

Report to the Winneshiek County Board of Supervisors  
Regarding Moratorium Resolutions 13-65 and 15-18

March 2, 2015

Dean Thompson and Dennis Karlsbrotten

## Background

In response to public interest and concern about potentials of mining silica sand in Winneshiek County for frac or proppant for hydrofracking, the Board of Supervisors (BOS) requested consideration by the Planning and Zoning Commission (P&Z) for a temporary moratorium on the issuance of conditional use permits for frac sand mining and operations.<sup>a</sup> P&Z responded favorably after a public hearing.

The BOS unanimously approved Resolution 13-65 to establish a temporary moratorium on frac sand mining operations in order to:

- (1) Determine if changes in the zoning ordinance and comprehensive plan are necessary based on,
- (2) Investigation of potential effects on road and infrastructure maintenance and effects on public services, public health, safety and general welfare that may result from frac sand mining operations.

The BOS assigned Supervisors Dean Thompson and Dennis Karlsbrotten to conduct or arrange fair and impartial consideration of the two basic issues. Fact-finding developed in overlapping phases.<sup>b</sup>

- A. Interviews, meetings, conferences, and tours involving the industry, scientists, and technical specialists in government and academia, elected officials and

---

<sup>a</sup> The terms *frac*, *frac sand* and *frac sand mining and operations* denote products and *industry* activities associated with the extraction of silica sand, a non-metallic mineral used to release *unconventional* oil and gas from rock strata in a process called *hydrofracturing*, *hydraulic fracturing* or just *fracking*. Silica sand is injected with water and chemicals under high pressure to fracture and *prop-open* fissures to release oil and gas. Thus, silica sand used as proppant is called *frac sand*, extraction pits are called *frac sand mines* and associated processes are collectively referred to as *frac sand mining operations*. The industry terms are used in this report.

The end use of silica sand to recover oil or gas and controversies surrounding expanded energy extraction and the process of hydraulic fracturing are not considered in this report and have not influenced BOS studies or findings. Nor have studies and findings been influenced by the industry's conflation of frac sand mining with US energy independence.

<sup>b</sup> Refer to Appendix A for a timeline of fact finding.

administrators in state and local government, and concerned citizens.

- B. Presentation of information to the BOS in public meetings by scientists and subject-matter experts.<sup>c</sup>
- C. Collaboration with the University of Iowa for impartial, science-based studies in Winneshiek County of potential effects from and regulation of frac sand mining operations.
- D. Discovery and consideration of relevant and credible sources of information from government, academia, the mining industry, private organizations, citizens, and media.

This report of findings is provisional because important studies by the University of Iowa are underway (explained below). This report is interim because the BOS (Resolution 15-18) extended the moratorium to October 2015, by which time a final report is expected. And this report is timely because sufficient credible information is available to recommend BOS action. Information available in May 2015, at the conclusion of all University of Iowa studies, is not expected to contradict findings that follow, although final reports may contribute additional findings.

## Findings<sup>d</sup>

### **ISSUE 1.0 Winneshiek County, Iowa Zoning Ordinance and Subdivision Regulations (the ordinance) and Winneshiek County, Iowa Comprehensive Smart Plan, 2012 (the comprehensive plan).**

Winneshiek County is within the Paleozoic Plateau, or 'Driftless Area.' The Paleozoic Plateau includes significant geologic formations of sandstone known, in descending order of age, as St. Peter, Jordan and Wonewoc. St. Peter and Jordan sandstone formations are locally recognized by name as major aquifers for private and municipal water supply. In Wisconsin and Minnesota, St. Peter, Jordan, Wonewoc and yet older sandstone formations are proven sources of frac sand used in hydrofracking to recover oil and gas from states to the east, south and west.

---

<sup>c</sup> Presentations were publicized to encourage public attendance. For more information, refer to Appendix A.

<sup>d</sup> Refer to Appendix B for supporting references and documents.

*“The St. Peter Formation is known within the silica sand industry as “Ottawa Sand,” among other names. It has been mined extensively from Illinois to Minnesota in areas where the formation is close to the surface.”<sup>e</sup>*

St. Peter sandstone is actively mined for construction material and dairy bedding at two quarries in Canoe Township of Winneshiek County.

Finding 1.1 St. Peter sandstone is widespread in Winneshiek County. It is exposed at or near the surface in northeastern townships. St. Peter sandstone also crops out on hillslopes and bluffs along incised valleys in other townships.

Finding 1.2 St. Peter sandstone in Winneshiek County exhibits properties suited for frac sand.

The Rein Quarry in Fillmore County, approximately 35 miles north of Decorah, is permitted for frac sand mining. St. Peter sandstone is extracted from the Rein Quarry. That quarry’s geologic setting and topographic position are highly similar to townships in northeastern Winneshiek County.

The Pattison Sand Company in Clayton County, Iowa actively mines and markets St. Peter sandstone for hydrofracking.

Finding 1.3 It is reasonable to conclude that St. Peter sandstone in Winneshiek County could be extracted and processed for frac sand in context of current or future oil and gas extraction technologies and prevailing energy markets. Jordan sandstone in Winneshiek County could be mined and processed for frac sand, although less is known about that sandstone formation in Winneshiek County.

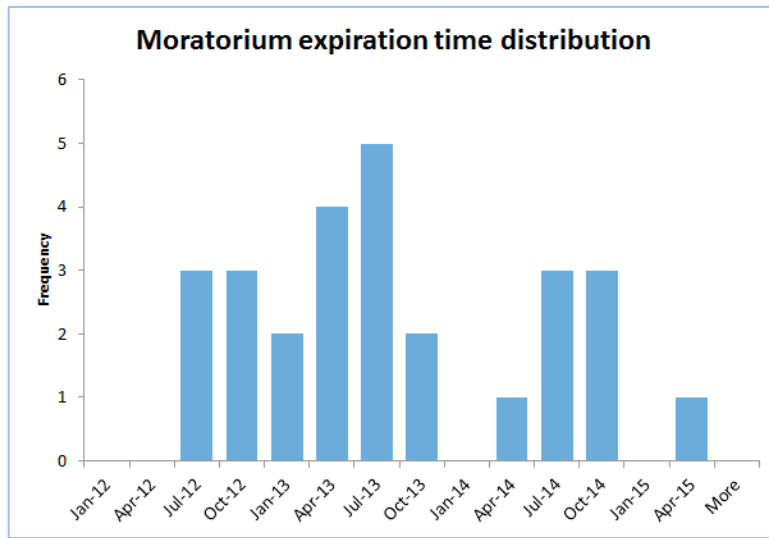
Finding 1.4 It is fallacy to believe frac sand mining of the St. Peter sandstone will not occur in Winneshiek County simply because it has not already done so. It would require a failure of imagination—and a failure of diligence—to believe otherwise: (i) There are active and permitted frac sand mines of the same geologic unit in neighboring counties, (ii) hydrofracking technologies change, and (iii) future markets for frac sand are by definition unpredictable.

---

<sup>e</sup> Supplemental Information Regarding Nonmetallic Mining in Goodhue County, Minnesota. (2012). Summit Envirosolutions, Inc., St. Paul, Minnesota.

The frac sand mining industry serving the petroleum market is relatively new. State and local government in Wisconsin, Minnesota, and Iowa have responded by establishing temporary moratoria (Figure 1) and introducing new state and local regulations for permitting or licensing frac sand mining operations. These legislative actions show that industrial frac sand mining operations are distinct in scale, scope, intensity, and effect from other non-metallic mining operations for local markets.

Figure 1- Moratoria in WI, MN & IA (2004).<sup>f</sup>



**Finding 1.5** It is reasonable to conclude that frac sand mining operations in Wisconsin, Minnesota, and Iowa differ from mining of aggregate and sand for local construction and agriculture.

**Finding 1.6** It is reasonable to conclude that zoning ordinance sections on mining that were formulated a decade ago could not have anticipated a new industry for silica sand and therefore cannot address issues of public safety, health, and welfare that have become firmly associated with industrial frac sand mining operations.

**Finding 1.7** It follows that current application requirements for issuing a conditional use permit cannot be adequate to consider and treat effects of industrial frac sand mining operations.

<sup>f</sup> See <http://seekingalpha.com/article/2782935-some-facts-about-u-s-frac-sand-market-emerge-energy-services-hi-crush-partners-u-s-silica>

Finding 1.8 It does not follow that the comprehensive plan requires amendment to consider new industrial activities. The comprehensive plan provides guidance to local government for decisions on public health, safety, and welfare.

In addition to non-metallic mineral mining for frac sand, there is new science-based information indicating that valuable metallic minerals may exist and could be mined in Winneshiek County.

Finding 1.9 It is reasonable to conclude that zoning ordinance sections on mining that were formulated a decade ago could not have anticipated metallic-mineral mining.

**ISSUE 2.0 Potential effects on road and infrastructure maintenance and effects on public services, public health, safety and, general welfare that my results from frac sand mining operations.**

Demand for frac sand increased exponentially over the last decade, especially the last five years. The US Geological Survey, US Energy Information Administration, and the private sector estimate that demand in 2013 exceeded 40 million metric tons per year; projections for 2015 approach 60 mmt/y.

Increasing demand for frac sand stimulated growth of the frac sand mining industry, particularly in western Wisconsin where communities and their local government were ill prepared for the *boom* and unanticipated consequences. State, county, and municipal government across the Mississippi in Minnesota, with urging of citizens, observed Wisconsin's circumstances and, under moratoria mentioned earlier, have undertaken appropriate studies in preparation for westward-extension of frac sand mining. In fact, Wisconsin state government is about to re-examine effects of frac sand mining operations.<sup>g</sup>

Credible and science-based studies of effects of industrial frac sand mining operations have been conducted or are underway by the frac sand industry,

---

<sup>g</sup> Wisconsin Department of Natural Resources issued a silica sand mining report in 2012. Prompted by a statewide petition, the board of WDNR approved a *new* study of the frac sand mining industry in that state.

universities, private organizations, and state and local government in Wisconsin and Minnesota.

The Minnesota Environmental Quality Board (EQB) has issued two important studies of silica sand mining. The first report in 2013 provided information on silica sand, silica sand mining operations, and issues and concerns relating to potential effects and governance. The second EQB report in 2014 further considered potential effects, suggested appropriate studies, and provided guidance—and offered technical assistance—to local governments for planning and regulating silica sand projects.

Finding 2.1 It is reasonable for Winneshiek County to accept as *authoritative sources* the EQB reports on silica sand mining operations, potential effects, and, as allowed by Iowa Home Rule, strategies to identify, study, and consider regulation of adverse effects on public health, safety, and welfare.

State regulatory authorities in Iowa have not become involved in frac sand mining issues, but Iowa counties have done so. Winneshiek and neighboring Allamakee County government held public hearings and approved temporary moratoria. Owing to differing moratoria schedules, Allamakee and Winneshiek conducted independent fact finding on public health, safety, and welfare.

During Winneshiek’s phases of fact finding:

(i) The BOS endorsed a National Institute of Health grant application by the University of Iowa to study risk and exposure to particulate matter near frac sand mines and routes of frac sand transport.

(ii) Thompson and Karlsbrotten studied potential effects of CAFO expansion in Highland Township in context of, among other important resources, Bear Creek Watershed’s significance to the local economy.

(iii) Thompson and Karlsbrotten toured or visited frac sand mines and transloading facilities; interviewed elected state and local officials in Iowa, Minnesota, and Iowa; met county administrators; attended conferences and meetings; met with citizens and advocacies; and developed a library of reference materials.

(iv) Thompson prepared portions of a grant application (awarded March 2014) to the Iowa Initiative for Sustainable Communities (IISC), University of

Iowa, to study the three-dimensional extent of St. Peter sandstone deposits; suitability of those deposits for frac sand; potential locations of frac sand mining operations based on statistical modeling; effects of industrial silica sand mining on county-financed infrastructure; effects of frac sand mining operations on the local economy; and analysis of constitutional issues of regulating frac sand mining operations.

(v) The BOS invited scientists and subject-matter experts to present information in public meetings at the courthouse. Presentations were publicized to encourage public attendance. IISC reports have also been presented to the BOS in public meetings with similar publicity and public participation. All presentations provided opportunities for public questions.<sup>h</sup>

What could be gained and what might be lost if industrial frac sand mining operations come to Winneshiek County? Based on sources of information described above, it is reasonable and prudent to reach the following findings of fact:

Finding 2.1 Locally-owned and operated businesses that mine aggregate and sand represent a significant sector of the local economy, provide stable employment, and produce material for local construction and agriculture.

Finding 2.2 Frac sand mining operations will create direct, indirect, and induced jobs. The number and types of jobs depend on the number and size of mines and associated operations. There is no assurance that jobs created will be filled exclusively or mostly by county residents.<sup>i</sup>

Finding 2.3 Heavy trucks hauling frac sand will accelerate deterioration of county-financed roads and bridges, shorten schedules for county maintenance or replacement, and require additional revenue from property taxation.<sup>j</sup>

Finding 2.4 Heavy and frequent truck traffic on gravel haul roads will

---

<sup>h</sup> Final reports of IISC studies will be presented by University of Iowa faculty and graduate students to the public at Luther College on May 5<sup>th</sup>.

<sup>i</sup> The University of Iowa (IISC) is studying economic impacts. A final report of benefits and costs will be available May 2015.

<sup>j</sup> Engineers at the University of Iowa (IISC) are studying effects of heavy truck traffic on infrastructure in northeastern townships. A final report will be available May 2015.

generate fugitive dusts, which may affect the health and safety of local residents and the traveling public.

Finding 2.5        Frac sand mining operations in northeastern townships would tend to concentrate heavy truck traffic on a few paved (asphalt and concrete) county roads. In addition to road damage, concentrated truck traffic on already busy roads will pose significant traffic safety issues and diminish aesthetic qualities of viewsheds along those scenic byways.

Finding 2.6        Models of frac sand mining operations and routes of frac sand transport by truck for transloading to trains or river barges indicate concentration of heavy truck traffic on state highways leading north or south. Models also indicate possible transport eastward on county roads through Allamakee County. In addition to road damage, concentrated truck traffic on already busy roads will pose significant traffic safety issues and diminish aesthetic qualities of viewsheds along those scenic byways.

Finding 2.7        Frac sand mining in northeastern townships could endanger important surface waters and private wells by withdrawing large volumes of ground water for 'wet-sand' processing, using chemical flocculants in processing water, and accidentally discharging processing water laden with chemicals and sediment. The risks and consequences are substantial. For example, \$2.8M has been spent by federal, state, and county government to rehabilitate and enhance Bear Creek Watershed. The Bear Creek fishery alone generates \$2.7M annually. By statute enacted in 2013, Minnesota requires a minimum one-mile setback of mining operations from trout water and springs.

Finding 2.8        Silica sand mining may also extend from northeastern townships to outcrops on hillsides and bluffs along incised valleys of the Upper Iowa River and its tributaries (e.g. Canoe Creek). Virtually every aspect of Winneshiek County's natural, historic, and cultural resources would be affected.

Finding 2.9        Frac sand mines, operations, and heavy truck traffic would diminish quantities and essential qualities of open spaces, public lands, and recreation opportunities. Such diminishment would affect tourism, tourism revenue, and enjoyment of natural resources and amenities by residents.



Finding 2.10 Karst terrain and hydrogeology are complex aspects of Winneshiek’s bedrock geology. Cold springs that sustain important fisheries, sinkholes, disappearing streams, algific microenvironments, and caves, such as Coldwater Cave (a national historic landmark) are important and sensitive natural resource areas and features. In Karst terrain, mining too near the water table or too near karst features—and accidental release of processing waters—could have serious and largely unpredictable consequences throughout the karst system.

Finding 2.11 Accidental release of tainted waters into important streams and rivers could occur by breaches in settlement ponds associated with frac sand processing or by uncontrolled storm water-runoff from extraction pits, processing sites, and stockpiles.

Finding 2.12 Mines and heavy traffic have been shown to reduce property values, hence property-tax revenue. Frac sand operations are likely to do both. If taxable valuations decline, one consequence could be an increase in property taxation to maintain county services. If road damages by frac sand truck traffic are borne by county taxpayers, property taxation would increase further.

Finding 2.13 Extracting, stockpiling, processing, and transporting frac sand, and the equipment used, have been shown to generate or redistribute fine particulate matter in the air, exposing residents and the traveling public to potential health and safety risks.

Finding 2.14 Removal of overlying soil and unconsolidated material at the surface in preparation for frac sand extraction threatens sites of archaeological significance, including, but not limited to, Native American burials.

Finding 2.15 Multiple frac sand mining operations concentrated in northeastern townships or along bluffs and hill slopes could have disproportionately large, cumulative, adverse effects on public health, safety and welfare.

Finding 2.16 With regard to the zoning ordinance (see Finding 1.4), and

findings of potential effects of sand mining operations, it is reasonable to consider a *resource protection overlay district* to protect scenic vistas, trout waters, water quality and quantity, tourism, sensitive habitats, air quality, sites or localities of historic significance, and the health, safety and welfare of residents of Winneshiek County, Iowa.

To conclude this report of findings, consider an informed reflection by Allison Dirr, a reporter for the Wisconsin Center for Investigative Journalism who extensively covered the frac sand mining industry.

*“On its face, it [frac sand mining] looks like simply an environmental issue. That was my impression when I first started reporting. But I learned it is also a jobs issue. A quality of life issue. An economic issue. A health issue. A political issue. A property rights issue. And, most fundamentally, a community issue.”<sup>k</sup>*

March 2, 2015

Dean Thompson, Winneshiek County Supervisor

Dennis Karlsbrotten, former Winneshiek County Supervisor

---

<sup>k</sup> <http://wisconsinwatch.org/2014/06/podcast-head-in-the-frac-sand/>