BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

British Columbia Ministry of Highways - Hat Creek Project - Preliminary Route Projection for Hat Creek Access Road - August 1977, and Summary by B.C. Hydro - August 1977.

ENVIRONMENTAL IMPACT STATEMENT REFERENCE NUMBER: 9

HAT CREEK PROJECT

BRITISH COLUMBIA MINISTRY OF HIGHWAYS

PRELIMINARY ROUTE PROJECTION FOR HAT CREEK ACCESS ROAD

AUGUST 1977

AND

SUMMARY BY B. C. HYDRO

AUGUST 1977

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

TO ENSURE IMMEDIATE ATTENTION
PLEASE QUOTE FILE NO. L2-M164-592
126.4-8 (A)
1303.3

MINISTRY OF HIGHWAYS AND PUBLIC WORKS

VICTORIA

HAT CREEK OFFSITES
AUG 22 1977

	INIT.	DATE
CKH	CKH	22 VIII
LJP		22 Aug
R.L.		30
File: 1303.3-1		
ACTION		
COPIES TO:		
Thermal Div.		

August 12, 1977

B.C. Hydro and Power Authority,
744 West Hastings Street-Ste. 500
Vancouver, British Columbia.
V6C 1A5

ATTENTION: Mr. C.K. Harman,
Project Manager,
Offsite Facilities.

Dear Mr. Harman:

RE: Hat Creek Project,
Access Road.

As promised, attached are 9 sepia plans and 10 profiles covering the projections of the above access road between STA -9+00 and STA 1017+00 (19 miles ±).

Between STA 310 and 410, we have shown a possible alternate projection around the proposed dam or station reservoir.

Should you have any questions, please contact us.

Yours truly,

E.E. Readshaw,
Director of Highways,
Design and Surveys.

DLC:nlp

Encls. (19)

B. C. HYDRO AND POWER AUTHORITY

PRELIMINARY

PROPOSED HAT CREEK PROJECT

PROJECT DESCRIPTION SUMMARY

PROJECT ACCESS ROAD

AUGUST 1977

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PROPOSED HAT CREEK PROJECT

PROJECT DESCRIPTION

5.2 PROJECT ACCESS ROAD

5.2.1 General

Access to the Hat Creek project would be provided by a new paved two-lane highway. The road would commence from the west side Highway No. 1 (Trans Canada Highway) near the Ashcroft Manor, and proceed up Cornwall and MacLaren Creeks and down the north side of Medicine Creek past the power plant site. It would then continue down past the mine mouth area and join Highway No. 12 at the north end of the Hat Creek Valley. The length of the new road would be about 31 km (19.5 mi).

5.2.2 Route

5.2.2.1 Description

Details of the proposed route of the access road are shown on appendices 1 and 2.

Starting from Highway No. 1 and travelling towards the project site, the first section of road would make a switchback to the south of the lower Cornwall Creek canyon in order to gain altitude and avoid this narrow canyon. The road would then proceed up Cornwall Creek Canyon crossing from the south side of the creek to the north side and back to again take advantage of the most favourable topography. The route would then turn to the west and follow MacLaren Creek to the divide between it and Medicine Creek. From

the divide, it would continue down the north side of Medicine Creek past the powerplant site above Harry Lake. From the powerplant the route continues in a westerly direction and makes a switchback to drop down to the bottom of the Hat Creek Valley. The road is then routed around the north edge of mine pit #1 to Hat Creek where it turns north and runs parallel to Hat Creek for a short distance. It then joins Highway No. 12 at the present intersection of Highway No. 12 and Hat Creek Valley road.

From Highway No. 1 the road would rise over 900 m (3000 ft.) to the summit near the powerplant and drop approximately 600 m (2000 ft.) from the powerplant to the intersection at Highway No. 12.

A short nearly-level section of road approximately 1.5 km (0.9 mi) long, would connect the powerplant site and the new access road.

About 9 km (5.5 mi) of the existing Hat Creek valley road would be relocated around the east side of the mine pit No. 1. The Hat Creek valley road would be relocated adjacent to and follow the Hat Creek diversion canal. It would join the new project access road near the coal handling area.

5.2.2.2 Area of Right-of-Way

The area required for the road right-of-way would be 100 to 120 ha (250 to 300 acres). Of the total area, approximately 70 to 80 ha (175 to 200 acres) is covered by forest.

The right-of-way corridor would have a minimum width of 30 m (100 ft.) and maximum width of about 100 m (330 ft.) on sections requiring sidehill cuts or high fills.

5.2.2.3 Creek Crossings

The proposed road alignment would make some nine creek crossings and of these, Cornwall, MacLaren, and Medicine Creeks, are the most significant. All of these crossings would be made using culverts through the road embankments. Precautions would be taken during culvert installation to minimize disturbance to the creek bed, to maintain creek flows, and to avoid obstructing fish passage.

5.2.2.4 Coordination with Department of Highways

The access road would join two provincial highways. Therefore it is likely that the access road would become part of the provincial highway system after construction of the Hat Creek project has been completed. To ensure that the B.C. Department of Highways requirements would be satisfied, arrangements have been made to have them participate in the route selection and assist with the preliminary design.

5.2.3 Design

The road would be designed to the B.C. Department of Highway Standards for a two-lane highway with a design speed of 80 km/h (50 mph), and to be suitable for a 300 to 350 ton lowbed transporter.

The design speed sets the limits for alignment sight distances, and other geometric features. The lowbed transporter would also limit the permissable horizontal and vertical alignment. In the case of the project road, the maximum radius of curvature of 7° 30' would govern the horizontal alignment.

On some sections of the road, it may not be feasible to maintain the sight distance specified for the 80 km/h design speed. If the situation does arise, it would be necessary to prohibit passing of reduce the speed limit in the area.

The maximum grade would be limited to 8 per cent. The 8 per cent grade will have little effect on passenger vehicles, but would cause heavy vehicles to slow down considerably. As the proposed road route virtually climbs at near maximum grade from both ends to the summit at the powerplant, it would be essential to provide truck passing lanes in steep areas without good sight distance to avoid traffic tie-ups.

Typical cross sections of the road are shown in Appendix 3. The width of the pavement would be 7.3 m (24 ft.). The top of the road including the shoulders would be 11 m (36 ft.) wide. The shape of the drainage ditches is also shown.

The road bed consists of:

- a layer of bituminious pavement.
- a surface course of crushed rock 230 mm (9 in) thick.
- a granular base course with a minimum thickness of 230 mm (9 in).
- the prepared subgrade.

The thickness of the various layers of material would be designed to carry the largest axle loads of the vehicles expected to be using the road.

Culvert details such as: size, location, types, headwalls and end walls would be determined during the final design. They will be sized to accommodate the peak flows calculated for the 100 year storm runoff.

The usual signs, guard rails and white lines would be provided throughout the length of the road. The details and location, which are governed by the design criteria and the terrain, would be determined as part of the final design.

5.2.4. Construction

5.2.4.1 Type of Operation

The schedule requires that many sections of the road be constructed simultaneously. A typical operation in each section would consist of the following sequence of activities:

i) The section would be surveyed and the necessary marker stakes would be installed.

ii) The section would be cleared and grubbed to remove all trees, stumps and roots etc. All the debris from the clearing would be disposed of by burning in accordance with the Forest Service regulations. Any merchantable timber would be sold.

iii) Next topsoil would be removed from the roadbed area and stockpiled for later use to dress the side slopes of the road.

iv) Then the subgrade would be prepared by cutting the areas higher than the road profile and filling areas lower than the profile. Material would be excavated from the cut areas and hauled to fill areas where it would be spread and compacted. The culverts would be installed where required as the work progresses.

Any material unsuitable for construction of the subgrade would be dumped in selected spoil areas. Areas would be selected which would not harmfully interfere with the natural drainage. Spoil would be deposited so that the slopes and height would blend in with adjacent surroundings and the surface seeded.

It may be necessary to obtain additional subgrade surface materials from borrow pits located outside of the roadbed area. The borrow pits would be excavated in horizontal layers in such a manner as to provide natural drainage in the pit. Before the pit is abandoned, the sides would be shaped and rounded to give a natural appearance.

Many sections of the road would require rock excavations by drilling and blasting.

v) To enhance the appearance and to provide erosion control, the excavations and embankments would be dressed with top soil or mulch and seeded with grass.

vi) After the subgrade is shaped to the correct profile the granular base course would be placed, graded and compacted. Dust from the grading operation would be supressed by spraying with water. The use of oil would

not be permitted in areas where it might contaminate the local water courses.

vii) Finally, the crushed rock surface course would be placed in a same manner as the base course. The bituminous pavement would be laid on the finished grade of the surface course during the following spring.

Asphalt and crusher plants would be required to produce base course, surface course and pavement materials. The gravel pits in which these plants would set-up would probably be located near the west end of road in the Hat Creek valley and existing pits in the Ashcroft area. The dust suppression equipment on these plants would meet Pollution Control Board and the Ministry of Highways regulations.

5.2.5.2 Construction Equipment

Various types of equipment required for a typical road construction are listed below.

- For excavating and hauling material: scrapers, bulldozers, front-end loaders, and trucks.
- For blasting rock - pneumatic track drills and air compressors.
- For shaping and spreading material: motor graders and bulldozers.
- For compacting: various types of steel wheeled sheep's-foot and pneumatic tire compactors and water tanker trucks with spray bars.
- For crushing and paving: rock crushers, asphalt plants, selt propelled paving machines and trucks.

5.2.5.3 Standard Specifications

B.C. Hydro have adopted, for other projects, construction specifications which endeavour to ensure the protection of the environment and to minimize any inconvenience to others while construction work is being performed. Exerpts from typical specifications are attached in appendix 4. Similar specifications would be incorporated in the contract documents for the Hat Creek access road.

5.2.5 Operation and Maintenance

5.2.5.1 Responsibility

During the construction phase of the Hat Creek project, which will continue until 1987, the road would likely be operated and maintained by B.C. Hydro as a private road. The public would be permitted to use the road at their own risk.

Upon completion of the powerplant construction the road would likely become a public highway and maintained by the Ministry of Highways.

5.2.5.2 Maintenance

During the spring, summer and fall maintenance would generally consist of controlling vegetation on the right-of-way, repairing and cleaning debris from the drainage system, repairing damaged guard rails, signs, etc. and keeping the road clear of debris.

Winter maintenance would consist mainly of snow removal and controlling ice by sanding and salting.

5.2. Traffic

During the project construction phase, traffic on the project access road would mainly be commercial vehicles transporting materials to the site and passenger vehicles driven by construction workers living in camps or the local communities. Other business and tourist vehicles would travel the road on a less regular basis.

The commercial vehicles would be predominantly semi-trailers, but would range from a 300-tonne lowbed unit to small panel vans. During the peak construction period an average of 20 to 30 trucks would be expected to travel to and from the site each day.

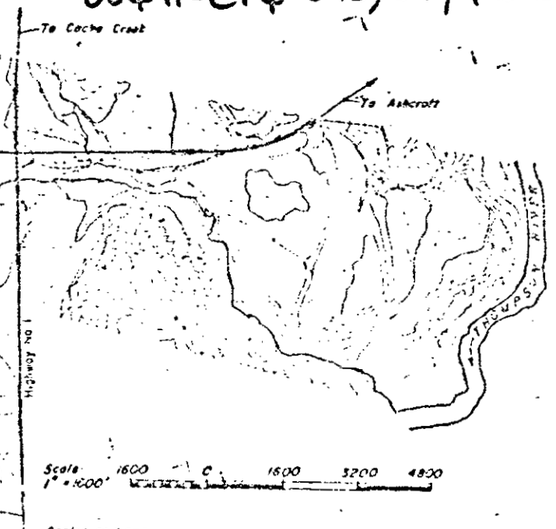
Peak construction worker traffic would occur on Friday afternoon when in addition to the local residents leaving the site, many camp residents would also leave for their homes in Kamloops and Vancouver. This peak is estimated to be 500 - 700 vehicles. Heavier than usual traffic would also be expected on Sunday evening and Monday morning when the workers returned to the camps. On the remaining week days a maximum of about 200 - 300 local vehicles would travel to and from the site at shift change.

After the powerplant is in operation, it is expected that those employed in the operation of the project would live in the Ashcroft - Cache Creek area. They would be working three shifts, five days a week which would mean that there would be a traffic rush just before and after the time of the shift change. The volume of traffic created by these workers is expected to be 200 to 300 vehicles daily in 1984 increasing to 500 to 600 by 2010.

Commercial vehicles would continue to travel the road in reduced numbers after the plant goes into operation.

EXTRACT FROM
MINISTRY OF TRANSPORT
19 No. - UNNUMBERED DRAWINGS.

SEE BCH DRAWINGS
604 H-C14 D13, D14 & D15



Scales as shown

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

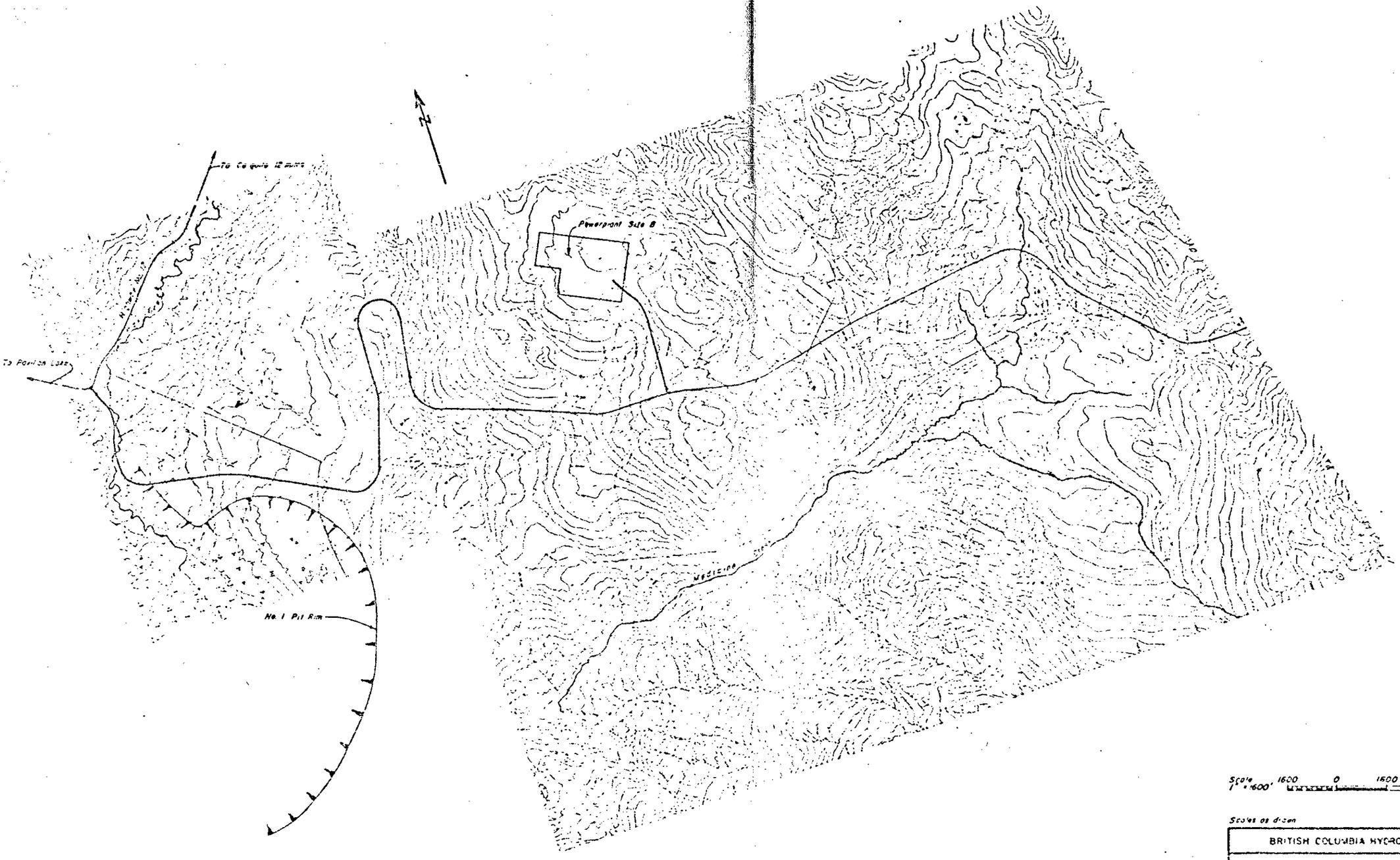
HAT CREEK PROJECT

PROJECT ACCESS ROAD
PLAN SHEET 1

DATE		R
DWN D.B.G.	DWG No. 604H-C14-D13	

REPORT No.

APPENDIX



Scale 1"=1600' 1600 0 1600 3200 4800 Feet

Scales as shown

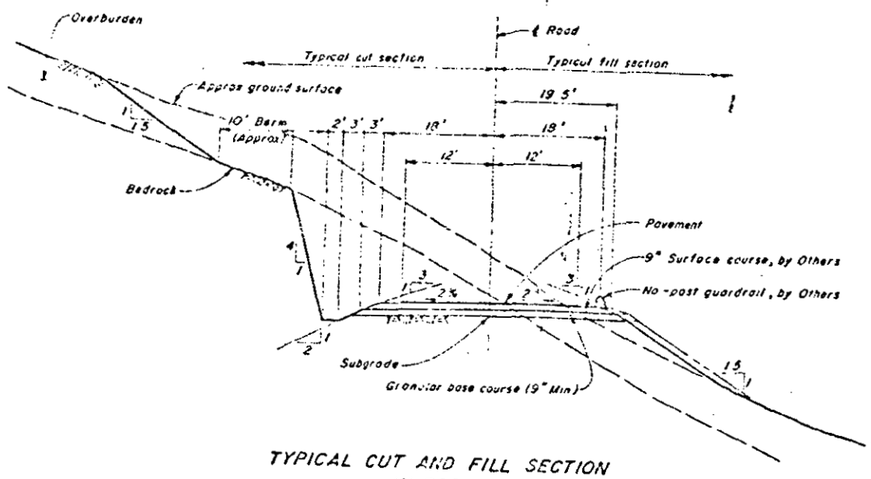
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

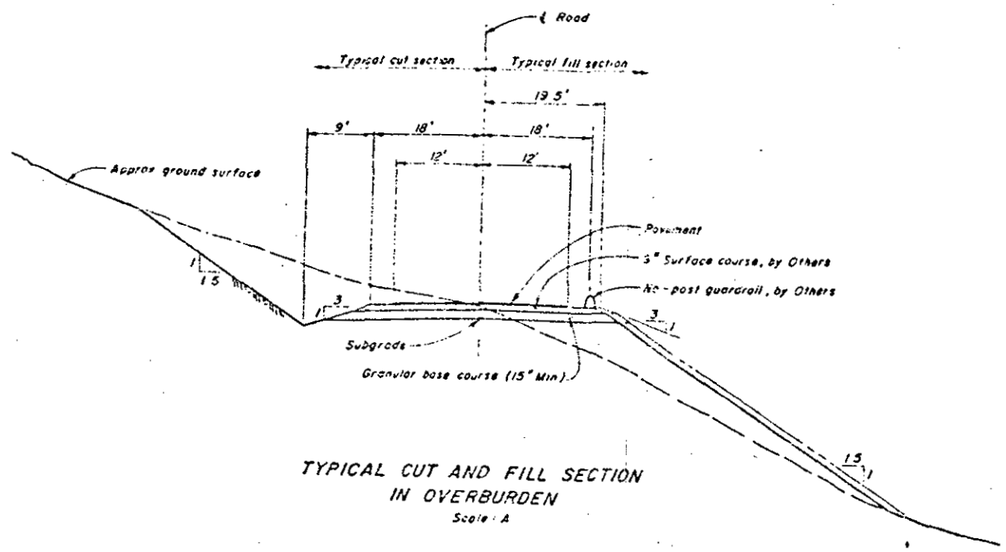
PROJECT ACCESS ROAD PLAN SHEET 2

DATE		R
DWN D.B.G.	DRG No. 604H-C14-014	

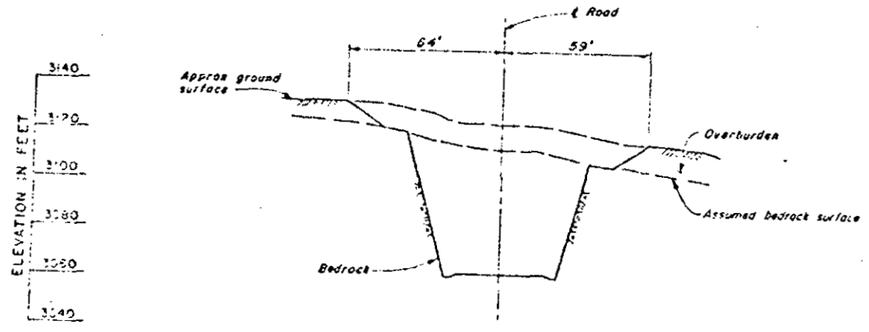
REPORT No. APPENDIX 2



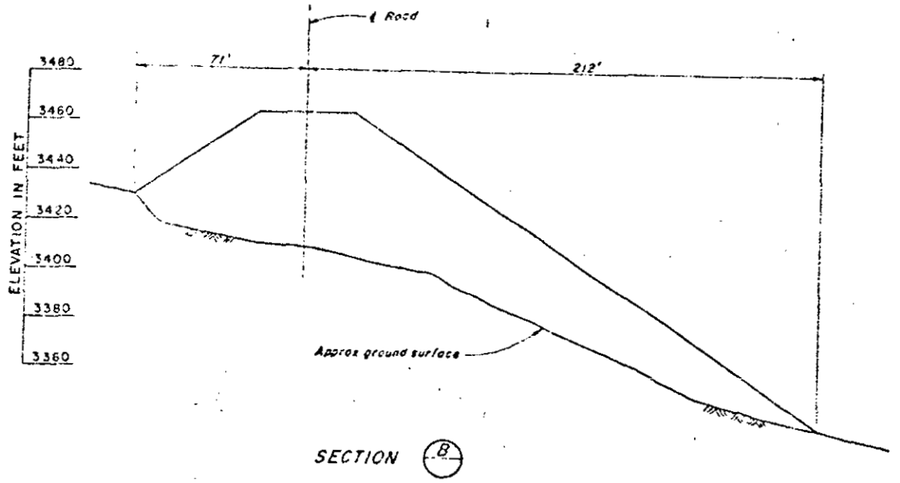
TYPICAL CUT AND FILL SECTION
IN ROCK
Scale A



TYPICAL CUT AND FILL SECTION
IN OVERBURDEN
Scale A



SECTION (A)



SECTION (B)

Scale B 1" = 30' 30 0 30 60 90 Feet

Scale A 1" = 10' 10 0 10 20 30 Feet

Scales as drawn

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

PROJECT ACCESS ROAD
SECTIONS

DATE JUL 1977		R
DWN A J W	DAS No 604H-C14-D15	
REPORT No		

APPENDIX 3

Appendix 4

Excerpts from

Typical Specifications Indluded in

B. C. Hydro Construction Contracts

Related to Protection of the Environment

and Minimizing the Inconvenience to Others

PRESERVATION OF FLORA AND FAUNA

The Contractor shall:

1. Refrain from destroying, removing or clearing trees, timber and shrubs to an extent greater than is necessary for the execution of the Contract.
2. Take such measures as may be necessary to prevent his employees from illegally hunting, disturbing, capturing or destroying animals and birds or illegally taking fish from any waters.
3. Prevent unnecessary disfigurment of the countryside.

Landscape Preservation

The Contractor shall preserve the natural landscape except where clearing is required for permanent works or permitted by the Engineer in writing, and shall so conduct his operations and operate his equipment that destruction, scarring or defacing of trees, native shrubbery and natural surroundings is kept to a minimum.

On completion of the Work, all working areas shall be smoothed and graded to conform to the natural appearance of the landscape. Where the Contractor's operations have resulted in destruction, scarring, damage, or defacing to trees, shrubbery, or landscape outside the limits of the Contractor's working areas, the same shall be corrected to the satisfaction of the Engineer.

FOSSILS

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall be as between the Authority and the Contractor, the absolute property of the Authority, and the Contractor shall take

all reasonable precautions and any precautions required by the Engineer to prevent his workmen or any other persons from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal, acquaint the Engineer of such discovery and carry out at the expense of the Authority the Engineer's orders as to the preservation and disposal of the same.

EROSION CONTROL SEEDING

(a) General

Erosion control seeding shall be applied to soil slopes where shown on the Drawings or required by the Engineer and shall include seeding, fertilizing, mulching and watering the areas required. Without in any way limiting the generality of the foregoing, erosion control seeding will be required on slopes in the forebay, penstock and powerhouse areas and if required by the Engineer after completion of the excavations, on the surfaces of spoil areas as directed by the Engineer. Such work in the spoil areas may not be required and the amount, if any, will depend on future requirements for such areas.

(b) Scheduling of Work

Except as otherwise approved by the Engineer for any specific area, slopes shall be erosion control seeded during the periods of September 15 to October 15 or April 1 to May 15 of any year and such seeding shall be completed in the 6 months period after any slope has been completed to the lines and grades specified.

(c) Materials

(i) Seed

The seed mixture shall consist of the following grass seed varieties which shall be uniformly mixed in the proportions indicated below:

Botanical Name	Common Name	% By Weight
Festuca Rubra	Creeping Red Fescue	30%
Festuca Rubra Commutata Var. Olds	Olds Red Fescue	15%
Loluim Perenne	Perennial Rye Grass	20%
Poa Praetensis	Kentucky Blue Grass	35%

All constituents of the seed mixture shall be "Canada No. 1" seed as specified under the Canada Seeds Act and Regulations and the Contractor shall provide the Engineer with three copies of the seed supplier's Control Sample Certificate, certifying compliance with the foregoing. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.

(ii) Fertilizer

Fertilizer shall be a standard commercial brand product of a formulation suitable for the soil to be seeded. The formulation will be decided by the Engineer afrer the slopes have been exposed and the results of tests on the soil are known. The formulation will be of the order of 10 percent total

nitrogen, 20 percent available phosphoric acid and 10 percent water soluble potash.

Fertilizer shall be delivered to the Site in the manufacturer's original unopened containers bearing the manufacturer's name and guaranteed analysis.

(iii) Mulch

Mulch shall be wood cellulose fibre such as Silva-Fibre or Spra-Mac Mulch dyed green.

(d) Soil Testing

Soils to be seeded will be tested by the Engineer.

(e) Soil Preparation

The Contractor shall repair all erosion and other damage to slopes prior to the application of fertilizer and seed at his own expense to the satisfaction of the Engineer.

(f) Seeding

Seed, fertilizer and mulch shall be applied evenly in one operation with a hydro seeding machine using water as a carrier. Mulching fibre shall be applied at the rate of 50 lbs. per 1,000 square feet, fertilizer at the rate of 25 lbs. per 1,000 square feet and seed at the rate of 2 lbs. per 1,000 square feet.

The entire seeding operation shall be performed by men experienced in the application of fertilizer, seed and mulch and using equipment which is specifically manufactured for, and commonly used in, this type of work.

(g) Reseeding

Slopes or areas which are eroded and/or in the opinion

of the Engineer, do not show a uniform stand of grass after germination are to be repaired and/or reseeded, mulched and fertilized at the same rates as specified in Sub-clause 8.13.05(f) or as directed by the Engineer at the Contractor's own expense.

(h) Booster Fertilizer

Between 180 days and 200 days after any September 15 to October 15 seeding or 60 to 90 days after any April 1 to May 15 seeding, or at such other time as may be determined by the Engineer, the Contractor shall apply with a hydro seeder using water as a carrier, fertilizer at the rate of 25 lbs. per 1,000 square feet to the areas previously seeded and mulched.

(i) Sprinkling

The Contractor shall supply water, labour and equipment for sprinkling the seeded areas as and when required by the Engineer.

CONVENIENCE OF OTHERS

The Contractor shall notify the Engineer at least 14 days in advance of starting any portion of Work which might inconvenience or endanger the traffic of Others so that arrangements may be made, if possible and necessary, for closing any road and providing suitable detours. The Contractor shall at all times conduct the Work in such a manner as to ensure the least interference with other traffic. The Contractor shall, at his own expense, provide, erect, maintain, light and subsequently remove, shelters, barricades, detours and warning signs, traffic lights and traffic control personnel wherever necessary to

safeguard Others or as may be required by the Engineer.

AVAILABILITY AND USE OF THE SITE

The Contractor shall not be intitled to exclusive use of any portion of the Site.

The Contractor is specifically advised that the heavily timbered areas are prime shelter areas for deer and will not be available for use by the Contractor for any construction purposes whatsoever.

Without limiting the generality of any of the provisions of Clause 4.28 the Contractor shall protect from damage as a result of his operations, to the satisfaction of the Engineer, all items of work by Others and the private property of others. In the event of damage to the work of Others, to the construction facilities of Others or to private property or the property of the Authority resulting from the Contractor's operations, the Contractor shall immediately notify the Engineer. The Engineer may at his option:

1. either direct the Contractor to immediately repair such damage, or
2. notify the Contractor that such damage will be repaired by Others.

Any such repairs shall be made to the Engineer's satisfaction.

(b) Access to the Site

(i) Public Highway

The Contractor shall comply with the requirements of the Highway Act and amendments thereto, and such other Acts, By-laws or Regulations, load limitations and clearances as are in force for the governing and regulation of traffic, or use of

any public road upon or over which it is necessary to do work or transport materials.

While the Contractor is using any public road whatsoever, he shall comply with all the applicable safety and traffic regulations whether implemented by the Engineer, the B. C. Department of Highways or the municipal of other lawful authority, and shall create a minimum of interference and inconvenience to others and the public.

Prior to the start of work in any area, the Contractor shall contact the municipal and any other lawful authority having jurisdiction, advising him of all particulars regarding the Contractor's intended use of public roads or highways, and the Contractor shall comply with all the municipal and other lawful requirements in connection therewith, at no extra cost to the Authority.

Public roads shall not be blocked or closed to traffic without the prior approval of the authority having jurisdiction. The Contractor shall submit his plan for closing or blocking any public road and providing suitable detours to the authority concerned at least 14 days in advance of his scheduled closing or blocking of such road. Where necessary or considered desirable by the authority concerned, the Contractor shall provide suitable detours, or temporary roads, to carry public traffic around the restricted construction area. The Contractor shall be responsible for the satisfactory maintenance of such detours and temporary roads whether they are constructed within the right-of-way or are existing roadways owned by others, and shall bear all

costs arising from the provision and maintenance of any and all detours. In the event of an existing road being temporarily closed to traffic, the Contractor shall erect a sufficient number of signs so that the temporary detour route shall be clearly indicated throughout its entire length.

The Contractor shall provide, erect and maintain all barriers, fences or other proper protection and provide, keep and maintain such watchmen and lights as may be necessary, or as may be ordered by the authority having jurisdiction or the Engineer, in order to ensure safety to all parties using this road. These barricades and lights are also to be provided and erected by the Contractor wherever traffic detours become necessary.

Where the passage of public traffic is restricted, endangered, or detoured due to the operation of equipment on the travelled way or to its temporary closure due to construction operations, flagmen shall be provided by the Contractor to warn and direct traffic past the operation. Adequate warning signs shall be erected and flagmen shall be carefully instructed in the correct method to use in flagging so that there will be no confusion in the minds of the travelling public as to the meaning of the signal given. Flagmen shall wear red jackets and shall be provided with "Stop and Slow" paddles for giving signal. The public shall be warned of the existence of flagmen by means of "Flagman Ahead" signs placed well in advance of

both sides of the area.

The Contractor shall supply and maintain all necessary signs and traffic control devices as ordered by the Engineer and shown as being required in the B. C. Highway Department's "Construction and Maintenance Sign Manual" and any municipal or other lawful requirements. All signs and devices shall conform to the standards set down in this Manual.

The Authority will not be responsible for any delays incurred by the Contractor resulting from any restrictions or limitations imposed or caused by the Department of Highways, municipality or other lawful authority in the use of public roads and the Contractor shall plan and schedule his traffic in accordance with such restrictions and limitations.

The Contractor's attention is drawn to the fact that the existing public gravel road passes through prime winter range of deer. The Contractor shall take any precautions directed by the Engineer while using the road to prevent harm to the deer.

(ii) Private Roads

The Contractor shall at all times maintain or provide access to all private roads and property fronting along or in the vicinity of the Work unless other reasonable road access exists. The Engineer shall be sole judge of what may be deemed reasonable road access.

(iv) Contractor's Construction Roads

The Contractor shall construct such temporary roads as are necessary for completion of the Work and to maintain access on public and private roads as required. The location of such roads shall be subject to the approval of the Engineer. The Contractor's construction roads shall be available for use by the Authority and by Others having permission from the Engineer to carry out work on the Site. The Contractor shall be responsible for the maintenance of and removal of snow from all of his temporary construction roads.

(vi) Traffic Control, Regulations and Load Limitations

While the Contractor is using any road on the Site he shall comply with any safety or traffic regulation implemented by the Engineer and shall keep to a minimum any interference and inconvenience arising from the use of such roads.

The Contractor shall enforce all required safety and traffic control measures on his construction roads for the duration of the Work. The Contractor shall provide and maintain, where necessary, such barricades, lights, detours, flagmen and signs as are required in accordance with Section 190 of the "General Specifications for Highway Construction", as published by the Department of Highways of the Province of British Columbia.

(c) Working Areas

Except as otherwise specified or approved by the Engineer, the Contractor shall confine his operations to the project access road right-of-way, the borrow and spoil disposal areas designated by the Engineer and to adjacent and intersecting public and Authority's roads. The Authority will advise the Contractor of the names of the owners and occupiers of each parcel of land included in the right-of-way and such other areas required for the Work so far as they can be ascertained.

The Contractor shall give the Engineer at least 14 days notice prior to commencing work in any parcel of land and shall not enter the parcel until notified by the Authority that it is available for construction purposes. On receipt of such notice the Contractor shall give the occupier of the parcel of land reasonable notice of his intention to start work in the area and the prospective date of such start.

The Contractor shall provide his own access to the right-of-way. Where the Contractor may find it expedient to use private roads or lands, or cross private property he may do so by arrangement with the owner and occupier but he will be held solely responsible for such arrangements, any claims that may arise from the use of such private roads or lands, reimbursement of the owner and occupier and restoration of such roads and lands. The Contractor shall inform and provide the Engineer with full details of all arrangements entered into in this regard. A copy of all written agreements with private parties shall be given to the Engineer.

The Contractor shall open existing fences crossing the

right-of-way and shall construct temporary fencing and gates on one or both sides of the right-of-way to prevent the straying of livestock or to safeguard the property of the owner and/or occupier. Before such fences are opened, the Contractor shall notify the owner and/or occupier of his intent, and where practicable the opening of existing fences and the construction of temporary fences and gates shall be in accordance with the wishes of the owner and/or occupier. The Contractor shall be liable for any loss or for any damage occurring to the owner or occupier by reason of inadequate temporary fencing.

(g) Prevention of Water Pollution

Except as otherwise specified or required by the Engineer, the Contractor's construction activities shall be performed in such a manner that will prevent, to the satisfaction of the Engineer, solid matter, contaminants, debris, and other pollutants and wastes entering into streams, flowing or dry watercourses, lakes and underground water sources. Such pollutants and wastes include, but are not limited to, refuse, garbage, cement, concrete, sewage effluent, industrial waste, oil and other petroleum products, aggregate processing tailing and mineral salts. Sanitary wastes shall be disposed of on land by burial at approved sites or by other methods is approved by the Engineer.

Where necessary, in the opinion of the Engineer, the Contractor shall construct intercepting ditches, sumps, bypass channels, barriers, settling ponds, or other means approved by the Engineer to prevent muddy water and eroded materials from entering streams or watercourses or damaging permanent installations.

Except as otherwise specified, excavated materials shall not be deposited or stored in, or alongside of, watercourses where, in the opinion of the Engineer, they could be washed away by highwater or storm runoff.

Waste waters from aggregate processing, concrete batching, or other construction operations shall not be discharged directly into streams, watercourses, or other surface drainage features. The Contractor shall use turbidity control methods such as settling ponds, gravel filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation systems or other methods meeting the approval of the Engineer. Any waste waters discharged into surface water shall be essentially free of material in suspension. For the purpose of this Sub-clause, material in suspension is defined as that material which will settle from the water by gravity during a 1-hour quiescent detention period.

(h) Dust Abatement

During the performance of the Work the Contractor shall furnish all labour, equipment and materials required to reduce dust nuisance and to prevent dust which has originated from his operations from becoming a nuisance.

(j) Facilities of Others

(i) Permanent Installations

The Contractor shall at all times exercise due care to avoid damaging permanent installations such as buildings, walls, fences, power and water supplies and other such installations. The Contractor shall be solely

responsible for any damage to such installations and shall repair such damage forthwith to the satisfaction of the Engineer.

(ii) Temporary Construction Facilities

The Contractor is advised that temporary construction facilities of Others such as, but not limited to, access roads, power and water lines, and communication lines will be constructed by Others during the course of the Work. The Contractor shall not disrupt the continuance of usage by Others of such facilities unless the Contractor is advised by the Engineer that they are no longer required by Others. Should the Contractor at any time wish to relocate temporary construction facilities of Others to facilitate the Work, he shall not do so without the prior written approval of the Engineer.

(iii) Land Subdivision Monuments

At points where construction of the new roadway will cover or destroy any land subdivision monuments or property marks, the Contractor shall be responsible for their protection from disturbance until their positions have been referenced and he shall not remove them until ordered to do so by the Engineer.

WATER SUPPLY

Except as otherwise specifically provided for in this Clause, the Contractor shall provide, operate and maintain such supplies of water as are required for the complete and satisfactory execution of the

Work including the provision of any storage, pumps, piping and ancillary equipment required for such purpose.

Potable water shall be safe, clean, disinfected and correctively treated to the satisfaction of the Engineer and the Provincial health authorities. All outlets dispensing nonpotable water shall be conspicuously posted as dispensing water unfit for drinking.

All necessary precautions shall be taken to avoid contamination of potable water including the supplies of the Authority.

DEWATERING AND DRAINAGE

The Contractor shall investigate, design, construct, operate, maintain and subsequently remove all diversions and such dewatering and drainage systems as are necessary for the orderly and proper execution of the Work. The diversions and dewatering and drainage facilities provided by the Contractor shall be subject to approval by the Engineer and shall not damage or inteffere with the proper execution of the Work or the work or property of the Authority or others.

SEWAGE DISPOSAL AND WASTE WATER

Except as otherwise specifically provided for in the Tender Documents, the Contractor shall provide, operate and maintain any facilities required for the disposal of sewage and waste water. On no account shall the Contractor discharge raw sewage or polluted water into natural watercourses, lakes, ponds, future reservoir sites or any area near camps, worksites, or buildings nor shall the Contractor make use of any permanent facilities installed for the Work or for the Authority by Others for disposal of sewage or waste water without the prior written consent of the Engineer. The Engineer may in his absolute discretion

refuse to give such consent and the Authority will not be responsible for any effect such refusal may have on the Work.

The Contractor shall ensure that all drainage and sewage disposal installations constructed by him, including temporary outside tiolets, shall conform to the requirements of the Provincial Department of Health or any other governmental requirements and are maintained and operated to the satisfaction of the Engineer.

On completion of the Work, the Contractor shall terminate or dispose of his drainage and sewage disposal installations, to the satisfaction of the Engineer.

REFUSE DISPOSAL

The Contractor shall collect and dispose of refuse from all premises and work centres provided for the Work by the Contractor. The refuse shall be deposited in metal, covered, flyproof cans set in locations approved by the Engineer and shall be removed by the Contactor at least twice per week. Disposal shall be either by an incinerator and/or to a pit which can be completely covered over to a depth of not less than 3 feet with rock or earth backfill. The incinerator and/or pit shall be located in an area approved by the Engineer. All such pits shall be periodically backfilled in order to maintain them in a sanitary condition to the satisfaction of the Engineer.

Refuse shall not be disposed of for any reason whatsoever outside the areas designated or approved by the Engineer.

BORROW AREAS

The Contractor shall use only those borrow areas designated or approved by the Engineer. Any royalties or other charges required to be paid to others for materials obtained from borrow areas will be paid by

the Authority.

Except as otherwise approved by the Engineer, borrow areas shall be excavated in horizontal layers and inssuch a manner that water will not collect and stand therein. Before being abandoned, the sides of borrow areas shall be brought to stable slopes with slope intersections rounded and shaped to provide a natural appearance. All rubbish, Contractor's equipment and structures shall be removed from these areas. Waste piles shall be levelled and trimmed to regular lines and shaped to provide a neat appearance.

Unless otherwise directed by the Engineer, the provisions of Sub-clause 7.07(g) relating to prevention of water pollution shall apply with respect to all borrow areas.

SPOIL DISPOSAL AREAS

The Contractor shall dispose of surplus materials in spoil disposal areas where and as directed by the Engineer.

Each spoil fill shall be developed in an orderly manner and in such a way that it does not interfere harmfully with the natural drainage in the area. The Engineer reserves the right to limit the amount of material which can be placed in any spoil disposal area and to control the height and slopes to which the material can be placed. Spoil fills shall be stable within themselves, shall not cause instability of adjacent natural slopes or any parts of the Work and shall be graded, to the satisfaction of the Engineer, to provide free draining surfaces which do not detract from the general appearance of the area.

The Contractor shall take such measures as are necessary to preserve to the satisfaciton of the Engineer, the natural drainage in

the area and prevent any objectionable accumulation of water resulting from the formation of spoil heaps.

FIRE

The Contractor shall take every precaution to prevent fire occurring on or about the Site and to minimize any damage which might thereby be caused. He shall provide suitable and adequate fire fighting equipment, as approved by the Engineer, for ready use in all structures, buildings, or on work in progress including the Authority's buildings occupied by the Contractor, if any, and shall have at all times at the site at least two men who are experienced in the use of such equipment.

The Contractor shall maintain such equipment, and such additional fire fighting equipment as may elsewhere in the Tender Documents be required, in efficient condition until construction is completed and the Work accepted by the Authority. He shall comply with laws and regulations respecting fires and with instructions of the Engineer with respect to the prevention of fires. No fires shall be lit in the fire season without permission in writing, obtained from the Engineer.

The Contractor shall fight diligently at his own expense any fire which occurs in the Contractor's working area however or wherever the fire may originate. He shall employ all requisite equipment and manpower up to the limit of his equipment and manpower employed at the Site, including the equipment and manpower of his Sub-contractors. If the fire is proved to have originated from or to have spread to the Contractor's working area because of an Act of God or the negligence or actions of persons for whom the Contractor is not responsible the Authority will reimburse his fire fighting costs in accordance with Clause 4.46.

If the Engineer directs the Contractor to assist in fighting fires outside the Contractor's working area for which the Contractor is not responsible, the Contractor shall comply with such directions and will be reimbursed by the Authority for his costs in so doing in the same manner as for Extra Work except that, if the Contractor is required to fight forest fires by and under the direction of the British Columbia Forest Service in accordance with the British Columbia "Forest Act" and Amendments thereto, the Authority will not be responsible for the payments of any amounts expended by the Contractor in fighting such forest fires.

If the Engineer directs persons other than employees or Sub-contractors of the Contractor to assist the Contractor in fighting a fire in the Contractor's working area, the costs of such assistance shall be borne by the Authority, but if the fire originates from or spreads or threatens to spread due to the negligence of the Contractor, or to his neglect to fight the same diligently, the Contractor shall reimburse the Authority for the cost of such assistance.

EXPLOSIVES

The supply, transportation, storage and use of explosives for the Work shall conform to law at all times and be subject to any requirements of the Engineer.

The methods of blasting and the times during which blasting operations may be carried out by the Contractor shall be subject to the approval of the Engineer to whom adequate notice of any blasting operation shall be given.