A REPORT OF THE NORTHERN PIPELINE AGENCY May 198

PIPELINE

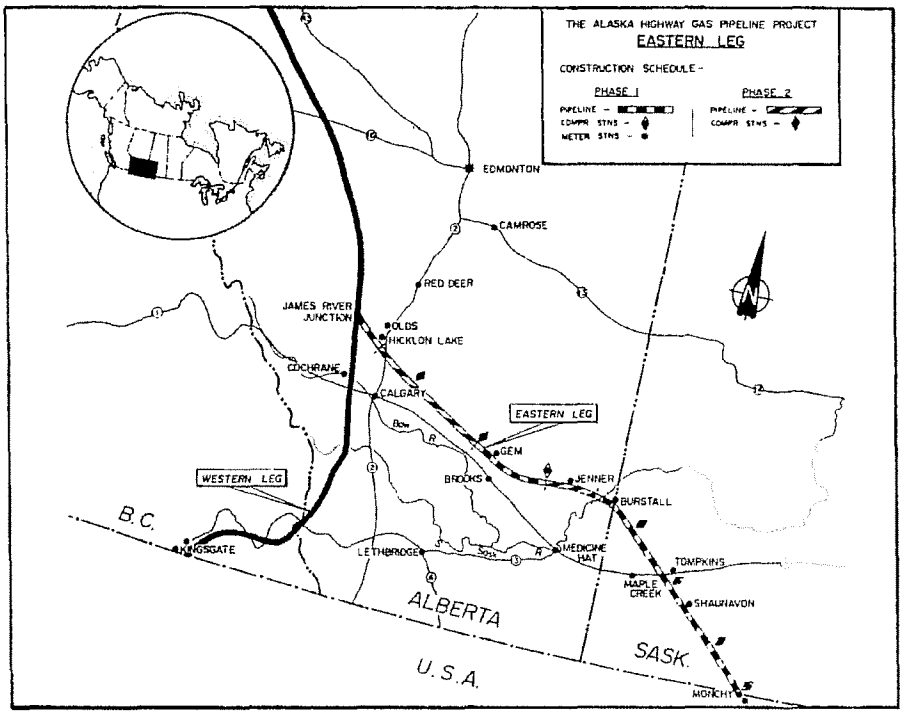
Surveillance Teams Prepare for 1981 Construction

As construction on the Eastern Leg of the Alaska Highway gas pipeline in Alberta and Saskatchewan gets underway in late May, so does the on-site work of the Northern Pipeline Agency's 12 field surveillance officers. The group is divided into three teams, each headed by a Senior Surveillance Officer, to oversee and report on the day-to-day progress on the 1,067 mm (42 in.)-diameter sections of pipeline to be built this year - a total of 172.5 km (119.5 mi.) in Alberta and 258 km (160 mi.) in Saskatchewan. When completed in 1982, the Eastern Leg will extend 635 km (394 mi.).

Keith MacDonald, the Agency's Regional Manager of Surveillance, explains that each team combines both people with environmental backgrounds and experience in pipeline construction to oversee the application of the Agency's technical requirements and environmental terms and conditions by Foothills Pipe Lines (Yukon) Ltd., its segment companies and contractors. Socio-economic terms and conditions are also supervised by Agency staff, who regularly visit communities along or near the pipeline route and work in close consultation with the field surveillance teams.

Surveillance crews are there to identify problems before they become serious, notes MacDonald. "They work long hours, usually 10 hours or sometimes more if required, six days a week," he continues. "Their days off are arranged so that someone is always on site when the contractor is working."

MacDonald feels the Agency's surveillance role is particularly important in ensuring that environmental standards laid down by the Agency are met during the course of clearing and construction. "It's a good idea to have an independent body overseeing a large project because it assures the public that there is quality going into that pipeline," he says. "Engineering is fairly straightforward; the standards have been set and accepted by the industry. However, many people in the construction industry are not aware, for instance, that siltation in the creeks can adversely affect fish and incubating fish eggs. We do know of the impacts on wildlife habitat and our job is to see that it's protected."



The construction schedule for the Eastern Leg has been arranged to prevent or minimize interference with wildlife activity such as the nesting of waterfowl and birds of prey, the seasonal movements of pronghorn antelope and the migration and spawning of fish in streams crossed by the pipeline. In certain areas in Alberta, spring and fall flooding for irrigation is another factor which has influenced pipeline construction scheduling. As part of an intensive two-week orientation program, surveillance officers are thoroughly briefed on environmental considerations and mitigative measures to be taken.

Senior Surveillance Officer Jim Wallace heads up the Agency team of four which will supervise construction of a total of 157.5 km (97.5 mi.) of pipeline in Alberta by Marine Pipeline Construction of Canada Limited of Calgary. Beginning in May, Wallace's team will operate out of Olds while Marine Pipeline builds the first

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Conference Examines Employment Training Needs

A shortage of skilled labour in the Peace-Liard district of northeastern British Columbia could occur with the onset of major developments in coal, hydro, petrochemicals, logging and mining, as well as construction of the Alaska Highway gas pipeline. This concern was the focus of a conference organized by the Peace-Liard Employment Advisory Council on "Finding, Retaining and Training Manpower," which was attended by about 60 people April 10, at Northern Lights College in Dawson Creek, B.C.

Influx of 40,000 People Possible

Bill Anderson, Commissioner of the Peace-Liard Economic Development Commission, foresees no problem in meeting manpower requirements provided that anticipated employment and population statistics are known in advance. An influx of up to 40,000 people into the Peace-Liard region will occur over the next five to seven years due to a number of resource projects happening simultaneously, said Anderson. This means an increase of more than 65 percent over the present estimated population of 64,866. By 1985, Anderson continued, 22,000 - 23,000 new jobs may be created in northern British Columbia, which represents more than a doubling of the present estimated employment figure of 20,400. These new jobs will create a great demand on the area's educational system to provide the trained personnel.

Bruce Sider of Westcoast Transmission Company Limited, agents for Foothills Pipe Lines (North B.C.) Ltd., estimated pipeline jobs during the 1982 to 1985 construction period will peak at 1,800 and taper to about 60 during the operational phase. At least 20 per cent of the labour force will come from the Peace-Liard region, for construction of the 715 km (444 mi.) section of the Alaska Highway gas pipeline through North B.C. said Sider, and at least 50 per cent of the trained labour force will come from within B.C.

Union officials attending the conference cautioned that safety standards should not be sacrificed by a reduction in training time in order to get as many people through training programs as quickly as possible.

The conference included sessions on regional economic and sociological projections and training opportunities. The day concluded with the formation of a steering committee of conference participants, which will look into funding needs and sources to facilitate future manpower training programs.

The Peace-Liard Employment Advisory Council is composed of volunteers from education, labour and government. It aims to promote regional training and employment opportunities, to co-ordinate and assess projections of regional employment needs for better program planning and to encourage greater communication among local school systems, government agencies, labour unions, business and industry.

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Surveillance Teams Prepare for 1981 Construction

stretch, running 54 km (33.5 mi.) in a southeasterly direction from James River Junction, 88 km (54.7 mi.) northwest of Calgary. Upon completion of this segment later in the summer, the surveillance team will move its field office to Brooks as the contractor begins work on the pipeline section extending about 103.5 km (64 mi.) from a point near Gem to a point near Jenner.

In addition to the Agency's surveillance crews, the Alberta government is providing three full-time and four part-time environmental surveillance officers. During 1980 construction on the Western Leg, the province had one full-time environmental surveillance officer in the field, supplemented by a number of specialists part time.

Ernie Paydli is the Senior Surveillance Officer of the three-man Agency team based in Medicine Hat, overseeing construction by O.J. Pipelines Ltd. of Edmonton of a five km (three mi.) section which crosses the South Saskatchewan River at a point about 16 km (10 mi.) west of the Alberta - Saskatchewan border. Although the river is only about 250 metres (820 ft.) wide at the crossing, because of the steepness of the river banks extensive grading and erosion control measures are required to provide for the gradual descent of the pipeline into a trench in the riverbed. Grading begins in June, followed by actual construction during the summer and early fall, with testing, clean-up and revegetation to conclude by the end of October.

The third surveillance team of five, headed by Senior Surveillance Officer Pat Patterson, will set up in Maple Creek, Saskatchewan. Majestic Wiley Contractors Limited of Edmonton begins construction in late May on the section which extends east of the South Saskatchewan River for 10 km (six mi.) to the Alberta-Saskatchewan border, and continues southeast through Saskatchewan for 258 km (160 mi.) to the Canada-United States border near Monchy, Saskatchewan.

The remaining Alberta portions of the Eastern Leg are scheduled for 1982 construction. These include 114 km (71 mi.) between Hicklon Lake and Gem, and 62 km (39.5 mi.) between Jenner and the South Saskatchewan River.

Contracts have yet to be awarded for construction of three compressor stations located near Jenner, Alberta, Tompkins, Saskatchewan, and Monchy, Saskatchewan, and the meter station near Monchy. Construction begins this summer on these facilities and on the Western Leg's meter station located at the Canada-United States border near Kingsgate, British Columbia.

Granular Resources Plan Expected Soon

A plan to co-ordinate the use of granular materials along the Alaska Highway gas pipeline right-of-way in the Yukon over the next five years will be finalized this summer.

With construction of the 818 km (508 mi.) Yukon stretch of the pipeline to start in 1982 by Foothills Pipe Lines (South Yukon) Ltd., at least 3.8 million cubic metres (5 million cu. yd.) of gravel will be needed for pipeline-related purposes such as work pad areas, pipe bedding, insulation and cement structures.

Under the supervision of the federal Department of Indian Affairs and Northern Development (DIAND), the main users of granular materials in the Yukon are the respective public works departments of the federal and Yukon governments for roadwork and maintenance, communities and private construction firms.

The Shakwak project, through the federal department of Public Works, requires a considerable amount of granular resources. Shakwak is a joint Canadian/American project to rebuild and pave the approximately 403 km (250 mi.) section of highway from the Alaska-Yukon border, through the Yukon, to Haines, Alaska, on the panhandle. The project will be undertaken by Public Works Canada once financing has been allocated by the United States.

Dale Longlitz, head of Land Tenure and Use for the Northern Pipeline Agency, says there is no management plan for granular resources in this area that indicates the estimated gravel requirements for each user group and the pits they will utilize. "It's always been a matter of first come, first served," he remarks.

Dale Longlitz, head of Land Tenure and Use

Longlitz is seconded to the Agency as a representative of DIAND with the authority to issue under the *Territorial Lands Act* the land-use and quarrying permits required for the pipeline project.

Task Force Reviews Needs

He is also chairman of a task force on granular resources which includes representatives from the federal and Yukon public works departments, DIAND, Yukon Department of Municipal Affairs, the Shakwak project, the Northern Pipeline Agency and Foothills (South Yukon). Their role is to review the pipeline requirements with regard to potential conflicts of interest with other users.

"Through a series of meetings, Foothills will identify its requirements and the respective locations of the material," Longlitz explains. "This allows the others to review each source in the context of co-operative use and development."

Longlitz says he is encouraged by the co-operation shown by the various players. A number of abandoned gravel pits will be reopened for construction of the pipeline and new pits will be developed by Foothills (South Yukon) with an eye to future use by the others. The silt content in many of the abandoned pits is too high for road construction, he notes, but good for pipeline work.

This approach to granular material use in the Yukon will prevent haphazard pit development and possible damage to the environment, stresses Longlitz. Gravel pit locations will take into consideration environmental factors such as wildlife habitat, drainage and run-off conditions, thermakarst (soil with high ice content) in adjacent areas and the aesthetics of maintaining a green belt between the gravel pit and the highway.

As with any other aspect of design and construction of the Canadian portion of the Alaska Highway gas pipeline project, Foothills (South Yukon) must meet the Northern Pipeline Agency's terms and conditions, including environmental standards. The company is required to indicate how gravel pits will be developed with minimal environmental impact, as well as what restoration and revegetation measures will be taken. Before using a granular resource area, Foothills (South Yukon) must obtain the necessary land-use and quarrying permits, as well as Agency approval of development and rehabilitation plans.

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Nature's Challenges Along the Eastern Leg

occurred next to the right-of-way at Matzhiwin Creek, Onetree Creek and Irishman's Coulee in Alberta and at Jones Creek in Saskatchewan, and some potential for failure exists at Devenie James and Red Deer Rivers in Alberta and on the north wall of the Frenchman River valley in Saskatchewan. The failure potential at these sites is related to steep slopes in combination with ground water seepage pressures. The latter largely occurs where surface glacial drift material contacts the underlying bedrock.

Construction designs which mitigate against slope failures include grading to reduce slope angles, removal of grading spoils to the toe of slopes to prevent additional overburden pressures, and controlling surface drainage to reduce ground water seepage pressures. This is done by using erosion berms, ditch plugs with gravel filters, and subsurface drains to lower ground water levels.

Northern Pipeline Agency surveillance personnel will ensure the application of special design measures to overcome the challenges in construction, erosion control and reclamation along the gas pipeline's Eastern Leg.

Nature's Challenges Along the Eastern Leg

by Dick Cowan

A combination of geology and dry climate poses certain challenges with respect to erosion control, surface reclamation and slope stabilization for construction of the Eastern Leg of the Alaska Highway gas pipeline through the prairies of southeastern Alberta and southwestern Saskatchewan.

In the southerly extensions of the Red Deer River valley badlands in Alberta, areas along the Eastern Leg such as Matzhiwin Creek, Irishman's Coulee and Wolf Coulee are subject to extensive erosion by wind and water. In these badlands - areas almost entirely lacking in vegetation - the amount of sediment naturally eroded each year may be 15 times that of adjacent vegetated areas. Studies on Alberta badlands indicate an average surface lowering of about 10 mm (.4 in.) per year; in the badlands of the western United States erosion rates have been measured at 15-46 mm (1.2-1.8 in.) per year. Once plant life is disturbed in areas susceptible to acute erosion, revegetation must be undertaken for purposes of pipeline protection and right-of-way maintenance.

Aerial view of badlands erosion in Wolf Coulee, Alberta.

The Red Deer River valley badlands began to form about 15,500 years ago when glacial melt waters cut the main river channel and exposed certain rock formations prone to badland development. The rocks are soft shales, siltstones and weakly cemented sandstones containing gypsum, a water soluble mineral, and up to 50 per cent montmorillonite, a clay which can absorb much water and expands while doing so. During summer, the action of wetting and drying on these clays creates a "popcorn" effect by loosening the surface material, which is then carried off by wind and rain. Summer dryness also accelerates disruption of the surface by causing it to crack. In winter, moisture retained by the clays expands on freezing to further loosen the surface material which washes away during snow-melt, blows away in windstorms, or creeps downslope.

Erosion also occurs below ground where water seepage dissolves soluble sulphate particles in the rock, thereby producing tubular openings. This "piping" phenomenon has been observed on the existing pipeline right-of-way operated by NOVA, AN ALBERTA CORPORATION, although it may not be the result of sulphate solution.

Extensive grading for pipeline construction at water crossings is necessary due to the steepness of the banks and coulee slopes. Erosion control methods involve using water bars, called erosion berms, to deflect water from the right-of-way. In some places the water is diverted into surface drainage ditches and carried downslope, while elsewhere the water is only diverted from the right-of-way into adjoining vegetation. Because of the extreme erosion potential, closely spaced erosion berms may be necessary to slow run-off rates. These are tied in to ditch plugs which keep water from channeling along the pipe and also force water to the surface with gravel filters. Subsurface drains may also be employed. Revegetation is assisted by mixing a weed-free straw mulch into the soil which helps to anchor the soil and establish seedlings. Excess spoil material produced by grading may be contoured into valley wall terraces, used for constructing irrigation berms or spoil piles, or disposed of in borrow pits. If the material is contoured into valley walls, subsurface seepage waters are carefully drained off so that the fill will remain stable. Any salvaged topsoil is used to revegetate the spoil.

High Winds, Low Rainfall

Another concern along the Eastern Leg involves the stabilization and revegetation of wind blown sand dunes in the Middle Sandhills of Alberta and in the Great Sandhills of Saskatchewan. These dunes formed on sand plains deposited in glacial lakes about 15,500 years ago. Once the vegetation is disturbed or graded from these soils, wind erosion can form depressions or blow-outs which make the area difficult to revegetate and possibly expose buried pipelines. Rainfall is naturally low in these areas and the high permeability of the sands allows water to percolate rapidly downwards, taking available nutrients with it and impeding the establishment of new grass.

One of the best techniques for erosion control in these sand hills is to minimize surface disturbance during construction and maintain as much rooted grass as possible. For disturbed areas, revegetation with native species adapted to sand is preferred. Yearly fertilization helps maintain nutrient levels and the use of hay mulch adds organic material for moisture retention. A further mitigative measure which has been successful elsewhere is the use of a gouging implement which creates small hollows in the soil and at the same time dispenses the seed. The hollows serve to collect moisture and protect the seed or seedlings from being blown away. Revegetation success always depends on careful scheduling of seeding times to take advantage of moisture availability and on minimizing subsequent disturbance.

Problems relating to slope stability on the Eastern Leg can be overcome by special pipeline construction designs. Slope failures or slides have

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Pipe Tested For Toughness

Initial reports indicate the success of a series of burst tests on large-diameter pipe undertaken by Foothills Pipe Lines (Yukon) Ltd. Between December, 1979, and April, 1981, seven tests have been conducted at the company's Burst Test Facility near Rainbow Lake in northwestern Alberta, to determine how effectively pipe of different toughness levels at a given strength, filled with gas of a certain temperature, pressure and composition, will stop a fracture. Strength refers to the amount of loading the pipe can handle, whereas toughness relates to the pipe's ability to accommodate strain and to absorb some energy before finally breaking apart.

For test purposes, a shaped explosive charge is used to cut a narrow .61 metre (2 ft.)-long notch about three-quarters of the way through the pipe wall. "It's a controlled explosion, directed into the pipe wall, as opposed to a big blast," explains Mike Stanistreet, Manager of Materials Engineering for the Northern Pipeline Agency. "The idea is to simulate a critical defect or 'burst' in the pipe, which contains gas under operating conditions similar to those planned for the mainline portions of the Alaska Highway gas pipeline. It's as if someone were to accidentally strike a live, pressurized pipeline with a heavy piece of equipment such as a backhoe," Stanistreet continues. "The pipe literally bursts open. The questions are, how well, and how quickly can the pipe arrest the fracture? If the pipe cannot contain the burst under prescribed operating conditions, it may be necessary to install special devices called crack arresters."

Questions of this nature were raised by the National Energy Board (NEB) in its report on the 1976-77 hearings on Foothills' (Yukon) application for the certificate to build the pipeline. Because the largest diameter gas pipelines in Canada at that time were 1,067 mm (42 in.), the NEB required the company to perform a series of tests to determine the fracture control capabilities of 1,219 mm (48 in.) and 1,422 mm (56 in.) pipe sizes, under representative conditions expected during construction and operation. Under the provisions of the *Northern Pipeline Act*, the Northern Pipeline Agency has the responsibility for monitoring the tests. The Agency also has the responsibility to approve the fracture control methodology for line pipe and to make recommendations to the NEB. This methodology is taken into account as it affects the purchase of line pipe for the project.

Officials examine initial results of April 2 burst test at Rainbow Lake, Alberta.

As the first of its kind in Canada, Foothills' (Yukon) burst test program has included experiments with pipe containing gas under pressure at temperatures both above and below the freezing point. Under warm, or normal discharge conditions from the compressor stations, gas is approximately 20° C (68° F). The cold mode, to be used for the northern sections of the pipeline to prevent melting of permafrost soils, involves chilling the gas to between 0° and −5° C (32° and 23° F).

Preparation for a burst test at Foothills' (Yukon) Rainbow Lake facility takes at least a month or two, says Stanistreet, because it involves constructing a 106.7 metre (350 ft.) length of buried pipeline between two permanently installed reservoirs with end caps, and filling it with gas pressurized at the maximum operating pressure, usually 8,690 kilopascals (1,260 lb. per sq. in.) or 7,450 kp (1,080 lb. per sq. in.). "In effect, it means building a mini-pipeline," he remarks. The gas composition is varied to match that which is expected to flow from the Prudhoe Bay gas facility, and is circulated through a cooling or heating system to obtain the required temperature. The test, or actual burst, is performed once the conditions of pressure, composition and temperature have been reached.

Stanistreet points out that the whole procedure, from the time of firing the charge to when the pipe fracture comes to a halt, is over in a matter of seconds. "In that time frame we have to collect data both on the speed at which the fracture runs and at which the gas decompresses." Speeds are calculated by adhering very fine copper wire at preset intervals along the length of the pipe and recording in milliseconds the time at which these wires break after the charge has been detonated. Decompression data is collected by the use of pressure transducers. These devices convert pressure changes to electrical signals which are then monitored by high speed tape recorders.

Foothills' (Yukon) program has included three cold burst tests on 1,219 mm (48 in.) pipe, one cold test on 1,067 mm (42 in.) pipe, two warm tests on 1,422 mm (56 in.) pipe and one warm test on 1,219 mm (48 in.) pipe. Once the data is analyzed, a decision will be made whether further testing is necessary. However, Stanistreet notes, preliminary reports and on-site observations appear to confirm theoretical predictions that tough pipe can self-arrest a fracture without requiring other means of control.

Moccasin Telegraph

Hearings on alternative routes of the Alaska Highway gas pipeline in the Ibex Pass area of the Yukon begin June 16 in Whitehorse. The federal Environmental and Assessment Review Panel (EARP) studying the environmental implications of constructing the pipeline through the Yukon, is renewing hearings first held in Whitehorse in 1979 on the Environmental Impact Statement prepared by Foothills Pipe Lines (South Yukon) Ltd.

At the time, the panel found the company's information deficient on certain environmental aspects of the project, including route alternatives. Foothills (South Yukon) has since provided additional material on pipeline routes in the Ibex Pass area west of Whitehorse. The panel, chaired by Ewan Cotterill, will receive briefs on the company's route submissions at the June hearings. Briefs must be filed with the panel's Ottawa office by June 8.

The information on the Ibex Pass is the first of several submissions Foothills (South Yukon) is required to make to the EARP Panel. A review of the additional material will take place over the next few months.

Foothills (South Yukon) is recruiting northerners to train as technicians to operate and maintain the Alaska Highway gas pipeline, scheduled to go into service in 1985. Twenty-three positions will be available for trainees to take technical courses as part of an apprenticeship program, as well as gain on-the-job experience in British Columbia with Westcoast Transmission Company Limited and in Alberta with NOVA, AN ALBERTA CORPORATION. Northerners selected for employment and training, together with their families, will be assisted in temporarily relocating for training assignments until operations commence in Yukon.

The Operations & Maintenance Training/Employment Program is set up to eventually have northerners fill technical positions once the pipeline becomes operational. Between 125 and 150 permanent positions, including office and field staff, will be created to run the pipeline. The majority of jobs require highly trained personnel.

In late April, Foothills (South Yukon) officials began touring Yukon communities along the pipeline route to provide information on training and employment opportunities.

The Yukon Advisory Council has been appointed with two new members and five original members to serve a second two-year term. The Council, established in February, 1979, under the *Northern Pipeline Act,* is appointed by the federal cabinet to represent a cross-section of Yukon interests to advise the Minister responsible for the Northern Pipeline Agency on matters relating to the planning and construction of the Alaska Highway gas pipeline in the territory.

The two new members appointed are: Paul Birckel, Chief of the Champagne/Aishihik Band, and Hector MacKenzie, a wilderness guide from Tagish and a member of the Yukon Conservation Society.

Members re-appointed to the Council are: Clifford Geddes, Donald Roberts, Dale Stokes, Robert Stubenberg and Charles Taylor.

At its first meeting held May 5, the new Council re-elected Donald Roberts as chairman and elected Dale Stokes as vice-chairman. The next meeting is scheduled for early June.

Three joints of 1,219 (56 in.) diameter pipe were hauled by the Whitepass & Yukon Railway in a successful test run from the port of Skagway, Alaska, to Whitehorse. The 25 metre (80 ft.) pipe lengths, weighing 11 tonnes, were strapped to a specially prepared flatcar and overhung on two adjoining cars. The experiment was conducted to determine how well the narrow gauge railroad could move long joints of pipe for the Alaska Highway gas pipeline.

Pipeline

The Northern Pipeline Agency was created by Parliament in April, 1978 to oversee planning and construction of the Alaska Highway gas pipeline project in Canada. Inquiries or suggestions regarding the Agency's publication "Pipeline" may be directed to:

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