

May 24, 2001

Alberta Transportation  
Central Region  
#401, 4902 – 51 Street  
Red Deer, Alberta  
T4N 6K8

**Mr. Melvin Mayfield, P.Eng.**  
**Construction Services Coordinator**

Dear Mr. Mayfield:

**Central Region Landslide Assessment Site C1**  
**H27:10 Ghostpine Creek Slide**  
**2001 Annual Inspection Report**

Alberta Transportation has initiated a process of risk management at site-specific slope movement sites that includes a 3-ring binder document control system. This Annual Inspection report forms Section B of the document control system for the above site. The annual site inspection was undertaken on May 22, 2001 by Mr. Darren Ratcliffe, P.Eng. of Klohn Crippen Consultants Ltd. Mr. Ratcliffe was accompanied by Mr. Roger Skirrow, P.Eng., Mr. Fred Cheng, P.Eng., Mr. Melvin Mayfield, P.Eng., Mr. Frank Vidmar, and Mr. Stephan Zitterer of Alberta Transportation.

This report was prepared by Klohn Crippen Consultants Ltd. for Alberta Transportation Central Region under Contract No. CE053/2000.

**1. PROJECT BACKGROUND**

This site is located on Highway 27 between the junction of SH836 and the Ghostpine Creek crossing (Sta. 11+970). Significant slides have occurred in the past at this cut to fill transition zone location and these have been remediated with subsurface drains and berms. The features that signify movements due to the previous slide activity at this site consist of cracking in the pavement and the side slopes. It is understood that the pavement at this site is constructed from full depth asphalt with no sub-base construction.

Ditch erosion is also an on-going problem at this site and remedial measures have included a cobble lined ditch on the south side of the highway.

It is understood that this section of highway is included in the 3-year plan for surface overlays.

The slide location, site plan, instrument locations and cross-section are illustrated on Figures 1 and 2. The slide features are also illustrated in the attached photographs.

## **2. SITE OBSERVATIONS**

The cracking of highway pavement and slopes is summarized on Figure 1. Essentially there has been no change in the crack pattern since the last inspection in May 2000. Dips and bumps are present in the highway pavement as a result of repeated patching in the area. A new patch was placed in 2000 on the north lane on the west side of the movement site.

Three slope inclinometers are operational at this site with locations as shown on Figure 1. The instruments were read on May 29, 2001 and the following observations were noted:

### **SI #2**

No movement was observed in this reporting period. The total cumulative movement in the zone at about 2 m below the surface remains at about 5 mm. More movement is apparent in the upper 1 m of the instrument installation. Maximum cumulative movements at the ground surface towards the northeast are now about 15 mm since 1994.

### **SI #3**

There has been no additional movement in the A or B directions since 1997 at the 12 m depth. In this reporting period, very minor movement is continuing towards the northeast from the ground surface to about 2 m depth. Maximum cumulative movements at the surface towards the northeast remain about 40 mm since 1994.

### **SI #4**

No significant movement was observed in this reporting period. The total cumulative movement in the zone from about 2 m depth to the ground surface towards the south remains about 20 mm.

The observed direction of the movements has no obvious pattern and may just reflect settlement type deflections of the subgrade, responding to changes caused by the various highway works.

The highway ditch on the south side of the highway was being eroded and was subsequently upgraded with cobble size drain rock erosion protection in 1998. The ditch now appears to be performing satisfactorily.

On the north side of the highway, ditch flows have eroded channels terminating in a large eroded gully down to the creek. Although the gully does not affect the highway at this time, it may become a significant problem in the future particularly after erosion further increases due to a series of heavy rainfall events.

The french drains installed in 1990/91 were not observed on this visit, however, it is known that the berms were constructed on a layer of pit run gravel. Provided that the ends of the drains were picked up in this layer then drainage should be occurring.

### **3. SITE ASSESSMENT**

There is no sign of imminent slope instability that could jeopardize the highway and movements to date have been small.

Based on the risk level criteria provided by Alberta Transportation, a risk rating of 9 has been assigned to this site. This is based on a probability factor of 9 for an active slide and a consequence factor of 1 as closure of the highway is unlikely due to the very small movements.

### **4. RECOMMENDATIONS**

The following recommendations are provided:

- As the movement in the area is very slow, it is recommended that highway pavement be milled down and patched to remove the cracks, dips and bumps in this road section as part of the overlay construction.

The construction of a compacted sub-base under the pavement may improve the performance of the highway surface. It is recommended that a series of test pits be dug to confirm the foundation conditions at the cut to fill transition zone. The optimum depth of subcut and granular backfill requirements would be determined at this time.

- The eroded cracks on the north side of the highway should be repaired by constructing drainage channels, say 0.5 m wide, with similar cobble size erosion protection as the south side. For the large eroded gully down the steeper portion of the side slope, it is recommended that a 600 mm CSP be provided in the gully for

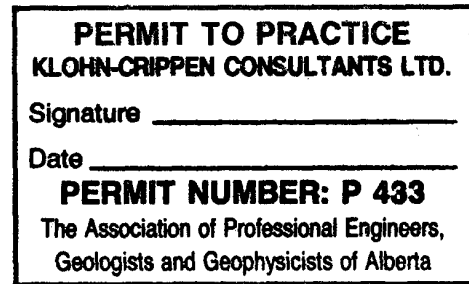
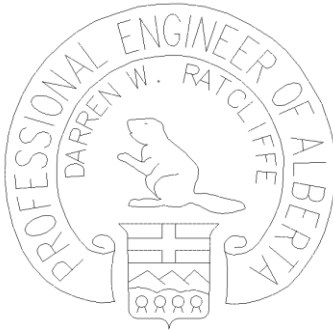
the full length of the slope section. An impervious plug should be provided at the top of the slope to ensure that water is directed into the pipe rather than the slope. The remainder of the slope over the pipe can be reinstated with common fill and re-vegetated. At the downstream end of the pipe where it discharges into the creek, a gabion mat should be provided to form a discharge apron of minimum dimensions 2 m by 2m.

- It is recommended that the bi-annual instrumentation monitoring be discontinued until the highway remediation work has been completed. Following the construction activities, a series of readings should be taken to assess the effect of the work.

Please contact the undersigned if you have any questions regarding this report.

Yours truly,

**KLOHN CRIPPEN CONSULTANTS LTD.**



Darren Ratcliffe, P.Eng.  
Senior Geotechnical Engineer

Brian Rogers, P.Eng.  
Manager, Alberta

## **FIGURES**

Looking east towards Ghostpine Creek



Looking west (newest patched area in background (2000))





Looking west at area patched in 1999





Looking west at small erosion channel forming on north side of highway





Erosion channel at fenceline



Looking north at erosion channel leading to large gully down to the toe of the embankment





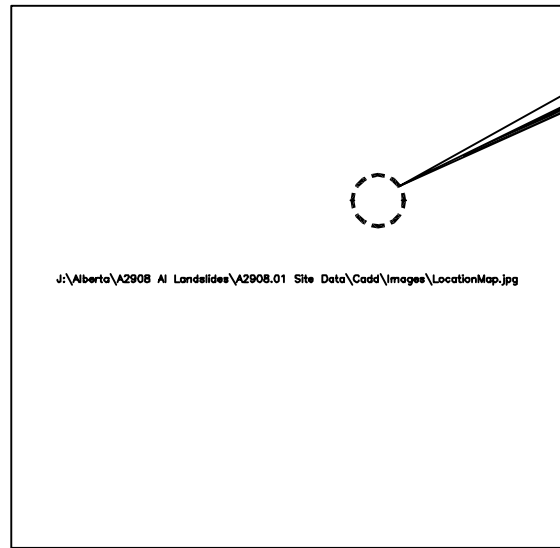




View down gully

## **FIGURES**



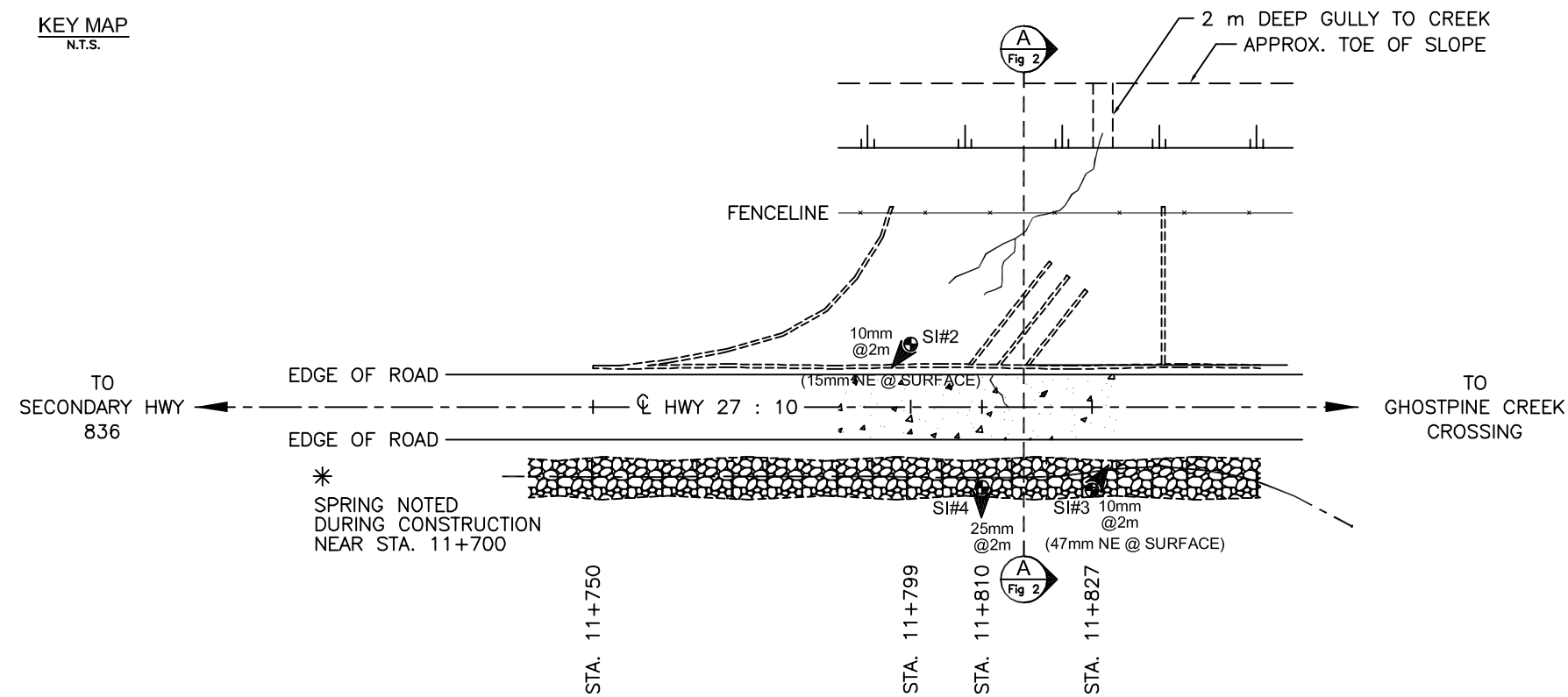


KEY MAP  
N.T.S.



**NOTES**

1. ALL LOCATIONS OF FEATURES WERE INTERPRETED FROM VARIOUS DATA SOURCES AND ARE APPROXIMATE.
2. ALL STATIONS SHOWN ARE IN METERS.



PLAN  
1:1 000

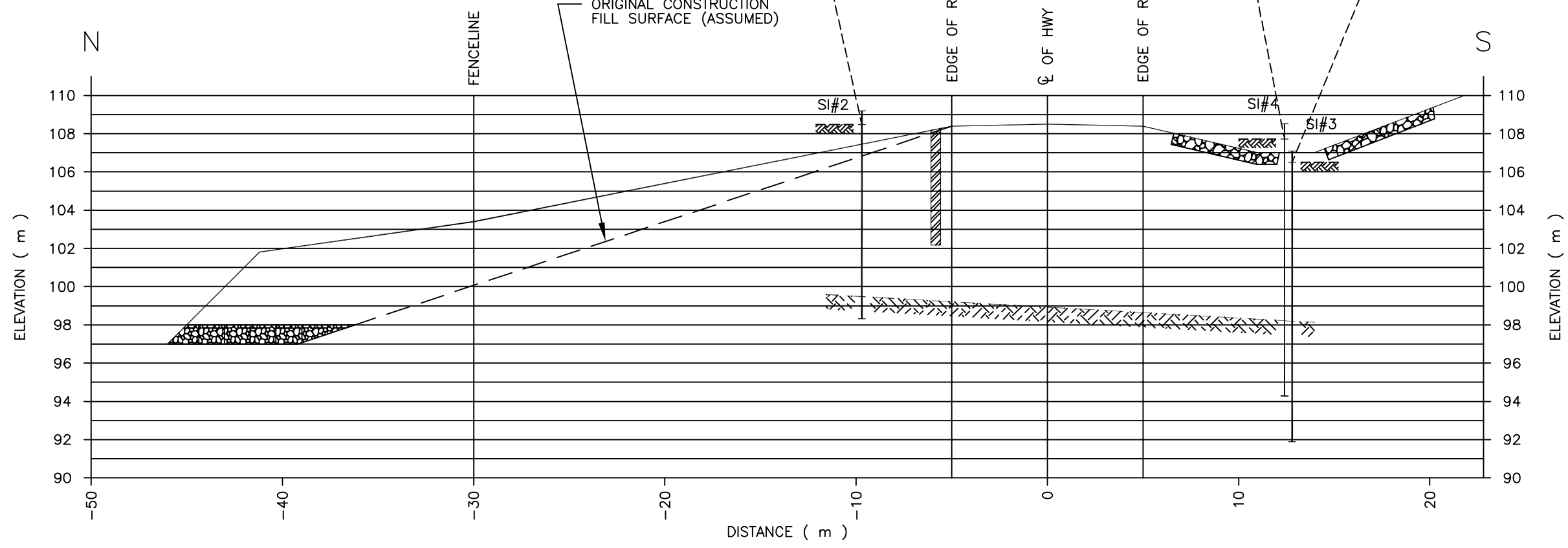
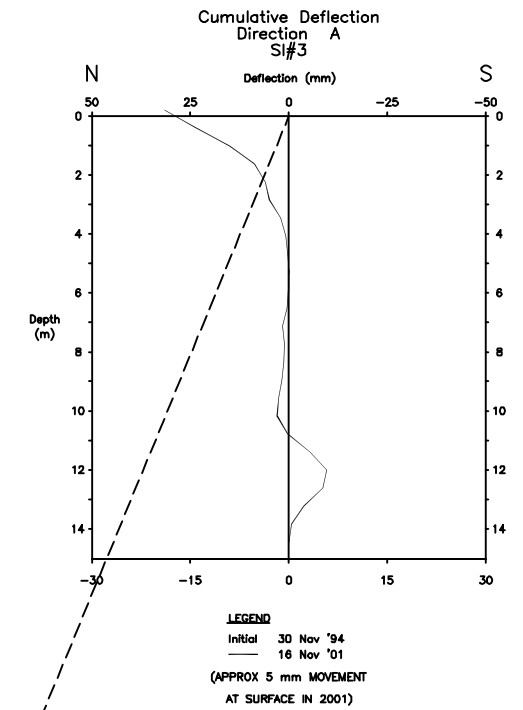
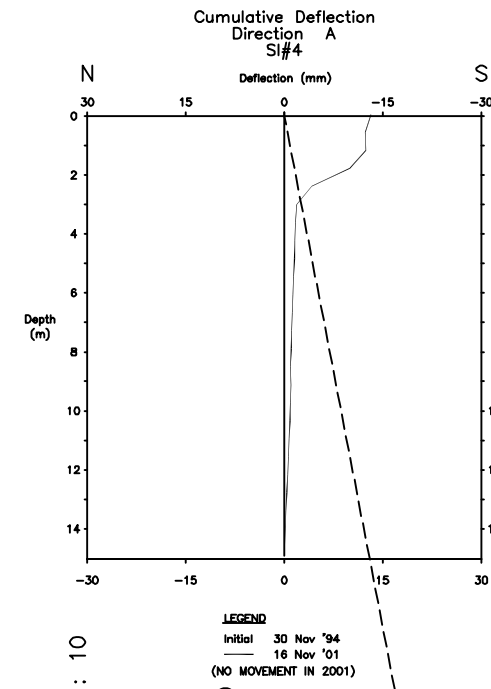
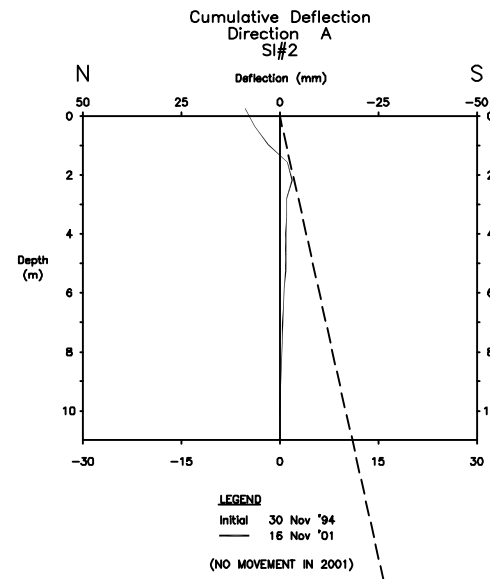
**LEGEND**

- SI# SLOPE INDICATOR LOCATION & CUMULATIVE MOVEMENT VECTOR
- 10mm @2m
- FENCELINE
- FRENCH DRAIN (ASSUMED 1989-1991)
- FRENCH DRAIN (PROPOSED 1992)
- CRACKS (APPROXIMATE LOCATIONS)
- REPAVED SECTION
- DITCH (COBBLE LINED)

PERMIT	SEAL	Ⓔ				DESIGNED BY	APPROVED BY	CONSULTANT			PROJECT				
		Ⓕ				S.A.T.	D.W.R.				CENTRAL REGION				
		Ⓖ	NOV 2001 INSPECTION	NOV 01	S.A.T.	D.W.R.	DRAWN BY				CHECKED BY	LANDSLIDE RISK ASSESSMENT			
		Ⓖ	MAY 2001 INSPECTION	MAY 01	S.A.T.	D.W.R.	SCALE				TITLE				
		Ⓑ	NOV 2000 INSPECTION	NOV 00	E.N.L.	D.W.R.	1:1 000 0 10 20 m				SITE C1 : GHOSTPINE CREEK SLIDE				
		Ⓕ	MAY 2000 INSPECTION	MAY 00	E.N.L.	D.W.R.					SITE PLAN				
MARK	DESCRIPTION OF REVISIONS		DATE	DWN.	ENG.			DATE	SHEET	DRAWING No.	REV.				
								NOV 2001	1 of 2	FIGURE 1	D				

**LEGEND**

- TOP OF BEDROCK
- FRENCH DRAIN (LATERAL DRAINS NOT SHOWN)
- GRAVEL FILL
- DITCH (COBBLE LINED)
- GROUND SURFACE AT INSTRUMENT



PERMIT	SEAL	A				DESIGNED BY S.A.T.	APPROVED BY D.W.R.	 	PROJECT CENTRAL REGION LANDSLIDE RISK ASSESSMENT		
		B				DRAWN BY E.N.L.	CHECKED BY		TITLE SITE C1 : GHOSTPINE CREEK SLIDE SECTION A-A		
		C	NOV 2001 INSPECTION	NOV 01	S.A.T.	D.W.R.	SCALE 1:250		DATE NOV 2001		
		D	MAY 2001 INSPECTION	MAY 01	S.A.T.	D.W.R.			SHEET 2 of 2		
		E	NOV 2000 INSPECTION	NOV 00	E.N.L.	D.W.R.			DRAWING No. FIGURE 2		
F	MAY 2000 INSPECTION	MAY 00	E.N.L.	D.W.R.	REV. D						
MARK		DESCRIPTION OF REVISIONS			DATE	DWN.	ENG.				

Looking west at area patched in 1999  
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