

# Uranium Information Sheet

June 2016 – Updated for Extended Feasibility Study (EFS) Results



The purpose of this information sheet is to provide general information about uranium, its natural occurrence and its occurrence at the Hillside Project. As Rex Minerals Ltd (Rex) has moved closer to developing the Hillside Copper Project on the Yorke Peninsula (YP) questions have arisen in the community about uranium, in particular how much is present at Hillside and is it safe for the public, workers and the environment.

Uranium is a naturally occurring metallic element that has always been present, since the formation of the earth. It is a fairly common element in soil, rock, seawater and groundwater. Uranium is a radioactive material and it releases radiation when it undergoes a process called radioactive decay. The radiation that we are exposed to from sources like soil, water and food is referred to as background radiation. Concentrations of background radiation can vary considerably from place to place, depending on the local geology and other factors.

Uranium grades are expressed as a ratio of “parts-per-million” (ppm). For example 10,000 ppm represents 1 %. In South Australia the regulatory threshold for consideration as a radioactive material is set by the Environment Protection Authority (EPA) is equivalent to 200 ppm uranium. Any material that is over this limit (0.3% of all the material to be mined at Hillside), will be mixed and blended as it is blasted, mined and trucked. This will result in any material containing uranium above 200 ppm being diluted to levels below this regulatory threshold. Currently consideration is underway to lowering this regulatory threshold to 80ppm. Even with this reduction, the normal mixing and blending of rock during mining at Hillside will result in uranium concentrations less than the lowered regulatory threshold.

**The average uranium grade of the ore material to be mined at Hillside is 56 ppm. The average uranium grade of waste rock – that is the material which will make up the rock storage facility (RSF) is 12ppm. Both ore and waste rock are well below the level for classification as a radioactive material of 200 ppm and consequently, worker and public doses will be very low.**

Past practices of clearing the land for broad acre farming and grazing caused substantial environmental problems, particularly in the form of wind-blown dust. Much of this dust contains naturally occurring low levels of uranium, which most people would never realise, as these levels are too low to have a negative impact on the crops, stock or people. These levels could be even higher if certain imported rock phosphate fertilisers are used which can contain significantly more uranium (10-100 times greater), than the natural background environment. This is because phosphate fertilisers are made from phosphate rocks which contain varying levels of uranium. Where high annual rates of phosphorus fertilizer are used, this can result in uranium concentrations in soils and drainage waters that are several times greater than are normally present. However, the impact of these increases on the risk to human health from radiation contamination of foods is very small.

Importantly Rex has undertaken a large amount of work in regards to understanding the levels of uranium in the Hillside deposit, the surrounding rock and in the surface soils covering the deposit. Rex has completed over 850 drillholes (239,000m) throughout the ore and waste rocks at Hillside (refer Figure 1).

## Would you like to know more about uranium or radiation?

If you have further questions about uranium or radiation, please visit, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) website which provides accessible information about radiation related issues at, [www.arpansa.gov.au](http://www.arpansa.gov.au). Also [radiationanswers.org](http://radiationanswers.org) which provides public education in radiation matters.

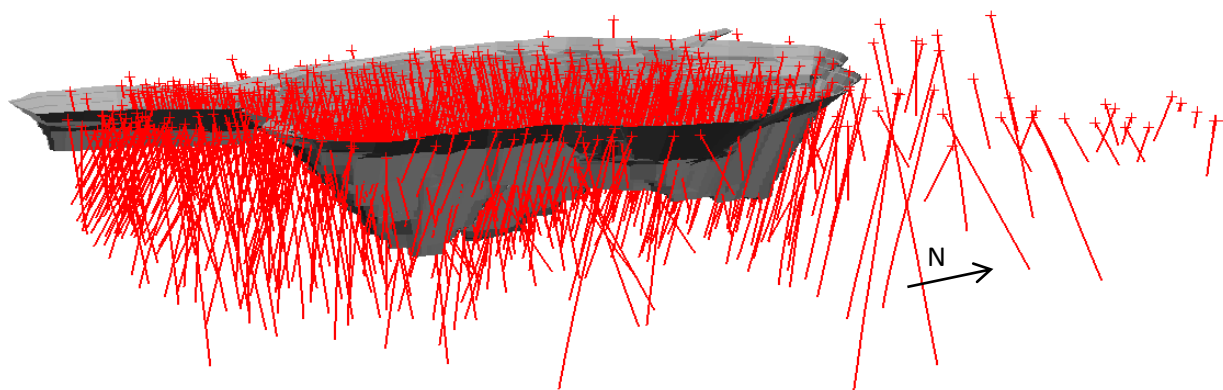
If you would like to read the full reports for Rex’s baseline radiological assessment and Rex’s radiation impact assessment, these were both published in February 2014 and are still available on Rex’s website; [www.rexminerals.com.au](http://www.rexminerals.com.au)

Rex continues to be open and transparent in the information it provides and welcomes questions. Rex will continue to keep the broader community up to date with the most commonly asked questions on our website and through a

This has given Rex a high quality representation or model of copper and gold along with other elements including uranium in both the waste rock and the orebody. Rex has completed research to understand in detail the current background levels of uranium and other forms of radiation from the surface soils and crops at Hillside and the broader area, for full details see;

[http://www.rexminerals.com.au/~rex/Lib/Docs/Appendix-39\\_Radiation-Baseline\\_Radiological\\_Assessment.pdf](http://www.rexminerals.com.au/~rex/Lib/Docs/Appendix-39_Radiation-Baseline_Radiological_Assessment.pdf).

### Hillside Mine Design – EFS Pit

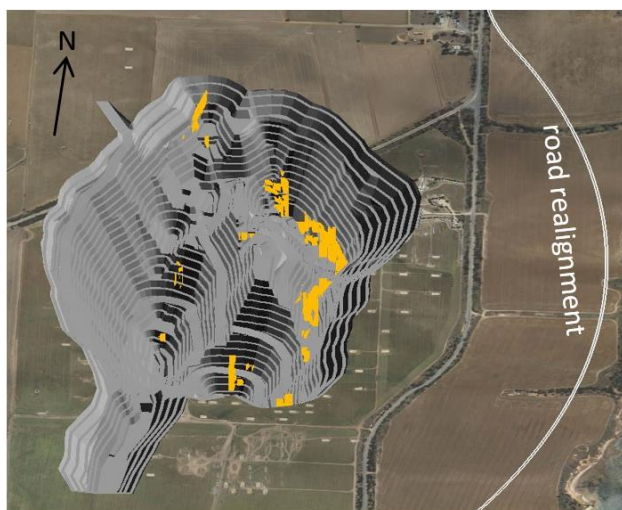


**Figure 1: Over 850 holes (239,000m) have been drilled into the Hillside deposit and surrounding rock (see image above).**

For comparison purposes, the two images below show a bird's eye view of the EFS pit design and orebody model. The green in Figure 2 shows the copper orebody greater than 0.2% Cu. The yellow in Figure 3 shows those areas of rock containing uranium at levels above 200ppm. This uranium represents 0.3% of all the material to be mined and through mixing and blending during mining will be below the regulatory threshold of 200 ppm.



**Figure 2: Copper Ore (green) to be mined from the EFS Pit.**



**Figure 3: Rock containing uranium (orange) above 200ppm within the EFS Pit.**

The average uranium grade in the ore to be mined and processed at Hillside is 56 ppm. The average of the waste material from the processing plant (tailings) has a similar uranium grade as the ore. The tailings material will be stored within a purpose built dam (tailings storage facility) constructed using waste rock which has an average uranium level of 12 ppm. At mine closure, the tailings storage facility will be fully encapsulated using waste rock mined from the pit. The tailings combined with the surrounding waste rock will have an average uranium level of 16 ppm. This is comparable to some of the outcropping geology on Yorke Peninsula (e.g. the costal granites) which are on average 14 ppm uranium. To put these numbers into perspective, most of the world's economically viable deposits of uranium ore are in the order of 1,000 ppm to 20,000 ppm, however some ore bodies in the Athabasca Basin, Northern Saskatchewan, Canada far exceed those grades.

Experts established a radiation baseline for Hillside by collecting samples of soil, dust, surface water and groundwater along with an array of biota samples including meat (fish, rabbit, beef and lamb) and crops (canola, wheat and barley) from areas surrounding Hillside and sending them for analysis. Radiological dose estimates were also calculated for workers in the open cut and underground mine, processing plant operators and members of the public. The annual radiation worker dose level limit set by the Federal Government's radiation body ARPANSA is 20 mSv per annum. The doses estimated for Hillside for an open pit miner are 0.3 mSv per annum. This means that workers would not be exposed to levels that would pose any concerns for their long term health. It is important to understand that 20 mSv per annum already has a significant factor of safety applied to ensure workers who may work in these environments for all of their working lives have no likelihood of health impacts from radiation dose.

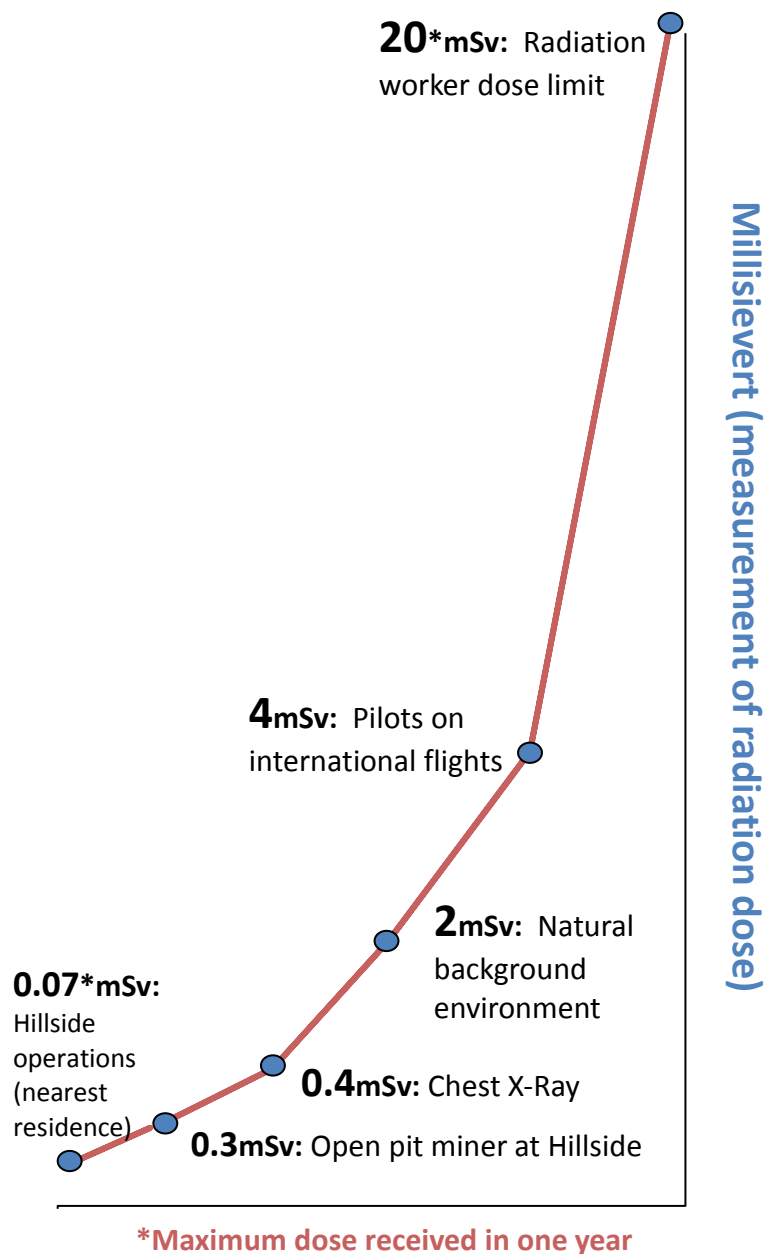
Rex provided these independent reports to the regulators for their assessment. The South Australian EPA concluded that the levels of radiation from contained uranium in dust would be extremely low – well below levels that would impact on farming, public health or the environment in general.

The levels of uranium and associated radiation at Hillside will not impact on the safety of the public, workers or the environment. There is no evidence that uranium levels in the surrounding environment will increase as a consequence of the development of Hillside.

Furthermore Rex will be held accountable by the EPA who will ensure that uranium is managed appropriately and dose levels monitored where required.

### Comparison of annual dose levels to Hillside

A millisievert (mSv) is a measurement of a dose of radiation



The South Australian Department of State Development published a 'Frequently Asked Questions' which included the following information:

**Should I be worried about Uranium or Radiation with the mining that will occur?**

This is an understandable question given just the word 'uranium' worries some people. It may be helpful to state what we know: From the comprehensive assessment of all of the information provided during the application process, we know that operations at the Hillside mine will be safe for the public, residents and workers. We know there is uranium that occurs naturally in the ground and along the cliffs on Yorke Peninsula – it has always been there, and is safe. We know that over the life of the mine and after closure there will be low, but safe levels of uranium at Hillside, within the mine, and in the mine waste. It will not increase over time, and it will not become unsafe in the future.

See the following link for full FAQ:  
[http://minerals.statedevelopment.sa.gov.au/mining/mines\\_and\\_quarries/hillside\\_copper\\_gold\\_and\\_iron\\_ore\\_project/frequently\\_asked\\_questions](http://minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries/hillside_copper_gold_and_iron_ore_project/frequently_asked_questions)