

September 22, 2016

To: Ross Lockridge, Rural Conservation Alliance

From: James R. Kuipers, P.E., Consulting Engineer

Re: **5 Acre 20,000 Ton Mine Plan Layout**

Please see the attached Figure 1 depicting a conceptual layout for a 5 acre 20,000 ton sand and gravel mining operation. The layout, as described below, shows how the quantity and area are commensurate with each other in allowing for technically feasible mining operations to occur should that combination of limitations be implemented in regulations.

Figure 1 shows a typical five-acre (266,667 square feet) site. The outer dimensions depicted in Figure 1 are for a square five-acre site with dimensions of 465 ft x 468 ft. The next inner dimension depicted shows a 50 ft buffer zone around the mining area. This buffer zone would typically be utilized to store topsoil/growth medium from the disturbed area within the site that would also serve as a visual barrier and/or might include access roads into the site.

20,000 tons of in-place sand and gravel material, assuming a density of 150 lbs/cubic feet, would result in mining 266,667 cubic feet of material. Conceptually, if one foot of material was mined, then the operator would require the entire five-acre, 266,667 square ft site. However, typical sand and gravel deposits are at least 5 ft in depth, and in most cases a greater depth of material is mined. The yellow shaded area shows at its outer extent the area (53,333 square feet) that would be required if the mine were to extract 20,000 tons to a depth of five feet, with the next extent showing the area (26,667 square feet) that would be required if mining took place to a depth of 10 feet, and the inner extent shows the area (13,333 square feet) that would be required if mining took place to a depth of 20 feet. The area required for actual mining would occupy from 0.3 acres to 1.2 acres.

As indicated by the grey shaded area in Figure 1, this leaves at least 1.5 acres for ancillary requirements such as material stockpiles, crushing and screening equipment, truck parking and turn-around, etc. A 100 ton per hour mobile crushing and screening plant of approximate corresponding dimension is superimposed on the drawing for reference to show the amount of room which might typically be occupied by crushing and screening operations as well as product stockpiles for a small gravel and sand mining operation. In addition, the internal flow of loader and/or truck traffic, including a provision for a ramp from the bottom of the mine area, and truck traffic in and out of the site carrying produced material, is also shown. The highly portable nature of the typical crushing and screening plant used for the type of sand and gravel operation depicted, as well as the variability in means to move material to and from the mined area and to and from the mine site allows for enough flexibility that numerous aspects such as limited access and access opposite residential areas can be addressed. Ancillary areas for other uses such as office, parking, vehicle storage and loading are also depicted in Figure 1.

The five-acre 20,000 ton mine combination is a common regulatory requirement for small sand and gravel operations in many U.S. jurisdictions, and in no case that I know of have restrictions in that regard resulted in the inability of an operator choosing to produce 20,000 tons over a two-year period, to be able to do so within five acres. It is my experience that in many cases operators conduct concurrent reclamation and in so doing, mine additional tons and disturb additional acreage while at the same time reclaiming the same amount of acreage, so their total disturbance never exceeds five acres. I have seen operations sustained over tens of years in this fashion.