Midwest Generation Groundwater Modeling

Joliet 9, Lincoln Stone Quarry

NOVEMBER, 2021

BAS GROUNDWATER CONSULTING

KPRG

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Model Scenarios

DRAFT

- Current Conditions:
  - Used the 2013 calibrated model, as is. Updated pond elevations for Boyd's and Main Quarries. Updated extraction rates from pumping wells.
  - Defined a surrogate source of "1" beneath Lincoln Stone Quarry (LSQ), forward run for 100 years with advection and dispersion (=1 as in previous LSQ modeling)
- Model Scenarios:
  - From the calibrated, steady-state flow system and equilibrated concentration distribution (i.e. 100-year concentrations):
    1. Remove the source and lower the Main Quarry (constant head cells) to 477 feet, amsl. Run the flow model in steady state and the transport model for 100 years.
    2. Cap placement over regraded ash. Remove the source concentrations from layer 1, keep in layers 2-4, remove the pond (constant head) of Main Quarry, reduce recharge through LSQ by 3 orders of magnitude
    3. Same as #2, but add in a low-K barrier wall along entire southern and eastern sides of LSQ, from land surface through the bottom of the model (through Dolomite)
    4. Same as #2, but add in 47 extraction wells within LSQ, as per design by Geotech. Wells are 60-feet deep and pump a maximum of 7.5 gpm each

Model Scenario #1

DRAFT

- From the calibrated, steady-state flow system and equilibrated concentration distribution (i.e. 100-year concentrations):
  1. Remove the source and lower the Main Quarry (constant head cells) to 477 feet, amsl. Run the flow model in steady state and the transport model for 100 years.

30-year plume distribution

DRAFT

- Constant source beneath LSQ (i.e starting condition)

Results shown for model layer 5, base of Main Quarry

- Scenario 1, remove all sources, dewater to 477 ft, amsl

Adjacent Drawdown

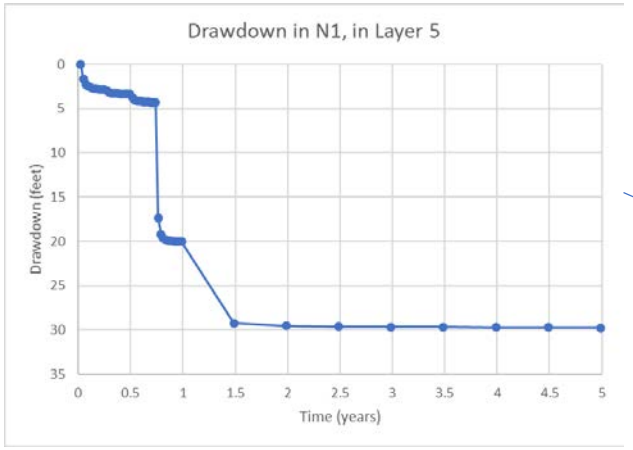
DRAFT

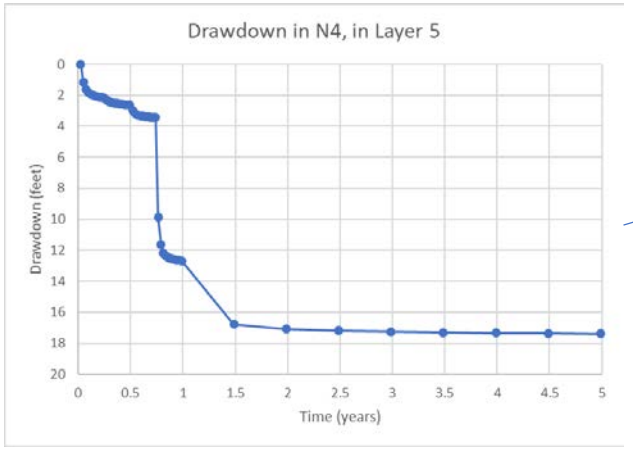
- Run transient flow model, stepping Main Quarry down to 477 feet over 1 year in four quarterly steps
- Drawdown in feet in layer 1, at 1 year
- Drawdown in feet in layer 5, at 1 year

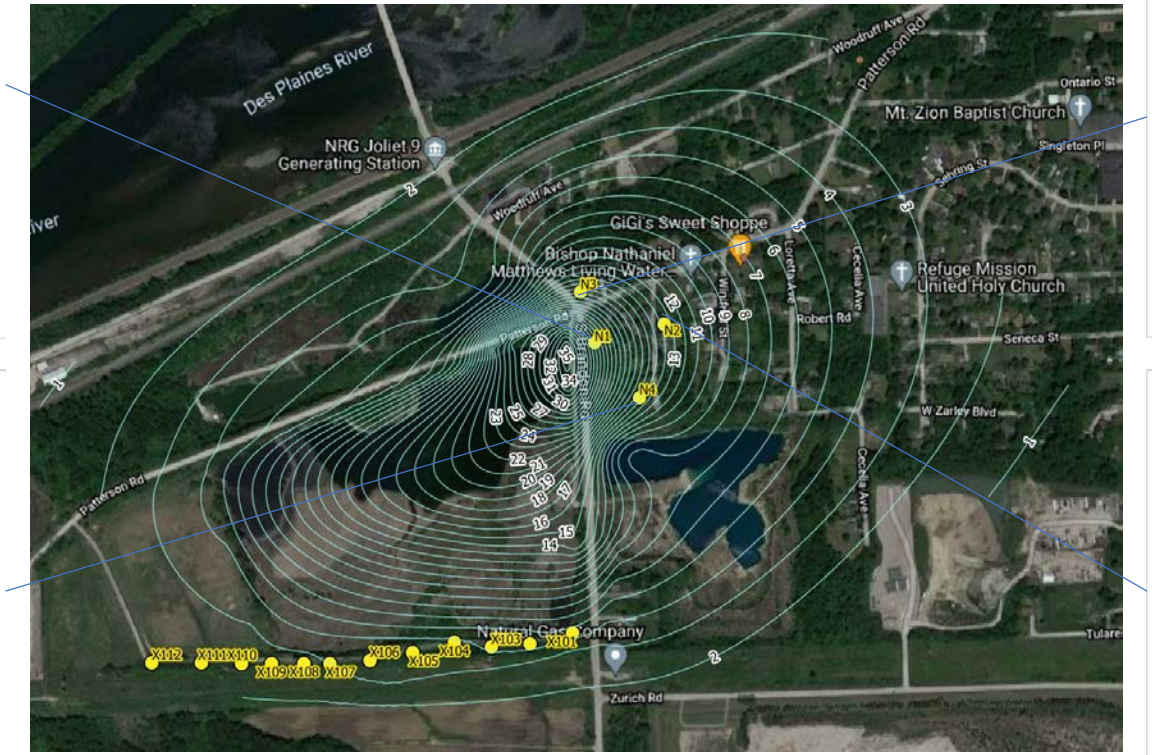
Adjacent Drawdown

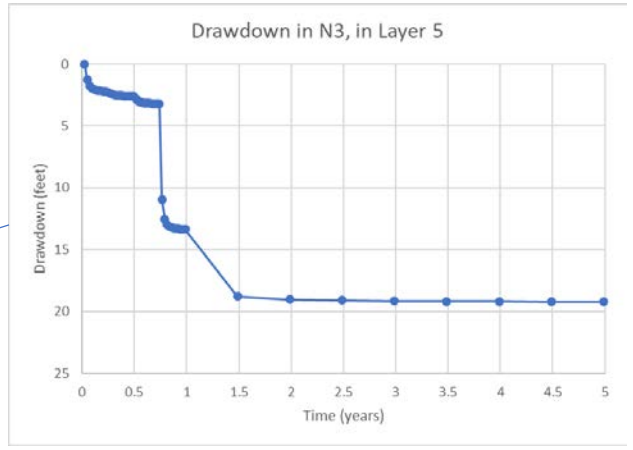
DRAFT

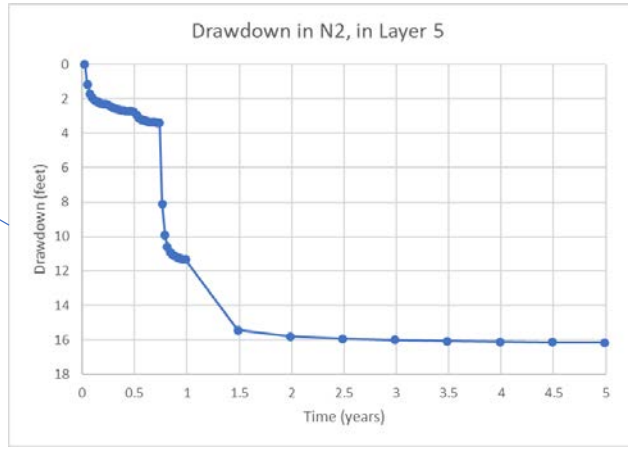
- Run transient flow model, stepping Main Quarry down to 477 feet over 1 year in four quarterly steps
  - Drawdown in feet in layer 5, at 1 year











Model Scenario #2

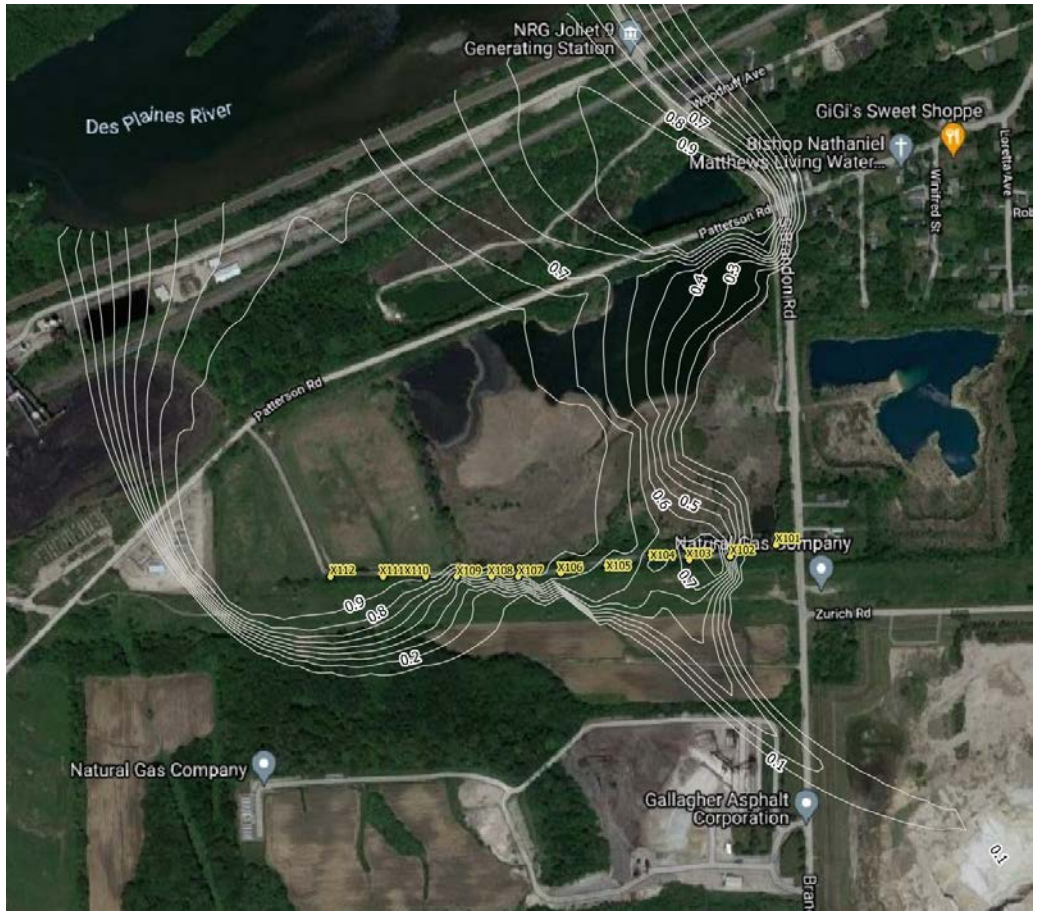
DRAFT

- From the calibrated, steady-state flow system and equilibrated concentration distribution (i.e. 100-year concentrations):
  2. Cap placement over regraded ash. Remove the source concentrations from layer 1, keep in layers 2-4, remove the pond (constant head) of Main Quarry, reduce recharge through LSQ by 3 orders of magnitude

100-year plume distribution

DRAFT

- Constant source beneath LSQ (i.e starting condition)



Results shown for model layer 5, base of Main Quarry

- Scenario 2, remove source from layer 1, remove pond at Main Quarry, reduce recharge through LSQ

Model Scenario #3

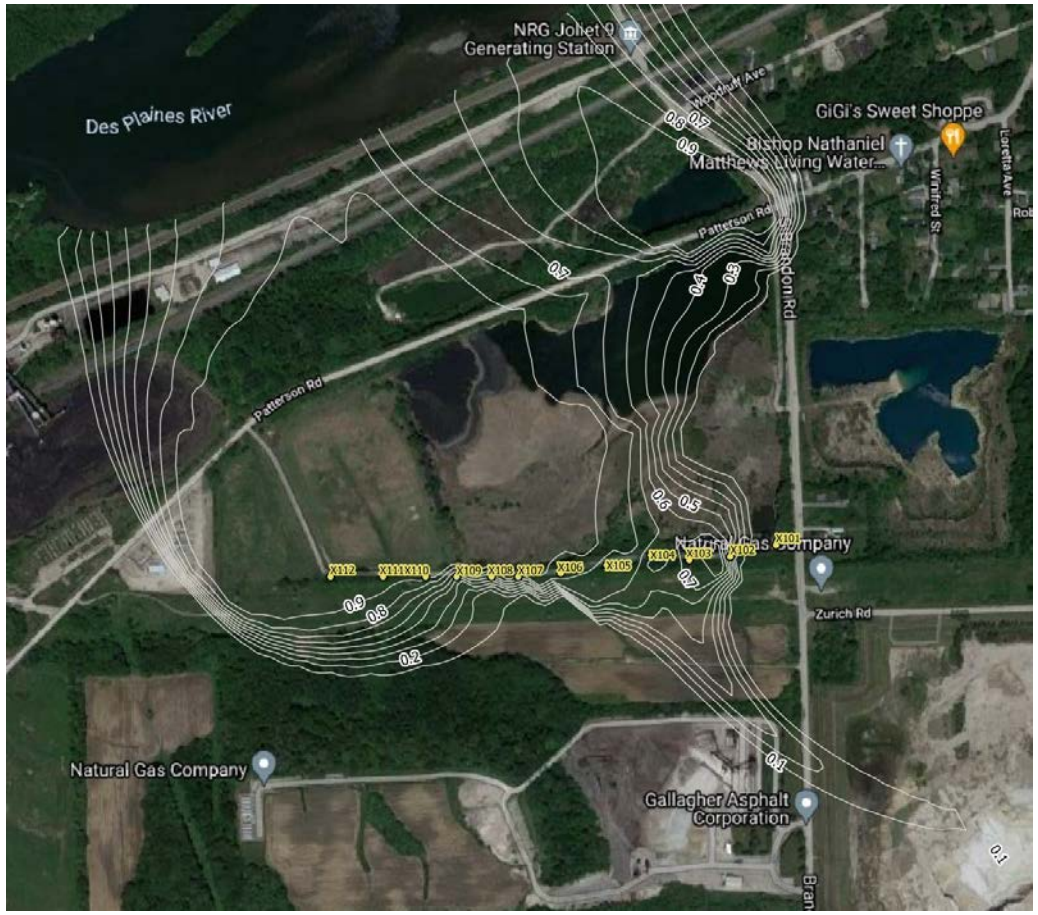
DRAFT

- From the calibrated, steady-state flow system and equilibrated concentration distribution (i.e. 100-year concentrations):
  3. Same as #2, but add in a low-K barrier wall along entire southern and eastern sides of LSQ, from land surface through the bottom of the model (through Dolomite)

100-year plume distribution

DRAFT

- Constant source beneath LSQ (i.e starting condition)



Results shown for model layer 5, base of Main Quarry

- Scenario 3, in addition to #2, add a low-K barrier wall along southern and eastern edges of LSQ through Dolomite

100-year plume distribution

DRAFT

- Constant source beneath LSQ (i.e starting condition)

Results shown for model layer 5, base of Main Quarry

- Scenario 3b, in addition to #2, add a low-K barrier wall along southern and eastern edges of LSQ through Dolomite. Remove existing extraction wells

Model Scenario #4

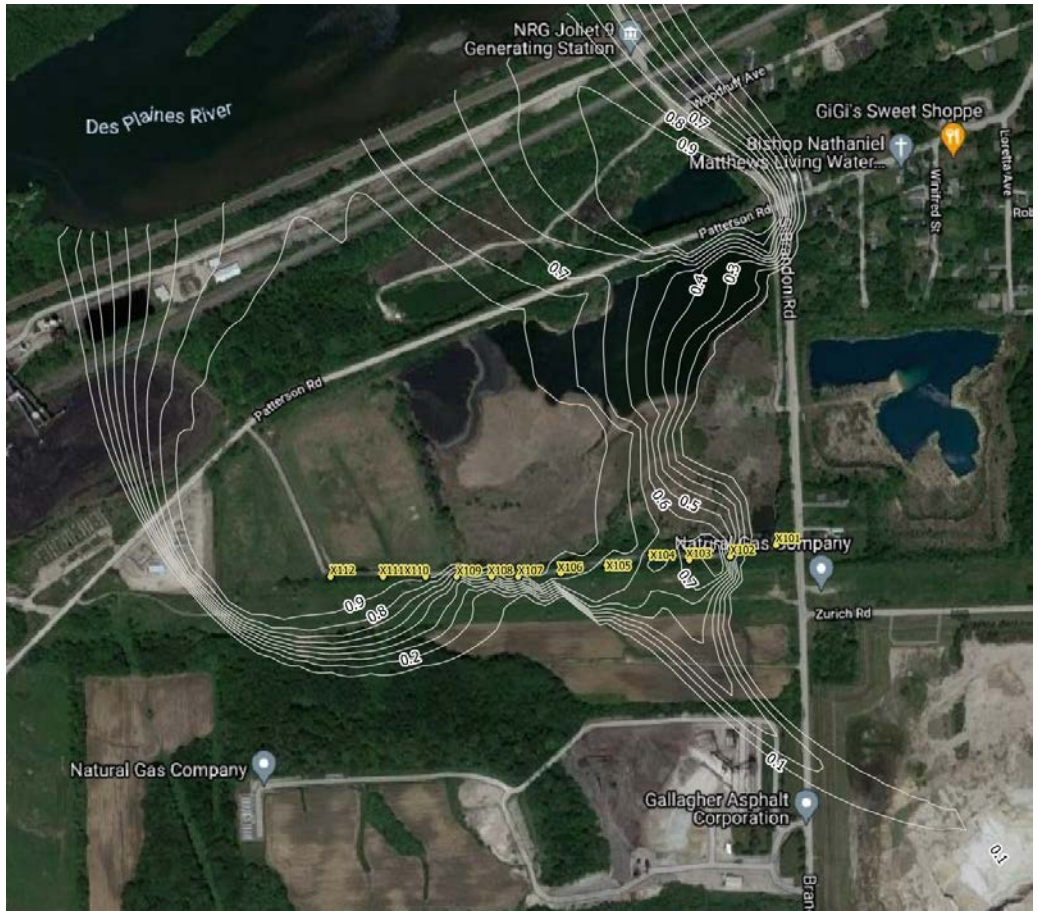
DRAFT

- From the calibrated, steady-state flow system and equilibrated concentration distribution (i.e. 100-year concentrations):
  4. Same as #2, but add in 47 extraction wells within LSQ, as per design by Geotech. Wells are 60-feet deep and pump a maximum of 7.5 gpm each

100-year plume distribution

DRAFT

- Constant source beneath LSQ (i.e starting condition)



Results shown for model layer 5, base of Main Quarry

- Scenario 4, in addition to #2, add 47, 60-foot wells pumping ~100 gpm total