BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
PETITION OF MIDWEST GENERATION, LLC FOR AN ADJUSTED STANDARD FROM 35 ILL. ADM. CODE 811 AND 814	)	AS 2019-001 (Adjusted Standard - Land)

NOTICE OF ELECTRONIC FILING

To: Attached Service List

PLEASE TAKE NOTICE that on May 7, 2019, I electronically filed with the Clerk of the Illinois Pollution Control Board ("Board") the attached public comments and request for public hearing, copies of which are served on you along with this notice.

Dated: May 7, 2019

Respectfully Submitted,

/s/ Jennifer Cassel
Jennifer Cassel (IL Bar No. 6296047)
Earthjustice
1010 Lake Street, Ste. 200
Oak Park, IL 60301
(215) 717-4525 (phone)
(212) 918-1556 (fax)
jcassel@earthjustice.org

May 7, 2019

Bradley Halloran
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph Street
Suite 11-500
Chicago, Illinois 60601

RE: Public Comments and Request for Public Hearing in IPCB AS 19-1, Petition of Midwest Generation for an Adjusted Standard from Portions of 35 Ill. Admin. Code Part 811

Dear Mr. Halloran,

Citizens Against Ruining the Environment, Earthjustice, Environmental Law & Policy Center, Prairie Rivers Network, and Sierra Club (collectively, "Commenters") respectfully submit these comments on the petition of Midwest Generation, LLC for a revision to its 1996 Adjusted Standard[1] at the Lincoln Stone Quarry coal ash impoundment in Joliet. Midwest Generation is seeking permission to close the impoundment in place using a final cover made from "ClosureTurf" rather than the currently mandated two-stage cover system. *See* Petition at 1; Adjusted Standard Condition 7(c), at 23.

Commenters write to emphasize that closing the Lincoln Stone Quarry in place, regardless of the type of cover, would violate both state and federal law. It is beyond dispute that the coal ash at Lincoln Stone Quarry sits deep within the water table, with at least 50 and up to 100 feet of ash permanently inundated by groundwater. Groundwater flows freely into and out of the ash, disseminating hazardous coal ash contaminants into the shallow aquifer. As a result, closure in place would violate both the Illinois Environmental Protection Act, 415 ILCS 5/1 *et seq*, and the federal coal combustion residuals rule ("Coal Ash Rule"), 40 C.F.R. § 257.50 *et seq*. The debate about what type of cap to install ignores the fundamental question of whether cap-in-place is lawful in the first place. As explained below, closure by cap-in-place is neither lawful nor protective of health or the environment.

Due to the severe ongoing groundwater pollution at the site and the serious threat that closure by cover would pose to the environment and residents of Joliet, Commenters hereby request a public hearing for the sole purpose of offering oral public comment pursuant to Section 101.628(c) of the Board's rules. *See* 35 Ill. Adm. Code §§ 101.628, 104.420. Commenters submit that the Board would benefit from hearing the perspective of concerned citizens and residents on this important matter.

[1] Opinion and Order of the Board, *In Re Petition of Commonwealth Edison Company for an Adjusted Standard*, AS 96-9 (Aug. 15, 1996) ("Adjusted Standard").

I. The coal ash at Lincoln Stone Quarry sits deep below the water table and will perpetually contaminate surrounding groundwater if left in place.

Lincoln Stone Quarry sits near the Des Plaines River in unconsolidated glacial overburden that contains a shallow aquifer.[2] In its 2018 groundwater flow evaluation submitted to the Illinois Environmental Protection Agency ("IEPA"), Midwest Generation reported that the base of the Quarry—and therefore the coal ash—sits at approximately 477 feet above sea level, with natural groundwater levels in the vicinity about 100 feet higher at 570-585 feet above sea level.[3] Midwest Generation's federal disclosures report a smaller range, with the base of the ash at 501 feet above sea level and the top of the uppermost aquifer at 555 feet above sea level.[4] Whichever range is correct, there is no dispute that Midwest Generation's coal ash sits many dozens of feet below the water table.

For this simple reason, groundwater pours continuously into the Quarry. In 1996, the Pollution Control Board found that an average of 8.5 million gallons of "sluice water, groundwater, and precipitation" flow into the Quarry every day. Adjusted Standard at 4. At that time, Midwest Generation's predecessor proposed and the Board approved a plan to grant legal approval to this perpetual, rapid infiltration of groundwater. The water flows into the Quarry, and then a "gravity-flow drainage system" discharges the water first into the North Quarry and then directly into the Des Plaines River at a permitted outfall. *Id.* Midwest Generation must "assure[] that the water level in the Main Quarry is maintained below the natural watertable level," which in theory "assures that the leachate is discharged to the Des Plaines River through Edison's NPDES-permitted outfall." *Id.* at 6.

This strategy of deliberate infiltration of groundwater has not, however, prevented widespread and ongoing releases of coal ash contamination into the shallow aquifer. Even in 1996, Midwest Generation's predecessor admitted that 101,400 gallons of water per day, or 1.2% of the total, was not captured by the "drainage system" and instead escaped directly into the surrounding groundwater. *Id.* at 4. In the 2018 groundwater flow evaluation, Midwest Generation admitted that the true figure is much higher: nearly a quarter—24%—of the groundwater that flows into the Quarry circumvents the drainage system.[5] Twenty years later, it is clear that "managed infiltration" at this site has utterly failed, and continues to fail, to prevent continual releases of coal-ash contaminated leachate into the groundwater.

Unsurprisingly, these releases have caused widespread groundwater contamination in the vicinity of the Quarry. The 2017 annual groundwater monitoring report submitted to IEPA shows that, at multiple wells—particularly wells located on the site's southeast side, away from the Des Plaines River—dangerously high levels of arsenic, boron, and molybdenum pollute groundwater. Arsenic concentrations as high as 200 µg/L—20 times the federal EPA and Illinois EPA's health-based standard

[2] KPRG and Associates, Inc., Midwest Generation, LLC, Joliet/Lincoln Stone Quarry Landfill: Annual Groundwater Flow Evaluation 2017-2018, at 3 (July 10, 2018) (attached as Exhibit 1).
[3] *Id.* at 3-4.
[4] Joshua D. Davenport, P.E., Placement Above the Uppermost Aquifer Location Restrictions: Lincoln Stone Quarry (Oct. 2018), http://3659839d00eefa48ab17-3929cea8f28e01ec3cb6bbf40cac69f0.r20.cf1.rackcdn.com/LSQ_LSQ1_LRI.pdf.
[5] Annual Groundwater Flow Evaluation 2017-2018 at 4.

of 10 µg/L—were measured in 2017 at the site.[6] Molybdenum—a pollutant linked to gout (joint pain, fatigue), high blood pressure, liver disease, and potential adverse impacts on the reproductive system[7]—was found in one sampling at 1600 µg/L, exceeding the Illinois applicable groundwater quality standard.[8] Boron, an indicator of coal ash pollution, also violated the standard in multiple wells.[9] These trends have continued. In its report for the fourth quarter of 2018, Midwest Generation admitted exceedances of the applicable groundwater quality standards for arsenic, boron, and barium, with arsenic at concentrations at sixteen times safe levels.[10]

Midwest Generation has also reported statistically significant increases above federal groundwater protection standards for a number of pollutants pursuant to the Coal Ash Rule, in particular arsenic, lithium, and molybdenum.[11] An analysis of the 2017 federal groundwater monitoring data showed arsenic exceeding federal standards by a factor of 11, boron and lithium by a factor of 4, and molybdenum by a factor of 25.[12] Under the federal rule, these exceedances require Midwest Generation to initiate closure and evaluation of corrective action at Lincoln Stone Quarry. 40 C.F.R. § 257.95(g)(5).

II. The Environmental Protection Act prohibits closing the Lincoln Stone Quarry by cap-in-place.

As set forth above, capping Lincoln Stone Quarry in place would allow the continued contamination of groundwater at the site. This contamination violates our state's Environmental

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[6] KPRG and Associates, Inc., Midwest Generation, Joliet/Lincoln Stone Quarry Landfill: Annual Report Year Ending December 31st, 2017, at 8 (Apr. 26, 2018) ("2017 Annual Report") (attached as Exhibit 2, without appendices).

[7] Agency for Toxic Substances and Disease Registry, "Toxicological Profile for Molybdenum: Draft for Public Comment, April 2017," *available at* https://www.atsdr.cdc.gov/toxprofiles/tp212.pdf, at pp. 8-10.

[8] 2017 Annual Report at 13-14.

[9] *Id.* at 9.

[10] *See* Letter from William Naglosky, Joliet Station Manager, to Illinois Environmental Protection Agency (Jan. 8, 2019) (attached as Exhibit 3). Importantly, there may be far more instances where boron was found at unsafe levels than were reported to IEPA. The applicable groundwater quality standard for the Lincoln Stone Quarry appears to be 5.92416 mg/L. *See* Exh. 3, Table 1. Illinois' Class I groundwater standards, set to protect health, limit boron to 2mg/L. *See In Re: Groundwater Quality Standards: 35 Ill. Adm. Code 620*, PCB R89-014(B), Final Order at 18 (Nov. 7, 1991) (noting that Class I standards were intended to fulfill "the principle that groundwaters that are naturally potable should be available for drinking water supply without treatment"); 35 Ill. Adm. Code 620.410. Exhibit 3 only includes those results where boron exceeded the 5.92416 mg/L standard. Thus, there may be numerous other instances where boron was found at unsafe levels in groundwater at the site, but those results were not reported to IEPA.

[11] *See* Significant GW Standard (Nov. 2, 2018), http://3659839d00eefa48ab17-3929cea8f28e01ec3cb6bbf40cac69f0.r20.cf1.rackcdn.com/LSQ_LSQ1_GMVIII.pdf.

[12] Environmental Integrity Project, Coal's Poisonous Legacy, Groundwater Contaminated by Coal Ash Across the U.S., at 55 (Mar. 4, 2019), https://earthjustice.org/sites/default/files/files/National%20Coal%20Ash%20Report%203.4.19.pdf; *see also* Earthjustice, Environmental Integrity Project, Prairie Rivers Network, and Sierra Club, "Cap and Run: Toxic Coal Ash Left Behind by Big Polluters Threatens Illinois Water," at 16-17) (Nov. 2018), https://illinoiscoalash.files.wordpress.com/2018/12/ilcoalashreport_capandrun.pdf.

Protection Act. The Act holds that "[n]o person shall: (a) cause or threaten or allow the discharge of any contaminants into the environment in any State so as to cause or tend to cause water pollution in Illinois" or "(d) [d]eposit any contaminants upon the land in such place and manner so as to create a water pollution hazard." 415 ILCS 5/12(a), (d). These provisions apply to contamination not only of surface water but also of groundwater. *See id.* 5/3.550 (defining "water" as "all accumulations of water, surface and *underground*, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this State" (emphasis added)); *see also People ex rel. Ryan v. Stonehedge, Inc*., 288 Ill. App. 3d 318, 321 (1997).

Capping the Quarry in place would allow violations of the Act to continue indefinitely. Coal ash that remains in contact with groundwater can continue to leach contaminants—causing violations of Section 12(a)—for decades or even centuries.[13] The existence of a groundwater management zone ("GMZ") at Lincoln Stone Quarry does not remedy these legal violations. The Pollution Control Board has held that the existence of a groundwater management zone does not immunize polluters from liability under Section 12 of the Environmental Protection Act. *See People v. Texaco*, PCB 02-03, 2003 WL 22761195, at *9 (Nov. 6, 2003). Exceedances of groundwater quality standards constitute water pollution under Section 12(a) regardless of the existence of a GMZ. These exceedances will continue indefinitely if coal ash is left in place at Lincoln Stone Quarry because a final cover does nothing to address horizontal groundwater infiltration.

III. The federal Coal Ash Rule prohibits closure in place at Lincoln Stone Quarry.

A coal ash impoundment or landfill cannot legally close in place if infiltration of groundwater into the ash and releases of contaminants from the ash will continue after closure. This requirement derives from the general performance standard set forth at 40 C.F.R. § 257.102(d). Although Illinois does not have a mandate to directly enforce federal standards, the state should not approve closure of an impoundment in violation of federal law.

A. Illinois should evaluate the closure of coal ash impoundments with an eye toward the overarching federal standards.

The federal closure performance standard for coal ash units is relevant for at least three reasons.

First, the Illinois Environmental Protection Agency has stated that it desires to match or surpass the standards established by the federal Coal Ash Rule in proceedings before the Pollution Control Board. For instance, in IEPA's motion to amend the proposed state coal ash regulations, the agency stated: "The federal rule is a comprehensive, clear, environmentally protective, publicly accessible means to perform groundwater monitoring, corrective action, and closure of CCW surface

[13] As part of the final risk assessment prepared for the federal Coal Ash Rule, EPA modeled the peak concentrations of coal ash contaminants in groundwater wells adjacent to unlined surface impoundments. The median peak concentration for modeled coal ash contaminants ranged from 74 to 4,400 years. *See* U.S. EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals, at 5-36 (Dec. 2014).

impoundments in Illinois."[14] Later, explaining why IEPA was not simply adopting the federal Coal Ash Rule wholesale, IEPA stated its desire to establish *more* stringent requirements: "One factor in its recommendation is the Agency's desire to be able to be more stringent than the federal rule with regard to the constituents in 40 C.F.R. Part 257, App. III."[15]

Second, it would serve the interests of regulatory certainty and efficiency to resolve all questions regarding the closure of Lincoln Stone Quarry in one forum. Lincoln Stone Quarry is covered by the federal Coal Ash Rule and must close in accordance with its requirements, in addition to any independent requirements imposed by the state of Illinois. *See* 42 U.S.C. §§ 6907(a)(3), 6944(a). As EPA explained in the preamble to the Coal Ash Rule:

> EPA's role under sections 1008(a)(3) and 4004(a) is to establish minimum criteria to determine which facilities "shall be classified as sanitary landfills and which shall be classified as open dumps," and to encourage states to use the criteria as a part of their solid waste management planning. Under this regulatory structure, Congress intended that the federal requirements apply directly to facilities and operate independent of state involvement . . . .

80 Fed. Reg. 21,302, 21,333 (Apr. 17, 2015). Midwest Generation will need to comply with the Coal Ash Rule eventually. Ignoring those federal requirements in state proceedings needlessly prolongs and complicates the path to safe, responsible cleanup at Lincoln Stone Quarry.

Finally, the federal closure performance standard was crafted to prevent groundwater contamination, and a closure plan that violates 40 C.F.R. § 257.102(d) is highly likely to cause or allow continued violations of the Illinois Environmental Protection Act. US EPA explained in the preamble to the Coal Ash Rule the dangers posed by direct interaction between coal ash and groundwater:

> [W]here the groundwater elevation is high enough to intersect the base of the waste management unit . . . this hydraulic connection can enhance the transport of contaminants of concern from the CCR unit into groundwater. . . .
>
> In some recent damage cases, placement of large volumes of CCR into highly permeable strata in the disposal area promoted CCR-water interactions. . . . Placement of CCR into un-engineered, unlined units in permeable strata has plainly led to adverse impacts to groundwater.

80 Fed. Reg. at 21,362. Such adverse impacts, all of which would violate Section 12(a) of the Act, cannot be prevented if coal ash impoundments are allowed to remain sitting in groundwater. There is no question that many feet of coal ash would remain in groundwater if the Lincoln Stone Quarry were

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[14] Illinois EPA's Motion to Amend, at 4, *In Re Coal Combustion Waste (CCW) Surface Impoundments at Power Generating Facilities: Proposed New 35 Ill. Adm. Code 841*, No. R14-10 (July 15, 2016 IPCB).

[15] Illinois EPA's Response to Questions Posed by the Board, at 10, *In Re Coal Combustion Waste (CCW) Surface Impoundments at Power Generating Facilities: Proposed New 35 Ill. Adm. Code 841*, No. R14-10 (Mar. 6, 2017 IPCB).

closed by cap-in-place. For that reason, closing the Lincoln Stone Quarry by a cover of any kind, rather than removal, would violate both the federal closure performance standards at 40 C.F.R. section 257.102(d) as well as the Illinois Environmental Protection Act.

B. The federal Coal Ash Rule prohibits closing a coal ash disposal unit in place if groundwater will continue to inundate the ash after closure.

Closing a coal ash disposal unit in place, where the ash will continue to interact with groundwater, violates several provisions of the federal closure performance standard set forth at 40 C.F.R. § 257.102(d). First, such a closure does not "[c]ontrol, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters." *Id.* § 257.102(d)(1)(i). When ash is sitting in groundwater, there is no barrier to "control, minimize or eliminate" infiltration of liquids into the CCR or releases or CCR leachate into the groundwater. In those circumstances, infiltration and releases are not "control[led], minimize[d] or eliminate[d]" at all, much less "to the maximum extent feasible."[16] Those performance standards, as such, cannot be met where groundwater continues to pass freely through the ash. US EPA has interpreted similar language in related regulations to prohibit just this result. For example, the standard for interim status hazardous waste units requires a closure plan that "[c]ontrols, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste." *Id*. § 265.111(b). EPA has interpreted this provision to ban closure-in-place that leaves waste in contact with groundwater. *See, e.g.*, Regulatory Interpretation of the Closure Performance Standard, OSWER Directive No. 9476.00-13, Haz. Waste & Haz. Subst. Compl. ¶ 504 (C.C.H), 2015 WL 7710403.

Second, for similar reasons, closure via cap-in-place would not "[p]reclude the probability of future impoundment of water." 40 C.F.R. § 257.102(d)(ii). The plain meaning of "preclude" is to prevent *all* impoundment of water from whatever source, including groundwater. A disposal unit that is already in groundwater, and will continue to be regularly saturated with groundwater, is not only probable but certain to impound water. Finally, before a final cover can be installed at a surface impoundment,[17] "free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues." *Id.* § 257.102(d)(2)(i). The Coal Ash Rule defines "free liquids" as "liquids that readily separate from the solid portion of a waste under ambient temperature and pressure." *Id*. § 257.53. With this context, the closure performance standard clearly requires that a surface impoundment no longer contain wet CCR before the operator may install a final cover. CCR soaked with groundwater could not satisfy this standard.

Notably, Indiana's Department of Environmental Management ("IDEM") has already made clear that it recognizes the requirements of 40 C.F.R. § 257.102(d) to apply to groundwater. On December 17, 2018, IDEM sent a request for additional information to Duke Energy with regard to their closure of impoundments at the Gibson Generating Station North Ash Basin. IDEM's letter clearly lays out the

[16] "Feasible" in the context of the Resource Conservation and Recovery Act refers only to physical possibility without any consideration of cost. *See Util. Solid Waste Activities Grp. v. Envtl. Prot. Agency*, 901 F.3d 414, 448-49 (D.C. Cir. 2018) ("Under any reasonable reading of RCRA, there is no textual commitment of authority to the EPA to consider costs in the open-dump standards.").
[17] Midwest Generation recognizes in its Petition that "the Main Quarry is a 'CCR Impoundment' as defined in the Federal CCR rules." Petition at 3.

legal infirmity of closing an impoundment in place when it will come into future contact with groundwater:

> Please note, the closure approach you have proposed leaves waste in place either in contact or in potential contact with ground water. The Coal Combustion Residual (CCR) rule's closure performance standard when leaving CCR in place includes the following requirement: "Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere … " 40 CFR 257.102(d)(1)(i). For purposes of this requirement, it is IDEM's position "infiltration" can come from any direction, and it is not limited to liquids that pass through the final cover system. Specifically, it is IDEM's position ground water infiltration into closed-in-place CCR constitutes "post-closure infiltration of liquids into the waste." Further, it is IDEM's position the phrase "releases of CCR, leachate, or contaminated run-off to the ground or surface waters" includes releases to ground water. IDEM cannot approve a closure plan that would leave CCR in place without a description of how the plan controls, minimizes, or eliminates post-closure infiltration and releases "to the maximum extent feasible."

Letter from Amy McClure, Chief, Solid Waste Permits Section, to Owen Schwartz, Duke Energy Indiana, Inc., at 1 (Dec. 17, 2018) (attached as Exhibit 4). IDEM's interpretation of the Coal Ash Rule is correct.

In addition to the closure performance standard at 40 C.F.R. § 257.102(d), Midwest Generation will also need to comply with the Coal Ash Rule's corrective action requirements in the coming months. The Lincoln Stone Quarry has already triggered corrective action under the federal rule because monitoring wells have shown statistically significant levels of arsenic, lithium, and molybdenum.[18] In accordance with the timeline set forth by the Coal Ash Rule, Midwest Generation has now initiated an assessment of corrective measures,[19] which must be completed by August 1, 2019, at the latest. *See* 40 C.F.R. § 257.96(a) (setting for the timeline for assessment of corrective measures after a groundwater protection standard exceedance). The selected corrective action remedy must, among other things, "[b]e protective of human health and the environment," attain federal groundwater protection standards, and "[c]ontrol the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment." *Id.* § 257.97(b)(1),(2),(3). Like the Closure Performance Standard, this standard cannot be met if the source of pollution—CCR—continues to soak in groundwater. Therefore, appropriate corrective action will likely also require removal of ash at the Quarry.

[18] *See* Significant GW Standard (Nov. 2, 2018), http://3659839d00eefa48ab17-3929cea8f28e01ec3cb6bbf40cac69f0.r20.cf1.rackcdn.com/LSQ_LSQ1_GMVIII.pdf.

[19] E-Mail from Sharene Shealey, Will County Generating Station, to Rick Cobb et al. (Mar. 4, 2019), http://3659839d00eefa48ab17-3929cea8f28e01ec3cb6bbf40cac69f0.r20.cf1.rackcdn.com/LSQ_LSQ1_GMXXVI.pdf.

In sum, cap-in-place, no matter what variety of cover Midwest Generation settles on, cannot comply with federal closure and corrective action requirements.

IV. Conclusion

The 1996 Adjusted Standard and Midwest Generation's new Petition rely on the flawed premise that cap-in-place is a legal method of closure for the Lincoln Stone Quarry. Because, as no one disputes, groundwater is flowing constantly through the coal ash at the Quarry and contaminating nearby groundwater, leaving the ash in place will violate both the Illinois Environmental Protection Act and the federal closure performance standard. In addition, the federal corrective action process that has been triggered will likely require source control through removal of coal ash from Lincoln Stone Quarry. In light of these realities, a debate about the technical specifications of the final cover is beside the point. The undersigned organizations respectfully urge the Pollution Control Board to consider these comments in its consideration of Midwest Generation's Petition.

Sincerely,

Ellen Rendulich
Citizens Against Ruining the Environment

Jennifer Cassel
Henry Weaver
Coal Program Attorneys
Earthjustice

Jeffrey Hammons
Staff Attorney
Environmental Law and Policy Center

Andrew Rehn
Water Resources Engineer
Prairie Rivers Network

Faith Bugel
Greg Wannier
Attorneys
Sierra Club

CERTIFICATE OF SERVICE

I hereby certify that on this 7th day of May, 2019, I electronically served the foregoing public comments and request for public hearing, including exhibits 1-4, upon the parties of record at the email addresses indicated in the service list below.

I further certify that my email address is jcassel@earthjustice.org; the number of pages in the email transmission is 96; and the email transmission took place today before 5:00 p.m. CT.

Respectfully Submitted,

/s/ Jennifer Cassel

Jennifer Cassel (IL Bar No. 6296047)
Earthjustice
1010 Lake Street, Ste. 200
Oak Park, IL 60301
(215) 717-4525 (phone)
(212) 918-1556 (fax)
jcassel@earthjustice.org

SERVICE LIST

Michelle M. Ryan, Assistant Counsel
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, IL 62794
michelle.ryan@illinois.gov

Bradley P. Halloran, Hearing Officer
Illinois Pollution Control Board
100 West Randolph Street
Suite 11-500
Chicago, IL 60601
brad.halloran@illinois.gov

Kristen L. Gale
Susan M. Franzetti
Nijman Franzetti LLP
10 S. LaSalle Street, Suite 3600
Chicago, IL 60603
kg@nijmanfranzetti.com
sf@nijmanfranzetti.com

Don Brown, Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center
Suite 11-500
100 West Randolph
Chicago, Illinois 60601
don.brown@illinois.gov

Exhibit 1

MEMORANDUM

Date 7/12/2018

To: BOL File Room

From: Pamela Ketchum

Re: LPC# 1978090001 - Will County
LINCOLN STONE OUARRY
Groundwater

The Annual Groundwater Flow Evaluation for the above referenced facility was dated 7/10/2018 and was received by the Agency on 7/12/2018. A copy is attached.

cc: DesPlaines Regional Office - Gino Bruni
Will County Land Use Department
Joshua Rhoades

Illinois
Environmental
Protection Agency

Bureau of Land
1021 North Grand Avenue East
Box 19276
Springfield, IL 62794-9276

SOLID WASTE LANDFILL GROUNDWATER, LEACHATE, FACILITY AND GAS REPORTING FORM

This form must be used as a cover for the following list of notices and reports required to be submitted to the Illinois EPA's Bureau of Land, Permit Section. This form must be used for Solid Waste facilities only. Reporting for Hazardous Waste facilities should be submitted on a separate form. All reports submitted to the Illinois EPA's Bureau of Land Permit Section must contain an original, plus a minimum of two copies.

Note: This form is not to be used with permit applications. The facility's approved permit will state whether the document you are submitting is required as a report or an application.

Facility Name: Joliet/Lincoln Stone Quarry Site ID #: 1978090001
Facility Address: 1601 S. Patterson Rd., Joliet, IL 60436

Check the appropriate heading. Only one heading may be checked for each corresponding submittal. Check the appropriate sub-heading, where applicable. Attach the original and all copies behind this form.

___ LPC-160 Forms

Groundwater
___ Quarterly – Indicate one: 1 2 3 4
___ Semi-Annual
___ Annual
___ Biennial

Leachate
___ Quarterly – Indicate one: 1 2 3 4
___ Semi-Annual
___ Annual
___ Biennial

___ Well Construction Information
___ Well Construction Forms, Boring Logs and/or Abandonment Forms
___ Well Survey Data (e.g., Stick-up Elevation Data)

X Annual Groundwater Flow Evaluation

___ Notice of Observed Increase in Groundwater
Notice of Intent to Perform Confirmation Procedures (Re-sampling) in Groundwater

___ Notice of Confirmed Increase of Groundwater Exceedence from Re-sample

___ Notice of Methane Exceedences

___ Annual Facility Report (per 35 Ill. Adm. Code 813.504) and Gas Monitoring Report

___ Annual Certifications per 35 Ill. Adm. Code 813.501

___ Other (identify) _____

IEPA-DIVISION OF RECORDS MANAGEMENT
RELEASABLE
AUG 14 2018
REVIEWER: EMI

RECEIVED
JUL 12 2018
IEPA-BOL
PERMIT SECTION

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MIDWEST GENERATION
JOLIET/LINCOLN STONE QUARRY LANDFILL

1978090001—Will County
Permit No. 1994-241-LFM (Modification No. 24)

ANNUAL GROUNDWATER FLOW EVALUATION
2017-2018

RECEIVED
JUL 12 2018
IEPA-BOL
PERMIT SECTION

MIDWEST GENERATION, LLC
JOLIET/LINCOLN STONE QUARRY LANDFILL

2978090002—Will County
Permit No. 1994-241-LFM (Modification No. 24)

ANNUAL GROUNDWATER FLOW EVALUATION
2017-2018

Prepared By:
KPRG and Associates, Inc.
14665 W. Lisbon Rd., Suite 2B
Brookfield, WI 53005

July 10, 2018
KPRG Project No. 21406.12

TABLE OF CONTENTS

1.0 INTRODUCTION

The Joliet/Lincoln Stone Quarry facility consists of two portions. An older, inactive portion of the facility is referred to as the West Filled Area (WFA). The WFA occupies approximately 14 acres of the western portion of the facility. The Main Quarry, east and immediately adjacent to the WFA, is the active portion of the facility, where bottom ash and slag have been sluiced. Figure 1 provides a facility location map. In accordance with Condition X.20 of Permit No. 1994-241-LFM Modification No. 24, this report provides an evaluation of groundwater flow conditions (direction and gradients) for the Joliet/Lincoln Stone Quarry facility. The reporting period consists of the 3rd Quarter 2017 through the 2nd Quarter 2018. The objectives of this evaluation are as follows:

- To document groundwater flow conditions beneath the site over the noted reporting period for the water table, shallow zone and deep zone.
- To document the hydraulic control established by the extraction well system installed as part of an Interim Remedial Measure (IRM) along the south side of the facility.
- To evaluate the adequacy of the monitoring network relative to the observed flow conditions.
- To provide recommendations, if needed, to improve the monitoring network.

As part of an Illinois Environmental Protection Agency (IEPA) approved IRM, an extraction well system consisting of four extraction wells (X101 through X104) was installed within the February to April, 2010 timeframe. The system was subsequently expanded in 2011/2012 to include eight additional extraction wells (X105 through X112) providing coverage along the entire south perimeter of the Joliet/Lincoln Stone Quarry facility. The system is targeted for the shallow zone aquifer. The purpose of the extraction well system is to establish a hydraulic trough between the Main Quarry/WFA and the south perimeter of the facility (*i.e.*, a lowering of potentiometric head to an elevation lower than at the south perimeter of the facility, the Main Quarry and the WFA water levels). This hydraulic trough will facilitate movement of groundwater within the shallow zone from the south boundary of the facility back toward the north. Water moving to the south from the Main Quarry/WFA also will be intercepted by this extraction well system. The goal of the system is to intercept enough of the flow to facilitate meeting Applicable Groundwater Quality Standards (AGQSs) at the south perimeter wells over time. The initial system of four extraction wells (X101 through X104) became fully operational on April 30, 2010 and the additional eight extraction wells (X105 through X112) associated with the system expansion became fully operational on February 16, 2012. The system has been running continuously with the exception of minor down time for routine well system and pump maintenance. The hydraulic effects of the extraction system are discussed in Section 2.2.2.

2.0 EVALUATION OF FLOW CONDITIONS

This section documents the groundwater flow conditions beneath the site during the reporting period. It provides a brief summary of the subsurface geology and hydrogeology and a description of historic flow conditions. This is followed by a presentation of the existing flow conditions within the "shallow" and the "deep" dolomite monitoring zones. Also included in this report is a discussion of the actual "water table" condition as it relates to the site.

2.1 Summary of Geology and Hydrogeology

Geology

The following discussions of the general geology and hydrogeology are based upon the information from the references that are listed in Section 4. The facility is underlain by approximately 20 to 30 feet of unconsolidated glacial overburden (this thickness may vary substantially across the site) which is underlain by Silurian age dolomite. The Silurian dolomite is divided into four units identified as a weathered bedrock rind, Joliet Formation dolomite, Kankakee Formation dolomite and the Elwood/Wilhelmi dolomite. Beneath the Silurian dolomite is the Ordovician age Maquoketa Group consisting of the Brainerd Shale, Fort Atkinson dolomite and the Scales Shale. The Scales Shale unit is a recognized regional aquitard which hydraulically isolates the deeper bedrock aquifers from the shallower units.

Regional and site-specific data from the cited studies and investigations document fractures in the Silurian dolomite. Site-specific and regional data are consistent in describing a primary joint set that is vertical and oriented about N52°E and N40°W. The N40°W joints are described as "more distinct". Natural spacing between the joint sets ranges from 3 to more than 10 feet, and joint apertures are described as less than $1/16^{th}$ -inch. Bedding plane fractures are also described. Descriptions from the quarry walls and from cores obtained during drilling show significant clay infilling of the vertical joints and bedding plane fractures. Evidence of water movement through fractures is interpreted from iron staining and mineralization (primarily calcite, with some pyrite and marcasite).

There is additional fracturing at the quarry wall and the fractures/joints tend to be more open at the wall. This is interpreted to be a localized phenomenon that is the result of the blasting and unloading from former quarry operations. This effect does not appear to extend greater than about 10 or 15 feet away from the quarry wall.

The dolomite beneath the facility is divided into a "shallow" zone and a "deep" zone. These two layers are separated by a "lower permeability" zone identified

as the Brainerd Shale that is approximately 10 feet thick. The lower permeability zone is mappable across the site and has been used by the Illinois State Geological Survey (ISGS) as a tracer bed.

The shallow zone is about 140 to 150 feet thick. This places the bottom of the shallow zone and top of the lower permeability zone (Brainerd Shale) at approximately 430 to 440 feet above mean sea level (msl). The boundary between the bottom of the low permeability zone and the top of the deep zone is approximately 10 feet deeper, between about 420 to 430 feet above msl. The deep zone is 30 to 40 feet thick, so the boundary between the deep zone and the remaining Maquoketa Shale (Scales Shale member) unit is at approximately 380 to 400 feet above msl. For reference purposes it is noted that the deepest portion of the bottom of Lincoln Stone Quarry is at approximately 477 feet above msl.

Recent groundwater assessment studies have identified a horizon of higher permeability within the shallow Silurian dolomite zone. The higher permeability zone extends from approximately 500 feet above msl down to approximately 430 feet above msl which is basically at and below the base of the Joliet/Lincoln Stone Quarry. This feature is important in the understanding and interpretation of existing groundwater flow conditions beneath the site as further discussed in Section 2.2.2 below.

Hydrogeology

The water table beneath the site is encountered under unconfined conditions within the unconsolidated overburden and/or the upper portion of the shallow dolomite. There is sufficient potentiometric and chemical data from clustered piezometers around the Joliet/Lincoln Stone Quarry to indicate that the shallow dolomite zone and deep dolomite zone can be viewed as separate water bearing units. The intervening zone (Brainerd Shale) is of sufficiently lower permeability that it impedes downward migration and mixing of the groundwater. This is illustrated by the difference in the groundwater flow conditions within the shallow and deep zones, as discussed in the subsequent subsections of Section 2.0. The Scales Shale member of the Maquoketa Group, which defines the base of the deep dolomite, is widely accepted as a regional aquitard that hydraulically separates the groundwater in the overlying dolomite from deeper groundwater in the older sandstone and carbonate units beneath it.

Natural groundwater flow in the area is from the south and east to the north and west. This flow pattern largely parallels surface drainage from topographically high areas to the Des Plaines River and likely represents a topographically driven groundwater flow system.

Initial hydrogeologic evaluations performed in support of the original permit and of the Adjusted Standard for the site identify the natural groundwater level in the vicinity of the Main Quarry to have been between 570 and 585 feet above msl. The water level in the Main Quarry was generally maintained at an elevation below 555 feet above msl with the primary operating levels historically being between 540 and 550 feet above msl. However, the level in the Main Quarry has been intentionally lowered starting in the 2nd quarter of 2008 in response to the potential dewatering of Boyd's Quarry located immediately east of the facility. This was done to ensure maintaining an inward gradient along the east side of the Main Quarry. At this time, Main Quarry operating levels are targeted to be at or below approximately 545 feet above mean sea level.

As described in the initial hydrogeologic studies, the difference between the operational water level in the Main Quarry and the natural water table generates a hydraulic gradient into the Main Quarry and/or the WFA from the south and east. The initial studies estimated that approximately 76% of the groundwater that flowed into the Main Quarry/WFA area eventually reached the Des Plaines River by pumping from the North Quarry settling pond pursuant to the NPDES discharge permit. The remaining 24% of the groundwater naturally discharged from the Silurian dolomite directly to the Des Plaines River.

2.2 Evaluation of Groundwater Flow Direction and Gradients

The following discussions present the water level data obtained from the monitoring wells of the approved groundwater monitoring system. That data is supplemented with water level data from shallow zone assessment wells T01S through T11S, shallow zone extraction wells X101 through X112, deep zone monitoring well G45D and water table wells G45WT, G46WT, G47WT, G48WT, A08WT and R16WT. All of these wells were installed as part of an ongoing groundwater assessment program to provide additional hydrogeologic control. The water level data used are presented in Table 1.

2.2.1 Water Table

Water table maps for the 3rd and 4th Quarters 2017 and the 1st and 2nd Quarters 2018 are provided in Appendix A. These are based on water levels obtained from groundwater assessment monitoring wells which include screens that straddle the phreatic surface (WT-series wells). The maps indicate that groundwater flow within the upper portion of the saturated zone is generally in a northerly and westerly direction. The near surface groundwater from the south and east of the site flows through the Main Quarry and WFA. This is consistent with the natural groundwater flow patterns defined as part of the initial permit application and Adjusted Standard studies as

discussed in Section 2.1 above. All four quarters show consistent patterns.

2.2.2 Shallow Zone

The potentiometric surface maps of the shallow zone for the 3rd and 4th Quarters 2017 and the 1st and 2nd Quarters 2018 are provided in Appendix B. The maps show generally lower heads than were mapped in 1993 when data were first collected. This is in part the natural result of wet conditions that existed during 1993 baseline data collection and in part the result of dewatering associated with the operations of Laraway Quarry, beginning circa 1997. In spite of the general decline in heads, the groundwater flow patterns north and west of the facility remain consistent with the 1993 flow patterns.

As noted in previous submittals, a south-southeasterly component of groundwater flow was defined along the south perimeter of the Joliet/Lincoln Stone Quarry facility that was not evident in 1993 data. This component of flow has been determined to be the result of unrelated, off-site dewatering activities associated with surface mining operations at Laraway Quarry, approximately 1,000 feet to the southeast of the Joliet/Lincoln Stone Quarry facility. This change of natural flow conditions along the south side of the Joliet/Lincoln Stone Quarry facility is not observed in the water table conditions which were described above in Section 2.2.1. The noted change of natural flow within the shallow dolomite unit has been determined by the groundwater assessment activities to be the result of a higher permeability horizon that exists at, and just beneath, the base of Joliet/Lincoln Stone Quarry (approximate lowest quarry base elevation of 477 feet msl) within the shallow dolomite. This zone is undergoing additional depressurization as a result of dewatering operations at Laraway Quarry located approximately 1,000 feet southeast of the site. This depressurization is allowing for a component of groundwater flow to move from Joliet/Lincoln Stone Quarry to the south-southeast.

As noted in the introductory discussion in Section 1.0, to address the south-southeasterly groundwater flow component within the shallow zone, a total of twelve extraction wells (X101 through X112) were installed. The first four extraction wells (X101 through X104) were installed during the February to April 2010 timeframe and this portion of the system was put into full operation on April 30, 2010. The remaining eight extraction wells (X105 through X112) were installed during the October 2011 through January 2012

timeframe and this portion of the system was put into full operation on February 16, 2012.

The hydraulic effects of the pumping system are clearly seen on the shallow zone potentiometric surface maps. A cone of depression has been established between south perimeter wells G48S, G47S, G46S, G38S and G39S and the Main Quarry/WFA. Groundwater from the south perimeter of the site is generally being drawn back to the north to the extraction well system. Water from the Main Quarry/WFA is also being intercepted by the extraction system. The extracted water is being discharged back into the Main Quarry.

During all four quarters being evaluated, the water levels in the extraction wells were below the south perimeter monitoring wells G38S, G46S, G47S, and G48S with the exception of extraction well X111 in the 3rd quarter 2017 and extraction well X105 in the second quarter 2018. In both cases the pump lost efficiency and eventually failed. Both pumps have been replaced.

Extraction wells X102, X103, X104 and X105 are continuing to undergo an aggressive pump maintenance and cleaning schedule as a result of the scaling to improve their extraction efficiency. There has been substantial improvement at extraction well locations X102, X103, X104 and X105 since the more enhanced maintenance was implemented. It is noted that one of the pumps in the extraction well X105 rotation failed as discussed above. A new replacement pump has been purchased. Wells X106 through X112 are experiencing much less scaling and are operating efficiently.

Table 2 summarizes the horizontal gradients across the site within the shallow zone. The noted horizontal gradients (amount and direction) appear generally consistent among quarters and as compared to historical data.

2.2.3 Deep Zone

The potentiometric surface maps for the deep zone for the 3rd and 4th Quarters 2017 and the 1st and 2nd Quarters 2018 are provided in Appendix C.

As with the shallow zone, the head levels in the deep zone have declined since the 1993 baseline data. This is consistent with 1993 baseline data representing a wet condition. The contemporary data show general flow in the deep zone from east to west, with a southwesterly flow component. However, this too should eventually

flow toward the Des Plaines River, which wraps around to the west of the site.

A review of the deep zone potentiometric maps in Appendix C indicates that for the 3rd and 4th quarters of 2017 and the 1st and 2nd quarters of 2018 there is an east to west flow pattern with a southwesterly flow component. The previous annual flow evaluation (2016-2017) documented a decrease in deep zone water levels starting in the 1st quarter 2017 primarily under the western portion of the site. This was attributed to some dewatering of this unit by the underground mining operation located to the west. These water levels have since recovered to levels consistent with previous historical trends. Based on discussions with persons familiar with the underground mining operation indicates that some temporary dewatering had occurred last year during the construction of air vents extending through the Silurian Dolomite (the target rock in the underground mine is beneath the Maquoketa Group).

The overall flow patterns are generally consistent with historic conditions within the deep zone. Variations from earlier annual submittals appear to be interpretive artifacts that are the result of variations in the number and distribution of control points for the maps, rather than changes in flow direction in the deep zone. For example, in 1993, there were only four monitoring points controlling the interpretation of the deep zone. There are now 13 wells within this zone providing a more detailed assessment.

Table 3 summarizes the horizontal gradients across the site within the deep zone. The horizontal gradients (amount and direction) appear generally consistent across the site and are consistent with historical data. The general flow is in a west-southwesterly direction.

2.2.4 Vertical Gradients

Table 4 summarizes the vertical hydraulic gradient data obtained from well clusters across the site. The data indicate a downward vertical hydraulic gradient between the shallow and deep zones over most of the site. However, well cluster G33S/D, located near the Des Plaines River, does show a slight upward gradient during the 4th quarter 2017. The relative gradients are generally consistent with historical trends.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation of groundwater flow directions and gradients presented in Section 2.0, the following conclusions are made:

- The water table data indicates that actual near surface water table flow conditions/patterns are consistent with the natural groundwater flow patterns defined as part of the initial permit application and adjusted standard studies.

- The groundwater flow patterns in both the shallow and deep dolomite zones are generally consistent with historical patterns documented during the initial permitting process. The exception is the south-southeasterly flow component from the south side of the Main Quarry/WFA that is observed in the shallow zone. This flow component has been documented consistently since circa 1997 and has been determined to be related to a higher permeability horizon within the shallow zone dolomite which is being depressurized as a result of dewatering operations being performed at Laraway Quarry located approximately 1,000 feet southeast of the site.

- The extraction well system that was installed to address the south-southeasterly flow component from the Main Quarry/WFA within the shallow zone aquifer has established the desired hydraulic effect along the southern perimeter of the facility as evidenced by the potentiometric surface maps (see Appendix B, Figures B-1/1a through B-4/4a).

- The existing groundwater monitoring network as approved by Permit Modification No. 24 dated June 11, 2018 is adequate for continued monitoring of the groundwater quality, flow direction and hydraulic gradient associated with Lincoln Quarry.

No additional permit monitoring points are proposed or recommended at this time.

4.0 REFERENCES

1. Petition of Commonwealth Edison Company for Site-Specific Regulation for Existing Landfill and Units: 35 Ill. Admin. Code 811.814. October, 1994.

2. Willman, H.B. Summary of the Geology of the Chicago Area. Illinois State Geological Survey, Circular 460, 1971.

3. Willman, H.B. Rock Stratigraphy of the Silurian System in Northeastern and Northwestern Illinois. Illinois State Geological Survey, Circular 479, 1973.

4. Illinois State Geological Survey. Miscellaneous Historical Field Notes.

5. Harza Engineering Company/Commonwealth Edison Company. Geologic and Hydrogeologic Evaluation of the Lincoln Stone Quarry Site, Joliet, Illinois. 1976.

6. Andrews Environmental Engineering, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation. July, 2005.

7. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2006.

8. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2007.

9. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2008.

10. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2009.

11. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2010.

12. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2011.

13. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2012.

14. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2013.

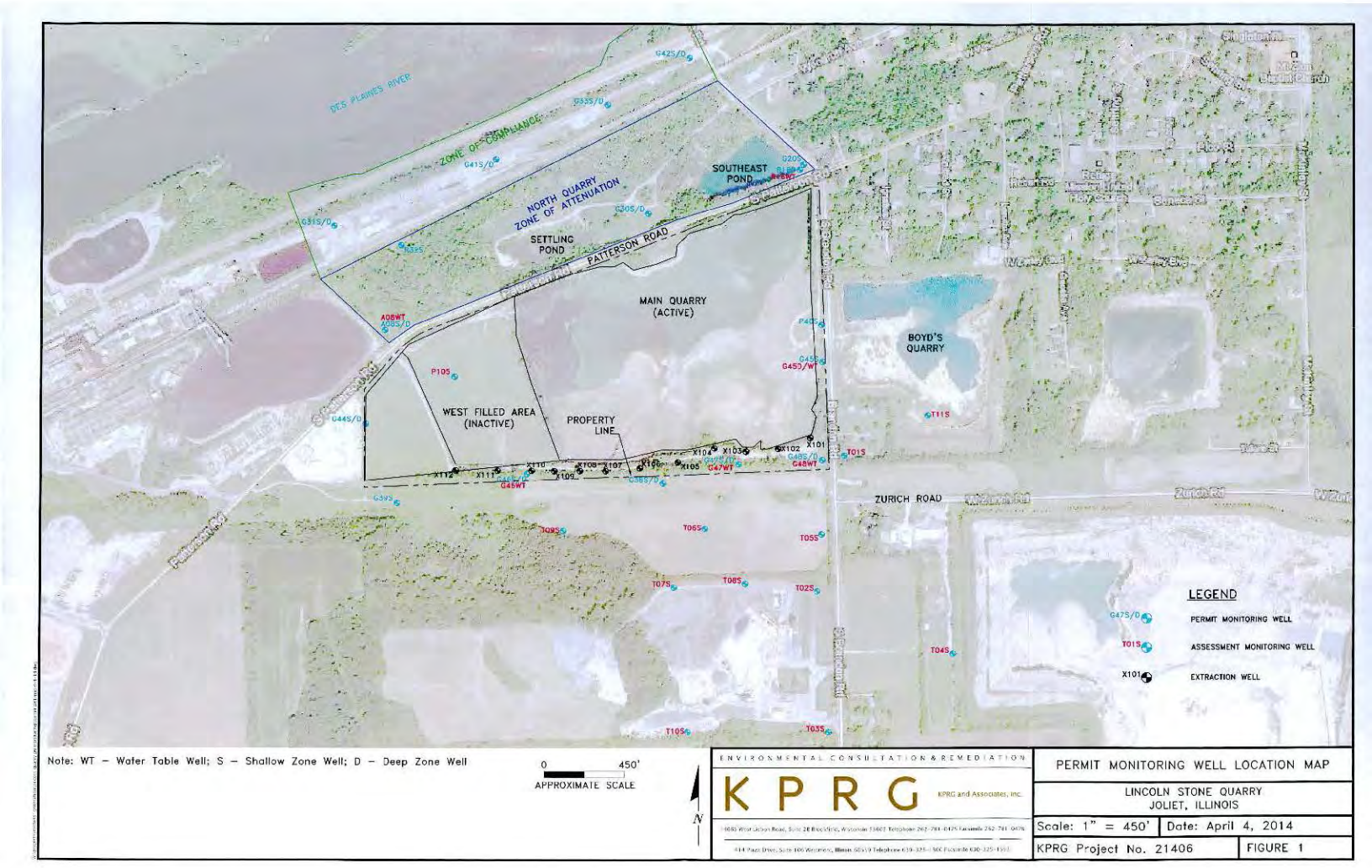
15. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, June, 2014.

16. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July, 2015.

17. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, June, 2016.

18. KPRG and Associates, Inc./Midwest Generation, LLC. Annual Groundwater Flow Evaluation, July 2017.

FIGURE



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

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PERMIT MONITORING WELL LOCATION MAP
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450' | Date: April 4, 2014
KPRG Project No. 21406 | FIGURE 1

TABLES

Table 1. Potentiometric Summary Data, Annual Flow Evaluation, Lincoln Stone Quarry, Joliet, IL

	Elevation of Groundwater Surface (feet above MSL)			
Well / Date	July/Aug 2017	Oct/Nov 2017	Jan/Feb 2018	April/May 2018
G20S	525.98	527.78	531.42	530.31
G30D	508.61	508.66	506.53	506.63
G30S	522.77	522.94	522.84	523.16
G31D	498.10	499.42	497.39	497.66
G31S	507.14	509.05	508.82	509.11
G33D	506.94	509.75	507.11	506.11
G33S	509.23	509.58	507.34	506.52
G38D	501.83	501.02	499.97	500.70
G38S	520.19	519.55	518.62	520.32
G39S	506.00	506.05	504.43	504.69
G41D	506.07	508.23	506.05	504.06
G41S	510.50	510.72	508.49	507.64
G42D	509.47	510.52	509.28	509.57
G42S	516.07	516.16	514.86	515.13
G44D	496.49	496.53	494.76	495.68
G44S	506.47	505.92	504.32	506.21
G45D*	510.25	510.04	507.62	509.09
G45S	541.05	541.26	540.78	541.28
P40S	540.60	540.81	540.40	541.71
R08D	498.57	499.81	497.73	498.38
R08S	513.01	512.93	511.64	512.29
R16D	509.41	519.66	518.21	518.02
R32S	519.21	519.61	518.10	518.64
G46D	498.08	498.25	496.37	497.40
G46S	504.41	502.52	502.43	502.63
G47D	502.41	502.19	500.58	501.30
G47S	532.27	517.90	516.77	519.23
G48D	504.45	507.86	505.80	506.94
G48S	517.49	518.46	516.98	521.05
R08WT *	538.14	538.25	537.12	537.55
R16WT *	534.10	533.80	532.66	532.86
G45WT *	543.62	543.26	543.47	544.43
G46WT *	573.75	572.99	572.62	574.11
G47WT *	584.12	583.28	585.20	585.42
G48WT *	583.91	582.63	583.66	583.81
P1-05 *	541.03	541.39	540.84	542.03
T01S *	508.96	504.82	501.18	506.39
T02S *	498.82	497.07	492.65	494.97
T03S *	499.31	496.06	491.09	494.91
T04S *	478.35	478.48	478.32	476.78
T05S *	506.80	505.3	501.05	504.04
T06S *	511.10	510.52	498.66	508.83
T07S *	507.83	507.26	503.52	505.43
T08S *	503.81	502.28	498.36	500.33
T09S *	507.04	506.16	502.38	503.52
T10S *	498.74	497.5	493.14	494.25
T11S *	508.83	506.11	499.29	505.24

NI - Not Installed
* - Denotes Assessment Well
NM - Not measured due to faulty transducer.
Levels for G44D in quarters 1 and 2 of 2017 taken from transducer.

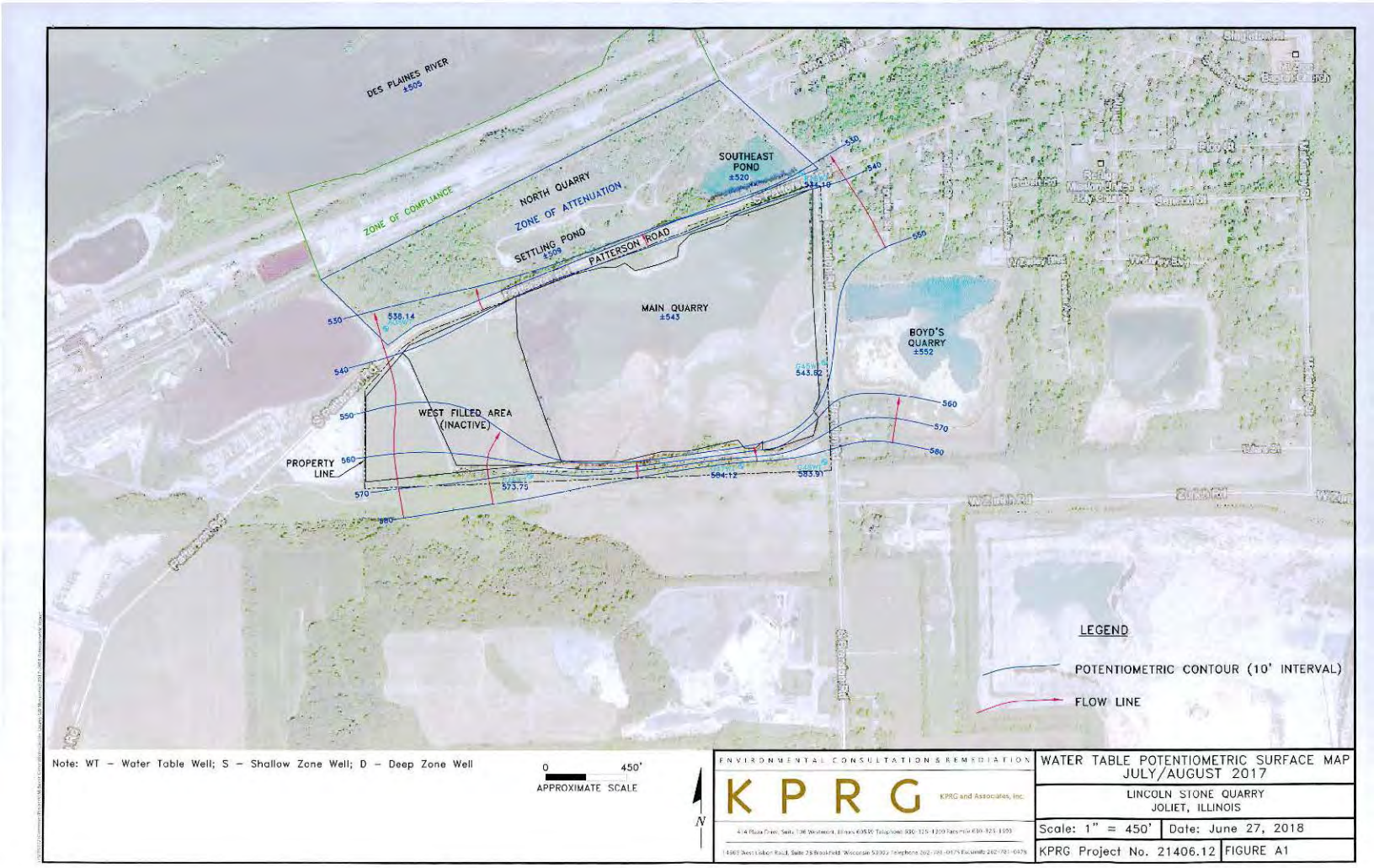
Table 2. Shallow Zone Horizontal Gradient Summary, Annual Flow Evaluation, Lincoln Stone Quarry, Joliet, IL

Quarter	From / Elevation		To / Elevation		Distance (feet)	Gradient (ft/ft)	Flow Direction
July/Aug 2017	Boyd's Quarry	552.82	Main Quarry	543.74	200	0.04540	West
	Main Quarry	543.74	Des Plaines River	505.00	1000	0.03874	North
	Main Quarry	543.74	G44S	506.47	950	0.03923	West
	Main Quarry	543.74	G38S	520.19	200	0.11777	South
Oct/Nov 2017	Boyd's Quarry	552.35	Main Quarry	544.17	200	0.04086	West
	Main Quarry	544.17	Des Plaines River	505.00	1000	0.03917	North
	Main Quarry	544.17	G44S	505.92	950	0.04027	West
	Main Quarry	544.17	G38S	519.55	200	0.12312	South
Jan/Feb 2018	Boyd's Quarry	551.66	Main Quarry	543.91	200	0.05795	West
	Main Quarry	543.91	Des Plaines River	505.00	1000	0.03891	North
	Main Quarry	543.91	G44S	504.32	950	0.04168	West
	Main Quarry	543.91	G38S	518.62	200	0.12647	South
April/May 2018	Boyd's Quarry	552.13	Main Quarry	545.11	200	0.05125	West
	Main Quarry	545.11	Des Plaines River	505.00	1000	0.04011	North
	Main Quarry	545.11	G44S	506.21	950	0.04095	West
	Main Quarry	545.11	G38S	520.32	200	0.12395	South

Table 3. Deep Zone Horizontal Gradient Summary, Annual Flow Evaluation, Lincoln Stone Quarry, Joliet, IL

Quarter	From Well / Elevation		To Well / Elevation		Distance between Wells (feet)	Approx. Horizontal Gradient (ft/ft)	Flow Direction
July/Aug 2017	G42D	509.47	G31D	498.10	2,280	0.00499	Southwest
	R16D	509.41	G44D	496.49	2,920	0.00442	Southwest
	G45D	510.25	G44D	496.49	2,680	0.00513	West-Southwest
Oct/Nov 2017	G42D	510.52	G31D	499.42	2,280	0.00487	Southwest
	R16D	519.66	G44D	496.53	2,920	0.00792	Southwest
	G45D	510.04	G44D	496.53	2,680	0.00504	West-Southwest
Jan/Feb 2018	G42D	509.28	G31D	497.39	2,280	0.00521	Southwest
	R16D	518.21	G44D	494.76	2,920	0.00803	Southwest
	G45D	507.62	G44D	494.76	2,680	0.00480	West-Southwest
April/May 2018	G42D	509.57	G31D	497.66	2,280	0.00522	Southwest
	R16D	518.02	G44D	495.68	2,920	0.00765	Southwest
	G45D	509.09	G44D	495.68	2,680	0.00500	West-Southwest

APPENDIX A
Water Table Contour Maps



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

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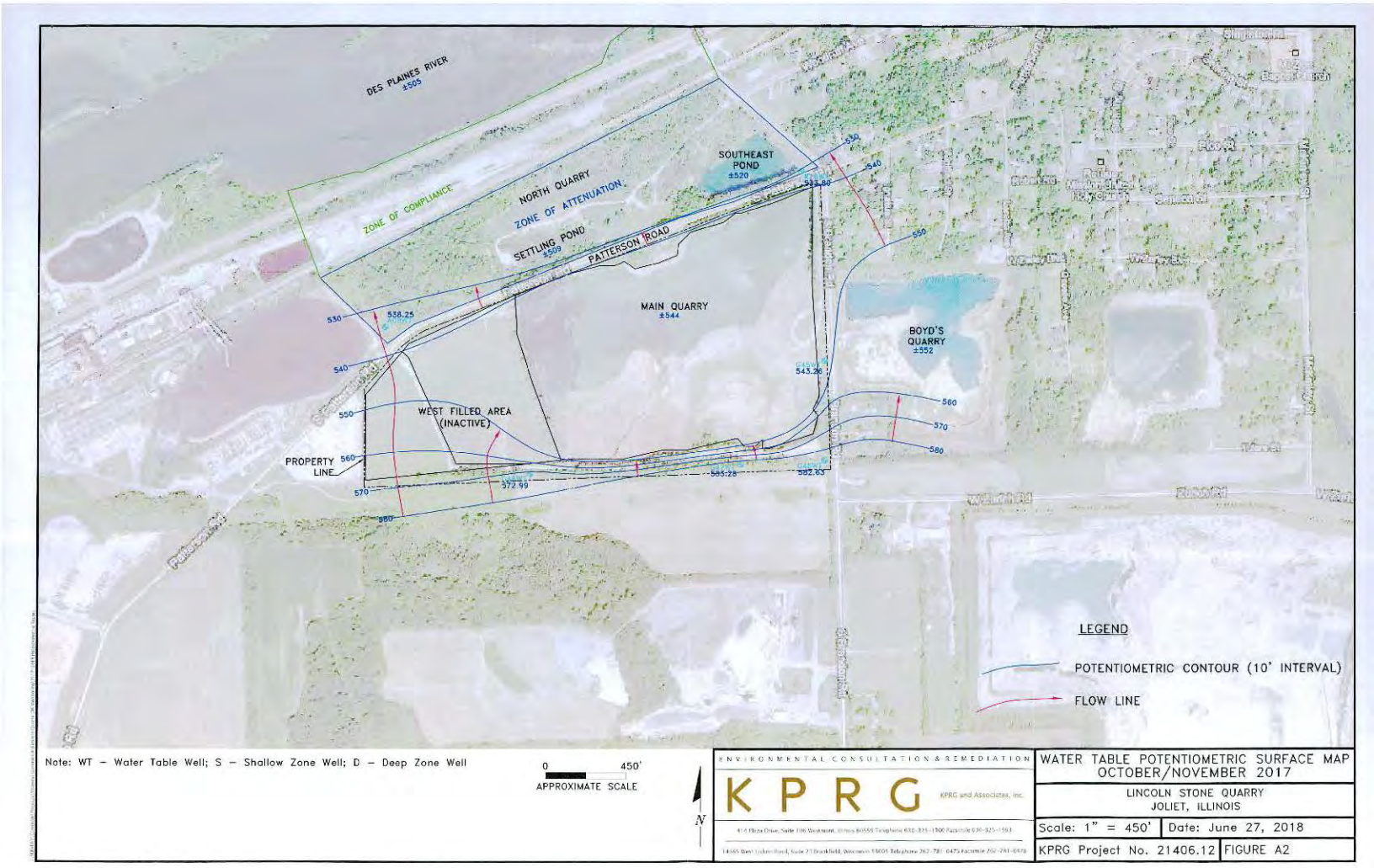
WATER TABLE POTENTIOMETRIC SURFACE MAP
JULY/AUGUST 2017

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450' | Date: June 27, 2018

KPRG Project No. 21406.12 | FIGURE A1



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

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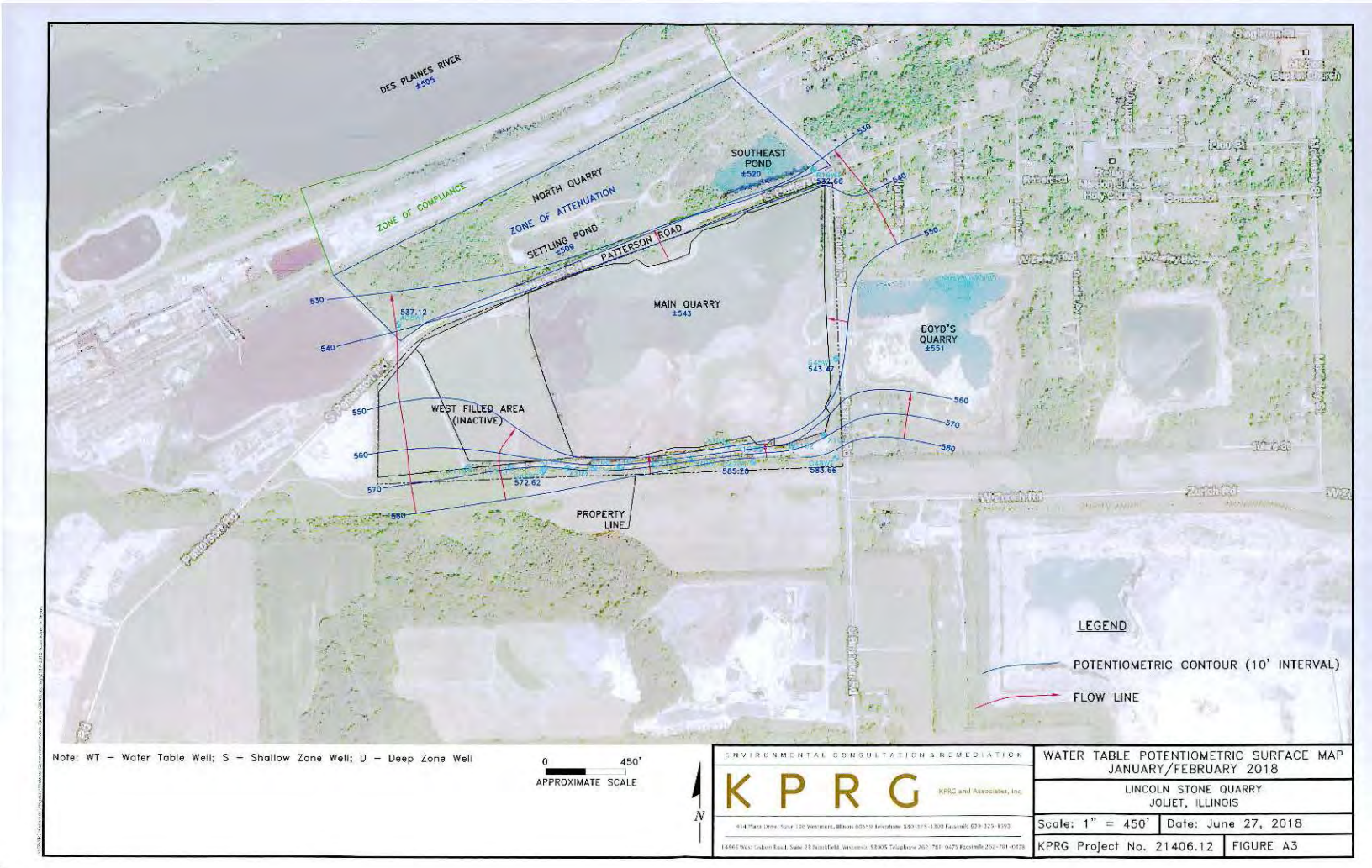
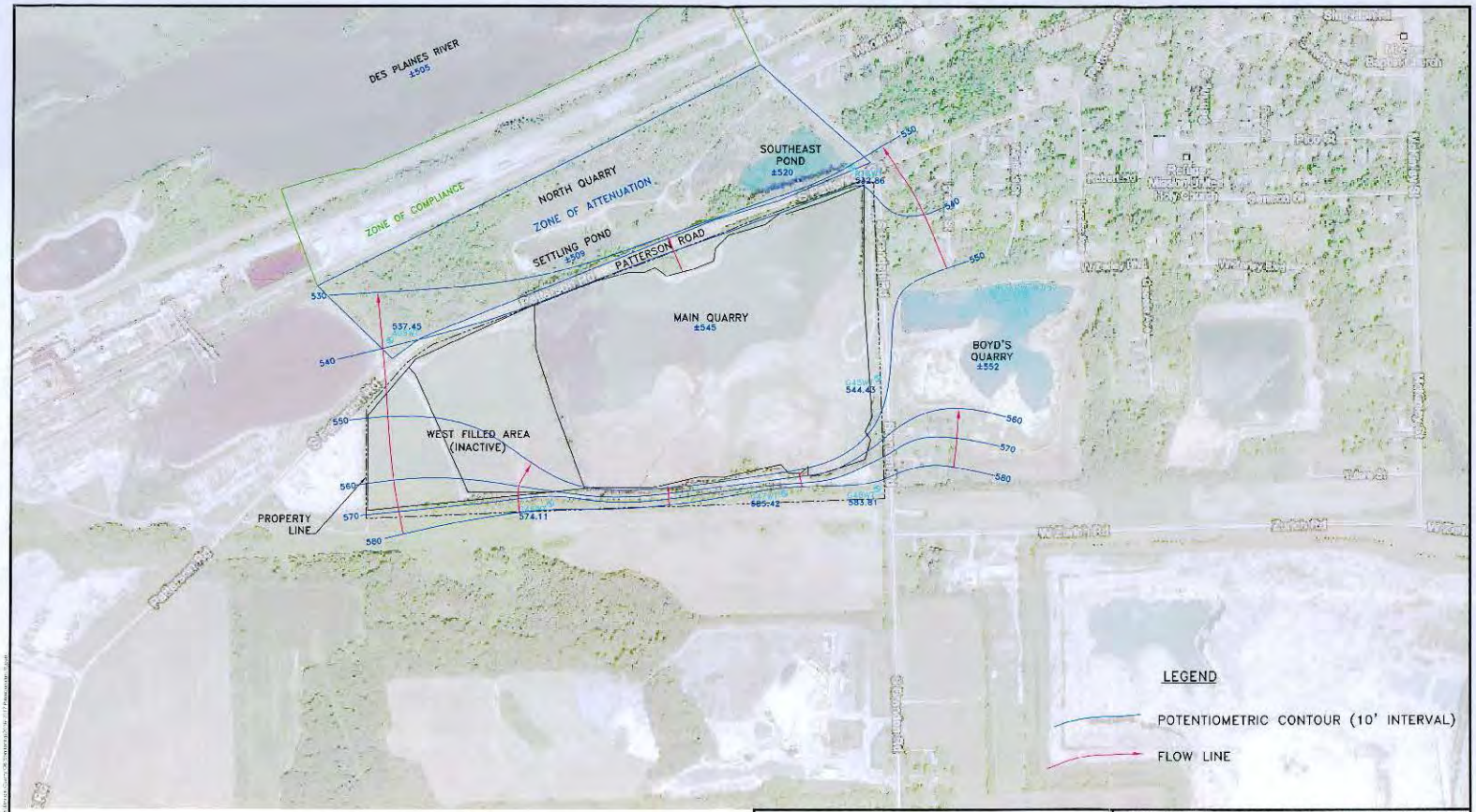
WATER TABLE POTENTIOMETRIC SURFACE MAP
OCTOBER/NOVEMBER 2017

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450'	Date: June 27, 2018
KPRG Project No. 21406.12	FIGURE A2


DES PLAINES RIVER
±505
ZONE OF COMPLIANCE
NORTH QUARRY
ZONE OF ATTENUATION
SETTLING POND
±509
SOUTHEAST POND
±520
PATTERSON ROAD
MAIN QUARRY
±543
BOYD'S QUARRY
±551
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
530
540
550
560
570
580
537.12
532.68
543.47
572.62
565.26
583.66
LEGEND
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
0 450'
APPROXIMATE SCALE
N
ENVIRONMENTAL CONSULTATION & REMEDIATION
K P R G
KPRG and Associates, Inc.
WATER TABLE POTENTIOMETRIC SURFACE MAP
JANUARY/FEBRUARY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE A3



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

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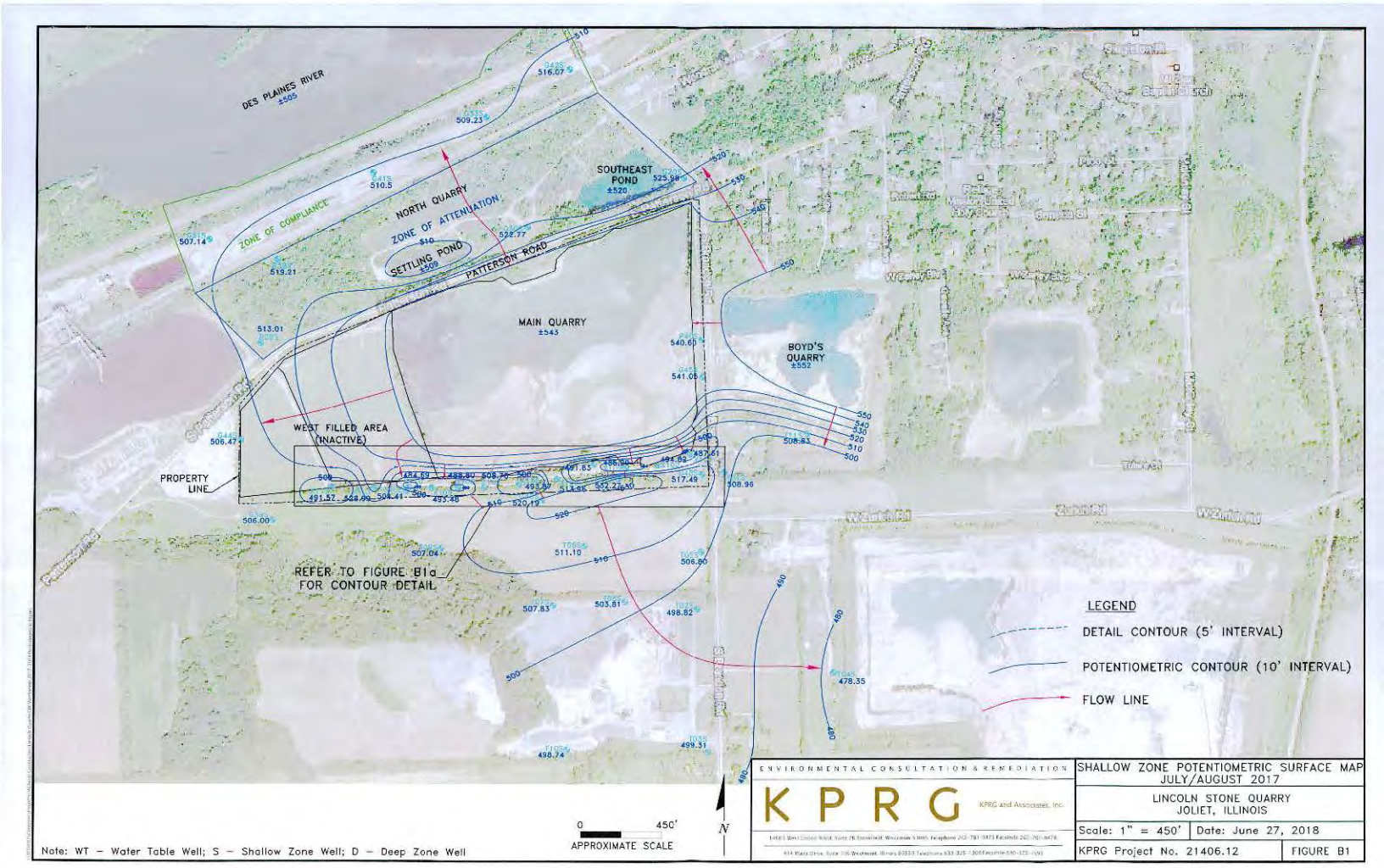
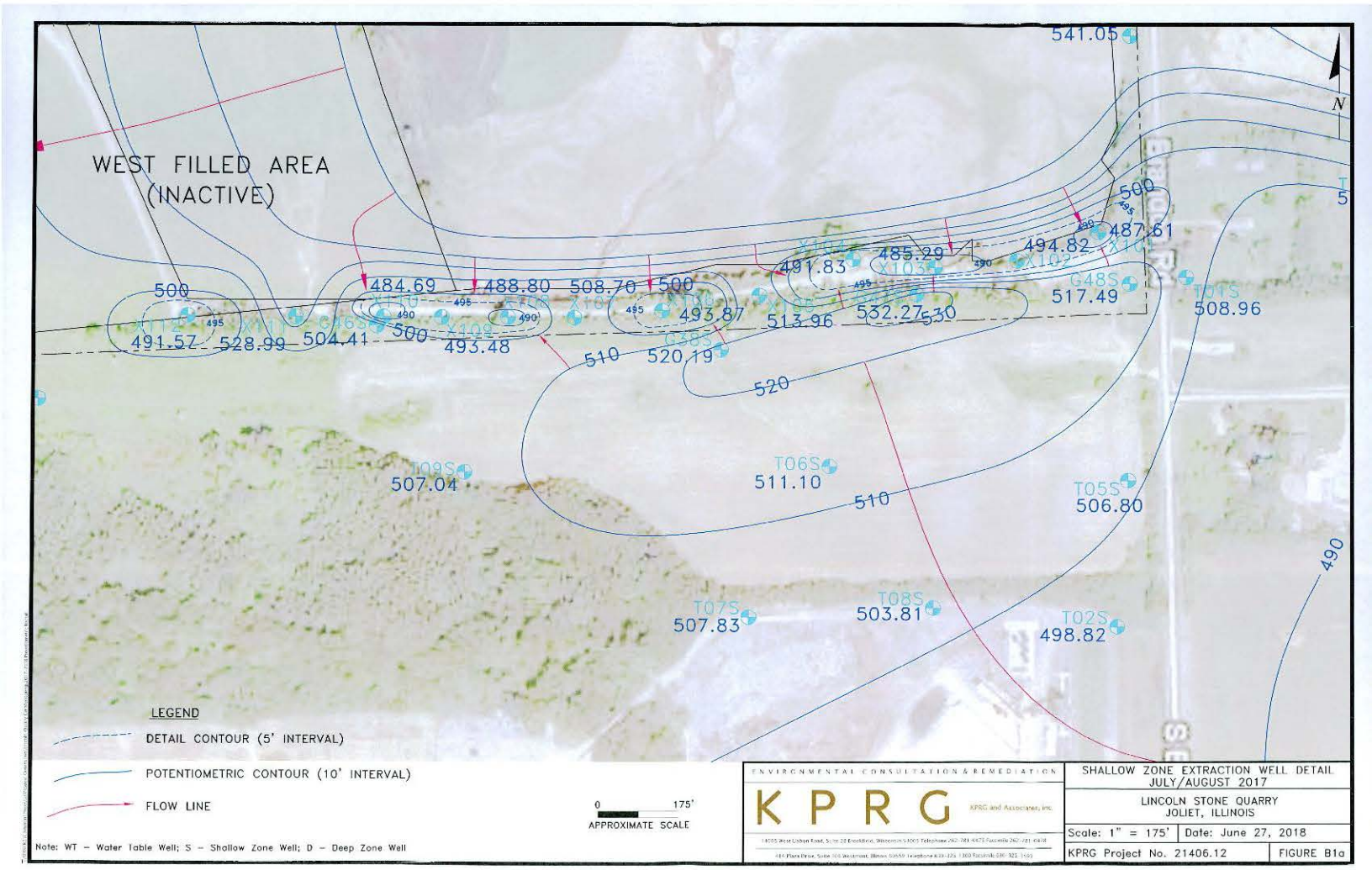
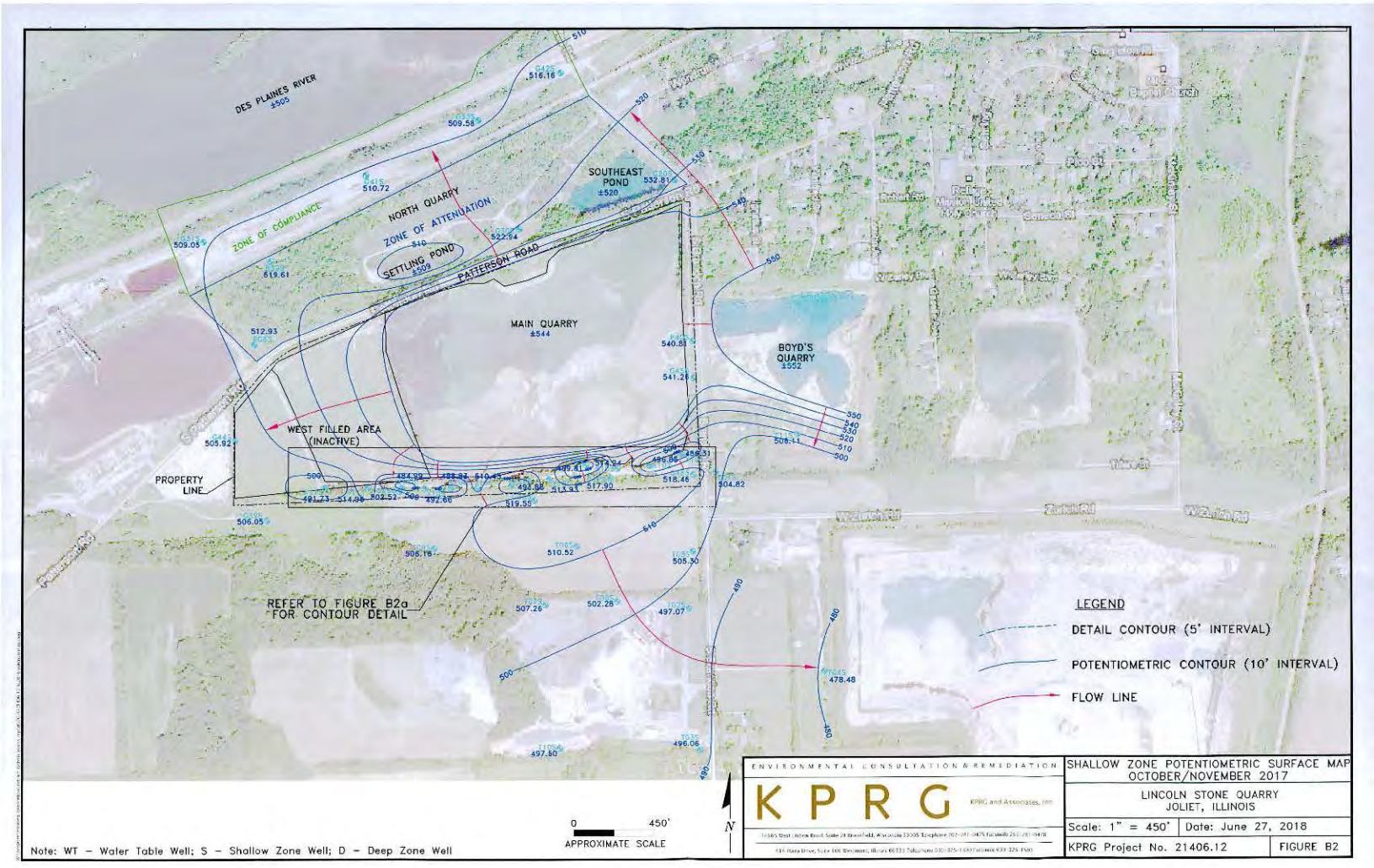
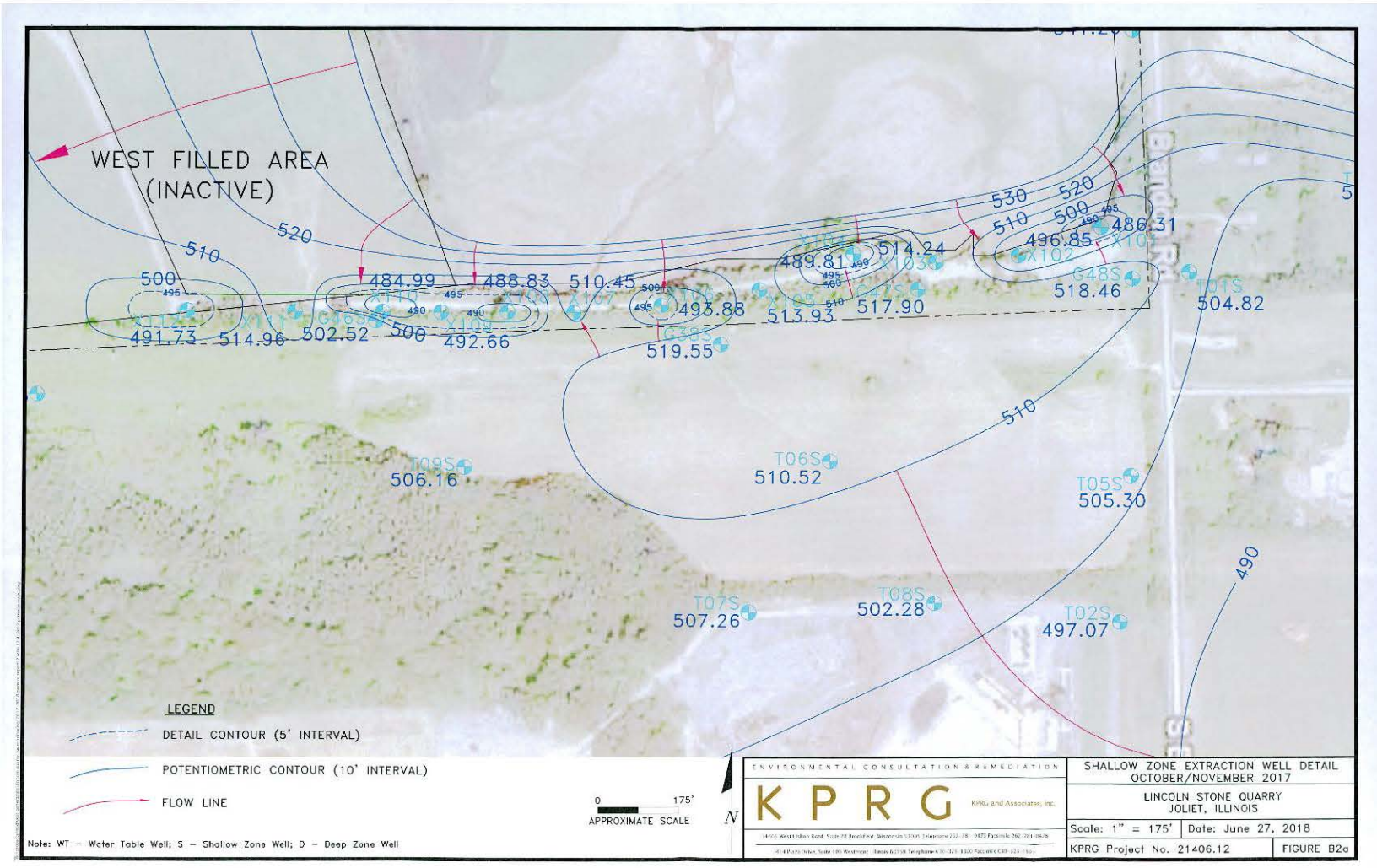
WATER TABLE POTENTIOMETRIC SURFACE MAP
APRIL/MAY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450' | Date: June 27, 2018
KPRG Project No. 21406.12 | FIGURE A4

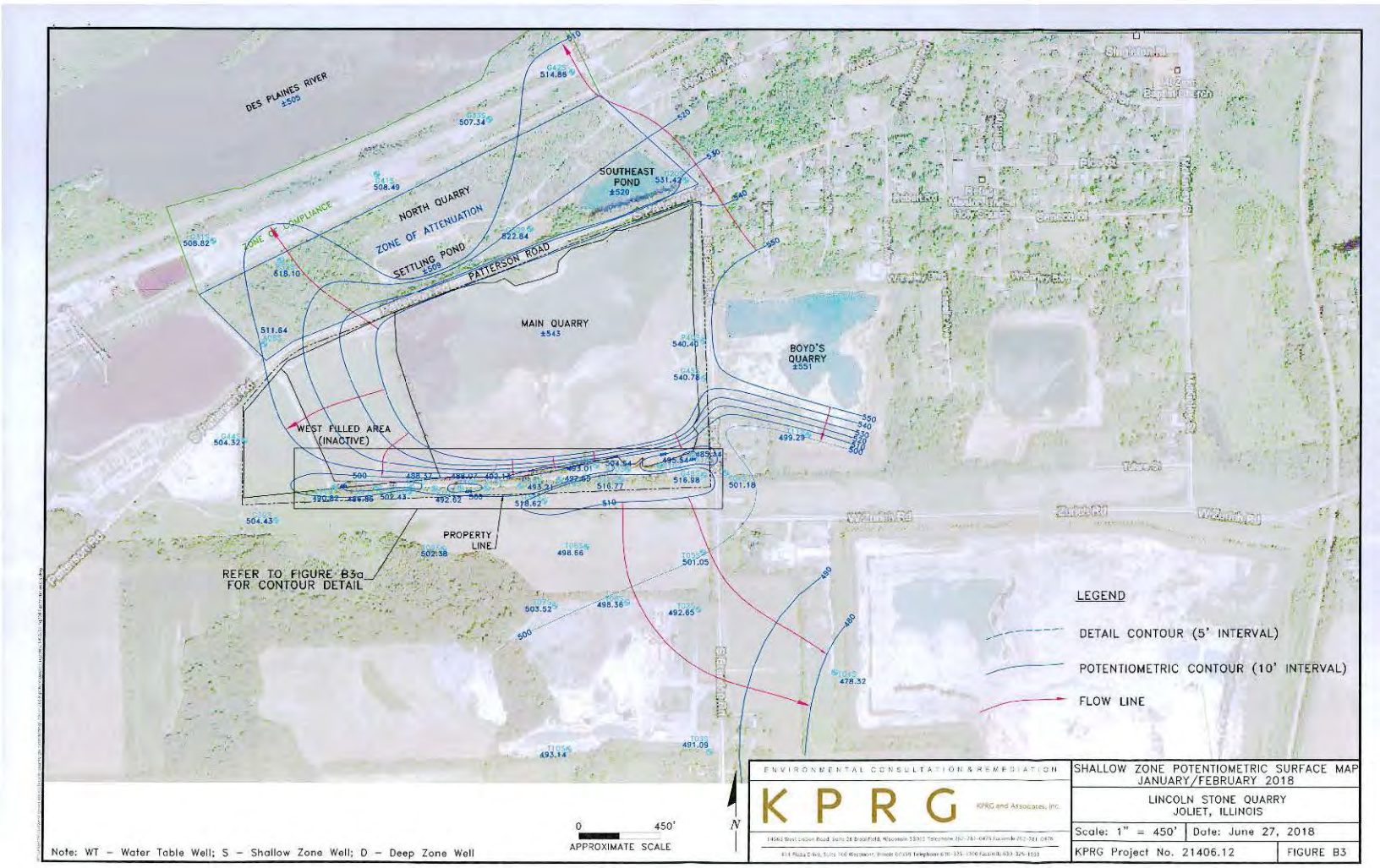
APPENDIX B
Shallow Zone Potentiometric Contour Maps

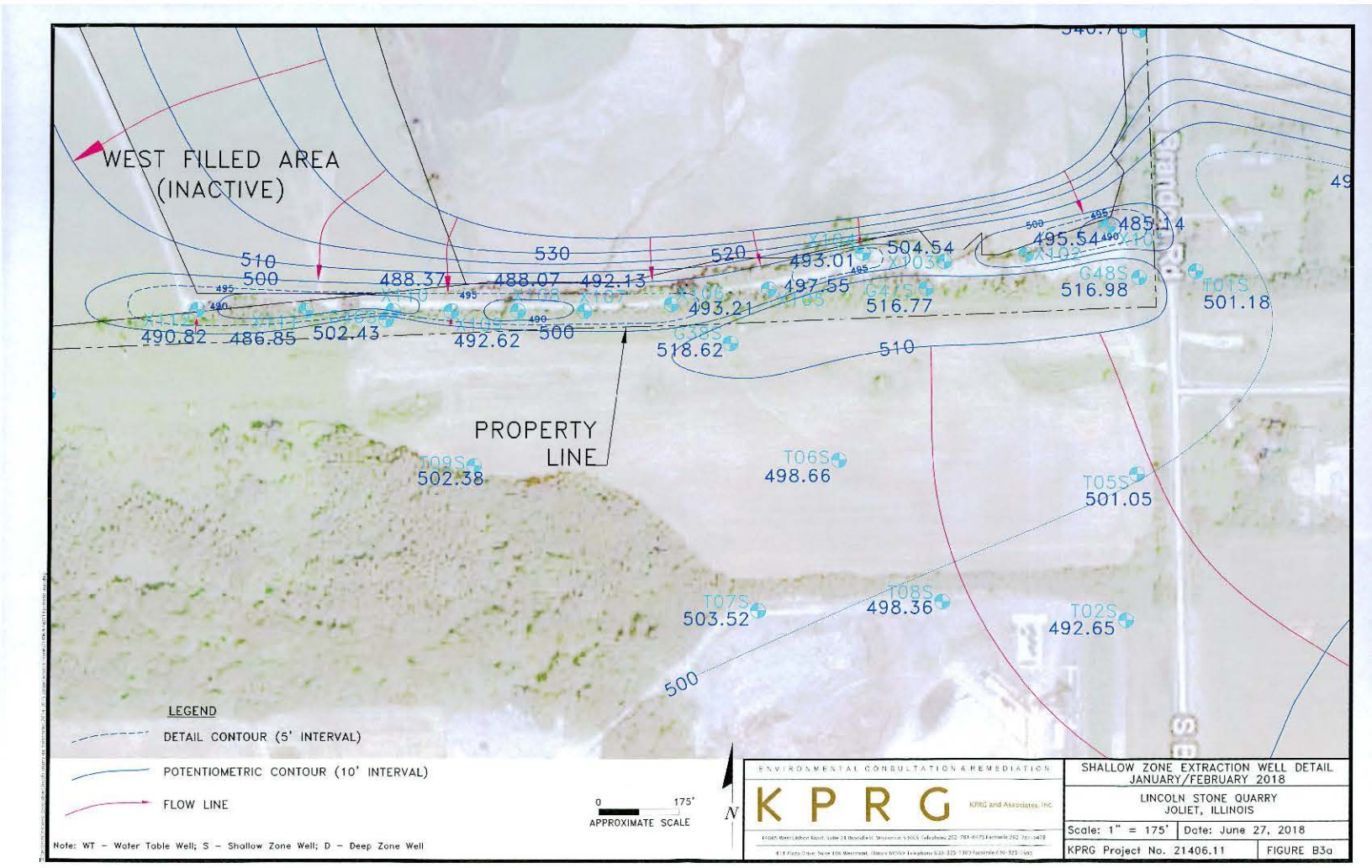

DES PLAINES RIVER
±505
ZONE OF COMPLIANCE
NORTH QUARRY
ZONE OF ATTENUATION
SETTLING POND
±509
PATTERSON ROAD
SOUTHEAST POND
±520
MAIN QUARRY
±545
BOYD'S QUARRY
±552
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
REFER TO FIGURE B1a FOR CONTOUR DETAIL
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
450'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE POTENTIOMETRIC SURFACE MAP
JULY/AUGUST 2017
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B1

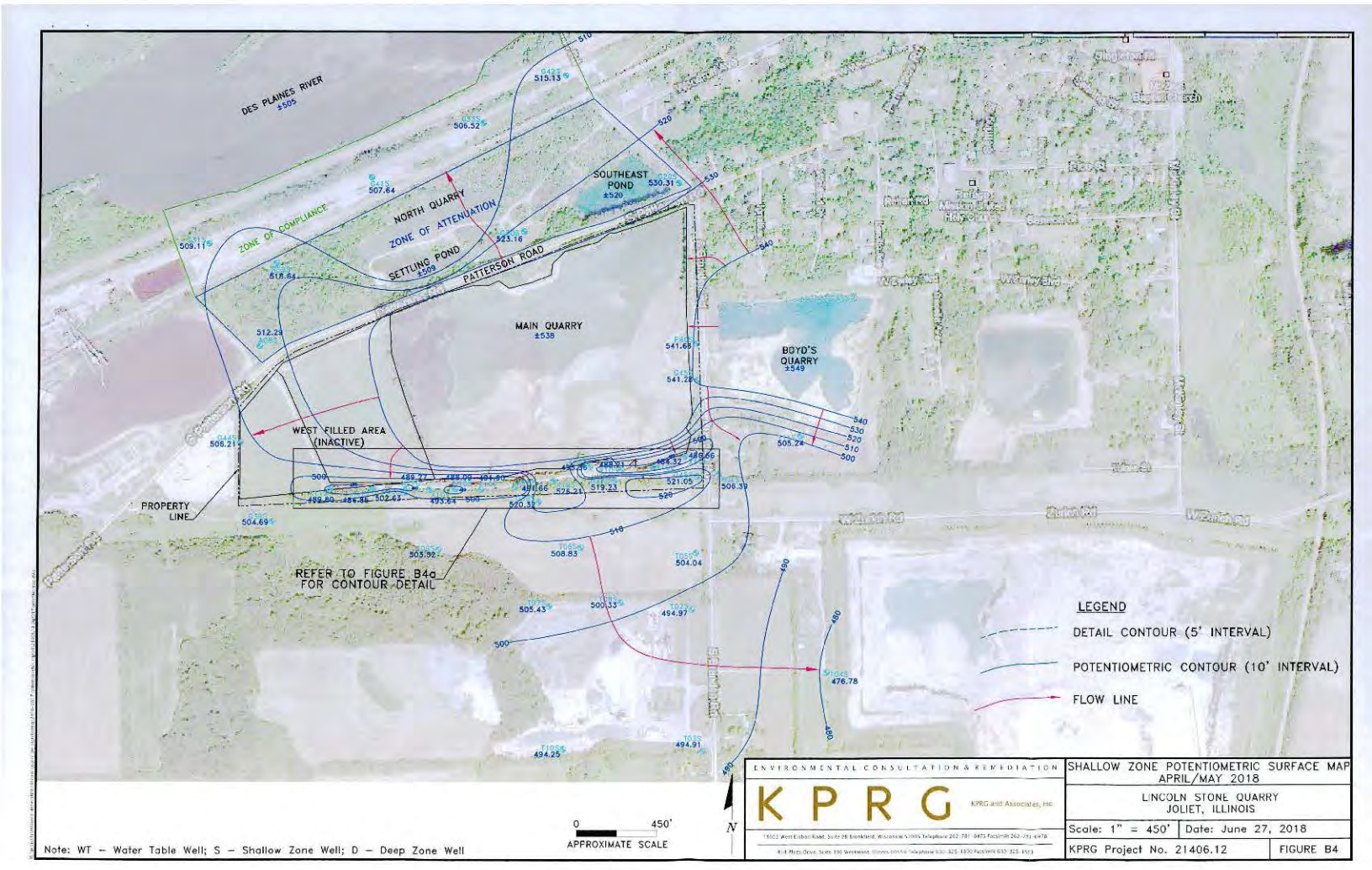

WEST FILLED AREA
(INACTIVE)
N
541.05
500
487.61
494.82
485.29
491.83
484.69
488.80
508.70
500
493.87
513.96
532.27
530
517.49
G4S
T01S
508.96
491.57
528.99
504.41
500
493.48
510
520.19
520
T09S
507.04
T06S
511.10
510
T05S
506.80
490
T07S
507.83
T08S
503.81
T02S
498.82
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
175'
APPROXIMATE SCALE
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE EXTRACTION WELL DETAIL
JULY/AUGUST 2017
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 175'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B1a

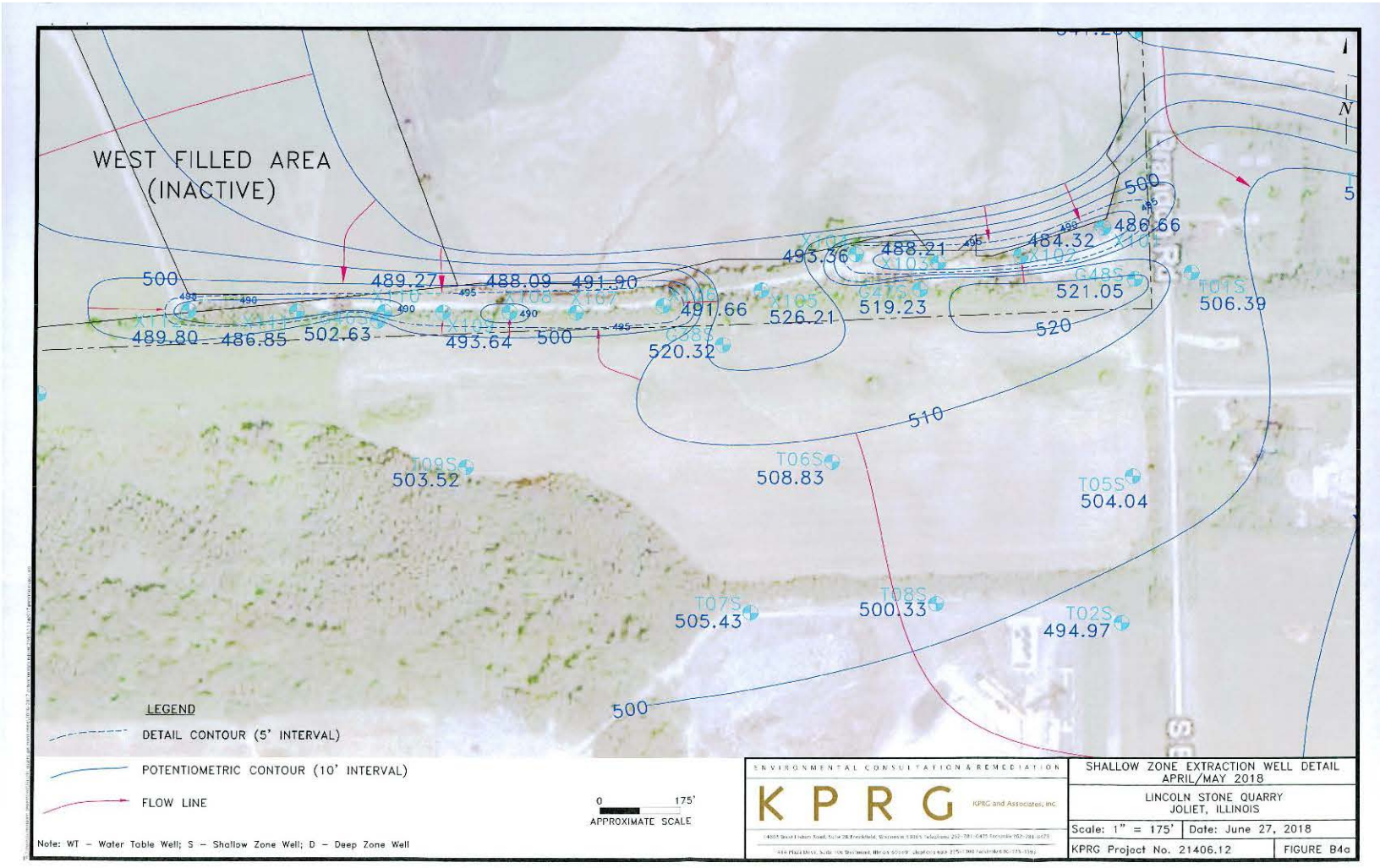

DES PLAINES RIVER
±505
ZONE OF COMPLIANCE
NORTH QUARRY
ZONE OF ATTENUATION
SETTLING POND
±509
PATTERSON ROAD
SOUTHEAST POND
±520
MAIN QUARRY
±544
BOYD'S QUARRY
±552
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
REFER TO FIGURE B2a FOR CONTOUR DETAIL
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
450'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE POTENTIOMETRIC SURFACE MAP
OCTOBER/NOVEMBER 2017
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B2


WEST FILLED AREA
(INACTIVE)
520
510
500
484.99
488.83
510.45
491.73
514.96
502.52
492.66
519.55
493.88
513.93
517.90
489.81
514.24
496.85
486.31
518.46
504.82
530
520
510
500
490
T09S
506.16
T06S
510.52
T05S
505.30
T07S
507.26
T08S
502.28
T02S
497.07
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
175'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE EXTRACTION WELL DETAIL
OCTOBER/NOVEMBER 2017
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 175'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B2a

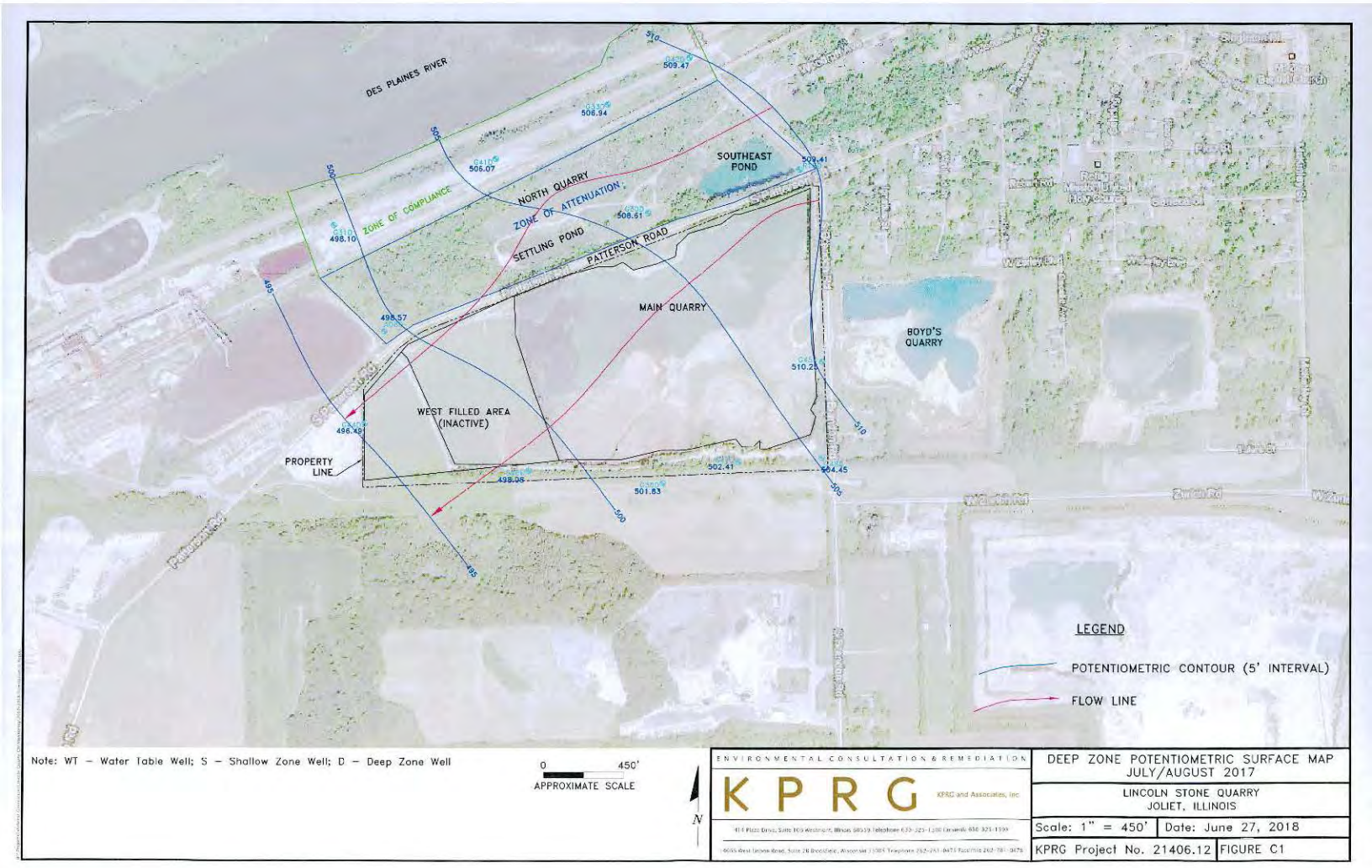

DES PLAINES RIVER
±505
NORTH QUARRY
ZONE OF ATTENUATION
ZONE OF COMPLIANCE
SETTLING POND
±505
SOUTHEAST POND
±520
PATTERSON ROAD
MAIN QUARRY
±543
BOYD'S QUARRY
±551
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
REFER TO FIGURE B3a FOR CONTOUR DETAIL
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
450'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE POTENTIOMETRIC SURFACE MAP
JANUARY/FEBRUARY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B3

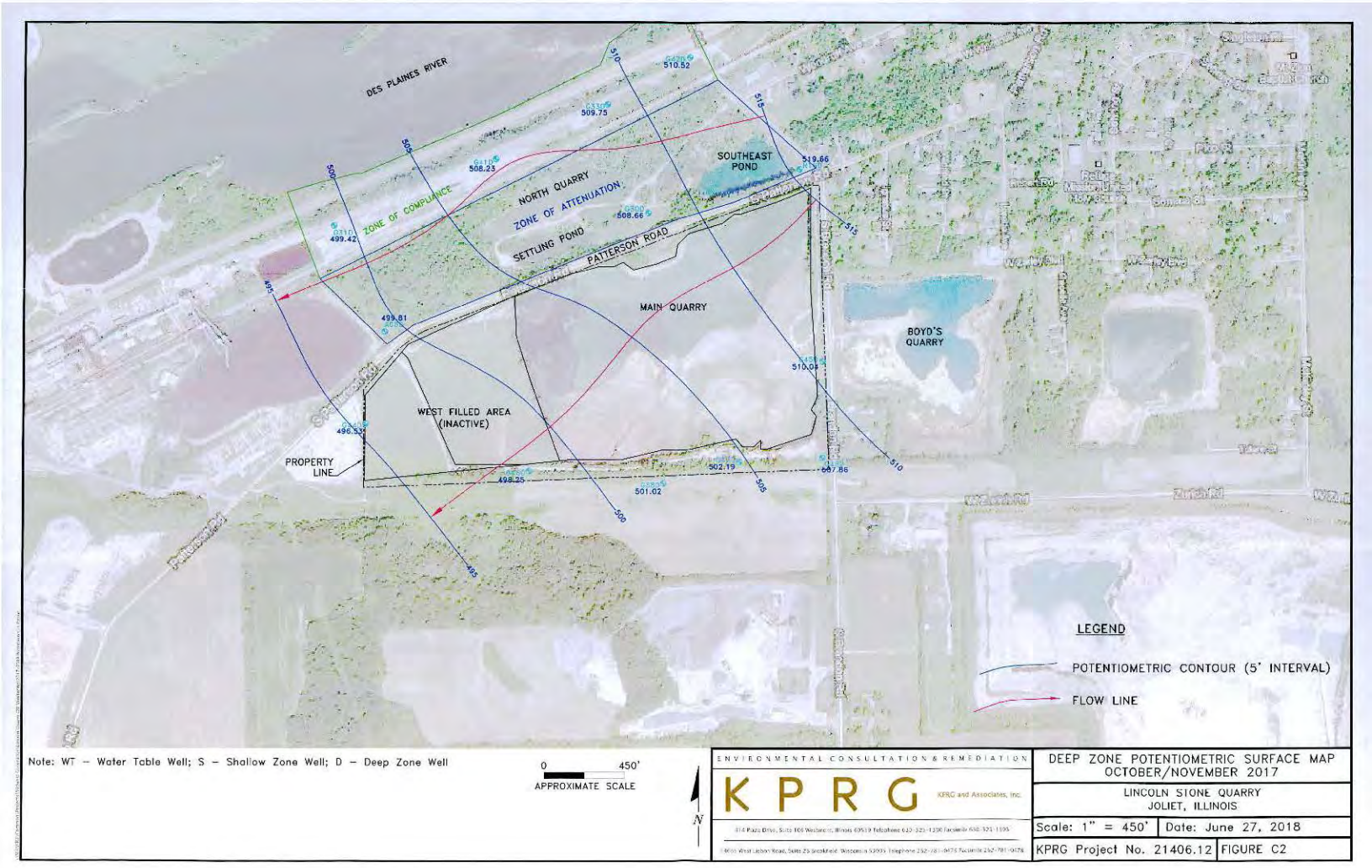

WEST FILLED AREA
(INACTIVE)
PROPERTY
LINE
510
500
530
520
488.37
488.07
492.13
493.01
504.54
495.54
485.14
497.55
493.21
516.77
516.98
501.18
490.82
486.85
502.43
492.62
518.62
502.38
498.66
501.05
503.52
498.36
492.65
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0 175'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE EXTRACTION WELL DETAIL
JANUARY/FEBRUARY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 175'
Date: June 27, 2018
KPRG Project No. 21406.11
FIGURE B3a


DES PLAINES RIVER
±505
ZONE OF COMPLIANCE
NORTH QUARRY
ZONE OF ATTENUATION
SETTLING POND
±509
SOUTHEAST POND
±520
PATTERSON ROAD
MAIN QUARRY
±538
BOYD'S QUARRY
±549
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
REFER TO FIGURE B4a FOR CONTOUR DETAIL
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0
450'
APPROXIMATE SCALE
N
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE POTENTIOMETRIC SURFACE MAP
APRIL/MAY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B4


WEST FILLED AREA
(INACTIVE)
N
500
489.27
488.09
491.90
489.80
486.85
502.63
493.64
491.66
526.21
520.32
493.36
488.21
484.32
486.66
519.23
521.05
506.39
520
510
503.52
508.83
504.04
505.43
500.33
494.97
500
LEGEND
DETAIL CONTOUR (5' INTERVAL)
POTENTIOMETRIC CONTOUR (10' INTERVAL)
FLOW LINE
0 175'
APPROXIMATE SCALE
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
SHALLOW ZONE EXTRACTION WELL DETAIL
APRIL/MAY 2018
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 175'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE B4a

APPENDIX C
Deep Zone Potentiometric Contour Maps


DES PLAINES RIVER
ZONE OF COMPLIANCE
ZONE OF ATTENUATION
NORTH QUARRY
SOUTHEAST POND
SETTLING POND
PATTERSON ROAD
MAIN QUARRY
BOYD'S QUARRY
WEST FILLED AREA (INACTIVE)
PROPERTY LINE
509.47
508.94
506.07
509.41
508.61
498.10
498.57
496.40
498.05
501.83
502.41
504.45
510.25
LEGEND
POTENTIOMETRIC CONTOUR (5' INTERVAL)
FLOW LINE
Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well
0 450'
APPROXIMATE SCALE
N
ENVIRONMENTAL CONSULTATION & REMEDIATION
K P R G
KPRG and Associates, Inc
DEEP ZONE POTENTIOMETRIC SURFACE MAP
JULY/AUGUST 2017
LINCOLN STONE QUARRY
JOLIET, ILLINOIS
Scale: 1" = 450'
Date: June 27, 2018
KPRG Project No. 21406.12
FIGURE C1



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

ENVIRONMENTAL CONSULTATION & REMEDIATION

K P R G

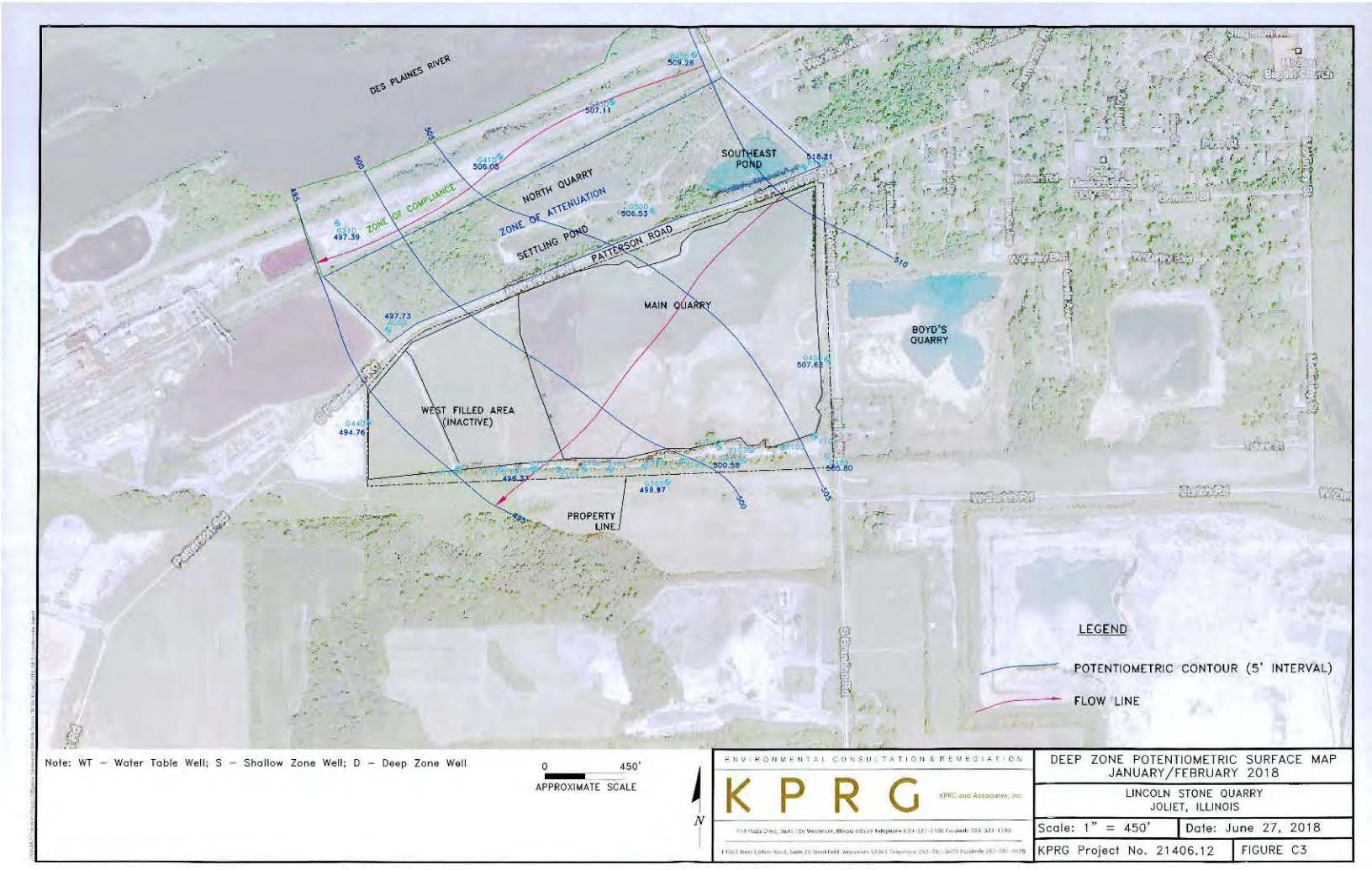
KPRG and Associates, Inc.

DEEP ZONE POTENTIOMETRIC SURFACE MAP
OCTOBER/NOVEMBER 2017

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450' | Date: June 27, 2018

KPRG Project No. 21406.12 | FIGURE C2



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

ENVIRONMENTAL CONSULTATION & REMEDIATION

K P R G

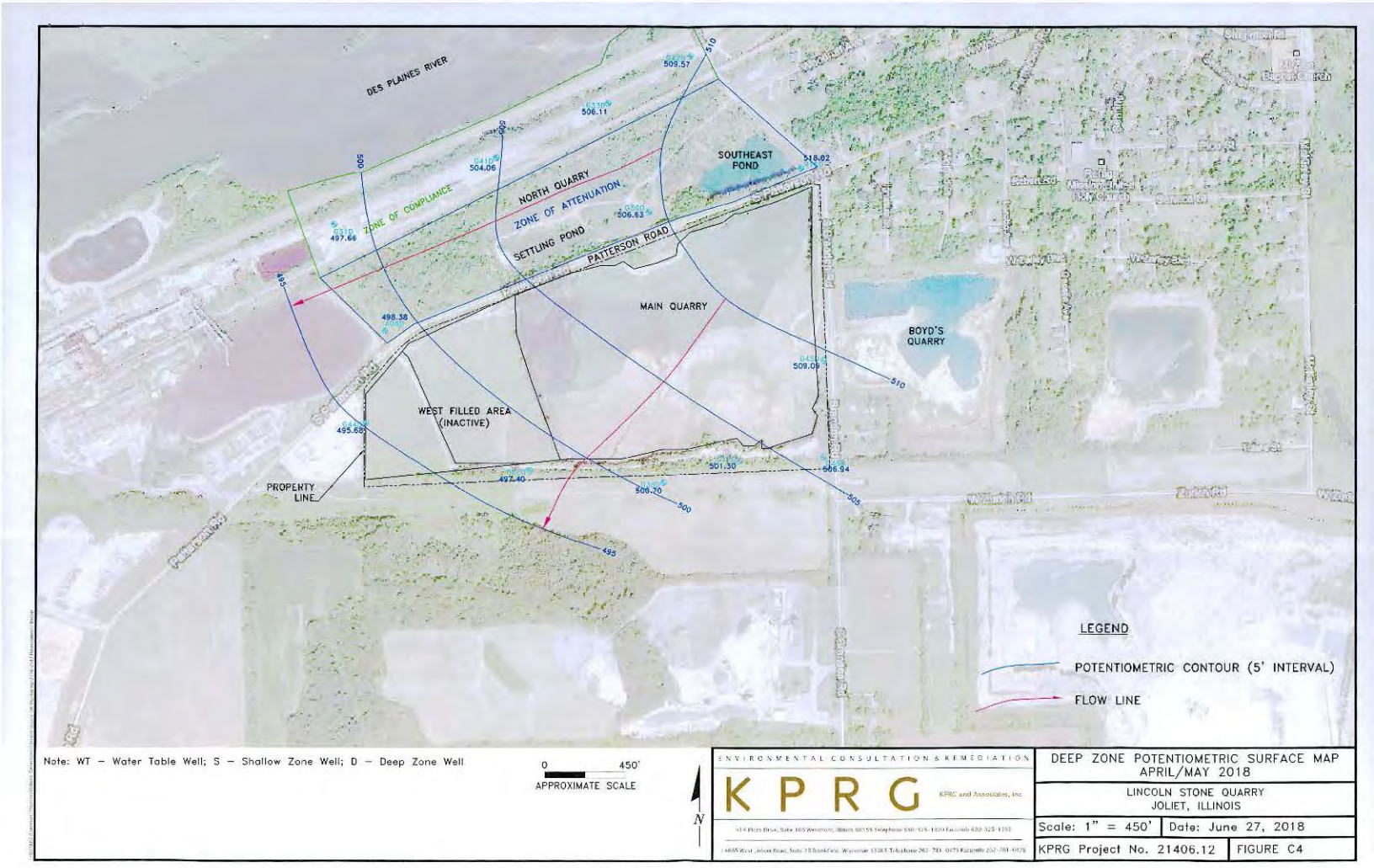
KPRG and Associates, Inc.

DEEP ZONE POTENTIOMETRIC SURFACE MAP
JANUARY/FEBRUARY 2018

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450' | Date: June 27, 2018

KPRG Project No. 21406.12 | FIGURE C3



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

ENVIRONMENTAL CONSULTATION & REMEDIATION

K P R G

KPRG and Associates, Inc

DEEP ZONE POTENTIOMETRIC SURFACE MAP
APRIL/MAY 2018

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450' | Date: June 27, 2018

KPRG Project No. 21406.12 | FIGURE C4

Exhibit 2

MEMORANDUM

Date 4/27/2018

To: BOL File Room

From: Pamela Ketchum

Re: LPC# 1978090001 - Will County
LINCOLN STONE QUARRY
813 Annual Certification 10E

The Annual Certifications per 35 Ill. Admin. Code 813.501 for the above referenced facility was dated 4/26/2018 and was received by the Agency on 4/27/2018. A copy is attached.

cc: DesPlaines Regional Office - Gino Bruni
Will County Land Use Department

MEMORANDUM

Date 4/27/2018

To: BOL File Room

From: Pamela Ketchum

Re: LPC# 1978090001 - Will County
LINCOLN STONE QUARRY
813 Annual Reports

The Annual Facility Report per 35 Ill. Adm. Code 813.504 and Gas Monitoring Report for the above referenced facility was dated 4/26/2018 and was received by the Agency on 4/27/2018. A copy is attached.

cc: DesPlaines Regional Office - Gino Bruni
Will County Land Use Department

MIDWEST GENERATION
JOLIET/LINCOLN STONE QUARRY LANDFILL

~~2978090002~~ Will County

Permit No. 1994-241-LFM (Modification No. 23)

19780 90001

ANNUAL REPORT
YEAR ENDING DECEMBER 31ST, 2017

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

K P R G

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

MIDWEST GENERATION
JOLIET/LINCOLN STONE QUARRY LANDFILL

297809000—Will County
Permit No. 1994-241-LFM (Modification No. 23)

ANNUAL REPORT
YEAR ENDING DECEMBER 31ST, 2017

Prepared By:
KPRG and Associates, Inc.
14665 W. Lisbon Rd., Suite 2B
Brookfield, WI 53005

April 26, 2018

TABLE OF CONTENTS

FIGURE

APPENDICES

1.0 INTRODUCTION TO ANNUAL REPORT

The Lincoln Stone Quarry (LSQ) facility, which is operated by Midwest Generation, LLC is located at the southwest corner of the intersection of Patterson Road and Brandon Road in Joliet, Illinois. It has operated as a disposal facility for bottom ash and slag from two coal-fired generating stations (Joliet Stations #9 and #29) since 1962. The disposal facility consists of an inactive portion referred to as the West Filled Area (WFA) and the active ash/slag disposal area referred to as the Main Quarry. Water is used to sluice the ash from the generating plants and is discharged into the Main Quarry where the ash then settles out and the water is subsequently discharged as discussed further below. It is noted that both power generating stations have recently been converted to gas and ash is no longer sluiced into the Main Quarry. Ash is currently being received by quad-axel trucks with ash from the ongoing closure of ash ponds at Joliet #29. The Annual Report for the Midwest Generation Lincoln Stone Quarry for calendar year 2017 was prepared in accordance with 35 Illinois Administrative Code (IAC) Section 813.504 and Condition Nos. III.1 and III.2 of the Illinois Environmental Protection Agency (IEPA) Permit Number 1994-241-LFM (Modification No. 23).

1.1 Permit Conditions

1.1.1 Permit Condition III.1

Pursuant to this permit condition and 35 IAC Section 813.501, annual certification has been submitted to the IEPA separately with a Solid Waste Landfill Groundwater, Leachate, Facility and Gas Reporting Form (LPC 591). A copy of this annual certification is provided in Appendix A. Also pursuant to this permit condition, all records required to be submitted to the IEPA pursuant to 35 IAC Sections 858.207 and 858.308 have been timely and accurately submitted. All applicable fees required by the Act have been paid in full.

1.1.2 Permit Condition III.2

Pursuant to this permit condition and 35 IAC Section 813.504, this Annual Report includes the following:

a. Information relating to monitoring data from the groundwater monitoring network and any other monitoring data specified in the operating permit including:
   1) Summary of monitoring data for the calendar year;
   2) Dates of submittal of comprehensive monitoring data to the IEPA during the calendar year;
   3) Statistical summaries and analysis of trends;
   4) Changes to the monitoring program; and
   5) Discussion of error analysis, detection limits, and observed trends.

b. Proposed activities:
   1) Amount of waste expected to be disposed in the unit, in the next year;
   2) Structures to be built within the next year; and
   3) New monitoring stations to be installed within the next year.

c. Any modification or significant modification affecting operation of the facility; and

d. Signature of the operator or duly authorized agent as specified in 35 IAC Section 815.102.

2.0 INTRODUCTION TO ANNUAL MONITORING

This section is intended to conform to the aforementioned Condition III.2a of the permit and, as such, it includes data collected in each of the four quarters of 2017.

2.1 Summary of Monitoring Data

The permitted groundwater monitoring network during 2017 was comprised of the following wells:

Upgradient:	G38D, G38S, G39S
Wells within the Zone of Attenuation:	G20S, G30D, G30S, G44D, G44S, R08D (formerly A08D), R08S (formerly A08S), R16D, R32S, G45S, G46D, G46S, G47D, G47S, G48D, G48S
Compliance:	G31D, G31S, G33D, G33S, G41D, G41S, G42D, G42S
Piezometer:	P40S
Surface Water Monitoring Point:	S501

A site map showing the monitoring well locations is provided on Figure 1. Quarterly groundwater monitoring data from List G1 is provided in Appendix B, while annual groundwater data from List G2 is provided in Appendix C.

2.2 Dates of Submittal of Monitoring Data

Groundwater monitoring data was submitted to the IEPA on the following dates:

March 24, 2017	List G1	First Quarter 2017 Event
July 11, 2017	Lists G1	Second Quarter 2017 Event
October 13, 2017	List G1, G2	Third Quarter 2017 Event
January 2, 2018	List G1	Fourth Quarter 2017 Event

3.0 STATISTICAL SUMMARIES AND EVALUATION OF TRENDS

3.1 Statistical Summaries

The groundwater data was analyzed for concentrations above the practical quantitation limit (PQL) in accordance with condition X.14 of the permit, which states that any of the following events shall constitute an "observed increase":

a. The concentration of any constituent in List G1 of Special Condition X.12 shows a progressive increase over four consecutive quarters.

b. The concentration of any constituent monitored in accordance with List G1 or List G2 of Special Condition X.13 exceeds the Maximum Allowable Predictable Concentration (MAPC) at an established monitoring point within the zone of attenuation.

c. The concentration of any organic constituent in List G2, monitored in accordance with Special Condition X.13 exceeds the preceding measured concentration at any established monitoring point.

d. The concentration of any constituent monitored at or beyond the edge of the zone of attenuation (compliance boundary) exceeds its Applicable Groundwater Quality Standard (AGQS), or pursuant to 35 IAC Section 811.320(d)(1), any constituent monitored at an upgradient well exceeds the AGQS.

After completing confirmation sampling procedures for observed increases in accordance with Condition X.15 of the permit, the following confirmed increases were reported to the IEPA for the 2017 monitoring period:

First Quarter 2017, Notification to IEPA on or about March 24, 2017:

Shallow Wells

- Ammonia, dissolved, G30S, G48S
- Arsenic, dissolved, G47S, G48S
- Barium, G38S
- Boron, dissolved, G48S
- Chloride, dissolved, G30S, G31S, G47S
- Molybdenum, dissolved, G46S
- Nitrate as N, total, G44S
- pH, G47S, G48S
- Sodium, dissolved, G30S, G47S, G48S

Deep Wells

- Chloride, dissolved, R08D

- Fluoride, dissolved, G33D, G41D, G42D
- Dissolved Nitrate, R08D
- Nitrate as N, total, R08D
- Sodium, dissolved, G31D, G33D, G41D, G42D, R16D

Second Quarter 2017, Notification to IEPA on or about July 11, 2017:

Shallow Wells

- Ammonia, dissolved, G30S, G47S, G48S
- Arsenic, dissolved, G47S, G48S
- Barium, G38S
- Boron, dissolved, G47S, G48S
- Chloride, dissolved, G30S, G31S, G47S
- Fluoride, dissolved, G47S
- Dissolved Nitrate, G44S
- Nitrate as N, total, G44S
- pH, G47S, G48S
- Sodium, dissolved, G30S, G47S, G48S
- Specific Conductance, G47S
- Sulfate, dissolved, G47S
- Total Dissolved Solids, G47S

Deep Wells

- Chloride, dissolved, R08D
- Fluoride, dissolved, G31D, G33D, G41D, G42D
- Dissolved Nitrate, R08D
- Nitrate as N, total, R08D
- Sodium, dissolved, G31D, G33D, G41D, G42D, R16D

Third Quarter 2017, Notification to IEPA on or about October 13, 2017:

Shallow Wells

- Ammonia, dissolved, G30S, G47S, G48S
- Arsenic, dissolved, G47S, G48S
- Barium, G38S
- Boron, dissolved, G47S, G48S
- Chloride, dissolved, G30S, G31S, G46S, G47S
- Fluoride, dissolved, G47S
- Nitrate as N, total, G44S
- pH, G47S, G48S
- Sodium, dissolved, G30S, G38S, G47S, G48S
- Specific Conductance, G47S
- Sulfate, dissolved, G47S
- Total Dissolved Solids, G47S

Deep Wells

- Fluoride, dissolved, G31D, G33D, G41D, G42D
- Sodium, dissolved, G31D, G33D, G41D, G42D, R16D

Fourth Quarter 2017, Notification to IEPA on or about January 2, 2018:

Shallow Wells

- Ammonia, dissolved, G30S, G47S, G48S
- Arsenic, dissolved, G47S, G48S
- Barium, G33S, G38S
- Boron, dissolved, G47S, G48S, R08S
- Chloride, dissolved, G30S, G31S, G46S, G47S
- Nitrate as N, total, G44S
- pH, G47S, G48S
- Sodium, dissolved, G30S, G47S, G48S
- Sulfate, dissolved, G47S
- Total dissolved solids, G47S

Deep Wells

- Fluoride, dissolved, G31D, G33D, G41D, G42D
- Nitrate as N, total, R08D
- Sodium, dissolved, G31D, G33D, G41D, G42D, R16D

Relative to progressive four quarter increases in detections of List G1 parameters the following are noted:

1st Quarter

- Sodium, dissolved, G47S

2nd Quarter

- Sodium, dissolved, G47S

3rd Quarter

- Sodium, dissolved, G42D

4th Quarter

- pH, G47S

3.2 Evaluation and Trend Analysis of Groundwater Quality

Groundwater concentrations reported for the first through fourth quarters of 2017 have been evaluated for trend characteristics. Graphs of Lists G1 and G2 parameter concentrations are provided in Appendix D. Due to the documented hydraulic separation between the shallow and deep wells associated with the low permeability zone, the data for the shallow wells (S-series) and deep well (D-series) is presented and discussed

separately. Data from the Main Quarry surface water sampling point, S501, is not included on the graphs because the AGQSs are not applicable to surface water.

A summary of the concentration trends is provided below. For the parameters with AGQS exceedances, in accordance with permit requirements, Midwest Generation has performed additional work and provided additional information to the IEPA. (See IEPA application log numbers 2005-058, 2005-059, 2005-413 and 2009-213.) An expanded groundwater extraction system has been installed along the south side of the facility and is operational.

3.2.1 Ammonia, dissolved

Shallow Wells

Dissolved ammonia concentrations in the initial permit shallow wells have historically been reported below the AGQS value of 1.57 milligrams per Liter (mg/L). The historical exception to this observation has been monitoring well G30S, located within the zone of attenuation, for which monitoring results began to exceed the AGQS value during fourth quarter 2003. For the 2017 quarterly monitoring, the dissolved ammonia concentrations at G30S were above the AGQS value in all four quarters and ranged from 2.0 to 2.2 mg/L. Relative to additional wells installed in 2006 and formally included into the monitoring network beginning in 2008, well location G47S had three confirmed exceedances in 2017, 5.5 to 8.5 mg/L in the second through fourth quarters, while G48S had four confirmed exceedances in 2017, ranging from 2.6 to 4.5 mg/L. These wells are located on the eastern portion of the south side of the Main Quarry, within the approved Groundwater Management Zone (GMZ). It is noted that the overall trends for ammonia in wells G47S and G48S have been decreasing over the last several years and although concentrations in G47S were up slightly in 2017, the overall trend since 2012 is decreasing. Concentrations in all remaining wells were fairly consistent with historic trends during 2017. No shallow zone compliance wells on the north side of the facility exceeded the AGQS for dissolved ammonia.

An initial interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The noted exceedance concentrations along the south perimeter are generally steady to decreasing over time as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway Quarry located approximately 1,000 feet southeast of the LSQ facility.

Deep Wells

Historically, there have been no confirmed exceedances of dissolved ammonia in the deep zone monitoring wells. The 2017 monitoring data was consistent with the historic trends with no confirmed exceedances. There is an increasing trend in

ammonia in well G47D, but the maximum recorded concentration is still below the AGQS.

3.2.2 Arsenic, dissolved

Shallow Wells

Historically, dissolved arsenic concentrations in shallow zone wells have been reported below laboratory method detection limits and/or below the AGQS value of 10 µg/L with the exception of well locations G47S and G48S located on the eastern portion of the south side of the Main Quarry which have generally indicated exceedances since initial sampling in 2007.

During 2017, this historical trend continued. The measured concentrations at all of the sample locations from shallow zone wells were below the laboratory detection limit of 10 µg/L with the exception of monitoring wells G47S and G48S. Monitoring well G47S, within the approved GMZ, shows some variability in arsenic detections over time. For 2017 the data indicated confirmed exceedances in all four quarters ranging from 130 to 200 µg/L. Monitoring well G48S results, within the approved GMZ, ranged from 17 to 33 µg/L over the last four quarters of sampling with an overall decrease since 2014. Historical trends in the other wells appear to be generally stable. No shallow zone compliance wells on the north side of the facility had confirmed exceedances of the AGQS for dissolved arsenic.

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The noted exceedance concentrations along the south perimeter are overall decreasing over time as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway Quarry located approximately 1,000 feet southeast of the LSQ facility.

Deep Wells

Historically, dissolved arsenic concentrations in deep zone wells have been reported below laboratory detection limits and/or below the AGQS value of 10 µg/L. During 2017, the measured concentrations at all of the samples from deep zone wells were below the laboratory detection limit of 10 µg/L. Historical trends for this parameter appear to be generally stable. Any noted variability on the time versus concentration curves since the 4th quarter of 2002 is attributable to estimated concentrations below the laboratory reporting limit. Two detections of arsenic in the third quarter of 2013 have not been replicated with resampling and therefore not considered a confirmed exceedance.

3.2.3 Barium, total and dissolved

Total barium is identified in the permit as a G2 List annual monitoring parameter. However, both total and dissolved barium analyses are being performed as part of ongoing groundwater quality assessment for these parameters. The AGQS for this parameter is set at 75 µg/L total barium.

Shallow Wells
The 2017 monitoring for total barium did not detect any confirmed concentrations above the AGQS in shallow zone wells with the exception of G33S (fourth quarter only) and G38S (first through fourth quarters) which indicated confirmed exceedances in the range of 84 to 99 µg/L. It is noted that the concentration trend for 2017 was decreasing consistently at well G38S. A review of time versus concentration curves for all other shallow zone wells indicates that the 2017 monitoring data ranges for barium (total and dissolved) are consistent with historical sampling data from all the monitoring points.

Deep Wells
The 2017 monitoring for total barium did not detect any confirmed concentration above the AGQS in deep zone wells. A review of time versus concentration curves indicate that the 2017 monitoring data ranges of barium (total and dissolved) concentrations are consistent with historical sampling data from all the monitoring points.

3.2.4 Boron, dissolved

Shallow Wells
During 2017 monitoring for dissolved boron, the following shallow zone monitoring points exceeded the established AGQS for boron of 5,924.16 µg/L: well R08S (third and fourth quarter; no third quarter resample was collected), well G47S (second through fourth quarters), and well G48S (all four quarters). Well R08S is located within the zone of attenuation south of the WFA and wells G47S and G48S are located within the approved GMZ to the south of the Main Quarry. G48S exhibited an overall decreasing trend in 2017, while concentrations in G47S were variable. There were no dissolved boron confirmed exceedances in north side shallow zone compliance wells.

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The noted exceedance concentrations along the south perimeter are generally decreasing over time (which is evident at well location G48S) as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway Quarry located approximately 1,000 feet southeast of the LSQ facility. The elevated boron in

2017 at well location G47S is associated with pumping system maintenance issues discussed in detail in the Application for Significant Modification to Permit – Assessment of Interim Corrective Action dated March 12, 2018.

Deep Wells
During 2017 monitoring for dissolved boron, no deep zone monitoring results exceeded the established AGQS for boron of 5,924.16 µg/L. The time versus concentration trends at all deep zone monitoring locations have generally been consistent and steady since 1993 with the exception of well R08D which has fluctuated somewhat over time with an overall decreasing trend since the third quarter of 2010. This well is located within the Zone of Attenuation, immediately downgradient of the WFA.

3.2.5 Cadmium, dissolved

Shallow Wells
Historically, no detections of dissolved cadmium have been reported in facility shallow zone groundwater. Data for all shallow monitoring wells for 2017 was reported as less than the laboratory method detection limit of 2 µg/L. The AGQS for dissolved cadmium is set at 264.07 µg/L. A review of the time versus concentration curves for this parameter indicates generally stable conditions.

Deep Wells
Historically, no detections of dissolved cadmium have been reported in facility deep zone groundwater. Data for all deep monitoring wells for 2017 was reported as less than the laboratory reporting limit of 2 µg/L. The AGQS for the facility is set at 264.07 µg/L. A review of the time versus concentration curves for this parameter indicates generally stable conditions.

3.2.6 Chloride, dissolved

Shallow Wells
During the 2017 monitoring, confirmed detections of dissolved chloride were reported above the AGQS of 144.29 mg/L within the following permitted shallow zone monitoring wells locations: G30S (all four quarters), G31S (all four quarters), G46S (third and fourth quarters), and G47S (all four quarters). Exceedance concentrations at these locations ranged from 160 mg/L at G31S and G47S to 200 mg/L at G30S. It is noted that the overall trend at G30S and G31S since 2014 has been decreasing. A review of time versus concentration curves for dissolved chloride indicates substantial variability.

Deep Wells
The 2017 monitoring for total chloride did not detect any confirmed concentrations above the AGQS in deep zone wells with the exception of R08D for the first and second quarters. This well is within the Zone of Attenuation south of the WFA.

3.2.7 Copper, total

Total copper is identified in the permit as a G2 List annual monitoring parameter, however, it was included into assessment monitoring for quarterly sampling following a confirmed exceedance in 2nd quarter 2005.

Shallow Wells
There were no confirmed detections of total copper above the AGQS of 20 ug/l in any of the shallow zone monitoring points in 2017. A review of historic trend data for this parameter indicates sporadic elevated detections of total copper are limited to well location G30S (within the zone of attenuation). These sporadic detections began during 2004 monitoring and there have been no exceedances since 2014. Copper has generally not been detected above reporting limits at any of the other monitoring locations. The isolated nature of copper detections, both spatially and with time, suggests that the AGQS total copper exceedance at this location is not associated with a release from the facility.

Deep Wells
There were no confirmed detections of total copper above the respective AGQSs in any of the deep zone monitoring points in 2017.

3.2.8 Fluoride, dissolved

Shallow Wells
In 2017, there were no confirmed detections of fluoride in shallow zone wells above the established AGQS of 1.73 mg/L for this parameter with the exception of results at G47S during the second and third quarters, which ranged from 2.1 to 2.2 mg/L. A review of time versus concentration curves for dissolved fluoride generally indicates a decrease in concentrations at wells G47S and G48S relative to 2012 and earlier.

Deep Wells
The 2017 monitoring indicated four quarters of confirmed exceedances of the dissolved fluoride AGQS at well locations G33D, G41D, and G42D and second through fourth quarters at G31D ranging from 2.8 mg/L in G33D to 4.5 mg/L in G31D. All four of these wells are located on the northern portion of the site along the Des Plaines River. These detections are consistent with historical monitoring data for these locations since installation in 1999. There were no other confirmed exceedances of the dissolved fluoride AGQS in any of the other deep zone monitoring wells, which is also consistent with historical trends for this parameter.

Based on potentiometric surface maps developed for the deep zone, well G42D is an upgradient water quality well. This well has consistent fluoride detections above the AGQS indicating a potential off-site, upgradient source to the east of

this well location and/or desorption of fluoride from the underlying Scales Shale, and are not the result of a release from the regulated unit.

3.2.9 Iron, total

Total iron is on the G2 list of annual monitoring parameters with an AGQS value of 8,361 µg/L.

Shallow Wells
There were no detections of total iron above the AGQS in any of the shallow zone monitoring points in 2017. Total iron concentrations ranged from less than 200 µg/L (the laboratory method detection limit) to 2,000 µg/L (well G38S). A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous monitoring with overall trends being stable with the exception of the above noted iron detection at well G38S.

Deep Wells
There were no detections of total iron above the respective AGQSs in any of the deep zone monitoring points in 2017. Total iron concentrations ranged from less than the detection limit of 200 µg/L to 960 µg/L at well G48D. A review of the historical time versus concentration data indicates that the 2017 results are generally consistent with previous monitoring with recent overall trends being stable to decreasing.

3.2.10 Lead, total

Total lead is on the G2 list of annual monitoring parameters with an AGQS value of 6 µg/L.

Shallow Wells
There were no confirmed detections of total lead above the AGQS in any of the shallow zone monitoring points in 2017. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous monitoring.

Deep Wells
There were no confirmed detections of total lead above the AGQS in any of the deep zone monitoring points in 2017. All concentrations were reported as not detected with a method detection limit of 5 µg/L. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous monitoring with overall trends being stable.

3.2.11 Manganese, dissolved

Shallow Wells
Shallow zone monitoring data for dissolved manganese did not indicate any concentrations of this parameter above the established AGQS of 634.1 µg/L in any of the shallow zone monitoring points in 2017. A review of historical time versus concentrations trends for this parameter indicates a stable/steady trend since 1999 with the exception of some concentration fluctuations at well G20S located within the zone of attenuation. The manganese concentration at this location has been decreasing since a spike in the third quarter of 2015.

Deep Wells
Deep zone monitoring data for dissolved manganese did not indicate any concentrations of this parameter above the established AGQS of 634.1 µg/L in any of the deep zone monitoring points in 2017. A review of historical time versus concentrations trends for this parameter indicates a general stable/steady trend since 1999 with some minor fluctuations.

3.2.12 Mercury, total

Total mercury is on the G2 list of annual monitoring parameters with an AGQS value of 0.2 µg/L.

Shallow Wells
There were no confirmed exceedances of total mercury above the AGQS in any of the shallow zone monitoring points in 2017. Most concentrations were reported as not detected with a method detection limit of 0.2 µg/L. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous monitoring with overall trends being stable.

Deep Wells
There were no confirmed exceedances of total mercury above the AGQS in any of the deep zone monitoring points in 2017. All concentrations were reported as not detected with a method detection limit of 0.2 µg/L. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous monitoring with overall trends being stable.

3.2.13 Molybdenum, dissolved

Shallow Wells
A review of 2017 dissolved molybdenum data from shallow zone monitoring points indicates that there were no exceedances of the established AGQS of 1,380.4 µg/L with the exception of G46S (first quarter) at a confirmed concentration of 1,600 µg/L. It is noted that well G46S is within the approved GMZ and subsequent quarterly sampling indicated no exceedances at this location. A review of historical trends as depicted on the time versus

concentration curves indicates that there is some spatial variability of this parameter within the shallow zone monitoring points however, with a clear decreasing trend in most wells for this parameter since the second quarter of 2010.

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry to address the noted molybdenum exceedance in this area. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The noted molybdenum concentrations have begun to decrease over time as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway.

Deep Wells
A review of 2017 dissolved molybdenum data from the deep zone monitoring points indicates that there were no exceedances of the established AGQS of 1,380.4 µg/L for this parameter at any deep well locations. All trends are consistent with historical data and a generally decreasing trend at well R08D since 2010.

3.2.14 Nitrate, dissolved

Dissolved nitrate is on the list of G2 parameters for annual monitoring; however, due to some previous exceedances of the AGQS it is currently included in assessment monitoring and is being performed on a quarterly basis.

Shallow Wells
A review of 2017 dissolved nitrate data from shallow zone groundwater monitoring points indicates that there were no exceedances of the established AGQS of 2.6 mg/L for this parameter at any shallow well locations in 2017 with the exception of a second quarter G44S confirmed exceedance of 2.6 mg/L. There were no exceedances with subsequent quarterly sampling at this location. A review of historical trends as depicted on the time versus concentration curves showed generally stable trends in dissolved nitrate.

Deep Wells
A review of 2017 dissolved nitrate data from deep zone monitoring points indicates that there were no exceedances of the established AGQS of 2.43 mg/L with the exception of the well R08D first and second quarter results of 3.1 and 2.7 mg/L, respectively. Well R08D is located within the zone of attenuation on the north side of the WFA. The results are generally consistent with the historical dissolved nitrate data for the deep zone with some sporadic exceedances at R08D. Subsequent quarterly monitoring at this location shows nitrate concentration returning to historically consistent levels.

3.2.15 Nitrate, total

Total nitrate is on the list of G2 parameters for annual monitoring; however, due to some previous exceedances of the AGQS it is currently included in assessment monitoring and is being performed on a quarterly basis.

Shallow Wells
A review of 2017 total nitrate data from shallow zone groundwater monitoring points indicates that there were no exceedances of the established AGQS of 1.0 mg/L for this parameter with the exception of well location G44S (all four quarters). Well G44S is located to the west of the West Filled Area. The reported exceedances ranged from 1.5 mg/L to 2.7 mg/L. There were no total nitrate exceedances in any of the north side shallow zone compliance wells.

A review of the historical total nitrate trends over time in the shallow zone indicates generally steady concentrations.

Deep Wells
A review of 2017 total nitrate data from deep zone monitoring points indicates that there were no confirmed exceedances with the exception of well R08D (all four quarters; R08D had an exceedance during the initial third quarter but was inadvertently not resampled). The reported exceedances at this location ranged from 1.2 mg/L to 3.3 mg/L. These exceedances are consistent with previous data since 2012 and with an overall decreasing trend since 2015. This well is within the zone of attenuation on the north side of the WFA. A review of the historical trends in the remaining deep zone indicates some variability but generally steady concentrations. No wells within the zone of compliance have shown exceedances of the AGQS for this parameter.

3.2.16 pH

Shallow Wells
The AGQS for pH is set to range from 6.14 to 8.56 standard units (su). A review of the 2017 shallow zone groundwater monitoring data indicated the following confirmed exceedances of the AGQS: G47S (all four quarters) and G48S (all four quarters). Both of these wells are within the approved GMZ. There were no pH exceedances in any of the shallow zone compliance wells.

A review of the historical pH measurements over time in the shallow zone indicates some variability; however, the overall trends appear to be generally steady in most wells. There has been an increasing trend over the past year at well G47S and a decreasing trend in well G48S.

Deep Wells
A review of the 2017 deep zone monitoring data did not indicate any confirmed exceedances of the AGQS. A review of the historical pH measurements over time

in the deep zone indicates some variability; however, the overall trends appear to be generally steady.

3.2.17 Potassium, dissolved

Shallow Wells
A review of 2017 dissolved potassium data from shallow zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 30.93 mg/L for this parameter.

A review of the historical dissolved potassium concentrations over time in the shallow zone indicates some spatial variability; however, the overall trends appear to be generally steady or in some cases decreasing (e.g., wells R08S and R32S) over time.

Deep Wells
A review of 2017 dissolved potassium data from deep zone monitoring points indicates that there were no exceedances of the established AGQS of 30.93 mg/L at any of the sampling points.

A review of the historical dissolved potassium concentrations over time in the deep zone indicates some spatial variability, however, the overall trends appear to be generally steady and the 2017 data is consistent with the historical data for this parameter.

3.2.18 Selenium, dissolved

Shallow Wells
A review of 2017 dissolved selenium data from shallow zone monitoring points indicates that there were no exceedances of the established AGQS of 324.9 µg/L for this parameter. This is consistent with historical dissolved selenium data indicating that the concentration of this parameter has never exceeded the AGQS. A review of historical time versus concentration curves indicates steady/stable trends.

Deep Wells
A review of 2017 dissolved selenium data from deep zone monitoring points indicates that there were no exceedances of the established AGQS of 324.9 µg/L for this parameter. This is consistent with historical dissolved selenium data indicating that the concentration of this parameter has never exceeded the AGQS.

3.2.19 Sodium, dissolved

Shallow Wells
A review of 2017 dissolved sodium data from shallow zone monitoring points indicates that there were confirmed exceedances of the established AGQS of

165.2 mg/L at sampling locations G30S (all four quarters), G38S (third quarter), G47S (all four quarters), and G48S (all four quarters). Well G30S is located within the zone of attenuation to the north of the Main Quarry and WFA, while G38S, G47S, and G48S are wells located on the south side of the Main Quarry and within the approved GMZ. These confirmed exceedance concentrations ranged from 170 mg/L in G38S to 620 mg/L in G47S. The sodium concentrations at well location G48S have generally decreased since 2013 while the concentrations at G47S are somewhat variable with an increase in 2017 but still below the highest detection in 2011. There were no confirmed dissolved sodium exceedances in any of the north side shallow zone compliance wells.

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry to address the noted exceedances in this area. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The effectiveness of the extraction system is reflected in the above observations of overall decreasing sodium concentrations at well locations G47S and G48S since the start of operations.

Deep Wells

The 2017 monitoring indicated confirmed exceedances of the dissolved sodium AGQS at well locations G31D (all four quarters), G33D (all four quarters), G41D (all four quarters), G42D (all four quarters), and R16D (all four quarters). These wells are located on the northern portion of the site along the Des Plaines River with the exception of R16D which is located in the eastern most corner of the North Quarry zone of attenuation. These confirmed exceedance concentrations ranged from 180 mg/L in G33D to 250 mg/L in G42D. These detections are generally consistent with historical monitoring data for these locations since the start of sampling in 1999. There were no other exceedances of the dissolved sodium AGQS in any of the other deep zone monitoring wells which is also consistent with historical trends for this parameter.

Based on potentiometric surface maps developed for the deep zone, well G42D is an upgradient water quality well. This well has consistent sodium detections above the AGQS indicating a potential off-site, upgradient source to the east of this well location and/or desorption of sodium from the underlying Scales Shale and are not the result of a release from the regulated unit.

3.2.20 Specific Conductance

Shallow Wells

A review of 2017 specific conductivity data for shallow zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 2,172.2 µmhos/cm for this indicator parameter with the exception of G47S during the second and third quarters ranging from 2,460 to 2,570 µmhos/cm. A review

of historical time versus concentration curves indicates some spatial variability; however, many of the general trends for individual wells are steady.

Deep Wells
A review of 2017 specific conductivity data for deep zone monitoring points indicates that there were no exceedances of the established AGQS of 2,172.2 µmhos/cm for this indicator parameter. A review of historical time versus concentration curves indicates some spatial variability; however, in general, trends for individual wells are steady.

3.2.21 Sulfate, dissolved

Shallow Wells
A review of 2017 dissolved sulfate data for shallow zone monitoring points indicates that there was only one location of confirmed exceedances of the established AGQS of 493.2 mg/L within the permitted monitoring well network. Monitoring well G47S in the second through fourth quarters with concentrations ranging from 570 mg/L to 810 mg/L. Well G47S is located on the south side of the Main Quarry and within the approved GMZ. A review of the historical dissolved sulfate data over time in the shallow zone indicates some variability; however, the overall trends appear to be generally steady.

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry to address the noted exceedances in this area. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The sulfate concentrations in other wells that previously had exceedances are decreasing over time (which is evident at well G48S) along the south perimeter as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway Quarry. The elevated sulfate in 2017 at well location G47S is associated with pumping system maintenance issues discussed in detail in the Application for Significant Modification to Permit – Assessment of Interim Corrective Action dated March 12, 2018.

Deep Wells
A review of 2017 dissolved sulfate data for deep zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 493.2 mg/L for this parameter. A review of the historical dissolved sulfate data over time in the deep zone indicates some spatial variability; however, the overall trends for individual wells appear to be steady and in some cases decreasing.

3.2.22 Total Dissolved Solids

Shallow Wells
A review of 2017 total dissolved solids (TDS) data for shallow zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 1,111.6 mg/L within the permitted monitoring well network with the exception of G47S (second through fourth quarters) at a concentration of 1,600 mg/L. This well is located on the south side of the Main Quarry, within the approved GMZ. There were no confirmed exceedances in any of the north side compliance zone wells. A review of the historical TDS data over time in the shallow zone indicates some variability both spatially and at specific well locations; however, the overall trends for individual wells appear to be generally steady with the noted exception of well G47S (located within the approved GMZ).

An interim remedial action consisting of four extraction wells has been installed and operational since the end of April 2010 at the southeast corner of the Main Quarry to address the noted exceedances in this area. This system was expanded in 2011 along the entire south perimeter of the Main Quarry and WFA (becoming operational in the first quarter of 2012). The noted exceedance concentrations are generally decreasing over time along the south perimeter as the extraction system continues to intercept Main Quarry leachate being pulled to the southeast as a result of dewatering operations at the Vulcan Laraway Quarry. The elevated TDS in 2017 at well location G47S is associated with pumping system maintenance issues discussed in detail in the Application for Significant Modification to Permit – Assessment of Interim Corrective Action dated March 12, 2018.

Deep Wells
A review of 2017 TDS data for deep zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 1,111.6 mg/L for this parameter. A review of the historical TDS data over time in the deep zone indicates some spatial variability; however, the overall trends for individual wells appear to be generally steady/stable.

3.2.23 Total Organic Carbon

Shallow Wells
A review of 2017 total organic carbon (TOC) data for shallow zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 8.26 mg/L. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous recent data.

Deep Wells
A review of 2017 TOC data for deep zone monitoring points indicates that there were no confirmed exceedances of the established AGQS of 8.26 mg/L for this

parameter. A review of the historical time versus concentration data indicates that the 2017 results are consistent with previous recent data.

3.2.24 Zinc, dissolved

Shallow Wells
No detections of dissolved zinc have been reported in facility shallow zone groundwater above the AGQS of 610.7 µg/L. A review of the time versus concentration curves for this parameter indicates generally stable conditions since 1993.

Deep Wells
No detections of dissolved zinc have been reported in facility deep zone groundwater above the AGQS of 610.7 µg/L. A review of the time versus concentration curves for this parameter indicates generally stable conditions since 1993.

3.3 Changes to the Monitoring Program

There were no changes to the permit monitoring program over the 2017 reporting period.

3.4 Error Analysis, Detection Limits and Observed Trends

3.4.1 Discussion of Error Analysis

Under the current facility permit, the statistical method for evaluating groundwater quality compares the data: (i) from upgradient and compliance boundary wells to establish interwell AGQSs and (ii) the data from wells within the zone of attenuation to interwell MAPCs. At this site, the MAPCs are currently set at the same value as the AGQSs. The use of interwell comparison values increases the effect/influence of spatial variability between individual monitoring points, which increases the systematic error of the statistics relative to providing potential false positives. This point was demonstrated in the groundwater assessment analysis provided to IEPA in February 2005 (IEPA Application Log No. 2005-058) and associated comment responses dated February 22, 2006.

3.4.2 Statistical Method

Under the current permit for the facility, the statistical method specified employs the 99-percent upper confidence limit (99% UCL; also a 99% lower confidence limit for pH) using the standard Student's t-test. These values were calculated from the IEPA approved 1993 baseline data set for each individual chemical parameter for use in interwell comparisons.

3.4.3 Discussion of Detection Limits

For all groundwater parameters, the analytical laboratory met the reporting limits required by the permit AGQS/MAPC values.

3.4.4 Discussion of Observed Trends

A detailed discussion of observed trends from both shallow and deep zone monitoring wells for individual parameters is provided in Section 3.2 above.

4.0 ANTICIPATED ACTIVITIES

4.1 Amount of Waste Expected to be Disposed in 2018

As required by the permit, an estimate of the waste quantity to be disposed in the unit during the following year is to be provided. The LSQ is no longer having ash slurried from plant operations since the facility has converted to gas. Ash from the closure of Ash Pond 2 on the Joliet #29 side is currently planned to be trucked to the LSQ for placement/disposal. At this time it is estimated that approximately 45,000 cubic yards of ash will be placed into the LSQ in 2018.

4.2 Structures to be Built Within the Next Year

The proposed expansion of the extraction well system along the south side of the Main Quarry and WFA was approved by IEPA on August 8, 2011 and construction was initiated on August 17, 2011. Construction was completed in the first quarter of 2012. No new structures were added in 2017 and no new structures are anticipated to be built in 2018, however, it is noted that after the last ash is received from the closure of Ash Pond 2 as discussed above, closure procedures will be initiated for the Lincoln Stone Quarry in accordance with the operating permit.

4.3 New Monitoring Stations to be Installed Within the Next Year

At this time, no new permit monitoring stations are anticipated to be installed during 2018.

4.4 Modifications or Significant Modifications Affecting Operation

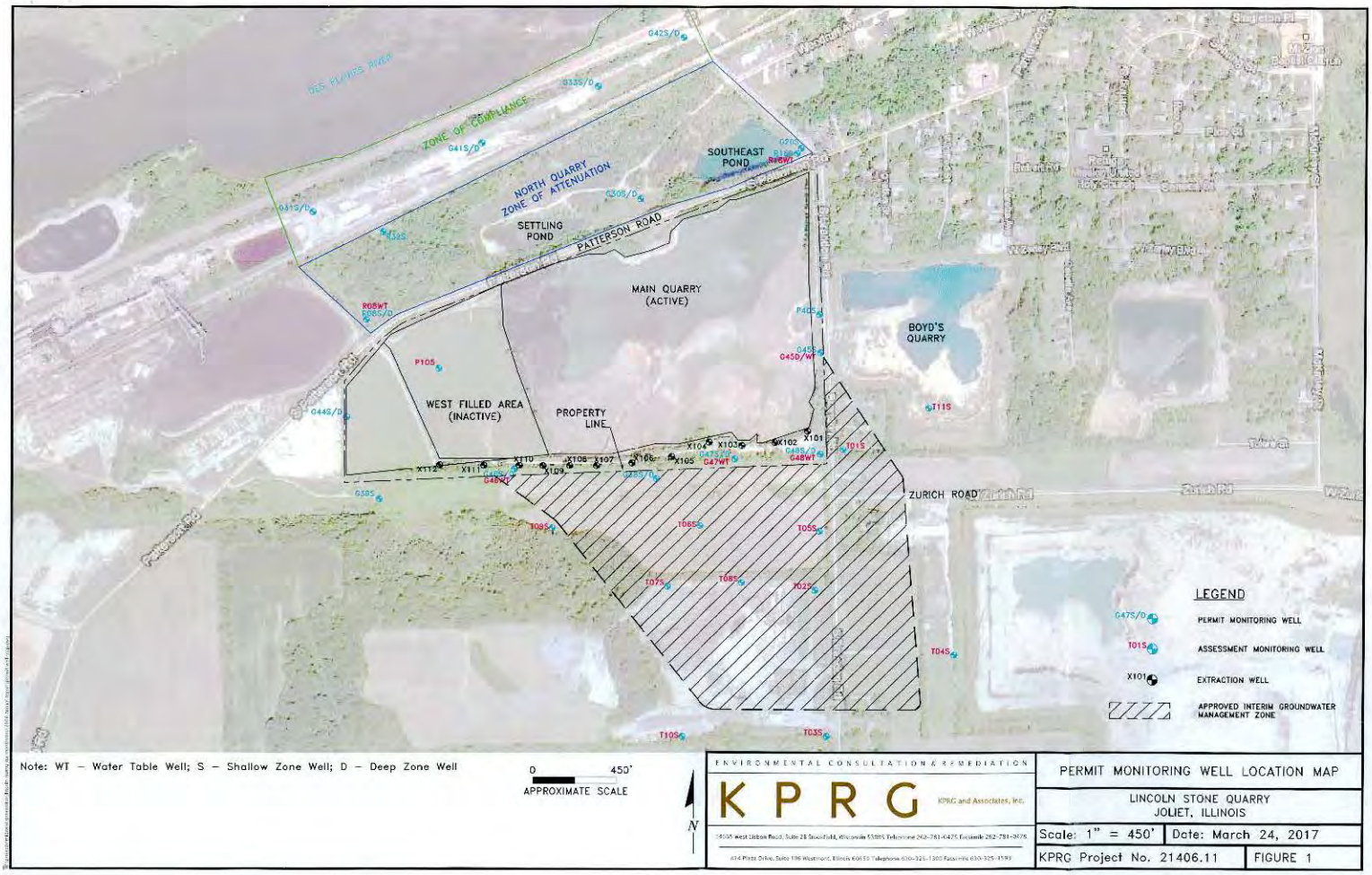
A renewed operational permit was issued by IEPA on August 14, 2015 as Permit Modification No. 21. The permit is valid through May 21, 2019.

An Application for Significant Modification to permit which assesses the 2017 performance of the expanded corrective action and confirms the definition of the approved GMZ is due to IEPA on March 15, 2018 (already submitted under separate cover). The results of this evaluation did not have any recommendations for the modification or operation of the extraction well system and approved monitoring of the GMZ.

4.5 Signature of Operator or Duly Authorized Agent

The signature of the operator/duly authorized agent is provided in Appendix E in accordance with permit Section III. Reporting, Condition 2(d) and as specified in 35 Ill. Adm. Code 815.102.

FIGURE
Well Location Map



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'
APPROXIMATE SCALE

N

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

PERMIT MONITORING WELL LOCATION MAP

LINCOLN STONE QUARRY
JOLIET, ILLINOIS

Scale: 1" = 450' | Date: March 24, 2017

KPRG Project No. 21406.11 | FIGURE 1

Exhibit 3

MEMORANDUM

Date 1/10/2019

To: BOL File Room

From: Pamela Ketchum

Re: LPC# 1978090001 - Will County
LINCOLN STONE OUARRY
Groundwater

The 4th Quarter 2018 Notice of Confirmed Increase of Groundwater Exceedance from Re-sample for the above referenced facility was dated 1/8/2019 and was received by the Agency on 1/10/2019. A copy is attached.

cc: DesPlaines Regional Office - Gino Bruni
Will County Land Use Department

January 8, 2019

Illinois Environmental Protection Agency
Reporting and Financial Assurance Unit
Division of Land Pollution Control #24
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62702

Federal Express

Re: 1978090001- Will County
Joliet/Lincoln Stone Quarry
Fourth Quarter 2018

Dear Agency Representative,

In accordance with Condition Number X.15 of Permit No. 1994-241-LFM (Modification Number 24), granted to Lincoln Stone Quarry, Inc. as owner and Midwest Generation, LLC as operator, provided herein is written notification of confirmed exceedances in groundwater quality for groundwater samples collected from the referenced facility during the fourth quarter 2018. Confirmation procedures were completed in accordance with Condition Number X.15 of the above-referenced permit. The parameters indicating confirmed exceedances during the fourth quarter 2018 are provided in Table 1 and are being addressed as part of the ongoing remedial activities and reissued permit.

If there are any questions, please contact Sharene Shealey at 724-255-3220 or Richard Gnat of KPRG at 262-781-0475.

Sincerely,

William Naglosky
Joliet Station Manager

cc: Sharene Shealey, Midwest Generation, LLC
Peter O'Day, Midwest Generation, LLC
Richard Gnat, KPRG and Associates, Inc.

Illinois
Environmental
Protection Agency

Bureau of Land
1021 North Grand Avenue East
Box 19276
Springfield, IL 62794-9276

SOLID WASTE LANDFILL GROUNDWATER, LEACHATE, FACILITY AND GAS REPORTING FORM

This form must be used as a cover for the following list of notices and reports required to be submitted to the Illinois EPA's Bureau of Land, Permit Section. This form must be used for Solid Waste facilities only. Reporting for Hazardous Waste facilities should be submitted on a separate form. All reports submitted to the Illinois EPA's Bureau of Land Permit Section must contain an original, plus a minimum of two copies.

Note: This form is not to be used with permit applications. The facility's approved permit will state whether the document you are submitting is required as a report or an application.

Facility Name: Joliet/Lincoln Stone Quarry Site ID #: 1978090001
Facility Address: 1601 S. Patterson Rd., Joliet, IL 60436

Check the appropriate heading. Only one heading may be checked for each corresponding submittal. Check the appropriate sub-heading, where applicable. Attach the original and all copies behind this form.

___ LPC-160 Forms

Groundwater	Leachate
___ Quarterly – Indicate one: 1 2 3 4	___ Quarterly – Indicate one: 1 2 3 4
___ Semi-Annual	___ Semi-Annual
___ Annual	___ Annual
___ Biennial	___ Biennial

___ Well Construction Information
- ___ Well Construction Forms, Boring Logs and/or Abandonment Forms
- ___ Well Survey Data (e.g., Stick-up Elevation Data)

___ Annual Groundwater Flow Evaluation

___ Notice of Observed Increase in Groundwater
Notice of Intent to Perform Confirmation Procedures (Re-sampling) in Groundwater

X Notice of Confirmed Increase of Groundwater Exceedence from Re-sample

___ Notice of Methane Exceedences

___ Annual Facility Report (per 35 Ill. Adm. Code 813.504) and Gas Monitoring Report

___ Annual Certifications per 35 Ill. Adm. Code 813.501

___ Other (identify) _____

IL 532-2674
LPC 591 12/2004

JLM:bjh\04171p.doc

Table 1
Midwest Generation, LLC
Joliet/Lincoln Stone Quarry
4th Quarter 2018 Confirmed Exceedances

		4th Quarter 2018		AGQS/MAPC	Exceeds AGQS/MAPC	4 Quarter Increase
Well/Parameter	Units	Initial	Resample			
G30S						
Ammonia as N	mg/L	2.0	1.9	1.57	Yes	No
Chloride, Dissolved	mg/L	200	210	144.29	Yes	No
Sodium, Dissolved	mg/L	260	270	165.2	Yes	No
G31D						
Fluoride, Dissolved	mg/L	4.3	4.4	1.73	Yes	No
Sodium, Dissolved	mg/L	230	230	165.2	Yes	No
G31S						
Chloride, Dissolved	mg/L	160	180	144.29	Yes	No
G33S						
Barium	ug/L	170	160	75	Yes	No
G38S						
pH (Field)	SU	8.96	8.94	6.14-8.56	Yes	No
Sodium, Dissolved	mg/L	190	190	165.2	Yes	No
G41D						
Fluoride, Dissolved	mg/L	3	3.2	1.73	Yes	No
Sodium, Dissolved	mg/L	200	190	165.2	Yes	No
G42D						
Fluoride, Dissolved	mg/L	3.6	3.7	1.73	Yes	No
Sodium, Dissolved	mg/L	230	250	165.2	Yes	No
G47S						
Ammonia as N	mg/L	7.1	4.2	1.57	Yes	No
Arsenic, Dissolved	ug/L	160	130	10	Yes	No
Boron, Dissolved	ug/L	14000	11000	5924.16	Yes	No
pH (Field)	SU	10.11	10.2	6.14-8.56	Yes	No
Sodium, Dissolved	mg/L	560	450	165.2	Yes	No
Total Dissolved Solids	mg/L	1600	1300	1111.6	Yes	No
G48S						
Ammonia as N	mg/L	3.3	2.5	1.57	Yes	No
Arsenic, Dissolved	ug/L	19	23	10	Yes	No
Boron, Dissolved	ug/L	6200	6000	5924.16	Yes	No
Sodium, Dissolved	mg/L	290	290	165.2	Yes	No
R08D						
Boron, Dissolved	ug/L	7000	6900	5924.16	Yes	No
R16D						
Sodium, Dissolved	mg/L	200	200	165.2	Yes	No

Exhibit 4

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Eric J. Holcomb
Governor

Bruno L. Pigott
Commissioner

December 17, 2018

VIA CERTIFIED MAIL 7017 2400 0000 0752 2580

Duke Energy Indiana, Inc.
Attn: Owen R. Schwartz
1000 East Main Street
Plainfield, Indiana 46168

Dear Mr. Schwartz:

Re: Request for Additional Information
Gibson Generating Station North Ash Basin System Pond Closures
Gibson County
SW Program ID 26-UP-13

We reviewed your closure and post-closure plan application received on December 22, 2016 (VFC #80399262), and additional information received on July 21, 2017 (VFC #80494709). Additional information and/or changes are needed before we can continue our review. The needed information or changes are identified in the enclosures.

Please note, the closure approach you have proposed leaves waste in place either in contact or in potential contact with ground water. The Coal Combustion Residual (CCR) rule's closure performance standard when leaving CCR in place includes the following requirement: "Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere..." 40 CFR 257.102(d)(1)(i). For purposes of this requirement, it is IDEM's position "infiltration" can come from any direction, and it is not limited to liquids that pass through the final cover system. Specifically, it is IDEM's position ground water infiltration into closed-in-place CCR constitutes "post-closure infiltration of liquids into the waste." Further, it is IDEM's position the phrase "releases of CCR, leachate, or contaminated run-off to the ground or surface waters" includes releases to ground water. IDEM cannot approve a closure plan that would leave CCR in place without a description of how the plan controls, minimizes, or eliminates post-closure infiltration and releases "to the maximum extent feasible." You will note IDEM's position on this matter throughout the comments in the Engineering and Geology Enclosures. In submitting a response to this Request for Additional Information in support of your closure method, please note IDEM's interpretation of 40 CFR 257.102(d)(1)(i), and address that provision accordingly.

Please provide four copies of your response. At least three copies should be on paper printed double sided. If possible, please submit one in Acrobat PDF format, either on a CD or DVD with the printed copy, or by e-mail to tkreke@idem.IN.gov. Please note any e-mail and its attachment(s) must total less than 20 MB in size. The date we receive the paper copies will be the receipt date for your response.

Enclosed is a signature and certification statement which must be submitted with each copy of your response; you may submit one signed original and three copies of this statement. One copy can be included as part of the PDF version. Please mail paper copies and CDs/DVDs to:

Thomas Kreke, Permit Manager
Indiana Department of Environmental Management
Solid Waste Permits
IGCN 1101
100 North Senate Avenue
Indianapolis, Indiana 46204-2251

Since our goal is to provide you with as timely a decision as possible, we request you provide the required information within 60 days from the date you receive this letter. If you believe you cannot submit the requested information within that time frame, please contact Thomas Kreke to arrange a schedule for submitting the information.

Public records for your facility are available in IDEM's Virtual File Cabinet (VFC) at www.IN.gov/idem; the VFC can be accessed under the Resources tab by clicking the e-Services link. Documents related to this request include the application we received on December 22, 2016 (VFC #80399262), and additional information received on July 21, 2017 (VFC #80494709).

Indiana Code (IC) and Indiana Administrative Code (IAC) references in this document can be reviewed at iga.IN.gov. IC references are under the "Laws" link; IAC references are under the "Publications" link.

If you have any questions, please contact Thomas Kreke, the Permit Manager assigned this facility, by dialing (317) 233-9468 or by e-mail at tkreke@idem.IN.gov.

Sincerely,

Amy McClure

Amy McClure, Chief
Solid Waste Permits Section
Office of Land Quality

Enclosures: Engineering
Geology
Certification Statement

cc with enclosures: Gibson County Health Department
Gibson County Commissioners
Gibson County Solid Waste Management District
Director, Southwest IDEM Regional Office

ENGINEERING ENCLOSURE
Request for Additional Information
Gibson Generating Station North Ash Basin System
Closure and Post-Closure Plans
SW Program ID 26-UP-13
Gibson County

Reviewer: Daniela Klesmith
Telephone: (317) 232-8840
Email:dklesmit@idem.IN.gov

Please address the following comments developed from an engineering review of your response received on July 21, 2017 (VFC #80494709), to the IDEM April 27, 2017 (VFC #80475323) request for additional information regarding the proposed Closure and Post-Closure plan for the North Ash Basin System:

The proposed ash pond closure and post-closure consist of the following:

- North Ash Pond - Closure in Place; portions closed previously.
- North Settling Basin - Closure by Removal; portions closed previously. This will be repurposed to serve as: a lined contact water basin at the south end, a new parking area in the center, and a lined storm water detention basin at the north end.

1. Closure and Post-Closure Cost

Include 10% contingency cost to the total cost of closure and post-closure cost estimates for unforeseen expenses.

2. Impoundment dewatering and stabilization procedures

a. Provide additional details on elimination of free liquids from the impoundment and ash stabilization techniques to provide for stable foundation for placement of additional structural fill and cover meeting requirements of 40 CFR 257.102(d)(2).

b. Slope stability of the cover system and the embankments for the impoundment with additional structural fill has not been provided.

3 Compliance with 40 CFR 257.102(d)(1)

We reviewed your responses to item #7 included in the July 20, 2017 submittal (VFC #80494709, pages 9 -13 of 214) and have the following comments:

a. The CCR rule's closure performance standard when leaving CCR in place includes the following requirement: "Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or

surface waters or to the atmosphere . . . ." 40 CFR 257.102(d)(1)(i). For purposes of this requirement, it is IDEM's position that "infiltration" can come from any direction and is not limited to liquids that pass through the final cover system. Specifically, it is IDEM's position that ground water infiltration into closed-in-place CCR constitutes "post-closure infiltration of liquids into the waste." Further, it is IDEM's position that the phrase "releases of CCR, leachate, or contaminated run-off to the ground or surface waters" includes releases to ground water. IDEM cannot approve a closure plan that would leave CCR in place without a description of how the plan controls, minimizes, or eliminates post-closure infiltration and releases "to the maximum extent feasible." In submitting response to this additional information request in support of your closure method, please note IDEM's interpretation of 40 CFR 257.102(d)(1)(i) and address that provision accordingly.

b. Update the closure and post-closure cost estimate to reflect the expected expenses of any additional measures taken during closure to control, minimize, or eliminate ground water infiltration and potential releases from waste in contact with ground water to the maximum extent feasible.

GEOLOGY ENCLOSURE
Request for Additional Information
Gibson Generating Station North Ash Basin System
Closure and Post-Closure Plans
SW Program ID 26-UP-13
Gibson County

Reviewer: Troy Weaver
Telephone: (317) 233-2430
Email: tweaver@idem.IN.gov

Please address the following comments developed from a geology review of your response received on July 21, 2017 (VFC #80494709), to the IDEM April 27, 2017 (VFC #80475323) Request for Additional Information (RAI) regarding the proposed Closure and Post-Closure plan for the North Ash Basin System:

1. Within the Geology Enclosure section of the Response, the facility states that: ". . . Duke Energy will include the information requested in the RAI Geology Enclosure items 3 through 6, 9 through 15, and 17 in the Groundwater Sampling and Analysis Program required by the CCR Rule. This information will be submitted in accordance with the schedule and requirements listed in the CCR Rule."

   Therefore, Geology Section staff are unable to determine the acceptability of the limited responses to the above RAI enclosure items due to the facility deferring their full response to a later, unspecified date. Please provide specific responses to the above noted enclosure items 3 through 6, 9 through 15, and 17.

2. Within the Geology Enclosure section of the Response, the facility's responses to Items 1, 2, 7, 8, 16, and 18 through 21 are acceptable with the following conditions to Items 16 and 18:

   a. Item 1

   In the response to Geology Enclosure, Item 1 of the RAI, the facility provides their interpretation of closure by removal criteria under 40 CFR 257.102(c). Regardless of the facility's interpretation, IDEM and the facility agree to 30 years post-closure ground water monitoring.

   b. Item 16

   In the response to Geology Enclosure, Item 16 of the RAI, the facility provides their interpretation of criteria under 40 CFR 257.102(d). Regardless of the facility's interpretation, they need to provide the elevations of the seasonal high and low water table, the elevation(s) of the bottom of the waste, and the lithologic composition of soils adjacent to and

below the impoundments being closed under the North Ash Basin System (i.e. the North Settling Basin and the North Ash Pond).

c. Item 18

Discharge of these contact/process fluids and leachate, which may contain suspended solids and dissolved/aqueous phase CCR contaminants, into the unlined Gibson Cooling Pond remains a concern. Provide a contact/process fluids and leachate treatment plan for the RWS II Landfill, North Ash Pond, and the "lined contact water basin" portion of the repurposed North Settling Basin.

Solid Waste Land Disposal Facilities
Signatures and Certification Statements for Requested Additional Information

329 IAC 10-11-3(d) requires that the signatory of a solid waste land disposal facility permit application and of other information requested by or on behalf of the Commissioner (including the supplemental information requested by our office for your solid waste land disposal facility permit application) sign the following certification statement:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that I am authorized to submit this information."

_____ _____

APPLICANT'S SIGNATURE DATE

_____

APPLICANT'S NAME TYPED

Note: It is not necessary to submit this form if an equivalent signed certification statement is incorporated into your submittal