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PRELIMINARY FEASIBILITY STUDY
NI 43-101 TECHNICAL REPORT
FOR THE
WILLOW CREEK MINE

Submitted to:
Western Coal Corp.
July 16, 2010

Moose Mountain Technical Services
P.O. Box 797
Elkford, B.C. Canada
V0B 1H0
Tel: (250) 423-4531
Fax: (250) 423-9260

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3.0 Summary

This report is prepared by Moose Mountain Technical Services Ltd. (MMTS) for Western Coal Corp. (WCC) and the Willow Creek project owned by Willow Creek Coal Partnership, a wholly-owned direct and indirect subsidiary of WCC. The purpose is to provide a "Technical Report" that adheres to Canadian NI 43-101 standards set by Canadian security regulators.

WCC received an amended "Permit C-153 Approving Mine Plan and Reclamation Program for the Willow Creek Mine in August 2008" ("Mine Permit"). This permit allows mining in the southeast portion of the Willow Creek coal deposit located at the Willow Creek property near Chetwynd, BC. WCC plan to apply for an amended Mine Permit to allow mining the entire deposit. The updated 2010 plan involves surface mining of Gething Formation coal seams and includes an expanded sequence of pits and expanded waste rock dump areas.

Agriculture and resource extraction are an accepted part of the regional economy. The Willow Creek Mine has already operated, and has a valid Environmental Assessment Certificate and Mine Permit. The mine plan presented in this study represents an expansion of the previously approved mine plans, and as such will require amendments to regulatory approvals

Environmental studies have been undertaken in support of a Mine Permit amendment application. No "fatal flaws" which might preclude mine development approvals, have been identified. Environmental management and regulatory issues which have potential to affect project scheduling as critical path items, and those which have the potential to impact costs significantly, are identified and mine design work and costs include consideration of these environmental issues. Overall, the environmental and regulatory environment for this project is favorable. Environmental management issues are generally typical of coal mines in Western Canada.

Based on updated economic and mine planning studies, the Willow Creek coal reserve has the potential to deliver 21.5 Mt of product coal, consisting of 7 Mt of hard coking coal (HCC) and 14.5 Mt of pulverized coal injection (PCI) coal from eight mineable seams.

The Willow Creek coal mine is a metallurgical coal deposit, located west of the town of Chetwynd in north-eastern British Columbia. The Willow Creek property incorporates Coal Lease #15, BC mineral tenure # 389294, and covers an area of 6,151ha. A location map is shown in Figure 6.1.

The majority of the seams occur in the Upper and Middle Gething, although some seams have been located in the Lower Gething Formation. Many of the seams are over 1m thick.

The coal resources within a pit limit based on an incremental cut-off strip ratio of 20:1 is used to determine the 'potential surface mineable resources'. The resultant pit delineated resources are given in the Table below. These resources are given in raw in-situ tonnes, and thus do not account for expected plant yields, mining loss or dilution.

Table 3-1 Resource Summary at 20:1 Incremental Strip Ratio

Category	In-Situ Coal (Mtonnes)		
	HCC+PCI	Oxide	Total
Measured	35.7	1.6	37.3
Indicated	11.5	0.1	11.6
Total	47.2	1.7	48.9
Inferred	0.3	0	0.3

Pit reserves are estimated based on detailed pit designs, within economic pit limits. These are shown in Table below

Table 3-2 Willow Creek Pit Reserves

Coal Type	ROM (kMTRC)	Clean Saleable Coal Reserves (kMTCC)
HCC	9,765	6,967
PCI	18,610	13,658
Oxide	1,263	915
Total	**29,634**	**21,541**

The pit slope design recommendations by Piteau are provided as suitable for Pre-Feasibility. Further pit slope Geotechnical work will be required for Feasibility design.

The Willow Creek mine plan is based on maximizing backfilling of mined out pits, with minimized external dumps. The North waste rock dump is designed to store approximately 286 million cubic metres of waste rock from the Willow Creek open pits, approximately 100Mbcm in external dumps with the remainder backfill into mined out pits. The waste rock dump design was evaluated for factors of safety for slope stability (static and pseudo static), flowslide runout, boulder rollout, and control of overland flow and seepage, and was assessed to be adequate.

Willow Creek is similar to other Rocky Mountain multi- seam operations and will be mined using truck and shovel methods with separate unit operations for coal and waste. Major mining equipment includes 311mm blasthole drills, 26m^3 hydraulic shovels, and 136 tonne haul trucks. This fleet configuration is proven in this mining application and provides the flexibility to mine in several pits concurrently. The mining unit operations include preproduction, drilling, blasting, coal loading and hauling, waste loading and hauling, pit maintenance, and waste dump resloping.

To ensure a workable operating plan, the main pit is divided into 10 pit phases for scheduling and mine development purposes. This allows for backfilling, evens out stripping requirements, and provides multiple coal products for market requirements. Sufficient external waste dump room is designed to meet waste mined volumes until mined out phases becomes available for in-pit backfilling.

Mine start up is based on a restart of the existing mine at the previous production levels. The initial startup will occur within the Central region of the mine similar to the mine plan from the previous operations. Mining will then progress generally from the North end of the property to the South end. This progression takes advantage of mining the lower elevation pits early to allow for increased backfilling. The production schedule sequencing is designed to provide a relatively consistent annual strip ratio and trucking requirements while maintaining the critical components of the mine development sequence. Mine development critical components are primarily driven by access, dump development and opening backfill capability prior to filling the North Slope dump.

The coal will be processed in the Willow Creek Coal Handling and Preparation Plant (CHPP). The Willow Creek CHPP requires upgrading to produce HCC from Willow Creek and to produce high-yield, low-ash PCI coal from the Brule and Willow Creek mines.

The Willow Creek Coal seams easily produce a low ash clean coal, except A0 & A2 which have a lower yield (approximately 50% at a 10% ash) and a slightly higher near gravity material. As indicated by the bulk sample washabilities, all seams including Seam A demonstrate that they have very little material at the probable cut point range from 1.5 to 1.60 S.G.

The coal Seams 1, 2, and 4 will produce hard coking coal when cleaned in the process plant and produce a low ash product in the range of 6 to 8 percent ash. Seams 3, 5, 6, 7 and 8 will produce a low ash PCI coal which can be sold in the coking coal market. This coal will have an ash range of 4 to 7%.

The previous Willow Creek coal preparation plant facility was designed to handle 450tph with a design flexibility that allows the operation to bypass raw coal feed material. For the expanded Willow Creek operation, and to accommodate coal from the Brule Mine, WCC will undertake the following upgrades:

- Replacing the existing roll crushers with a rotary breaker that will reduce fines generation, allow coarse rock to be rejected before the process plant and properly size the feed before processing.
- Adding plant feed screening, prior to feed entering the plant, at 6mm x 0 fines to bypass cleaning when fine coal quality already meets market specification.
- Increasing the plant throughput tonnage from 450t/h to 660t/h.
- Adding fine coal cleaning and dewatering equipment to increase fine coal cleaning capacity and improve efficiency.

The following are clean coal quality specifications for two products produced by Willow Creek Preparation plant after the proposed upgrades are completed.

Table 3-4 Willow Creek Clean Coal Indicative Specifications

	Hard Coking Coal	LV-PCI
Moisture (AR)	8%	8.50%
Volatile Matter (DB)	21.5-23.5%	15-16%
Ash % (DB)	8.00%	7.00%
Sulphur	0.60%	0.57%
Calorific Value (GAR)		7340
Fixed Carbon		77%
Free Swelling Index	6-8	1
Mineral Matter Reflectance	1.32	
D D P M	30	
Vitrinite %	59	
C S R	75	
Phosphorus in Coal	0.05%	0.03%
Hardgrove Grindability Index		68

Primary road access to the plantsite area is via Highway 97, an all-weather paved highway, and 3km of the Willow Creek Forest Service Road, an all weather gravel industrial road. CN Rail provides direct access to the Port of Vancouver, B.C. and the Ridley Island Coal Port at Prince Rupert, BC. Existing power lines deliver power off of the BC Hydro grid to site via a 25 kV line. An allowance has been included in Offsite Development costs for an upgrade to the power supply.

Major site infrastructure will include the Mine Maintenance Facility, Office Complex, Warehouse, Laboratory, Coal Handling and Preparation Plant (Washplant), and Washroom Facilities and Dry. Separate from the Willow Creek project, a maintenance facility for coal haulers from Brule will also be located at Willow Creek.

At mine closure a significant portion of the resloping and reclamation work will have already been completed. The mine dump development sequence has been scheduled to accommodate continuous reclamation of dumps along with direct placement of salvaged soils as they become available. The last soil stockpile to be salvaged at mine closure will be located on the top of the West dump. Final reclamation of areas above the active coal haul route will be re-sloped after mine closure.

At completion of mining, any unfilled pits will be allowed to fill with water from surface runoff and groundwater, forming ponds. Overflow will decant to the watercourses established by the mine closure water management plan. Typically the pit walls will not be re-sloped.

The capital costs associated with expanding the Willow Creek open pit coal mine is $294 million. This cost is sub-categorized in the following Table:

Table 3-5 Initial Capital Cost Summary ($millions)

	$ Millions
Offsite Development	10.00
General and Site Services	2.50
Preproduction Mine Operations	8.36
Mine Development and Infrastructure	29.34
General Site Infrastructure	6.01
Washplant Expansion	19.70
Mining Mobile Equipment	161.89
Indirect	56.46
TOTAL	**294.26**

Indirect costs include project in-directs, Owners Costs and Contingencies

These costs are exclusive of spending prior to 2010.

WCC completed a cash flow analysis for the Willow Creek Project. Key metrics of the Base Case scenario are set out in the following Table:

Table 3-6 Project Values and Benefits

Metric	Value/Amount
Mine life, years	14
Product coal, millions MTCC	20.6
Strip ratio, BCMW/MTCC	11.9
Long Term Pricing	
HCC, USD per tonne	$150
PCI, USD per tonne	$120
FX rate, USD/CAD	0.95
On-site cost, CAD/MTCC	$57
FOB port cost, CAD/MTCC	$85
Capital, millions CAD	
Mobile mining equipment	$210
Infrastructure & other	$110
Contingency	$32
NPV_{10}, millions CAD	$151
IRR, %	26
Payback period, years	5

*Capital includes Initial and Sustaining

4.0 Introduction

4.1 Terms of Reference

This report is prepared by Moose Mountain Technical Services Ltd. (MMTS) for Western Coal Corp. (WCC) and the Willow Creek project owned by Willow Creek Coal Partnership, a wholly-owned direct and indirect subsidiary of WCC. The purpose of the report is to provide a Technical Report that adheres to Canadian NI 43-101 standards set by Canadian security regulators. This includes an estimate of resources prepared in accordance with current reporting standards including the geology of the property, the exploration history, and the modeling techniques that formed the basis for resource estimation and the technical and economic basis for a viable and sustainable operation.

MMTS's work in preparing this Study is based on information provided by WCC, public domain documents, budgetary service and supply costs and work carried out by others. Included in the work by others are evaluations and predictions of future coal prices. MMTS used information from these parties where it was reasonable.

Further information or evaluation of other documents should be sought directly from the parties involved. Because of the forward looking nature of the future costs, prices, and other financial parameters on project economics, Reserves estimates and financial results are estimates based on the input assumptions as stated. MMTS does not warrant any implied or inferred accuracy to future cost and price information or assumptions used in this study.

Unless otherwise stated all units within this report are "International System of Units" or SI the modern metric system adopted by the Canadian Standards Association (CSA). A glossary and a list of abbreviations and acronyms are included in Sections 25.16 and 25.17.

Unless otherwise noted all currency is in Canadian dollars designated as $ or CAD.

This Technical Report is an abridged version of the full Prefeasibility Study report on file with WCC. All Table of Contents and Figure and Table numbering systems have been left consistent with the full PFS report.

Several specialty consultants provided background data and information and the results are compiled by MMTS. The main technical areas referred to in the report are prepared by:

- Moose Mountain Technical Services - Geology Resource Modeling and Mine Planning.
- Taggart - Coal Metallurgy and Plant Design
- WCC - Marketing, Infrastructure, Financial Modeling.
- Piteau Associates - Geotechnical, Pit Slopes, and Hydrogeology
- SRK – Environmental
- Norwest Corp. – Geotechnical Dump Design and Water Management

Assessment reports from previous exploration programs have provided the details on the geology of the property. Various contributors to this report have gathered their own data, with details in the appropriate sections of the report. A complete list of references is listed in Section 23.0.

Addition technical and costing information has been gathered from regional and local sources for supply of construction and services for the operations. Where possible, local contractor, operating supplies, labour rates, and services have been provided through budgetary quotes.

4.2 Site Visits

Mr. R.J. Morris, M.Sc., P.Geo. of MMTS completed site visits in August 2005 and July 2006, which included reviewing drillhole logs, previous reports, and geological mapping in the 7 Pit area. This led to new drilling, interpretation, modeling and mine planning in 2006. Another site visit from September 30 to October 2, 2008 by R.J. Morris as well as others from MMTS, and the additional drilling in 2007 and 2008 resulted in further updates to the interpretation, modeling and mine planning in 2008.

Mr. J.H. Gray of MMTS completed site visits on July 18th and 19th 2006, April 4th 2007, and again on September 30th and October 1st, 2008 to review the status of the site.

Mr. Mark Zik of Taggart completed a site visit on June 3rd 2010, to do an inspection of the existing preparation plant and to observe the coal feed to the plant.

5.0 Reliance on Other Experts

Portions of the material in this report were originally reported in the Technical Report, "Resource and Reserve Estimate for the Willow Creek Coal Mine Property" November 19, 2007 which in turn referenced previous work including: Geology, Modeling, and Mine Planning by Norwest and resource modeling by Mintec. MMTS has based their work on the work of these others but has reviewed the data and methodologies for the current work and updated and revised as noted in this report. In Section 19.2 Data verification and update, a summary of the verification is reported.

Contributors
MMTS was commissioned to compile the work and complete the report for the study. Specific work areas by responsibility include:

Moose Mountain Technical Services Ltd.

- Review the existing exploration data
- Compile a drillhole database
- Prepare a three dimensional block model
- Provide an estimate of coal resources and reserves that conform to NI 43-101 current reporting standards and procedures
- Provide economic pit limits and detailed pit and waste dump designs
- Provide end of period mine plans
- Provide a life of mine production schedule
- Details of MineSight Infrastructure
- Provide detailed capital and operating costs for mine development and mine operations
- Prepare a Prefeasibility Report

Piteau Associates

- Geotechnical assessment
- Development of slope design parameters for open pits and waste fill structures

Norwest Corporation

- Environmental field investigations and baseline studies
- Development of design parameters and constraints for waste fill structures (backfill and external waste dumps)

Taggart

- Material handling flow sheet design
- Preparation plant flow sheet design
- Review of provided coal washability data (#1 to #8 seams from 1994 and 1996 sampling as well as Brule Mine data from 2004 sampling) for the purpose of coal plant design

WCC

- Air and Water Quality Studies
- Permit Application
- Community Relations and Socio Impact Studies
- Regulatory Affairs
- Develop Financial Analysis

6.0 Property Description and Location

6.1 Location

The Willow Creek coal mine is a metallurgical coal deposit, located west of the town of Chetwynd in northeastern British Columbia. The coal lease is within the Pine Pass area in the Peace River District of northeast British Columbia (see Figure 6-1 Location Map). The coal lease crosses the Pine River Valley approximately 45km west of the town of Chetwynd, with the majority of the lease situated on the south valley slope. The approximate centre of the license area is located on NTS Map 93O0-9E at longitude 122° 17' west and latitude 55° 36' north."

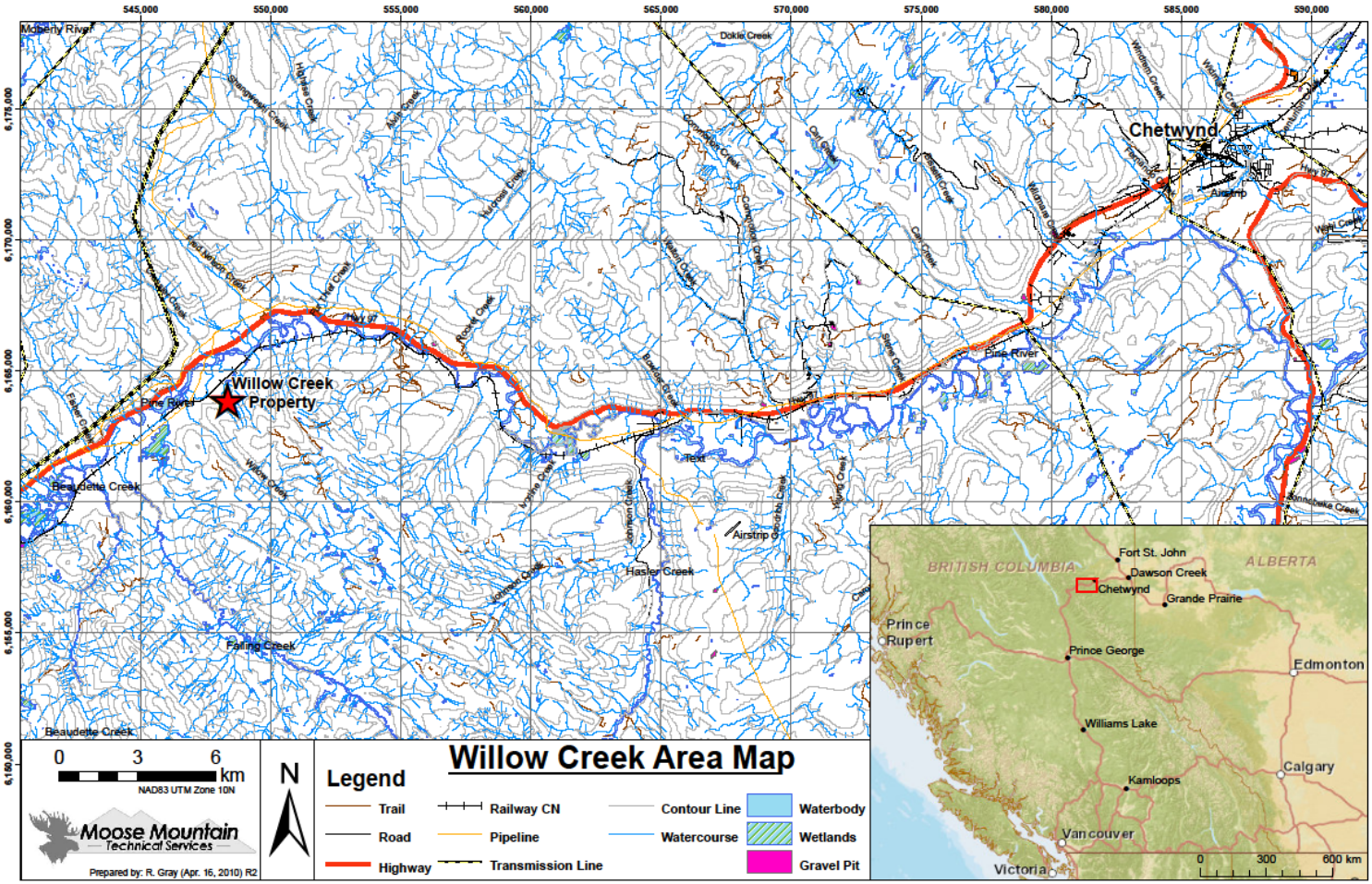

Figure 6-1 Location Map

6.2 Ownership and Tenure

The Willow Creek Coal Mine is owned by Willow Creek Coal Partnership, a wholly-owned direct and indirect subsidiary of Western Coal Corp. Willow Creek Coal Partnership is a successor company to Falls Mountain Coal Inc. which was acquired by Western Coal Corp. from the previous owner, and was a wholly owned subsidiary of WCC at the time of reorganization. Numerous quotations and historical references will be made to Falls Mountain Coal Inc. in the following descriptions.

The coal property containing the Willow Creek Coal Mine is Coal Lease #15, comprised of what were originally 21 crown coal licenses and covering an area of 6,151ha. This lease is recorded as Tenure number 389294 with the register of mineral titles in British Columbia. All resources and reserves are contained within tenure 389294. See Figure 6.2.

The mine plan addresses the central portion the Willow Creek Property, known as Willow North and Willow Central. The lease covers the surface exposures and near subsurface extensions of the Gething Formation units on both limbs of the Pine Valley Anticline; it thus encompasses the Willow West and South Blocks as well as Willow North and Central. The location of this tenure and other nearby WCC coal licenses is shown on Figure 6-2 Land Tenure.

WCC has additional coal licenses and leases in the area between the Sukunka and Pine Rivers, totalling more than 21,000 ha and including the Burnt River property which hosts the active Brule coal mine. As part of the terms of the agreement with Pine Valley Mining Corp. (PVMC) to acquire Falls Mountain Coal, a royalty will be payable to PVMC of C$1.00/tonne, escalating at 2% per annum from 2007 to a maximum of C$1.50/tonne on all coal loaded through the load-out at Willow Creek, up to a maximum total royalty payment of C$26 million. There are no other known royalties, rights or other payments to which the Willow Creek property is subject.

Reclamation bonds totalling $2.0 million are in place with the BC Ministry of Energy, Mines and Petroleum Resources (MEMPR). An additional $0.25 million is scheduled for payment 30 days after restart of pit operations, followed by tranches of $1.0 million twelve months after restart, $1.25 million twenty-one months after restart, and $1.0 million thirty-three months after restart, bringing the total to $5.5 million. Additional bonding requirements will likely be added at the time of approval of the amendment to permit mining in the northern portion of the deposit.

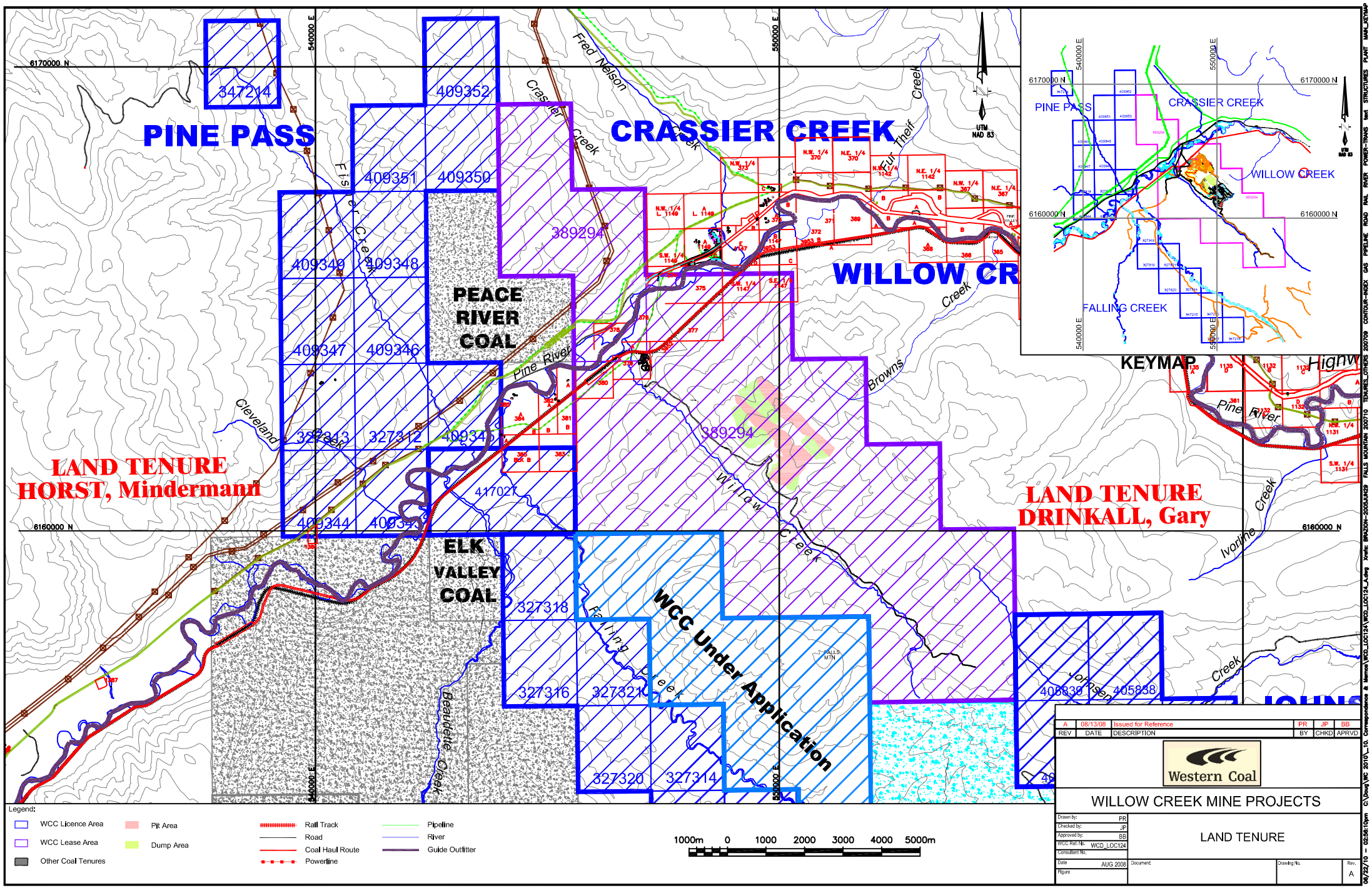

Figure 6-2 Land Tenure

7.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

7.1 Access

The following sections have been adapted from Norwest, 2005:

> The Willow Creek coal property is located within the Pine Pass area in the Peace River District of northeast British Columbia. The coal lease straddles the Pine River valley approximately 45km west of the town of Chetwynd, with the majority of the licenses situated on the south valley slope. The approximate centre of the license area is located on NTS Map 93O/9 at longitude 122° 17' west and latitude 55° 36' north."
>
> Primary road access to the general area is via Highway 97, which is an all-weather paved highway connecting the Peace River District with the central interior city of Prince George, B.C. Near the property, the highway is located along the north bank of the Pine River Valley. The Willow Creek Forest Service Road branches off Highway 97 and crosses the Pine River, providing access to the coal reserve areas of the Willow Creek block. Access within the Willow Creek portion of the property is currently via the Willow Creek Forest Service Road, mine haul roads and exploration roads.
>
> CN Rail operates a rail line through the Pine River valley to service the Peace River District. The rail provides access to the port of Vancouver, B.C. and to the Ridley Island Terminals coal port at Prince Rupert, B.C. In the vicinity of the Willow Creek minesite, the line lies on the south side of the Pine River, where a siding has been constructed for loading and transporting coal shipments to market.

7.2 Climate and Length of Operating Season

The climate of the region may be classified as northern temperate. Daily temperatures range from a mean maximum of 7°C to a mean minimum of minus 6°C, with a mean daily temperature of 1°C. Extreme temperatures range from a maximum of 32°C to a minimum of minus 48°C. The average annual number of days with frost is 210.

The mean total precipitation in the region is approximately 425mm, which includes the rainfall equivalent of a mean snowfall of 165cm. The average annual number of days with measurable precipitation is ninety-five. The greatest recorded rainfall in twenty four hours is 66.5mm.

7.3 Local Resources and Infrastructure

Some of the requisite infrastructure for Willow Creek is in place, including the rail load-out facility and site access. The transition to mining HCC and larger scale self mining requires significant infrastructure improvements to ensure the planned low cost operation.

Willow Creek has marginal power available for the current facility and inadequate for the planned operation. The existing supply is a 25KV power distribution line from Chetwynd (circa 50km). Agreement is required from BC Hydro to supply increased power (from previous levels of 1.5MW) to 6MW. Upgrade of site power facilities will also be required. An allowance is included in this study for an upgrade. At present there is no plan to use electric drills and shovels at Willow Creek. A more significant upgrade would be required for this.

7.4 Physiography

The property is situated in the Rocky Mountain Inner Foothills physiographical region. It is characterized by relatively low, rounded, northwest-southeast trending ridges and valleys, and is dissected by the 1.5km wide Pine River Valley. The elevation difference relative to the Pine River Valley, within the license area, is approximately 670m. Elevations range from 627m along the Pine River Valley to 1,300m along the eastern property limits. The Pine River watershed cuts across and drains the property. In addition, glaciation appears to have had a large influence in shaping the topography of the license areas.

The property is forested by jack pine and minor spruce. Poplar stands occur in low areas such as the Pine River Valley, and in wet areas adjacent to creeks and seepages. Most of the forested terrain may be classified as open forest, i.e., with little or no underbrush. The exceptions are the wet areas where willows and devil's club are common.

7.5 Geohazards

There are no identified regional geohazard issues.

8.0 History

The following is from Norwest, 2005:

> "Coal was discovered in the Peace River District of British Columbia during Alexander Mackenzie's overland journey to the Pacific some 200 years ago. The first coal licenses were granted in 1908, but owing to the remoteness of the area, it was not until the 1940's that the coals were exploited.
>
> From 1946 to 1951, the Coal Division of the British Columbia Department of Lands and Forests conducted coal exploration in the Pine River area of the Peace River District in anticipation of the construction of another major rail route through the Rockies. The work concentrated on three areas: Willow Creek, Noman Creek, and Falling Creek.
>
> As a result of the work completed by the British Columbia Department of Lands and Forests in the 1940's and 50's, which included trenching and 39 diamond drillholes, the Willow Creek area has been the subject of various exploration programs in the 1970's and 1980's. In 1973, the Pine Pass Coal Company drilled 5 diamond holes at the headwaters of Willow and Johnson creeks. Although the drilling confirmed the presence of thick coal seams in the Gething Formation at this locale, the perceived structural and stratigraphic problems precluded further drilling in the area.
>
> In addition to the Pine Pass Coal Company, the only company to test drill the Gething Formation in the Willow Creek area was Semper Resources/David Minerals in 1980 and 1981. The Semper Resources/David Minerals Ltd. exploration program at Willow Creek comprised 42 trenches and 45 diamond drillholes. In 1981, Semper Resources amalgamated with David Minerals Ltd. to further develop the Willow Creek Project. Subsequent to this, Kilborn Engineering Ltd. was commissioned to complete an underground mine engineering feasibility study. Environmental studies were completed and the project progressed to Stage 2 of the Mine Development Review process. The exploration work that was completed at that time formed the basis for the later programs conducted by Pine Valley Coal Mining Corporation; some of those results are incorporated into the present database. Besides the drillholes and trenches, the 1981 work of importance includes an airborne topographic survey and supporting ground surveys, construction and upgrading of drill roads and trails, construction of a bridge across the Pine River, and the geological mapping of extensive portions of the north, central and south blocks.
>
> In 1992, Globaltex Industries Inc. (Later called Pine Valley Mining Corporation) acquired the original 14 coal licenses comprising the Willow Creek Coal Project and proceeded with a surface mining review completed by MDF Mining Consultants Ltd. Globaltex continued from that time to expand and develop the property, and conducted a drill exploration program in 1994. The property size has also been increased to its present status of one coal lease (Lease #15), comprised of 21 coal licenses and an additional 15 coal licenses, all of which are shown in Figure 6-2 Land Tenure.

> In February 1996, Globaltex was joined by Mitsui Matsushima Canada Ltd. and BCR Ventures (BC Rail) in ongoing efforts to develop the property. Pine Valley Mining Corporation was formed to represent the collective interests of the participants and to act as operator. Major drillhole exploration programs were conducted by the joint venture in 1996 and 1997. Subsequent to the 1999 Final Feasibility Study conducted on the Willow Creek Property, Globaltex purchased BCR Venture's interests in the project in January of 2001.
>
> During the period September 2001 to March 2002 a total of 84,000 tonnes of coal was mined from the Willow Central area for the purposes of test burning by a major Japanese steel producer. Globaltex Industries Inc changed its name to Pine Valley Mining Corporation on 14th May, 2003. In January 2004 Pine Valley Mining purchased the one-third share of the Willow Creek project owned by Mitsui Matsushima Canada Ltd.
>
> In early 2004 Pine Valley Mining Corporation committed to develop the Willow Creek Mine. Construction of the Willow Creek plantsite commenced in July 2004 and mining commenced in late July 2004. Construction of the raw coal handling facilities including crushing plant, stockpile and reclaim system, rail siding, rail loading system and environmental control works were completed in February 2005."

Construction of a coal washing plant commenced in April 2005 and the plant was commissioned in December 2005. Coal sales of un-washed Low Volatile PCI coal started in September 2004 and the coal washplant started in November 2005.

In October 2006 the mine ceased operations after Pine Valley Mining Corporation and its subsidiaries went into Companies Creditors Arrangement Act (Canada) (CCAA) protection. Falls Mountain Coal Inc. was acquired out of receivership in mid-2007 by Cambrian Mining Plc, former parent and now wholly owned subsidiary of WCC. As operator, on behalf of Cambrian, WCC conducted drill programs in 2007 and 2008 and undertook significant site upgrades and plant improvements preparatory to restart in late 2008. With the advent of the global financial crisis in 2008, the restart was aborted and the property was on care and maintenance until April 2010. WCC acquired Falls Mountain Coal Inc. from Cambrian in 2008 and, in 2009, merged with Cambrian.

Late in 2009, WCC undertook drilling for confirmation of coal quality in the initial mining areas of the North pits. Analytical work, including seam quality, seam washability and composite washability results were received too late for full incorporation in this report, but were reviewed and found to broadly confirm previous coal quality analysis. Coal carbonization tests on composites of these materials are scheduled for later in 2010.

9.0 Geological Setting

9.1 Introduction

The following three sections are adapted from Norwest, 2005:

> "The Cretaceous sediments of the northern Foothills were deposited along the western margin of the Western Canada Basin in a series of transgressive-regressive cycles during the Columbian Orogeny. Environments of deposition varied laterally and vertically from marine through prodeltaic and near shore, to delta plain and alluvial. Lithologies include mudstone, siltstone, sandstone, conglomerate and coal.

9.2 Regional Geology

9.2.1 Stratigraphy

The WCC Property is underlain by the Jurassic-Cretaceous Minnes Group, and the Lower Cretaceous Bullhead and Fort St. John Groups. The Geological Survey of Canada (GSC) classification of the Upper Jurassic, Lower Cretaceous strata has been adopted in this report. A stratigraphic column is shown in the Figure below.

Series	Group	Formation	Approximate Thickness (m)
Lower Crestaceous Transitional	Fort St. Johns	Hulcross	90-120
		Boulder Creek	80-110
		Gates	80-200
		Moosebar	150-300
	Bullhead	**Gething**	350-550
		Cadomin	125-250
	Minnes	Bickford	300-500
		Monach	150-225
		Beattie Peaks	250-300
		Monteith	350-450
Jurassic	Fernie	Fernie	-

Figure 9-1 Stratigraphic Column

The oldest unit mapped on the property to date is the Cadomin Formation, which further to the south, has a distinct lithology that allows it to be formally referred to as the Cadomin Conglomerate. Conformably overlying this formation is the principal unit of economic significance, the Gething Formation. This formation contains the nine seams that are the subject of the present study, Seam 1 through 8 and Seam A. Both of the previously mentioned formations constitute the Bullhead Group.

Overlying the Gething Formation is the Moosebar Formation, which is marine and the youngest unit of the Fort St. John Group. This is a thick and prominent marine shale unit which is a glauconite rich, sometimes conglomeratic or sandy member, named the Bluesky. Conformably overlying this are the other formations of the Fort St. John Group which in this area, include in succeeding order, the Gates, Boulder Creek and Hulcross Formations. Coal seams occur in the Boulder Creek Formation, but the development of these seams is not as significant as that of the Gething Formation. They have not yet been

studied in sufficient detail to determine if they have economic significance for this coal property."

"The non-marine Gething Formation, also of the Bullhead Group, conformably overlies the Cadomin Formation, and underlies the Bluesky Member of the Moosebar Formation. It consists of multiple fining upward cyclothems that strongly suggest a fluvial to deltaic environment. The Gething Formation is distinguished from the coal bearing Bickford Formation, which underlies the Cadomin Formation, by its greater proportion of shale and numerous coal seams, and also by its greater proportion of plant fossils. It consists of dark grey mudstone; siltstone; lithic, very-fine to coarse-grained sandstone; carbonaceous, silty and sandy mudstone; coalified plant debris; minor bentonite; black shale; occasional minor tuffs in the upper part; minor conglomerate; and coal. Below the Bluesky Member, the Upper Gething is made up of distinctive, interbanded, dark grey mudstone and lighter grey siltstone approximately 30 to 40m thick. The sandstone in the upper portion of the formation contains pebbles and coal stringers. These units are cross-bedded, bioturbated, and show evidence of soft sediment deformation. Fossil bivalves and worm burrows are also found in some parts of the formation. The formation is 500m thick in the Peace River Canyon, and is 420m thick at Willow Creek.

In the Gething Formation, coal seams have been drilled and trenched throughout the whole of the Willow Creek Property. The majority of the seams occur in the Upper and Middle Gething, although some seams have been located in the Lower Gething Formation. Many of the seams are over 1m thick."

An approximate stratigraphic section for the pit areas in this study is shown below.

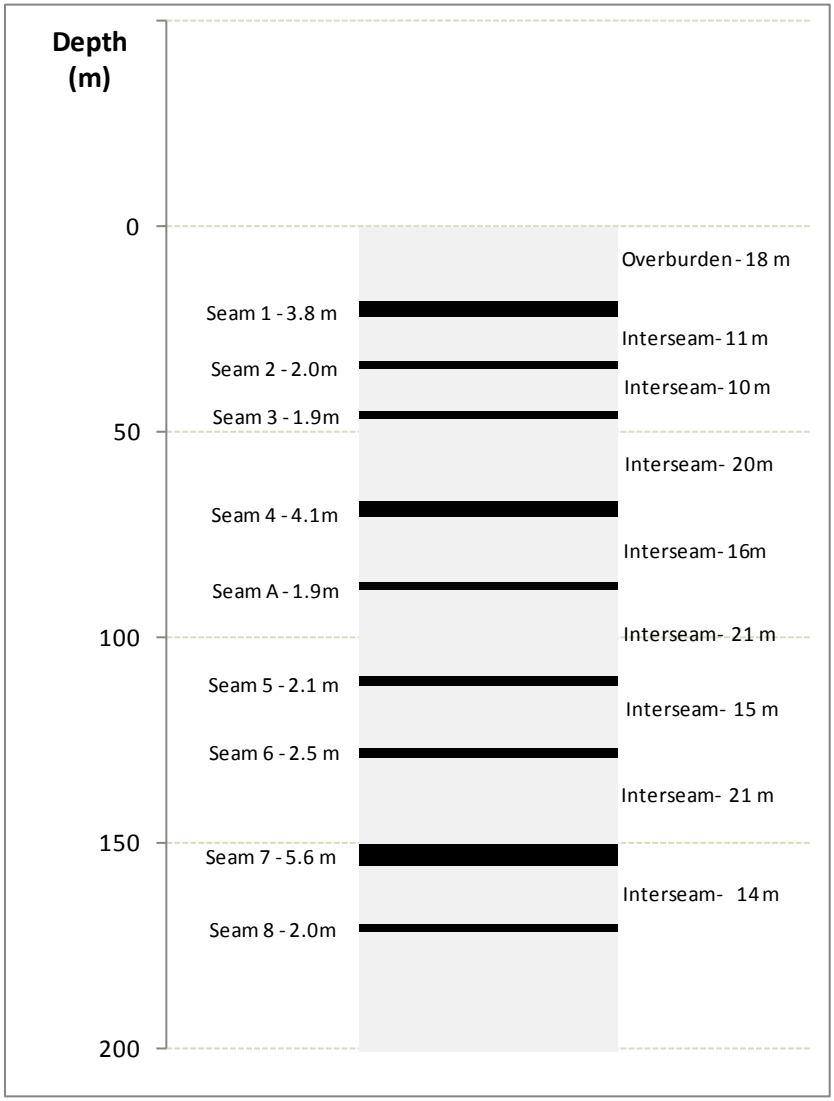

Figure 9-2 Mineable Coal Seams - Average Stratigraphic Column

Note: Seam and Interburden thicknesses are an average of all composites within the model bounds (seams>1.0m, Interburden>3.0m)

9.2.2 Structure

"In the Pine Valley area, the coal bearing strata are exposed in a series of northwesterly trending folds that are cut by thrust faults. Deformation during early Campanian to late Eocene time was characterized by high lateral compressive stresses that had a near-horizontal orientation. Depth of burial was not excessive, resulting in brittle to semi-brittle styles of deformation.

Large sheets of strata became detached during deformation and were displaced to the northeast along thrust faults. These thrusts generally have staircase geometry, with wide flats almost parallel to bedding, connected by narrow ramps oblique to bedding that cut up-section toward the northeast. The tendency is for the faults to be sub parallel to bedding in incompetent rocks such as coal, mudstone and shale, and to be more oblique to bedding in competent lithologies such as sandstone.

Deformation tended to migrate northeastward across the region, and as a rule, the lower or more external of any two thrusts is the younger. Comparatively little folding preceded faulting; consequently thrusts tended to develop in essentially horizontal strata. As movement occurred along a thrust, its staircase geometry caused folding in the overlying strata and older thrust faults. Because of this folding, an older thrust may dip either southwest or northeast, although the overall movement of the plate of strata remains northeastward.

Concentric folds, angular folds and box folds are typical fold geometries. The dip of fold limbs can vary from nearly horizontal to overturned, but is usually in the range of 20° to 50°. Fold axes trend northwesterly. Plunge oscillates between northerly and southerly over the length of a large scale fold and is usually shallow, but can steepen locally to as much as 35°. The major folds persist for large distances, in several cases more than 50km, and usually have an en echelon alignment."

Illustrations showing typical structural styles for the Willow Block are presented in the Figure below.

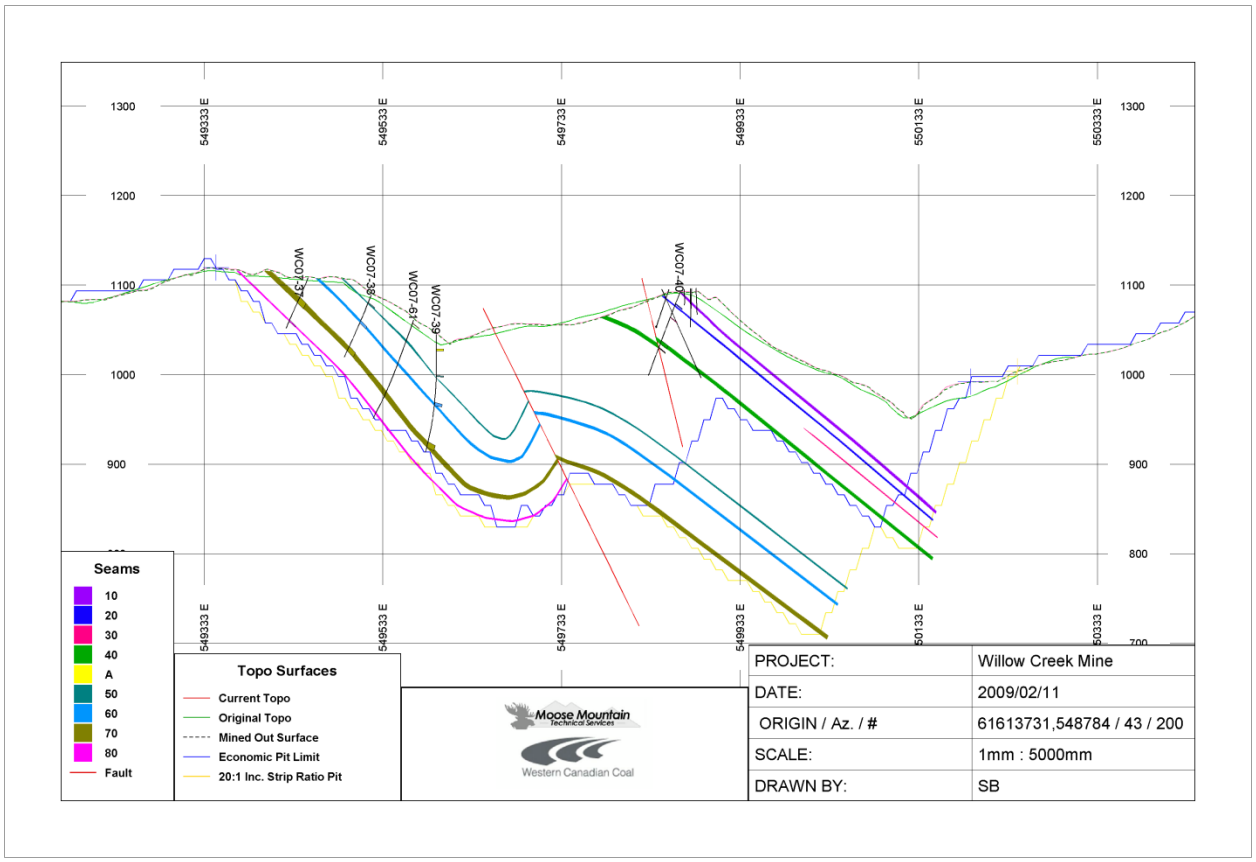

Figure 9-3 Typical Structural Styles for the Willow Block

> "Concentric folds are roughly U-shaped, and in concentric folding both the competent and incompetent layers can maintain a constant thickness throughout the structure.
>
> Chevron folds are V-shaped, with relatively short hinge areas and straight limbs. Strain in the hinge zone is usually accommodated by limb faults, the development of bulbous hinge zones, or boudinage of incompetent layers. The latter can produce localized tectonic thickening and thinning of coal seams. Examples of all of these features have been found associated with chevron folds on the Western Coal/Cambrian Mining plc Property, but have been simplified for portrayal on the cross sections.
>
> Box folds are characterized by a broad, nearly flat crest, flanked by steeply dipping limbs. The plates of strata that form the top and limbs tend to be largely undeformed, but the abrupt hinge zones often exhibit some of the small-scale structures that are associated with the hinge zones of chevron folds."

A plan view and typical sections at Willow Creek are shown in the Figures below.

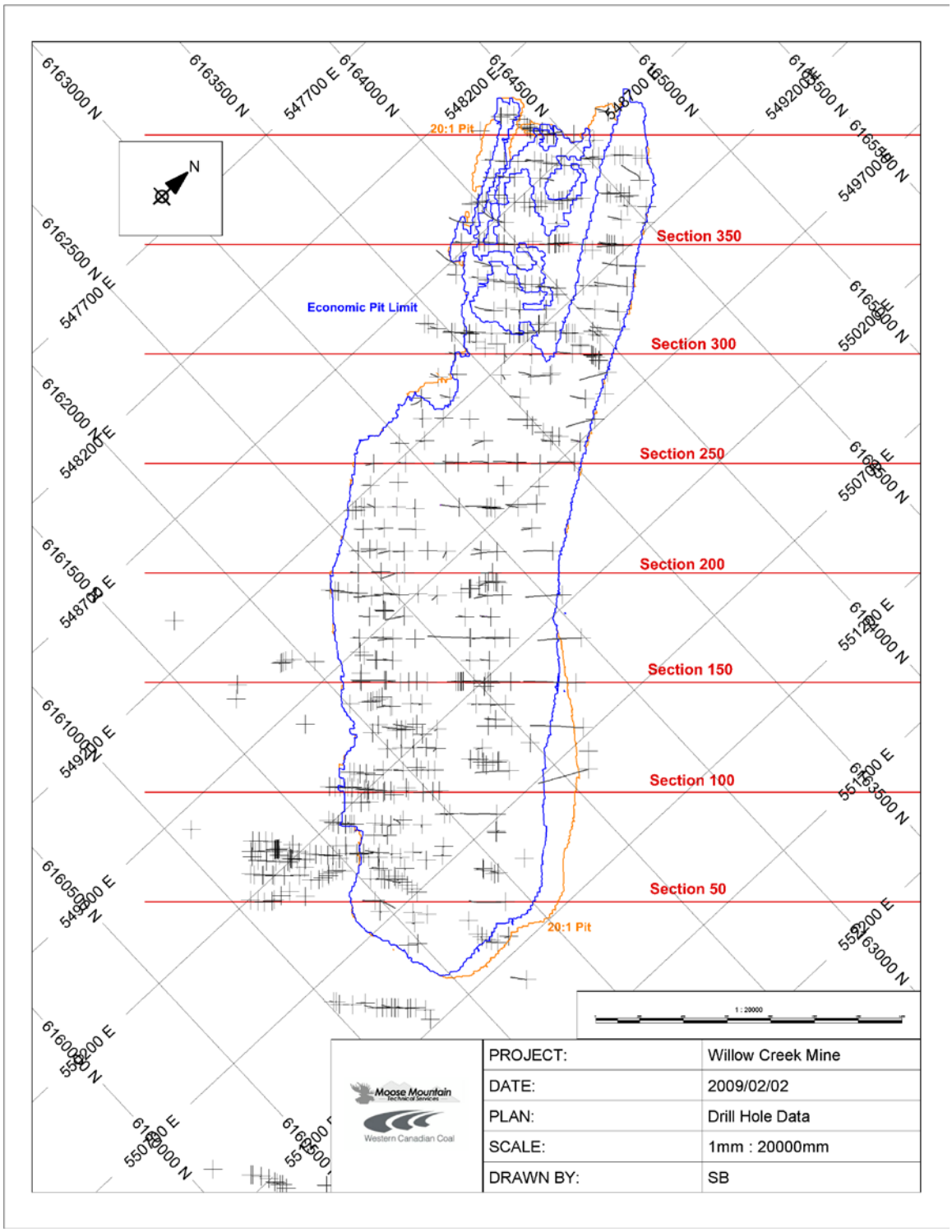

Figure 9-4 Drillhole Collars, Pit Outlines and Section Locations

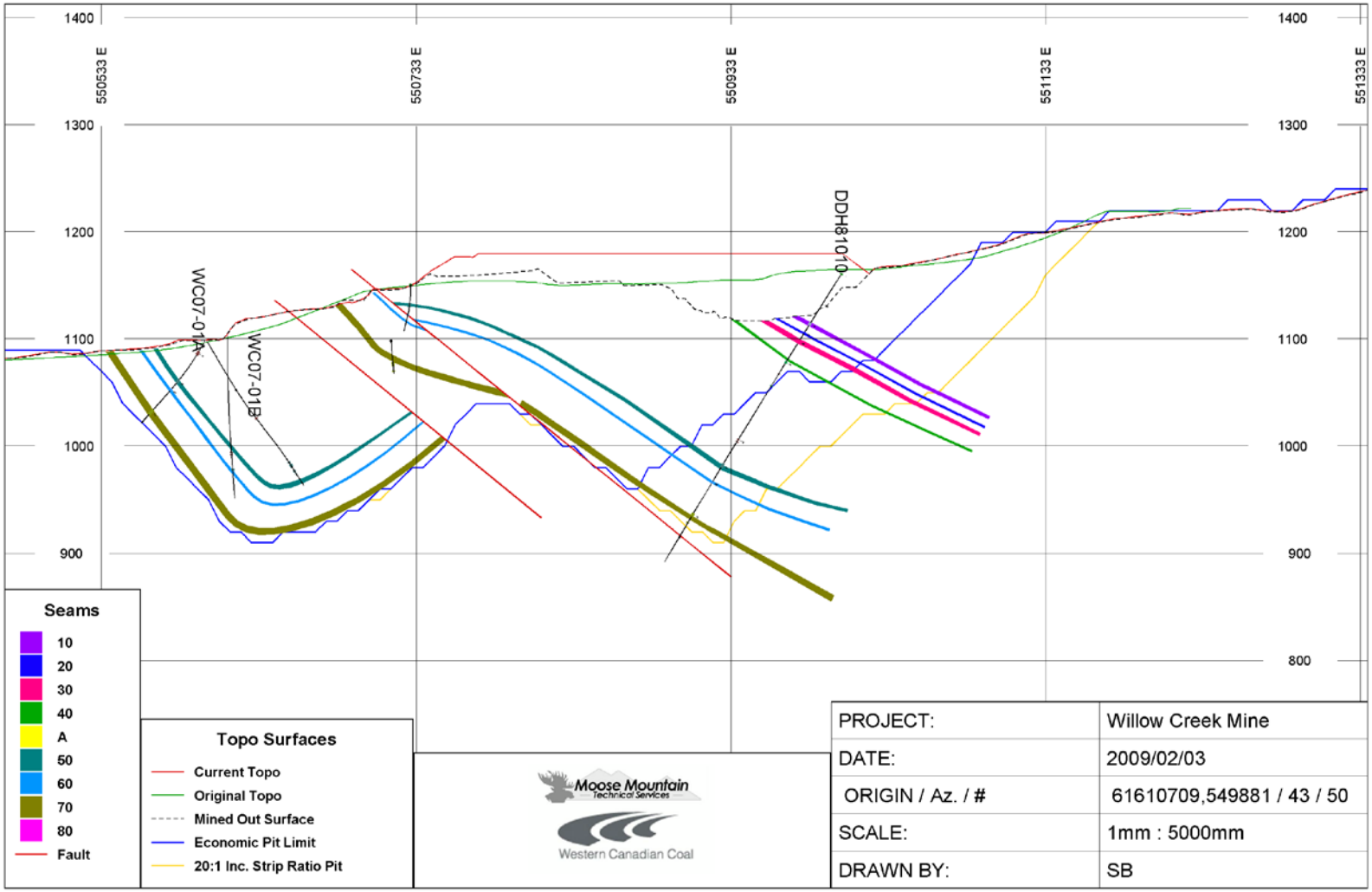

Figure 9-5 Cross-section: Non-orthogonal Section 50

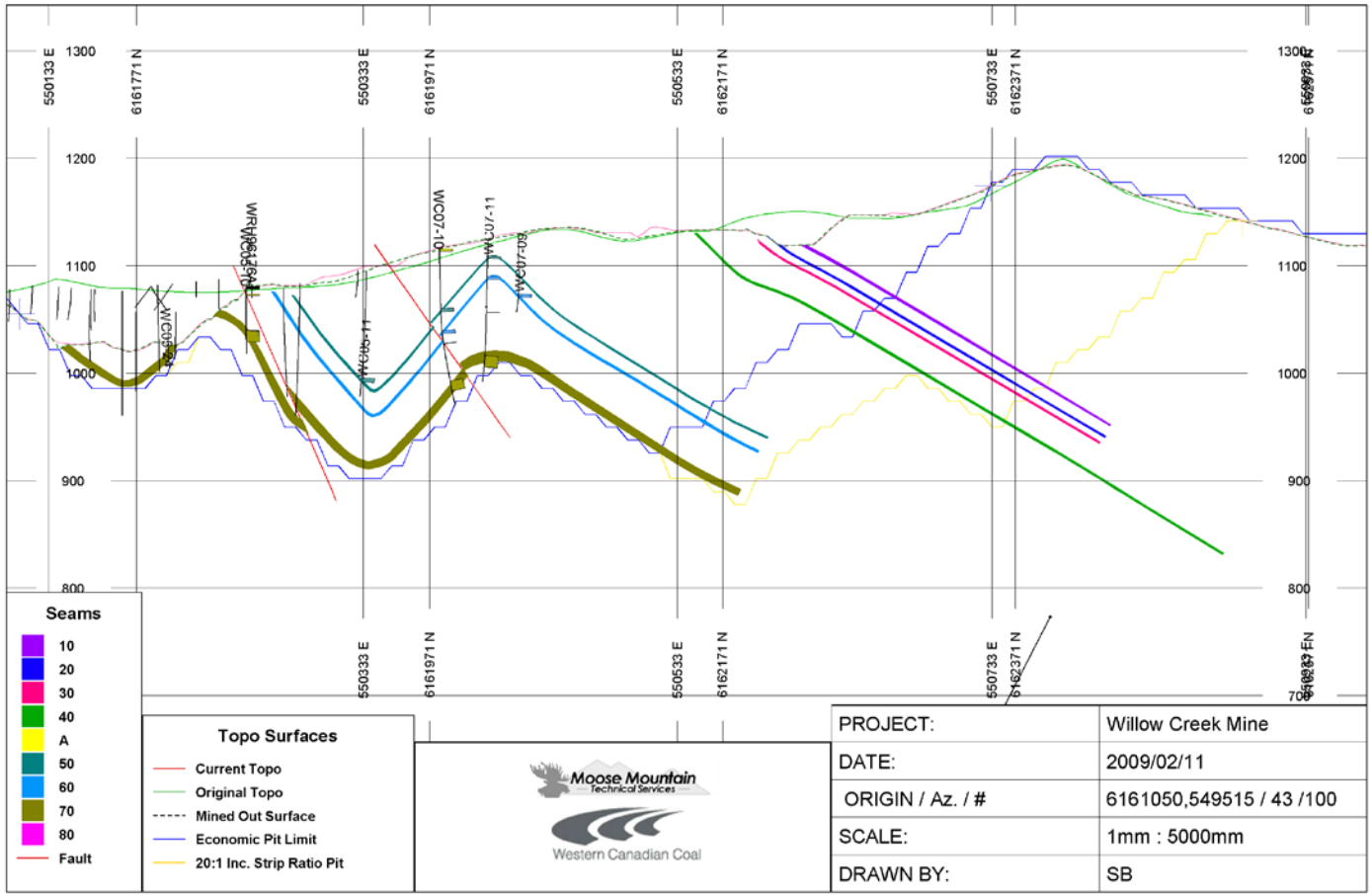

Figure 9-6 Cross-section: Non-orthogonal Section 100

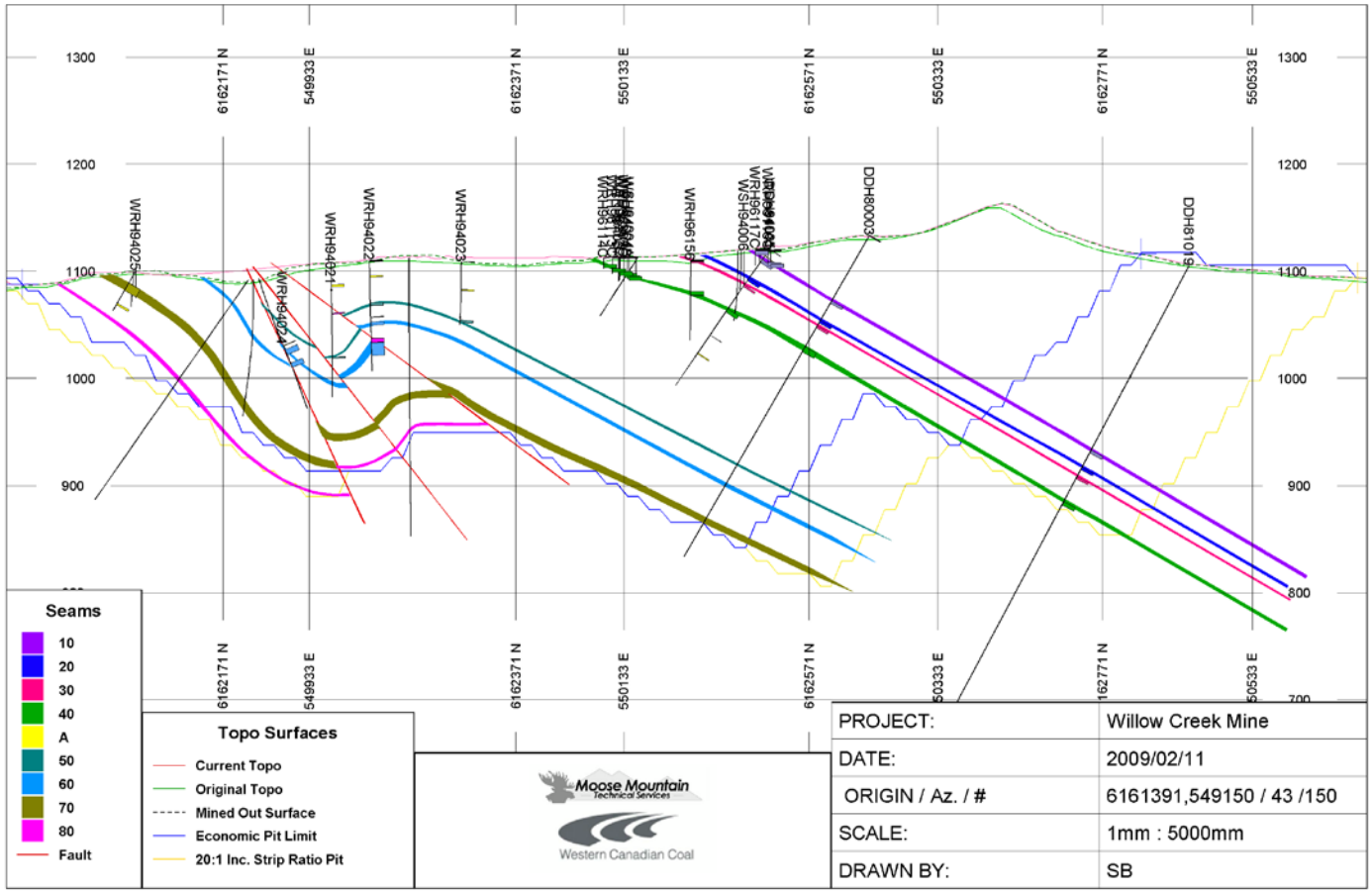

Figure 9-7 Cross-section: Non-orthogonal Section 150

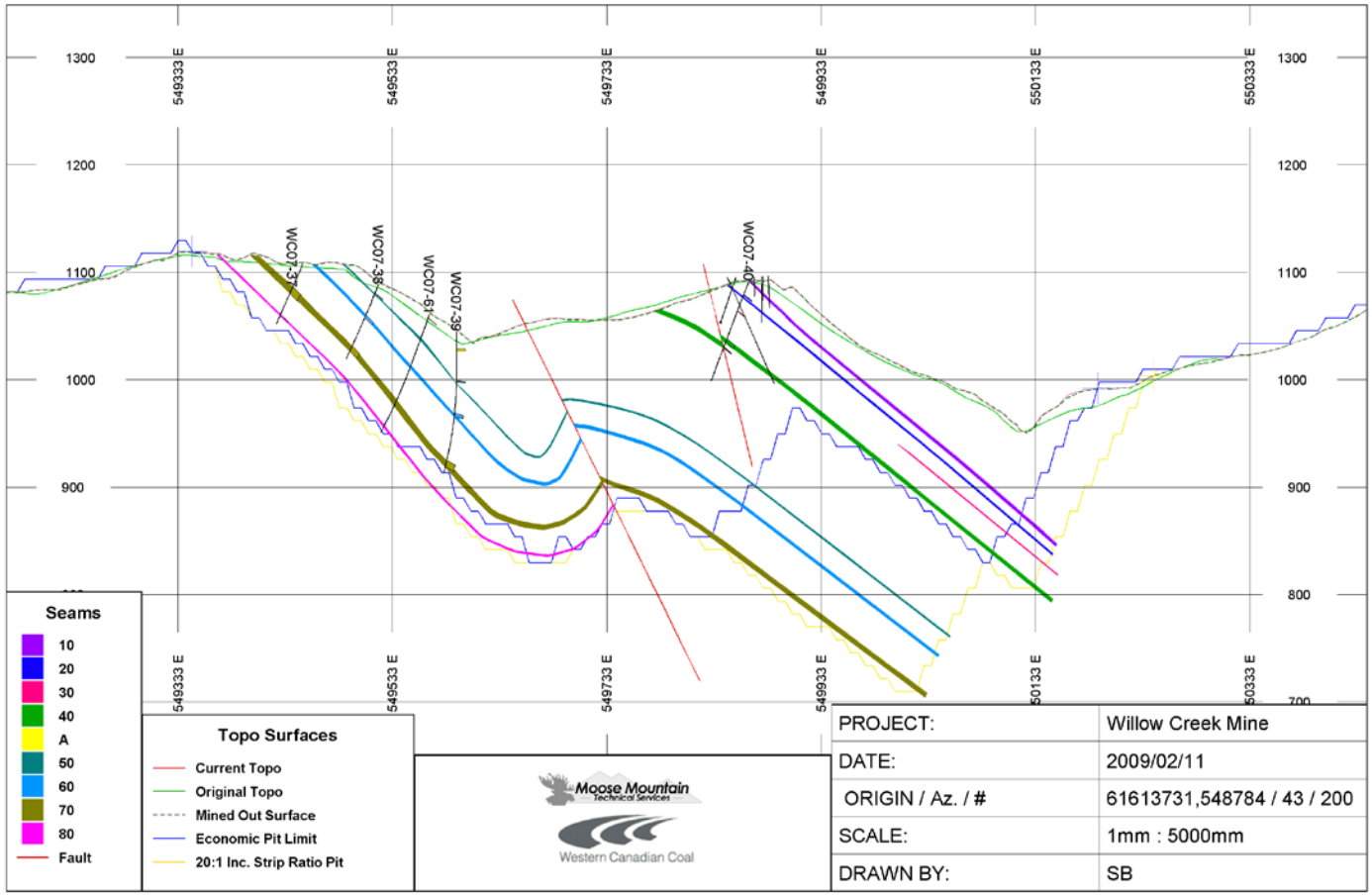

Figure 9-8 Cross-section: Non-orthogonal Section 200

9.3 Local Geology

The Willow Creek Property has been subdivided into four structural blocks: Willow North, Willow Central, Willow South and Willow West. Of these, the Willow North and Willow Central blocks, which are the subject of this study, are located along the ridge on the northeast margin of the property, immediately south of the Pine River."

10.0 Deposit Type

The following description is adapted from Norwest, 2005:

> "The definition of "Deposit Type" for coal properties is different from that applied to other types of geologic deposits. For coal deposits this is an important concept because the classification of a coal deposit as a particular type determines the range of values that may be applied during the estimation of Reserves and Resources.
>
> As specified in Geological Survey of Canada Paper 88-21, which is a reference for coal deposits as specified in NI 43-101, coal "Deposit Types" are either surface mineable, underground mineable, non-conventional or sterilized. All of the deposits of interest for the Willow Creek property in this report refer to the potentially surface mineable coals. In addition to "Deposit Types" the GSC Paper 88-21 also refers to "Geology Types", which are a definition of the amount of geological complexity, usually imposed by the structural complexity of the area. The classification of a coal deposit by "Geology Type" determines the approach to be used for the Resource estimation methodology and the limits to be applied to certain key estimation criteria.
>
> The identification of a particular deposit type for a coal property defines the confidence that can be placed in the extrapolation of data values away from a particular point of reference. The classification scheme of the GSC is similar to many other international coal reserve classification systems but it has one significant difference. This system is designed to accommodate differences in the degree of tectonic deformation of different coal deposits in Canada. Four classes are provided for that range from the first, which is for deposits of the Plains type with low tectonic disturbance, to the fourth which is for Rocky Mountains type deposits such as that of Byron Creek, which is classed as "severe". The third class is referred to as "complex"; the steeply dipping but only moderately faulted strata of the Willow Creek property are typical of this class."

MMTS concludes that the Willow Creek Property should be classified as complex.

11.0 Mineralization

The following description is adapted from Norwest, 2005:

> "The present study only addresses coal seams of the Gething Formation. There are seams present in other formations of the sequence in this area but their distribution and commercial significance has not yet been determined for the Willow Creek Property.
>
> The Gething Formation seams of interest in this study are those numbered from 1 through 8 and Seam A. Another seam, referred to as Seam 9, achieves mineable thickness from place to place. This seam is not being considered for mining as part of the present study. There are other seams in this formation but these are too thin to be of economic significance."

For this report, only the main seams were modeled, with no splits. A minimum coal thickness of 1.0m is required to meet the criteria for inclusion to the mineral resource. Partings were considered separable from the seam if they were greater than 1.0m, and non-separable if less than 1.0m. If the parting was greater than 3.0m, the seam packages were modeled separately, and considered as a repeat.

Seam naming has been kept the same, with the seams called Seam 1 at the top of the section and Seam 8 at the bottom. Seam A occurs in the north only, between Seams 4 and 5. On some sections a zero was added to the end of the seam name to identify seam splits (e.g. Seam 7 is represented as Seam 70 where intact and Seam 71 and Seam 72 to indicate splits).

12.0 Exploration

Exploration prior to 2005 was completed prior to MMTS's involvement. The following is adapted from Norwest, 2005.

> "The Semper Resources/David Minerals Ltd. exploration program at Willow Creek comprised 42 trenches and 45 diamond drillholes. In 1981, Semper Resources amalgamated with David Minerals Ltd. to further develop the Willow Creek Project. Subsequent to this, Kilborn Engineering Ltd. was commissioned to complete an underground mine engineering feasibility study. Environmental studies were completed and the project progressed to Stage 2 of the Mine Development Review process. The exploration work that was completed at that time formed the basis for the later programs conducted by Pine Valley Mining; some of those results are incorporated into the present database. Besides the drillholes and trenches, the 1981 work of importance includes an airborne topographic survey and supporting ground surveys, construction and upgrading of drill roads and trails, construction of a bridge across the Pine River, and the geological mapping of extensive portions of the north, central and south blocks.
>
> In 1992, Pine Valley Mining acquired the original 14 coal licenses comprising the Willow Creek Coal Project and proceeded with a surface mining review completed by MDF Mining Consultants Ltd. Pine Valley Mining continued from that time to expand and develop the property, and conducted a drill exploration program in 1994. The property size has also been increased to its present status of one coal lease (Lease #15), comprised of 21 coal licenses and an additional 15 coal licenses, all of which are shown in Table 6-2.
>
> In February 1996, Pine Valley Mining was joined by Mitsui Matsushima Canada Ltd. and BCR Ventures (BC Rail) in ongoing efforts to develop the property. Pine Valley Coal Ltd. was formed to represent the collective interests of the participants and to act as operator. Major Drillhole exploration programs were conducted by the joint venture in 1996 and 1997. Subsequent to the 1999 Final Feasibility Study conducted on the Willow Creek Property, Pine Valley Mining purchased BCR Venture's interests in the project in January of 2001."

The section titled "Data Verification" summarizes the verification process completed by MMTS.

13.0 Drilling

In October 2005, 28 drillholes were completed in the 7-Pit area of the mine to assist with the geological re-interpretation by MMTS. In 2007, an additional 77 holes were drilled, with 52 added holes in 2008. In total there are 655 drillholes in the database, for a total of 47,081m of drilling, which have been used for this report.

The 2005, 2007 and 2008 drilling was in response to recommendations from MMTS. The October 2005, 2007, and 2008 drilling results were reviewed by R.J Morris of MMTS, the Geologist QP.

All of the drilling completed by previous owners and operators of the property was under the direct supervision of an experienced coal geologist. Norwest (2005) provides more details on the previous drilling in the Technical Report – "Willow Creek Property" July 28, 2005: Technical Report – Norwest Mine Services Ltd.

14.0 Sampling Method and Approach

MMTS has not been involved in any sampling or coal quality work on the property. All of the previous sampling was completed under the direct supervision of an experienced coal geologist. The following is adapted from the Technical Report – "Willow Creek Property" July 28, 2005: Technical Report – Norwest Mine Services Ltd.

> "Coal deposits are not evaluated on a sample by sample basis but on a seam by seam basis and the results are always reported that way. Many thousands of individual samples are usually obtained on coal properties in order to define the local coal quality characteristics of the seams. Each sample has certificates of analysis that may be one page long or, if the testing is exhaustive, consist of many pages of test results. There are several hundred drillholes on the Willow Creek portion of the Pine Pass Coal Property, each intersecting up to ten seams with as many as ten samples or more in each seam tested for coal quality. This means that there will be thousands of quality sample certificates. It is important to realize that the coal industry has its own safeguards against bias in the coal quality estimates for any property and against the possibility of bias in the results. Firstly, all Canadian coal properties have been explored in the past at one time or another and the seams have been tested using the same procedures that were developed at least one hundred years ago.
>
> The results are not secret but are well documented and published even with respect to individual seams on specific coal properties. Coal properties are not newly discovered but are revisited because the selling price for coal changes from time to time. Furthermore, each coal producer has to provide its contracted consumer, even prior to mining, with samples of the coal in the seams of the property for their independent testing. Otherwise the operator has to provide the consumer with the opportunity to conduct its own drilling and testing of the samples on the property. Note also that all shipments of coal to international markets are subject to independent testing by cargo superintendents to ensure that the contract specifications are met. The following specific points are provided:
>
> A) The sampling method used on the Pine Pass Property is exclusively core drilling. As is standard in the coal industry, individual sections of coal are bagged and sent to the coal testing laboratory. The results are evaluated on a seam by seam basis. The drillholes, their locations, names and distribution are well shown on various maps documenting the geology of the property. The crop limits of the various seams are shown on the maps and the sections show the distribution of the seams that have been tested.

B) There are no drilling, sampling or recovery factors that could materially impact the accuracy and reliability of the results.

C) All the samples are of the same quality consisting of coal core and they are representative of the quality of the seams from which they were extracted. There is no potential for sample bias.

D) The samples are described as coal and the geological controls are the limits of the top and bottom of the seams. The widths of individual seams vary from a thickness of zero meters in some locations to as much as seven meters or more. The sampling interval is defined by the drillhole spacing which has a present target of an average of about 200m, but closer in areas where more detail is needed for structural or mining control. There is no such concept of lower grade that applies to coal. In fact coal does not have grade, it has quality.

E) As indicated previously coal deposits are evaluated by seam, not by individual sample."

MMTS agrees with sampling methods used at the Willow Creek property.

15.0 Sample Preparation, Analysis and Security

MMTS has not been involved in any sampling on the property. All of the previous exploration sampling completed on the property has been under the direct supervision of an experienced coal geologist. The following has been adapted from the Technical Report – "Willow Creek Property" July 28, 2005: Technical Report – Norwest Mine Services Ltd.

> "Sample preparation and security procedures that were used for samples at Willow Creek are the same as those employed by the coal industry in general today. Once the driller has boxed the core, the geologists (Company employed or contracted) moved it to a convenient place, such as a logging shack or shed, for logging and sampling. The core was measured and described in the core boxes and the coal intervals are identified. The procedure for sampling of coal core was to bag the complete core for each ply which must be not less than 15cm in length in the case of coal and not less than 5cm in the case of rock bands. These minimum sample lengths were specified so that, on crushing to standard product sizes, the coal samples would still be representative. For the rock the smaller sample size was applicable because only the ash content and the content of waste components needed to be known.
>
> The samples for each ply were appropriately bagged and tagged and if the samples were too big multiple bags per ply were used. The samples were then dispatched by commercial ground transportation to a commercial coal laboratory. The labs used for the northeast British Columbia coal exploration were and continue to be Loring Laboratories and Birtley Testing in Calgary and Commercial and General Testing in Vancouver. All of the above were utilized for the coal exploration at Willow Creek. These laboratories use standard coal testing procedures as specified by ASTM. The tests and analyses were designed primarily to evaluate the coal seams as a source of coking coal, PCI coal, and thermal coal.
>
> Most of the analytical data comprising the coal characteristic work has been generated through exploration programs in 1994, 1996, and 1997. In 1980/81, previous owners completed analyses on a raw basis only; therefore much of this data was not used to characterize the expected clean coal. The representative coal quality by seam and by principal mining area for Willow Creek is shown on Table 18.1. The clean coal data was generated from laboratory test results on +0.15mm size @ 1.70 SG cut samples, +0.15mm size @ 1.60 SG cut samples, and +0.15mm @ 1.80 SG cut samples for drill core from 1994 through 1997. All analyses were performed using ASTM coal testing procedures.
>
> In coal work it is not usual to employ special security methods for the shipping and storage of samples as coal is a low value bulk commodity. Normally coal samples are

sent to the lab by bus, unsupervised, or they are "hot-shotted" or taken by pickup truck by one of the field geologists. All Canadian and foreign coal companies working on Canadian coal projects use this procedure. The author believes the sampling; testing and security measures used are adequate for coal and are typical of current practice in the Canadian coal industry."

16.0 Data Verification

MMTS has completed numerous levels of data verification from 2006-2008, including:

- Geological mapping in the 7 Pit area
- Review of in-fill drilling, 28 holes, in the 7 Pit area in 2005
- Review of in-fill drilling, 77 holes, in 2007
- Review of in-fill drilling, 55 holes in 2008
- Re-interpretation of the geological model in the 7 Pit area
- Checking of 76 drillhole logs (115 coal seam intercept depths)
- Checking coal seam intercept depths of all 1996 drillholes
- Checking all drillhole collar elevations against topography
- Adjusting coal seams to drillhole intercepts
- Reviewing geological interpretation of the 4 Pit area

The geological mapping confirmed the overall structure of the deposit as interpreted. With the aid of the in-fill drilling, MMTS was able to complete a re-interpretation in 2006, which showed only minor variation from the original. Additional holes in 2007 and 2008 have resulted in updated interpretation conducted by WCC and verified by MMTS. MMTS was involved in the entire DB preparation, on site verifying coal picks and correlation.

Checking drillhole collar elevations for the 2006 and previous data, against topography showed the drillholes to be consistently 2m lower than the new topography. Eleven drillholes were found to be more than two meters different from the topography and their collar elevations were adjusted to fit (see Section 19.2). Along with the adjustment of collar elevations, coal seam interpretations were also adjusted where necessary. In most cases the new collar elevations simplified the geology by removing single hole anomalies.

Checking the 77 drillholes from 2007 included comparing the database to the actual down-hole geophysical logs. As well, all intercept depths for the entire 1996 drill program were compared to the original listing. In total, fourteen depth changes were made to the database, ranging from 0.2m to 3.5m. Though not all of the logs were checked, it is believed that by checking 23% of the drillholes within the pit area and not finding major database errors, our verification was sufficient.

The updated 2008 drillholes were similarly checked for overlaps and inconsistencies, and minor adjustments were made where necessary. Faults were inserted where it was found that a seam package is repeated within a drillhole. New geologic interpretation was done on 10m sections based on the updated drilling.

The drillhole distribution is generally on 200m sections with numerous holes along the section line. This hole spacing conforms with GSC 88-21 criteria for a complex deposit to provide an assurance-of-existence of measured and indicated resources.

17.0 Adjacent Properties

Although there are adjacent properties held by Falls Mountain Coal Inc. that has been explored for coal, information from them has not been used in the preparation of this report. These include Crassier Creek, Fisher Creek, Pine Pass, Willow Creek West, Willow Creek South and Falling Creek; the first three of which have had historical coal resources reported on them.

18.0 Mineral Processing and Metallurgical Testing

18.1 Introduction

For process plant design and product yield estimates, WCC and previous owners commissioned independent coal laboratories to perform standard washability testing on coal core samples and bulk samples.

18.2 Coal Metallurgy

The coal washability tests were performed following ASTM standards for coal testing. In addition, numerous samples were provided to customers and prospective customers who conducted their own tests on the coal.

Coal Seams and Zones

There are eight significant coal seams in the resource base that are of economic interest. They include:

- Seams 1, 2, and 4 will produce hard coking coal when cleaned in the process plant and produce a low ash product in the range of 6 to 8 percent ash.
- Seams 3, 5, 6, 7 and 8 will produce a low ash PCI coal which can be sold in the metallurgical coal market. This final product will have an ash range of 4 to 7%.

Due to the complex geology in the area, the partings and the coal plies will vary across the property and hence the ash content of the seams will vary across the property. The raw coal ash varies significantly across different seams. Economic seam thickness is determined by evaluating whether each coal ply is economical to mine. The seams must have a minimum thickness before it is considered to be economic (taken as 1m in this study).

Plant Yield and Size Analysis

Particle size distribution of the coal entering the plant is an important factor when predicting plant yield and product quality. Generally speaking, the technology for cleaning and dewatering coarse coal is very efficient and equipment technology for cleaning and dewatering fine coal is less efficient. Hence the coarse plant feed is efficient and easy to clean while the fine fraction is more difficult to clean.

The following Table presents product yield for each of the seams in the mine reserve. “Product % Yield” is the amount of clean coal produced from run-of-mine (ROM) tonnes coming into the preparation plant. The plant yield is determined by following factors:

- The type of process equipment used in the preparation plant. (see plant description)
- The type of product produced -hard coking coal or PCI.

- The amount of fines that can be diverted around the plant (not processed) while still meeting product specifications.
- The size analysis of the raw coal entering the plant.
- The "washability" of each coal seam which is determined by laboratory testing using proven procedures.
- The amount of out of seam mine dilution that is mined with the coal seam when the coal is extracted from the pit. The information in the Table assumes the out of seam mine dilution to be at 15% (by weight). Note: mineable reserves are based on 10% out of seam dilution at 85% ash which is approximately equivalent to the following samples.

The coal quality of seams in the reserve is set out in the following Table:

Table 18-1 Product Yield by Seam from Willow Creek Mine Reserve

SEAM	ROM ASH%	PRODUCT %YIELD	PRODUCT ASH%	PRODUCT TYPE
Seam 1	14.1	87.3	8.0	HCC
Seam 2	31.6	60.8	8.8	HCC
Seam 3	18.0	81.8	8.0	PCI
Seam 4	23.3	73.4	8.0	HCC
Seam 5	20.3	74.2	7.0	PCI
Seam 6	12.0	86.7	7.0	PCI
Seam 7	18.8	76.9	7.0	PCI
Seam 8	20.4	73.4	7.0	PCI

Seams 1, 2, and 4 will produce hard coking coal when cleaned in the process plant and produce a low ash product in the range of 6 to 8 percent ash. Seams 3, 5, 6, 7 and 8 will produce a low ash PCI coal which can be sold in the coking coal market. This coal will have an ash range of 4% to 7%.

Due to the complex geology in the area, the partings and the coal plies will vary across the property and hence the ash content of the seams will vary across the property.

Indicative Quality

The Willow Creek Coal seams easily produce a low ash clean coal, except A0 & A2 which have a lower yield (approximately 50% at a 10% ash) and a slightly higher near gravity material. As indicated by the bulk sample washabilities, all seams including Seam A demonstrate that they have very little material at the probable cut point range from 1.5 to 1.60 S.G.

The following are clean coal quality specifications for two products produced by Willow Creek Preparation plant after the plant upgrades are completed.

Table 18-2 Willow Creek Clean Coal Indicative Specifications

	Hard Coking Coal	LV-PCI
Moisture (AR)	8%	8.50%
Volatile Matter (DB)	21.5-23.5%	15-16%
Ash % (DB)	8.00%	7.00%
Sulphur	0.60%	0.57%
Calorific Value (GAR)		7340
Fixed Carbon		77%
Free Swelling Index	6-8	1
Mineral Matter Reflectance	1.32	
D D P M	30	
Vitrinite %	59	
C S R	75	
Phosphorus in Coal	0.05%	0.03%
Hardgrove Grindability Index		68

Inherent Moisture
The Willow Creek seams have low inherent moisture (0.7% to 1.0%)

Volatile Matter
Volatile matter mainly consists of combustible gases including - hydrogen, carbon monoxide, methane, tar vapors and some incombustible gases such as carbon dioxide and water vapor. The amount of volatile matter in the coal is a significant indicator of coal rank.

The ASTM classification of bituminous coals, based on a dry mineral-matter-free volatile content, indicates that Seams 1, 2 and 3 are classified as medium volatile bituminous coal while Seams 4, 5, 6, 7 and 8 are classified as low volatile bituminous coal.

Note: According to ASTM standards, low volatile bituminous is less than 22% and medium volatile bituminous is between 22% and 31%.

Fixed Carbon
The fixed carbon content, on a dry mineral-matter-free basis, ranges from 74.9% to 80% for Seams 1, 2, 3 and 4 and from 82.4% to 83.4% for Seams 5, 6, 7 and 8.

Sulphur Content
Sulphur occurs in coal in three different forms:

- organic – as part of the coal substance,
- pyrites or marcasite (Fe2 O3)2
- as sulfates.

Previous test work (Loring Laboratories Ltd. September 1994) indicates the majority of the sulphur occurs in the organic component. This form of sulphur cannot be removed through conventional coal beneficiation. Historically, Willow Creek's coal contains less than 0.6% total sulphur. Also, because the pyritic sulphur is very low, Acid Rock Drainage (ARD) in the plant refuse dump and any misplaced coal from these seams in the waste dumps is expected to have a low acid generating potential.

Free Swelling Index
Free Swelling Index (FSI) is a measure of the coking properties of coal. Traditionally, FSI's greater than 3.5 are used to classify coals as coking coals. Also, this test is often used to determine the relative degree of oxidation of coal. These FSI results categorize Seams 1, 2, and 4 as coking coals. The remaining seams exhibit lower FSI's and are therefore suitable as PCI or thermal coal.

Hardgrove Grindability Index
The Hardgrove Grindability Index (HGI) is a measure of ease with which a coal may be ground into powder. As shown in Table 5.1, the HGI values range from 74 to 95 for Seams 1, 2, 3, and 4, while Seams 5, 6, 7 and 8 range between 59 and 92. This is important when designing the preparation plant because it will alert the designer to possible dustiness, segregation and super fines loading in the circuits. HGI values greater than 100 have been found in coking coals from mines in the Rocky Mountains of Western Canada.

Seam 4 has higher HGI values ranging from 104 to 121 and will likely produce more fines. However, this seam is blended with the other coarser seams and the effect this fine coal has on the plant product and plant operation is minimized. The plant size distribution used for plant design takes Seam 4 into account when it is blended with other seams.

Calorific Value
All the seams have high heating values, ranging from 7619 to 8387 (db) Kcal/Kg.

Fluidity
Values for the fluidity of the Willow Creek coking coal Seams 1, 2, 3, 4, and Seam A range from <1 to 22ddpm. Also the information reviewed concerning results from customer coking coal blend tests, indicate a 4 to 5ddpm from tests performed by Japanese Steel Mill labs while CANMET shows a ddpm of 2. These low ddpm results may be indicative of a negative impact from storage and or analytical procedures such as drying and pulverizing.

Chlorine Content
Analysis from the drum samples of Willow Creek Semi-Hard Coal show that there is no chlorine to report. Chlorine does not represent a quality concern.

Ash Chemistry
The ash chemistry can be summarized as follows:

- Seams 1 and 4 have more basic ash components and therefore higher Base/Acid ratios.
- Seams 2, 5, 7 and 8 have more acidic ash components.
- Seams 1, 4, and 3 central have high iron contents.

The Japanese standard threshold limit for determining the potential for ash "slagging" is set at a Basic/Acid ratio of below 0.5. Testing results show Willow Creek is below this ratio; therefore "slagging" is not a quality concern.

The phosphorous content in the ash can be considered " moderate to high", with values of 3.71% for Seam 3 that has a total ash content of 6.5 %, plus another phosphorous content in the ash of 1.3% for Seam 7 that has a total ash content of 3.6% . Because the total ash content in these coals is low when compared to others in the market, these anomalies will be mitigated with blending of other coals.

Ash Fusion
Ash fusion testing has become an important factor when evaluating PCI coals due to the importance of potential ash slagging. From previous studies, the IDT temperatures of the seams to be designated for PCI market are:

- Seam 5 = 1335 'C
- Seam 6 = 1149 'C
- Seam 7 = 1363 'C

Mine operation will blend these three seams and the net product ash fusion temperature will be above the 1200 'C minimum. Ash fusion temperatures below 1200'C can possibly create "slagging" in the steel furnace.

18.3 Evaluation of Coking Characteristics

The following discussion examines the coking characteristics of Willow Creek's Seams - 1, 2, 4 and A with respect to rank, grade, petrography, thermal rheology, ash chemistry and carbonization characteristics. The results are based on samples taken from drill core and bulk samples taken from actual full scale plant runs and prepared in laboratories. The coking properties of specific blends of Willow Creek Coals were determined by Coaltech Inc., Pittsburgh, Pennsylvania, in 1994 and by Canada Centre of Mineral and Energy Technology (CANMET), Ottawa, Ontario, in 1997, and again in 2005, in pilot-

scale and small scale coke ovens, under standard conditions. The following is a summary of their findings.

Petrography

Petrographic analysis microscopically evaluates the maceral composition of the coals being considered. Three maceral groups have been established, vitrinite, exinite, and inertinite. The knowledge of these parameters predicts the coal type.

Observations from the Petrographic Analysis of individual seams and the coal blends Seam 1, (55%) and Seam 2, (45%) CANMET 2005 are as follows:

- There is a general increase in reflectance from Seam 1 through Seams 2, 3, 4 and A.
- The Ro max values for the metallurgical coals range between 1.24 and 1.47. The Willow Creek metallurgical blend averaged 1.37 while the CANMET Seam 1- 2 blend was 1.28 therefore the Ro max values classify Seams 1, 2, 3, 4 and Seam A as medium volatile bituminous. Coals with this rank are considered optimum for producing coke with high strength properties.
- The most predominate inertinite is semifusinite.
- The stability for Seams 1, 2, 3, 4 and Seam A range from 50 to 59 while the CANMET Seam 1 and 2 blend showed a 61.8. All Willow Creek hard coking coal seams indicate good coke stability.

Thermal Rheological Properties

The melting and swelling properties of a coal observed during the coking process are important indicators of a coal's coking potential. The tests which measure these plastic properties are FSI, Dilatation and Gieseler Fluidity. They are usually termed The Thermal Rheology Properties.

The Free Swelling Index (FSI) is the easiest method of measuring a coal's coking property and therefore is widely used in Western Canada to determine a coal as "coking" or "non-coking".

Although previous studies show FSI's ranging from 2.5 to 7, the coal produced at the minesite has shown strong coking properties with 7 to 8 FSI's. The two Washed Seam 1 samples (see the CANMET 2005 report Appendix) and the Loring Lab Washability data show very strong FSI's as high as 9. This indicates the potential to produce excellent coking quality coal.

Fluidity is a measure of the plastic properties of a coal with respect to softening and agglomerating during a coking coal blend. The two Washed Seam 1 samples CANMET 2005 show ddpm's of 16 at a 8.19% ash and a 33 at a 5.17% ash. Clean coal from Willow Creek Seams 1, 2, 4 and Seam A are similar to other medium volatile coking coals from Western Canada that normally produces strong metallurgical cokes if they have fluidity values greater than 3ddpm.

Dilatation tests indicate good contraction at 30 % and moderate dilatation at 8 (Table II CANMET Component Coal Analysis).

The above discussions demonstrate that Seams 1, 2, 4 and small amounts of Seam A when blended properly will produce strong cokes.
The Certificate of Analysis for vessel shipments from the Willow Creek property confirms the above discussions.

Carbonization
Several pilot scale coke oven tests have been performed on Willow Creek coal, with respect to Seams 1, 2, and 4. Of particular interest are the carbonization tests performed by CANMET in May 2006 which established two blends, Willow Creek Standard Coking Coal Blend and the Willow Creek Low Ash Product. Of particular interest is the very complete and thorough description and analytical review provided by Paul Readyhough (Readyhough Consulting Inc.)

The above report simply confirms that the Pine Valley metallurgical coals will make a positive contribution to the hard coking coals on the market today.

Pulverized Coal Injection (PCI)
The use of PCI coal by the world's major steel companies has become a standard practice. Pulverized coal is injected with the hot blast directly into the raceway of the furnace to provide energy and reductant in addition to the energy from the coke bed, and in doing so some of the costly high quality coke is replaced. Therefore, the use of the lower cost PCI to replace more costly high grade coking coal reduces the steel making operating costs. Low volatile coals, like Seams 3, 5, 6, 7, and 8, exhibit characteristics for a good PCI coal.

Rank
The coal seams which will comprise the PCI blend are classified as low volatile bituminous coals.

Ash Content
The ash specifications for the Willow Creek coal have been set at 8% (DB). However, the washability information indicates that most of the coal will float at a very low S.G. and produce a low ash product. This will likely result in the plant operators by-passing fines to help achieve specification ash.

Calorific Value
The ash versus calorific value plots indicate that a 9% specification ash (air dry basis) will produce a 7775 Kcal / Kg coal. This high calorific value along with a high mineral-matter-free carbon content of 82.3% shows that Seams 5, 6, and 7 designated for the PCI market have good heating characteristics.

19.0 Mineral Resource and Reserve Estimates

19.1 Introduction

Reserves and resources have been calculated for the North and Central areas of the Willow Creek property. Only areas that can be potentially surface mined have been targeted for evaluation. Coal that could be mined using underground methods has not been analyzed in this report.

The mine planning for the Willow Creek coal property is based on work done with MineSight®, a suite of software for geologic modeling and mine planning, used extensively on the Rocky Mountain coal properties. It is well proven in the industry for complex coal. A comprehensive description of the three dimensional block coding and resource estimate can be found in Appendix A.

In addition to the geological information used for the block model, other data used for the resources and reserve estimate include the targeted coal prices and distribution costs for the operation, estimated mining cost data, geotechnical slope design parameters, recoveries, and projected plant costs and throughput rates.

The initial Resource Model, Reserves and Mine Plan for the project were developed by Norwest Mine Services Ltd., in NI 43-101 compliant Technical Reports for the Willow Creek Property dated September 9, 2002 and July 28, 2005. Subsequent to this work Pine Valley Coal's consultant, Mintec Inc. rebuilt the geology model based on the work done by Norwest. The previous drillhole data and seam structures, and pit designs were imported into MineSight® with no significant changes to the original (Norwest) geology information or mine plan. This model was used for internal short term production planning.

In August 2005 R.J. Morris of MMTS was requested to review the geology interpretation in the active mining areas and comment on the Resource Model and Mine Plan. From this, an infill drill program was recommended to adjust for bench scale deviation in the coal seam locations. Drilling was carried out in 2005 and 2007 by Falls Mountain Coal to provide more data and assist in amending the five year mining plan to improve mining efficiencies. MMTS used this drilling and did an updated interpretation of Seams 5, 6 and 7 in the southwest area (Willow Creek Central) of the active mining area.

Pine Valley Coal also provided an updated survey/topography as of the end of November, 2005 to account for mined out areas in the pit. This information was provided to Mintec for a model update. Mintec used this revised data and rebuilt the Willow Creek 3d block model in December of 2005. MMTS revised the mine plan which indicated the potential for significant changes in the pit limits and mine plan which required Pine Valley Coal to revise the Life-of-Mine plan starting with rebuilding the Geological model and verifying the resource model to NI 43-101 compliant standards. This revision was the basis for the Resource and Reserve statements in the Technical Report "Resource and Reserve Estimate for the Willow Creek Coal Mine Property" March 30 2006 by MMTS.

In July 2008, WCC provided MMTS with revised drillhole data and with updated footwall interpretation in the form of geological solids generated using Gemcom's GEMS® program. MMTS has used these solids to create footwall polylines. The true thickness tool has then been used to create seam polygons by obeying the minimum thickness rules, as detailed in Appendix A.

The drillhole data has been updated again in November, 2008 to include all of the 2008 drilling. The footwall polylines, surfaces, and polygons are re-built based on the refined seam interpretation. The resource and reserve estimates are based on the November 2008 updated drilling and geologic interpretation.

The model used in the PFS is based on a new interpretation that is significantly different than was the basis of the 2006 reports. This is due to the 2007 and 2008 infill drilling programs.

19.2 Data verification and update

In the NI 43-101 compliant Technical Report, dated Nov 19 2007 and filed on SEDAR March 6, 2008, a reconciliation of the drillhole collar elevations against the end of 2005 topography (from Lidar) found that several drillholes deviated significantly enough from the topography to justify changing their collar elevations to match the topography surrounding the drillholes. The current work uses these correct drillholes.

MMTS also reviewed the geophysical logs and seam interpretations at each pass of drillhole updating, and verified them as suitable for the ongoing work.

19.3 Drillhole Coding

An updated three dimensional block model (3dbm) has been completed using MineSight® software in February, 2009. The drillhole data is updated to include 2007 and 2008 drillholes.

The updated drillhole assay file is composited into "Seam Package" information using the following criteria to assign mineable vs. non-mineable coal and separable/non-separable partings in each drillhole.

- Minimum removable parting 1.0m
- Coal zone aggregate minimum minable thickness 1.0m
- Maximum parting thickness 3.0m

The gross coal thickness, the mineable percentage and the non-separable partings percentage for each seam package are stored in the interval for each seam composite. A comprehensive description of this procedure is given in Appendix A.

19.4 Seam Interpretation

The 69 seam solids, and fault surfaces obtained from WCC in 2008 have been reviewed in MineSight® for integrity and overlaps. These are used as the basis for seam footwall interpretation. Interpretation also includes surfaces created from pre-2007 drillhole data in an area of 7 North where the WCC update has not been completed. Some footwall interpretation of Seams 5, 6, 7, and 8 has been carried out by MMTS in 2008 in an area previously modeled by Norwest for the 2002 Technical Report.

A MineSight® routine has been used to calculate the True Thickness for each composite interval, based on the seam dip of the footwall. Polygons are then created using the True Thickness tool to create polygons only when the minimum minable thickness of 1.0m had been satisfied. Polygons are created on each 10 meter cross-section based on a 300m search cell using Inverse Distance Squared weighting.

This True Thickness method is used extensively in complex coal and has been found to better represent the coal thickness in these types of deposits. The 1000 meter search distance only assigns a True Thickness, and thus only creates a seam polygon within this distance of a seam composite.

19.5 3D Block Model

For a comprehensive description of the modeling methodology, see Appendix A.

The sectional seam interpretation is used to build a 3dbm with the following dimensions based on a rotated grid in UTM coordinates:

Table 19-1 Block Model Bounds

Model Axis	Origin	Length	Interval
X (Easting)	546732.5	2870	10m
Y (Northing)	6160371	4800	10m
Z (Elevation)	350	1370	12m
Model Rotation	-47		

The existing topography (as of September 30, 2008), the original topography, and the mined out surface are all imported into the model. The bottom of the overburden surface is also modeled, based on the original topography and the interpolated overburden thickness from drillhole data. Waste is assigned as Overburden, Rehandle, or Waste, based on these surfaces. All coal seams are clipped to the lowest of either the bottom of the overburden, or the mined out surface.

The seam and percent metallurgical coal are calculated from the seam polygons created as described above, with up to 2 seams per block. The percentage of Oxide coal is calculated within the seam with parameters of 1m bloom below the bottom of the original overburden surface, and oxide an additional 6.5m below this. The specific gravity is 1.35 for all seams and 2.3tonne/bcm for waste.

The minable percent and non-separable partings are interpolated to the block model from the drillhole data. These are then used to re-calculate the percent of HCC (hard coking coal) +PCI coal, the percent oxide coal and the percent of each waste type for each block in the model.

The seams are then categorized into resource classes based on distance to the third closest composite data, as outlined in GSC Paper 88-21 for coal defined as complex, as follows:

Table 19-2 Resource Classification Parameters

Resource Class	Distance to a Minimum of 3 Composites with Seam data (m)
Measured	200
Indicated	400
Inferred	800
Speculative	> 800

The block model seam coding is checked by comparing block volumes with volumes directly from the polygons. The differences are negligible.

19.6 Coal Resource

The term "resource" is utilized to quantify coal contained in seams occurring within specified limits of thickness and depth from surface. The term "resource" refers to the in- place inventory of coal that has 'reasonable prospects for economic extraction'. Coal resources are always reported as in-place tonnage and not adjusted for mining losses or recovery. However, minimum mineable seam thickness and maximum removable parting thickness are considered.

The MineSight® pit optimization program MSEP has been run to determine the general pit limit sensitivity using the updated model. The MSEP program runs a Lerchs-Grossman (LG) optimization based on the coal values in the 3d Block model, and economic parameters, and overall slope angle. The pit optimization is limited to be run on only Measured and Indicated categories. As a result, the Inferred and Speculative interpreted coal within the resource pit is only 1.1% of the total resource.

The resource is restricted to allow no mining 30m from the creek known as Tributary 2 of Willow Creek at the south of the mine.

A pit limit based on the break-even incremental cut-off strip ratio of 20:1 is used to determine the resources, as specified in GSC Paper 88-21. The resultant pit delineated Resource is estimated in the Table below. These resources are given in raw tonnes, and thus do not account for expected plant yields, mining loss or dilution.

Table 19-3 Resource Summary at 20:1 Break Even Strip Ratio

Category	In-Situ Coal (Mtonnes)		
	HCC+PCI	Oxide	Total
Measured	35.7	1.6	37.3
Indicated	11.5	0.1	11.6
Total	47.2	1.7	48.9
Inferred	0.3	0	0.3

Table 19-4 Resource by Seam at 20:1 Incremental Strip Ratio

Category	Seam	In Situ Coal (ktonnes)		
		HCC+PCI	Oxide	Total
Measured	1	3,952	269	4,221
	2	1,602	86	1,688
	3	1,137	46	1,183
	4	5,890	325	6,215
	A	841	133	974
	5	4,049	165	4,214
	6	5,662	183	5,845
	7	11,538	332	11,870
	8	1,024	44	1,068
	Total	35,693	1,585	37,278
Indicated	1	1,752	12	1,764
	2	775	1	776
	3	577	0	577
	4	2,149	21	2,170
	A	42	0	42
	5	1,221	15	1,236
	6	1,574	10	1,584
	7	3000	11	3,011
	8	399	18	417
	Total	11,489	88	11,577
Inferred	1	107	5	112
	4	164	5	169
	Total	271	10	281
Total Resource		**47,453**	**1,683**	**49,136**

19.7 Coal Reserves

A coal reserve is the economically mineable part of a Measured or Indicated coal resource demonstrated by at least a Preliminary Feasibility Study, which includes information on mining, processing, economic and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified (CIM Definition Standards).

A preliminary mine design and financial analysis have been completed for the Willow Creek Property. MMTS has designed pits using the following mining criteria:

- Minimum coal seam thickness: 1.0m;
- Recommended highwall and footwall design parameters
- ROM density based on insitu seam ash % and coal loss and dilution of 10% averaged over all seams

In addition to the application of mining criteria, breaker and plant yield factors are used to estimate clean saleable reserves on a seam by seam basis. Details of the mining and recovery parameters development are included in section 25.

The Table below summarizes the clean saleable mineable reserves in the Willow Creek property.

Table 19-5 Coal Reserves Summary

Coal Type	ROM (kMTRC)	Clean Saleable Coal Reserves (kMTCC)
HCC	9,765	6,967
PCI	18,610	13,658
Oxide	1,263	915
Total	29,634	21,541

20.0 Other Relevant Data and Information

There is no other relevant Data and other Information is covered in Section 25.

21.0 Interpretation and Conclusions

Mining at Willow Creek will occur in the multi seam Gething Formation which is a known complex coal deposit. The design basis parameters for this study have been developed and reconciled from other successful Gething mines and previous operations at Willow Creek. This study develops a revised production schedule, costs and cash flow to show the economic viability of the project. Since much of the development and infrastructure is in place from previous operations, capital investment justification is of lesser significance than operating performance and costs. Specific conclusions for the various project sections are reviewed below.

21.1 Resources

The majority of the coal seams occur in the Upper and Middle Gething, although some seams have been located in the Lower Gething Formation. The resources are from eight coal seams, many of the seams are over 1m thick. The Willow Creek mine plan covers the surface exposures and near subsurface extensions of the Gething Formation on both limbs of the Pine Valley Anticline; they thus encompass the Willow West and South Blocks as well as Willow North and Central.

The Willow Creek coal mine is a metallurgical coal deposit with HCC and PCI coals. The coal resources are based on a pit with an incremental cutoff strip ratio of 20:1 to determine the 'potential surface mineable resources'. The resultant pit delineated resources are 48.9 million tonnes of HCC and PCI coal in the measured and indicated categories and an additional 0.3 million tonnes classified as inferred. These in situ resources do not account for expected plant yields, mining loss or dilution.

21.2 Reserves

The mining reserves are based on the resource model, limited to a designed economic pit limit, and with mining parameters applied. Based on selective mining techniques used in these deposits a mineable reserve is calculated. This includes a minimum mineable thickness of coal and removable partings of 1m, and average mining loss and dilution of 10%. Detailed estimates of insitu ash and SG have not been made, but typical Ash and SG values for mineable coal plys, parting dilution and waste dilution are applied. The resultant ROM reserves in MTRC are 9.8 million HCC, 18.6 million PCI, and 1.2 Oxide for a total of 29.6 million. After applying appropriate plant recoveries to each seam the resultant Saleable coal reserves in MTCC are 6.9 million HCC, 13.7 million PCI, and 0.9 million Oxide for a total of 21.5 million. These reserves will reasonably be expected to be achievable with the parameters as specified.

21.3 Mining

The mine plan developed for this PFS is based on selective mining techniques and equipment typical of this type of complex coal deposit. Multiple pits and multiple coal products for coal markets are scheduled. The waste rock management and disposal plan involves external dumps for the production in the earlier years of the schedule, followed by backfilling of mined out pits as they are developed. The backfilling is integral to the plan on a capacity, productivity, and mining cost basis. Waste rock dumps also are configured during the operating schedule to reduce post closure and reclamation costs.

It is noted that the mine plan is relatively intricate, with certain physical constraints for access and waste rock dump capacities. Over the mine life it is assumed that adjustments will be made to the mining plan and production schedule and sequence to accommodate, variations in equipment performance, operating conditions, and coal markets. These adjustments can be reasonable accommodated, however evaluation of backfilling capacities, pit phase accesses, and post closure landform consideration will need to be addressed for significance, feasibility, and cost.

21.4 Metallurgy & Process

The seam metallurgy is typical of Gething coals and previous operations have established experience in processing performance results and clean coal specs. The modifications to the plant are based on past experience on the Willow Creek coals and significant test results. The plant performance and operating costs on the scheduled coals will be reasonably within the ranges specified in this report. It can be expected the seams characteristics will vary within the deposits and with ongoing experience and optimization studies in the plant, modifications to circuits can be assumed over time. This should be included in operating budgets.

21.5 Environmental and Regulatory

WCC is engaged in the Mine Permitting Process for the re-opening of the Willow Creek Mine. Overall, the Regulatory, Social and Environmental setting for the Willow Creek Mine project is favourable. Given its present operating status and current approvals, the probability of securing necessary amendments and approvals for expansion is high.

There are no significant issues that are expected to prevent the issuance of necessary permits for the planned mine expansion, although some new conditions may be required. A risk of delay to regulatory approvals does exist, and is consistent with those experienced by other proposed developments in the region. Reclamation bonding is in place for current operations and it is anticipated a reasonable increase will cover proposed activities.

The Mine Permit Application (MPA) process is currently being carried out by WCC. Full details can be found in WCC's MPA documentation.

21.6 Key Project Results

This Prefeasibility Study is the assessment of the cost justification and financial analysis to increase the ROM Reserve base of the Willow Creek Property from 15.7 million to 29.6 million MTRC, improve the process plant performance, and increase the production capacity of the pre-existing infrastructure. The results of the PFS show positive economic returns for the $352 million Capital expenditure. These include:

- NPV_{10} $205 million
- IRR 30%
- Payback 5 years.

The process plant Capital Improvement will also allow WCC to utilize the Willow Creek infrastructure to support their other operations and potential projects in the local area. As such the capital and operating cost for the Willow Creek have been consolidated with WCC's other operations in the local area and apportioned back to the Willow Creek financial analysis.

21.7 Risks

21.7.1 Mining Risks

The mine plan is intricate and over the life of the plan conditions will change.

- Changes to the production sequence or significant design aspects could create pit access difficulties and reduce opportunities for backfill of waste rock.
- Changes in the mining of clean coal product types to meet specific sales requirements could leave coals at the end of the mine life that won't support the full mine operation costs.

Mitigation for these issues is possible but can affect operation costs.

21.7.2 Economic Risks

As with any mining operation, the economic performance of the operating plan will be sensitive to the future market price of coal.

21.7.3 Coal Processing Risks

There is inherent variability in the coals seams over the project life. Adjustments to the CHPP will be required over time, requiring Capital modifications and changes in operating costs. Allowance has not been made in the cash flow for these costs changes but this is typical of coal plants and not deemed a significant financial risk.

The performance of Gething coals in the established plant processes can vary as the feed coal varies. Adjustments may be required to mining methods to reduce pit dilution, and to exclude high ash problem coal may be required in future mining areas. Any loss of reserves would need to be made up with additions from other resource areas or adjacent WCC mines.

21.7.4 Closure and Reclamation Risks

Reclamation is scheduled to begin as early as year 2 of production as final dump slopes become available. Incorporating ongoing reclamation will reduce costs and allow for early placement of soils and seeding. Delays of reclamation will not have a significant impact on operation but may increase the required bonding.

21.7.5 Permitting Risk

The mine permitting process may take longer than anticipated. This is a minimum risk since operations can start under existing operating permit limits.

21.8 Opportunities

21.8.1 Mining Development Opportunities

The ultimate designed pit limit has been developed based on the 100% price base case with two exceptional areas noted in the pit design section. The development of the mine focuses on opening backfill areas on the Seam 4 footwall in the northeast section of the design pit. This staging has the added benefit of postponing some final high wall developments until later years. Pit 4N1, the lowest pit on the north face, is designed based on 100% prices of coal but since this pit is primarily HCC, which tends to have less price fluctuations than PCI coal, this has a lower risk than the PCI pits.

At Year 4 there is an option to step in the high wall on the PCI pits, 7N2 and 7C2, without causing access or dump development problems. The mining of pit 4N2, the higher pit on the north face mining to Seam 4, has been moved well within the 100% base case for HCC coal due to the diversion requirements on the upper section of Far East Creek. Modification of this high wall, although possible is not likely to be required.

The final high wall designed to the 100% base case is established and developed in year 7 with Pit 4C. If market conditions at that time dictate a change to the economic pit limit, there will be limited impact on the overall mine development progression.

The overall pit sequencing will be able to accommodate any future pit expansion to the south.

22.0 Recommendations

22.1 Geology and Exploration

A continuing program of geological mapping and drilling should be set up to cover areas within the immediate mine plan. The mapping can provide down dip information for structure and seam continuity while the drilling can be used to keep the mine plan up-to-date and to verify coal quality especially during operations. A reconciliation program should be followed during mining that relates both modeled coal volumes to actual production as well as coal quality.

This work will be funded as an operating expense.

22.2 Mining

1. Although there is sufficient data to estimate average ROM coal quality at Willow Creek, additional work is required to improve the accuracy of coal quality predictions. This work should include:
   a. A comprehensive coal quality sampling program in all the mining areas should be completed including insitu ash assays and interpolating this information into the resource model for use in the and subsequent mine plans.
   b. Quality analysis should include sufficient wash-ability tests to enable SG and yield modeling.
   c. Code coal quality data to the 3DBM by drillhole composite interpolations
2. Process Yield including Breaker Rock and Plant Yield should be reviewed considering the updated ROM coal quality estimated in this report.
3. It may be necessary to install vertical well dewatering in advance of pit development. The need for advanced dewatering via vertical wells should be accessed through a hydro-geological study. At this stage of the project it is assumed that vertical well dewatering is not required.
4. The use of an electric cable shovel will increase production rates and lower unit cost of mining waste. However the use of a large shovel is limited to the large waste blocks in the central and south regions. The economics of a large electric shovel usually require more than the 10 years that would be available in this mine plan.

22.3 Geotechnical Evaluation

Based on the work carried out in this PFS and the resultant economic evaluation, this PFS level Geotechnical study should be followed by Geotechnical evaluation and design work at a Feasibility study level in order to further assess the economic viability of the project and define designs suitable for execution. Adjustments to the pit designs to meet the Feasibility Study level of design is required to ensure the execution of the mine plans is safe and doesn't require expensive remedial corrections during operations.

22.4 Future Studies

The purpose of this PFS is to quantify the revised reserves and capital and operating costs for the production expansion for the re-opening of the Willow creek mining operations. Since much of the development and capital investment is already in place, MMTS does not consider it necessary for WCC to follow this report with a full Feasibility study. However certain aspects of this study require some upgrading to Feasibility level of design to ensure safe and efficient operations in the future and as a sound basis for future operations planning. More detailed design work in waste rock management, surface water management, and reclamation may be required for the mine permitting process as well. These study areas include:

- Hydro-geology
- Pit Geotechnical
- Surface water management planning
- Updated ARD and ML planning
- Waste dump reclamation
- Closure costs

These studies are typical of ongoing work for operating mines. Since the Willow Creek Mine will be going into operation, the costs for these studies, both with operations personnel and outside consultants and suppliers, can be included in future operating budgets.

23.0 References

Moose Mountain Technical Services, July 18, 2010 – Preliminary Feasibility Study for the Willow Creek Mine

Taggart Global, March 26, 2010: Pre-Feasibility Study – Willow Creek Plant Upgrade

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Geological Survey of Canada, 1989: Paper 88-21, A Standardized Coal Resource/Reserve Reporting System for Canada.

Norwest Mine Services Ltd., February, 1998: Western Coal/Cambrian Mining plc, Semi-Detailed Report – Willow Creek Property.

Amendment to Permit C-153, May 5 2006, F.W. Herman (Chief Inspector of Mines – British Columbia)

24.0 Date and Signature Pages

I, Robert J. Morris, M.Sc., P.Geo., do hereby certify that:

1. I am a Principal of Moose Mountain Member Corp, 6243 Kubinec Road, Fernie, BC V0B 1M1
2. I graduated with a B.Sc. from the University of British Columbia in 1973.
3. I graduated with a M.Sc. from Queen's University in 1978.
4. I am a member of the Association of Professional Engineers and Geoscientists of B.C. (#18301).
5. I have worked as a geologist for a total of thirty-three years since my graduation from university.
6. My past experience with coal exploration and mining includes work with all of the coal mines in southeast B.C., as well as mining projects in Northern and Central B.C., Indonesia, Thailand, Columbia, England, Mongolia, and Iran.
7. I have read the definition of "qualified person" set out in NI 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfill the requirements to be a "qualified person".
8. I am responsible for the geology and resource review and verification and preparation of the technical report titled "Preliminary Feasibility Study NT 43-101 Technical Report for the Willow Creek Mine" dated July 16, 2010.
9. I completed a site visit of the Pine Valley – Willow Creek Property during the period August 13 to 17, 2005, July 18th & 19th 2006, and September 30th to October 2nd 2008. Prior to my original site visit I had no prior involvement with the Willow Creek Property.
10. I am independent of Western Coal/Cambrian Mining plc and Falls Mountain Coal, and work as a geological consultant to the mining industry.
11. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose, which makes the Technical Report misleading.
12. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
13. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public.

Date July 16, 2010

"Signed"

_____

Signature of Qualified Person
Robert J. Morris, M.Sc., P.Geo.
Print Name of Qualified Person

I, James H Gray. P.Eng., do hereby certify that:

1. I am a Principal of Moose Mountain Member Corp., 1584 Evergreen Hill SW Calgary, Alberta Canada T2Y 3A9.
2. I graduated with a Bachelor of Applied Science in Mining Engineering from the University of British Columbia in 1975.
3. I am registered by The Association of Professional and Geoscientists of the Province of British Columbia, registration number 11,919, and the Association of Professional Engineers, Geologists and Geophysicists of Alberta (M47177).
4. I have worked as a Professional Engineer for over 25 years since my graduation from university.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the reserve definition, mine planning and preparation of the technical report "Preliminary Feasibility Study NT 43-101 Technical Report for the Willow Creek Mine" dated July 16, 2010.
7. I have visited the Willow Creek Property on July 18th & 19th 2006, April 4th 2007 and most recently on September 30th and October 1st, 2008.
8. I have not had prior involvement with the property that is the subject of the Technical Report.
9. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
10. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated July 16, 2010

"Signed"

_____

Signature of Qualified Person

James H Gray P.Eng.
Print Name of Qualified Person

I, Mark Zik, P.E. do hereby certify that:

1. I am a Senior Project Manager at Taggart Global LLC., 4000 Town Center Blvd, Suite 200, Canonsburg, Pennsylvania, USA 15317.
2. I graduated with a Bachelor of Applied Science in Mining Engineering from the Pennsylvania State University 1979.
3. I am registered by The State Board of Professional Engineers, Land Surveyors and Geologists of the Commonwealth of Pennsylvania, registration number PE-045788-R.
4. I have worked as a Professional Engineer for over 26 years since my graduation from university and my successful completion of the requirements for registration as a Professional Engineer.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation plant flow sheet design, the materials handling flow sheet design, and the review of the washability data for the purpose of flow sheet design for the Technical Report "Preliminary Feasibility Study NT 43-101 Technical Report for the Willow Creek Mine" dated July 16, 2010.
7. I have visited the Willow Creek Property on June 3rd 2010.
8. I have not had prior involvement with the property that is the subject of the Technical Report.
9. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
10. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated July 16, 2010

"Signed"

_____
Signature of Qualified Person

Mark Zik, P.E.
Print Name of Qualified Person

25.0 Additional Requirements for Technical Reports on Development Properties and Production Properties

25.1 Mine Design Criteria and Assumptions

25.1.1 Introduction

The mine planning for the Willow Creek coal property is based on work done with MineSight© a suite of software used extensively on the Rocky Mountain coal properties. It is well proven in the Industry. This suite includes the geology resource model, pit optimization, detailed pit design, and optimized production scheduling.

In addition to the geological information used for the block model, other data used for the mine planning includes the base economic parameters, mining cost data derived from supplier estimates and historical data, geotechnical slope design parameters, metallurgical recoveries, and project design plant costs and throughput rates.

25.1.2 Mining Datum

Project design work is based on the NAD 83 coordinate system.

25.1.3 Mining Loss and Dilution

Within the pit areas of Willow Creek, the various coal seams that will ultimately make up the plant feed allow a consistent and repeatable mining recovery process. In future operations, seam tops will be delineated by blasthole drilling information. Dozers and backhoes will be used to prepare the seam for mining. Seam preparation has a significant effect on plant feed quality and overall mining recovery. Poor mining preparation of the in-place coal will dilute the raw coal quality characteristics with partings and consequently reduce the plant yield and clean coal output. Over-prepared coal in the pit ensures the best-delivered ash and plant yield but increase mining losses in the pit.

The effect of mining loss and dilution on plant feed quality can be varied using standard MineSight© reserve routines on the 3d Block Model and analyzed for its impact on project economics. By assigning a fixed thickness of mining loss and dilution for each coal seam, mining recovery is dynamically adjusted for the seam being mined (i.e. A 23 cm mining loss from cleaning the top of an 8m seam represents a 2.9% loss while the same loss due to preparation on a 1m seam will generate a 31 % loss). By further assigning quality estimates to the parting, and the HW and FW dilution; the delivered ash to the raw coal stockpile or to the breaker can be estimated.

Delivered feed ash is higher for a thin seam based on the same in-pit seam mining preparation as a thick seam, resulting in the loss and dilution percentages being substantially higher for the thinner seam.

To estimate loss and dilution, a fixed depth of coal loss and a fixed addition of dilution are applied each time a seam is cleaned. In seam zones that have removable partings the seam is essentially cleaned twice or has 4 contact points instead of 2, top of seam and bottom of seam. The thickness of coal loss and dilution is primarily an operational issue including blasting effects, method of cleaning and method of coal removal. Faults in seams, available time to clean and tight headings (high wall wedges) also contribute to coal loss and dilution.

The loss and dilution used at a similar operation (WCC's Wolverine mine) is an estimated 0.1m per contact or 0.2m per seam cleaning and removal. Although Wolverine is similar to Willow Creek in that is has some similarly dipping seams and will employ the same method of backhoe cleaning and seam extraction, it has been assumed that a 15% higher loss and dilution will occur at Willow Creek to account for higher occurrence of faults and tight headings.

The average coal loss and dilution applied to each seam at Willow creek is estimated to be 0.23 meters where no removable partings occur, and 0.46m where a removable parting occurs. A typical section illustrating loss and dilution where a removable parting occurs is shown in the Figure below.

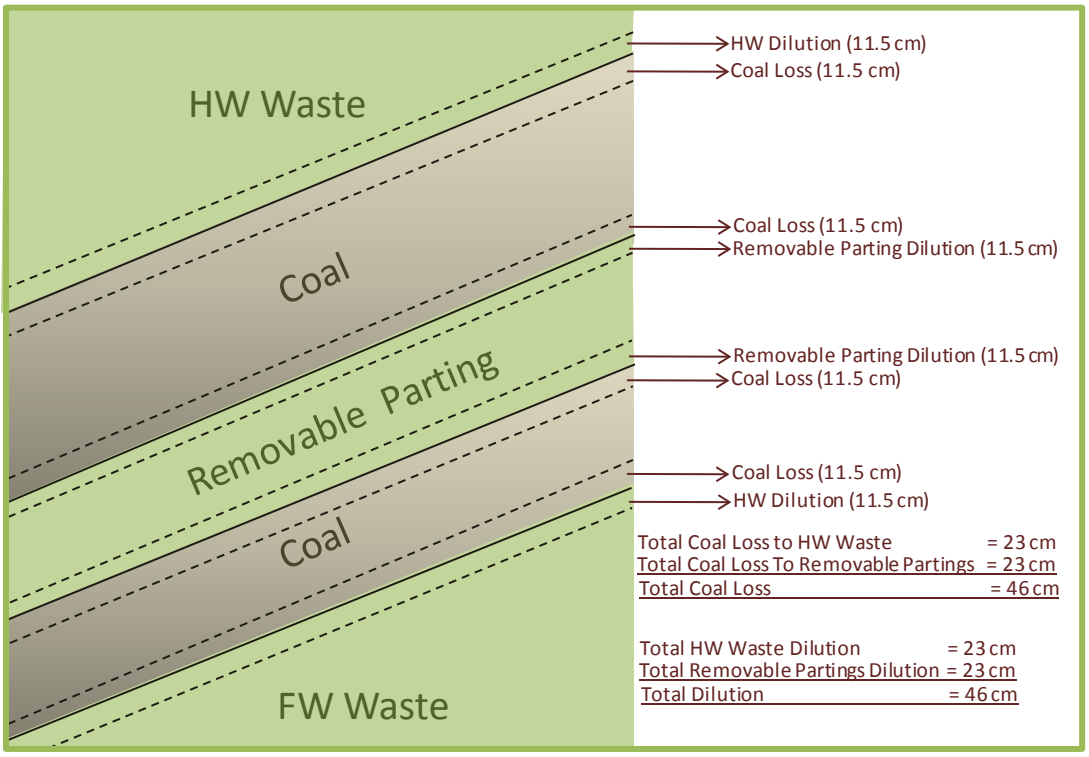

Figure 25-1 Average Coal Loss and Dilution Illustration

Removable Partings

Thickness and number of occurrences of removable partings in each seam has been estimated by reviewing the drillholes composites throughout the geological model. Partings thicker than 1m are considered to be removable. The Table below shows the average thickness of removable partings when they occur.

Table 25-2 Removable Partings Thickness Estimates

Seam	Average Parting Thickness (m)	Starting	Ending
1	1.6	6163900N	6164800N
4	1.2	6163900N	6164800N
5	1.3	6161600N	6162000N
7	1.5	6161600N	6162900N

Weighted Coal Loss and Dilution

A coal loss and dilution of 0.23 meters is applied to the insitu seam thickness on 100 meter sections to calculate the percentage loss and dilution on a seam by seam basis. In areas where removable partings occur, the applied coal loss and dilution is doubled to 0.46 meters to account for the parting removal requiring a second seam cleaning and removal.

The Table below summarizes the estimated coal loss and dilution, as a percentage of volume or tonnage, for each seam including and excluding removable partings, and the estimated cumulative loss and dilution inside the ultimate pit.

Table 25-3 Estimated Coal Loss and Dilution at Willow Creek

Seam	Excluding Removable Partings			Including Removable Partings		Seam distribution in Ultimate Pit	Cum Weighted Loss	Cum Weighted Dilution
	Average Seam Thickness	Dilution	Loss	Dilution	Loss			
	m	%	%	%	%	%	%	%
1	3.3	6.3%	6.3%	8.7%	8.7%	12.0%	1.0%	1.0%
2	1.4	14.8%	14.8%	13.6%	13.6%	4.7%	1.7%	1.7%
3	1.5	15.0%	15.0%	15.0%	15.0%	3.0%	2.1%	2.1%
4	4.0	5.4%	5.4%	6.9%	6.9%	19.2%	3.4%	3.4%
5	1.8	11.3%	11.3%	14.8%	14.8%	10.0%	4.9%	4.9%
6	2.7	8.5%	8.5%	8.5%	8.5%	14.9%	6.2%	6.2%
7	4.4	4.0%	4.0%	10.4%	10.4%	34.8%	9.8%	9.8%
8	1.7	13.6%	13.6%	13.6%	13.6%	1.5%	10.0%	10.0%
A	1.5	15.6%	15.6%	15.6%	15.6%	0.1%	10.0%	10.0%

The Table above shows that overall seam loss and dilution weighted by seam volume distribution inside the anticipated mining area is an average overall 10% loss and dilution.

25.1.4 ASH and SG

Coal quality data has been compiled by WCC on a seam by seam basis for two areas of Willow Creek, the central and the north. As WCC is still waiting for lab results, MMTS suggests that there is currently insufficient data to attempt to model the coal quality in the geology 3D block model (3DBM). Ash and SG are therefore applied as averages in this study.

In GSC Paper 88-21 in situ bulk density for low to medium volatile bituminous coal (as at Willow Creek) has a range of 1.36 @ 5% ash to 1.44 @ 15% ash.

Ash and SG design basis assumptions at Willow Creek have been estimated after reviewing the available quality data and inspection of typical geophysical logs. These assumptions are shown in the Table below.

Table 25-4 SG and Ash Design Basis Assumptions

Insitu Coal SG (excl. NRP)	1.35	t/m3
NRP SG	1.8	t/m3
NRP Ash	50.0	%
Dilution SG	2.2	t/m3
Dilution Ash	85.0	%

NRP = None Removable Partings

Each block in the geology model contains a percentage NRP interpolated from composites. The design basis Ash and SG assumptions, and the % NRP are used to estimate the average Insitu coal SG and Ash by seam in the Table below.

Table 25-5 Estimated Insitu Ash and SG

Seam	Insitu Coal SG (No NRP) t/m3	Insitu Coal ASH (No NRP)* %	NRP SG t/m3	NRP Ash %	NRP ** %	Estimated Insitu Coal SG (incl. NRP) %	Estimated Insitu Coal Ash (incl. NRP) %
1	1.35	8.0	1.8	50.0	5.9	1.38	10.5
2	1.35	8.0	1.8	50.0	9.0	1.39	11.8
3	1.35	8.0	1.8	50.0	0.9	1.35	8.4
4	1.35	8.0	1.8	50.0	5.3	1.37	10.2
5	1.35	7.0	1.8	50.0	7.2	1.38	10.1
6	1.35	7.0	1.8	50.0	0.9	1.35	7.4
7	1.35	7.0	1.8	50.0	8.9	1.39	10.8
8	1.35	7.0	1.8	50.0	3.6	1.37	8.5
A	1.35	10.7	1.8	50.0	2.5	1.36	11.7

** Insitu Ash based on Clean Coal Ash assumptions from Dan Avery at WCC*
*** Based on reserves from Series 3 Ultimate Pit, undiluted NPRT*

Insitu Ash and SG in the Table above and Loss and Dilution estimated in the previous section are used to estimate the Run of Mine (ROM) ASH and SG in the Table below.

Table 25-6 Estimated ROM Ash and SG

Seam	Coal Loss %	Dilution %	Dilution SG t/m3	Dilution Ash %	Estimated ROM SG %	Estimated ROM Ash %
1	8.7	8.7	2.2	85.0	1.44	17.0
2	13.6	13.6	2.2	85.0	1.49	21.7
3	15	15	2.2	85.0	1.47	19.9
4	6.9	6.9	2.2	85.0	1.43	15.4
5	14.8	14.8	2.2	85.0	1.50	21.2
6	8.5	8.5	2.2	85.0	1.42	14.0
7	10.4	10.4	2.2	85.0	1.47	18.5
8	13.6	13.6	2.2	85.0	1.47	18.9
A	15.6	15.6	2.2	85.0	1.49	23.1

25.1.5 Breaker Rock and Plant Yield

The project Life of Mine production schedule is used to quantify the annual clean coal tonnages for delivery to the market and thus generates the project revenues. The Geology model is the source of the raw coal quantities, and the clean coal reserves generated from the model are used in the production schedule. As such the coal yield used in the geology model includes all mining, plant, and transportation processes from the insitu coal to the final market product.
The process metallurgy description of plant yield for Willow Creek in Section 18.0 describes the plant yield predictions from raw coal feed to the plant through to clean coal produced at the onsite train loadout.

The forecasting of the reject percentage that will be removed prior to plant feed tonnage is based on numerous factors. These factors include insitu non-removable partings, hanging wall and footwall contamination caused by blasting, cleaning the seam and removal of the seam. The contamination from these sources may be partially extracted as breaker reject.

Assumptions must be made, as there is no operating data available from the existing Willow Creek site that can be extrapolated from. There is however Wolverine, another Western Coal Corporation (WCC) operating mine, that has similarly dipping seams. This mine calculated an overall breaker rock volume of 6.5% and 6.8% for 2007 and 2008 respectively. Plant Yields have been proposed for the pit optimization and design by WCC based on the following assumptions:

- 9mm Screen Undersize Diverted for Cleaning,
- Average 10% Dilution,
- Interpolated at 8% Ash for HCC.,
- 7% Ash for L.V. PCI.

The estimated Willow Creek plant yields are shown in the Table below.

Table 25-7 Estimated Plant Yields and Clean Coal Ash at Willow Creek

Seam %	Plant Yield %	Clean Coal Ash %
Seam 1	87	8.0
Seam 2	65	8.0
Seam 3	81	8.0
Seam 4	73	8.0
Seam 5	74	7.0
Seam 6	86	7.0
Seam 7	77	7.0
Seam 8	73	7.0

A breaker reject yield of 6.5% is assumed for Willow Creek. A pseudo overall plant mass balance for 100 tonnes of Plant Feed for Seam 7 is illustrated below.

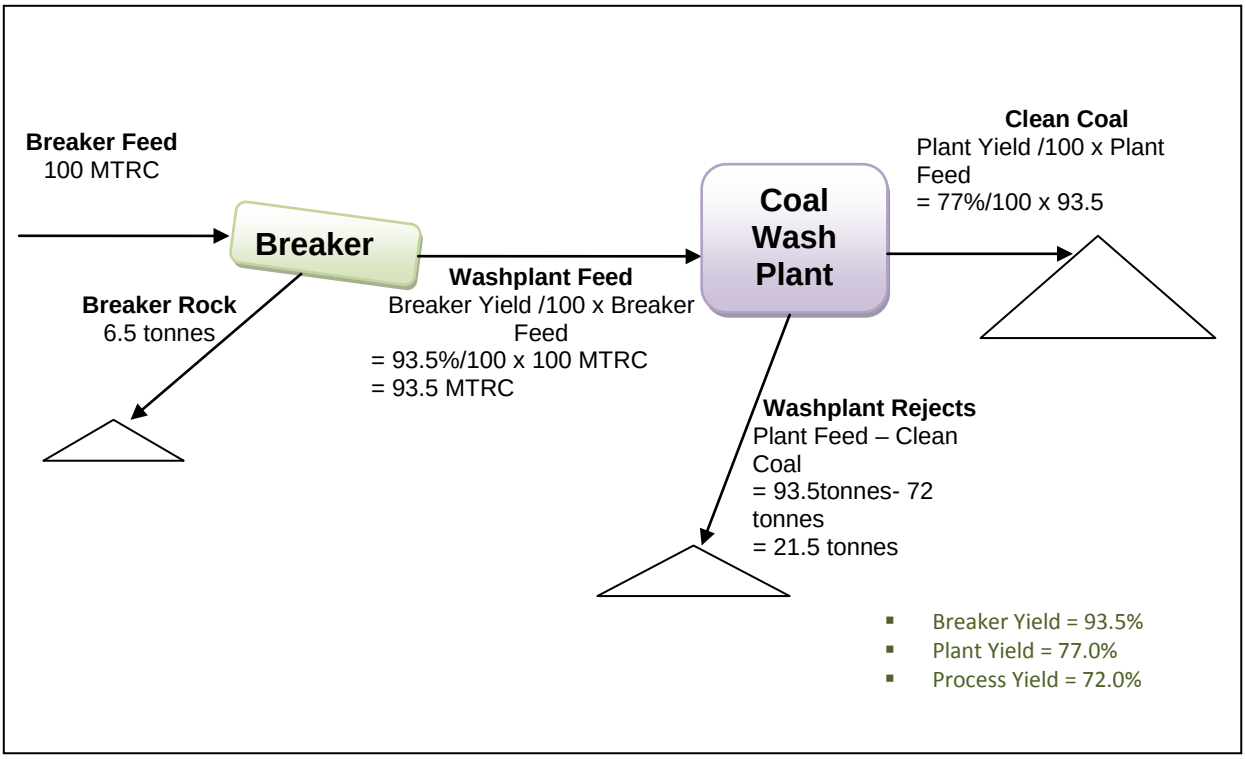

Figure 25-2 Mass balance illustrating estimated Process yields at Willow Creek processing Seam 7

The overall process yield incorporating the breaker yield (100% - breaker rock) and the plant yield by seam are shown in the Table below.

Table 25-8 Overall Process Yields at Willow Creek

Seam	Breaker Yield %	Plant Yield %	Overall Process Yield %	Clean Coal Ash %
Seam 1	93.5	87	81	8.0
Seam 2	93.5	65	61	8.0
Seam 3	93.5	81	76	8.0
Seam 4	93.5	73	68	8.0
Seam 5	93.5	74	69	7.0
Seam 6	93.5	86	80	7.0
Seam 7	93.5	77	72	7.0
Seam 8	93.5	73	68	7.0
Seam A	93.5	54	50	8.0

The production target at Willow Creek is 2.2 Million MTRC plant feed per year. An annual Breaker Feed throughput after production ramp-up of 2.3 million MTRC is required to achieve the Plant Feed throughput target.

25.1.6 Pit Slopes

The design basis, (DB), pit slopes angles (PSA) have been prescribed by Piteau. These are specified for each mining Region by sector with overall pit slope angles ranging from 34 to 50 degrees.

25.1.7 MineSight Economic Planner (MS-EP) LG Pit Setup

Economic pit limits for the Willow Creek Preliminary Feasibility Study have been determined using MineSight's Economic Pit Limit program (MS-EP) which is based on the Lerschs-Grossman (LG) pit optimization routine using preliminary cost and pit slope design criteria

25.1.8 LG Economic Pit Limit Results

The results for the LG sensitivity cases are shown below. The graph below shows the pit resource sensitivity to price case at varied pit slope assumptions.

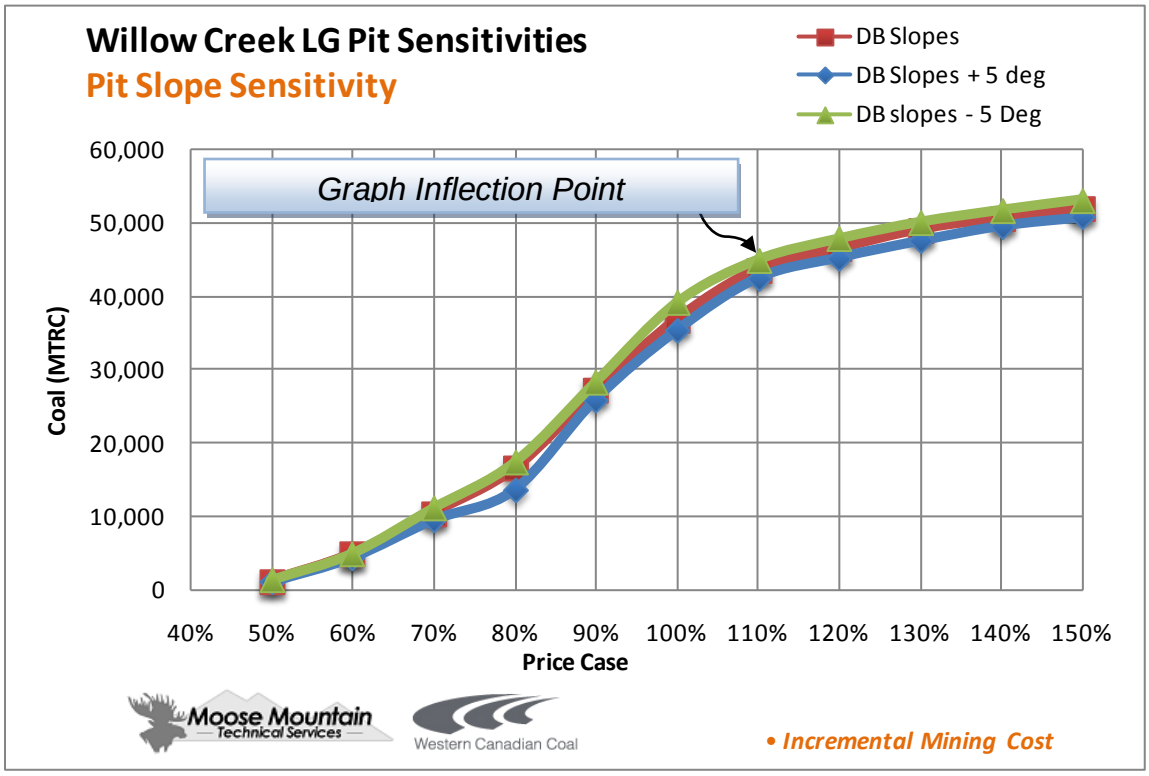

Figure 25-4 Pit Slope Sensitivity

For the all the pit slope sensitivity cases an inflection occurs in the graphs at the 110% price case. There remains upside to pit resource by increasing prices beyond the 110% case, but to a lesser degree. It is clear from the above graphs that the LG economic pit limit is not sensitive to pit slope angle assumptions. The incremental pits phases between the 90% case and the 110% case are not likely to add or subtract significant profit (or loss) to the mine cash flow. Additional cases between the 90% and 100% cases using design basis LG pit slopes are shown in the graph below. These cases are used to evaluate the optimum pit limit in more detail.

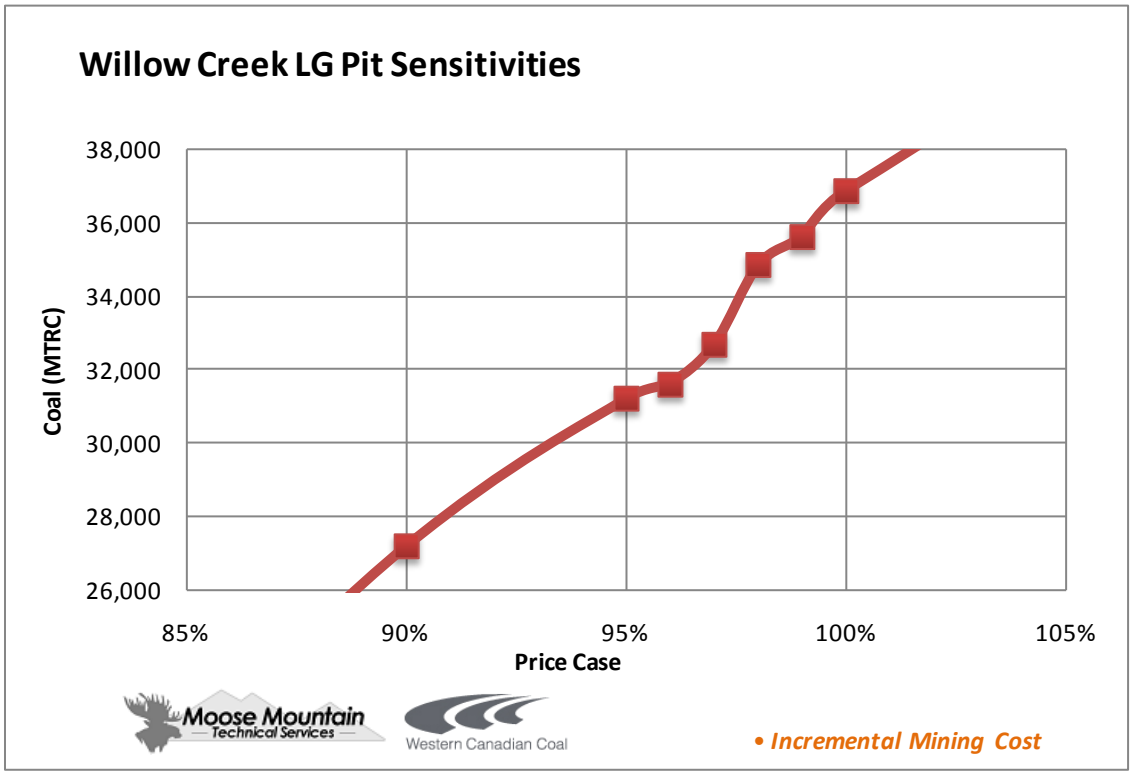

Figure 25-5 Additional LG Cases between 90% and 100%.

An analysis of the above graph shows that a significant increase in coal tonnes occurs between the 95% and 100% case. The incremental pit shells will be close to neutral profitability and increase the risk of being loss making increments if mining costs are higher, or coal prices are lower than assumed. A plan view of the 100% price case is shown below, followed by three sections illustrating the incremental pit cases.

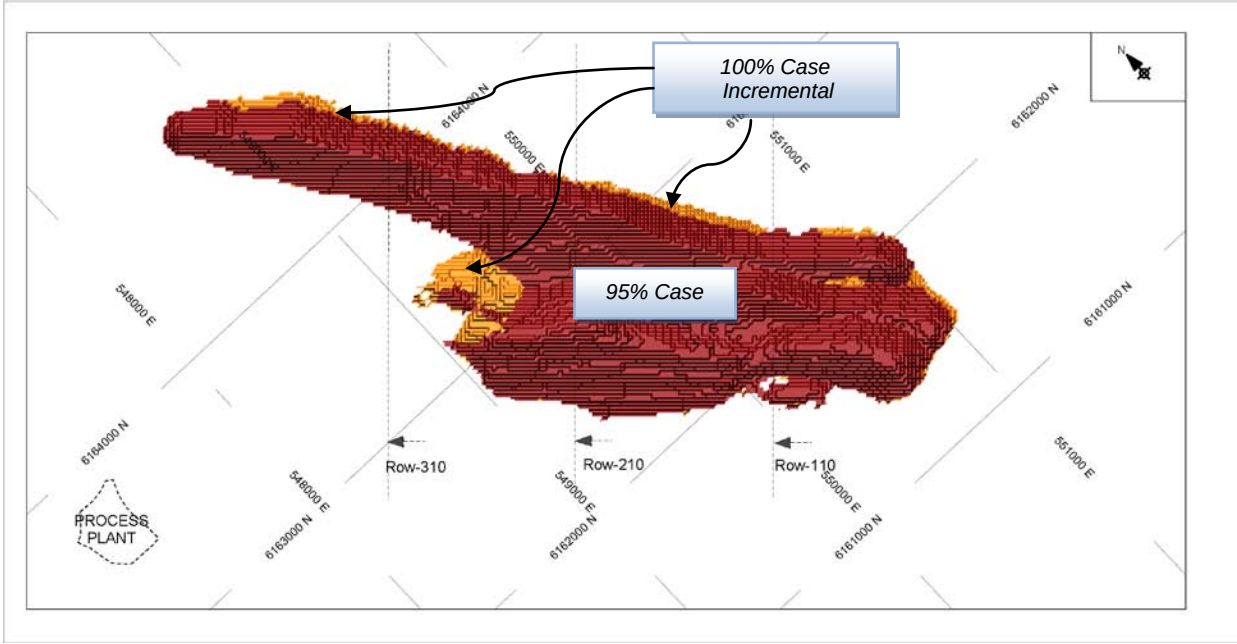

Figure 25-6 Plan View of Case B (Design Pit Slopes) 95% & 100% Price Case LG Pits

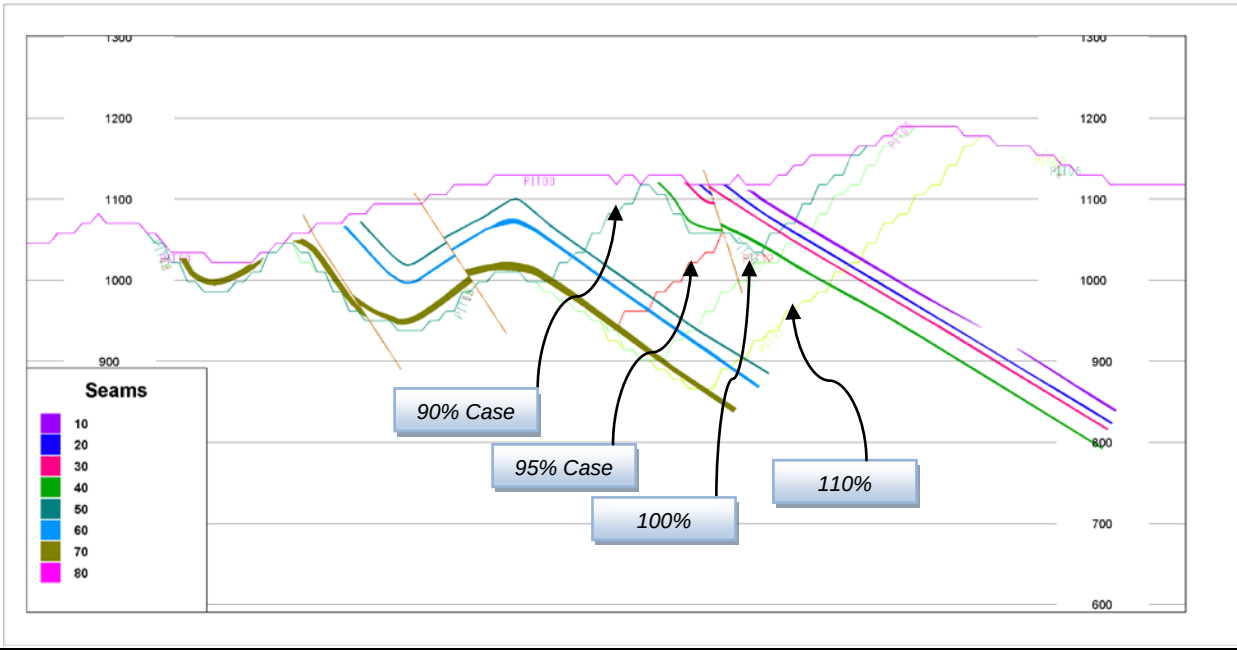

Figure 25-7 LG Pits Case B (Design Bases Pit Slopes) Section at Row 110

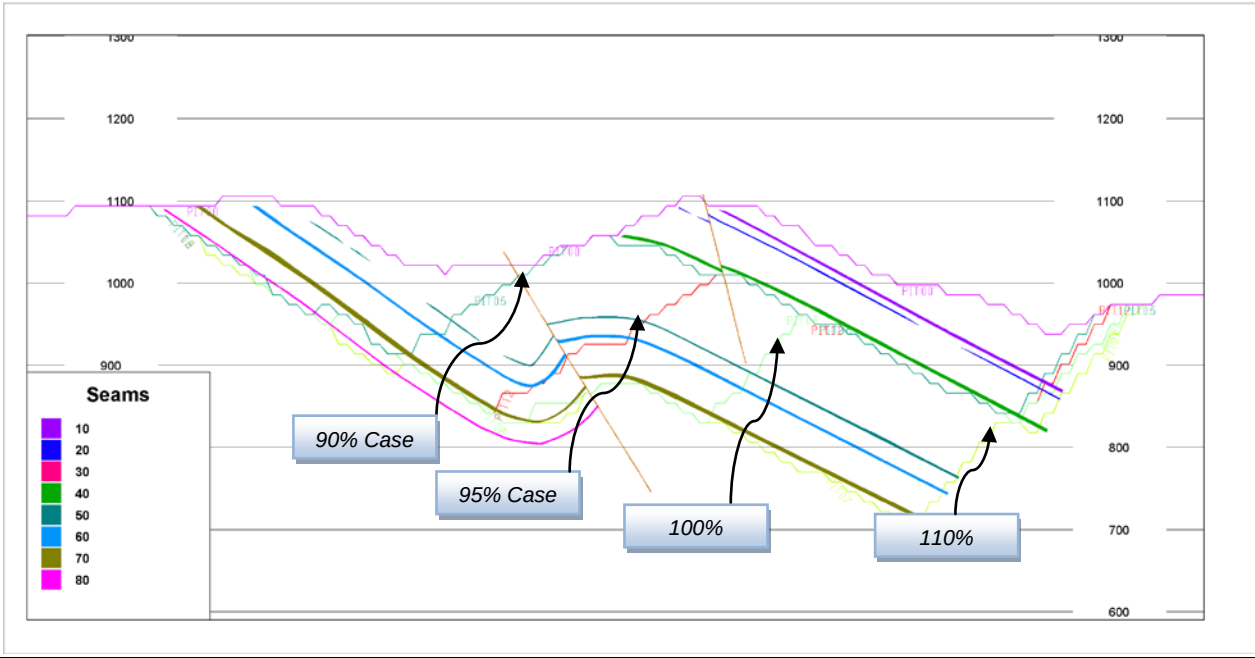

Figure 25-8 LG Pits Case B (Design Bases Pit Slopes) Section at Row 210

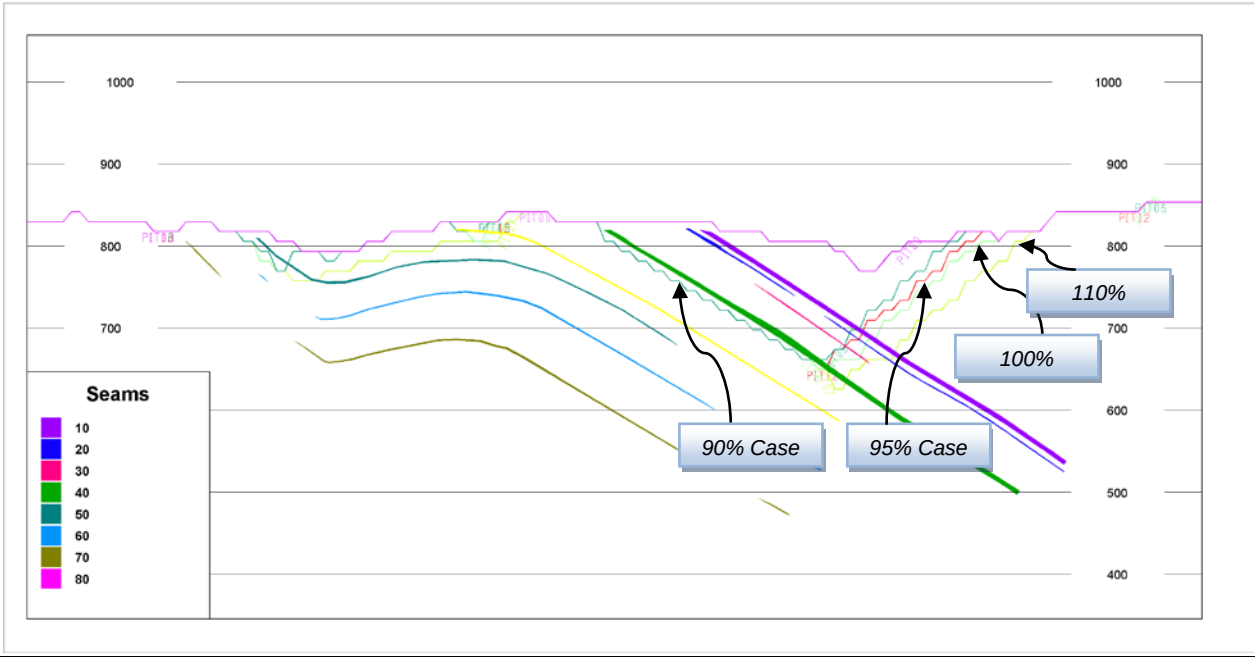

Figure 25-9 LG Pits Case B (Design Bases Pit Slopes) Section at Row 310

The Figure below illustrates the incremental volume in the pushback between the 95% and 100% price cases.

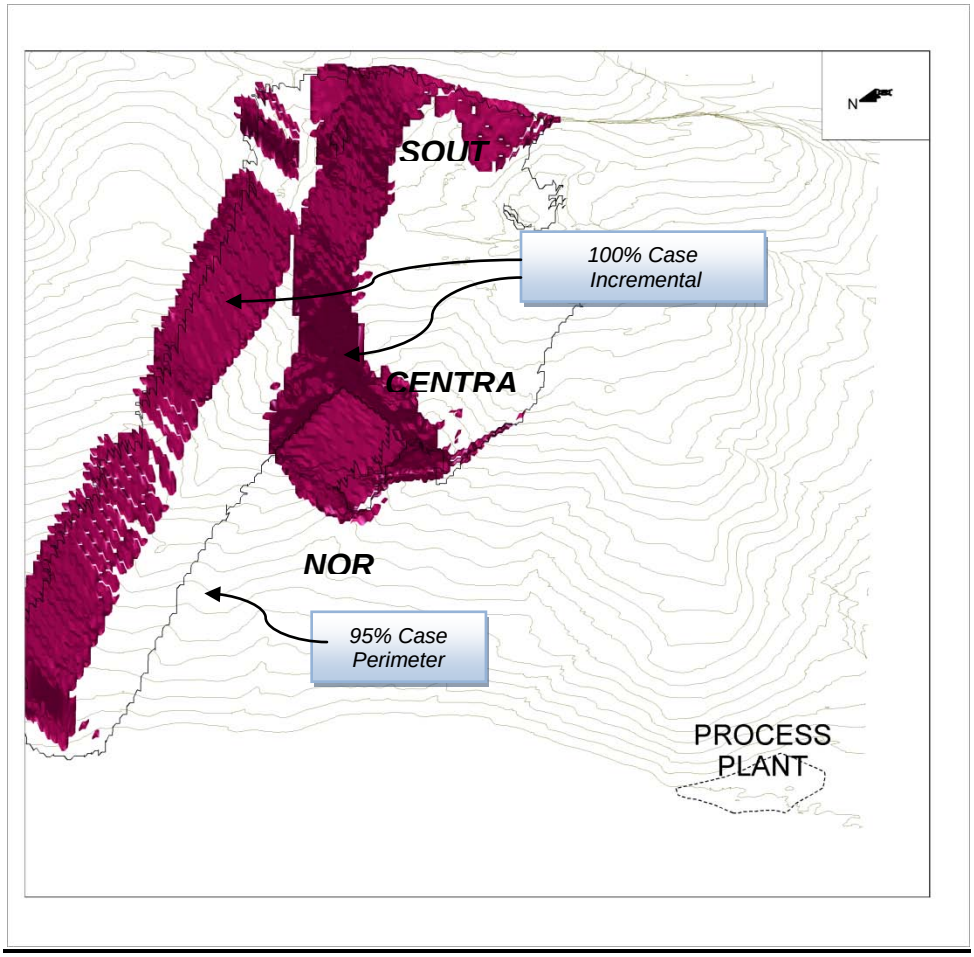

Figure 25-10 Incremental Volume between 95% & 100% Price Case LG pits (Case B)

The above Figure shows that largest mined volume in the incremental push back between the 95% and 100% cases occurs in the Central mining region, and is driven by coal at depth. The profitability of mining coal in this pushback is marginal.

The pit limit to be used as a guide for detailed pit design at Willow Creek is the Case B 95% Case. The 100% Case is used in areas where the pit limit is not sensitive to the price case.

The 95% Case allows for potential upside to the pit delineated resources should:

- future exploration extend the interpretation in future studies;
- mining cost prove to be lower than currently estimated;
- process yield assumptions improve;

The Figure below compares the 2007 designed pits and the new recommended LG pit limit showing:

- The 2007 mining pits have merged into one pit;
- East highwall moves between 150m and 300m east,
- East highwall moves between 50 and 200m deeper
- The geology update moves the North West pit eastwards
- The Central mining area is mined approximately 80m deeper
- The larger and more continuous mining area will allow more efficient mining practices

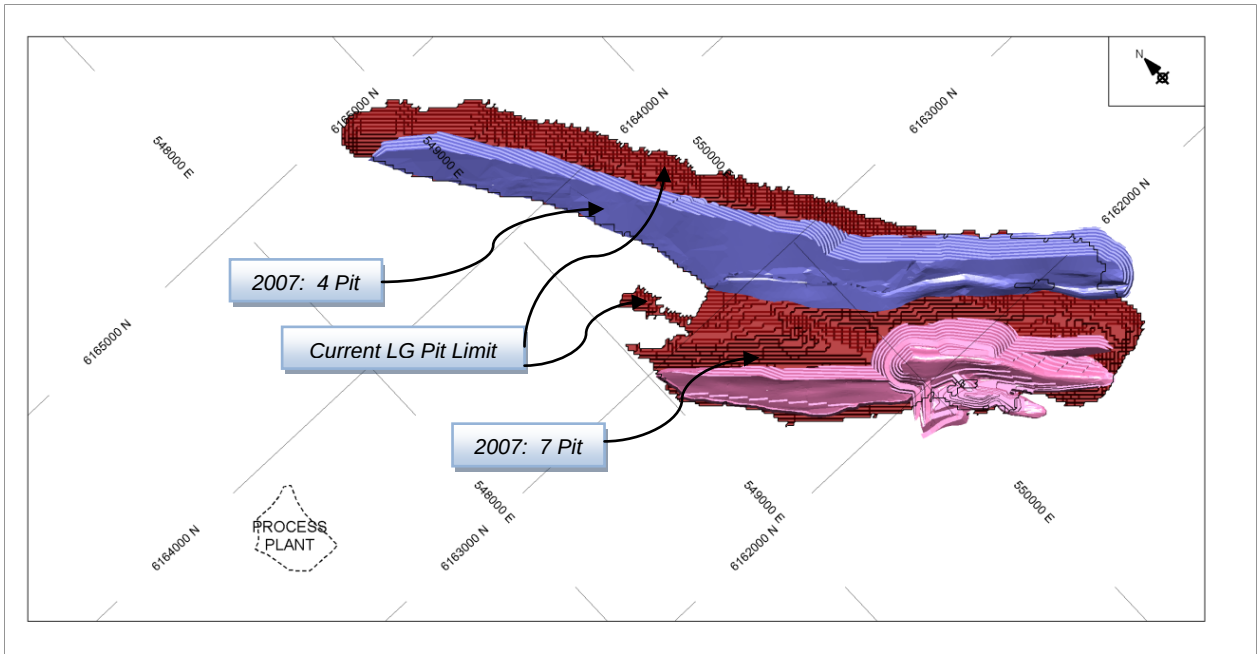

Figure 25-11 Plan View of LG pits-Previous MPA vs. new Design Basis LG Economic Pit Limit

25.2 Design Pits

The selected LG pits are used as guides for designed pits. Design pits are smaller than the 100% Case LG shell primarily in two areas, the upper section of Far East Creek and the ridge separating Far East Creek and Central Creek drainage.

Pit design is limited to a 50m setback of Far East Creek for the upper section because the diversion of the upper section of Far East Creek is not economically strong enough to override the risk assessment. The design pit is limited to the 95% LG shell for approximately 600 meters on the ridge separating Far East Creek and Central Drainage and transitioning back to the 100% LG shell over a distance of approximately 500 meters. The two defining issues in his region of the model are:

1. sensitivity to small increments of coal price and
2. the additional waste requirement to mine to the 100% LG shell will exceed the North Slope waste capacity

The cost of development and incremental haulage to an additional waste dump makes mining beyond the 95% shell uneconomic in this region.

25.2.1 Pit Design Criteria

Wall Angles

Wall angle design parameters used for this study are shown in the Table below.

Table 25-11 Pit Slope Design Parameters

Highwall Design Criteria		
Max BFA	66	degrees
Max Bench Height (2 steps)	24	m
Min Berm width	9.5	m
Max Pit Slope Angle	51	degrees
Footwall Design Criteria		
Dip 0° to 30° :	no Benching	
Dip 30° to 50° :		
Berm	12	m
Bench Height	50	m
Dip $>50^o$:		
Berm	12	m
Bench Height	25	m
Max Pit Slope Angle	51	degrees

Section	Sector	FW / HW	Bedding Angle Degrees
North	A	FW	42
North	B	HW	33
Central	C	FW	39
Central	D	HW	24
South	E	FW	63
South	F	FW	49
South	G	HW	32

Design criteria used for the footwall is a 10m berm every 3 benches or 36m. Actual locations of the berms and berm widths will likely be governed by identifiable stable bedding planes.

Geotechnical assessment of pit slopes is required prior to the completion of a feasibility study.

Haul Road Widths

Haul road widths are based on double lane traffic and berm heights of ¾ the tire diameter. Equipment selection process determined that a 136 tonne capacity truck is a best fit for this size of operation. The dimensions of a 136 tonne capacity truck which has an operating body width of 6.64m and uses standard tires designated as 33.00R51 which have a diameter of 3.06m were chosen to establish the road requirements. Road surface clearance requirements are 19.9m and each berm requires 6.1 meters of road width. A haul road on the high wall or against topography will only require a single berm on the outside or 26 meters and roads requiring berms on both sides require 32.1 meters. An additional meter of road width is added to the design road widths, 27 meter for single berm and 34 meters for double berm roads to allow for extra ditch width if required.

25.2.2 Designed Pit Phases

To ensure a workable operating plan, the main pit is divided into eleven smaller pits or stages to phase development for backfilling, even out stripping requirements, and provide multiple coal products for market requirements. Sufficient external waste dump room has been designed to meet waste mined volumes until mined out phases becomes available for in-pit backfilling.

All the incremental pit phases are show in the Figure below.

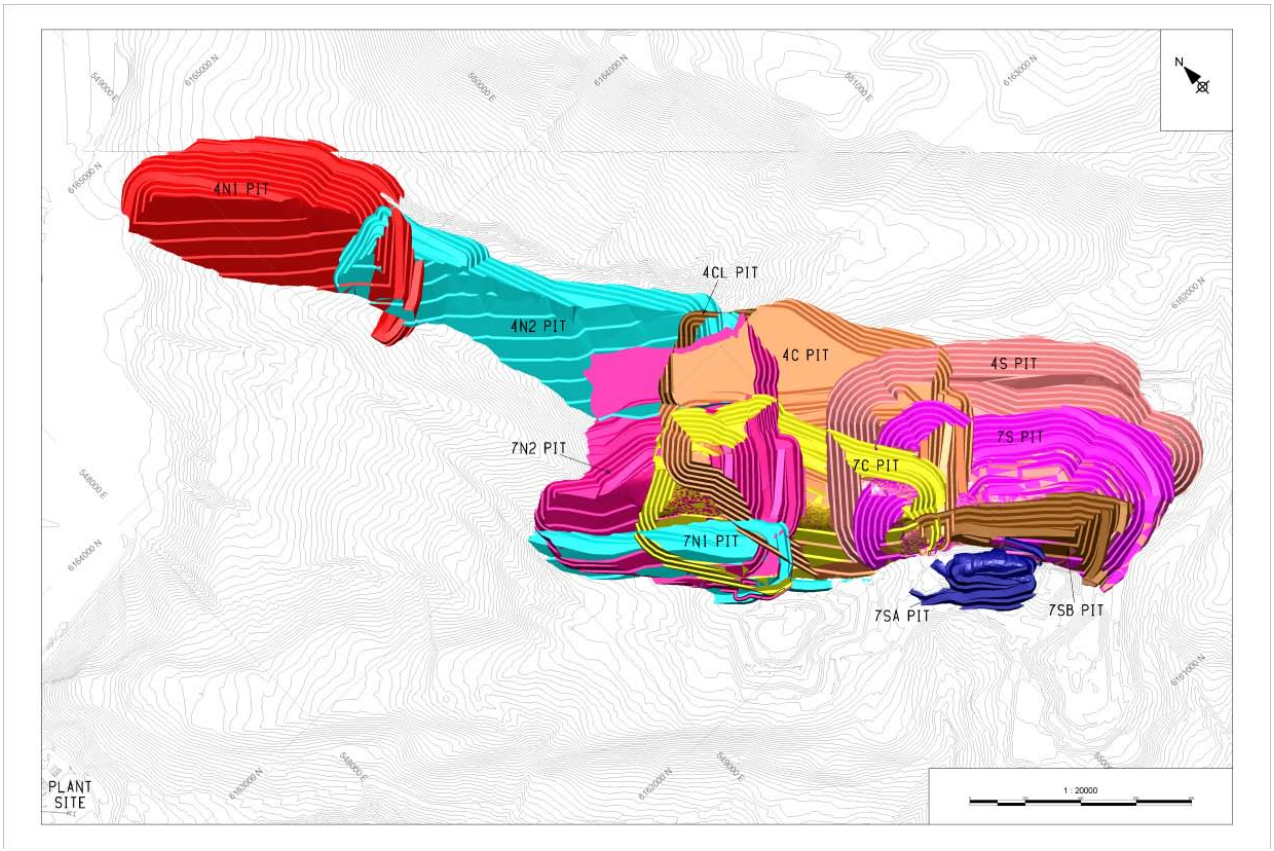

Figure 25-23 Willow Creek All Incremental Pit Phases

Ultimate Pit

The ultimate pit is shown in the Figure below.

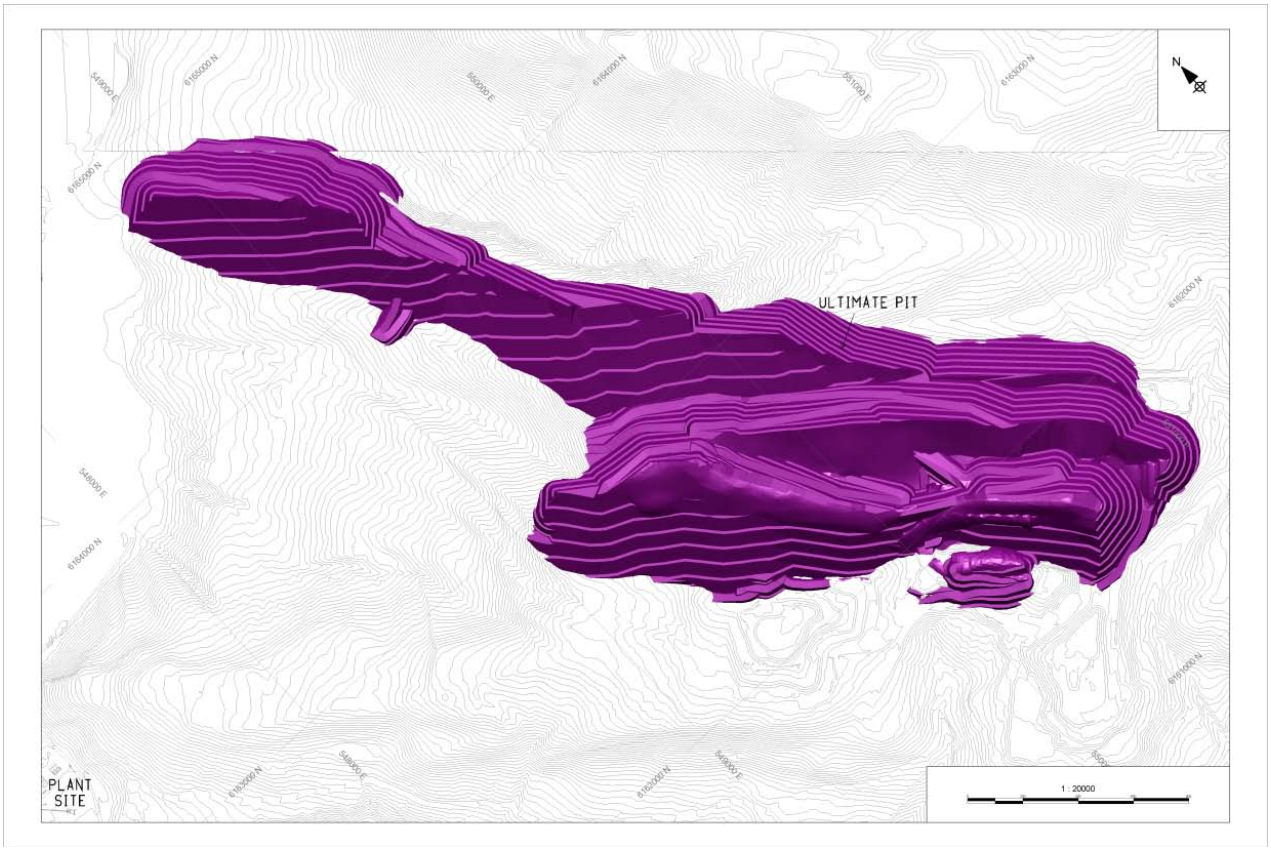

Figure 25-24 Willow Creek Ultimate Pit

25.3 Pit Reserves

GSC Paper 88-21 requires that mining parameters be applied to in-situ tonnages for the estimation of recoverable reserves. These parameters generally include provisions for mining losses and the inclusion of dilution and their application to appropriate in-situ resources results in the estimation of recoverable reserves. The recoverable reserve is the amount of coal that is expected to be extracted from the resource in-place during the mining process. In the present estimate, and in conformity with the requirements of GSC Paper 88-21, the mining parameters include the following:

- Any coal losses due to mining;
- Mining dilution;
- Provision for oxidation;
- Thickness limits for mining.

Mining parameters used for the Willow Creek reserve estimate are described in Section 19.7.

The results of the estimation of recoverable measured and indicated reserves in the Willow Creek Ultimate pit are summarized in the Table below.

Table 25-12 Summary of Willow Creek Measured and Indicated Pit Phase Reserves (ROM)

PIT PHASE	HCC			PCI			OXIDE			TOTAL			WASTE	S/R
	kMTRC	ASH %	YIELD %	kMTRC	ASH %	YIELD %	kMTRC	ASH %	YIELD %	kMTRC	ASH %	YIELD %	kBCMW	BCMW /MTRC
7SA	-	-	-	369	18.5	72.0	6	18.5	72.0	375	18.5	72.0	1,085	2.9
7SBi	-	-	-	668	18.0	73.1	39	18.1	73.2	706	18.0	73.1	5,695	8.1
4N1	2,563	16.1	72.5	264	20.0	74.9	172	16.7	72.3	2,999	16.5	72.7	26,942	9.0
7N1	-	-	-	884	17.9	72.5	147	17.9	72.9	1,031	17.9	72.5	6,259	6.1
7N2i	927	17.2	70.8	2,891	17.5	74.0	238	17.3	73.0	4,056	17.4	73.3	41,456	10.2
4N2i	3,140	16.5	72.1	24	19.7	69.7	185	16.9	73.4	3,349	16.5	72.2	26,978	8.1
7C1i	48	15.8	67.6	4,192	17.9	73.3	223	18.0	72.0	4,463	17.8	73.2	27,606	6.2
4C2i	1,397	17.8	70.2	2,380	18.1	73.6	197	17.8	72.3	3,974	18.0	72.4	38,472	9.7
4CLi	1,019	17.1	69.1	109	19.9	76.0	0	21.0	69.6	1,129	17.4	69.7	6,258	5.5
7S1i	0	15.4	68.0	4,485	18.1	73.1	39	18.2	72.9	4,524	18.1	73.1	37,096	8.2
4S1i	669	17.7	70.1	2,346	18.3	73.4	17	16.9	69.4	3,032	18.2	72.7	26,673	8.8
TOTAL	**9,765**	**16.8**	**71.4**	**18,612**	**18.0**	**73.4**	**1,262**	**17.5**	**72.6**	**29,639**	**17.6**	**72.7**	**244,519**	**8.2**

Note: 'i' denotes incremental phase reserve.
1. Estimated process yield

The Figure below shows the ROM strip ratio by pit phase.

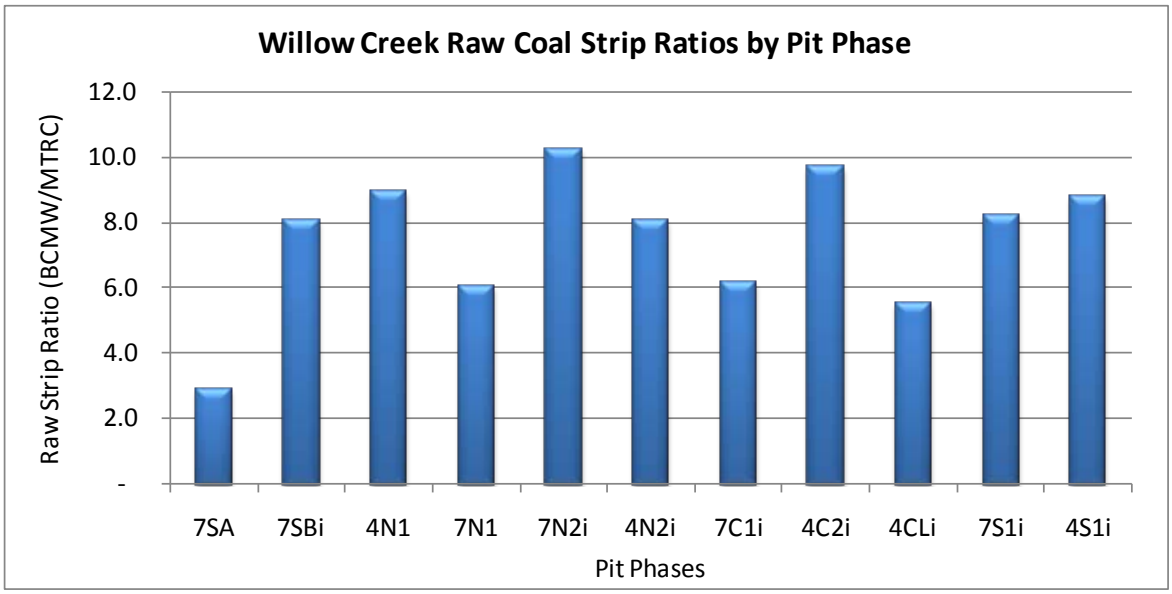

Figure 25-25 Raw Coal Strip Ratio by Pit Phase

Typically, sequencing the mining order from lowest strip ratio to the highest optimizes cash flow which improves project rate of return. The Figure above illustrates that the Willow Creek sequential pit phases are not designed from lowest strip ratio to highest as a result of the limitations in waste placement areas. The Table and Figures below summarize the ultimate pit reserves by seam.

Table 25-13 Summary of Willow Creek Ultimate Pit Reserves (ROM) by Seam

Seam	Coal	ROM			
	Type	Coal	Ash	Yield	Proportion
		kMTRC	%	%	%
Seam 1	HCC	3,501	17.0	81.0	11.8%
Seam 2	HCC	1,421	21.7	61.0	4.8%
Seam 3	PCI	904	19.9	76.0	3.0%
Seam 4	HCC	5,516	15.4	68.0	18.6%
Seam 5	PCI	3,118	21.2	69.0	10.5%
Seam 6	PCI	4,328	14.0	80.0	14.6%
Seam 7	PCI	10,358	18.5	72.0	34.9%
Seam 8	PCI	475	18.9	68.0	1.6%
Seam A	PCI	20	23.1	50.0	0.1%
Total		**29,639**	**17.6**	**72.7**	**100%**

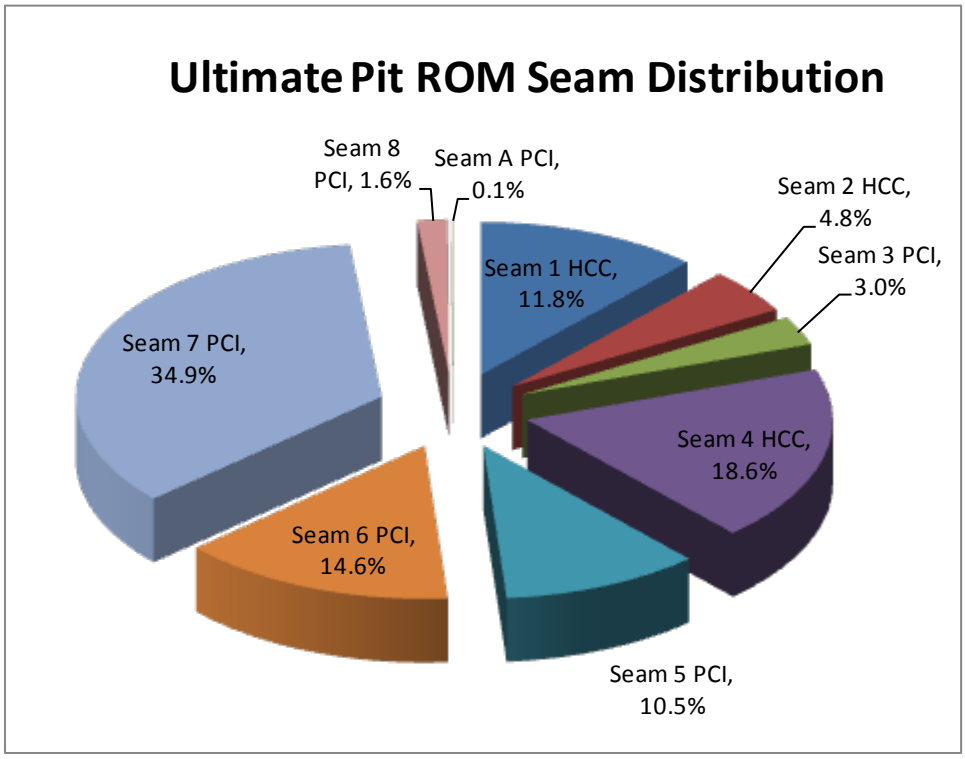

Figure 25-26 Willow Creek Ultimate Pit Seam Distribution

The Figure shows that PCI contributes 65% of the coal reserve with the largest PCI contributors Seam 7, Seam 6 and Seam 5, with smaller contributions of PCI from Seam 3 and Seam A.

HCC makes up 35% of the pit reserve from Seam 1, Seam 4 and Seam 2.

Willow Creek reserves by confidence of existence classification as per CIM definitions in GSC 88-21 are summarized in the Table below.

Table 25-14 Summary of Reserves by Confidence of Existence Classification

Reserve Class	ROM Coal million MTRC	Proportion
Proven	27.7	94%
Probable	1.9	6%
Total	**29.6**	**100%**

The Table below compares reserves in the 2007 Willow Creek 43-101 with the reserves reported in this study.

Table 25-15 Comparison of Reserves to 2007 Reserves

Reserve Class	2007 43-101 million MTRC	Current million MTRC	Difference million MTRC	Variance %
Proven	14.8	27.7	12.9	87%
Probable	0.9	1.9	1.0	107%
Total	**15.7**	**29.6**	**13.9**	**88%**

The current study has increased the Willow Creek pit reserve by 88%. This increase is a result of higher coal prices and a revised geological model after additional exploration drilling.

25.4 Dump Design

25.4.1 Site Constraints

The Willow Creek property is very constrained regarding available dump room. The mining area is bounded by creeks on the east, south and west sides and the Pine River floodplain to the north. Construction of a dump onto the floodplain is geotechnically precluded by a thick saturated clay layer overlain by a thin gravel layer. The saturated nature of this clay layer creates an inherently unstable foundation to accommodate the required deposition rate and quantity of the mine waste rock.

25.4.2 Waste Rock Dump Geotechnical Design

The geotechnical design for the Willow Creek waste rock dumps follows the OMS Manual to meet regulations and to construct the dump efficiently and safely.

25.4.3 Design Basis

The purpose of the North waste rock dump is to permanently store 286 million (loose) cubic metres of waste rock from the Willow Creek Mine efficiently and safely, protecting human health and safety and the environment. The new dump will be a new landform in the Pine River Valley and is designed to be geotechnically stable in the long-term and provide other environmental values through resloping, coversoiling, and replanting. It is a side hill fill (based on classification in British Columbia Mine Dump Committee, 1991).

Unlike most other coal mine waste rock dumps, portions of the dump will have an engineered outer shell built in 20-30 metre lifts using “upstream construction” (terminology borrowed from dam design) built from select coarse rock dumped perpendicular to the outer slope face to virtually eliminate the risk of

large scale flowslide failures that could affect the haul roads, sedimentation pond, and other facilities near the toe of the structure.

Segregation of waste rock as it is dumped will create a fill zone of higher hydraulic conductivity at the toe of the dump which will aid in keeping the water table low within the fill.

Three-metre high safety berms along the crest of each lift will have two functions: to reduce the risks to mine trucks inadvertently driving over the crest of the dump and to catch boulders to reduce hazards to people and equipment below the dump crest. Similarly a five metre high boulder rollout catch berm along the initial lift above the north haul road will further mitigate the boulder rollout hazard, especially for the first lift and during resloping.

Water management on the dump platform will direct away from the crest, towards a ditch near the haul road to be safely routed off the dump through existing watercourses to the North Pond sediment control structure.

During construction, the dumps will be monitored with piezometers and inclinometers. These instruments, along with visual monitoring and periodic inspections, will help to confirm design assumptions, or indicate the need for design modifications as construction progresses. The cycle of design, monitoring, analysis, and review is an essential element of this design.

When construction is complete, the dump slope will be resloped to a planar 2H: 1V slope angle and capped with cover soil and replanted. The top platforms will be sloped away from the crest to reduce water ponding and overtopping the crest. Water that does not percolate into the dump will be channelled off the dump through the haul road ditch system.

The key design element of this dump is that it is designed to virtually eliminate the risk of flowsliding and to provide for the safety of people and equipment working below the dump through the use of an engineered fill shell.

25.4.4 Dump Design and Construction

Site Preparation

The intent of the actions in this section is to provide a good contact between the dump waste rock and geotechnically competent surficial materials (to reduce the risk of slope failure through weak foundation materials), and to salvage suitable quantities of cover soil for reclamation.

Prior to dump construction:

- The site shall be logged (removal of merchantable timber), and cleared (removal of all remaining trees, shrubs, and brush). All debris shall be disposed of in an approved manner.

- Cover soil shall be salvaged and stockpiled in accordance with material handling plans for reclamation material. (This cover soil may be used to construct the boulder rollout catchberm).
- The surface water diversion system shall be in place prior to disturbance of the footprint area.
- The final foundation footprint shall be inspected by a qualified geotechnical engineer. The engineer shall map and record the surficial geology. Any areas containing soft, wet, or liquefiable materials that could affect the integrity of the dump shall be removed from the footprint area.

Designated areas requiring foundation preparation prior to dumping are highlighted in the complete dump design report. These areas will be stripped of overburden material down to a competent foundation in order to enhance the stability of the initial rock dump lifts. Water management structures will be required to control both surface runoff and shallow subsurface flows.

Run of Mine Materials

Given the design requirements for the durable shell, a key feature of material selection for the North Dump is to ensure that the material meets the requirements for being durable and free draining. For the purpose of discussing material selection for shell construction in this report, three waste rock materials are considered as follows:

- Shell - select coarse sandstone, siltstone and conglomerate material intended for construction of the shell.
- General rock fill - blasted run of mine rock which could include weaker and/or finer grained rock types such as shale, interbedded siltstones and carbonaceous materials.
- Overburden or unconsolidated materials - overburden soils, weathered rock zones, coarse coal reject or other loose materials.

No slop, snow, wet or weak materials, garbage, scrap metal, coarse coal reject, tailings, shall be placed in the shell portion of the waste rock dump. Saturated materials will require containment and placement as per the OMS manual recommendations.

Each truck load of material shall be assigned one of the three material types (Shell, general rock fill or overburden) based on the mine plan and the geological data base. Details of placement and monitoring will be provided in the OMS Manual. Quality assurance and quality control (QA/QC) procedures, including documentation and surveys, shall be maintained regarding the disposition and properties of these three material types.

Construction and Zoning

Prior to placement of the initial lifts, the boulder rollout catchberm shall be constructed. The initial catchberm/ditch structure shall be a minimum of five metres high with 1.5H: 1V or steeper slope and be

continuous along the toe of any designated dump lift. Removal of accumulated rock debris adjacent to the catchberm is detailed in the OMS manual.

Shell

All initial Shell lifts shall be a maximum of 30 metres high (with 20m recommended for standard operating conditions), end dumped along the hillside in a north to south direction (e.g. not dumped toward the road or river) and a minimum of 30 metre wide using Shell material. A three-metre high safety berm shall be maintained along the outer crest of the Shell. This safety berm will act as a boulder rollout catchberm for subsequent lifts. All safety berms shall remain in place until the final lift is placed, and the slope is regraded to 2H: 1V.

Core

The core zone of the lift (between the shell and original ground) will be a maximum of 20-30 metres high and managed to prevent weaker materials from contaminating the outer shell zone.

Resloping

The dump shall be resloped to 2H: 1V in advance of reclamation and the platform resloped to provide drainage towards post-closure surface water channels.

Slope

The slope shall be resloped to 2H: 1V by pushing in the boulder rollout catchberm and some of the platform to form a continuous, roughly planar 2H: 1V slope. During resloping, access to the toe area shall continue to be restricted. The cover soil boulder rollout safety berms at the toe of the dump shall remain in place until final resloping is completed.

Platform

The dump platform shall be resloped with a gradient towards the designated water management ditch to promote drainage. After placement of reclamation material on the slope, a two metre high watershed berm shall be placed along the crest of the dump to limit the amount of surface water flowing over the crest after reclamation.

25.4.5 Stability Analysis

Two-dimensional limit equilibrium stability analyses were performed on selected representative cross-sections.

The stability analyses indicate that the rock dumps meet the design criteria set out in Appendix D2, Table ES-1. The most critical failure mode is a deep seated foundation failure through the undifferentiated fill.

The primary focus of the design is to attempt to eliminate the flowslide mechanism through the use of the following design elements:

- A 30 metre wide shell of select resistant rock fill
- Maximum 30 metres high lifts
- Lifts are constructed perpendicular to the eastern face

- Inter-lift bonding through attention to removal of soft material, snow, and water between lifts
- High factor of safety (FS ≥ 1.5) against foundation instability
- Visual monitoring and installation of slope inclinometers at specified locations

Dump Surface Stability (Edge Slumping / Sliver Failure)
Edge slumping / sliver failures are not a design issue, but instead are an operational issue covered in the OMS manual.

Operational Stability
Fill Failures: Because the strength of the shell is slightly higher than that of the undifferentiated waste rock and the foundation, to evaluate the theoretical factor of safety against a failure mostly within the shell, the model must be constrained to keep the failure surface in the shell. Doing so results in a factor of safety of 1.7 to 1.8 for repose slopes. When one constrains the failure surface to reside within the fill, the theoretical factor of safety is greater than 1.5.

Foundation Failures: A failure surface that extends into the glacial till / colluvium foundation is the most critical. Factors of safety prior to reslope are 1.5 and after resloping remain at 1.5. The slip surface extends just behind the highest crest to near the toe of the dump. For completeness, the factor of safety against the entire dump sliding along foundation soils is calculated. This value is greater than 1.5 at the end of construction.

Bedrock Failure: Geological analysis reveals no adversely dipping coal beds in critical areas beneath the dump areas on the north slope of the minesite.

Pseudo-static Conditions: The most critical pseudo-static mode is the foundation failure mode. The factor of safety remains high when a pseudo-static acceleration of 0.03g is modelled. All factors of safety exceed the design criteria.

Interim Stability: The factor of safety for interim dump configurations remains above 1.1 - 1.2 which exceeds design criteria.

Long-Term Stability (Closure)
The factor of safety values after regrading range from 1.4 to 1.8 which exceed design criteria.

To test the sensitivity of the factor of safety to a rising water table, a 10 metre high water table was postulated for the resloped condition for critical sections. Factors of safety are sensitive to the shape of the assumed water table. For reasonably conservative assumptions, the critical factor of safety for deep seated foundation failure range from 1.1 to 1.4. It should be noted that foundation drainage control measures which are being incorporated for environmental water management will benefit geotechnical stability by controlling and diverting sub-surface drainage away from the dump slope toes.

Summary of Stability Analyses
For each of the conditions listed in Appendix D2, Table ES-1, the calculated factor of safety meets or exceeds the design criteria.

25.5 Mine Development and Production Schedule

Annual production requirements, mine operating considerations, access constraints, destination capacities, equipment performance and operating costs are used to determine the optimal production schedule. These are then used as the basis of the cash flow model for mining.

Scheduling results from MS-SP are presented by period as well as cumulatively and include:

- Material mined by period broken down by material type, bench and mining phase.
- Truck and Shovel requirements by period in number of units and number of operating hours.
- Tonnes transported by period to different destinations.

Scheduling is conducted in 8 consecutive periods in quarters (3 months per quarter) followed by annual periods. Full capacity production of breaker feed is planned for quarter 8.

MS-SP is setup with 360 mine operating days scheduled per year and 20 scheduled hours per day

The primary objective of the production schedule is to meet the annual clean coal production target and maintain a relatively constant annual strip ratio while still providing backfill capabilities before the North Slope dump is filled.

The throughput target from Willow Creek at full capacity is 2.35 million MTRC Breaker Feed to achieve a Plant Feed of 2.2 million MTRC (after the Breaker).

Mining capacity will be ramped up over a two year period. The initial start up loading capacity will consist of a 26 m^3 shovel, 15 m^3 shovel , and 12 m^3 shovel used to develop the North Coal Haul Road and pioneer the 4 seam pit on the lower north slope, pit 4N1.

Mining precedence is required to specify the mining order of the pit phases based on relative location of the phases. For example if the phases represent progressive expansions in a single direction then the first expansion must stay ahead (vertically below) of the next expansion and so on. The Willow Creek pit phase precedence's are simplified in the Figure below.

Phase A ID	Constraint	Phase B ID
7C1I	After	7N2I
7SBI	After	7SA
7N2I	After	7N1
7C1I	After	4N2I
4C2I	After	7C1I
4CLI	After	4C2I
7S1I	After	4CLI
4S1I	After	7S1I
7S1I	After	7SBI

Figure 25-27 Willow Creek Pit Phase Precedence

Additional Precedence Conditions required for the Willow Creek production schedule are shown in the Figure below:

Phase ID	Constraint	Elevation	From	To	Period
7S1I	No More Than	1034			16
4CLI	No More Than	986			17
4C2I	Must Include		16	17	
7SBI	Don't Mine		2	13	
4N1	Don't Mine		1	2	
4CLI	Don't Mine		1	15	
7S1I	Don't Mine		1	11	
7C1I	Must Mine	842			16
7SA	Must Mine	1010			2
7SA	Must Mine	986			3
7N1	Must Mine	950			8
4N2I	Must Mine	686			13
4N1	Must Mine	362			10
7N2I	Mine To	1010			10

Figure 25-28 Additional Precedence Conditions

The production schedule sequencing is designed to provide a relatively consistent annual strip ratio and trucking requirements while maintaining the critical components of the mine development sequence. Mine development critical components are primarily driven by access, dump development and opening backfill capability prior to filling the North Slope dump.

The life of mine production schedule is summarized in the Table below. Mine start up is based on a restart of the existing mine at the previous production levels. Over a 2 year time frame equipment will be added as mining areas become available. The initial startup will occur within the Central region of the mine until the North Face haul road is completed and available for coal haul. Upon completion of the North face haul road and the North settlement pond, mining on the North Slope can begin. The

development of pits 4N1 and subsequently 4N2 are critical to the mine plan as dump room is limited until backfilling is available.

During the last mining periods, mining of pit 7S and 4S will continue to completion. Waste will be backfilled into pit 4C in lifts. A 10% ramp will allow for lifts to progress to the final elevation of 1090. To limit the volume of waste hauled to the upper benches, backfilling in to 4C lower should begin as soon as the pit is mined out.

Mining will progress generally north to south, culminating in Year 14. This progression is designed to maximize the proportion of waste that can be backfilled into mined out pit areas. See Figure 25-49 for end of mining pit configuration.

Table 25-16 Willow Creek Production Schedule

PRODUCTION SCHEDULE		Q1	Q2	Q3	Q4	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	LOM
COAL MINED to BREAKER																			
HCC	**kMTRC**	-	-	38	210	788	1,882	1,523	1,242	581	624	1,175	14	-	320	998	371	-	**9,765**
Process Yield	**%**	0.0	0.0	74.5	74.9	73.2	72.0	70.9	72.5	72.1	71.7	69.9	68.0	0.0	69.7	70.1	67.6	0.0	**71**
Ash	**%**	0.0	0.0	17.2	16.6	16.4	16.5	16.2	16.6	16.5	17.0	17.7	15.4	0.0	17.3	17.7	16.4	0.0	
PCI	**kMTRC**	39	173	177	92	959	297	658	980	1,649	1,569	1,035	2,328	2,305	2,012	1,346	1,972	1,020	**18,610**
Process Yield	**%**	72.4	71.7	70.7	73.0	72.9	75.0	73.1	73.1	74.9	73.7	74.0	73.0	73.5	73.0	73.4	73.0	73.1	**73**
Ash	**%**	18.4	18.5	18.8	19.0	18.1	18.3	18.1	18.0	17.0	17.8	18.2	18.1	17.9	18.1	18.6	18.2	18.0	
Oxide	**kMTRC**	1	47	30	34	189	160	178	129	120	158	120	18	44	19	6	7	-	**1,260**
Process Yield	**%**	71.3	72.0	71.3	73.4	73.1	72.2	72.4	73.5	73.6	71.9	72.5	72.6	72.9	73.7	70.2	67.4	0.0	**73**
Ash	**%**	19.6	18.2	18.0	16.9	17.3	17.1	17.5	17.2	17.2	18.3	17.4	18.3	18.2	17.6	16.9	16.8	0.0	
Coal Mined to Breaker	**kMTRC**	**40**	**220**	**245**	**336**	**1,936**	**2,338**	**2,359**	**2,350**	**2,350**	**2,350**	**2,330**	**2,360**	**2,350**	**2,350**	**2,350**	**2,350**	**1,020**	**29,634**
Process Yield	**%**	72.4	71.8	71.4	74.2	73.1	72.4	71.6	72.8	74.1	73.1	71.9	73.0	73.5	72.6	72.0	72.2	73.1	**73**
Ash	**%**	18.4	18.4	18.4	17.3	17.3	16.8	16.9	17.2	16.9	17.6	17.9	18.0	17.9	18.0	18.2	17.9	18.0	
Clean Coal																			
HCC	**kMTCC**	-	-	29	157	577	1,355	1,079	901	419	447	821	10	-	223	699	251	-	**6,967**
PCI	**kMTCC**	28	124	125	67	699	223	481	717	1,235	1,157	767	1,699	1,694	1,469	989	1,440	745	**13,658**
Oxide	**kMTCC**	1	34	21	25	138	115	129	95	88	113	87	13	32	14	4	5	-	**915**
Total Clean Coal Produced	**kMTCC**	**29**	**158**	**175**	**250**	**1,415**	**1,693**	**1,689**	**1,712**	**1,742**	**1,718**	**1,675**	**1,722**	**1,727**	**1,706**	**1,692**	**1,696**	**745**	**21,541**
Plant Rejects	**ktonnes**	8	48	54	65	396	493	517	486	455	480	504	484	470	492	505	501	208	**6,168**
Breaker Rock	**ktonnes**	3	14	16	22	126	152	153	153	153	153	151	153	153	153	153	153	66	
Process Waste Backhauled	**ktonnes**	11	62	70	87	522	645	670	639	608	632	656	638	623	645	658	654	275	
WASTE MINED	**kBCMW**	**820**	**1,389**	**1,140**	**3,000**	**18,032**	**22,000**	**21,800**	**21,800**	**20,624**	**20,216**	**21,545**	**21,800**	**19,216**	**16,798**	**15,573**	**15,087**	**3,668**	**244,508**
Strip Ratio (waste mined/ coal mined)	**BCMW/ MTRC**	20.54	6.32	4.65	8.92	9.31	9.41	9.24	9.28	8.78	8.60	9.25	9.24	8.18	7.15	6.63	6.42	3.60	**8.25**
Strip Ratio (waste mined/ clean coal)	**BCMW/ MTCC**	28.37	8.80	6.52	12.01	12.75	13.00	12.91	12.74	11.84	11.77	12.87	12.66	11.13	9.85	9.20	8.90	4.92	**11.35**

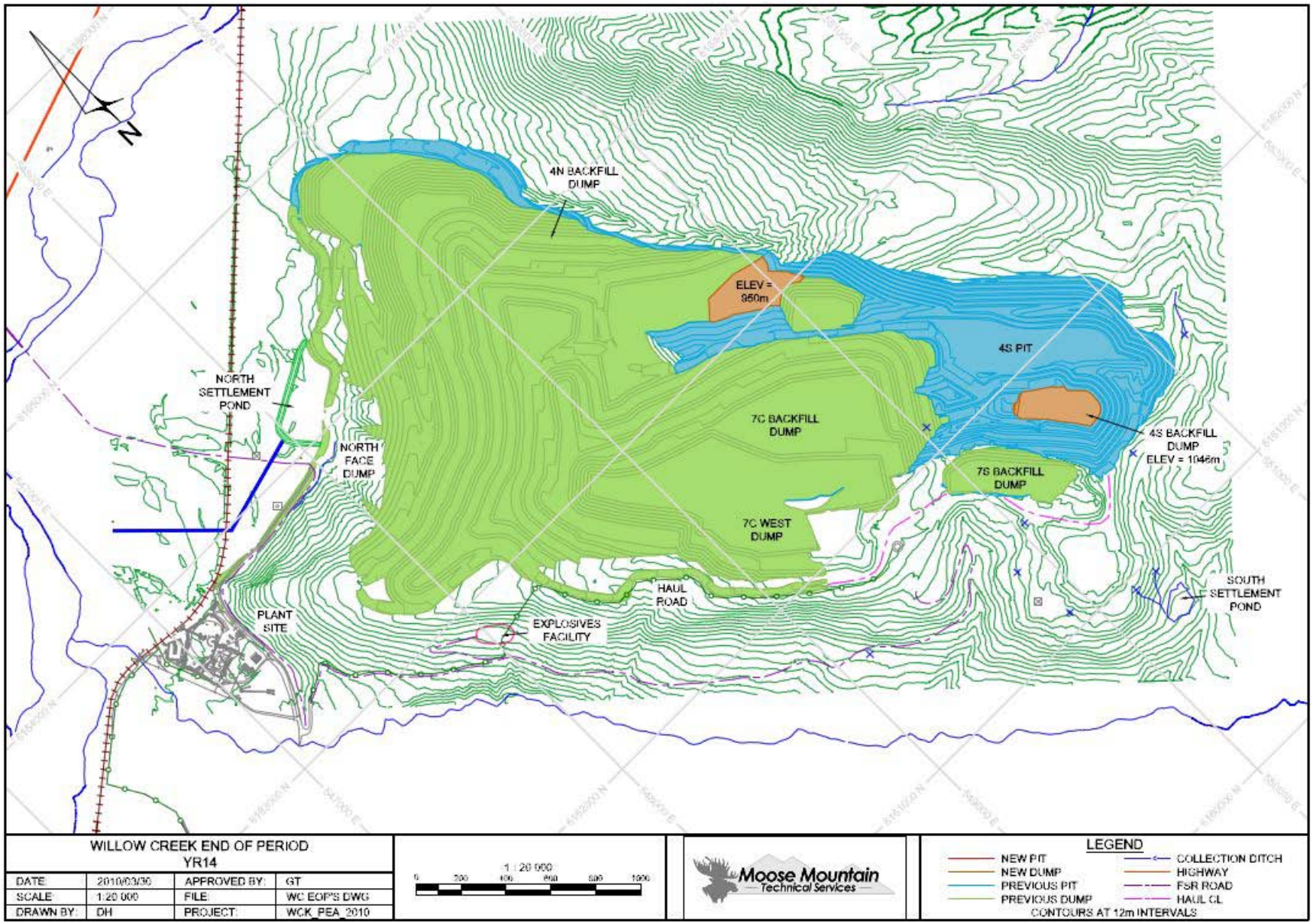

Figure 25-49 End of Mine

25.6 Mine Operations

Willow Creek is similar to other Rocky Mountain multi- seam operations and will be mined using truck and shovel methods with separate unit operations for coal and waste. Major mining equipment includes 311mm blasthole drills, 26m^3 hydraulic shovels, and 136 tonne haul trucks. This fleet configuration is proven in this mining application and provides the flexibility to mine in several pits continuously. The mining unit operations include preproduction, drilling, blasting, coal loading and hauling, waste loading and hauling, pit maintenance, and waste dump resloping.

25.6.1 Major Mine Equipment

The mine equipment will be owner-operated, with the exception of the bulk explosives trucks, and any equipment required by maintenance contractors.

The major mining equipment is summarized in the Table 1

Table 25-17 Major Mine Equipment

MAJOR MINE EQUIPMENT FLEET SUMMARY	Function	Year 1	Year 2	Year 7	Year 12	Year 14
Drilling						
Diesel Drill - 311mm	Primary Drill	3	4	4	4	2
Diesel Drill - 150mm	Highwall Drill	1	1	1	1	-
Loading						
Hydraulic Shovel - 26 m^3	Loading Coal & Waste	2	3	3	2	2
Hydraulic Excavator - 15 m^3	Loading Coal & Waste	1	1	1	1	1
Hydraulic Excavator - 12 m^3	Loading Coal & Waste	1	1	1	1	1
Front End Loader - 34.1 t	Loading Coal	1	1	1	1	1
Front End Loader - 17.6 t	Breaker Loader	1	1	1	1	1
Hauling						
Rear Dump Haul Truck - 136 t	Hauling Coal	1	2	2	3	3
Rear Dump Haul Truck - 136 t	Hauling Waste	9	19	19	19	16
Rear Dump Haul Truck - 136 t	Back Haul Reject	1	2	3	4	2
Total Haul Trucks Required		11	23	24	26	21

25.6.2 Preproduction

The Willow Creek deposit has been mined previously and is close to surface, so little pre-stripping is required. Preproduction will not require specialized equipment, but will employ a reduced fleet of production equipment in the first 18 months of mine start-up. The mine reaches full waste production by Q7 and full coal production by Q8.

25.6.3 Drilling

The waste rock will require drilling and blasting to create suitable fragmentation for the loading equipment. Dozers will be required to terrace the weathered slopes of the eastern pits to establish drill ramps. The ramps will allow holes to be drilled on the proper burden and spacing on outside edges.

Primary production drilling will be with diesel rotary drills.
A 150mm diesel air track drill will be available for controlled blasting on high wall rows, for re-blasting oversize muck and for development of initial benches and accesses.

25.6.4 Blasting

Blasthole loading is planned on a seven day per week, dayshift continuous basis. A contractor will be employed to deliver explosives to the blasthole, and to provide the blasting accessories. The contractor crew will include a site supervisor and four explosives loading truck/mixing operators (two shifts of two employees providing 7 day per week day shift coverage). The blasting crew will be mine employees and operate on two shifts; each with a supervisor and 4 blasters
The holes will be stemmed to provide adequate confinement of the blasts, and to avoid excessive fly-rock. Crushed rock and drill cuttings will be used for stemming material. A loader with a side dump bucket is included in the mine fleet to tram and dump the crush into the holes. The crushed rock is provided by the onsite rock crusher specified for mine roads. Secondary screening of the rock crusher product will be required to produce a top size of ¾ - 1 inch for the blasting crush.

The drill and blast designs for Willow Creek are based on an equilateral pattern size of 7.9m by 9.1m. The collar has been set at 6m to adequately confine the blast. Subgrade has been designed at 1.5 m to blast to bench grade between rows.

An over-drill of 1m has been allowed for caving which usually occurs in the first 24-36 hours after holes have been drilled. Prior to loading with explosives, holes which haven't caved back to design will be

backfilled to the design level. Bulk explosives composed of ammonium nitrate and fuel oil (ANFO), and emulsion will be used for blasting at Willow Creek.

The coal at Willow Creek does not require blasting to allow it to be mined. To minimize losses and reduce explosive requirements, decking will be placed where the seams are intersected by the holes. Control blasting will be required along the final highwalls to ensure the walls remain competent while mining occurs on lower benches.

25.6.5 Loading and Hauling Waste

The mine plan for Willow Creek requires waste and coal production from up to three pits concurrently. Dump room is limited at Willow Creek so to accommodate dump requirements, the pits have been scheduled to provide an opportunity for backfilling with waste rock and coal rejects. Backfilling reduces haul distances and land disturbance, however the strike length of the pits that can be mined are reduced. A fleet of three 26 m^3 diesel hydraulic shovels have been selected as the primary shovels to excavate the waste. The medium capacity diesel hydraulic shovel provides suitable flexibility to travel between waste and coal production faces and between multiple pits and benches. Matched with the 26 m^3 diesel hydraulic shovels is a fleet of 136 tonne trucks which can be loaded in three passes.

The shovels will access the benches from the hanging wall side of the coal seams. The waste will be drilled and blasted in advance of loading and hauling activities. The waste will be mined out along the available strike, exposing the toe of the coal seam. The waste directly covering the coal will be removed by excavators and crawler dozers. When the waste mining operations have advanced far enough along strike the un-blasted coal will then be loaded out with a front end loader, or with a shovel or excavator. This mining progression will be repeated for each seam until the pit limit is reached.

This selective type of operation requires multiple working faces so that the drilling, blasting, and coal mining activities can be sequentially scheduled and to give adequate separation between the various activities for efficient operations. The mobility of the diesel hydraulic shovels will be advantageous for this type of operation.

Supporting the 26m^3 hydraulic shovels will be a 15m^3 excavator and a 12m^3 excavator. The excavators will be equipped with backhoes and will be used to remove the hanging wall waste off the coal seams and load the waste into the haul trucks. A smaller 7-9 tonne backhoe equipped with a flat edged coal bucket will work in tandem with the production excavator final cleaning the seam.

25.6.6 Loading and Hauling Coal

Once the coal has been final cleaned and the waste has been mined from the toe, the backhoe will remove the coal from the footwall for subsequent loading by a loader, shovel, or excavator. The backhoe will remove partings from the seams where present.
Coal bearing blocks will be mined in two passes, or half benches. This allows a larger volume of the hanging wall to be removed by the production shovels and improved reach for final cleaning and removal of the seam with a backhoe.

A 34 tonne front end loader will load the majority of the coal. The front end loader provides the flexibility to mine coal from various parts of the pit to keep the plant stockpiles fed. The coal will be loaded into the 136 tonne trucks and hauled to a stockpile location at the process plant where a loader will tram the coal to the breaker. Some of the 136 tonne trucks will be equipped with side boards to increase the volume of raw coal that they can carry. The use of stockpiles at the process plant will allow the coal to be campaign mined. This provides the mine with additional flexibility to schedule the coal haul around coal releases and shovel maintenance. When the coal haul is not scheduled the haul trucks will be redirected to the waste hauls. Campaign coal mining allows the fleet capital to be minimized and utilization of the trucks to be maximized.

For the purposes of this analysis, the trucks required to haul plant rejects and breaker rock to the waste dumps will be dedicated to this haul. The reject haul will continue when the coal haul is not scheduled, and the dump that the reject is hauled to may be distant from the active coal loading face. There will be opportunities where the trucks hauling reject from the plant to the dump, can back-haul coal from the pit to the process plant stockpiles.

25.6.7 Resloping

Reclamation will be ongoing over the life of the Willow Creek Project. As the project progresses, inactive waste rock dumps will be resloped. Topsoil will be salvaged prior to mining, and will be hauled and direct placed on areas being reclaimed where possible; or hauled to topsoil stockpiles. Inactive disturbed areas will be covered with soil and seeded as soon as possible to establish a stable vegetation cover.

25.6.8 Pit Maintenance

Ancillary mining equipment suitable for mountain operations will support the mining activities to ensure roads and services for the working areas are built and maintained for summer and winter operation. Equipment to control road dust through water application will be required in the summer and equipment to remove snow and sand the roads will be needed in winter. Pit maintenance services include haul road maintenance, mine dewatering, and snow removal.

25.6.9 Mine Operations Support

The mine support equipment fleet is summarized in the Table below

Table 25-21 Mine Support Equipment Fleet

MINE SUPPORT EQUIPMENT FLEET SUMMARY	Function	Year 1	Year 2	Year 7	Year 12	Year 14
Production Support						
Hydraulic Backhoe - 7 - 9 t	Coal Cleaning	2	2	2	2	1
Front End Loader – 11.4 t	Crusher Feed	1	1	1	1	1
Track Type Tractor -433 kW	Shovel Support	1	2	2	2	1
Fuel/Lube Truck	Fuel & Lube	1	1	1	1	1
Rubber Tired Dozer 253 kW	Pit clean up	1	2	2	2	1
Water Truck - 20,000 Gal	Water Truck - Waste	1	2	2	2	1
Water Truck - 20,000 Gal	Water Truck - Coal	1	1	1	1	1
Grader - 4.9m	Waste Road Grading	1	1	1	1	1
Grader - 4.3m	Waste Road Grading	-	-	1	1	-
Grader - 4.3m	Coal Road Grading	1	1	1	1	1
Tire Manipulator - 14 tonnes	Tires	1	1	1	1	1
Track Type Tractor-433 kW	Dump Maintenance	3	4	4	4	1

25.6.10 De-Watering

All surface water and precipitation collected in the pit will be handled by submersible pumps installed in sumps in the pit bottoms. The water will be pumped out of the pits to drainage ditches.

Horizontal drain holes are planned in order to depressurize the final footwalls.

It may be necessary to install vertical well dewatering in advance of pit development. The need for advanced dewatering via vertical wells should be accessed through a hydro-geological study. At this stage of the project it is assumed that vertical well dewatering is not required.

25.6.11 **Mine Ancillary Equipment**

The mine ancillary equipment fleet is listed in the Table below.

Table 25-22 Mine Ancillary Equipment Fleet

ANCILLARY EQUIPMENT FLEET SUMMARY	Function	Year 1	Year 2	Year 7	Year 12	Year 14
Blasting						
Hole Stemmer - 3 tonnes	Blasthole stemmer	2	2	2	2	1
Auxiliary Equipment						
Track Type Tractor - 433 kW	Pit Support	1	1	1	1	1
Float Tractor Trailer - 180 tonne	Float tractor	1	1	1	1	1
Hydraulic Backhoe 5 - 7 tonne	Utility Excavator	1	1	1	1	-
Sump Pump - 1,400gpm	Pit Dewatering	3	4	5	5	3
Light Plant	Lighting plant	4	4	6	6	2
250 tonne crane	Maintenance	1	1	1	1	1
Passenger Vans	Transportation	3	3	3	3	2
Ambulance	Ambulance	1	1	1	1	1
Pickups - 1/2 ton	Mine transport	10	15	15	15	8
Mine Rescue Truck	Rescue Truck	1	1	1	1	1
Crew Bus	Crew Bus	4	7	7	7	3
Maintenance Truck - 1 Tonne	Service truck	4	6	6	6	3
Fire Truck	Fire Truck	1	1	1	1	1
Crusher/Screening Plant - 12" max	Road Crush	1	1	1	1	1
Picker Truck	Utility Crane	1	1	1	1	1
Scraper - 37 tonnes	Crush Haul	1	2	2	2	1
Hydraulic Crane - 40 t	Utility Crane	1	1	1	1	1

25.6.12 **Mining Technical Systems**

Fleet management systems have been planned for the shovels, excavators, haul trucks, and supervisor's vehicles. These systems provide production reporting, truck assignment, health monitoring and fleet

analysis. Information gathered from machines in the field is linked to supervisory, engineering, maintenance and accounting functions, allowing gaps between realized and unrealized potential production to be reduced.

25.7 Manpower Requirements

Mine personnel requirements were estimated on the basis of the mine working two 12 hour shifts per day, seven days per week. The mine has been scheduled to operate 360 days per year, allowing up to five days for weather and other disruptions.

The Table below summarizes the average levels of employment for the Willow Creek Mine.

Table 25-23 Labour Manning Summary

Department	Staff	Hourly	Total
Mine Management	8	0	8
Mine Operations	23	170	193
Mine Maintenance	14	42	56
Technical Services	19	2	21
Process	17	50	67
Administration	17	6	23
Total Manpower	**98**	**270**	**368**

25.7.1 Salaried Personnel Summary

The manpower levels for salaried labour are further detailed in the Table below. The organizational chart for management, mine operations, safety, process, and technical services personnel are presented in Figure 25-52

Table 25-24 Salaried Labour Summary

Description	Number of personnel
LOCAL MANAGEMENT	**8**
General Manager	1
Administrative Assistant	1
Operations Manager	1
Human Resources Superintendent	1
Administration Manager	1

Process Manager	1
Technical Services Superintendent	1
Safety Manager	1
MINE OPERATIONS	**23**
Operations Superintendent	1
Operations General Foreman	2
Operations Foreman	8
Training General Foreman	1
Shift Trainers	4
Drilling & Blasting General Foreman	1
Drilling & Blasting Foreman	2
Dispatch Foreman	4
MINE MAINTENANCE	**14**
Maintenance Superintendent	1
Maintenance General Foreman	2
Maintenance Engineer	1
Maintenance Planner	2
Maintenance Planning Clerk	1
Maintenance Foreman	6
Electrical Foreman	1
TECHNICAL SERVICES	**19**
Senior Geologist	1
Pit Geologist	1
Coal Quality Technicians	2
Project Engineer	1
Senior Environmental Engineer	1
Environmental Technician	2
Senior Mining Engineer	1
Mine Engineer	2
Dispatch Engineer	1
Drilling & Blasting Engineer	1
Drilling & Blasting Technician	2
Surveyor	2
Geotechnical Engineer	1
Engineering Clerk	1
SAFETY & ADMINISTRATION	**17**
IT Coordinator	1
Payroll Clerk	1
Accounts Payable	3
Receptionist	1

Loss Control Coordinator	1
Loss Control Officers	4
Materials Manager	1
Buyer	2
Purchasing Clerk	1
Junior Buyer	1
Warehouse Supervisor	1
PROCESS	**17**
Senior Process Engineer	1
Sampler Assayers	4
Lab Technicians	2
Process Maintenance Superintendent	1
Maintenance Planner	1
Maintenance Planning Clerk	1
Maintenance Foreman	1
Electrical Foreman	1
Process Operations Superintendent	1
Process Foreman	4
TOTAL SALARIED	**98**

25.7.2 Mine Operations, Maintenance, and Technical Services

The mining activities will be organized under the following operating and General Mine Expense Functions:

- **Mine Operations**
  Reporting to the manager operations, the operations superintendent will be responsible for the mine operations group. Within the mine operations group are pit operations, drilling & blasting, and training.

- **Mine Maintenance**
  Reporting to the manager operations, the maintenance superintendent will be responsible for field and shop maintenance.

- **Technical Personnel**
  The technical services department, led by the superintendent technical services, will include mine planning, drilling & blasting engineering, geology, coal quality, environmental, and survey personnel. To maximize coal recovery, and to provide quality control in the field, coal quality technicians will be employed to provide 12 x7 dayshift coverage.

25.7.3 Hourly Employees

The hourly labour requirements vary by equipment operating hours. The hourly manpower requirements based on full production requirements are shown in the Table below.

Table 25-25 Hourly Labour Summary

Description	Number of personnel
MINE OPERATIONS	**170**
Drill Operator	12
Blasters	8
Shovel Operator	15
Haul Truck Driver	80
Grader Operator	8
Excavator Operator	8
Loader Operator	6
Track Dozer Operator	22
Scraper Operator	2
Crusher Operator	4
MINE MAINTENANCE	**42**
Fuel Truck Operator	2
Electrician	4
HD Mechanic	19
LD Mechanic	2
Machinist	0
Crane Operator	6
Welder	6
Tireman	2
Labourer Service man	1
PROCESS	**50**
Welder	2
Millwright	8
Apprentice	4
Maintenance Service	4
Labourer	2
Electrician	6
Control Room Operator	4
Breaker Control	4
Upper Plant Operator	4
Lower Plant Operator	4
Dryer Operator	4
Janitor	4
TECHNICAL SERVICES	**2**

Environmental Sampler	2
ADMINISTRATION	**6**
Warehouse	6
TOTAL HOURLY	**270**

25.7.3.1.1 General Organization Chart for Willow Creek Project

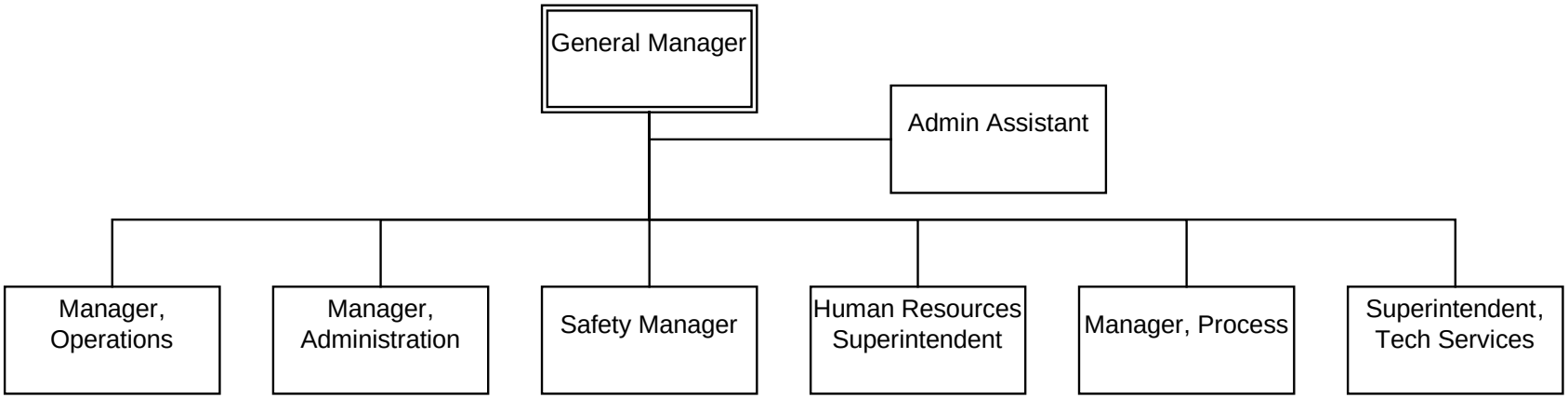

Figure 25-52 Willow Creek Management Organization Chart

25.8 Coal Processing and Handling

A total of eight (8) seams for Willow Creek Mine are projected to be processed in the washing plant. Two clean coal products, hard coking coal (HCC) and pulverized coal injection (PCI) will be produced based on the seams to be washed. According to the mining plan, Seams 1, 2 and 4 produce HCC, which accounts for 35% of the Willow Creek ROM reserves. Seams 3, 5, 6, 7, 8 and Seam A produce PCI, which accounts for 65% of the reserve. A total of three (3) seams will also be processed from the Brule Mine, which are Brule Seam 60, Brule Lower and Brule Upper respectively. Brule Mine is expected to produce PCI product. Brule coal will not be dealt with explicitly in this report, but performs in a similar manner to Willow Creek PCI coals.

Willow Creek products are high value metallurgical coal. Therefore, fines recovery is required to maximize plant yield and project value.

The current plant is operated at 450 MTPH feed rate and is set up with the option of bypassing 13mmx0 dry raw coal. The plant is configured with two washing circuits; the 50mmx1.0mm fraction is processed in a heavy media cyclone, the 1.0mmx0.15mm fraction is cleaned with a water only cyclone/spiral circuit, and the 0.15mmx0 raw coal is discarded to refuse.

Based on Taggart's analysis, the most viable upgrade will be eliminating the raw coal bypass (inside the plant) and adding a flotation circuit to clean the 0.15mx0 fraction. This circuitry will provide full wash capability with clean coal recovery to "zero"; in addition, washing the finer coal fractions increases the CSN value, enhancing the overall coking properties of the product. An optional ultra-fine coal polishing circuit is also recommended to allow the option to reject the 0.045mmx0 raw coal fraction; this is beneficial (reduce reagent consumption, improve product quality) in the event of poor flotation recovery and or quality.

25.8.1 Material Handling and Process Design Basis

The proposed preparation plant upgrades and additions will increase throughput from 450 to 660 (db) tonnes/hour of run of mine coal. The materials handling has been designed to accept run of mine coal from both Brule and Willow Creek mines. The run of mine coal will be reduced to a top size of 50mm prior to entering the processing plant. Accordingly, the preparation plant circuits are sized to handle variations in yield from both mines.

25.8.1.1 Operating Parameters

The basis for plant operation is 355 days per year. The plant was designed to operate approximately 6,300 hours per year at an operating availability of 85%. The total scheduled hours per year are approximately 7,400. In addition to approximately 1,100 of operating delays and unscheduled maintenance time, there is approximately 1,000 hours of scheduled maintenance hours available during the calendar year.

25.8.1.2 Run of Mine Materials Handling System

Run of mine coal will be trucked from the mining areas to a truck unloading facility located at the coal preparation plant. The run of mine coal will be reduced to a top size of 50mm before being fed to either the processing plant or bypass to the clean coal stockpile.

The truck dump consists of an enclosed in-ground surge bin with 450mm grizzly c/w two 45,000 CFM dust collectors. Reclaim from the surge bin is achieved using two 1,500mm wide, drag type feeders. A 1,500mm wide conveyor belt transports the run of mine coal to the breaker building and discharges over a 2.4m x 6m scalping screen. The undersize discharges onto the 900mm raw coal conveyor, the oversize is fed to a 2.7m dia. x 5.4m rotary drum breaker. The drum undersize discharges to the raw coal conveyor with oversize reporting to a reject bunker for disposal.

The raw coal conveyor transports the sized run of mine coal to the 1,200 tonne enclosed storage silo, c/w 14,000 CFM dust collection. Run of mine coal discharge from the silo is controlled utilizing a cut off gate and 1,500mm volumetric feeder, providing consistent feed to the 900mm crusher building feed conveyor. The material passes through an ash analyzer mounted above the crusher building feed conveyor prior to discharge into the chute housing two flop gates. The first flop gate will direct material to either; a 2.4m x 7.3m scalping screen or to the second flop gate.
Oversize (50 x 13mm) from the scalping screen will report the 900mm transfer conveyor and be weighed on a belt scale as process plant feed, undersize (13 x 0 mm) reports to the clean coal conveyor where it is combined with plant product.

The second flop gate will direct material to either; the 900mm transfer conveyor and be weighed on a belt scale as process plant feed, or the 900mm clean coal conveyor bypassing the processing plant.

Clean coal from the process plant and bypass products are transported by the clean coal conveyor and 900mm x 30m radial stacker to the clean coal stockpiles.

25.8.1.3 Refuse Handling

Coarse refuse is collected on the 900mm refuse conveyor to be conveyed to the 300 ton refuse bin. Fine refuse will be collected on the 900mm reversing refuse conveyor which will discharge to either; 900mm refuse conveyor to be conveyed to the 300 ton refuse bin, or the 900mm belt press conveyor to be conveyed to the 75 ton refuse bin. The 75 ton refuse bin will be utilized to dispose of fine refuse from thickener when the processing plant is shut down. Refuse will transported by truck to disposal in waste dumps or pit backfill.

25.8.1.4 Clean Coal Storage and Reclaim

The 900mm clean coal conveyor collects coal from the product transfer conveyor and bypass streams, conveys the coal through an ash analyzer mounted above the conveyor to the 900mm radial stacker. Here the coal will be stockpiled into separate product piles, dependant on product specifications. Clean coal reclaim is accomplished utilizing dozers and front end loaders to move coal to four trap feeders, the trap

feeders will load the coal onto the rail load-out conveyor. It is conveyed to the flow weigh bin at the rail load-out and metered into rail cars as they pass at slow speed below the weigh bin.

25.8.2 Coal Processing Plant

25.8.2.1 Coarse Coal Circuit (50 x 1.4mm)

The raw coal is fed to the plant via the 900mm plant feed conveyor) where it passes over a belt scale, enters the preparation Plant and is initially screened at 1.4mm on two 3m x 6m de-slime screens. The coarse fraction (50 x 1.4mm.) is mixed with heavy medium on route to the heavy media cyclone sump. The mixed raw coal and heavy media is then pumped to one 1m (40 inch) heavy media cyclone (3060) where the clean coal reports to the overflow and discharged onto two 3m x 6m drain and rinse screens, where magnetite is reclaimed for reuse. The clean coal is then dewatered using four clean coal centrifuges before reporting to the 900mm product transfer conveyor.
The underflow refuse is discharged onto one 1.8m x 3m drain and rinse screen, where magnetite is reclaimed for reuse. The refuse reports to one 1.8m x 3.6m high frequency dewatering screen, where refuse is rejected to the 900mm refuse conveyor for disposal.

25.8.2.2 Intermediate Coal Circuit (1.4 x 0.15mm)

The de-slime screen undersize (1.4 x 0mm.) reports to two water only cyclone feed sumps and is then pumped to two banks of 380mm water only cyclones for separation. The underflow (1.4 x 100 mesh) is fed to one bank of 12 spirals where it is separated into reject, middlings, and clean coal. The reject reports to the spiral refuse sump where it is pumped to one bank of 3 x 250mm thickening cyclones, the underflow dewatered on a 1.2m x 3m fine refuse high frequency dewatering screen and discharged the 900mm refuse conveyor for disposal, overflow sent to the 30.5m dia. static thickener. Spiral middlings are re-introduced to the water only cyclone sumps for re-processing. Clean coal is discharged to the clean coal classifying cyclone feed sump where it is combined with the water only cyclone overflow and screen bowl screen effluent; this is pumped to one bank of 10 x 15” clean coal classifying cyclones. Underflow passes over four 2.1m static sieve bends; the overflow from the sieve bends combine with the froth flotation clean coal for dewatering in the three high capacity screen bowl centrifuges, before reporting to the 900mm product transfer conveyor . Overflow from the clean coal classifying cyclones combines with the underflow from the static sieve bends and reports to the fine coal classifying cyclone feed sump.

25.8.2.3 Fine Coal Circuit (minus 100 mesh)

Overflow from the clean coal classifying cyclones report to the fine coal classifying cyclone feed sump where it combines with the static sieve bend underflow. From here it is pumped to the one bank of 42 x 150mm dia. fine coal classifying cyclones, under normal operation the underflow and overflow combine and report to one bank of 4 x 30m³ froth floatation cells. Floatation overflow reports to the three high capacity screen bowl centrifuges for dewatering before reporting to the 900mm product transfer conveyor, underflow reports to the 100ft. dia. static thickener.

When oxidized coal is being processed the underflow from the fine coal classifying cyclones will bypass flotation and report to the screen bowl centrifuges for dewatering, the overflow from the fine coal classifying cyclones will report to the 100 ft. static thickener.

Thickener underflow is pumped to three, 3m wide belt presses for dewatering before being discharged to the 900mm refuse conveyor.

25.8.2.4 Plant Water Balance

Based on the flow sheet, the plant will require 50m³/hr of make-up water. The following Table below depicts the plant water balance and tonnages by product stream. Plant make-up will come from wells and/or water from the north sedimentation pond.

Table 25-26 Water and Material Balance by Product Stream

Product Stream	Water (m³/hr)	% Surface Moisture	Tonnage (Mtph db)	Yield (% of Raw Coal)
Clean Coal	38	7.7	456	69
Refuse	47	18.7	204	31
Plant Feed	35	5	660	100

25.9 Mine Closure, Reclamation and Decommissioning

The following discussion relates to the Mine Operation activities on these items. More detail is provided in Section ahead in this report and in the MPA documents by WCC.

25.9.1 Soil Salvage

Sites for long term (5 or more years) soil storage are limited within the footprint of the mine. The lower slope soil salvage sites will need to be relocated as the spoil development advances. To mitigate having to relocate soil stockpiles several times, the dump development is sequenced to provide resloped faces as early as year 2 for direct placement of salvaged soil. Soil salvaged in the central plateau region of the mine can be stored long term on the 7C West dump.

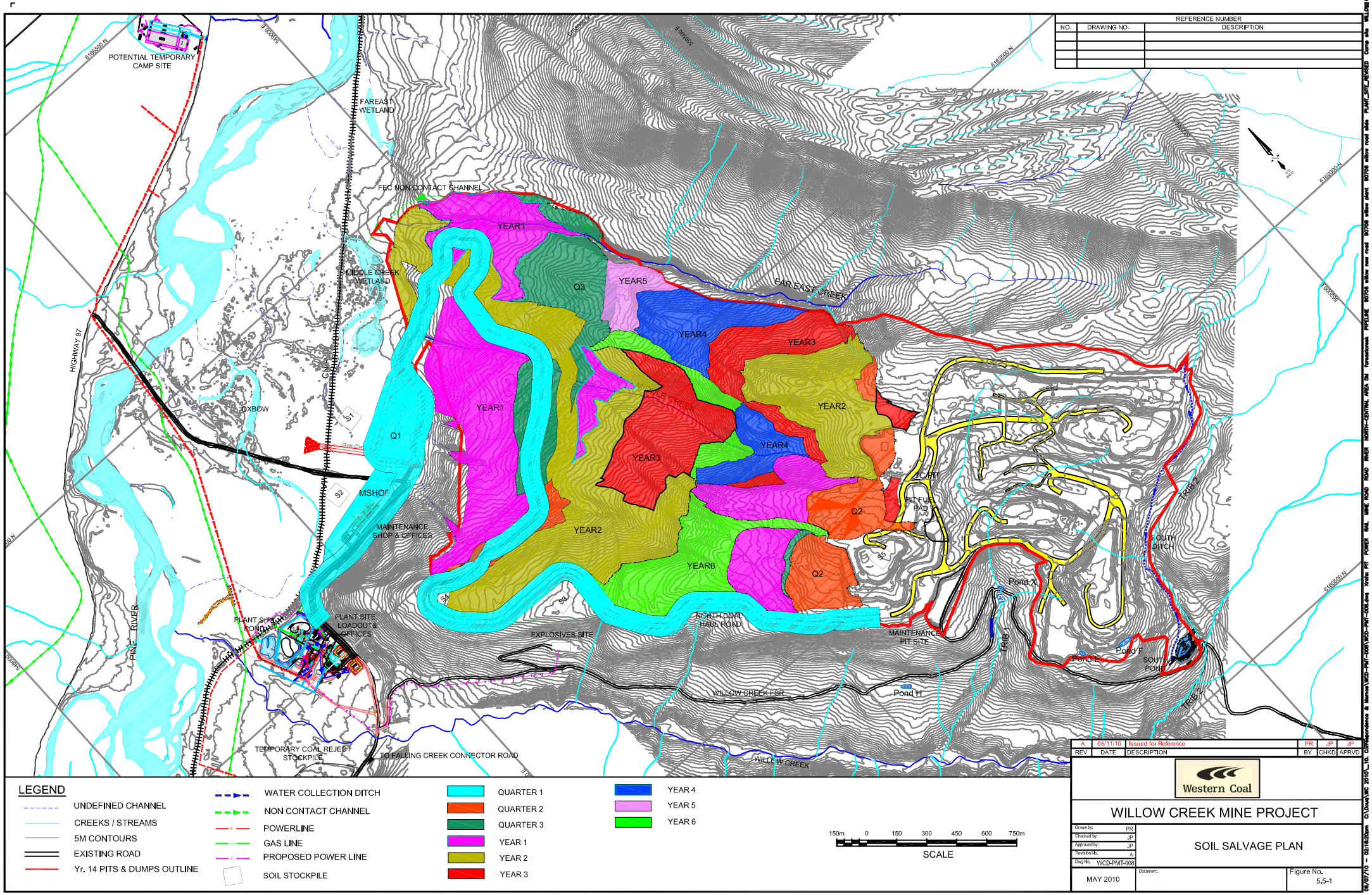

Figure 25-61 Soil Salvage Plan by Year

25.9.2 Drainage and Settling Ponds

The mine drainage systems and settling ponds are based on meeting the property Environmental water management objectives as well as providing mine plans for safe and efficient mining operating. Specific water management structures are discussed in more detail under Mine Infrastructure.

25.9.3 Open Pit Mine

Generally the mined-out pits will naturally be filled with water from surface runoff and groundwater forming small ponds. The only overflow will be through designed discharge to the North as established by the mine closure water management plan. Typically the pit walls will not be re-sloped.

25.9.4 Waste Rock Facilities

Mine waste dumps will be comprised of non-reactive waste rock and will be constructed in series of lifts at 37° inter-slope angles with appropriate berm widths. This will effectively result in an overall slope angle 2H: 1V. This overall angle is the recommended maximum angle that will sustain long-term vegetation. Research and testing during the life of the operations may show that a steeper reclaimed slope is more suitable for the end land use.

At decommissioning, the slopes of the waste dumps will be re-contoured and platforms will be scarified. The crests of the berms will be rounded and inter-slope angles will be reduced to provide overall slopes 2H: 1V including the berms. Low-gradient drainage ditches will be established across the slopes to collect surface runoff. The surfaces will be capped with suitable surficial soils and seeded to establish vegetation that will minimize erosion.

25.9.5 Roads and Drainages

Decommissioned mine roads will be scarified and capped with suitable surficial soils if necessary to promote plant growth. Dykes and dams that are exposed above the water line will also be scarified and capped with suitable soils. The surfaces will then be seeded to establish vegetation.

25.9.6 Exploration Activities

All surface facilities related to exploration activities will be removed and all areas of disturbance will be reclaimed.

25.9.7 Buildings and Infrastructure

All buildings and associated infrastructure will be decommissioned and materials will be recycled where

practical. The areas that have been levelled for the plantsites will be scarified and capped with suitable soils. The surfaces will then been seeded to establish vegetation.

25.9.8 Monitoring and Reporting

Monitoring and reporting will meet the requirements of all permits that are obtained for the Willow Creek project.

25.9.9 Reclamation Schedule and Cost

The details of the reclamation design including the schedule and cost will be finalized during the Mine Permit amendment application for the Willow Creek project.

At mine closure a significant portion of the resloping and reclamation work will already be completed. The mine dump development sequence has been scheduled to accommodate continuous reclamation of dumps along with direct placement of salvaged soils as they become available. The last soil stockpile to be salvaged at mine closure will be located on the top of the West dump.

Although some reclamation may occur above active roads when mine traffic can be temporarily suspended, final reclamation of areas above active coal haul route will be re-sloped after mine closure. Setbacks designed into the 35 meters lifts with 27 meter haul road widths, will significantly reduce the reclamation dozer hour required.

The calculated Dozer hours are for resloping and placement of the salvaged topsoil. The estimated cost of reclamation totals $3.073 million over the life of the project.

25.10 On-Site Facilities, Services and Infrastructure

Infrastructure requirements for the Willow Creek open pit coal mine are discussed below. Some of the items currently exist on site, and some require construction or purchase.

Access to site is via an existing road spurs off of Highway 97 to the south, and crosses the Pine River, and the CN Rail line. This is the Willow Creek Forest Service Road (FSR) which runs from the NW to the SE along the property after passing the plant site. The FSR will be upgraded to allow passage of the mine service vehicles. A security gate and manned gatehouse will be installed on the south side of the rail crossing. All visitors to site will check in at this gatehouse.

A general arrangement map for Willow Creek shows the location of mining pits and dumps, as well as surface water diversion and management and major site infrastructure.

Access to the Forest Service Roads will be maintained by a grade separation road running from the security gate to Willow Creek along the south edge of the North coal Haul road. This road will be accessed by crossing the coal haul road at a controlled intersection with good line of site near the security gate. The current Willow Creek external traffic management plan will be modified as necessary to accommodate public access.

The proposed buildings are discussed in further detail in subsequent sections. The project Scope includes the following site buildings:

- Mine Maintenance Facility and Office Complex
- Warehouse
- Laboratory
- Washplant
- Washroom Facilities and Dry

Existing lines deliver power off of the BC Hydro grid via a 25k line.

The site includes infrastructure for power supply and distribution. The installed system is adequate to deliver power to the washplant, offices, lab, washrooms and dry, first aid, security and general site lighting.

The distribution system will need to be expanded to run power to the Explosives mixing plant, and then southeast to the satellite mine offices.

A sprinkler fire suppression system is installed in the washplant and Rainbird® spray systems serve the clean coal stockpile area A water reservoir has also been prepared to store water for distribution to the sprinklers and Rainbirds as well as to the fire trucks on site.

A stacker is used to feed the coal from the plant onto the clean coal stockpile. Coal from the clean coal stockpile is dozed to trap feeders and then transferred by conveyor to the rail load-out facility. Unit trains will be loaded in approximately four hours, from a surge bin that will load the coal into the rail cars as the train passes below. A dust suppression spray and physical restraints will keep coal dust controlled in the load out building as well as the conveyors. The rail line runs to the sea port at Ridley Terminals in Prince Rupert, British Columbia

Raw coal from the pit will be hauled by rigid frame haul trucks and dumped just to the south of the washplant. Also, additional raw coal from the Brule operation will be hauled by B-train haulers and dumped in this same area to the south of the washplant.

Raw coal will be piled by dozer or wheel loader into run of mine (ROM) coal stockpiles as required for operational flexibility. The ROM stockpile area will include a perimeter ditch to collect all water runoff.

The maintenance facilities at the Willow Creek mine have been conceptually sized to a total of 5 large service bays, one large wash bay and 1 service bays for support and light equipment. The support facilities (warehouse, offices, dry, and lunchroom)
Diesel fuel and gasoline storage for the site will be located near the maintenance facility. The system will include three x 90,000L diesel fuel tanks and a 15,000L gasoline tank. This system does not yet exist on site.

There are three main areas on site that require water:

- Washplant make-up water, fire water and pit utility water
- Water for Maintenance facilities to wash mobile equipment
- Potable water for use by employees for drinking and washing.

The coal washplant, fire water and pit utility water will be sourced from existing water tanks. The coal washplant will require make-up water fed into the system at a rate of 49m3/h. During dry dusty periods in the summer the mine will need an estimated 90m3 every 2 hours (40m3/h) for dust suppression. An additional 15m3/h should be available for fire water. This water will be used on site, and will not be released off site.

There are existing wells where water will be sourced from. There is also an existing 1,500 m^3 water tank available to hold water from the existing wells. An additional 2,000 m^3 tank will be supplied.

The mobile equipment will be brought in for regular maintenance, and will be washed regularly as part of this maintenance. The wash water for the maintenance facility will be sourced from the north settling pond. The used water will be collected by sumps located in the wash bay of the maintenance facility, pumped to the north settling pond, settled and re-used.

Potable water requirements per person on site are estimated at 150L/day. With an average of 150 people on site every day, this works out to a requirement of about 1m3/h.

The supply of potable water is from existing wells. Filters will be used to remove particulate material and bacteria from the water before it is used. Drinking water will be trucked in. Waste water from offices, washrooms, and labs will be pumped to and collected in the septic fields.

Additional water wells will be prepared to provide additional water usage to the site.

A water reservoir has been excavated and prepared for supplying make-up water to the washplant. Water will be sourced from existing wells.

Ponds and water collection structures are in place to collect any run-off from the plantsite area. These ponds are designed to settle out suspended solids and/or ex-filtrate prior to discharge to the receiving waters.

The explosives mixing plant and storage tanks for the emulsion tankers will be located as per the specified Tables of distances. Booster and Cap magazine storage will be located separately as shown. The cap and booster are stored in separate magazines, each one surrounded by a berm

Satellite offices will be constructed near the mining operation and will be used by pit and maintenance foremen and crew. There will also be a small lay down area for equipment components to facilitate in-pit maintenance. Power will be run out to these satellite offices.

The lab and washroom buildings are adjacent to the washplant.

In order to keep pit 4N dry for mining, the Far East Creek will be diverted along a high wall road above the pit.

The south settling pond is constructed to collect runoff water flowing south from the mine

The north settling pond is constructed to collect mine runoff draining northwards

25.11 Environmental and Socio/Economic Impact

Conclusions

The majority of the seams occur in the Upper and Middle Gething, although some seams have been located in the Lower Gething Formation. The resources are from eight coal seams, many of the seams are over 1m thick. The Willow Creek mine plan covers the surface exposures and near subsurface extensions of the Gething Formation on both limbs of the Pine Valley Anticline; they thus encompass the Willow West and South Blocks as well as Willow North and Central.

The Willow Creek coal mine is a metallurgical coal deposit with HCC and PCI coals. The coal resources are based on a pit with an incremental cutoff strip ratio of 20:1 to determine the 'potential surface mineable resources'. The resultant pit delineated resources are 48.9 million tonnes of HCC and PCI coal in the measured and indicated categories and an additional 0.3 million tonnes classified as inferred. These in situ resources do not account for expected plant yields, mining loss or dilution.

Recommendations
A continuing program of geological mapping and drilling should be set up to cover areas within the immediate mine plan. The mapping can provide down dip information for structure and seam continuity while the drilling can be used to keep the mine plan up-to-date and to verify coal quality.

A reconciliation program should be followed during mining that relates both modeled coal volumes to actual production as well as coal quality.

25.12 Metallurgical Coal Marketing

25.12.1 **Steel Production – Demand driver for coking coal**

Demand for metallurgical coal is driven by steel production. A major component of metallurgical coal – coking coal, is the raw material used to produce coke (also referred to as coal coke).

Coke provides most of the energy and reductants that blast furnaces utilize to reduce and smelt iron ore to pig iron – known in its molten form as "hot metal".

Blast furnace hot metal (pig iron) is then processed to steel in BOF (basic oxygen furnace) converters by removing excess carbon and unwanted elements. The blast furnace/BOF process is still the lowest-cost steelmaking route, and currently accounts for more than 60% of world steel production.

25.12.2 **Metallurgical coal types**

Metallurgical coal is classified into three major categories; hard coking coal (HCC), semi-soft coking coal (SSCC), and coal for pulverized coal injection (PCI). The category of semi-hard coking coal (SHCC) is also used, but is less common, and applies to lower-grade hard coking coal.

The generic term "coking coal" refers to the aggregate of hard, semi-hard and semi-soft coking coals, while metallurgical coal is coking coal plus PCI coal. The term "weak coking coal" refers primarily to semi-soft coking coal, but may contain some lower quality semi-hard coking coals.
HCC, SHCC and SSCC – which are different types of coking coal, are the basic ingredients for the manufacture of blast furnace coke.

PCI coal is not used in coke making, but is injected directly into the lower region of blast furnaces to supply both energy and carbon for iron reduction, thus replacing some of the coke that may otherwise have been used.

Hard coking coal represents the highest quality and the most valued of the coking coal spectrum due to coke making and blast furnace operations value-in-use considerations. Import demand for hard coking coals that are at the higher end of the quality spectrum, particularly for premium grade coking coals, is traditionally strong, as compared with lesser coking coal quality categories.

The purchase of premium hard coking coal traditionally forms the major element in buyer selection of coking coals. However, when there are expectations for the international coking coal market to return to balance or surplus, or coking coal supply is already in surplus – which usually reflects a slowing trend in steel demand and production – short-term interest in higher proportional usage and purchase of cheaper, lower coking coal grades of hard, semi-hard and semi-soft coking coal, focused on relative price competitiveness, will usually occur.

Most of the 'low hanging fruit" in relation to high quality hard coking coal resources – that is, low cost, well geographically positioned, accessible and near tidal water, high quality, environmentally exploitable and located in a stable country – has already been developed.

Hard coking coals that have been become benchmark coals are generally those premium and standard quality brands that have been produced from very large high quality, low cost resources, and therefore have been/continue to be produced and exported on a long-term basis. For example, the major premium hard coking coal benchmark, Goonyella, will continue to be produced from the Goonyella-Riverside mine for the next 60-70 years.

World seaborne metallurgical coal imports for 2009 were 233Mt and in 2010 are forecast to exceed 250Mt.

25.12.3 **Coke Production and Consumption**

When coking coal is heated in the absence of air to a certain temperature it produces a carbon enriched solid in a porous and fused form, which is called "coal coke" – more generally referred to as "coke". Coke provides most of the energy and reductants that blast furnaces utilize to reduce and smelt iron ore to pig iron (hot metal). Coke is also used in other applications in the non-ferrous and chemical sectors.

Subject to the average quality of a coking coal blend that is charged into a coke oven, the volume of coking coal required to produce a tonne of coke in modern coke oven facilities generally ranges between 1.36 and 1.40 tonnes.
Coke research group Resource-Net estimated world coke production in CY2008 at 545Mt, while the International Energy Agency's (IEA) global coking coal consumption estimate in that year was 814Mt, implying a world average coking coal to coke conversion ratio of 1.49.

International (across country border) trade in coke has traditionally been around 30Mtpy, equivalent to ~5-6% of global consumption. China has traditionally been the world's largest coke exporter, accounting for 15.4Mt and 12.1Mt of deliveries in CY2007 and CY2008 respectively. However, in 2009, China's coke exports plummeted to just over 0.5Mt and in 2010 is expected to remain at levels below 5Mt.

25.12.4 **Willow Creek Hard Coking Coal (HCC)**

The Willow Creek mine will produce a high quality Hard Coking Coal which has previously been tested and shipped under contract to a number of major international steel mills. It has low ash, high coking properties especially very high CSR (Coke Strength after Reaction). Willow Creek HCC has enjoyed strong market acceptance particularly from Brazilian and European steel mills that have expressed firm interest in securing term supplies of Willow Creek HCC once production recommences in 2011. In addition several major Asian steel mills from Japan, Korea, Taiwan and China have continued to pursue WCC for the opportunity to secure term supply agreements for this valuable HCC.

25.12.5 **Willow Creek LV PCI Coal**

Pulverized Coal Injection (PCI) Use

Coal used for Pulverized Coal Injection (PCI) is typically low volatile matter (LV) or high volatile matter (HV) coal, with many steel mills utilizing a combination of both coal types to replace some of their metallurgical coke feed into the blast furnace. The LV to HV ratios for PCI coals range from 50:50 to 90:10, with the latter range more popular throughout the world steel mills' PCI applications. LV PCI provides higher levels of carbon and the lower volatile matter content enhances blast furnace stability when compared to the HV PCI coals.

As many LV PCI coals can directly replace metallurgical coke on a 0.9 to 1.0 basis, the benefits of maximizing LV PCI is clearly evident, and this fact was one of the major "drivers" during price talks for this current year. HV PCI coals however have a lower coke replacement ratio, typically 0.7-0.8.

These days a consistent linkage with the price of HCC and that of LV PCI price exists, and in 2010 coal price settlements this ratio was set at 85% of the HCC price. In previous years it fluctuated between 70-80% of HCC price level. We need to remember that from a value point of view, PCI coal replaces coke, which is far more expensive and internationally now in tight supply. China which typically exports circa 15Mtpa has basically ceased coke exports due to strong domestic demand.

Table 25-30 Historical link of HCC and LV PCI Price

Prices USD FOBT	2007	2008	2009	2010 (Q1 only)
HCC	98	300	129	200
LVPCI	67.50	245	90	170
% LVPCI : HCC	69%	82%	70%	85%

When determining the pricing of PCI coal one needs to understand the true value in use from the buyers' perspective. The industry has seen that utilizing higher proportions of LV PCI in blast furnace operations will significantly reduce raw materials cost and provide a stable atmosphere within the blast furnace operation. This cost reduction has been particularly evident as metallurgical coke prices are again at very high levels, currently exceeding USD450 per tonne. Following the record high prices for internationally traded Hard Coking Coal (HCC) in Japanese fiscal year 2008 of USD300 per tonne FOBT, and a LV PCI price record of USD245 FOBT we are witnessing in 2010 a price resurgence again with HCC at USD200 FOBT for April-June qtr 2010 and LV PCI at USD170 FOBT (a significant rise over the 2009 prices of USD129 & USD90 respectively).

The annual coal prices for PCI historically were linked to both Semi Soft Coking Coal (SSCC) price and somewhat to Thermal Coal price and this was usually related to the energy content (calorific value) of each category of coal. However, in the last few years we have seen this nexus broken and a higher value in use for PCI coal has begun to be acknowledged from both buyers and sellers. Coal producers and steel mills worldwide, have researched and investigated the benefits of maximizing PCI rate in their blast furnace operations and have identified that high calorific value LV PCI coal provides increased carbon and lower crude steel costs.

The outlook for an ongoing and strong demand for LV PCI is universally acknowledged by both metallurgical producers and end users alike. One concern however by buyers has been that the majority of the world's supply of seaborne LV PCI coal comes from Queensland, Australia.

Willow Creek LV PCI

The Willow Creek mine produces a high quality LV PCI which has previously been tested and shipped under contract to a number of major steel mills in Japan and Korea and received market acceptance by these end users. To date these same buyers and many steel producers in the South American and European regions have expressed strong interest in securing ongoing supplies of Willow Creek LV PCI once production recommences in 2010.

Willow Creek LV PCI's coal quality features fit comfortably within the parameters that LV PCI end users seek and the company has no doubt whatsoever that all of the coal will be contracted on both annual and term contract basis. During March 2010, WCC held price talks with steel mills throughout Asia and subsequently some contracts have already been secured for the supply of Willow Creek LV PCI from the second half of 2010.

25.13 Capital Cost Estimate

The capital costs associated with starting up the Willow Creek open pit coal mine are summarized in the Table below. All capital costs listed are Canadian $ unless otherwise specified.

Table 25-31 Capital Cost Estimate

	$ Millions
Offsite Development	10.00
General and Site Services	2.50
Preproduction Mine Operations	8.36
Mine Development and Infrastructure	29.34
General Site Infrastructure	6.01
Washplant Expansion	19.70
Mining Mobile Equipment	161.89
Indirects	56.46
TOTAL	**294.26**

The total project capital cost is M$294.26.

25.14 Operating Cost Estimate

The operating cost for the Willow Creek Project is estimated based on an average annual process rate of 2.2 MTRC per year plant feed (2.35 MTRC per year breaker feed). Currencies are expressed in both Canadian $ and US $. All costs in this section are stated in Q2 2010.

When it is required, certain costs in this report are converted using a fixed currency exchange rate of CAD$1.00 to USD$0.92.

The expected accuracy range of the operating cost estimate is +30%, -15%.

Power will be supplied by grid lines at an average cost of $0.06/kWh.

Process power consumption estimates are based on the equipment load power draws for the process equipment. The power cost for the mining section is included in the mining operating cost. Power costs for surface service is included in site services.

Table 25-47 Operating Cost Summary

	$/MTCC
Mine	55.55
Processing and Loadout	6.05
G&A and Site Services	3.35
Total Site	64.95
Coal Transportation & handling	28.50
Total Cost FOB vessel	**$93.45**

The operating costs are defined as the direct operating costs including mining, processing, and G&A.

For purposes of economic evaluation, total costs for coal transportation and handling (rail, port, analytical) required to deliver coal from the minesite onto the customer's vessel at Ridley Terminals Inc. port in Prince Rupert are estimated to be $28.50 per tonne of product shipped. Actual rail and port charges are subject to confidential negotiation between WCC and its suppliers. WCC sells most of its products on an FOB vessel basis, with a small portion from time to time sold on a CIF basis (delivered to customer's port).

25.15 Project Economic Analysis

25.15.1 Contracts

Western Coal has contracts with and expressions of interest from its current customers for both Willow Creek HCC and PCI. This coal is typically sold under annual to multi-year contracts, traditionally with annual price negotiations. The market has move this year to quarterly pricing, and this is anticipated to be the basis for sales of Willow Creek coal.

25.15.2 Taxes

The nature and rates of taxes, royalties and other government levies or interests applicable to the mineral project or to production, and to revenues or income from the Willow Creek Project are as follows:

- Net Current Proceeds (NPC) tax is assessed as 2 percent of Net Revenue with Net Revenue defined as total gross revenue less cash operating costs exclusive of royalty payments.
- Net Revenue Tax (NRT) is calculated as 13 percent of profit in excess of a "normal return on investment over the life of the mine."
- H.S.T
- Income Tax

25.15.3 Cash Flow Analysis

WCC completed a cash flow analysis for the Willow Creek Project. Key metrics of the Base Case scenario are set out in the following Table:

Table 25-59 Project Value and Benefits

Metric	Value/Amount
Mine life, years	14
Product coal, millions MTCC	20.6
Strip ratio, BCMW/MTCC	11.9
Long term pricing	
HCC, USD per tonne	$150
PCI, USD per tonne	$120
FX rate, USD/CAD	0.95
On-site cost, CAD/MTCC	$57
FOB cost, CAD/MTCC	$85

Capital, millions CAD	
Mobile mining equipment	$210
Infrastructure and other	$110
Contingency	$32
NPV_{10}, millions CAD	$151
IRR, %	26
Payback period, years	5

*Capital includes Initial and Sustaining

25.15.4 **Sensitivity**

The following Table illustrates project sensitivity to key economic parameters, namely coal price, discount rate, operating cost, capital cost, and Canada: US dollar exchange rates.

Table 25-60 Willow Creek Sensitivity Analysis
(Figures in Parentheses represent base case assumptions.)

	NPV ($CAD millions)
Base Case	**$151**
Price (150USD/t HCC, 120USD/t PCI)	
10% increase	**$206**
10% decrease	**$96**
Discount rate (10%)	
@12%	**$119**
@8%	**$189**
OPEX	
20% increase	**$0**
10% decrease	**$232**
CAPEX	
20% increase	**$103**
10% decrease	**$276**
FX Rate (1 CAD = 0.95 USD)	
1 CAD = 0.9 USD	**$196**
1 CAD = 1 USD	**$111**

Average strip ratio is relatively high, with a large tonnage of PCI coal that is economic at design prices but would become un-economic at lower prices greater than 20% decrease. Operating costs have a greater sensitivity than capital since much of the plant and infrastructure is already in place.

Because mining progresses along strike, a prospective adjustment to pit limits to accommodate changed economic conditions is possible.

Exposure to near term coal price upside provides the most significant opportunity for the project during the heavy investment years.

The Willow Creek Expansion is expected to have a positive impact on the region, in particular because there are currently many people out of work. The mine is readily accessible by highway from Chetwynd and Moberly Lake. Extensive design measures are being taken to prevent fish habitat destruction, as this would trigger a Canadian Environmental Assessment Review which could add significant costs and a year or more to the permitting time-line. Major environmental concerns for the project will continue to be managing dust and selenium release to the environment.

25.16 List of Acronyms

ARD – Acid Rock Drainage
ASTM – American Society for Testing and Materials.
BCMW Bank Cubic Meter Waste
BCMRC Bank Cubic Meter Raw Coal
BCR – BC Rail
CAD – Canadian Dollars
FOB – The abbreviation for "free on board". The FOB price is the sales price of coal loaded in a vessel at the port and excludes freight or shipping cost
FSI (Free Swelling Index) - A number assigned to particular coal used in determining its suitability for coke making or other uses. The index, from zero to nine, is determined by tests established by ASTM standards
GSC – Geologic Survey of Canada
MEMPR – Ministry of Mines and Petroleum Resources
ML – Metal Leaching
MSEP – MineSight Economic Planner used to produce economic pit limits
MSSP – MineSight Strategic Planner used to produce an economic production schedule
MTCC – Metric Tonne Clean Coal
MTRC – Metric Tonne Raw Coal
NTS –
QP – Qualified Person
USD – US Dollars
UTM –

Above mean sea level	amsl
Ampere	A
Annum (year)	a
Bank cubic metre	bcm
Cubic metre	m3
Day	d
Days per week	d/wk
Days per year (annum)	d/a
Degree	°
Degrees	deg
Degrees Celsius	°C
Diameter	ø
Dry metric ton	dmt
Gram	g
Grams per cubic centimetre	g/cc
Grams per litre	g/L
Grams per tonne	g/t
Greater than	>

Hectare (10,000 m2)	ha
Hertz	Hz
Horsepower	hp
Hour (not hr)	h
Hours per day	h/d
Hours per week	h/wk
Hours per year	h/a
Inch	"
Joule	J
Joules per kilowatt-hour	J/kWh
Kelvin	K
Kilo (thousand)	k
Kilocalorie	kcal
Kilogram	kg
Kilograms per cubic metre	kg/m3
Kilograms per hour	kg/h
Kilograms per square metre	kg/m2
Kilojoule	kJ
Kilometre	km
Kilometres per hour	km/h
Kilonewton	kN
Kilopascal	kPa
Kilovolt	kV
Kilovolt-ampere	kVA
Kilovolts	kV
Kilowatt	kW
Kilowatt hour	kWh
Kilowatt hours per short ton (US)	kWh/st
Kilowatt hours per tonne (metric ton)	kWh/t
Kilowatt hours per year	kWh/a
Kilowatts adjusted for motor efficiency	kWe
Less than	<
Litre	L
Litres per minute	L/m
Megabytes per second	Mb/s
Megapascal	MPa
Megavolt-ampere.	MVA
Megawatt	MW
Metre	m
Metres above sea level	masl
Metres per hour	m/hr
Metres per minute	m/min
Metres per second	m/s

Metric ton (tonne)	t
Micrometre (micron)	µm
Microsiemens (electrical)	µs
Miles per hour	mph
Milliamperes	mA
Milligram	mg
Milligrams per litre	mg/L
Millilitre	mL
Millimetre	mm
Million	M
Million tonnes	Mt
Minute (plane angle).	’
Minute (time)	min
Month	mo
Newton	N
Newtons per metre	N/m
Ohm (electrical)	Ω
Ounce	oz
Parts per billion	ppb
Parts per million	ppm
Pascal (newtons per square metre)	Pa
Pascals per second	Pa/s
Percent	%
Percent moisture (relative humidity)	% RH
Phase (electrical)	Ph
Power factor	pF
Revolutions per minute	rpm
Second (plane angle)	"
Second (time)	s
Short ton (2,000 lb)	st
Short ton (US)	st
Short tons per day (US)	stpd
Short tons per hour (US)	stph
Short tons per year (US)	stpy
Specific gravity	SG
Square kilometre	km2
Square metre	m2
Thousand tonnes	kt
Tonne (1,000 kg)	t
Tonnes per annum	tpa
Tonnes per day	t/d
Tonnes per hour	t/h
Tonnes per year	t/a

Total dissolved solids	TDS
Total suspended solids	TSS
Volt	V
Week	wk
Weight/weight	w/w
Wet metric ton	wmt
Yard	yd
Year (annum)	a
Year (US)	y

25.17 Glossary

Air Dried Basis (adb) Coal that has been left to dry in air and has an approximate 'dry' moisture of 1%

Ash - Impurities consisting of silica, iron, alumina and other incombustible matter that are contained in coal. As increases the weight of coal and adds to the cost of handling. Ash content is measured as a percentage by weight of coal on an "as received" or a "dry" (moisture-free) basis.

As Received Basis (arb) Coal as received with in-situ/drained moisture content assumed to be 8%.

Coal Washability - The analysis of the specific gravity distribution of chemical and physical characteristics of coal.

Drillhole - A circular hole made by drilling either to explore for minerals or to obtain geological information.

Dip - The angle at which a stratum is inclined from the horizontal, measured perpendicular to the strike and in the vertical plane.

Dry Basis (db) - Coal that has moisture removed by prescribed laboratory procedure or excluded by calculation.

Exploration - The search for coal by geological surveys, prospecting or use of tunnels, drifts or drillholes.

Fault - A fracture in rock along which the adjacent rock surfaces are differentially displaced.

First Nations - An aboriginal governing body organized and established by aboriginal people within their traditional territory in British Columbia, which has been mandated by its constituents to enter into treaty negotiations on their behalf with Canada and British Columbia.

Fixed Carbon - The solid residue, other than ash, remaining after the volatile matter and moisture have been liberated from coal during combustion.

Float/Sink - A laboratory procedure, which measures the floating and sinking of particles of material of various size fractions in heavy liquids at various specific gravities.

Front End Loader - A tractor or wheel type loader with a digging bucket mounted on the front end that dumps.

Geophysical Log - A graphic record of the measured or computed physical characteristics of the rock section encountered by a probe or sonde in a drillhole, plotted as a continuous function of depth. Also commonly referred to as an e-log.

Highwall - The unexcavated face of exposed overburden and coal or ore in an opencast mine or the face or bank of the uphill side of a contour strip-mine excavation.

Interburden - Waste material located between economically recoverable resources.

Isopach - The areal extent and thickness variation of a stratigraphic unit in geology.

Lease - A contract between a landowner and a lessee, granting the lessee the right to search for and produce coal upon payment of an agreed rental, bonus and/or royalty.

Metallurgical - Coal with characteristics making it suitable for production of coke that can be used by the iron and steel industry.

Mineable - Capable of being mined under current mining technology and environmental and legal restrictions, rules and regulations.

Out-of-Seam Dilution (OSD) - The contamination of mined coal with rock outside of the coal seam being mined.
Outcrop - Coal, which appears at or near the surface; the intersection of a coal seam with the surface.
Overburden - The rock, earth or other material lying over the coal.
Proximate Analysis - Laboratory analysis to determine the percentage by prescribed methods of moisture, volatile matter, fixed carbon and ash.
Pulverized Coal Injection (PCI) - Low-grade metallurgical coking coal.
Raw Coal - The coal that remains after oversized OSD material has been removed in the breaker station and which is the feedstock for the preparation plant.
Reclamation - The restoration of land at a mining site after the coal is extracted. Reclamation operations are usually conducted as production operations are taking place elsewhere at the site. This process commonly includes re-contouring or reshaping the land to its approximate original appearance, restoring topsoil and planting native grasses, trees and ground covers.
Rotary Drill - A drill machine that rotates a rigid, tubular string of rods to which is attached a bit for cutting rock to produce boreholes.
Royalty - A share of the product or profit reserved by the owner for permitting another to use the property. A lease by which the owner or lessor grants to the lessee the privilege of mining and operating the land in consideration of the payment of a certain stipulated royalty on the mineral produced.
Run-of-Mine Coal (ROM) - The coal produced from the mine before it is separated and any impurities removed.
Saleable Coal - The shippable product of a coal mine or preparation plant. Depending on customer specifications, saleable coal may be run-of-mine, crushed-and-screened (sized) coal, or the clean coal from a processing plant.
Strip Ratio - The volume of overburden material (bank cubic meters) that must be removed to provide a unit weight of coal (tonne).
Surface Mining - Methods of mining at or near the surface. Includes mining and removing coal from open cuts with mechanical excavating and transportation equipment and the removal of capping overburden to uncover the coal.
Syncline - A fold in which the core contains the stratigraphically younger rocks; it is generally concave upward.
Tailings - Fine refuse material or waste that has been separated from the fine clean coal in the froth flotation cells in the coal processing plant.
Thermal Coal - Coal with characteristics making it suitable for burning to produce steam for generating electricity.
Thrust Fault - A fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall.
Train Loadout - A facility to load coal in rail cars.
Volatile Matter - Those products, exclusive of moisture, given off by a material such as gas or vapour, determined by definite prescribed methods, which may vary according to the nature of the material.
Yield - The ratio of the clean coal product to the raw coal plant feed, expressed as a percentage.