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REPORT ON THE PROGRESS OF THE DNR REVIEW OF THE PROPOSED CRANDON MINE & OTHER MINING-RELATED ISSUES

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Introduction: We begin this progress report with a focus on new items of interest, discuss various areas of progress in our review, and then provide more basic information relating to the proposed project and the setting of water quality standards and effluent limits.

It has been almost four years since the company filed its first documents and we started our regulatory review of its mining proposal. Since our previous status report last spring, the Department's staff and consultants have continued to review the Environmental Impact Report, permit applications, technical support documents, and other data provided by the Crandon Mining Company. We are also preparing our draft Environmental Impact Statement on the proposed mine. As expected, progress is slow in some areas. We want to be certain to completely evaluate the technical studies provided to us and consider all of the possible environmental impacts and alternatives should the project be permitted and built. The final written decision on the mining permit will likely take two years or longer, and will be based on the record developed during the final hearing process. (We will discuss the final hearing process in detail in a future report.)

Rules Changes: In July 1996, the Department received a petition from a group of state legislators requesting that certain revisions be made to the state's mining regulations. The petition requested that rules be adopted to require mining permit holders to carry adequate insurance to fund appropriate remedial measures in the event that the mining operation caused environmental contamination and also to evaluate the manner in which groundwater quality is regulated at mining sites. There has also been significant public opinion that mining facilities are regulated differently than other industrial or solid waste facilities. The Department evaluated the two legislative recommendations, drafted rule revisions, and held five public hearings to receive public comment on the proposed revisions.

As a consequence, two rules changes have been adopted by the Natural Resources Board. Changes to Ch. NR 132 establishing a dedicated irrevocable trust fund were adopted in September. Changes to Ch. NR 182 pertaining to regulation of groundwater quality at mining sites were adopted at the December Natural Resources Board meeting.

The changes to NR 132 will require mining companies to establish a dedicated irrevocable trust fund to be used for anticipated regular preventive maintenance or remedial actions in the event of unforeseen circumstances. This fund would guarantee the availability of money for such purposes in the event that the responsible mining company becomes financially insolvent or is unwilling to take the necessary action. The trust fund amount will be set during the Master Hearing. Only the DNR will have access to the fund for the aforementioned purposes.

The NR 182 revisions impose the groundwater quality provisions of Ch. NR 140 to mining sites. Some of the more stringent requirements of existing NR 182, such as predictive groundwater modeling, required investigation of any change in water quality, and preparation of a contingency plan, have been retained. The Design Management Zone for mines and mine waste sites is set at 1200 feet, and a boundary of 150 feet called the Mandatory Intervention Boundary will also apply. If groundwater standards are violated at the 150 foot boundary, the operator must take action to ensure that the standards will be met at the Design Management Zone. The rule requires that monitoring wells be located along and within this boundary. The Department believes that this rule incorporates the strictest aspects of both NR 182 and NR 140.

Local Agreements: In order for the project to be approved, it needs permission from those local governments which have zoning or land use authority over the project. A local agreement is a process by which a mining company negotiates with a municipality in order to secure zoning approvals for the company and financial or other concessions for the locality. For this project there are a number of entities that are eligible to enter into local agreements, including the Towns of Lincoln and Nashville in Forest County, the City of Crandon, and Forest and possibly Oneida Counties. At this writing, all of the entities except Oneida County have signed local agreements. All of the agreements secure local permit approval for the company. Many include monetary payments from the mining company to the community. Other concessions from CMC include a guarantee of property values for residents around Ground Hemlock Lake and an agreement to take on local governments' responsibility to provide interim drinking water in case of well drawdown or quality loss.

Summitville - Understanding Some of the Factors Contributing to an Environmental Disaster: When people ask us about mining and its potential environmental impacts, they often make comparisons between the proposed Crandon project and the Summitville Mine in Colorado. The Summitville mine, permitted in 1986, is a classic case of an environmental disaster. Not only is there severe acid rock drainage impacting surface waters with resultant fish kills, but the environmental problems were compounded after the mining company declared bankruptcy in 1992 to avoid financial liability and responsibility. Now, because of Summitville's Superfund status, millions of federal dollars are being spent to avoid further serious environmental impacts from this abandoned project. "If it could happen in Colorado in the 1990s," concerned citizens ask, "couldn't it also happen in Wisconsin?" So we decided to look more closely into the sequence of events leading to permitting at Summitville to understand why such a disaster occurred. Here is a summary of the Summitville experience:

- Summitville was a gold mine, using a cyanide heap-leach type of processing;
- There was no environmental impact statement on the proposed mining plan;
- The permitted construction and operation plans were violated while being implemented, and major budget cuts prevented proper regular inspections by state regulatory staff;
- Construction of the lined heap leach pad took place during freezing and snowy conditions resulting in serious quality control problems;

- As a result of inadequately sized retention facilities, the facility actually directed runoff into the abandoned mine workings present at the site from earlier mining operations, exacerbating acid drainage;
- State bonding requirements were seriously inadequate and failed to provide sufficient funds for remediation;
- Financial mechanisms designed to cover unforeseen emergencies were lacking;
- In 1986, when Colorado approved the permit application, the state agency had only 120 days to review the application before it automatically would have been approved under state law;
- The site is in an area of historic mining activity. Waste rock dumps and mine workings were present from mining activities in the late 1800s and early 1900s. These, along with natural exposures of eroding sulfide minerals, have contributed significantly to the acid rock drainage situation;
- Waste rock capable of generating acid drainage was placed on unlined pads and used in the construction of roads, causing acid drainage problems;
- Poor design implementation allowed cyanide-laden water to leak from ruptured pipes directly into surface waters;
- The setting is in mountainous terrain at 11,500 feet elevation, where there are 50 inches of precipitation annually, brief summers and long, cold winters.

We present this information because it represents a significant contrast to the regulatory framework and existing conditions here in Wisconsin, and it goes a long way in explaining what happened in Summitville. Colorado's mining-related regulations have been strengthened since the approval of the Summitville mine. If a comprehensive mining environmental review process had been in place in Colorado in the mid-1980s, it is almost certain that the Summitville project we know would not have been approved. This reinforces the Department's conviction that a thorough review, adequate bonding measures, strong enforcement measures, and rigorous scientific analyses are critical in the mining permit review process.

Here are a few references if you wish to read further:

Bigelow, Robert C. & Geoffrey S. Plumlee. 1995. "The Summitville Mine and its Downstream Effects." An on-line update of Open File Report 95-23. U.S. Geological Survey. Internet Address: *http://helios.cr.usgs.gov/summit.web/summit.html.* 10 pp.

Danielson, Luke & Alice McNamara. 1994. "The Summitville Saga." Clementine (Winter 1994):7-9.

Posey, Harry H., James A. Pendleton, & Dirk Van Zyl (eds.). 1995. "Proceedings: Summitville Forum '95." Colorado Geological Survey Special Publication 38, Denver, CO. 375 pp.

V. V. King, Trude (ed.). 1995. "Environmental Considerations of Active and Abandoned Mine Lands: Lessons from Summitville, Colorado." U.S. Geological Survey Bulletin 2220, Denver, CO.

Surface Water Mitigation Plan: The Department may not issue an approval under s. 281.17(1), Wis. Stats., if the withdrawal of groundwater for prospecting or mining purposes or the dewatering of mines will result in the unreasonable detriment of public or private water supplies or the unreasonable detriment of public rights in the waters of the state.

Department staff are in the process of defining the range of public rights in all waters that could potentially be affected by the groundwater drawdown resulting from pumping out the underground mine. These rights include navigation, enjoyment of natural scenic beauty, healthful water quality, swimming, fishing, ricing, and others. As part of this process, the Department will determine a surface water elevation (for lakes) or a stream flow (for streams) necessary to protect the public rights (called a "public rights stage"). Water levels or flows will vary with natural seasonal fluctuations. Once the Department completes its determination of how groundwater and stream flows could be affected by the mine, it will compare the projected impact to each of the potentially affected lakes and streams with the identified public rights stages.

If the groundwater drawdown from the mine causes public rights to surface waters to be violated, the company is required to mitigate those waters by replacing water removed by pumping. Mitigation water could come from groundwater intercepted before it seeps into the mine, or from mine water that would be treated to remove contaminants, and then pumped to surface waters. Frequent monitoring of water levels and flows would be required so that the need for mitigation water can be predicted in advance. Department staff has urged the Crandon Mining Company to use as much groundwater and treated mine inflow water as possible, thereby reducing the amount of water that would need to be discharged to the Wisconsin River.

The public rights stages, mitigation water sources, and other details are contained in a draft surface water mitigation plan the mining company has recently submitted. The plan cannot be finalized or approved until the Department finishes its review of the groundwater flow model. Details of the plan, along with the impacts of its implementation, will be released in our draft environmental impact statement. If the mine de-watering would reduce the stream flow anywhere in the Wolf River basin below the public rights stage, then the mining company would be required to add enough clean water (probably to affected Wolf River tributaries) to replace the water that it removed.

We anticipate there will be technical meetings with the company before our review is complete. Any technical meetings will be announced on our hotline phone message (608) 267-7534.

Wisconsin DNR Metallic Mining Web Site is Operational: Information about metallic mining regulation in Wisconsin, including DNR review of the proposed Crandon mine, is now available on the World Wide Web. This Web site is intended to help promote greater public understanding of how metallic mining is regulated in Wisconsin, and how the DNR is progressing in its review of current mining proposals.

From the introductory page (http://www.dnr.state.wi.us/org/es/science/mining) users can select information on how metallic mining is regulated in Wisconsin, and on the ongoing DNR review of the proposed Crandon mine. It also provides links to the U.S. EPA and U.S. Army Corps of Engineers Web sites pertaining to review of the proposed Crandon mine. Among the specific items available at this site (mainly in the form of portable document format files, or pdfs) are:

- a series of mining information sheets that delve in detail into the topic of metallic mining;
- state statutes and links to administrative rules pertaining to the regulation of metallic mining;
- an update on the status of the DNR review of the proposed Crandon mine;
- public comments and questions voiced at public meetings held at seven sites across northeastern and north central Wisconsin;
- comment and review letters by public agency staff examining the Crandon mine proposal; and
- a summary of the environmental impact report that was submitted by the Crandon Mining Company, and which is under review by the DNR.

Groundwater Modeling Update: This fall we provided the Crandon Mining Company with what we expect to be our final comments on the groundwater flow model. The purposes of the flow model are to help us understand the direction and rate of groundwater movement and the interaction between groundwater and the surface waters from lakes, streams, wetlands and springs. When we have completed our verification of the model inputs, we will use it to help evaluate the following questions:

- How much water would flow into the underground mine?
- What will be the extent of the groundwater drawdown?
- How will the drawdown affect water wells and surface waters?

By Christmas, we should receive most of the changes to the model that we requested. We will then verify that the model inputs were changed and continue to run it on our computers. When we are certain that the model is an accurate representation of the natural groundwater system in the area of the mine, we will use it to help evaluate impacts as shown above.

The flow model has a second major use besides helping predict drawdown impacts. It will also be used as the foundation for the solute (or contaminant) transport model. This model will help us evaluate water quality impacts to area groundwater and surface water from the abandoned mine and the tailings management area. The solute transport model uses the rate and direction of groundwater movement along with the additions to groundwater from rain and snow melt to help evaluate the impacts of contaminants in the groundwater. The Department, with the assistance of U.S. Geological Survey and Wisconsin Geological & Natural History Survey staff, has already started review of the solute transport model. We anticipate there will be technical meetings with the company before our review is complete; these will be announced on our hotline phone message (608) 267-7534.

Setting Surface Water Quality Standards and Effluent Limits: Water quality concerns are foremost on the minds of many who are concerned about the safety of mining. Many people want to know how DNR determines when surface waters (lakes and streams) are clean and healthful, and how we set limits on pollutant levels in wastewater discharged to our lakes and streams. These procedures apply to all municipal and industrial discharges in the state and are not unique to mining.

What are Water Quality Standards and Effluent Limits?

Water quality standards are a set of maximum allowable limits of pollutants in lakes or streams, as measured by their concentration *in the water of a lake or stream.* Concentrations are generally expressed as micrograms of pollutant per liter of water (abbreviated as µg/L, with one µg/L also being roughly equivalent to one part per billion.) Extremely small amounts of mercury are measured in nanograms per liter (ng/L, or parts per trillion). The surface water quality standards for the State of Wisconsin are described in Chapters NR 102 through NR 105 of the Wisconsin Administrative Code (Wis. Adm. Code). These administrative codes contain specific numerical water quality criteria for a range of pollutants, as well as descriptions of methods to be used in calculating numerical water quality based limits for those pollutants. ***Effluent limits*** are a set of allowable concentration and mass limits for pollutants *in a wastewater effluent.* These limits assure that no significant lowering of water quality occurs.

How are Water Quality Standards Determined?

Water quality standards have been established in order to protect against both short-term ("acute") and long-term ("chronic") impacts on aquatic life, wildlife, and human life. All of the criteria relating to long-term impacts have been established to represent safe levels of potentially harmful substances.

Acute Toxicity Criteria. Acute toxicity criteria protect against levels of pollutants that may kill organisms in the short-term.

Chronic Toxicity Criteria. Chronic toxicity criteria protect against levels of pollutants that may impair the survival, reproduction and growth of organisms over the long term.

> *Methods for Developing Acute and Chronic Toxicity Criteria.* The aquatic toxicity sections of Ch. NR 105, Wis. Adm. Code, are based in part on guidelines prepared by the U.S. Environmental Protection Agency (EPA) in 1985, and on EPA's ambient water quality criteria reports for 26 toxic substances. Many studies have been done on the toxicity of various pollutants to various species. Developing toxicity criteria requires calculation of an average toxicity value from the available database for each individual species. A statistical procedure is used to estimate concentrations that are harmful or lethal to only 1% of the individuals of a given species being tested. Chapter NR 105 allows strengthening of the criteria to protect species of commercial, recreational or ecological importance where necessary, or if limitations in the database used for developing criteria leave the most sensitive species unprotected.

Wildlife Criteria. Water quality criteria for the protection of wildlife establish allowable concentrations of substances in surface water that protect wildlife using the water for drinking or foraging.

To derive a wildlife criterion, DNR staff review scientific literature for mammal and bird studies useful in determining an appropriate concentration for any chemical of concern. Section NR

105.07, Wis. Adm. Code, contains numerical wildlife criteria (calculated according to procedures specified in the code) for four substances: DDT and metabolites, mercury, dioxin, and PCBs.

Human Health Criteria. Human health criteria are set to minimize the impacts or risks to humans who eat fish that build up concentrations of the potentially harmful chemicals we regulate, and who may drink water than contain those chemicals. In order to develop criteria that protect human health, we establish limits that provide an extra margin of safety. These limits are taken from appropriate epidemiological or animal dose-response studies, and are developed for both cancer-causing and non-cancer-causing substances.

How are Water Quality Standards Used?

Under Wisconsin Law, any discharge of wastewater into waters of the state must not exceed the water quality standards that apply to the lake or stream receiving the wastewater (the "receiving water"). Water quality standards in Wisconsin vary with the use of the receiving water and are factored into calculating effluent limits. Water quality standards that are most protective of water quality apply to streams designated as *outstanding resource waters* (such as the Wolf River). Other use designations include *exceptional resource waters*, *Great Lakes waters*, *fish and aquatic life waters*, and *variance waters* (generally intermittent streams and sewage treatment plant effluent discharge channels).

How are Effluent Limits Determined?

The individual chemical limits we develop are based upon water quality criteria in Chapter NR 105, Wis. Adm. Code. Limits on pollutants are set to protect the designated use of the receiving water, be protective of the most sensitive species, and prevent any significant lowering of water quality.

Anti-degradation. Ch. NR 207, Wis. Adm. Code states that no new or increased wastewater discharge is permitted that would significantly lower the water quality of the receiving water. No lowering of water quality at all is allowed for Outstanding Resource Waters (such as the Wolf River). For other receiving waters, this anti-degradation policy limits the total amount of pollutants in a new or increased discharge. The assimilative capacity is the difference between the water quality criterion for a substance, and the existing background level of that substance in the receiving water.

Considerations in Calculating Effluent Limits: The following factors are included when calculating effluent limits for a discharge:

- Classification of the receiving water, and downstream water if applicable, and the level of protection needed to maintain water quality;
- Acute and/or chronic toxicity of substances in the proposed discharge to fish and other aquatic life, based on actual bio-monitoring results;
- Health considerations in humans and other animals;

- Application of the most stringent toxicity criterion for each substance in the effluent;
- The background concentration of each regulated substance in the receiving water;
- Water hardness (a measurement of calcium and magnesium ions - toxicity of metals increases as hardness decreases);
- The degree and rate of dilution of the effluent by the stream flow of the receiving water, using a stream flow that corresponds to each type of criterion;
- Whether the receiving water is a public drinking water source;

Effluent Dilution and River Flows: The stream flow rate must be factored into effluent limit calculations. The amount of water flowing determines the degree of effluent dilution that will occur. Effluent limits are established for a variety of stream flows - for instance, the amount of permissible concentration of a pollutant might increase as flow rate increased. Stream flow calculations are based upon historical hydrologic records and precipitation data.

Calculating the Effluent Limit: A mass balance equation is used to calculate the limit, which factors in the background concentration of the substance and the amount of dilution available in the water body. For example, if the background concentration of a substance is low, there is greater assimilative capacity, so the limit can be higher compared to a limit based on a high background concentration. The smaller the effluent volume compared to the stream flow, the greater the dilution and the higher the effluent limit can be to maintain an "in-stream concentration" below the criterion.

Regulating Combinations of Chemicals

Synergistic impacts: Sometimes two or more substances can act together to produce an effect (such as interfering with cell growth, metabolism, reproduction or other vital function) that neither substance alone could produce. This is known as a *synergistic impact.* Considering the impacts of combinations of chemicals on human health and aquatic life is another important aspect of setting effluent limits. However, the potential for synergistic impact cannot typically be determined when setting chemical-specific water quality standards.

Unfortunately, it is not easy to develop meaningful criteria or limits for combinations of chemicals because it is unlikely that laboratory tests that measure the impacts on fish or aquatic life will have been done on the same chemicals in the same relative concentrations as found in a discharge. Therefore, instead of relying on chemical limits, the Department looks at *whole-effluent toxicity.* Whole-effluent toxicity tests are a means of determining the effect the entire mix of chemicals in an effluent has on aquatic life. Fathead minnows and water fleas are exposed to actual effluent to determine if there are any toxic effects. Dischargers are required to meet limits associated with both individual chemical and whole-effluent testing.

Progress Update and Project Review Schedule: The Department staff is making progress in reviewing the proposed Crandon mine. Among the most significant issues still being analyzed are potential groundwater quality impacts. In order for the project to meet state requirements, the mining project can not cause groundwater contamination that would result in a violation of groundwater or surface water standards at any time in the foreseeable future, so the pending results of the solute transport modeling are also critical.

There are several other outstanding issues as well, such as completing our review of the surface water mitigation plan, designed to protect the public rights in lakes and streams, and finishing our review of the proposed tailings management area (TMA). We have requested from the Crandon Mining Company additional testing on components that would be used in constructing the tailings facility. For example, we need additional information on whether the bentonite clay component of the proposed barrier system would maintain its low permeability when exposed to the liquid inside the TMA. We also requested further evidence that the proposed drain system would not be clogged by silt or chemical interactions deep inside the TMA. Until we can address these types of questions, we cannot complete our draft environmental impact statement (DEIS).

We are presently reevaluating our schedule for public release of our DEIS. Only after we have received all necessary permit applications and plan components, and have verified that what was submitted is adequate for our purposes, can we fully complete our analysis. From that point, it will take us about four months to complete our DEIS and release it for public review. We cannot now identify the exact date of completion. As we have always said, we will not release our DEIS before we have all of the necessary information.

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