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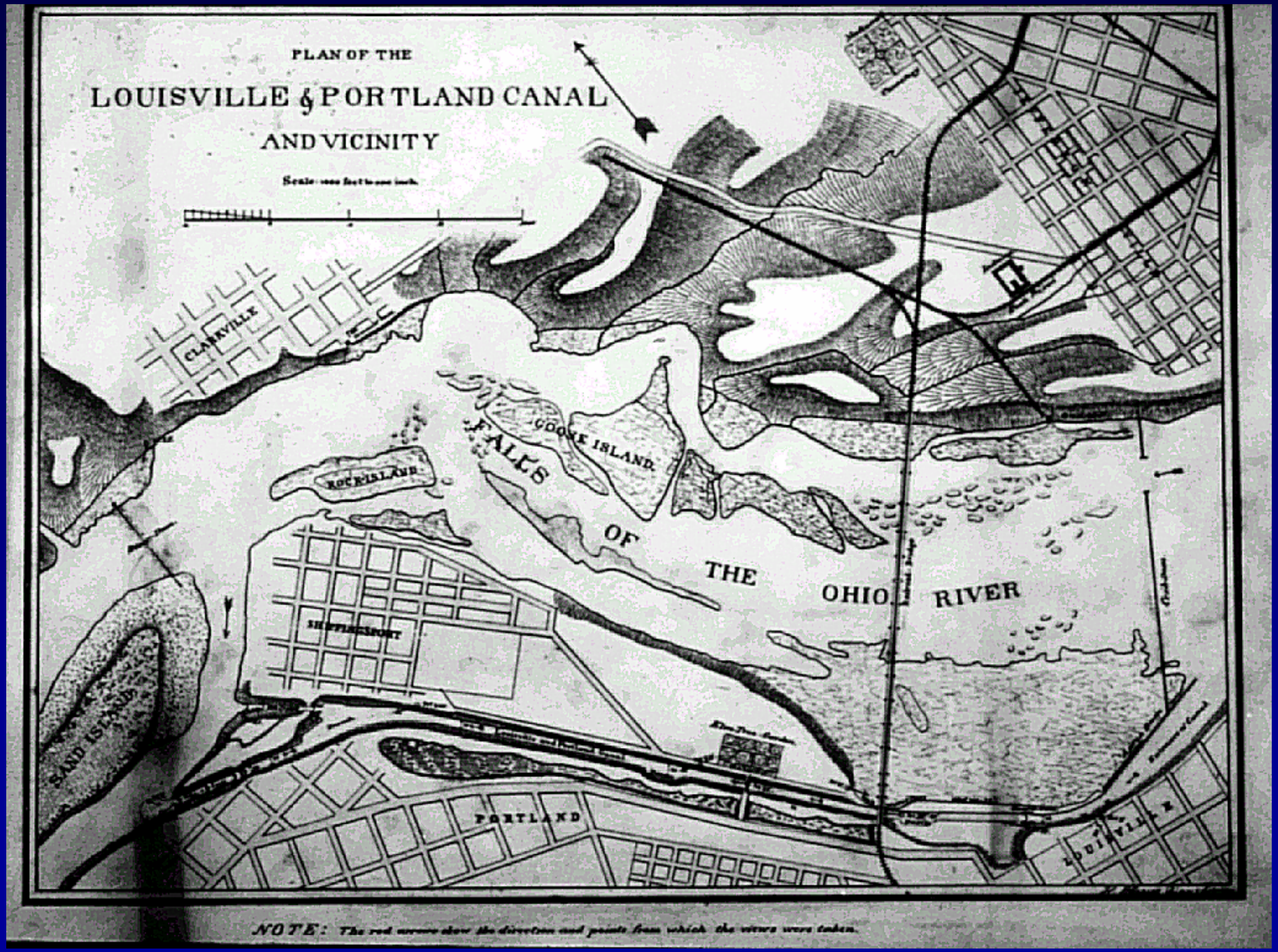
ROLLER COMPACTED CONCRETE FOR McALPINE LOCK REPLACEMENT:

BY

DAVID E. KIEFER P.E.


PLAN OF THE
LOUISVILLE & PORTLAND CANAL
AND VICINITY
CLARKVILLE
GOOSE ISLAND
ROCK ISLAND
FALLS
OF
THE
OHIO
RIVER
SHIPPINGPORT
SAND ISLAND
PORTLAND
LOUISVILLE
NOTE: The red arrows show the direction and points from which the views were taken.

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CONSTRUCTION OF 360' 2-STAGE LOCK, 1870

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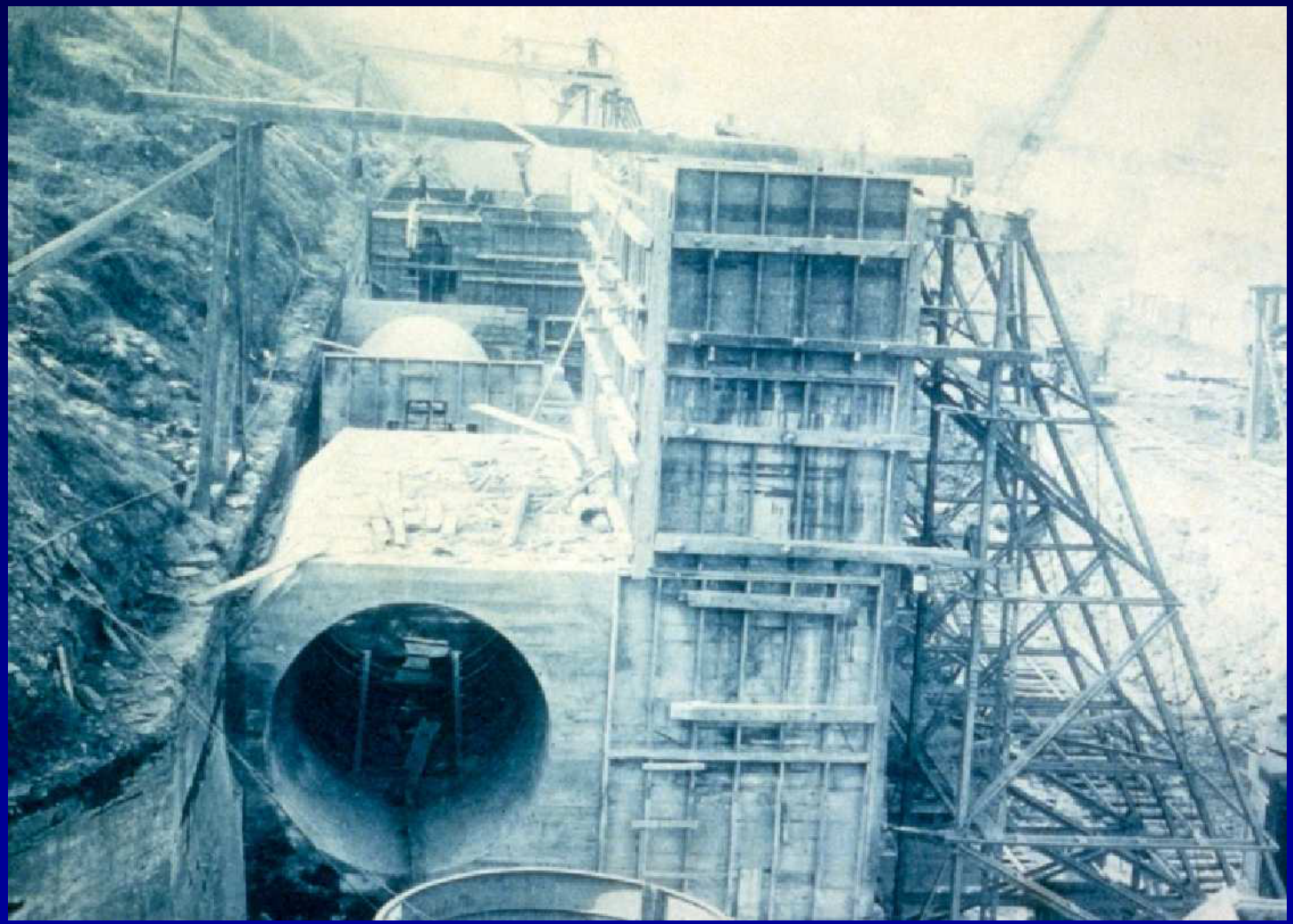
CONSTRUCTION OF 600' LOCK, 1900



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CONSTRUCTION OF EXISTING 1200' LOCK, 1960

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McALPINE LOCK REPLACEMENT PROJECT

*360’ lock deactivated due to miter gate failure

*600’ lock used only as back-up (slow and unreliable)

*New 1200’ lock will add capacity and reliability

*New lock will be located south of existing 1200’ lock

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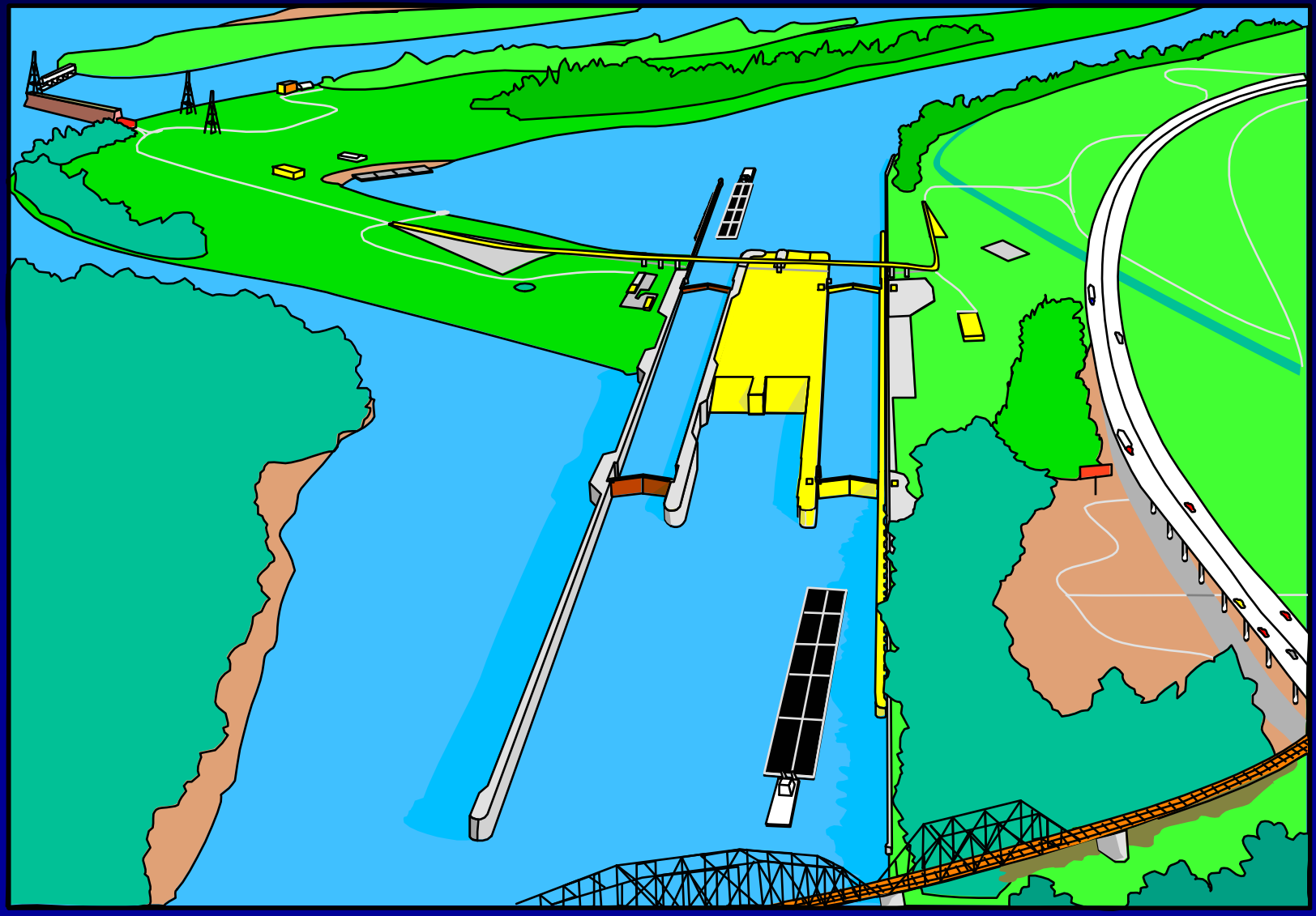
NEW 1200’ LOCK



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Downstream Cell Construction

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Downstream Cofferdam Cells

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Upstream Cofferdam Cells

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Demolition and Foundation Excavation

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ENGINEERING AND DESIGN OF NEW LOCK

*Evaluate Alternative/Innovative Emptying and Filling Systems

*Evaluate Alternative Lock Wall Designs

*Perform Hydraulic Model Studies

*Select Best Alternative for Hydraulic and Wall Construction Considerations.

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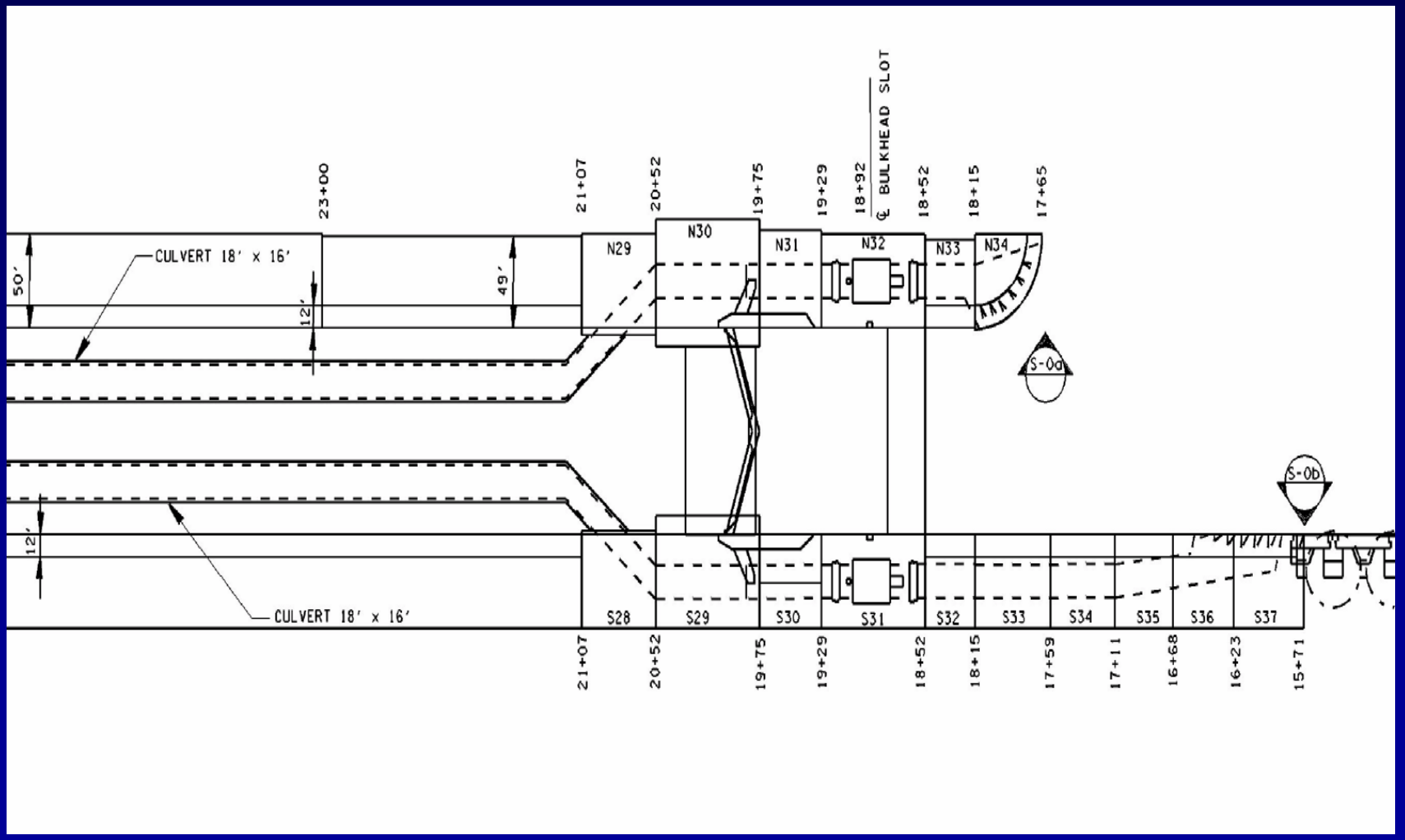
CONVENTIONAL INTAKE SYSTEM W/LOCK FLOOR CULVERTS



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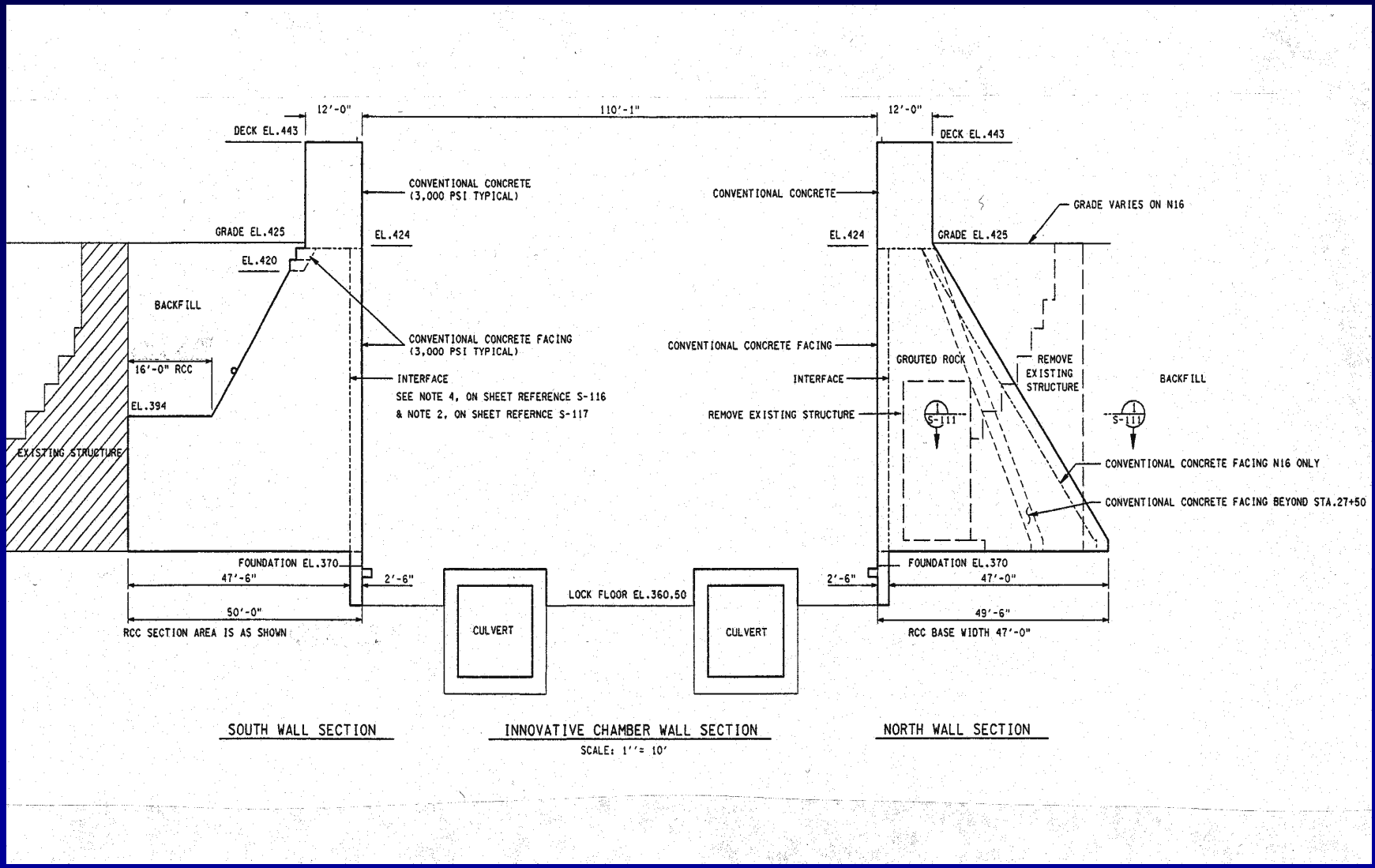
NEW 1200' LOCK CROSS SECTION



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LOCK WALL OPTIONS

* Thin-wall design with tie-back anchors

* Reinforced Earth type wall

* Thin-wall design with deadmen

* Grouted Stone Fill

* Roller Compacted Concrete (RCC) Selected as Preferred Option

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ROLLER COMPACTED CONCRETE

* ACI 207; Concrete of no-slump consistency in its unhardened state that is transported, placed, and compacted using earth and rockfill construction equipment.

* A well graded aggregate mixture with a little bit of cement, fly ash and water thrown in for good measure.

* Looks like a pile of wet rock.

* Work it like dirt/soil, core it like concrete.

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RCC CONSTRUCTION

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McALPINE LOCK CONSTRUCTION

* 150,000 cubic yards rock excavation

* 400,000 cubic yards concrete

* Access Bridge: 42 drilled shafts, 6’ diameter, 45’ to 100’ long

* 165,000 cubic yards backfill

* Traylor Bros, Granite, Massman (TGM)

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CONCRETE MATERIALS FOR MASS AND RCC

* Crushed Limestone Coarse Aggregate, 2” NMSA

* Natural, River Dredged Fine Aggregate

* Class F Fly Ash

* Type II, max 80 cal/g cement

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BATCH PLANT

- Twin 6-yard Besser compulsory mixers
- ASTM #3 (2-inch) and #57 (1-inch) coarse aggregate.
- Coarse aggregate wet belt and liquid nitrogen for temperature control.
- 70 Degree (Mass) and 80 Degree (RCC) temperature requirements.

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BATCH PLANT

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BATCH PLANT

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WET-CHILL BELT

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LIQUID NITROGEN

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TEST SECTION

- Constructed to demonstrate suitability of Contractor's equipment, methods and personnel.
- 50' long by 30' wide at top, (5) 1-foot lifts.
- Test section saw cut and inspected after placement for evaluation of RCC placement procedures.

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TEST SECTION

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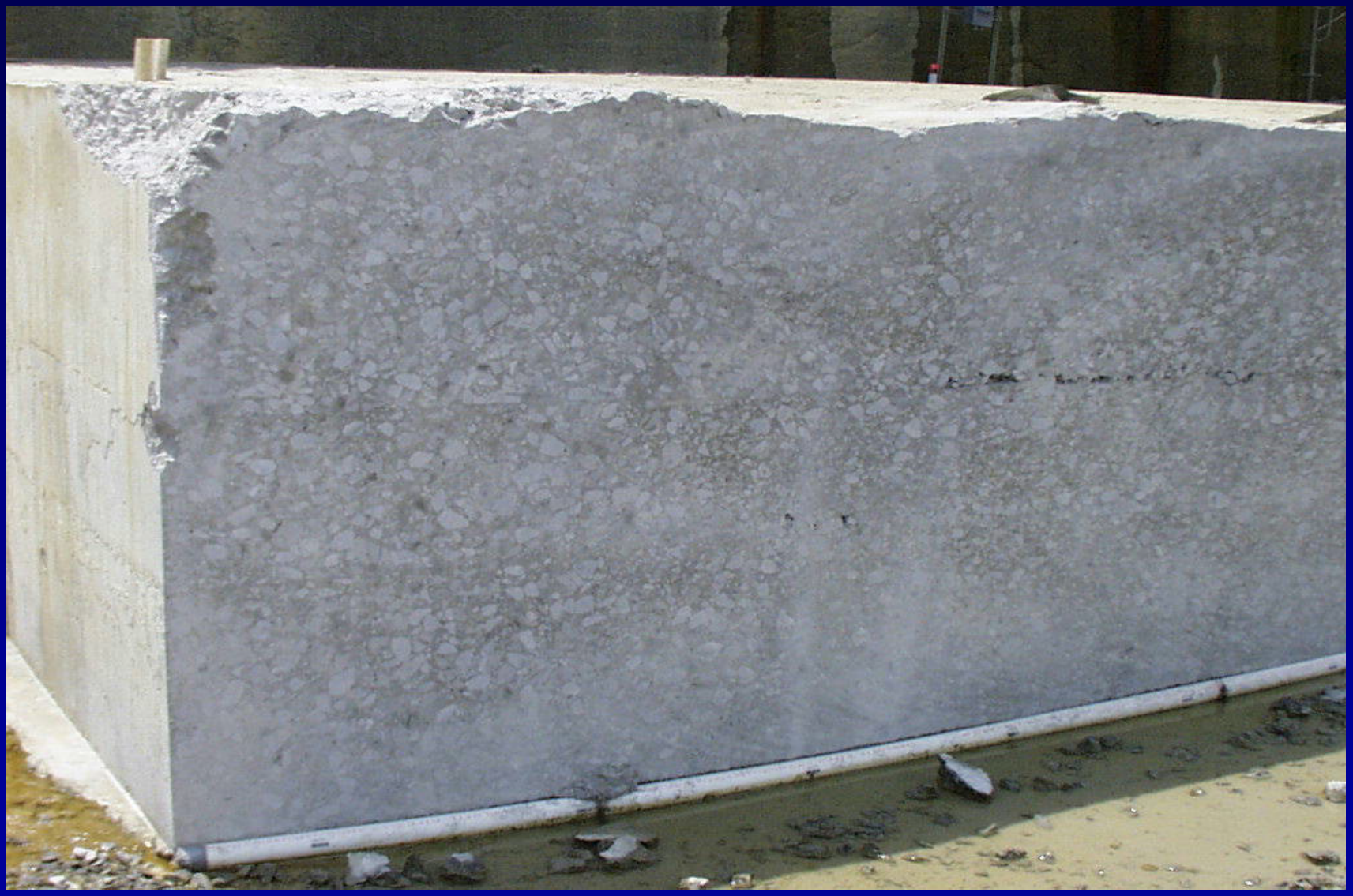
TEST SECTION



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TEST SECTION

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McALPINE
RCC CONSTRUCTION

RCC and conventional concrete transported from batch plant using Maxon Agitor trucks.

•Rotec creter-crane primarily used for concrete placement.

•Buckets and creter-crane used for RCC facing concrete

•Large and small rollers used for compaction

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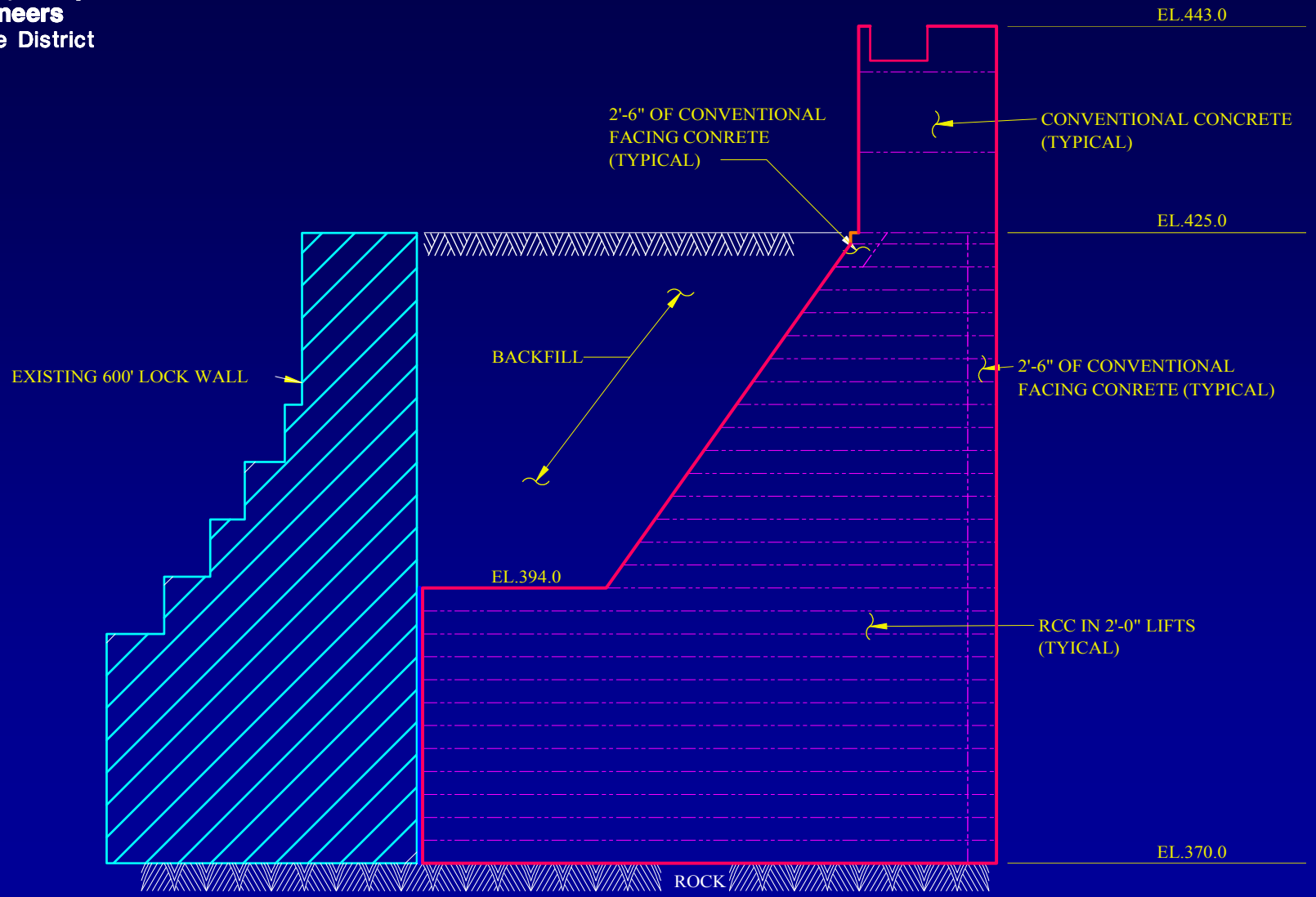
SOUTH LOCK WALL



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RCC CONSTRUCTION

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RCC CONSTRUCTION

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FACING CONCRETE

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BEDDING MORTAR

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CONSOLIDATION OF INTERFACE

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CONSOLIDATION OF INTERFACE

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PRIMARY ROLLER


CAT

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SECONDARY ROLLER


DEERE

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SEGREGATION

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QC – NUCLEAR DENSITY TESTING

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INSERTING MONOLITH JOINT

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SLOPING BACKFACE


CAT

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LOCK WALL FACE

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MIX PROPORTIONS

	MASS	RCC
Cement	259	120
Fly Ash	187	156
Coarse Agg.	2350	2440
Fine Agg.	1070	1132
Water	187	174

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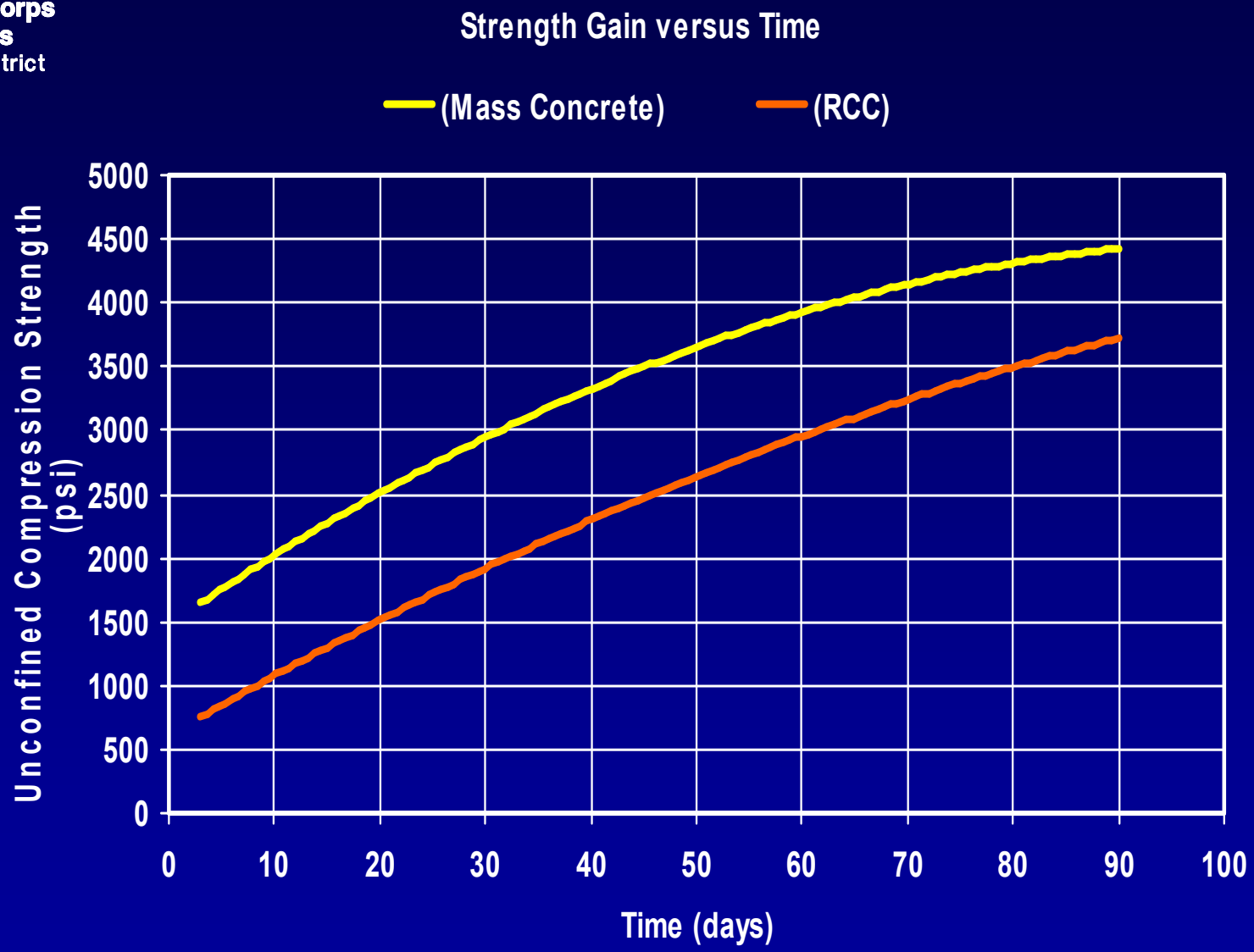

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JULY 2005


McAlpine Locks and Dam
Completed Project
2007

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QUESTIONS ???