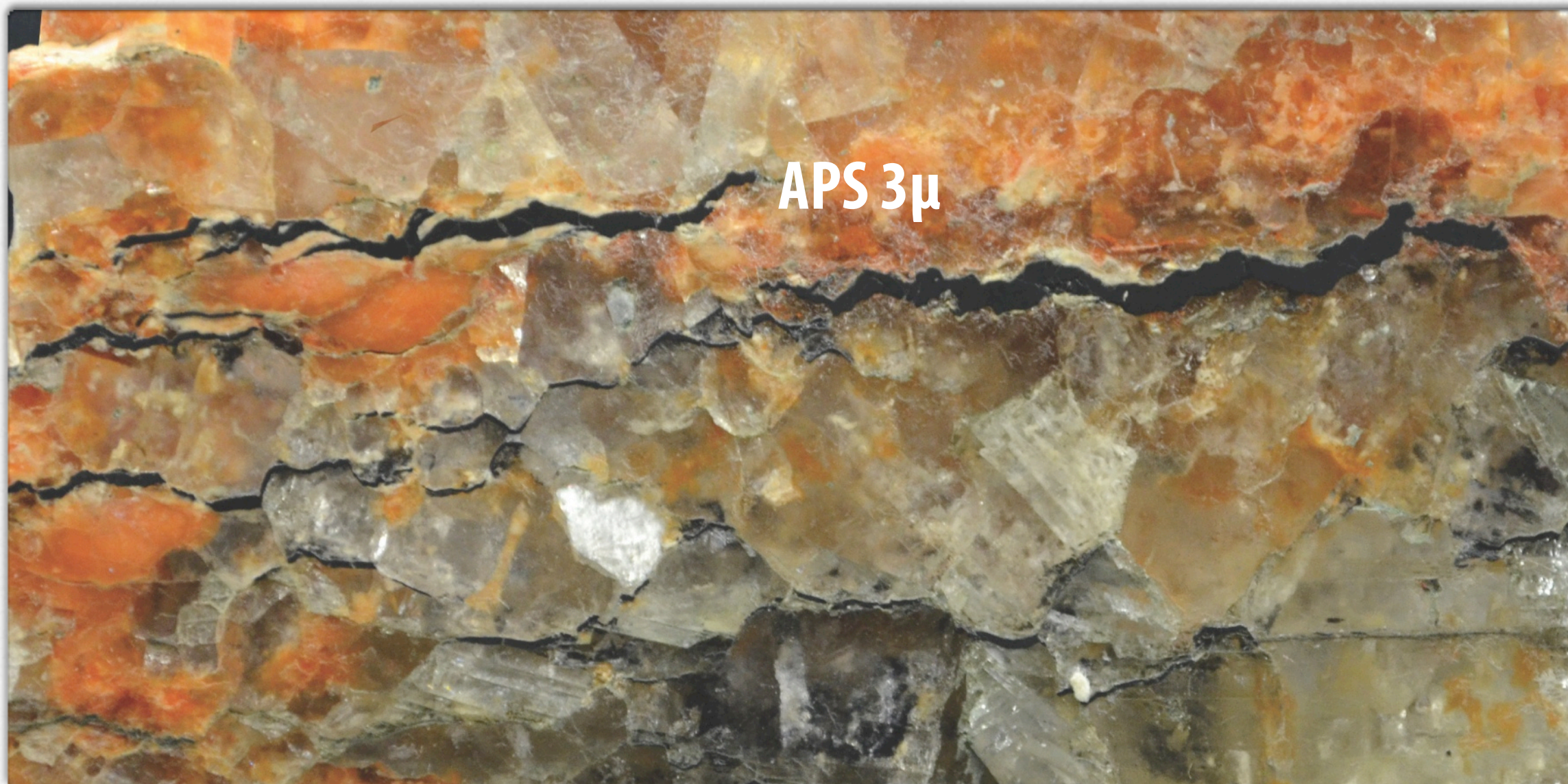


Sandia
National
Laboratories



Waste Isolation Pilot Plant, New Mexico





MICROFRACTURES AT THE WASTE ISOLATION PILOT PLANT
SEALED WITH **US GROUT ULTRAFINE**



PRACTICAL USES

- ▶ Stabilize and Strengthen Soils; Prevent Liquefaction
- ▶ Seal Against Seepage in Mines, Dams, and Tunnels
- ▶ Fortify Waste Containment
- ▶ Squeeze-grout and Rehabilitate Oil and Gas Wells
- ▶ Form Low-Permeability Grout Curtains
- ▶ Repair Concrete Structures



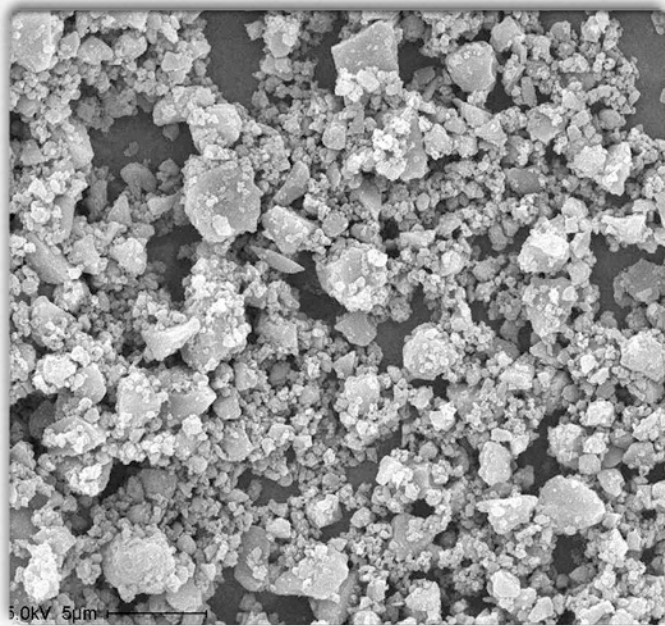


A Superior Grout

US GROUT MICROFINE & ULTRAFINE

PROVEN FORMULATION

ULTRAFINE PARTICLE SIZE + AMORPHOUS ALUMINUM SILICATE (PUMICE) + PORTLAND CEMENT



EXPERT MANUFACTURE

The finely-engineered tolerances and mix ratios are manufactured consistently on spec in a modern, computer-controlled plant in Idaho, USA.



EXPERT SUPPORT

Avanti International provides the customer service, objective professional advice, material estimates, and the caliber of world-class technical support that only comes from 35 years of experience.



EXPERTLY ENGINEERED RESULTS

- ▶ Water/Grout Ratio: 0.6/1*
- ▶ Wet Density: 1.54 - 1.56 grams/cc*
- ▶ Marsh Flow - Seconds: 35 - 60*
- ▶ Internal Cohesion: 1.22 Pascals*
- ▶ Bleed - 0.50%
- ▶ Shrinkage: -0.0260%
- ▶ Blaine Fineness: 15,110 cm²/gram
- ▶ Hydrational Heat: 31°C
- ▶ Gel Time*
 - ▶ INITIAL: 2.5 - 5.0 hours
 - ▶ FINAL: 4.5 - 7.0 hours
- ▶ Particle Size: d90 <8 microns; average 3.0 microns
- ▶ Compressive Strength: >1000 psi @ 24 hours*
- ▶ Permeability: 1x10⁻¹⁶ m/second

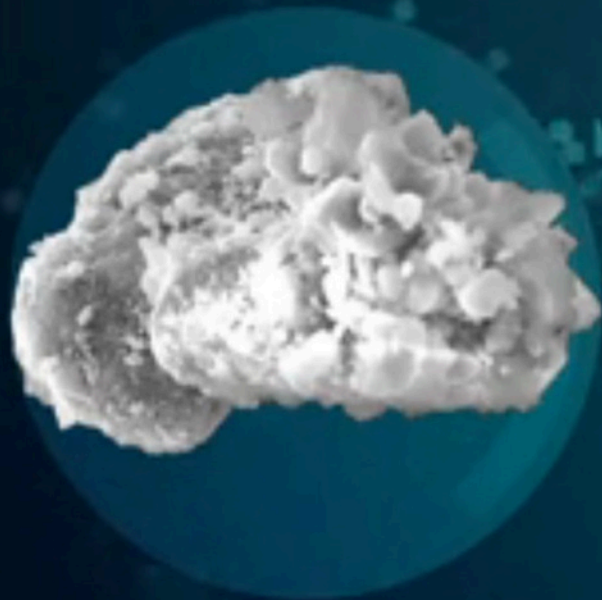
Those items with an asterisk (*) can be adjusted as required by the application.



GROUT VS. GROUT

- ▶ STANDARD OPC GROUTS with particle sizes that average 15 microns simply cannot penetrate microfractures or dense soils.
- ▶ US GROUT ULTRAFINE averages 3 micron particle sizes to allow deep, effective penetration AND is super-charged with pumice pozzolan to significantly increase performance and life-span.





standard cement
15 micron



ultrafine grout
3 micron



POZZOLANIC SUPER-CHARGE

- ▶ The ultrafine particle sizes that enable the superior penetration characteristics also super-charge the chemical reaction between the pumice pozzolan and the cement, successfully combating the main degradation mechanisms in standard cementitious grouts – ASR, CH, thermal cracking, porosity, sulfate attacks...



A SUPERIOR GROUT

- ▶ Resistance to chemical attack
- ▶ Flexible water to cement ratios
- ▶ Essentially no bleed
- ▶ Adjustable rheology and set time (with admixtures)
- ▶ Enhanced strength
- ▶ Century-spanning durability
- ▶ Volume stability
- ▶ Extremely low hydraulic conductivity/permeability
- ▶ Resistance to thermal shrinkage
- ▶ Two-hour plus injectability
- ▶ Composed of non-hazardous materials
- ▶ Superplasticizer premixed



A SUPERIOR GROUT **STABLE PRODUCT**

- ▶ Volume stability of less than 0.1% shrinkage.
- ▶ Easy to mix and pump, good workability, consistent performance results.
- ▶ Stable U.S. supply (sourced, refined and produced)



A SUPERIOR GROUT **FLOWS WHERE OTHERS CAN'T**

- ▶ US Grout has successfully penetrated microfractures as small as 3 microns up to distances of several meters.



A SUPERIOR GROUT

DENSE PERMEABILITY MATRIX

- ▶ Densely welded by pozzolanic action, there is essentially no permeability.
- ▶ Average diameter of disconnected grout pores is one micron (evidenced by mercury porosimetry and extremely low hydraulic conductivity).
- ▶ Grout continues to gain strength and density for years.
- ▶ Grout able to self-mend fractures during curing.



A SUPERIOR GROUT

HIGH COMPRESSION STRENGTH

- ▶ The unconfined, uniaxial compressive strength as high as 6.2 MPa (899 psi) one day after injection, increasing to 39.9 MPa (5785 psi) after 28 days.



A SUPERIOR GROUT

CENTURY-SPANNING DURABILITY

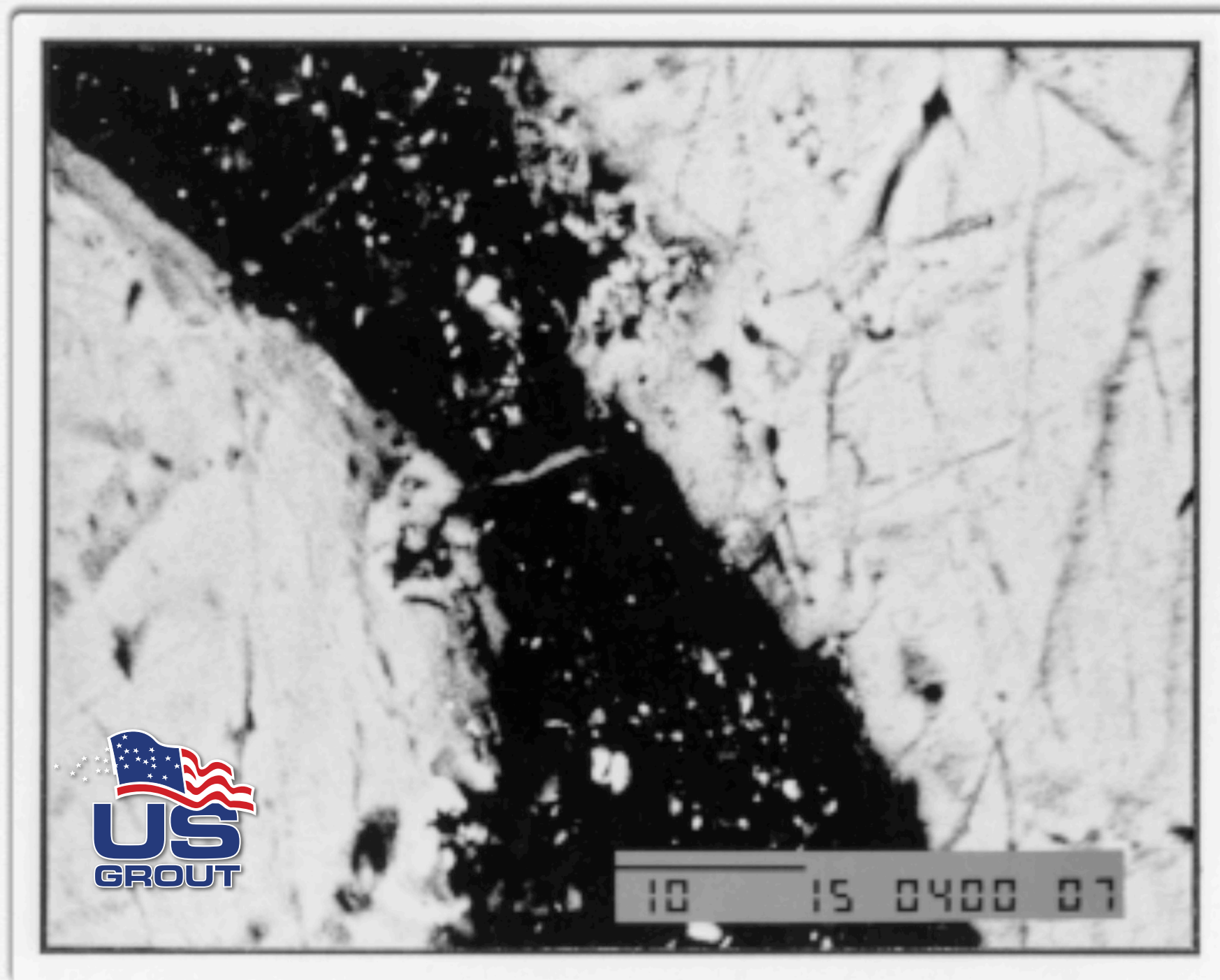
- ▶ The Romans built an empire on pozzolanic (pumice) concrete structures that continue to endure to this day. That same pozzolanic chemistry, refined by modern science, is what allows US Grout to meet the stringent durability requirements of confining waste at the Department of Energy's WIPP site.



THE WRONG GROUT CAN'T BE "MADE RIGHT"

- ▶ It is futile to try and make an unsuitable grout work by tweaking viscosity.
- ▶ A grout's ability to penetrate extremely small openings is determined by PARTICLE SIZE and RHEOLOGY, *not viscosity*.





BACKSCATTERED
ELECTRON
MICROPHOTO:

US Grout
Ultrafine
Passing
Through
a 7.9μ
Constriction

IMPRESSIVE PERMEATION GROUTING



US Grout can pass through and completely grout a silty sand with a hydraulic conductivity as low as 5×10^{-2} centimeters/second. The hydraulic conductivity of the grouted mass was reduced to 1×10^{-7} centimeters/second



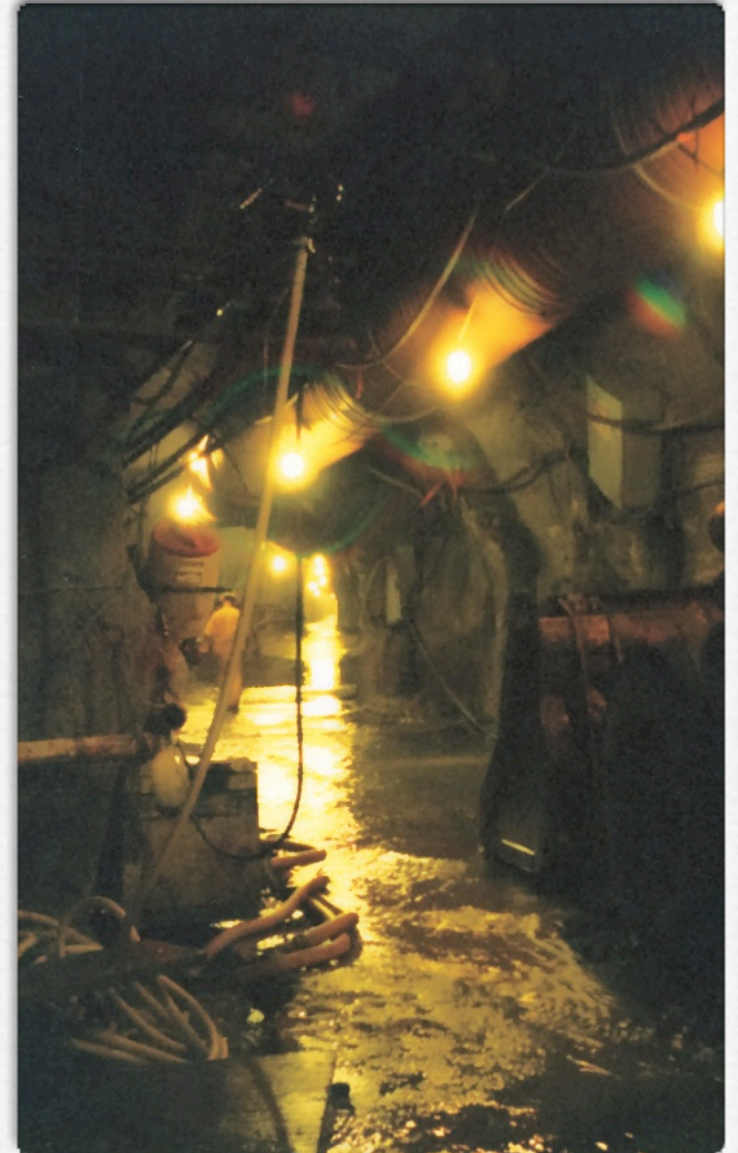
Sand Column Tests, US Grout Facility





Representative Grouting Projects

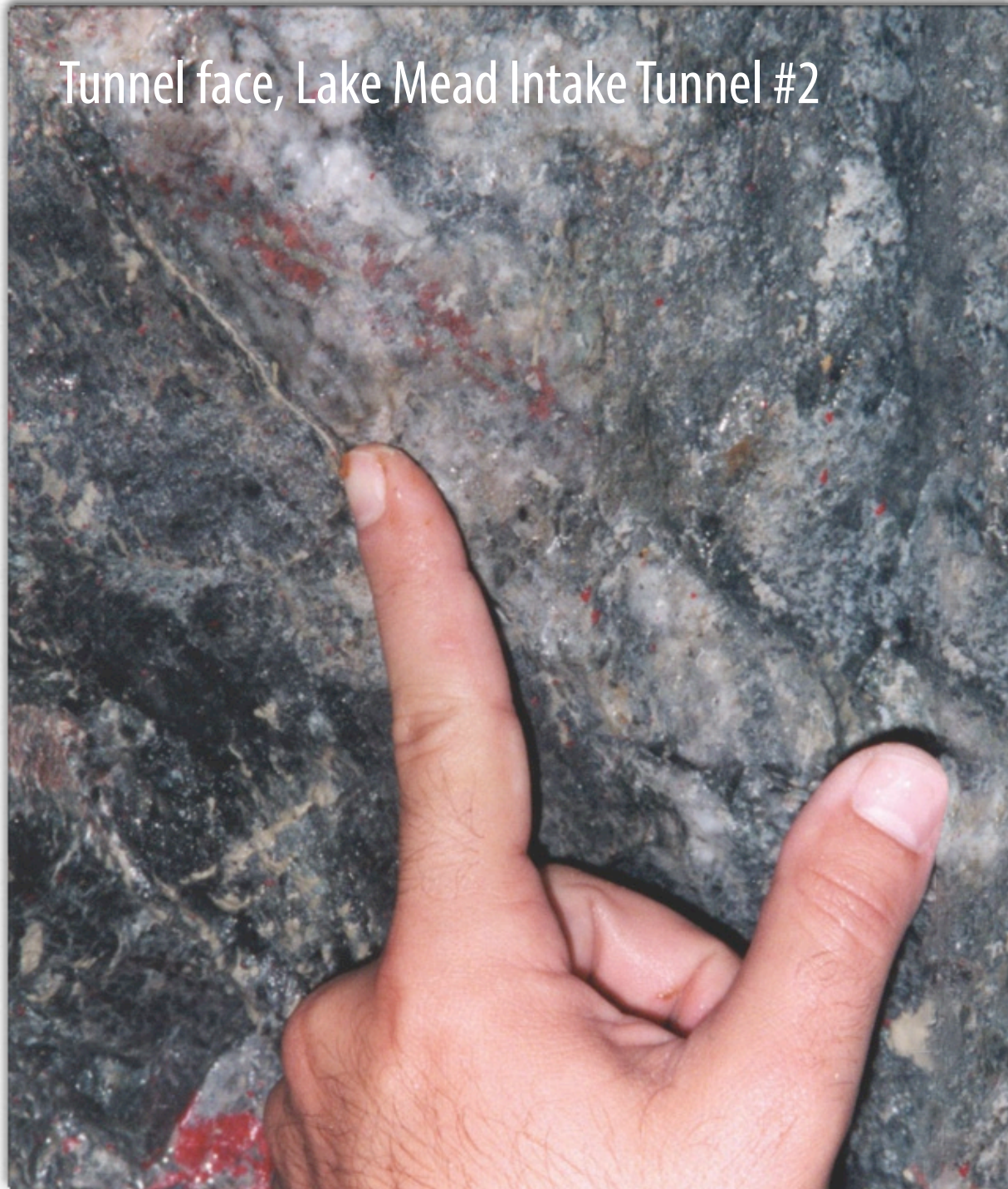
US GROUT MICROFINE & ULTRAFINE



BENEATH LAKE MEAD, NEVADA
Driving Intake Tunnel #2



Tunnel face, Lake Mead Intake Tunnel #2

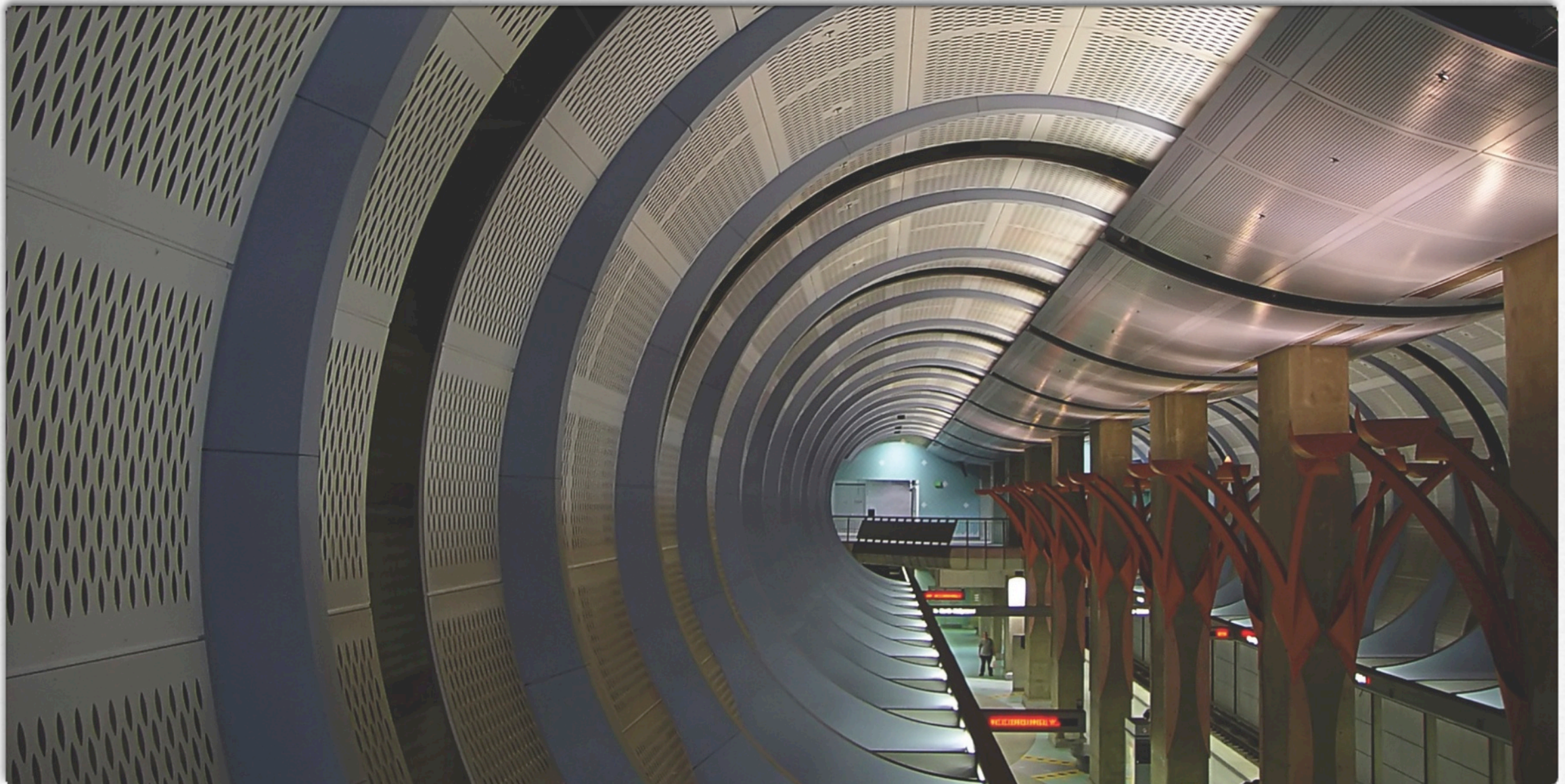




UNITED STATES STRATEGIC PETROLEUM RESERVE (SPR)

Successfully sealed water inflow into salt dome at Weeks Island, LA





HOLLYWOOD METRO TUNNEL

Successfully sealed against water inflow and prevented surface settlement





U.S. DEPT. OF ENERGY WASTE ISOLATION PILOT PLANT, N.M.
Successfully sealed microfractures against brine and radionuclide leakage





Available in standard 20kg bags, super sacks,
and bulk pneumatics.

SALES or INFORMATION: **1 (800) 767.4701**

www.usgrout.com

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