Table 1 outlines FCC's anticipated list of chemicals, reagents, and operating supplies that would be transported to and from the mine during the operating phase.

Table 1. Chemicals, Reagents and Operating Supplies – Idaho Cobalt Project (taken from the Assessment).

Reagent / Chemical or Product	Annual Use	Container Type	Container Size	Trucks/Year (per day)[1]
AERO® 343 Xanthate	280 tons	Flo Bin	1 ton	14
AERO® 350 Xanthate	308 tons	Flo Bin	1 ton	16
AEROFROTH® 65 Frother	42 tons	Plastic Barrel	55 gallons	3
Sodium Sulfide	100 tons	Sacks	50 pounds	1 – 5
Superfloc	24 tons	Sacks	50 pounds	Ship w/frother
Lime	75 tons	Super Sack	1000 pounds	4
Diesel	750,000 gallons	Fuel Truck	4,500 gallons	150
Gasoline	5,000 gallons	Fuel Truck	4,500 gallons	Ship w/diesel
Cement	2,500 tons	Bulk	20 tons	115
Oils, Lubricants, Grease, Antifreeze	10,000 gallons	Barrel	55 gallons	Ship w/diesel
Propane	40,000 gallons	Fuel Truck	9,400 gallons	5
Anti-scalant	4,000 gallons	250 gallon tote	4,000 gallons	1
Ammonium Nitrate	450 tons	Bulk Container	10 tons	45
Bulk Concentrate	11,200 tons	Sealed Container	16 tons	700 (2)
Water Treatment Chemicals and Reagents				
Polymer Flocculant	20 gallons	Sealed Pail	5 gallons	0[3]
Hydrated Lime	20 tons	Super Sack	1,000 pounds	2
Hydrochloric Acid	400 gallons	Plastic Drum	55 gallons	2
Coagulant	250 gallons	Sealed Tote	50 gallons	0[3]
Methanol	3,000 gallons	Bulk Truck	3,000 gallons	1[1]
Zeolites	3 tons	Super Sack	1,000 pounds	1
Employees				
		Vans		3500 (10)
		Pickups		1400 (4)

[1] Average values and actual truck count would vary.
[2] Does not add to truck count, as the product would be backhauled from the refinery. More fully described in FCC's Storm Water Management Plan for the Idaho Cobalt Project (Telesto, 2006).
[3] Does not add to truck count, as the small quantity would be transported with other materials.

The original Plan of Operations for the Mine Project included the use of copper sulfate during the ore processing. However, in a January 28, 2008 letter, FCC modified their Plan of Operation and withdrew the use of copper sulfate as a process reagent.

Approximately 11,200 tons of concentrate is anticipated to be shipped from the Mine Project mill facility annually. Steel roll-off containers with locking lids would be used to transport the concentrate. Empty containers would be filled at the mill, sealed, and loaded on single-frame trucks for transport to Salmon, Idaho. In Salmon, concentrate containers would be transferred to tractor-trailer equipment for transportation to a processing facility.

FCC has prepared a spill control plan that addresses management of hazardous materials during shipping and storage. Their plan includes notification to the Mine Project facility prior to transport of fuels or chemicals, travel only during daylight hours, use of pilot vehicles, and continuous radio contact with pilot vehicle and facility during transport.

NPDES Permit

Drainage is designed so that mine water, process water, and runoff from the TWSF and ore stockpile go through a treatment plant at a single point of discharge to Big Deer Creek. Water arising from ore processing, groundwater pumped from the mine, and drainage from the ore stockpile and the TWSF is stored in the water management pond. Water from the pond is recycled through the mill or is directed to the water treatment plant. The volume of mill processing water/TWSF runoff discharge treated and discharged to Big Deer Creek is limited in the NPDES permit to the net precipitation on the TWSF and water management pond. The single discharge (Outfall 001) is located in Big Deer Creek approximately 100 feet downstream (east) of water quality monitoring station WQ-24 (EPA 2007).

To estimate impacts to water resources a water and chemical mass balance for the ICP has been developed using a dynamic system model (DSM) that considers the relationships between the Project components and the surrounding water environment, and predicts the impact on them throughout the life of the mine and during the post-closure period. The DSM includes specific water balance calculations for each year of the Mine Project life. The ICP water management plan is based on operating a water treatment plant and releasing water in accordance with an NPDES permit in conjunction with temporary storage in a small water equalization pond adjacent to the water treatment plant and a larger water management pond to temporarily store process solutions. The water treatment plant would have the ability to treat up to 150 gpm of water for discharge through the NPDES outfall. Except during periods of very high inflow, the water treatment plant would treat incoming water on an as-received basis, with very little water stored in the water management pond. During periods of high inflow, water would accumulate in the water management pond for treatment during lower inflow periods.

The primary contaminants of concern (COCs) for the Mine Project are nitrate, sulfate, arsenic, copper, cobalt, nickel, and zinc. Primary COCs are constituents expected to occur at higher concentrations in the water management pond water compared to natural waters and which may also have significant environmental effects if discharged into surface water or groundwater.

The water management pond collects drainage from the TWSF and stores mining and milling process solutions if needed. The pond would be surrounded with an 8-foot high chain link fence for wildlife protection; double lined with HDPE liners, and have a leak detection and recovery system between the primary liner and secondary liner. Protection of the pond liners from potential ice damage (e.g., rub sheet of liner in pond corners) would be provided.

Water pumped from the mine workings at the Mine Project and runoff/drainage from the TWSF and ore stockpile is predicted to contain elevated concentrations of nitrate, sulfate, and metals (aluminum, cobalt, copper, iron, manganese and zinc). Therefore, a water treatment plant designed to process and discharge up to 150 gpm would be installed in the mill to treat the mine water and runoff/drainage from the TWSF and ore stockpile.

The water treatment process would utilize ion exchange as a means to remove any residual metals in excess of the NPDES effluent limits. This would eliminate the need for disposal of a stabilized waste (a potentially large waste stream), but would result in higher levels of sulfate in the discharge water. The treatment process would include biological treatment for removal of nitrate, if needed, to meet the nitrate effluent limit. If needed to meet the ammonia effluent limit, ammonia would be removed by an ion exchange process using zeolites, a naturally occurring alumino-silicate mineral. The treatment process would result in treated water (effluent) capable of meeting effluent limits imposed by an NPDES permit for discharge to Big Deer Creek.

Treated water from the water treatment plant would be routed through a pipeline to a year-round surface discharge (Outfall 001) located on Big Deer Creek. The pipeline would be routed using existing roads where possible. Where no roads exist, the pipeline would follow an alignment that minimizes pipeline length and physical disturbance to soils, vegetation and cultural resources. The pipeline would be buried, and be made of materials suited for this application such as steel, poly-vinyl chloride (PVC), or high density polyethylene (HDPE). Where the pipeline crosses existing waterways, a culvert designed to pass the 100-year, 24-hour event would be placed in the stream channel, the pipe placed on top of the culvert, and fill placed over the pipe to prevent the water from freezing. The pipeline would affect jurisdictional wetlands at the crossings of two Bucktail Creek tributaries and at Big Deer Creek.

Rather than an open pipe discharge to Big Deer Creek, an in-stream diffuser would be used for the discharge. The diffuser would consist of a perforated pipe or pipe with engineered orifices designed to cause rapid mixing of the mine discharge with Big Deer Creek. The pipe would be placed on the surface of the streambed or would be buried within the streambed.

The expected chemical constituents and effluent limits associated with the NPDES permit will be discussed in the Effects Analysis section of the Opinion.

II. STATUS OF THE SPECIES

In this section the Service presents information about the regulatory, biological, and ecological status of the species that provides the context for examining the probable effects from the proposed or ongoing activities and formulating the Opinion.

A. Regulatory Status and Population Organization

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (Fish and Wildlife Service 1999). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon and in the Jarbidge River in Nevada, north to various coastal rivers of Washington to the Puget Sound and east throughout major rivers within the Columbia River Basin to the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Fish and Wildlife Service 1999).

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation and alterations associated with dewatering, road construction and maintenance, mining, and grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (Fish and Wildlife Service 1999).

The bull trout was initially listed as three separate Distinct Population Segments (DPSs; Fish and Wildlife Service 1999). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs, plus two other population segments, into one listed taxon and the application of the jeopardy standard under section 7 of the Act relative to this species (Fish and Wildlife Service 1999)

> "Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process."

In its draft recovery plan for bull trout, the Service (2002) organized the rangewide distribution of the bull trout along the same lines as the DPSs in the listing document and core areas and local populations. Below is a list of important terms in the conservation strategy of the bull trout arranged in their hierarchal order.

<u>Interim Recovery Unit</u> - one of five population segments identified in the listing document (for example the Columbia River Interim Recovery Unit).

<u>Core area</u> - a division of the Interim recovery unit which is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat, and in some cases in their use of spawning habitat.

<u>Local population</u> - a group of bull trout that spawn within a particular stream or portion of a stream system. A local population is considered to be the smallest group of fish that is known to represent an interacting reproductive unit.

B. Survival and Recovery Needs and Strategy

The recovery planning process for bull trout (Fish and Wildlife Service 2002) has identified the following survival and recovery needs for the bull trout: (1) maintain and restore multiple, interconnected populations in diverse habitats across the range of each interim recovery unit; (2) preserve the diversity of life-history strategies; (3) maintaining genetic and phenotypic diversity across the range of each interim recovery unit; and (4) establish a positive population trend.

More specifically, the survival and recovery needs of the bull trout are often generally expressed as the need to provide cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways. All are needed to promote survival and recovery of bull trout at multiple scales ranging from the coterminus population to local populations.

Central to the survival and recovery of the bull trout at a population level is the maintenance of viable core areas described above (Fish and Wildlife Service 2002). Each of the interim recovery units listed below consists of one or more core areas. Approximately 114 core areas are recognized across the United States range of the bull trout (Fish and Wildlife Service 2002).

C. Rangewide Status and Distribution

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: (1) Jarbidge River; (2) Klamath River; (3) Coastal-Puget Sound; (4) St. Mary-Belly River, and (5) Columbia River. Each of these segments is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and survival and recovery needs of the bull trout within these units is provided below. A comprehensive discussion of these topics is found in the Service's draft recovery plan for the bull trout (Fish and Wildlife Service 2002).

1. Jarbidge River

This interim recovery unit currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawners, are estimated to occur within the core area. The current condition of the bull trout in this interim recovery unit is attributed to the effects of livestock grazing, roads, angler harvest, timber harvest, and the introduction of non-native fishes.

2. Klamath River

This interim recovery unit currently contains 3 core areas and 12 local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (Fish and Wildlife Service 2002). Bull trout populations in this unit face a high risk of extirpation (Fish and Wildlife Service 2002).

3. Coastal-Puget Sound

Bull trout in the Coastal-Puget Sound interim recovery unit exhibit anadromous, adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this unit. This interim recovery unit currently contains 14 core areas and 67 local populations (Fish and Wildlife Service 2002). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this unit. With limited exceptions, bull trout continue to be present in nearly all major watersheds where they likely occurred historically within this unit. Generally, bull trout distribution has contracted and abundance has declined especially in the southeastern part of the unit. The current condition of the bull trout in this interim recovery unit is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, angler harvest, and the introduction of non-native species.

4. St. Mary-Belly River

This interim recovery unit currently contains 6 core areas and 9 local populations (Fish and Wildlife Service 2002). Currently, the bull trout is widely distributed in the St. Mary River drainage and occurs in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (Fish and Wildlife Service 2002). The current condition of the bull trout in this interim recovery unit is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (Fish and Wildlife Service 2002).

5. Columbia River (includes the action area)

This interim recovery unit currently contains about 90 core areas and 500 local populations. About 62 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good but generally all have been subject to the combined effects of habitat degradation, fragmentation and alterations associated with one or more of the following activities: stream and river dewatering; road construction and maintenance; mining, and grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The draft bull trout recovery plan (Fish and Wildlife Service 2002) identifies the following survival and recovery needs for this unit: maintain or expand the current distribution of the bull trout within core areas; maintain stable or increasing trends in bull trout abundance; maintain/restore suitable habitat conditions for all bull trout life history stages and strategies; and conserve genetic diversity and provide opportunities for genetic exchange.

<u>Salmon River Recovery Unit</u> - The Salmon River Recovery Unit, one of 22 recovery units identified in the draft bull trout Recovery Plan (Fish and Wildlife Service 2002) in the Columbia River Interim Recovery Unit, encompasses the entire Salmon River basin, as area of 36,278 square kilometres. Bull trout are well distributed throughout most of the unit in 125 identified local populations located within 10 core areas. The Middle Salmon River-Panther Core Area encompasses the action area analyzed in this Opinion.

Middle Salmon River-Panther Core Area- The draft bull trout recovery plan (Fish and Wildlife Service 2002, chap 17, pg. 3) identifies the Salmon River and Panther Creek drainage (including Williams Creek) as a core area for bull trout. The Middle Salmon

River-Panther core area supports 20 existing bull trout local populations, all of which are identified as essential for bull trout recovery in the draft bull trout recovery plan (Fish and Wildlife Service 2002). A low number of bull trout exist in the Panther Creek drainage (Fish and Wildlife Service 1999).

The Blackbird Mine is continuing to release contaminants into Blackbird, Big Deer, and the South Fork of Big Deer Creeks, and Panther Creek including copper, arsenic, cobalt, and iron (Fish and Wildlife Service 2002). Water quality continues to be a problem with very low numbers of fish occupying the Mainstem Panther Creek downstream of Blackbird Creek (Fish and Wildlife Service 2002). Though contaminant releases from Blackbird Mine have improved to some degree since release of the draft bull trout recovery play.

There are 20 local populations within the Middle Salmon River-Panther Creek core area; therefore, it is considered to be at diminished risk from stochastic events (Fish and Wildlife Service 2002. In the draft bull trout recovery plan (Fish and Wildlife Service 2002), the adult bull trout abundance in the Middle Salmon River-Panther Creek core area was estimated to be between 500 and 5,000 adult fish and, subsequently, this core area was classified as not at risk from genetic drift (Fish and Wildlife Service 2002). By population trend, the Middle Salmon River-Panther Creek core area was judged to be at an increased risk (Fish and Wildlife Service 2002). This determination, however, was driven by the lack of productivity data for the last ten years, resulting in the increased risk category. Regarding connectivity, migratory bull trout may persist in some local populations in the Middle Salmon River-Panther Creek core area; therefore, it is considered to be at an intermediate risk (Fish and Wildlife Service 2002).

D. Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior. Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs. Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form), or saltwater (anadromous) to rear as subadults or to live as adults. Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more. They are iteroparous (they spawn more than once in a lifetime), and both repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented.

The iteroparous reproductive system of bull trout has important repercussions for the management of this species. Bull trout require two-way passage up and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous (fishes that spawn once and then die, and therefore require only one-way passage upstream) salmonids. Therefore even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route.

Additional information about the bull trout's life history can be found in the final rule listing the bull trout as threatened published in the Federal Register (Fish and Wildlife Service 1999)

E. Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors. Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats, fish should not be expected to simultaneously occupy all available habitats.

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout. Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to non natal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants.

Cold water temperatures play an important role in determining bull trout habitat, as these fish are primarily found in colder streams (below 59 degrees Fahrenheit), and spawning habitats are generally characterized by temperatures that drop below 48 degrees Fahrenheit in the fall. Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed. Optimum incubation temperatures for bull trout eggs range from 35 to 39 degrees Fahrenheit whereas optimum water temperatures for rearing range from about 46 to 50 degrees Fahrenheit (Buchanan and Gregory 1997). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 46 to 48 degrees Fahrenheit, within a temperature gradient of 46 to 60 degrees Fahrenheit. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 52 to 54 degrees Fahrenheit.

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin. Factors that can influence bull trout ability to survive in warmer rivers include availability and proximity of cold water patches and food productivity. In the Little Lost River, Idaho, bull trout have been collected in water having temperatures up to 68 degrees Fahrenheit; however, the trend in the relationship between temperature and species composition shows that bull trout made up less than 50 percent of all salmonids when maximum summer water temperature exceeded 59 degrees Fahrenheit and less than 10 percent of all salmonids when temperature exceeded 63 degrees Fahrenheit (Gamett 1999).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns. Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover. These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring. Increases in fine sediment can reduce egg survival and emergence.

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel. Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater. Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows.

Migratory forms of the bull trout appear to develop when habitat conditions allow movement between spawning and rearing streams and larger rivers or lakes where foraging opportunities may be enhanced (Frissell 1993). Benefits to migratory bull trout include greater growth in the more productive waters of larger streams and lakes, greater fecundity resulting in increased reproductive potential, and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss. In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbance makes local habitats temporarily unsuitable, the range of the species is diminished, and the potential for enhanced reproductive capabilities are lost (Rieman and McIntyre 1993).

Additional information about the bull trout's habitat requirements can be found in the final rule listing the bull trout as threatened published in the Federal Register (Fish and Wildlife Service 1999)

F. Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish. Adult migratory bull trout feed on various fish species. In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW et al. 1997).

Fish growth depends on the quantity and quality of food that is eaten and as fish grow their foraging strategy changes in quantity, size, or other characteristics. Resident and juvenile