NORTHERN DYNASTY MINES INC.
PEBBLE PROJECT

Application for Water Right

South Fork Koktuli River

INSTRUCTION #5 – *Attach sketch, photos, plans of water system, or project description (if applicable).*

BRIEF PROJECT DESCRIPTION

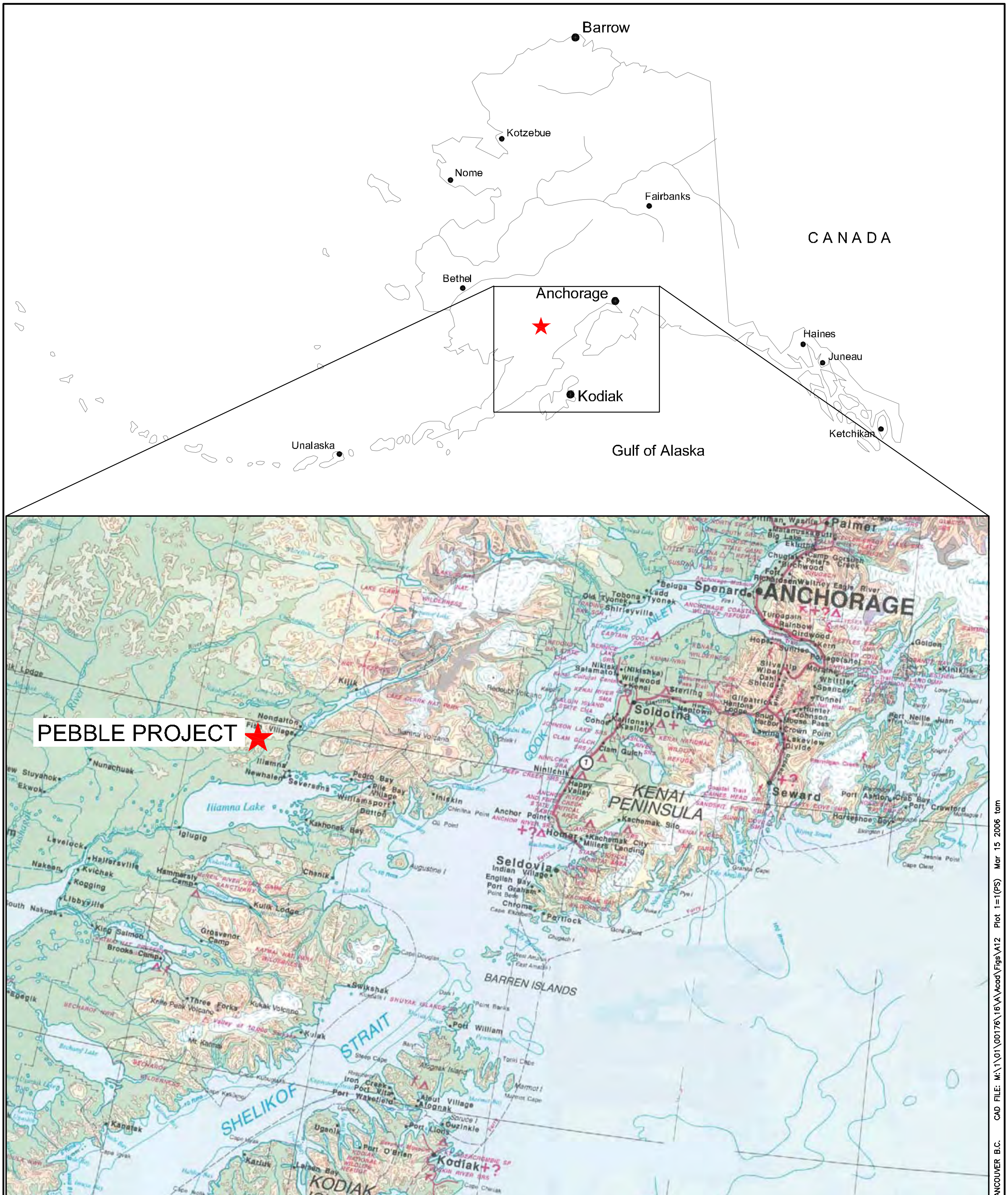
The Pebble Project will be a large open pit mine located 17 miles northwest of the community of Iliamna, on the north side of Lake Iliamna (Figure 1.1). Primary mine area facilities will consist of the open pit, ore conveyor, ore stockpile, a mill site (with associated offices, workshops, equipment repair and storage areas), tailing storage facilities, and a worker camp. Transportation facilities will include a mine area road network, and an approximately 100-mile road to a port facility on Cook Inlet. The primary port site facilities will include metal concentrates storage, fuel storage, a ship loading structure, barge landing, offices and worker housing.

DESCRIPTION OF IMPOUNDMENT FACILITIES

Following is a report describing the impoundment facilities that would be constructed and operated within the South Fork Koktuli River Drainage. This report contains the information required by 11 AAC 93.040(c)(8), more specifically:

> "a description of any impoundment, diversion, or withdrawal structures, including dimensions, construction materials, plans and specifications, and operation plans, and an application to construct or modify a dam, as defined in AS 46.17.900, if 11 AAC 93.171 requires an application;"

Specifically with respect to an application to construct and modify a dam, 11 AAC 93.040(c)(8) requires a person to submit an application to construct a dam if 11 AAC 93.171 requires an application. 11 AAC 93.171(a) requires a person to apply for a certificate of approval from the department prior to constructing a dam. As discussed herein, NDM is not prepared to construct a dam at the present time. Specific design and engineering information sufficient to begin construction of a dam is not available and will not be completed until NDM determines, through its continued exploration activities, the extent of the project. Thus, at the present time, NDM can not, and is not required to, submit an application to construct a dam. Once NDM develops the necessary information, such application will be submitted.



NORTHERN DYNASTY MINES INC.		
PEBBLE PROJECT		
PROJECT LOCATION		
Knight Piésold CONSULTING	PROJECT/ASSIGNMENT NO. VA101-176/16	REF. NO. 3
	FIGURE 1.1	REV. 0

REV. 0	15MAY'06	ISSUED FOR INFORMATION

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NORTHERN DYNASTY MINES INC.
PEBBLE PROJECT

FACILITIES DESCRIPTION IN SUPPORT OF A WATER RIGHTS APPLICATION

SOUTH FORK KOKTULI RIVER

(REF. NO. VA101-00176/16-3)

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SECTION 1.0 - INTRODUCTION

1.1 GENERAL

The Pebble Project is a proposed mining development of a large copper-gold-molybdenum deposit located in the Bristol Bay region of Southwestern Alaska. The Pebble Project property is centered at latitude 59° 53' 54" and longitude 155°17'44", approximately 238 mi southwest of Anchorage and 17 mi northwest of the Village of Iliamna. The project location is shown on Figure 1.1.

The deposit is situated on a drainage divide, with the Upper Talarik River draining to the east and south, and the North Fork and South Fork Koktuli rivers draining to the west and southwest, respectively. Mining of the ore deposit would result in an open pit mine located at the headwaters of the South Fork Koktuli Watershed and the Upper Talarik Watershed. The mine waste (tailings and waste rock) would be stored in two Tailings Storage Facilities (TSF) located in the South Fork Koktuli Watershed (TSF at Site A) and the North Fork Koktuli Watershed (TSF at Site G). A regional site plan of the watersheds for the respective water use facilities is shown on Figure 1.2.

1.2 SCOPE OF REPORT

The scope of this report is to provide details of the TSF located immediately south of the open pit (Site A) in the South Fork Koktuli Watershed in support of the Water Rights Application Process. The TSF located at Site A, and the water extraction limit for the South Fork Koktuli River, are shown on Figure 1.3. The design of the TSF is a work in progress and the technical details contained within this report are preliminary. Ongoing exploration continues to expand the deposit; the design and size of the TSF will be modified to be consistent with the ultimate Mine Plan.

A preliminary Water Management Plan is also included in this report. The main objective of the Water Management Plan is to control all water that originates within, or is brought into water extraction limits of the three watersheds, in an environmentally responsible manner. The water appropriated from upstream of the water extraction limits will be used for the following mining processes and beneficial uses:

- To collect water prior to mill start-up to ensure that there is sufficient water available to support the mine and mill operations through the initial years of operations, including during the winter months when ice development reduces the free water volume in the tailings pond.

- To provide the water required for the mining process (mine haul road dust suppression, equipment cooling, mill process, tailings slurry transport, concentrate slurry transport, etc).
- To ensure that there is sufficient water available in the system to offset the water that is lost to evaporation and sublimation, and the water that is permanently retained in the tailings voids.
- To provide potable water for daily use of the mine workers.
- To ensure that annual and seasonal fluctuations in the tailings pond do not impact the mining process.
- To protect the downstream aquatic resources by:
  - Submerging the potentially reactive waste materials deposited in the TSF to prevent oxidation and the potential development of acid drainage.
  - Promoting the saturation and/or flooding of tailings solids to prevent dust generation.
  - Controlling sediment.
  - Capturing and re-using process water that comes into contact with mineralized rock to ensure that the quality of the water for downstream fish and aquatic habitat is not adversely impacted by the mining operations.

SECTION 2.0 - TAILINGS STORAGE FACILITY

2.1 TAILINGS STORAGE FACILITY DESIGN AND OPERATION

2.1.1 General

The principal objectives of the design and operation of the TSF are to provide secure containment for tailings solids, potentially reactive waste rock and impounded process water. The design and operation of the TSF is integrated with the overall water management objectives for the entire mine development in that surface runoff from disturbed catchment areas is controlled, collected and contained on site. An additional requirement for the TSF is to allow effective reclamation of the tailings impoundment and associated disturbed areas at closure to meet land use objectives.

The TSF has been designed to store approximately 2 billion tons of tailings, approximately 900 million tons of potentially reactive waste rock, as well as mill process water, site runoff and the Probable Maximum Flood (PMF) event, in conformance with the Alaska Dam Safety Guidelines.

The tailings are the by-product of processing the Pebble Project ore. The flotation mill process will create two separate tailings streams; a bulk tailings stream (approximately 97% of the total tailings stream) and a pyritic tailings stream (approximately 3% of the total tailings stream). The bulk tailings, which testwork has shown to be non-reactive, will be discharged from delivery pipelines located along the embankment crests and adjacent high ground to facilitate beach development and separate the supernatant pond from the embankments. The pyritic tailings, which will be potentially reactive (i.e., potentially acid generating if allowed to oxidize), will be deposited below ponded water to prevent oxidation.

Waste rock will be extracted from the open pit in addition to the ore. Some of this waste is unmineralized rock or low grade rock adjacent to the ore, the remainder is material mined to maintain a safe geometry in the open pit mine. Testwork has shown that some of this waste rock will be non-reactive, while the remainder will be potentially reactive. The non-reactive waste will be used for construction purposes at the site, particularly the construction of the TSF impoundment structures. The potentially reactive waste rock will be encapsulated within the tailings mass to prevent oxidation and acid generation.

The PMF event is the flow resulting from the most severe combination of Probable Maximum Precipitation (PMP) and basin hydrogeological conditions. The PMP is the precipitation which results from the worst possible metrological conditions. The PMF is a purely hypothetical event that is sufficiently large to ensure that it is never exceeded, yet at the same time not so excessively large that design requirements are unnecessarily conservative.

The preliminary level design of the TSF has taken into account the following requirements:

- Permanent, secure and total confinement of both tailings streams and the potentially reactive waste rock within an engineered disposal facility.
- Control, collection and removal of water from the TSF during operations for recycling as process water.
- Minimizing seepage from the facility and providing seepage collection and recovery from the impoundment structures.
- Diversion of undisturbed surface runoff from areas upstream of the TSF, open pit, mill site, and crusher.
- Inclusion of monitoring features for all aspects of the facility to monitor embankment stability and ensure the design criteria are met.

2.1.2 Tailings Storage Facility Components

The TSF will ultimately include earthfill/rockfill embankments at the north and south ends of the facility. The first stage of the TSF embankments will be built during the initial construction of the Pebble Project. This stage will provide the required capacity to store the tailings and potentially reactive waste rock produced during the first two years of mine operation, plus the supernatant pond and the PMF. The design also includes allowances for wave run-up, contingent freeboard and ice.

The TSF embankments will be raised in stages, with each stage providing the required capacity for that particular period until the next stage is completed. The approximate final dimensions of the TSF embankments would be:

Embankment	Length (ft)	Maximum Height (ft)
North	15,300	700
Southeast	6,900	710
Southwest	16,000	740

The final facility covering approximately 6.6 mi2 (17 km2)

The staged development of the TSF is shown on Figure 2.1 (Start-up), Figure 2.2 (Year 5), Figure 2.3 (Year 15), and Figure 2.4 (Final). A typical embankment section through the North Embankment is shown on Figure 2.5 with a typical embankment section through the South Embankment shown on Figure 2.6.

The main components of the TSF are as follows:

- **Face Liner - HDPE Geomembrane Liner**

  A synthetic High Density Polyethylene (HDPE) geomembrane liner will be included along the upstream face of the initial embankments to control embankment seepage prior to development of low permeability tailings beaches. The liner will tie into the grout curtain at the South Embankments and into low permeability lacustrine silts and silty glacial till materials at the North Embankment. The 80 mil thick HDPE liner will be placed on low permeability core zone material (Zone S) which serves as a bedding layer for the liner and provides an added level of seepage control in that the combined HDPE liner and Zone S material behaves as a compound liner. The HDPE liner will not be required once the low permeability tailings beaches have been developed and the supernatant pond is maintained in the center portion of the facility away from the embankments.

- **Core Zone/ Low Permeability Blanket - Zone S**

  The core zone/ low permeability till blanket (Zone S) will be constructed with low permeability glacial till excavated from the pit. The core zone combined with the HDPE liner will behave as a compound liner and serve as the primary seepage control zone for the initial embankment stages, until tailings beaches are established for additional seepage control. The core zone will provide the primary embankment seepage control feature (along with the tailings) for the upper section of the embankments. This material will also be used to provide a low permeability till blanket beneath the downstream shell zone of the North and South Embankments to collect rainfall that percolates through the shell zone materials. The foundation will be graded such that infiltration reports to the downstream seepage collection sumps for recycle back to the TSF.

- **Transition Zone - Zone F/T**

  The filter and transition zones (Zone F/T) will be incorporated to ensure internal stability between embankment zones and will act to prevent the migration of fines from the core zone into the adjacent pervious shell zone materials. The transition zone will comprise both a specified sand filter adjacent to the core zone and a coarser gravelly sand transition zone between the filter sand and the downstream shell zone (C1).

- **Shell Zone - Zone C1(NR)**

  The downstream shell zone (C1), adjacent to the transition zone, will be constructed in controlled compacted layers comprising well graded non-reactive waste rock and overburden from the open pit.

- **Shell Zone – Zone C2(NR)**

  The downstream shell zone (C2), downstream of shell zone (C1), will be constructed with similar to Zone C1, but will typically incorporate non-reactive coarse rockfill material from the open pit.

- **Shell Zone - Zone C(PR)**

  The upstream embankment shell will also be constructed from mine waste rock. This zone will be within the TSF impoundment and it could selectively incorporate potentially reactive waste rock as it will be fully encapsulated within saturated non-reactive materials.

- **Seepage Cutoff Measures**

  Embankments will be keyed into low permeability foundation materials to reduce seepage from the TSF. The North embankment will be keyed into a low permeability lacustrine layer, which underlies the northern part of the TSF. Abutment areas will be keyed into the underlying bedrock, where grout injection will be used to form a seepage control curtain.

  The cutoff at the South embankments will involve excavation to the underlying bedrock and injecting grout to form a seepage control curtain.

- **Embankment Toe Drain**

  A toe drain will be constructed along the upstream toe of the embankments to capture potential seepage through or beneath the grout curtain and the lacustrine layer to enhance the stability of the embankments. The toe drain will drain into the seepage collection sumps for recycle back to the TSF.

- **Longitudinal Drain**

  A longitudinal drain will be installed within the upper sections of the embankments once the tailings beaches are developed and the HDPE liner is no longer required to form a compound liner system with the core zone. This longitudinal drain will collect seepage from the upper portions of the embankments and will drain into the seepage collection sumps located on the abutments prior to recycle back to the TSF.

- **Seepage Collection Sumps**

  The seepage collection sumps will be located at the downstream toe of the embankments and on the abutments. The sumps located at the downstream toes of the embankments will collect water from the embankment toe drains and from the low permeability till blanket at the North and South Embankments. The sumps located on the abutments will collect water from the embankment longitudinal drains. Drainage collected in the seepage collection sumps will be pumped back to the TSF.

- **Groundwater Monitoring Wells**

  Groundwater monitoring wells will be installed downstream of all embankments to provide on-going groundwater quality data.

2.1.3 Foundation Preparation and Excavation Requirements

North Embankment

All organics, including the thick peat layer along the valley bottom, will be removed from the embankment footprint prior to foundation preparation. This material will be stockpiled for reclamation at closure.

A layer of higher permeability sand and gravel with some silt underlies the organics. This material will be removed from under the embankment core zone during foundation preparation and suitable materials will be used for random fill in shell zone (C1). Where these deposits exist within the footprint of the shell zones (C1 and C2), they will be contoured and compacted, if necessary, to provide a stable foundation.

A lacustrine layer, comprised of silt and clay, underlies the North Embankment and forms a natural low permeability layer. This layer provides a natural geologic barrier for controlling basin seepage from the TSF, particularly in the initial years of operations, before the tailings beaches are well developed. The HDPE liner and the Zone S core zone will be keyed into the lacustrine layer to provide seepage control.

The excavation at the North Embankment will extend between 20 to 30 ft. below the existing ground surface and below the groundwater table. Active dewatering will be required during initial construction to allow excavation to the lacustrine layer and subsequent construction of embankment zones.

South Embankments

All organics and overburden from below the upstream zones of the embankments will be stripped and excavated to bedrock. The organics will be stockpiled for future reclamation, as with the North Embankment. The stripping and overburden excavation will result in an approximately 100 ft deep trench along the Southeast Embankment and an approximately 140 ft deep trench along the Southwest Embankment. Grout will be injected into the underlying bedrock to form a seepage control curtain, which will tie into the face liner of the embankment. A secondary trench, perpendicular to the dam axis, will be excavated to allow gravity flow of seepage collected in the upstream toe drain to the sump located outside the final downstream embankment toe. The depth of the secondary trench will range from 20 to 60 ft on the Southeast Embankment and 100 to 140 ft on the Southwest Embankment.

2.2 TAILINGS PHYSICAL PROPERTIES

The tailings particle size distribution test results indicate that the bulk tailings are uniformly graded, consisting predominantly of silt-sized particles. The bulk tailings were classified as a low plasticity silt (ML), using the Unified Soil Classification System. There was little variation in the particle size distribution test results for the different bulk tailings samples.

Laboratory consolidation testing of the bulk tailings at low stresses indicates that the permeability will initially be around 3×10^{-7} ft/s (1×10^{-5} cm/s) at a confining pressure of less than 6×10^{-1} psi (4 kPa); however, the permeability will reduce over time, as the tailings consolidate, to roughly 2×10^{-8} ft/s (5×10^{-7} cm/s) at a confining pressure of approximately 390 psi (2,700 kPa).

The predicted behavior of the bulk tailings can be summarized as follows:

- **Water Production**
  Lab testing has indicated that with a tailings slurry containing 32% solids, as much as 60% of the initial water volume will be released as supernatant. Based on this testwork, approximately 50 to 55% of the solution in the tailings slurry will be available for recycle to the mill from the TSF pond after allowing for evaporation losses and water retained in tailings. The volume of supernatant released will vary depending on the tailings type and the moisture content of the underlying tailings.

- **Tailings Density**
  The laboratory test results and operating experience at other similar copper mines indicate that final dry density will be in the order of 90 lb/ft3 (1.44 metric t/m3).

- **Pumping and Viscosity**
  The tailings streams will flow by gravity in pipelines from the process plant to the TSF for the initial several years of operations. The solids contents of the bulk and pyritic tailings streams will be approximately 32% and 50%, respectively. The critical solids content (i.e., the solids content at which the viscosity increases significantly) of tailings slurries, based on experience with similar copper-gold porphyry deposits and flotation mill processes, is typically about 65%. Pumping systems will be installed once the TSF

embankments are raised to the point where the driving head from the plant site is insufficient for gravity flow.

2.3 TSF CONSTRUCTION

The embankments will be developed in stages throughout the life of the project using low permeability glacial till, overburden and waste rock materials obtained from mining operations at the open pit.

The starter embankments will be constructed in two stages, Stage 1a and Stage 1b. Construction of Stage 1a will commence approximately 2 years prior to process plant start-up. The starter embankments will consist of zoned earthfill dams with an HDPE liner installed on the upstream face. The Stage 1a embankments will provide 1.5 years of storage for tailings and potentially reactive waste materials, while the raise to the Stage 1b crest elevation will allow for approximately 2 years of storage. The filling schedule and staged construction sequence of the TSF are shown on Figure 2.7.

The staged construction of the TSF will directly integrate waste materials from the pit. The scheduled placement of fill within the downstream shell zone can accommodate fluctuating quantities of non-reactive mine waste to coincide with the mine plan. Some of the finer grained overburden material produced from the pit development will be stockpiled, as the majority of the overburden will be mined early on in the mine life but will be required at various later periods during ongoing staged expansion of the TSF. The staged design of the embankments will be reviewed annually and refined, as required, to accommodate the availability of construction materials and to incorporate experience gained with local conditions and constraints.

2.4 RECLAIM WATER SYSTEM

A process water reclaim system is required to return sufficient water on a continuous basis from the TSF supernatant pond to the mill for use in the process. The water recovered will be routed through the Process Water Pond (PWP), which will be located near the process plant site.

Water for the process will be reclaimed from the TSF supernatant pond using pumps mounted on two barges. The barge-mounted pump-stations will be prefabricated units, naval architect designed and suitable for all anticipated weather conditions. Additional requirements include barge anchoring to cope with windy conditions, de-icing mechanisms to keep the unit free from surface ice, enclosure heating and ventilation, year round walkway access and sufficient water around the barge to minimize solids entrainment into the pipeline. Pipeline connections from the barge to shore will incorporate flexible joints to accommodate the rise and fall in pond elevation.

2.5 SEISMICITY AND EMBANKMENT STABILITY

Alaska is the most seismically active state in the U.S. and in 1964 experienced the second largest earthquake ever recorded worldwide. Both crustal earthquakes in the continental North American Plate and subduction earthquakes affect the Alaska region. Historically, the level of seismic activity is highest along the south coast, where earthquakes are generated by the Pacific Plate subducting under the North American plate. This seismic source region, known as the Alaska-Aleutian megathrust, has been responsible for several of the largest earthquakes recorded, including the 1964 Prince William Sound magnitude 9.2 (M9.2) earthquake. There is potential for a future large subduction earthquake (M9.2+) along the southern coast of Alaska, and this seismic source zone is located approximately 125 mi from the project site.

Several major active faults in Alaska have generated large crustal earthquakes within the last century. A magnitude 7.9 earthquake occurred along a part of the Denali fault in 2002, approximately 44 mi south of Fairbanks. The western portion of the Denali Fault trends in a NE-SW direction, approximately 125 mi north of the project site. Approximately 19 mi northeast of the project site is the western end of the NE-SW trending Castle Mountain Fault, which terminates approximately at the northwest end of Lake Clark. A magnitude 7.0 earthquake associated with this fault occurred in 1933. The Denali and Castle Mountain faults are capable of generating large earthquakes with magnitudes in the range of M7.5 to M8.0.
Consistent with current design philosophy for geotechnical structures such as dams, two levels of design earthquake have been considered: the Operating Basis Earthquake (OBE) for normal operations; and the Maximum Design Earthquake (MDE) for extreme conditions (ICOLD, 1995). Values of maximum ground acceleration and design earthquake magnitude have been determined for both the OBE and MDE.

Appropriate OBE and MDE events for the facilities are determined based on a hazard classification of the facility, with consideration of the consequences of failure. The hazard classification was carried out using the criteria provided by the document "Guidelines for Cooperation with the Alaska Dam Safety Program" (2003). Classification of the facilities is carried out by considering the potential consequences of failure, including loss of life, economic loss and environmental damage. The hazard classification has been assessed as at least Class II (Significant). The OBE and MDE are selected based on the dam hazard classification and an appropriate earthquake return period, as defined by the "Guidelines for Cooperation with the Alaska Dam Safety Program" (2003).

For a Class II hazard classification, the OBE is selected from a range of return periods from 70 to 200 years, depending on the operating life of the facility, the frequency of regional earthquakes and the difficulty of quickly assessing the site for repairs. The impoundment would be expected to remain functional during and after the OBE and any resulting damage should be easily repairable in a limited period of time.

The MDE is typically selected from a range of return periods from 1000 to 2500 years for a Class II hazard classification. However, the MDE for the Pebble TSF has been conservatively based on a Class I hazard classification making it equivalent to the Maximum Credible Earthquake (MCE), which has a bedrock acceleration of 0.30 g corresponding to a magnitude M7.8 earthquake, occurring along the nearby Castle Mountain Fault system. The MCE is considered to be the seismic event with the highest possible maximum ground acceleration at the project site. Although a M9.2+ megathrust earthquake does not impose the highest maximum ground acceleration at the Pebble site (predicted maximum acceleration of 0.17 g), the event was considered as well in the seismic design analyses because of the very long duration of ground shaking associated with earthquakes of this magnitude.

The TSF embankments will be designed to meet or exceed the Alaska Dam Safety requirements to ensure the embankment will remain stable without release of tailings or process water for all loading cases, including the MDE and the M9.2+ megathrust event. Limited deformation of the facility is acceptable under seismic loading from the MDE, provided that the overall stability and integrity of the facility is maintained and that there is no release of stored tailings or water (ICOLD, 1995).

2.6 WATER MANAGEMENT PLAN

2.6.1 General

A Water Management Plan has been prepared consistent with the proposed mining plan for the Pebble Project. The main objective of the Water Management Plan is to control all water that originates within, or is brought into the project area, in an environmentally responsible manner. This will include the control of surface water runoff, seepage, sediment transport, open pit groundwater and tailings process water during pre-production, operations, and post closure. The water requirements of the milling process and related mining activities will be supplied to the maximum extent from available water sources within the project area. The water management plan is based on the layout and design of the project facilities and processes, the project area topography and hydrometeorology, the start-up and ongoing mill water requirements, and the environmental mitigation requirements. This section describes the water management plan during pre-production and during operations.

2.6.2 Site Water Flow

Water Management and Sediment Control – Pre-production

The pre-production water management plan consists of the following:

- Establishment of sediment control measures prior to construction of all project facilities, including the TSF embankments and the initial development of the pit. Control measures to remove sediment will include both natural and constructed ponds.
- Construction of cofferdams to provide sediment control for the construction activities at the North Embankment, dewatering of the foundation for the construction of the Southeast Embankment, and provision of the initial storage capacity within the TSF basin for the collection of runoff required for mill start-up.
- Collection and storage of all runoff within the TSF catchment area in the start-up pond, upstream of the cofferdams.
- A potable water source for the mill, camp and associated facilities from a local well field.

Cofferdams will impound water in the start-up pond until the upstream face of the Stage 1a embankments have been lined with HDPE. The cofferdam will then be inundated and the TSF pond will expand to the entire footprint of the Stage 1a TSF. The TSF pond will contain approximately 1.7 billion ft^3 (48 million m^3) of water, based on a long term average discharge rate of 36 ft^3/s (1 m^3/ s) for the TSF catchment area over a period of about 1.5 years of construction prior to operations.

Once operations are underway the TSF will continue to intercept and contain all precipitation and runoff that occurs upstream of the water extraction limit.

Water Management and Sediment Control – Operations

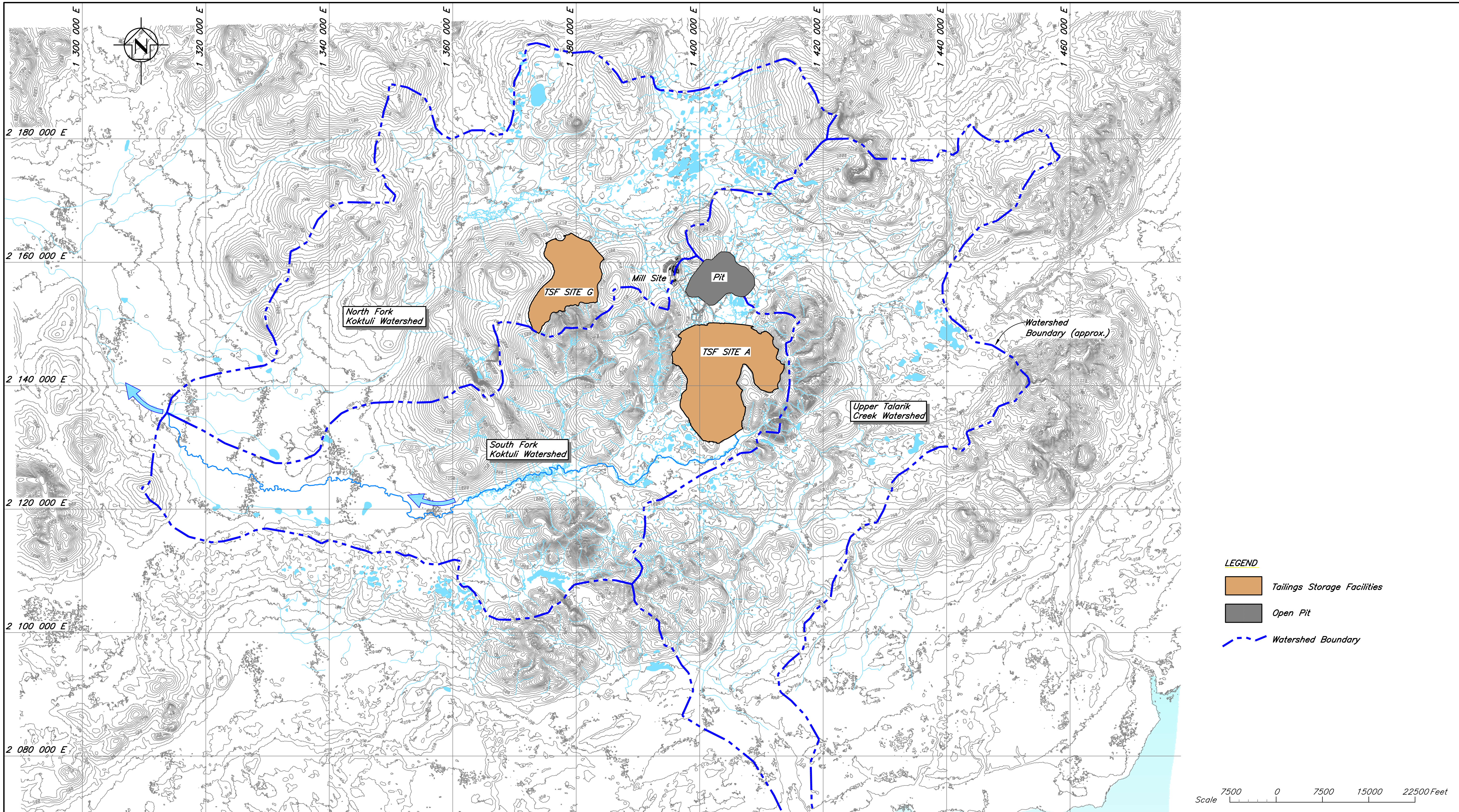
The water management and sediment control plan during operations consists of the following:

- All runoff within the TSF catchment area will be collected and stored in the TSF.
- The sediment control measures established during the pre-production construction period will be maintained and managed during operations.
- Groundwater and undiverted runoff from the pit will be collected and pumped to a series of surface sumps, which eventually will be pumped into the PWP or TSF.
- Process water will be discharged into the TSF with the bulk and pyritic tailings slurries. Tailings supernatant water will be pumped back to the mill for re-use in the mill processing.
- A tailings deposition strategy will be implemented to optimize the TSF supernatant pond volume, to compensate for ice development within the pond, and to prevent wind blown dust generation.
- Seepage from the TSF and rainfall infiltration into the downstream face of the embankments will be collected in seepage sumps and pumped back to the TSF.
- Groundwater monitoring wells will be used to verify the performance of the TSF.

SECTION 3.0 - REFERENCES

ICOLD – International Commission on Large Dams, (1995), "Tailings Dams and Seismicity: Review and Recommendations," Bulletin 98.

Alaska Department of Natural Resources (Sept. 2003). Guidelines for Cooperation with the Alaska Dam Safety Program (2003).



NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

REGIONAL SITE PLAN

Knight Piésold CONSULTING

PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-176/16	3

FIGURE 1.2 REV. C

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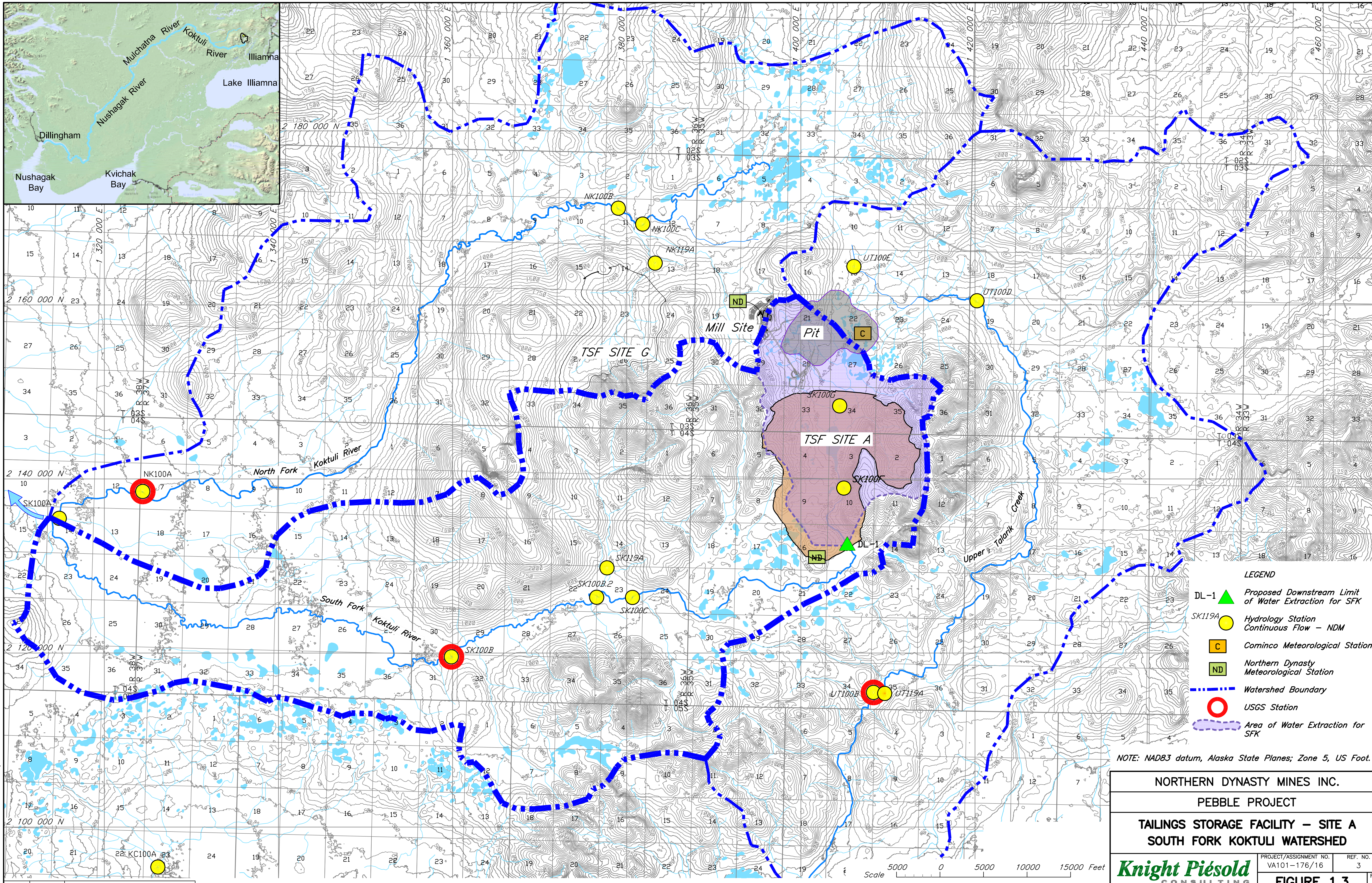
Mulchatna River
Koktuli River
Illiamna
Lake Illiamna
Nushagak River
Dillingham
Nushagak Bay
Kvichak Bay
NK100B
NK100C
NK119A
UT100E
UT100D
ND
Mill Site
Pit
C
TSF SITE G
TSF SITE A
SK100G
SK100F
DL-1
ND
NK100A
SK100A
North Fork Koktuli River
South Fork Koktuli River
Upper Talarik Creek
SK119A
SK100B.2
SK100C
SK100B
UT100B
UT119A
KC100A
2 180 000 N
2 160 000 N
2 140 000 N
2 120 000 N
2 100 000 N
1 320 000 E
1 340 000 E
1 360 000 E
1 380 000 E
1 400 000 E
1 420 000 E
1 440 000 E
1 460 000 E
LEGEND
DL-1 Proposed Downstream Limit of Water Extraction for SFK
SK119A Hydrology Station Continuous Flow – NDM
C Cominco Meteorological Station
ND Northern Dynasty Meteorological Station
Watershed Boundary
USGS Station
Area of Water Extraction for SFK
NOTE: NAD83 datum, Alaska State Planes; Zone 5, US Foot.
Scale 5000 0 5000 10000 15000 Feet
NORTHERN DYNASTY MINES INC.
PEBBLE PROJECT
TAILINGS STORAGE FACILITY – SITE A
SOUTH FORK KOKTULI WATERSHED
Knight Piésold CONSULTING
PROJECT/ASSIGNMENT NO. VA101-176/16
REF. NO. 3
FIGURE 1.3
REV. B
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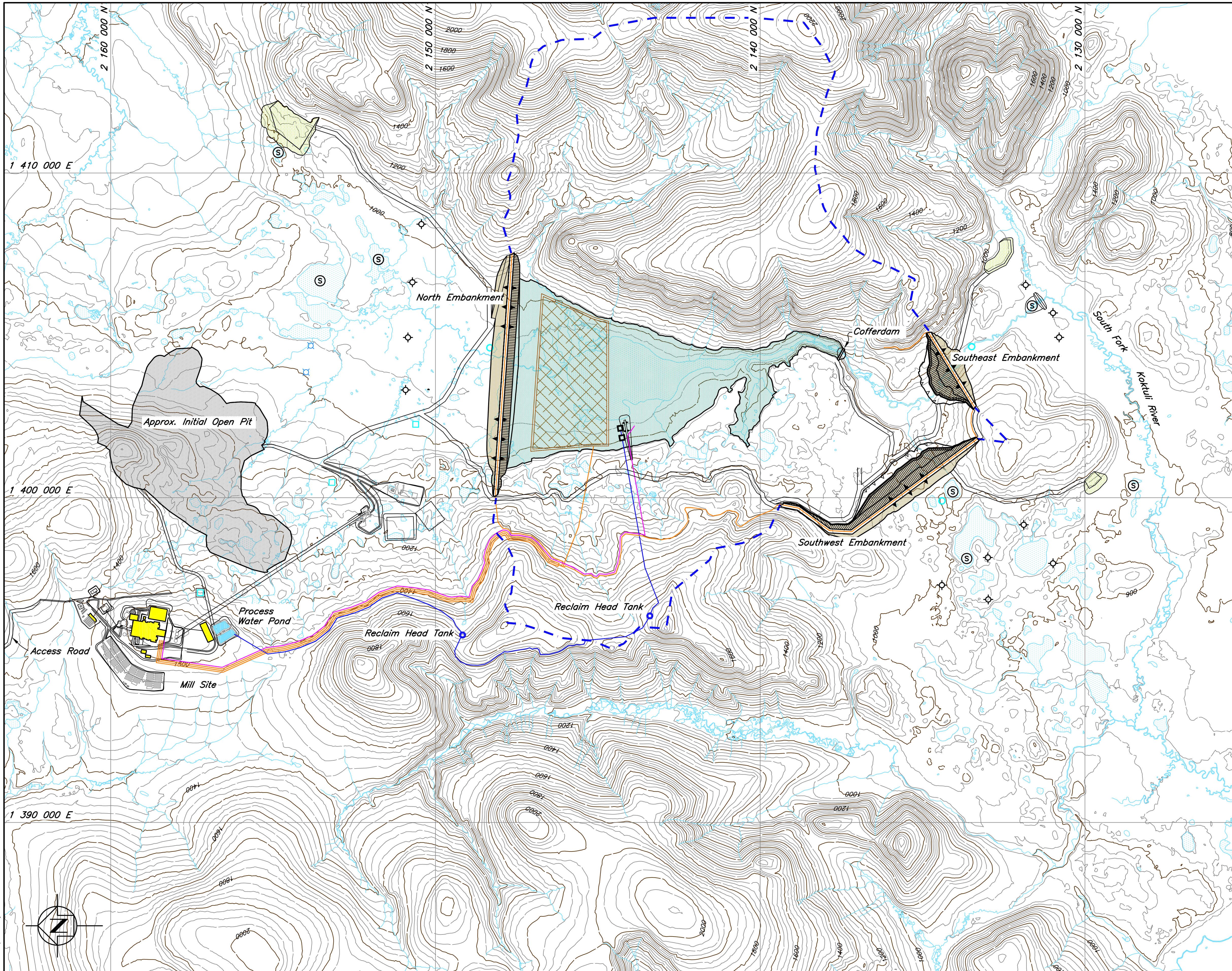


LEGEND

- Startup Pond
- Non-reactive Mine Rock
- HDPE Geomembrane Lined Embankment Face
- Potentially Reactive Waste Rock
- TSF Catchment Boundary
- Bulk Tailings Pipeline
- Pyritic Tailings Pipeline
- Reclaim Pipeline
- Roads
- Monitoring Well
- Potable Water Well
- Sediment Control
- Seepage Collection Sump
- Surface Runoff Collection Sump
- Topsoil Stockpile
- Barge Mounted Pump Station

NOTE

1. Mine site topography information is in NAD83 Alaska State Plane Zone 5 Foot. Outer stream/lake features have been incorporated from NAD27 information. Contour interval shown is 25 ft. Information provided by Eagle Mapping, Nov. 2004.

DRAFT

FOR DISCUSSION ONLY

Scale 1500 0 1500 3000 4500 Feet

NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

TAILINGS STORAGE FACILITY – SITE A GENERAL ARRANGEMENT STARTUP

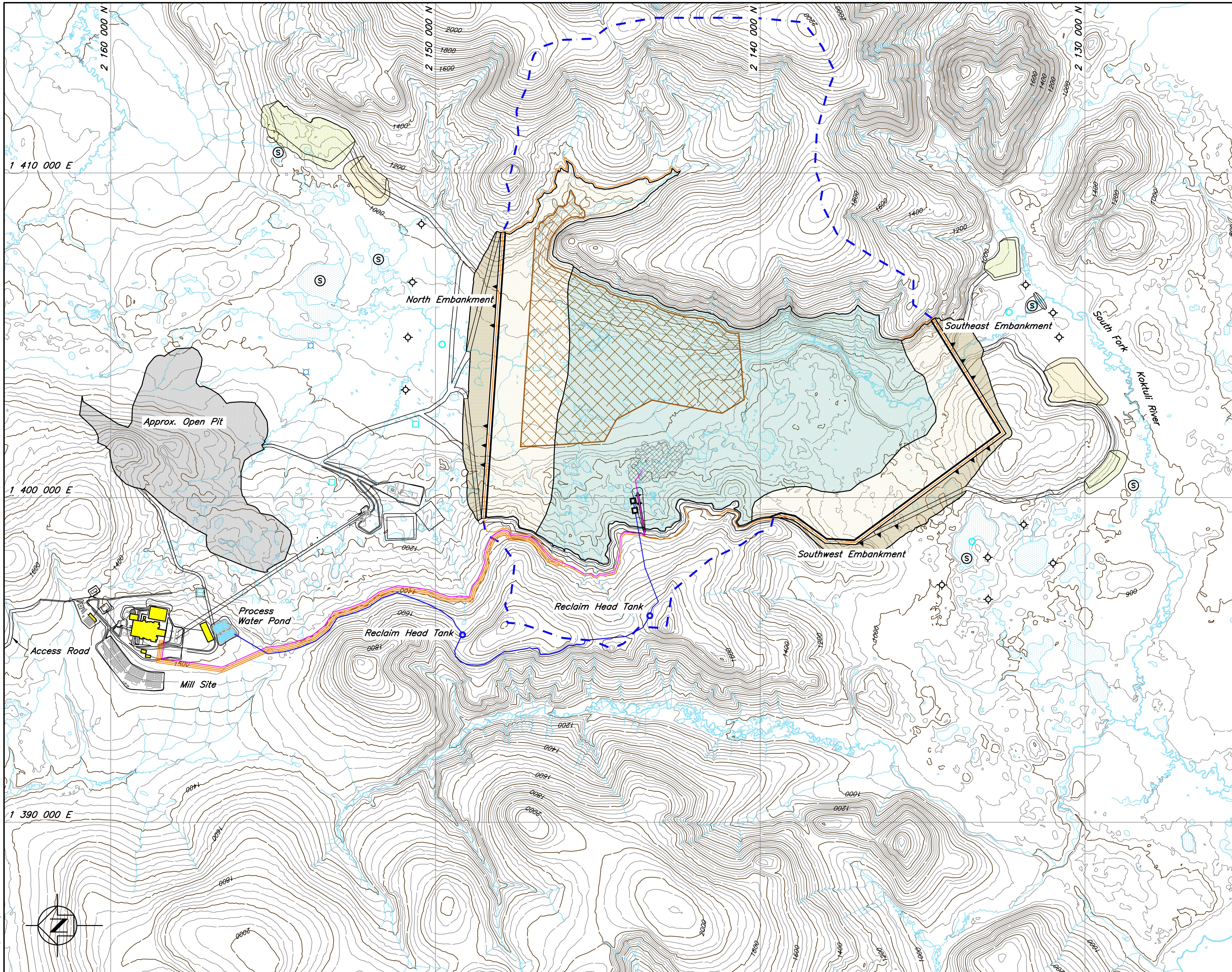
Knight Piésold CONSULTING

PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-176/16	3
FIGURE 2.1	REV. C

VANCOUVER B.C. CAD FILE: M:\1\01\00176\16\A\Acad\Figs\B50 1"=3000' Plot 1=1(PS) June 13, 2006 tam

XREF FILE : Topo_5ft, Hydro, Features

REV. C	01JUN'06	ISSUED FOR INFORMATION



NOTE

1. Mine site topography information is in NAD83 Alaska State Plane Zone 5 Foot. Outer stream/lake features have been incorporated from NAD27 information. Contour interval shown is 25 ft. Information provided by Eagle Mapping, Nov. 2004.

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NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

TAILINGS STORAGE FACILITY – SITE A
GENERAL ARRANGEMENT
YEAR 5

Knight Piésold CONSULTING

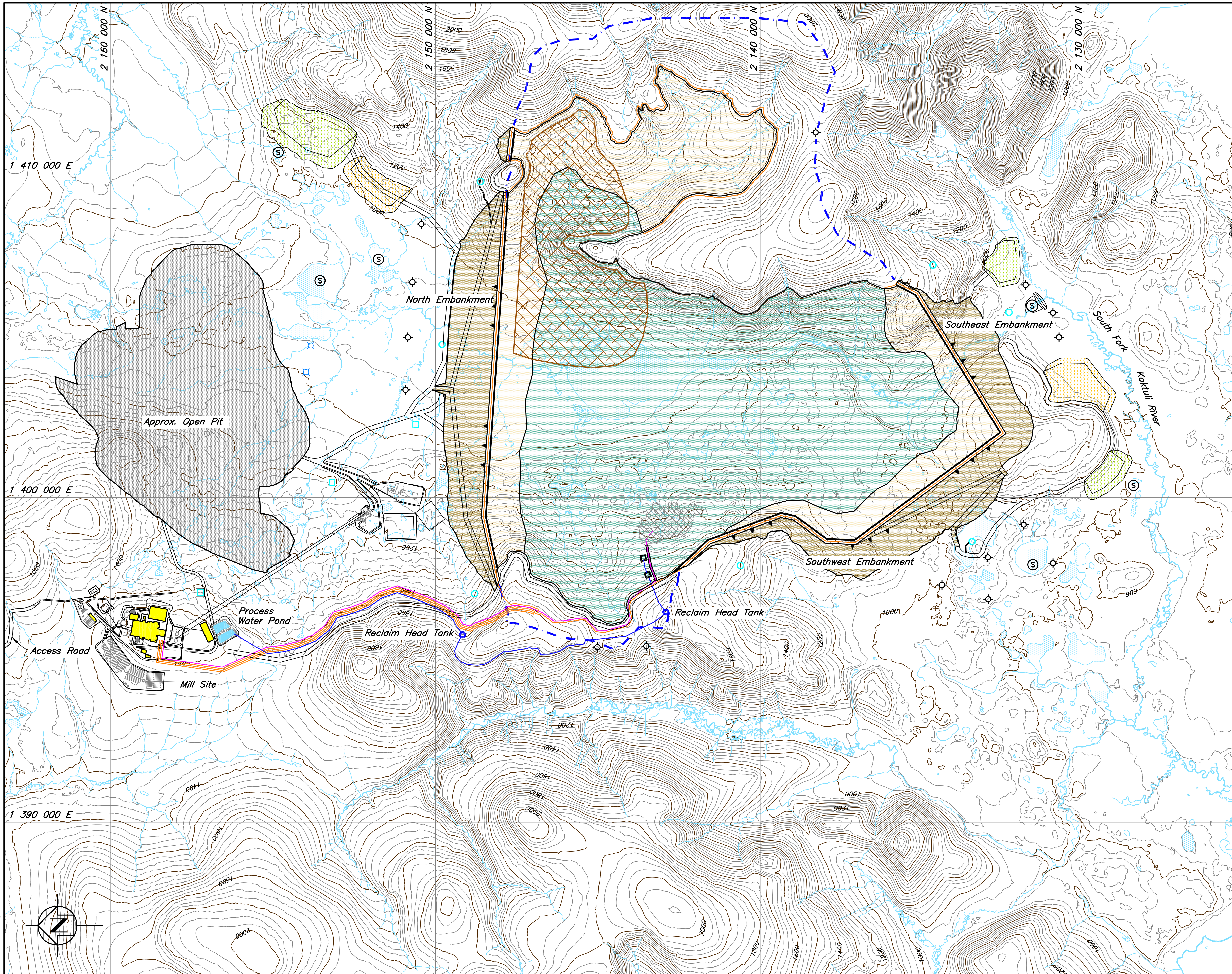
PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-176/16	3

FIGURE 2.2 — REV. C

REV.	DATE	DESCRIPTION
C	01JUN'06	ISSUED FOR INFORMATION

XREF FILE : Topo_5ft, Hydro, Features

VANCOUVER B.C. CAD FILE: M:\1\01\00176\16\A\Acad\Figs\B53 1"=3000' Plot 1=1(PS) June 13, 2006 tom



LEGEND

- Tailings Beach
- Supernatant Pond
- Non-reactive Mine Rock
- Potentially Reactive Waste Rock
- Pyrite Tailings
- TSF Catchment Boundary
- Bulk Tailings Pipeline
- Pyritic Tailings Pipeline
- Reclaim Pipeline
- Roads
- Monitoring Well
- Potable Water Well
- Sediment Control
- Seepage Collection Sump
- Surface Runoff Collection Sump
- Topsoil Stockpile
- Zone S (Core) Stockpile
- Barge Mounted Pump Station

NOTE

1. Mine site topography information is in NAD83 Alaska State Plane Zone 5 Foot. Outer stream/lake features have been incorporated from NAD27 information. Contour interval shown is 25 ft. Information provided by Eagle Mapping, Nov. 2004.

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FOR DISCUSSION ONLY

Scale 1500 0 1500 3000 4500 Feet

NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

TAILINGS STORAGE FACILITY – SITE A
GENERAL ARRANGEMENT
YEAR 15

Knight Piésold CONSULTING

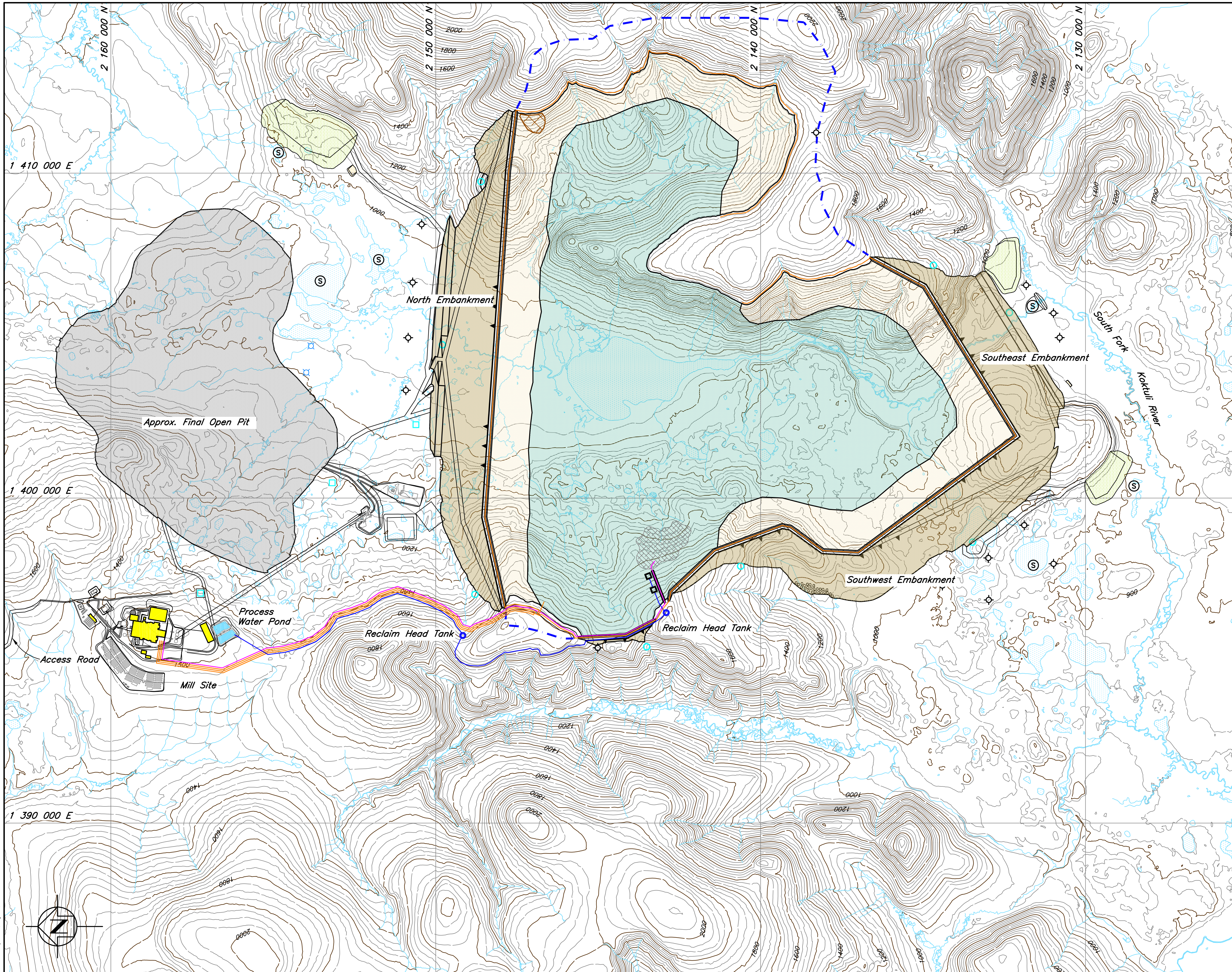
PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-176/16	3

FIGURE 2.3 REV. C

REV.	DATE	DESCRIPTION
C	01JUN'06	ISSUED FOR INFORMATION

XREF FILE : Topo_5ft, Hydro, Features

VANCOUVER B.C. CAD FILE: M:\1\01\00176\16\A\Acad\Figs\B54 1"=3000' Plot 1=1(PS) June 13, 2006 tom



LEGEND

- Tailings Beach
- Supernatant Pond
- Non–reactive Mine Rock
- Potentially Reactive Waste Rock
- Pyrite Tailings
- TSF Catchment Boundary
- Bulk Tailings Pipeline
- Pyritic Tailings Pipeline
- Reclaim Pipeline
- Roads
- Monitoring Well
- Potable Water Well
- Sediment Control
- Seepage Collection Sump
- Surface Runoff Collection Sump
- Topsoil Stockpile
- Zone S (Core) Stockpile
- Barge Mounted Pump Station

NOTE

1. Mine site topography information is in NAD83 Alaska State Plane Zone 5 Foot. Outer stream/lake features have been incorporated from NAD27 information. Contour interval shown is 25 ft. Information provided by Eagle Mapping, Nov. 2004.

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FOR DISCUSSION ONLY

Scale 1500 0 1500 3000 4500 Feet

NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

TAILINGS STORAGE FACILITY – SITE A GENERAL ARRANGEMENT FINAL

Knight Piésold CONSULTING

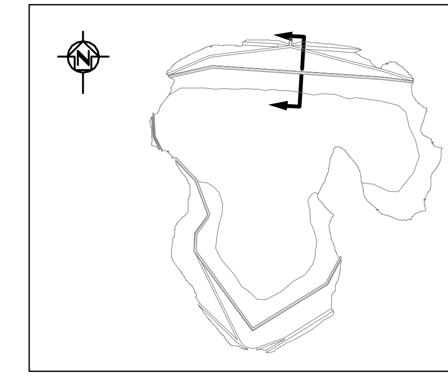
PROJECT/ASSIGNMENT NO.	REF. NO.
VA101–176/16	3

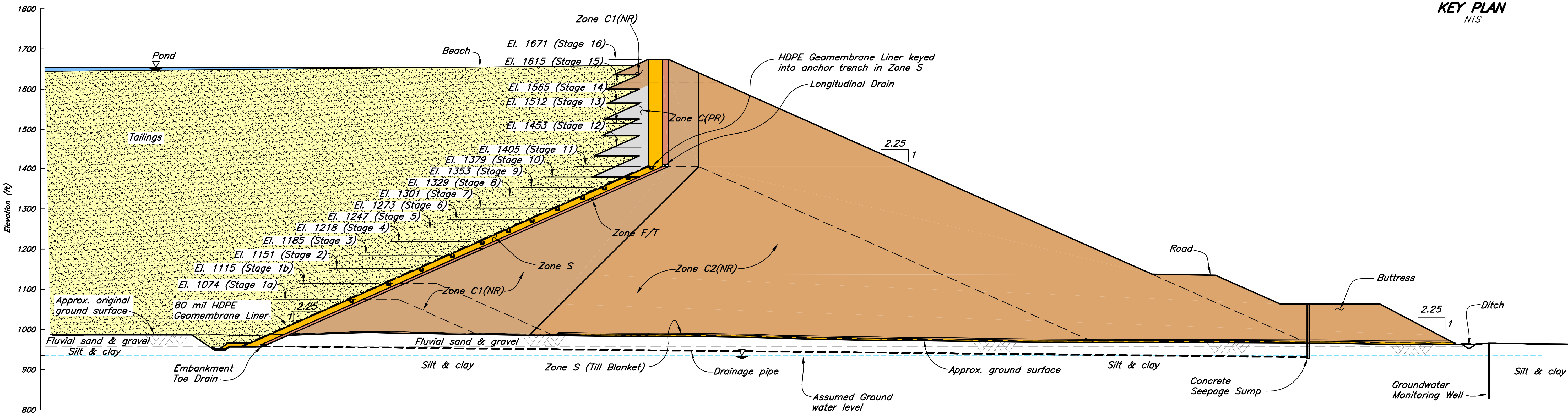
FIGURE 2.4 — REV. B

REV.	DATE	DESCRIPTION
B	01JUN'06	ISSUED FOR INFORMATION

XREF FILE : Topo_5ft, Hydro, Features

VANCOUVER B.C. CAD FILE: M:\1\01\00176\16\A\Acad\Figs\B55 1"=3000' Plot 1=1(PS) June 05 2006 tom





NORTH EMBANKMENT SECTION
Scale A

DRAFT

FOR DISCUSSION ONLY

Scale A 125 0 125 250 375 Feet

NORTHERN DYNASTY MINES INC.

PEBBLE PROJECT

**TAILINGS STORAGE FACILITY – SITE A
NORTH EMBANKMENT
SECTION**

Knight Piésold CONSULTING

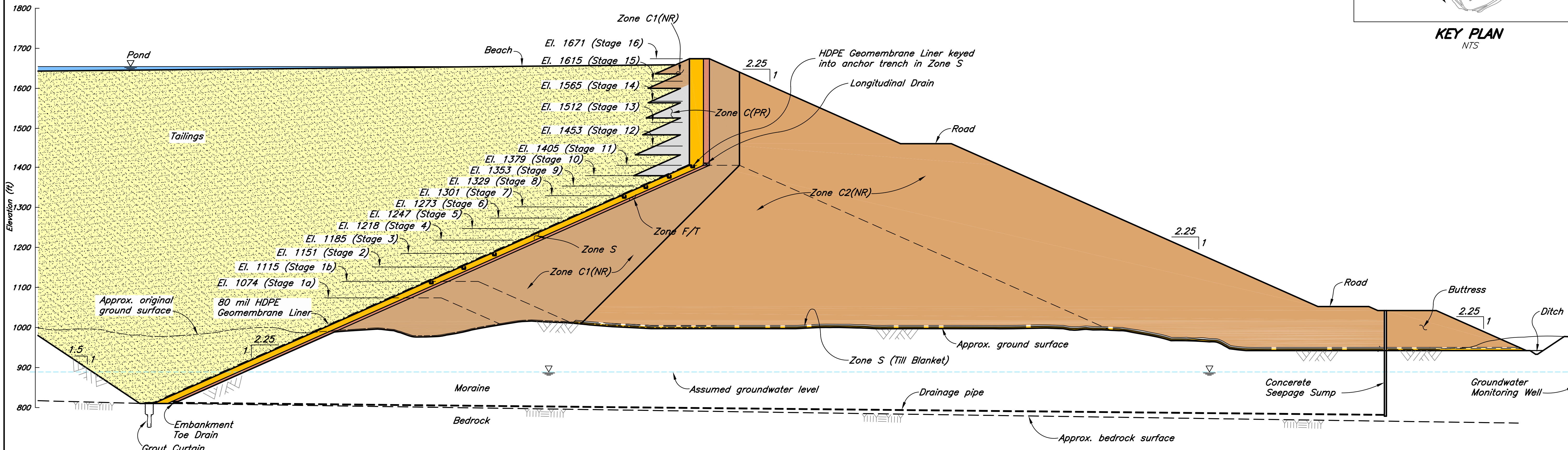
PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-176/16	3

FIGURE 2.5	REV. B

REV. B	01JUN'06	ISSUED FOR INFORMATION

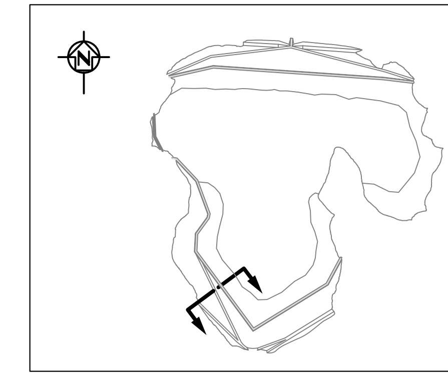
XREF FILE : -

VANCOUVER B.C.



SOUTHWEST EMBANKMENT SECTION

Scale A



KEY PLAN

NTS

DRAFT

FOR DISCUSSION ONLY

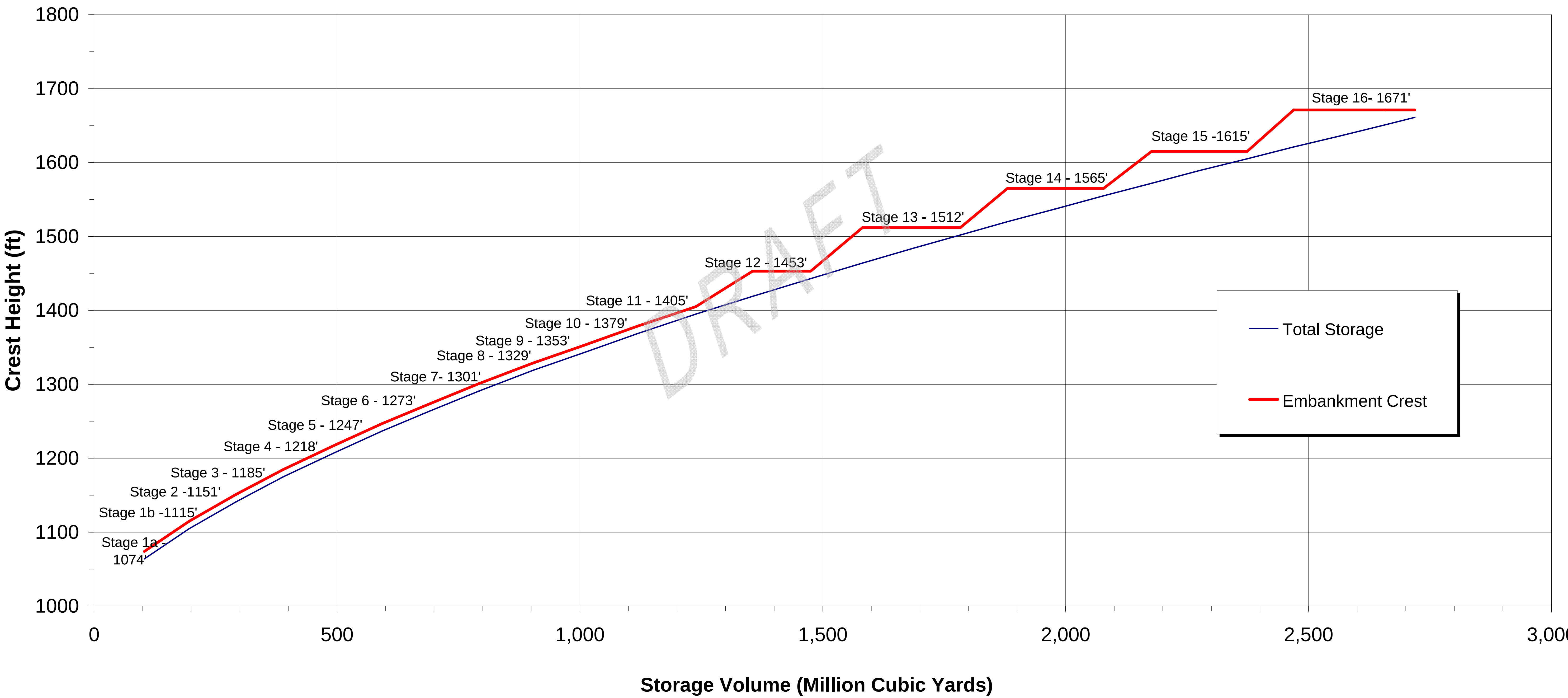
Scale A 125 0 125 250 375 Feet

NORTHERN DYNASTY MINES INC.	
PEBBLE PROJECT	
TAILINGS STORAGE FACILITY – SITE A SOUTHWEST EMBANKMENT SECTION	
Knight Piésold CONSULTING	PROJECT/ASSIGNMENT NO. VA101-176/16 · REF. NO. 3
	FIGURE 2.6 · REV. B

REV. B	01JUN'06	ISSUED FOR INFORMATION

XREF FILE : -

VANCOUVER B.C. CAD FILE: M:\1\01\00176\16\A\Acad\Figs\B57 1"=250' Plot 1=1(PS) May 31 2006 dls



NOTES:
1) Total Storage Volume Includes PR Waste, Tailings, Supernatant Pond and Storm Containment
2) Embankment Crest Elevation Includes 10 ft. freeboard

Rev B - Issued for Information

NORTHERN DYNASTY MNES INC.
PEBBLE PROJECT

TAILINGS STORAGE FACILITY SITE A
FILLING SCHEDULE

Knight Piésold
CONSULTING

PROJECT / ASSIGNMENT NO. VA101-176/16
REF NO. 3

FIGURE 2.7
REV. B