- Chemically binding the near surface particle using dust suppressants, thereby bonding the particles together and reducing the potential for wind erosion and saltation; or
- Periodically wetting the surface, thereby binding the surface particles together by capillary suction.

Shear has initially adopted the option to artificially reduce the near surface wind velocity by installing snow fencing within Cell A in areas that have shown signs of wind erosion and saltation. The snow fencing was installed during July 2011 and Shear is currently developing a monitoring program to monitor the effectiveness of this mitigation plan.

3.3.3 Particle Size and Plasticity Index

The typical particle size distribution of the fine PK samples in 2007 is shown in Figure 6, and in 2011 in Figure 7.

The plasticity of the in-place fine PK varies from being non-plastic to medium plasticity (CI). Samples of the finer portion of the in-place fine PK had an average Liquid Limit of 32%, Plastic Limit of 22%, and a Plasticity Index of 11%. The laboratory reports are attached in Appendix C.

3.3.4 Discharge Solids Content

The fine PK will be discharged as the underflow from the process plant thickener. The average solids content between 2006 to 2007 operating years was 29%. It is anticipated that, under normal operations, it will be discharged from the thickener at approximately 30% solids content. This is equivalent to dry density of 0.37 t/m^3.

3.3.5 Specific Gravity

Specific gravity testing of one sample of the coarse PK was carried out by EBA in January 2006. The measured apparent specific gravity was 2.74. It has been assumed the specific gravity of the fine PK is equal to that of the coarse PK.

3.3.6 Entrained Ice

The current percentage or volume of entrained ice within the deposited fine PK is not known. However close to two years of fine PK deposition within Cell A have been used to back calculate an in situ dry density of 0.685 t/m^3 based on a measured tonnage occupying a surveyed volume. As this is the average in situ density it will account for the volume of entrained ice. It is anticipated future fine PK discharge techniques will not be dissimilar to historical techniques, therefore the in situ dry density of 0.685 t/m^3 has been adopted for the balance of fine PK planning.

3.3.7 Settling and Placed Density Based on Operational Data

On the basis of actual mine operational data between January 2006 to April 2008 and the fine PK surface survey on April 22, 2008, the average dry density of the fine PK (including entrained excess ice) placed in the PKCA is estimated to be 0.685 t/m^3. The existing fine PK surface geometry is shown in Figure 4A, which indicates an average operational beach slope of 2.9%.

3.4 Flocculants and Coagulants

A coagulant and flocculent polymer treatment is performed in conjunction with a thickening reagent which is used to clarify the supernatant thickener. This is done in order to allow 90% of the water to be recycled to the plant and, thicken the fine PK to a 30% solids content prior to discharge to the PKCA.

The polymers are added at the head of the feed launder prior to entering the thickener. The coagulants and flocculants are added separately. The thickener uses highly interactive water clarification and compaction processes to produce relatively clear overflow water and a thickened fine PK underflow.

The polymer treatment causes the water to be clarified in the feed well of the thickener through the formation of fine PK flocs. The floc density increases until it settles into the compaction zone. The density of the flocculated material in the compaction zone increases through floc consolidation which is enhanced by a dewatering process.

The fine PK particles are small and negatively charged and therefore tend to remain in suspension. The coagulant is added to the feed and used to change the negative charge of the particles to a slightly positive charge overall. This is as a result of the coagulant's very strong positive charge.

As the particles are bonded together to form a long string of floc particles, the mass of the particles increases. Once the mass is great enough the particles sink to the bottom of the thickener. The fine PK underflow at the base of the thickener is then pumped to the PKCA.

The polymers currently being used are:

- Flocculant - SNF Flo Polymer AF 4400
- Coagulant - SNF Flo Polymer CV4120B

The toxicological and ecological information for the polymers is contained within the MSDS sheets presented in Appendix B of this report. The ecological information indicates that the concentrations of free polymer required to elicit significant biological responses to fish/daphnia/algae is > 100 mg/L for the flocculant (SNF Flo Polymer AE 4500) and > 10 mg/L for the coagulant (SNF Flo Polymer CV4120B). The calculated overall concentration in the fluid (water plus fine PK) pumped to the PKCA is approximately 30 mg/L for the flocculant and 19 mg/L for the coagulant based on information presented in Table 3. The free concentration of the polymers in the water would be significantly less since the polymer is bound to solid particles

The TDC process plant operators reported using the following dosage rates as listed in Table 3. The dosages will be modified accordingly to obtain a material that will settle and clarify.

Table 3: Typical Coagulant and Flocculant Application

	Solution Concentration (g/l)	Maximum Flow Rate of Solution Concentration Application (l/min)	Concentration in fine PK (based on dry weight)* (g/t)
Flocculant	2.5	4.2	81
Coagulant	5	1.3	50

* Concentration based on ore production rate of 1250 t/day and 15% fine PK output

3.5 Deposition and Construction Plan

3.5.1 Fine PK Deposition Plan

Currently the volume of fine PK within Cell A is approximately 579,489 m^3 at a dry density of 0.685 t/m^3 including entrained excess ice. Future mining operations will generate 552,300 tonnes of fine PK that will equate to approximately 806,277m^3 at a similar dry density.

The remaining capacity of Cell A in the existing PKCA (without constructing additional berms), is estimated to be approximately 134,000 m^3. This is estimated to be enough capacity for 9 months of full production.

Shortly after recommencement of mining operations it will be necessary to complete the construction of the Cell A perimeter berms to elevation 528.5m. This will provide an additional fine PK storage of 559,467 m^3 at a spigot elevation of 527.5m along the upstream face of the Cell A perimeter berm. This volume will equate approximately 383,234 tonnes of fine PK. The proposed staged discharge plan for Cell A is shown in Figure 4A which based on the current plan will commence in Year 1 and will be complete in Cell A in February 2019.

The balance of 169,066 tonnes of fine PK will be spigoted from the downstream face of Divider Dyke A into Cell B and is expected to occupy a volume of approximately 195,452m^3. The proposed staged discharge plan for Cell B is shown in Figure 4B which based on the current plan will commence Year 7 and will be complete in Cell B in Year 9.

The fine PK stage storage curve for both Cell A and Cell B are presented in Figure 5 Charts IV and V. Figure 8 to shows the Fine PK elevations in Cell A and Cell B with time.

Figures 4A and 4B also show the staged filling of Cell A and B. The spigot locations will be varied during operations to produce the desired beach. The PK discharge pipeline is a 100 mm HDPE insulated and heat traced pipe.

3.5.2 PKCA Construction Plan

In order to provide sufficient fine PK storage and water storage within the PKCA it will be necessary to raise and construct the structures as presented previously in Table 1.

4.0 OPERATIONAL WATER MANAGEMENT

4.1 Water Balance

4.1.1 Objectives

Water balance for the PKCA was carried out for the following objectives:

- Projecting water elevations in PKCA for Cells A, B, and C;
- Estimating the discharge volume and rate for the water released from Cell C to Stream C3;
- Estimating total retention time of the PKCA under a "Zero Discharge" scenario when no water is allowed to be discharged to the environment (Lake C3);
- Providing information to determine future construction requirements and contingency measures.

4.1.2 Water Sources

The drainage basins of Jericho Mine and a schematic of the site water management plan is shown in Figures 2 and 9 respectively. The PKCA area is divided into three cells: Cells A, B and C. Water inflows to each of the cells consist of the following:

- Direct precipitation onto the pond surface;
- Runoff from the watershed of each cell;
- Water released from deposited fine PK as a result of settling and consolidation (Cell A or Cell B only);
- Seepage through the up-gradient divider dyke from the up-gradient cell; and
- Runoff water collected from Pit Sump, Collection Ponds and/or East Sump and treated sewage effluent discharged into the PKCA (Cells A or B only).

Water outflows from each of the cells consist of the following sources:

- Evaporation from the pond surface;
- Seepage through the downgradient divider dyke of the cell;
- Reclaimed water pumped from the PKCA to the process plant (Cell C only); and
- Water discharged from the PKCA to Stream C3 (Cell C only).

4.1.3 Methodology

A water quantity balance model was developed using daily time steps for the remaining life of mine. The mine was assumed to recommence mining and processing operations at the beginning of August of Year One. Fine PK storage elevation, water elevation, water surface area, and fine PK elevation on the upstream face of the divider dykes were inferred from a series of stage storage and elevation relationships developed using AutoCAD Civil 3D. These together with the proposed fine PK discharge plan and construction schedule were used to develop a water balance model that took account of the solids and water management within the PKCA, as well as modeling the seepage through Divider Dykes A and B.

4.2 Water Balance Model Basis and Assumptions

4.2.1 Climatic and Hydrological Data

The climatic and hydrological data required for the water balance analyses included precipitation, lake surface evaporation, and runoff for watershed areas in the vicinity of the mine site. A detailed study of the climate and hydrology for the Jericho Mine project has been carried out (SRK, 2003b). Based on the findings in the study, the following parameters were adopted in the current water balance analyses:

- Annual precipitation of 330 mm for a mean (1 in 2 return period) year;
- Mean annual runoff of 225 mm corresponding to a mean runoff coefficient of 0.682;
- Annual lake surface evaporation of 270 mm; and
- Annual precipitation of 500 mm for a 1:100 event wet year.

The monthly distributions of the runoff and lake surface evaporation are listed in Table 4.

Table 4: Monthly Distributions of Runoff and Lake Surface Evaporation

Month	Monthly Percentage of Runoff (%)	Monthly Runoff (Mean) (mm)	Monthly Runoff (1:100 Wet) (mm)	Monthly Lake Surface Evaporation (mm)
May	3	7	10	14
June	57	128	194	78
July	16	36	55	97
August	10	23	34	57
September	13	29	44	24
October	1	2	3	0
November to April	0	0	0	0
Annual	100	225	340	270

4.2.2 Storage Curves and Initial Pond Elevations

The stage storage curves for the PKCA Cells A, B, and C are shown in Figure 5 as charts 1, 11, and 111.

The initial pond elevations that were used in the water balance model (using the assumption that mining operations will resume in August) are;

520 m for Cell A;

516 m for Cell B; and

516 m for Cell C.

The historical water elevations measured in Cell A have ranged between approximately 513 m and 517 m in 2006, 515 m and 517 m in 2007, and 517 m and 519 m in 2008. The historical water elevations measured in Cell B have ranged between approximately 512 m and 517 m in 2006, 514 m and 516 m in 2007, and 515 m and 516 m in 2008.

4.2.3 Mine Site Runoff Water, Pit Seepage Water, and Sewage to PKCA

The catchment areas within the Jericho mine site are shown in Figure 2 and summarized in Table 5. Runoff from Catchment Areas A, B, Plant Site and the Pit Area, will be collected and to the PKCA as described in the Site Water Management Plan (EBA, 2011).

Table 5: Mine Site Catchment Areas

Catchment Area	Area (m^2)
PKCA (Cell A)	215,300
PKCA (Cell B)	127,500
PKCA (Cell C)	191,900
Catchment Area A	703,428
Catchment Area B	178,800
Plant Site Catchment Area	308,200
Pit Area Catchment	241,700

Runoff from Catchment Areas A and B, and the Plant Site and Pit Area Catchment, will be pumped to the PKCA. It was assumed that all water from the C1 Catchment is diverted through the C1 diversion.

Permafrost is expected to exist throughout the Jericho pit with the exception of the active layer. Ground temperatures of approximately -5^{0}C were measured from two thermistor strings installed in the Jericho kimberlite pipe at depths of 40 m and 223.5 m (SRK, 2003a). It is expected that the seepage through the permafrost into the open pit will be negligible. The seepage water into the pit was thus ignored in the current water balance.

The treated sewage water line is discharged adjacent to the sewage treatment plant into the Cell A of the PKCA. The sewage treatment plant is located at the SE corner of the camp. The pipe size for the sewage line is similar to that for the fine PK discharge line. The assumed flow rate for the sewage line is 0.31 l/sec (or 9,855 m^3/year).

4.2.4 Seepage through Divider Dykes A and B

Water flow between Cell A and Cell B is controlled by seepage through the internal Divider Dyke A when the water elevation in Cell A is below 523.0 m. The design cross-section and profile for Divider Dyke A is presented in Figure 10. The filter material is much finer than the transition material and run-of-mine waste rock in the dyke thus dominates the seepage rate through the dyke. For the purpose of estimating the seepage volume through the dyke, both the transition zone and waste rock zone can be practically ignored without introducing significant errors. Therefore, the design geometry of the filter was used in estimating the seepage through Divider Dyke A.

It is assumed that the standing water elevation in Cell A will be controlled such that it will be below elevation, 523.0 m. The coarse PK will be used to raise Dyke A above its original design crest elevation of 524.0 m. When required, an overflow ditch across Dyke A may be excavated to drain freely any extra water above the elevation of 523.0 m in Cell A to Cell B.

As Cell A becomes full, a second divider dyke will be constructed between Cell B and Cell C. Water flow from Cell B to Cell C will be via seepage through the internal Divider Dyke B. It is assumed that Dyke B will have a design cross-section similar to that for Dyke A. A vertical profile along the proposed axis of Dyke B was used to calculate the vertical filter area for seepage calculations.

The hydraulic conductivity of a dyke filter material sample tested in EBA's laboratory was 1.3E-02 cm/sec and is generally found to be consistent with field observations. This value was used as the average hydraulic conductivity for the filter material for Dykes A and B in estimating seepage volume through the dykes.

It was assumed that the fine PK would completely block the filter area below the fine PK surface elevation; thus, no seepage water will pass through the blocked filter area.

It is expected that ice cover will form on the pond surfaces during winter. Based on measured ice cover thicknesses on similar ponds at the EKATI Diamond Mine site and past experience, the ice cover thickness in Cells A, B, and C of the PKCA was assumed to be 0.5 m in December, 0.8 m in January, 1.2 m in February, and 1.5 m from March to May. It was assumed that there would be no seepage through the ice covered filter area.

4.2.5 Discharge Water from Cell C to Stream C3

It is planned to discharge water in compliance with the water licence criteria, annually from the PKCA over the West Dam to Stream C3. This maximizes the storage volume in Cell C in the event that water cannot be discharged from the PKCA. Where possible the minimum operating pond surface elevation in Cell C will be 513.5 m to provide a sufficient water depth to avoid disturbing the lake bottom sediment. In order to achieve this, the discharge rate will exceed the natural seasonal flows in Stream C3 that were estimated in *Supplemental Climate and Hydrology* (SRK 2003b) (See Table 6). Historical discharge rates are presented in Table 7.

Table 6: Estimated Monthly Flow at Outlet of Former Long Lake

Month	Akkutuak distribution (m^3/month)	Atitok Distribution (m^3/month)
May	3,348	3,348
June	88,128	69,984
July	6,696	20,088
August	6,696	10,714
September	15,552	15,552
Annual Total	**120,420**	**119,686**

Table 7: Historical Discharge Quantities from PKCA to C3

Year	Quantity
2006	412,907
2007	302,280
2008	308,081
2009	121,050

The most conservative scenario is that total volume all water inflows and discharge occurring the following year

Surface water dispersion models were created using a series of PKCA discharge scenarios (SRK, 2004a), whereby the most conservative scenario assumes storage of total volume of water in the PKCA for one year with no discharge. This would include all water inflow sources. Discharge occurs in the following year . Based on this model the total volume of water discharged into the PKCA would be 959,500 $m^{3.}$ In order to simulate natural seasonal flow patterns while achieving the minimum 10:1 dilution in the mixing zone in Lake C3, discharge rates from May to October, respectively, would be 25,000 m^3, 551,600 m^3, 153,100 m^3, 87,400 m^3, 121,300 m^3 and 21,000 m^3.

The model indicates that the minimum dilution in Lake C3 is approximately 10:1 within 200 m of the outflow from Stream C3 occurs immediately prior to ice break-up. The dilution ratio increases rapidly to approximately 20:1 by early July. Based on the review of the water quality record in 2007, the modeled dilution ratios are deemed to be adequate to achieve aquatic thresholds, (EBA 2011).

The discharge rate from the PKCA will be managed to ensure a minimum 10:1 dilution at the edge of the mixing zone in Lake C3. This will be achieved by:

- Not discharging to Stream C3 prior to ice break-up;
- Maintaining discharge rates into Stream C3 below the modeled monthly rates.

Water quality at the stream outlet and within Lake C3 will be monitored, as described in Section 6.0, to ensure that the dilution ratio is being achieved.

4.2.6 Reclaim Water from Cell C

The reclaim line is installed downstream of Divider Dyke A, and will be extended to the downstream of the Proposed Divider Dyke B into Cell C after Divider Dyke B is constructed. The reclaim water line is 100 mm diameter. The line is not heat traced, and is not expected to be used during the winter.

An annual volume of 28,900 m^3 of water will be reclaimed from Cell C or the East Sump, to the process plant, as described in the “Site Water Management Plan” (EBA, 2011). The historical volumes of recycled water volumes from the PKCA to the process plant was approximately 11,000 m^3 in 2006 and 52,000 m^3 in 2007.

4.2.7 Construction of Divider Dyke B

Water balance results indicate that water elevation in Cell A will reach the maximum design specifications of 523.0 m in the second year of full production based on a mean precipitation year. This maximum design specification may be exceeded by the third year of production if a wet year occurs. Divider Dyke B will be required, prior to the freshet of the second year of production to avoid water in Cell A overflowing directly into Cell C. In the current water balance analyses, the following assumptions were applied:

- Construction of Divider Dyke B will be completed prior to the freshet of the second year of production;
- Construction of North Dam in the first year of production;

Cell A Coarse PK Perimeter Dyke Stage 1 between the first and second year of production, and Stage 2 between the third and fourth year of production.

Raise Divider Dyke A to elevation 524m during the first year of production.

Raise West Dam to elevation 528m during the first year of production.

Mine site runoff water and sewage will be pumped to Cell A until the completion of Divider Dyke B, after which it will be pumped to Cell B.

4.3 Results and Discussions

4.3.1 Water Levels

The water balance was carried out to project water elevations in Cells A, B, and C during the production period of the mine. Three scenarios were investigated to predict water elevations in the cells under mean and 1:100 wet year precipitation conditions. Annual discharge from Cell C to Stream C3 was a standard assumption in each scenario.

Figure 8 presents the predicted water elevations over time in Cells A, B, and C under mean precipitation years. The water elevations fluctuate over the mine life and cycle annually in response to the annual freshet and water discharge from Cell C to Stream C3. Table A2 summarizes the annual inflows and outflows of the three cells under mean precipitation years. The detailed monthly water balance results are presented in Table A1 in Appendix A of this report.

The maximum predicted water elevations in the Cells, A, B and C, for mean conditions and 1:100 wet year conditions are summarized in Table 9. The maximum predicted water elevations in Cell B and C are below the maximum operating water elevation of 523.0 m. As expected the water elevation in Cell A reaches maximum elevation in the third year of production due to blinding off of the filter dyke with fine PK material. Therefore, excess water entering Cell A will be allowed to overflow into Cell B in a controlled manner using a spillway.

Table 9: Predicted Maximum Water Elevations with Annual Discharge

Precipitation	Maximum Predicted Water Elevation (m)		
	Cell A	Cell B	Cell C
Mean during the whole production period	522.6	518.1	517.5
One 1:100 wet year in Yr 3 and mean for other years	523.0	520.1	519.5
One 1:100 wet year in Yr 8 and mean for other years	523.0	521.4	520.7

4.3.2 Water Discharge over West Dam

Water which meets licenced discharge criteria in Cell C will be pumped over West Dam into Stream C3 annually from June 15 to September 30 as described in Section 4.. The estimated annual discharge water volume under mean precipitation years is summarized in Table 10 (last column). The discharge pumping rates are shown in Figure 8 for mean precipitation years. The maximum annual discharge volumes and pumping rates for the three scenarios are summarized in Table 10.

Table 10: Maximum Annual Discharge Volumes and Pumping Rates

Precipitation	Maximum Annual Discharge Volume (m^3)	Maximum Pumping Rate (l/sec)
Mean precipitation during the entire production period	439,800	135
One 1:100 wet year in Yr 3 and mean precipitation for other years	527,760	162
One 1:100 wet year in Yr 8 and mean precipitation for other years	659,700	202

4.3.3 Dilution Ratio in Lake C3

As described in Section 4.2.5, one of the scenarios modeled in SRK (2004a) assumed an annual discharge of 959,500 m^3 of water from Cell C into Lake C3 with based on average natural seasonal inflows. Table 11 lists the discharge water volumes and the predicted minimum dilution ratios during specified periods for this scenario. For comparison, Table 11 also lists the anticipated maximum monthly discharge during the same periods for a mean precipitation year. The predicted maximum discharge volumes are lower than that simulated in SRK (2004a); therefore, the minimum dilution is expected to be greater than 10:1.

Table 11: Discharge Volumes and Predicted Minimum Dilution Ratio

Time Period	Discharge Volume Simulated in SRK (2004a) (m^3)	Predicted Minimum Dilution Ratio within 200 m from the Stream C3 Mouth in Lake C3 (SRK, 2004a)	Anticipated PKCA Discharge for a Mean Precipitation Year
June	551,570	10 to 20	175,200
July	153,138	>20	109,500
August	87,411	>20	65,700
September	121,291	>20	89,400

4.3.4 Seepage through Divider Dykes

Seepage volumes through Divider Dykes A and B were estimated based on the assumptions presented in Section 4.2.4. The water flows freely between Cell B and Cell C prior to completion of Dyke B. It was also assumed that water in Cell A will flow freely to Cell B after the average fine PK surface elevation is greater than the original Divider Dyke A design crest elevation of 524.0 m. The annual volumes of water flowing between the cells (including seepage through the dykes) are summarized in Table 8.

The seepage rates are dependent on the permeability of the dyke filter. The permeability may vary from the assumed values, and may reduce over time as the filter blinds off. As additional monitoring information becomes available water balance should be recalibrated and rerun. This is discussed further in Section 6.0 of this report.

4.3.5 Water Retention Time with Zero Discharge

Analyses were conducted to estimate the retention time of the PKCA if no water is allowed to discharge from Cell C to Stream C3 for a period of time. Four different start dates of a no discharge condition were evaluated. Mean year precipitation was assumed for each case. The predicted water retention time for the water level to reach elevation 523 m is listed in Table 12.

Table 12: Water Retention Time with Zero Discharge

Start Date with Zero Discharge	Predicted Date when Water Level in Cell B or C reaches 523.0 m	Total Retention Time (Year)
January Year 3	June Year 4	1.83
October Year 4	June Year 6	1.58
October Year 5	June Year 6	1.42
October Year 8	> August Year 9	> 0.83

4.3.6 Freeboard

The "maximum operating water level" for the PKCA has been defined as elevation 523 m. The water level may rise above this level while flood waters are discharged and will also be higher due to waves and wave run-up.

The maximum wave height for the West Dam is estimated to be 0.5 m (EBA 2005c). The wave heights at the divider dykes and East and Southeast Dams are slightly less.

The "maximum water level" that includes waves and a temporary rise during flood routing has been defined as 524 m for the PKCA. The water retention elements in the dams have been specified to be at elevation 524 m.

The difference between the "maximum operating water level" and "maximum water level" is the freeboard.

4.3.7 Extreme Events

The 24-hour probable maximum precipitation (PMP) event for the site is estimated, in SRK 2003b, to be 160 mm. For comparison, the greatest daily rainfall measured at either the Contowoyto Lake station or Lupin Airport was 42 mm, or a quarter of the estimated 24-hour PMP.

The total volume of the runoff water from the PKCA basin will be 85,500 m^3 during the PMP event, assuming a runoff coefficient of 1.0. The water level in PKCA Cells B and C will rise to 523.5 m if no water is discharged during the PMP event (assuming Cell A is filled with fine PK at the time of the event). The water level can be pumped down to the maximum operating level of 523 m in seven days assuming a discharge rate of 150 l/sec.

Additional water from the other site areas may be pumped to the PKCA following an extreme event; however the inflow rate will be controlled to maintain the water level in the facility below the operating level.

4.3.8 Limitations

The water balance analyses has been conducted based on current available information and a number of assumptions based on our current knowledge and understanding. It is envisioned that actual water elevations in the cells of the PKCA may be different from those predicted in this report for the following reasons:

- Precipitation, lake surface evaporation, and runoff will vary from the assumed monthly means;
- Actual fine PK deposition plan and mine operating plan may be different from those adopted in this report;
- Actual fine PK properties such as settled dry density may be different from those used in this study;
- Actual discharge water volume and reclaim water volume from Cell C may be different from those presented in this report;
- Actual hydraulic conductivities and as-built geometries of the dyke filters may be different from those used in the report.

The water balance should be reviewed on an annual basis.

5.0 DAM AND DYKE DESIGNS

The PKCA facility requires the construction of dams and dykes to control the water level and the discharge of fine PK. The dams and dykes are listed in Table 1 and shown in Figure 3. The dams and dykes were designed using Canadian Dam Safety Guidelines (1999) and comply with Canadian Dam Safety Guidelines (2007). The construction schedule for these structures was preliminarily developed based on projected water/fine PK levels and expected water quality in the PKCA over the remaining mine life. A number of assumptions were made in projecting the water/fine PK levels and predicting water quality when the report was prepared. These assumptions will be annually re-evaluated based on actual mine operational conditions, the mine plan, and information collected during the mine operation. The construction schedule can be then adjusted, when required, based on updated projections of water and fine PK levels and observed/predicted water quality in the PKCA.

All structures require that the detailed design and construction drawings be submitted to the Nunavut Water Board (NWB) 60 days prior to construction. A summary brief description of the structures is presented in the following sections.

5.1 West Dam

The West Dam design is described in EBA 2005c and was partially constructed to an elevation of 525 m during 2005 to 2007. This dam will require completion to final design elevation prior to commencement of mining operations. The design criteria for the West Dam are as follows:

- The dam should retain water within the PKCA.
- The dam will remain physically stable during the operational life of the mine.
- The dam will not be required after mine abandonment.

The typical cross-section of the West Dam is shown in Figure 11. The main water retention element in the dam is a frozen core overlying a frozen foundation. An effective frozen core dam requires that the central core and foundation remain frozen year round to act as an impervious barrier against seepage. The core and foundation must be nearly saturated with ice to produce a well-bonded and impermeable mass, and the permafrost must be sustained. A secondary seepage barrier is provided by a geosynthetic liner on the upstream face of the frozen core. Similar designs have been developed by EBA for the EKATI Diamond Mine.

The upstream shell primarily consists of rockfill. A small till zone has been placed at lower elevations to reduce convective water movement through the open graded rockfill. The downstream shell of the dam will be constructed of rockfill. This will provide a strong material and will have minimal settlement. The rockfill shells are designed to be constructed with 3.0H:1V outside slopes.

The dam includes piping for the installation of thermosyphons. The need for thermosyphons will be based on the ground temperatures of the dam and foundation at the end of construction and over the life of the dam.

5.2 East and Southeast Dam Design

The design of the East and Southeast Dams are described in EBA 2005a. The construction of East Dam was completed in 2006 and Southeast Dam was completed in 2007. The design criteria for the East and Southeast Dams are as follows:

- The dams will retain fine PK solids.
- The water in the PKCA will be maintained at low level; therefore water will not impoundagainst the East and Southeast Dams for long periods of time.
- The dams will remain physically stable during the operational life of the mine and following mine closure.
- A typical cross section of the dams is shown in Figure 11 and 12. The main water retention element in the dams is a geomembrane liner. The liner is keyed into the ground using frozen saturated fill. Additional water retention will be provided by the fine processed, coarse processed kimberlite and till placed upstream of the liner. The dam foundation is designed to remain in a frozen condition thereby minimizing or eliminating seepage through the dam foundation.

5.3 Divider Dyke "A" and "B" Design

The design of Divider Dyke A is described in EBA 2005b and was partially completed to a low point elevation of 521.5 between 2005 and 2007. The design criteria for the divider dykes are as follows:

- The dykes should retain the fine PK solids, to the extent practical. It will not be possible, or necessary, to prevent the movement of all colloidal particles through the dyke.
- The dyke should allow the movement of water from upstream (east) to downstream (west), as seepage flow through the dyke. In the event that seepage is impeded by the development of frozen zones or filter blinding, a surface overflow channel will be constructed in the dyke.
- The dyke will remain physically stable during the operational life of the mine and following mine closure.
- The completion of Divider Dyke A will be required prior to recommencement of full production.
- A second dyke, Divider Dyke B, will also be constructed prior to mining operations.

The design cross section of Divider Dyke A is shown in Figure 10. The design for Divider Dyke B will be similar to Divider Dyke B. The final design of Divider Dyke B will be submitted to the NWB prior to construction.

5.4 Perimeter Berm

Coarse PK stockpiles and berms will be placed around the perimeter of Cell A as shown in Figure 2. Fine PK will be deposited against the coarse PK stockpiles and berms. The perimeter berms will require stage construction during year one through year four after recommencement of mining operations in year one. The final design of the perimeter berms will be carried out with detailed stability evaluations of both the