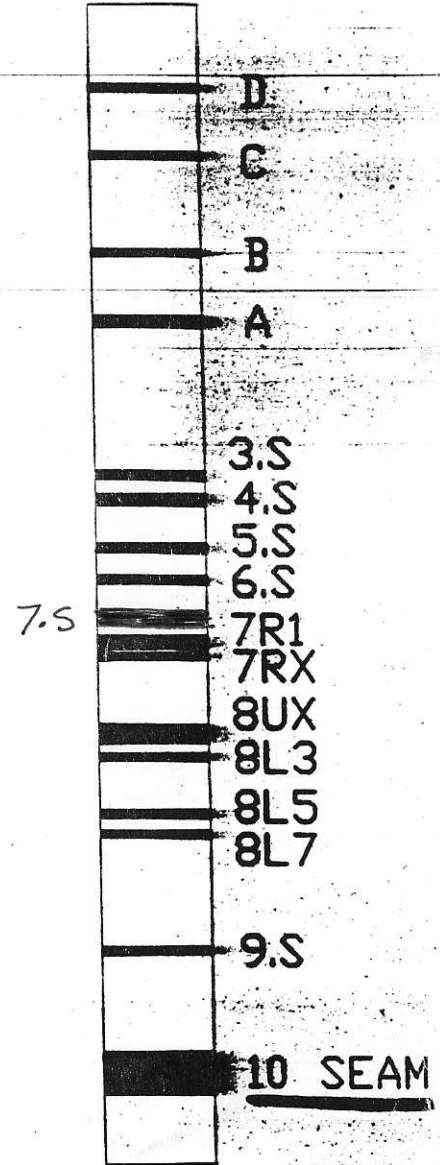
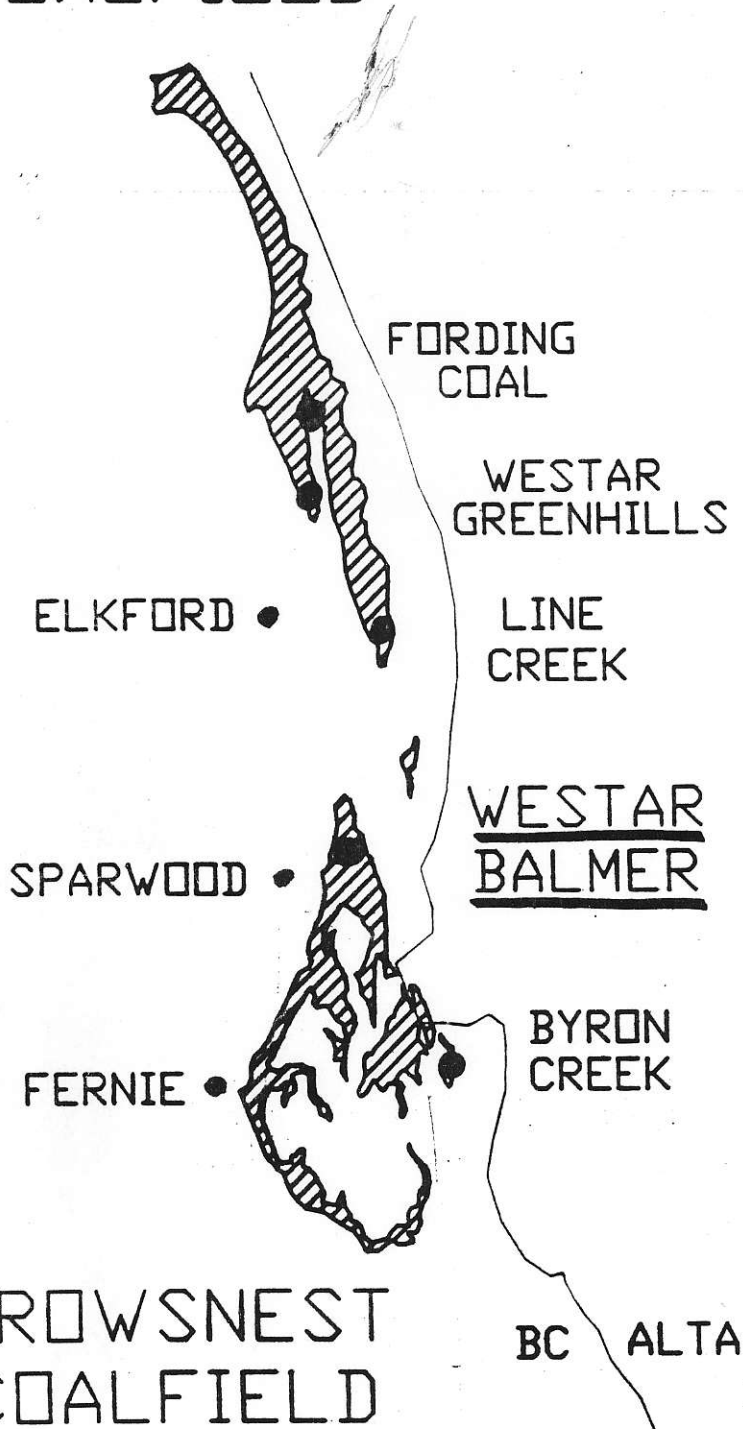


Pal Gilman?
Notes for Talk
Coal Forum Feb/92

ELK VALLEY COALFIELD



- Westar Mining Ltd's Balmer Mine is in the EAST KOOTENAYS between Sparwood and the Alberta border.
- The truck/shovel open pit mine has been in operation since 1969 and has produced over 100 million tonnes of met coal.
- Most of the production has been from the 50' thick Balmer 10 seam.
- During the past 8 years Balmer has become a multi-seam mine.
- Operations have spread over five low ratio pit areas requiring a complex system of roads and rock dumps.
- These pits are nearing completion and Balmer is now faced with an increasing strip ratio.
- This, along with an aging equipment fleet, unfavorable coal pricing, and a strong Canadian dollar, has left Balmer with a significant challenge to remain competitive.
- The current financial difficulties show that the operation has to change in order to survive.

- Coal seams at Balmer are within the Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group.
- Mining operations are at the northern tip of the CROWNEST COALFIELD, structurally separated from the mines in the ELK VALLEY COALFIELD.
- Coals range in rank from low to medium volatile bituminous with a wide range of metallurgical qualities.
- 14 complex seams are being mined, from the 10 seam near the base to the A-seam near the top.
- 10 seam averages 50' in thickness and easily washes to the product ash of 9.5 and 7.0 FSI with yields greater than 70%.

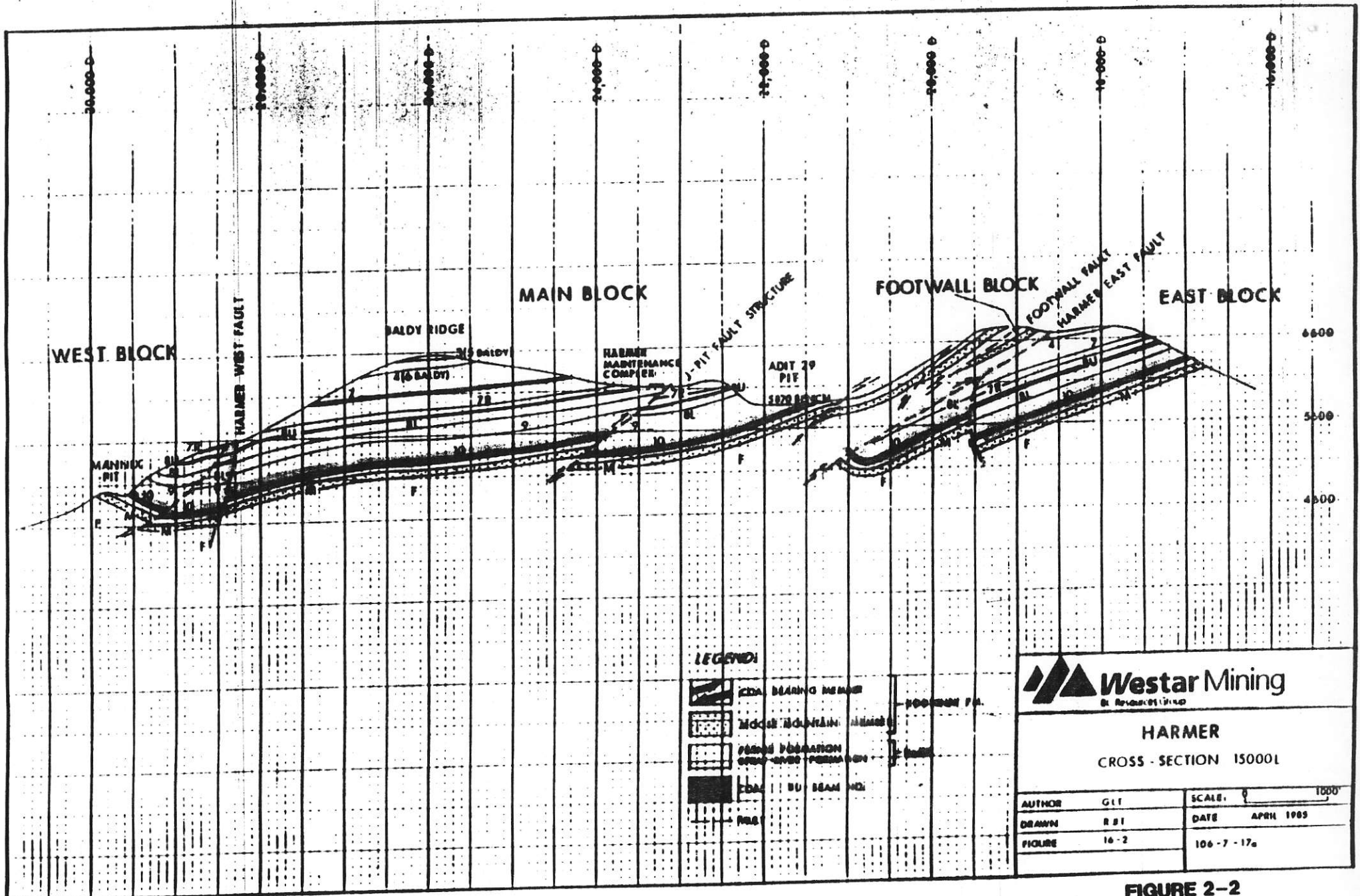
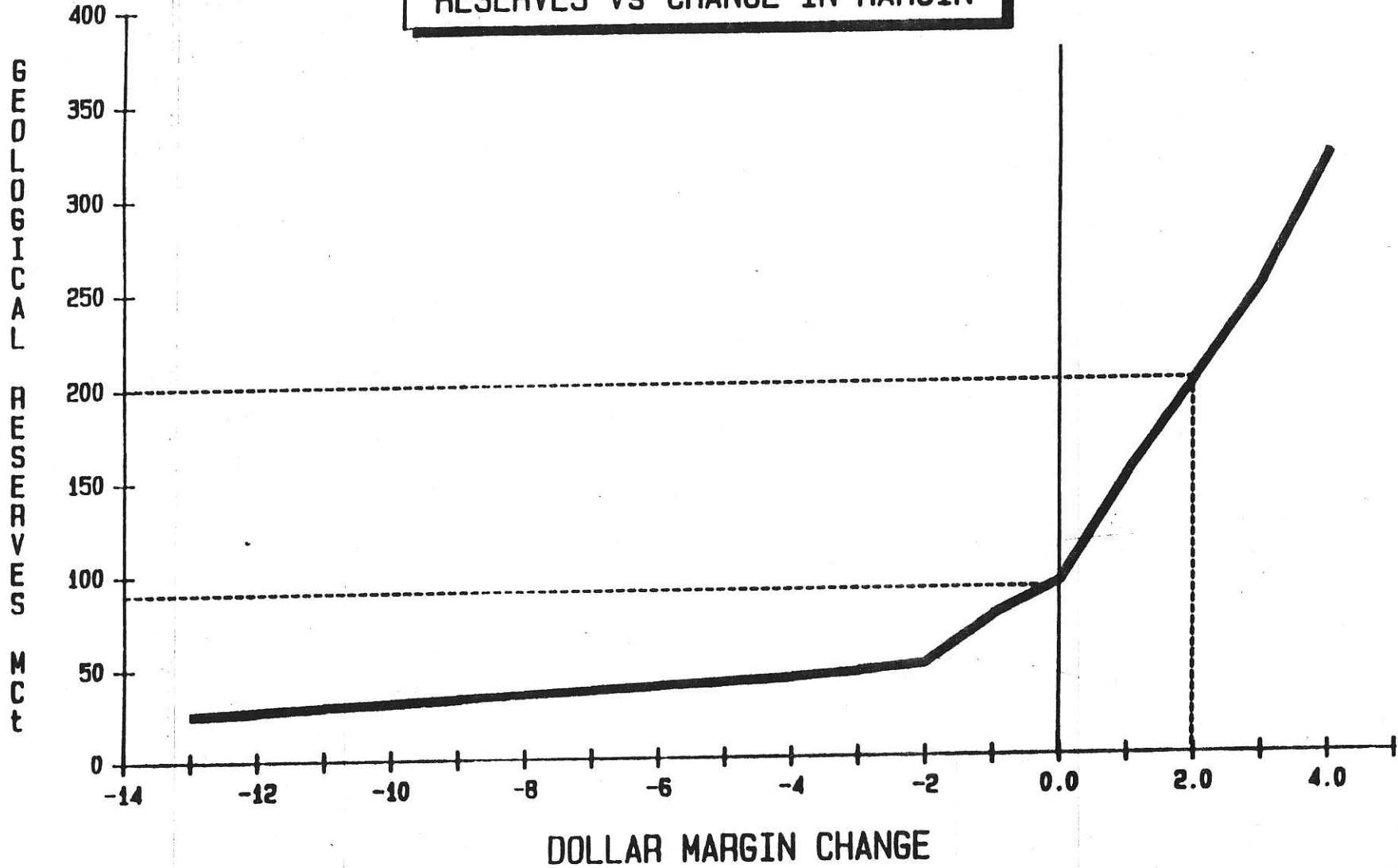


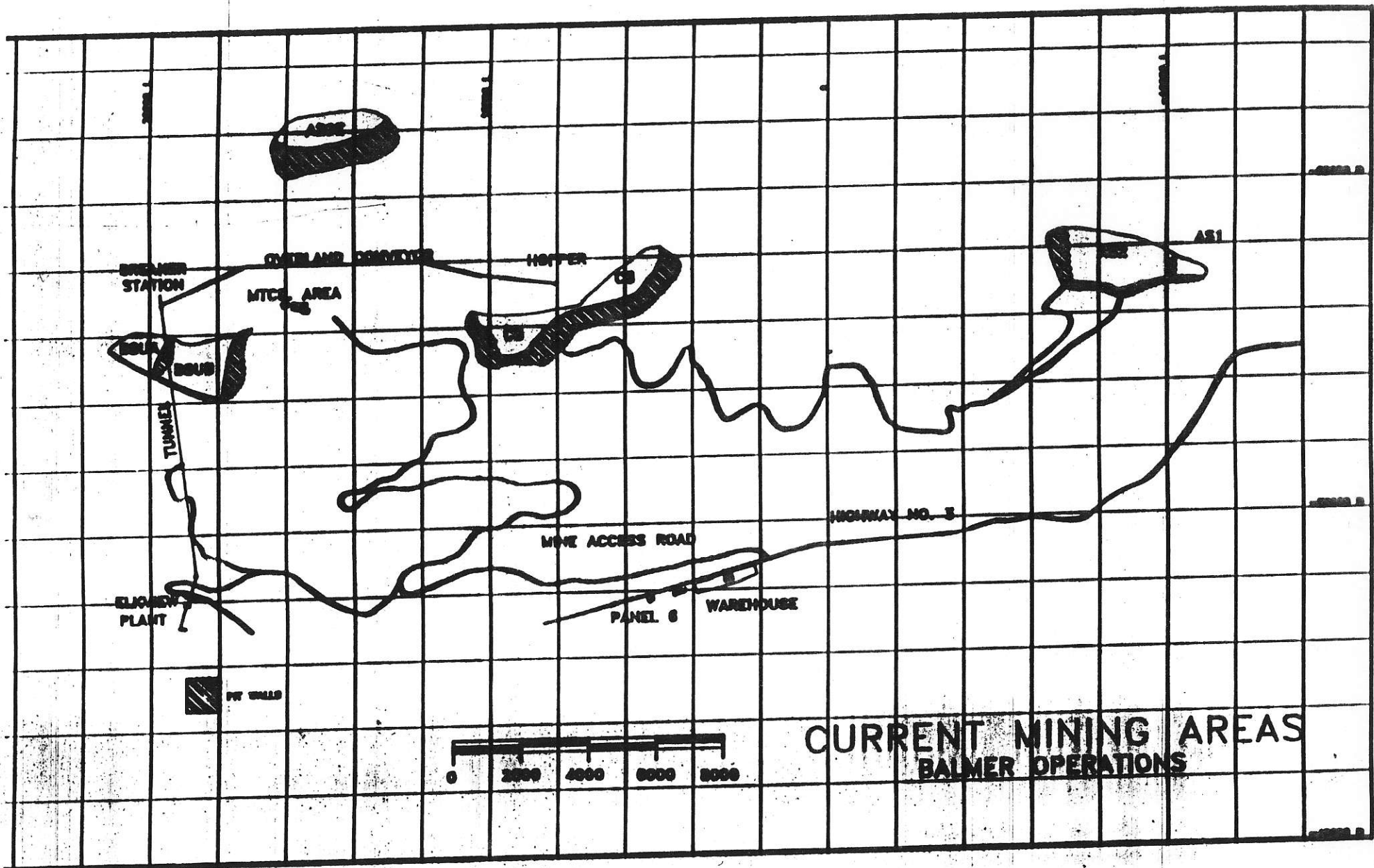
FIGURE 2-2

- The CROWSNEST COALFIELD is within a complex synclinalorium called the FERNIE BASIN.
- At Balmer, seams generally dip westerly at 10° - 25° but are highly folded & faulted.
- Major blocks are bounded by the Harmer West normal fault and several west-dipping thrust faults.
- These faults have complicated mining operations but in some areas seam repetitions have significantly increased 10 seam reserves.

RESERVES vs CHANGE IN MARGIN



- Measured reserves of metallurgical coal are substantial.
- Based on present price/cost factors 80 million clean tonnes are economical.
- But very small changes in coal price or mining costs have a major impact on reserves.
- A price increase or mine cost reduction of \$200 per clean tonne increases mineable reserves to 200 million tonnes.

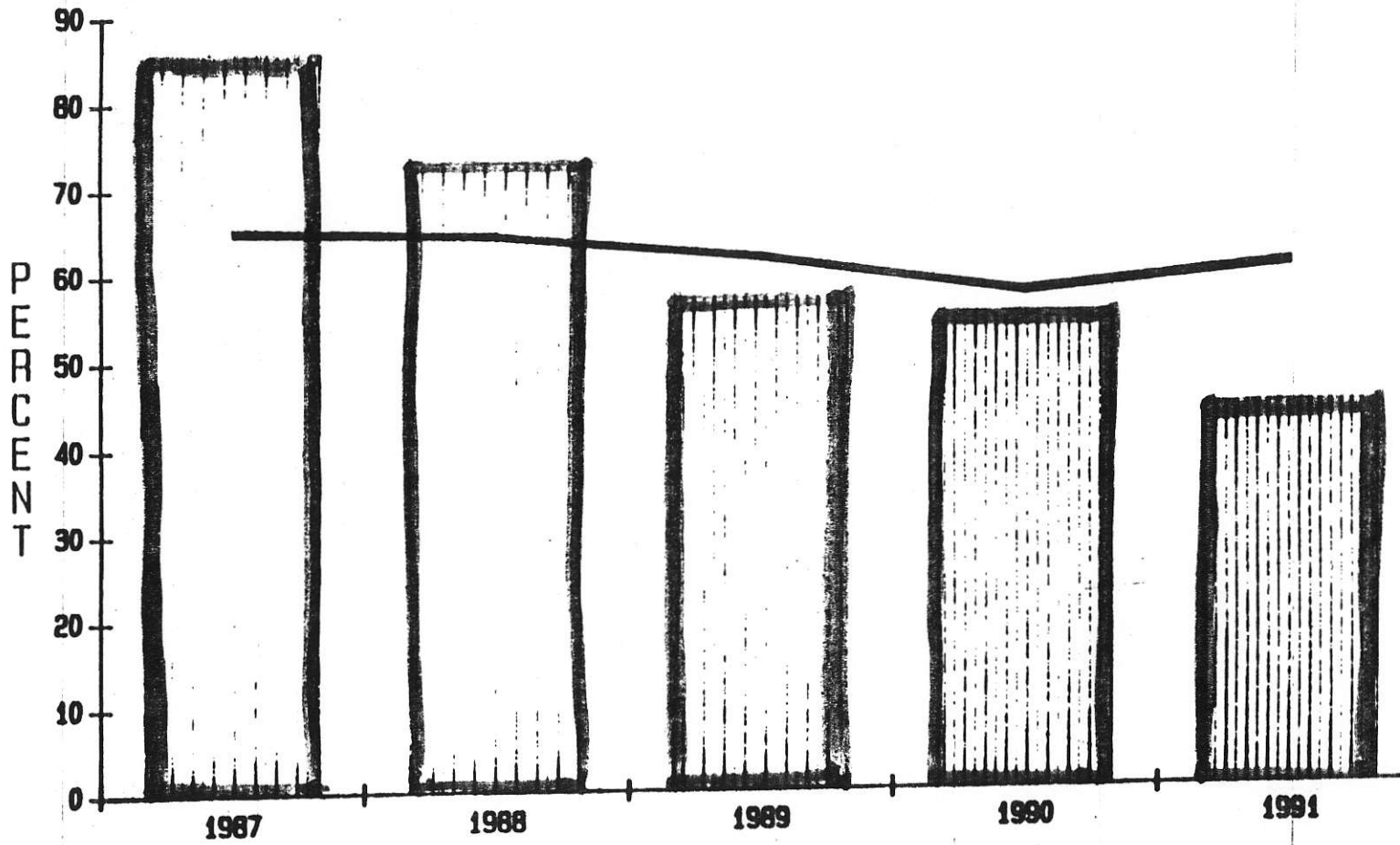


- The low ratio pits are now nearing completion.
- Numerous problems had occurred mining these pits and in today's market environment Balmer can not stay competitive at the productivities achieved.

REASONS for the low productivities are:

- Diverse, small pits with extensive road networks required extra auxiliary equipment.
- Mining complex seams in the small pits lead to:
 - 1) Split Bench Mining and long dozer pushes when the seams are tight to the highwalls.
 - 2) Often forced to mine the seams from footwall side thus increasing rock dilution and coal losses.
 - 3) Tight areas forced numerous small blasts, extra blast delays, extra cleanup and extra shovel moves.
- Reduced coal inventories left little operational flexibility and forced further subdivisions of the small pits to maintain coal release.

HISTORICAL COAL QUALITY / YIELD



▒ % 10 SEAM — YIELD

o Lower # 10 seam percentage in the coal blends and more upper seams contributed to increasing rock dilution and lower plant yields

AVERAGE EQUIPMENT AGE

FLEET	<u>AGE (yrs)</u>
P & H 2800 SHOVELS (5)	20
P & H 2100 SHOVELS (4)	20
HYDRAULIC SHOVELS (3)	3
M200 TRUCKS (12)	20
TITAN TRUCKS (31)	13

- Aging Equipment Fleet

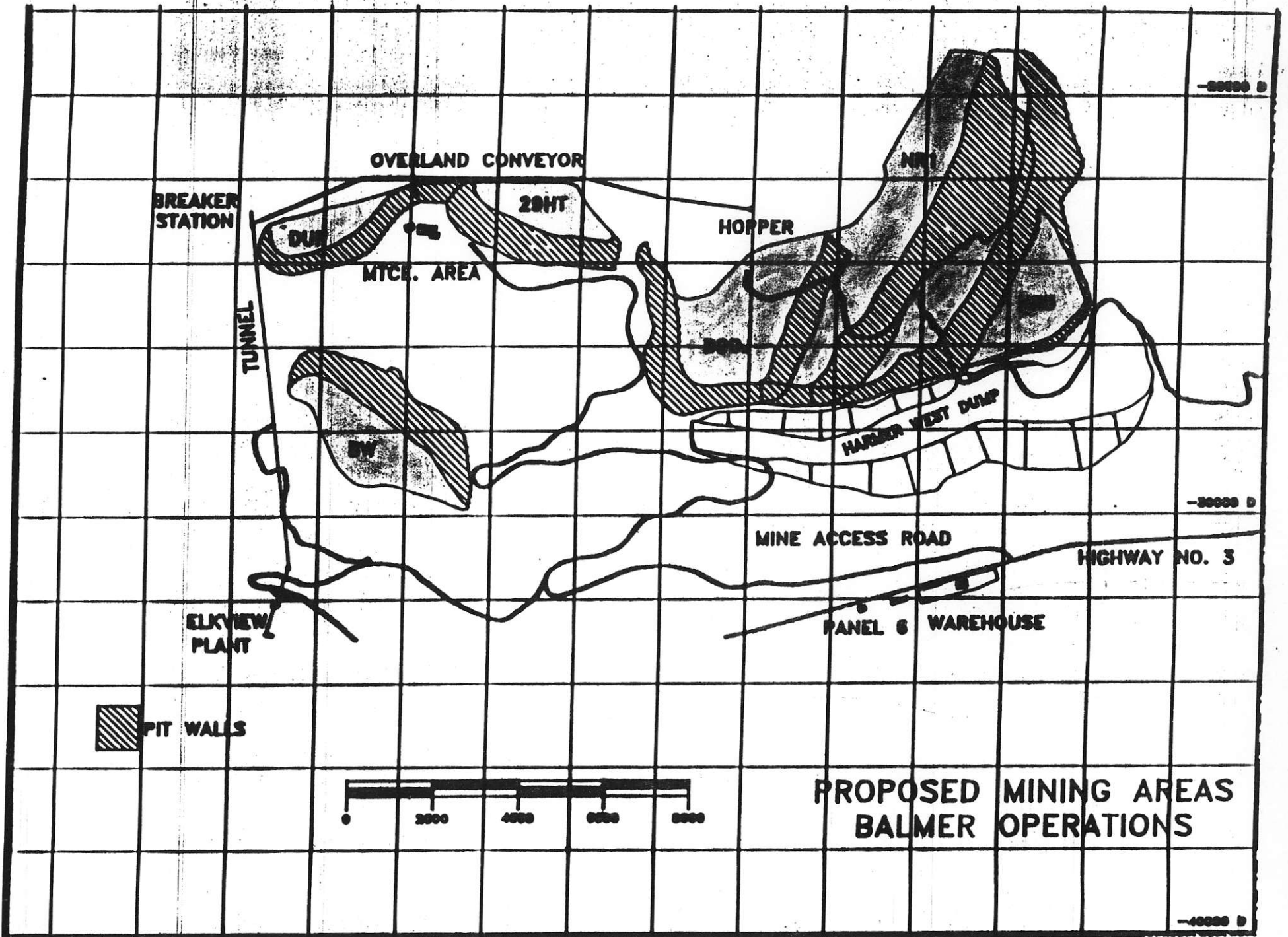
- Net result is BREAK EVEN MINING and the viability of the operation is questionable.

- Productivity gains of 30% have to be achieved.

RE-EVALUATION PROCESS

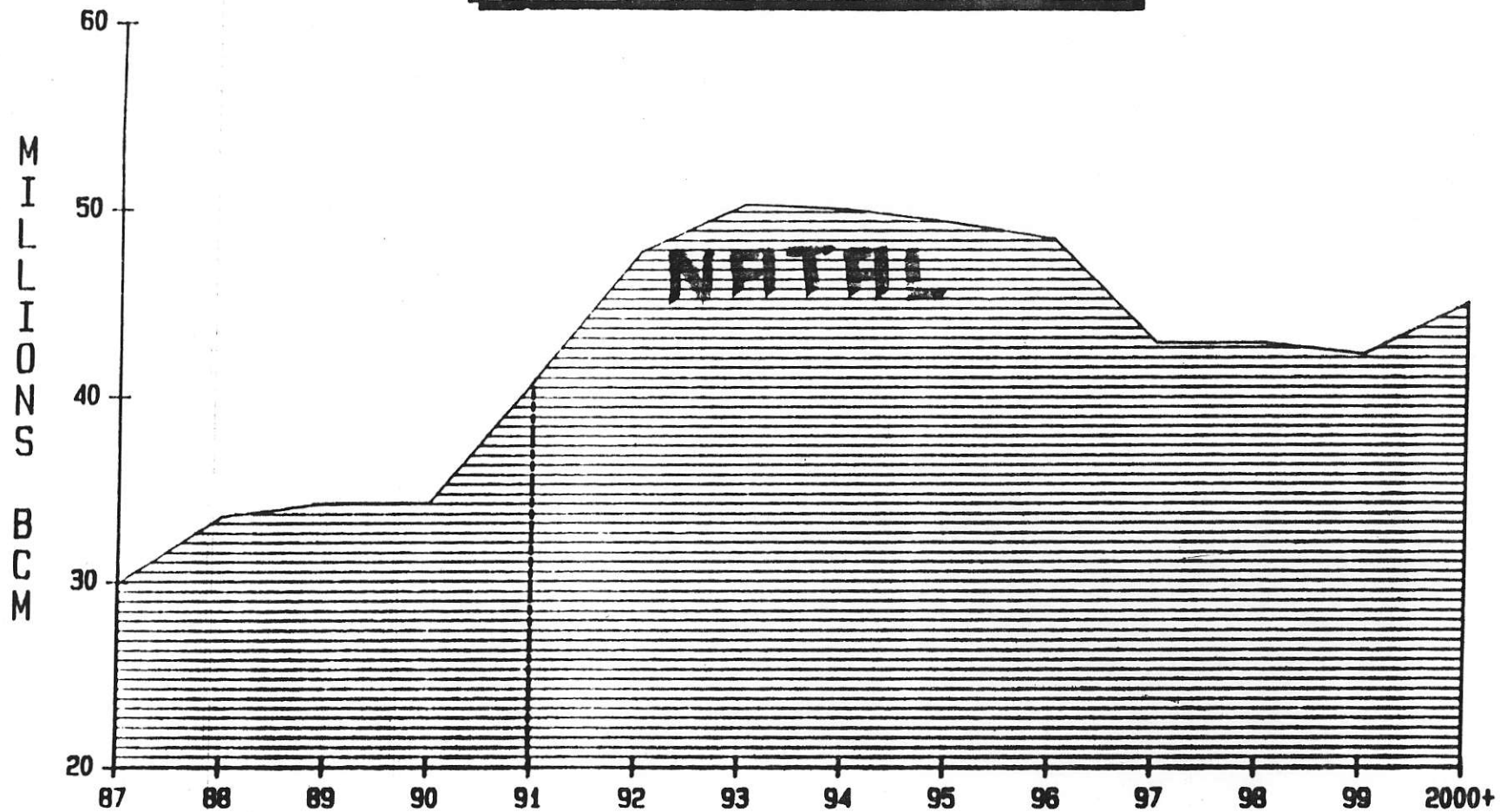
- WESTAR / CESL ENGINEERING TEAM
- COMPLETE RESERVE EVALUATION
- NO CONSTRAINTS
- PRIORITIZE:
 - PRODUCTIVITY
 - PRODUCTION
 - COSTS
- NEW VALUE APPROACH INSTEAD OF
TRADITIONAL STRIP RATIO APPROACH

- Western has revised its mine plan to improve the viability of the mine and extend mine life 15 years.
- Focus has been to improve those factors which we have control over:
RESOURCE UTILIZATION • MINING EQUIPMENT • PRODUCTION
- Only higher ratio areas are left at Balmer and remaining reserves are very sensitive to cost.
- It is therefore necessary to mine large areas so that larger equipment can operate efficiently at high production rates.
- Med System mine planning software was used to re-evaluate the coal deposit to define the most economic new mining areas.
- Throughout 1991 exploration drilling confirms the geology of the proposed pits.
- The New Mine Plan will ensure:
 - Large mining areas for larger equipment
 - Phased development for back-filling of pits
 - Shorter haul distances
 - Hangingwall access to coal seams
 - Uncovered coal to be left as pit inventory for enhanced blending and reduced stock piling
 - Maximized 10 seam release



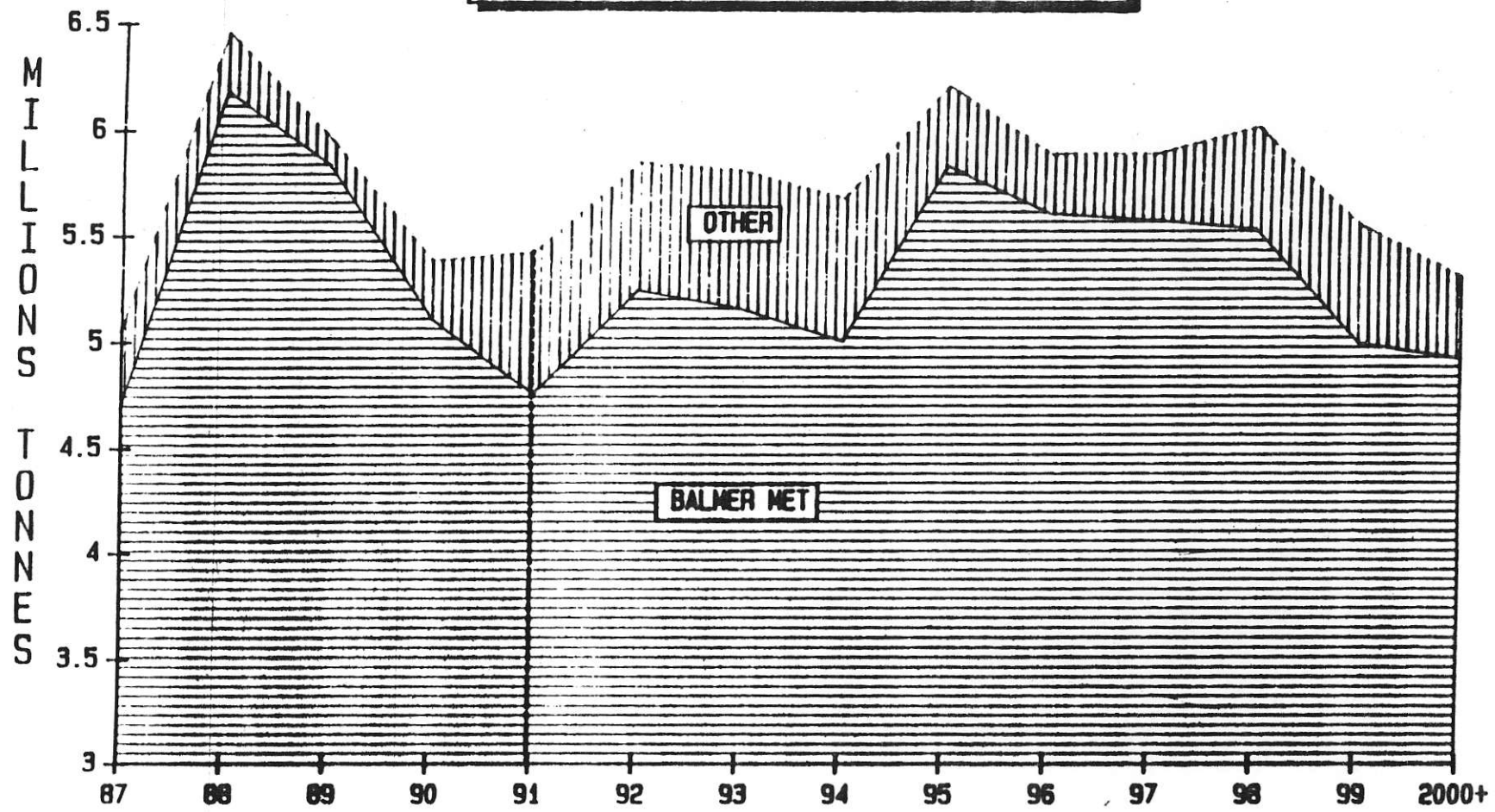
- The majority of the remaining coal reserves are on BALDY RIDGE to the north and BODIE CREEK / NATAL RIDGE to the south.
- BALDY RIDGE has a higher ratio and would require extensive infrastructure relocation and is therefore largely deferred.
- Exceptions are the DUPONT/H PITS around the maintenance complex and Baldy West above the ELKVIEW PLANT.
- BODIE J is being developed first. To avoid a long waste haul to the ERICKSON VALLEY a new WEST DUMP is proposed above Michel CREEK VALLEY.
- NATAL RIDGE is next, back-filling BODJ and dumping eastward into Erickson Valley.

FORECAST ROCK STRIPPING



Natal Ridge requires pre-stripping during the next five years to maintain future coal release.

FORECAST CLEAN COAL PRODUCTION

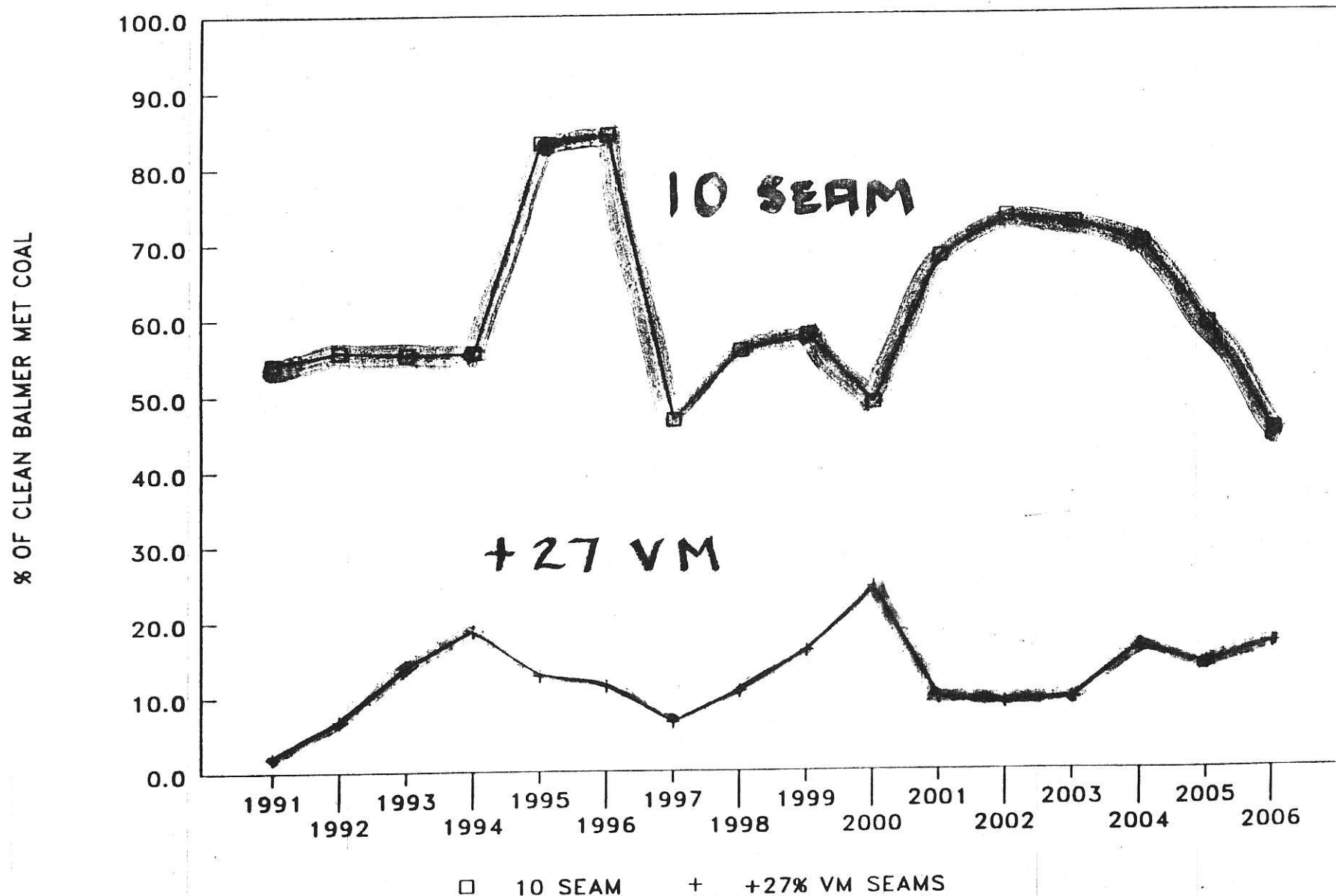


- The mine plan maximizes BASE MET coal production.
- Annual coal release from mine operations will be enough to supply the Elkview Plant at its capacity of 9.8 million raw tonnes.
- Higher percentages of # 10 Seams will be uncovered and only 9% of product will be sold as weak coking or thermal coal.

FIGURE 3-11

METALLURGICAL COAL SEAM COMPOSITION

SCH15YP LONG RANGE SCHEDULE



- Base Met production is maximized by blending high ash coals with higher VM coals that wash to a low ash.
- Blending in these + 27 VM coals helps to optimize the processing of all seams.
- + 27 VM coals will on average be 15% of the product.

**BALMER OPERATIONS
MAJOR PRODUCTION EQUIPMENT**

11/12/91 15:03
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	1990	1991				1992				1993	1994	1995	1996	1997
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q					
GD 120	2	2	2	2	2	2	2	2	2	2	1	1	1	
BE 61R				1	2	2	2	2	1	1	1			
BE 60R	6	6	6	5	4	4	4	3	2	1				
NEW DRILLS								1	1	2	3	4	5	
TOTAL DRILLS	8	8	8	8	8	8	8	8	7	7	6	6	6	
PH 2100	4	4	4	4	4	4	3	3	2	1				
PH 2800	5	5	5	5	5	5	5	4	3	2	1			
O&K RH120-HOE	1	1	1	1	1	1	1	1	1	1	1	1	1	
O&K RH120	1	1	1	1	1	1	1	1	1	1				
O&K RH120	1	1	1						1	1	1	1		
O&K RH200	1	1	1	1	1	1	1	1	2	2	2	2	2	
PH 4100								1	1	1	3	3	3	
PH 2800XPA										1	1	2	2	
HYDRAULIC SHOVEL														
TOTAL SHOVELS	13	13	13	12	12	13	12	12	11	10	9	9	8	
UNIT RIG M200	17	14	14	12	12	12	7	7						
TITAN 33-15	31	31	31	31	31	31	28	27	22	8	5	3		
TEST TRKS	4	4												
HAUL PAC 830E	2	2	8	10	12	15	25	28	39	39	40	40	40	
TOTAL TRUCKS	54	51	53	53	55	58	60	62	61	47	45	43	40	

NOTE: 2 TX 33-15 AT ELKVIEW ARE NOT INCLUDED

- Larger pits allow operation of P_H 2800 XPA's and 4100's which will gradually replace the existing cable shovels.
- By 1997 there will be 8 larger shovels instead of the 13 at present.
- 40 Haulpak 240 ton trucks will replace the existing UNIT RIGS and TITANS.
- 6 high capacity drills will be in operation.

SUPERINTENDENT
BALMER ENGINEERING

QUALITY CONTROL

SHORT RANGE

LONG RANGE

ENVIRONMENTAL

CHEMICAL ENGINEER

PIT ENGINEERS

PIT GEOLOGISTS

CHIEF GEOLOGIST

PROJECT
GEOLOGIST
DRILLERS

PLANNING
ENGINEERS

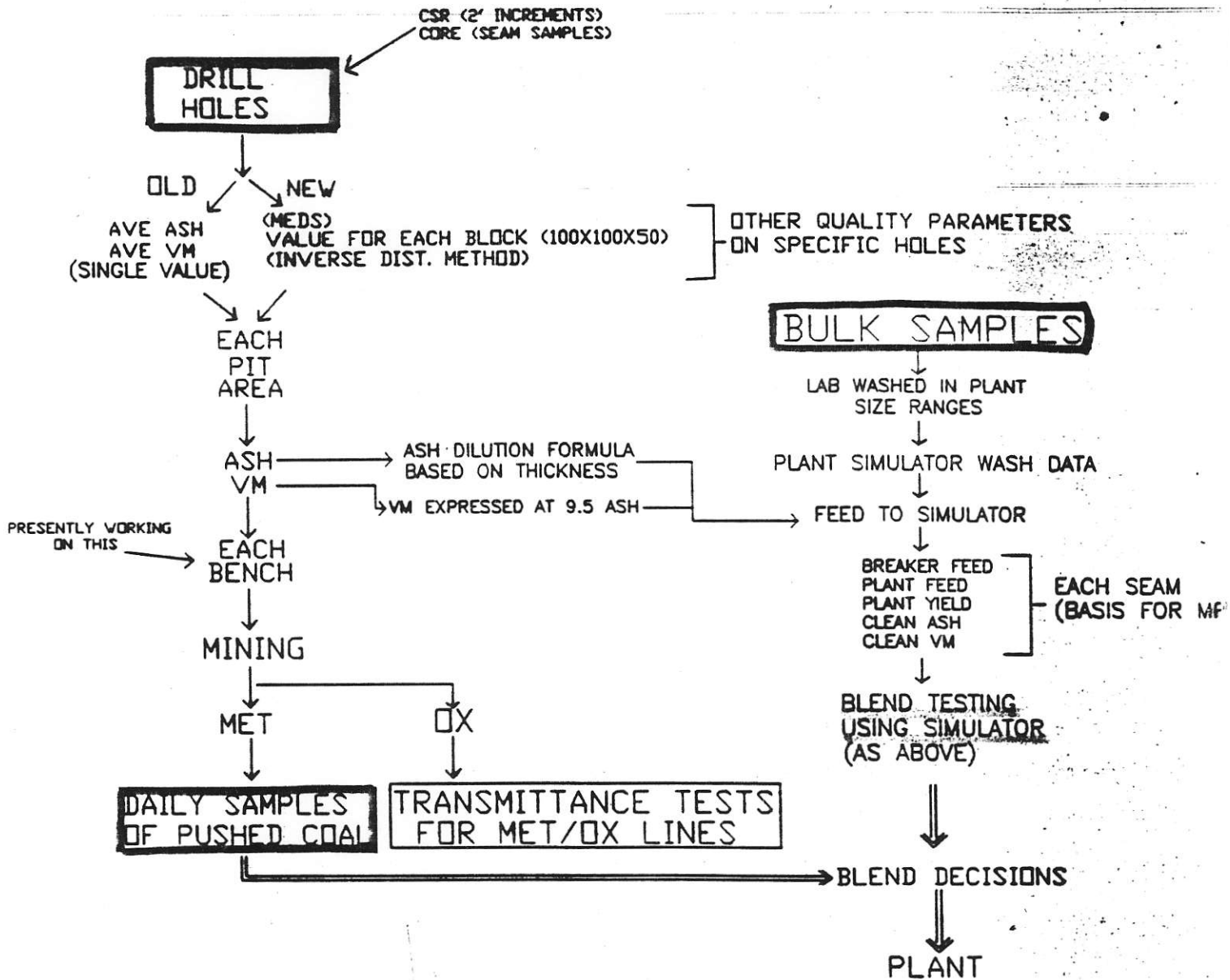
ASSAYERS
SAMPLERS

SURVEYORS

SAMPLERS

- Balmer Engineering has restructured to implement changes and ensure the targeted productivities are met.
- Seven day coverage is provided by the SHORT RANGE planning group by PIT ENGINEERS, PIT GEOLOGISTS, SURVEYORS and blasting crew.
- Geological services are provided by four geologists, two in LONG RANGE and two in SHORT RANGE.
- PIT GEOLOGISTS rotate through the project geologist position.
- Balmer operates its own DRILL SYSTEMS CSR 1000 rotary drill that has averaged 65,000 feet per year over seven years.
- The four drillers and one mechanic also run an Auger Drill for bench sampling of coal seams and an airtrack for rock drilling.
- A survey technician logs all the CSR holes and selected blast holes with a gamma ray Geophysical Logger.
- This technician also provides loading instructions for blast holes drilled through coal.

QUALITY



- Drilled coal is sampled on 2' intervals and analysed for ash/FSI.
- Float tests are done on the seam composites as required.
- Drill Hole seam intersections and quality is into into R-base and interpretations/plots are completed with AUTOCAD SOFTWARE.
- The Geological Model for Balmer is built on Med System Variable Block Models over 13 zones to keep the VBM's to a manageable size.
- The 13 VBM's are used to build the property 3-D block model with each block representing 100' square x 50' deep.
- Each block is assigned relevant coal quantity and quality values.

- Two samplers on continuous dayshifts provide coal cut quality checks.
- Grab samples are taken from active coal faces pushed down by dozers and from active stockpiles.
- Daily samples are analysed for raw ash, FSI and alkali extraction near oxidized boundaries.
- Pit grab samples are used only for detecting problem quality occurrences that may deviate from predicted values.
- They contribute substantially to reducing rock dilution and oxidation problems in the plant feed.
- Western Central Laboratory handles the majority of coal analyses for both Balme and Greenhills mines.
- A chemical engineer supervises 3 analytical chemists and 7 prep samples.
- Pit quality requirements are primarily drill samples and bulk samples.
- Elkview Plant requirements are for plant circuit testing and product monitoring.

- Coal seam blends for plant feed are established by using a plant simulator.
- Feed rates, clean ash and plant yield are predicted over a range of plant granitic
- The simulator is based on bulk sample washabilities of all coal seams in all pit areas and is calibrated to actual plant performance.
- Coal blends are optimized using two or three seams in order to maximize plant feed and yields.
- If all the seams for an engineered blend are not available, then the individual seam is washed to its optimum value and blended with other washed coals for product.
- Clean coal blended is done through the clean coal silos while train loading and at the port.

- Coal mining operations are controlled by one COAL FOREMAN on each crew who are graduate geologists.
- They control the dozers, loaders and trucks on the coal haul.
- Modular Mining truck dispatch system regulates coal dumping into both the Breaker Hopper and the overland conveyor hopper.
- Continuous feed into the Breaker hopper from the overland conveyor helps to homogenize truck dumped coal.
- From the Breaker, the coal travels 2 km by underground coal conveyor to the ETKview processing plant.
- Raw coal silos at the plant also blend the raw coals to smooth out feed variations.
- A Coalscan Raw Ash analyser at the Breaker continuously relays feed ash to the mine dispatcher.
- Feed variations are quickly detected and coal cuts checked for rock dilution or high ash occurrence within the seams.

- Lately, there has been renewed emphasis on coal cut activities.
- Coal release and mining strategies are constantly taking a higher profile in pit development to achieve optimum recovery and blending.
- PIT GEOLOGISTS give seven day coverage to ensure adherence to the coal release and blending strategies.
- Daily structural and quality maps are provided as guidance and co-ordination between different crews.
- Both geological and mining considerations are instrumental in determining how to mine the individual seams.
- Must always consider equipment restrictions, operator abilities, mining plan and productivity requirements.
- Operators are continually trained to:
 - 1) Understand coal seam structure & quality
 - 2) Blend across the whole seam to reduce feed variations.
 - 3) Remove rock partings where practical.
 - 4) Establish good operating techniques and attitude about the importance of consistent coal quality.

- Good coal mining practices were reached gradually by sustained effort over a considerable period of time.
- Through emphasis on the basics we have succeeded in providing better coal to the plant while minimizing coal mining losses.

In summary our 15 year plan requires:

48,000 BCMs/year total Stripping

5,800 tonnes/year clean coal

@ 8.0:1 average clean coal ratio

and 60% plant yield

10 seam is 55% of net production

SUMMARY

- WE HAVE A PLAN
- THERE IS A FUTURE

IF

- 1) WE CONVINCED BANKERS TO PROCEED
- 2) WE ACHIEVE COMMITMENTS
- 3) PRICES HOLD AND/OR WE OFFSET DECREASES
BY COST & PRODUCTIVITY IMPROVEMENTS