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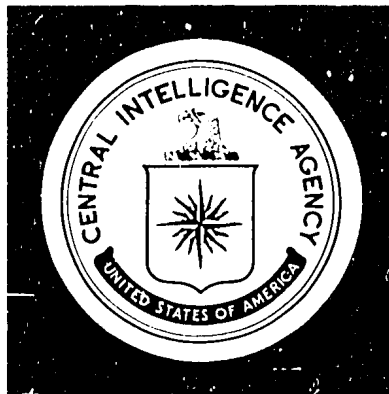
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Intelligence Memorandum

North Vietnam: The Dike Bombing Issue

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CENTRAL INTELLIGENCE AGENCY
July 1972

NORTH VIETNAM: THE DIKE BOMBING ISSUE

Conclusions

1. Hanoi's strident propaganda campaign alleging deliberate US bombing of the dikes continues. Hanoi no doubt is genuinely concerned about the effects any US bombing campaign against the dikes could have on the country's economy. North Vietnam's rainy season will reach its peak next month, and weaknesses in the dikes caused by last year's flooding have not been fully repaired.

2. A study of available photography shows conclusively that there has been no concerted and intentional bombing of North Vietnam's vital dike system. A few dikes have been hit, apparently by stray bombs directed at military-associated targets nearby. The observable damage is minor and no major dike has been breached. The damage should be easily repaired and should not add appreciably to the threat of flooding. No damage has been observed in the Hanoi area or against the primary dike system protecting that city. Repairs to any of the damaged dikes can be made, using local resources, in less than a week.

Introduction

3. Increased attention -- focused in large part by the North Vietnamese themselves -- recently has been given the elaborate dike system of water control in North Vietnam. Hanoi has made repeated accusations of deliberate US bombing of dikes and has undertaken an energetic effort to see that these charges be repeated by foreign observers. The following discussion provides a brief description of North Vietnam's water control system, its continual defense against floods, and the effect upon the system of the scattered bomb damage currently verified by photographic coverage of the entire Red River Delta.

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North Vietnam's Water Control System

4. North Vietnam's water control system is an elaborate network of dikes, dams, and locks which control the water of the heavily populated Red River Delta. Most of North Vietnam's farmland is in the Delta, and it is dependent on irrigation during the dry months and is endangered by flooding in the wet months, particularly in July and August.* From the head of the Delta near Viet Tri, 100 miles inland, the average fall of the Red River to the Tonkin Gulf is less than six inches per mile -- a factor which strongly influences its flooding characteristics. The rice fields and population centers of the Delta are protected by the water control system, which has greatly reduced -- but never eliminated -- flooding from natural causes. Two rice crops a year are grown -- the fifth-month rice is harvested in May-June and the tenth-month rice in October-November. The importance of the dikes and dams to North Vietnam's agriculture is clearly revealed by the instances when the water control system has failed. In the past, breaches in the dike system have flooded and destroyed more than one-third of the tenth-month rice crop. The Delta also contains the most important transportation waterways of North Vietnam -- the Red River, the Song Thai Binh River, and the two connecting waterways, the Canal des Rapides and the Canal des Bambous. These waterways link the country's principal urban centers -- Hanoi, Haiphong, and Nam Dinh. Southern North Vietnam also contains rivers necessitating a dike and lock system for water control and navigation, but the system is less important than that of the Delta.

Dikes

5. Much of the surface of North Vietnam is interlaced with an elaborate system of dikes totaling over 3,000 miles. Dikes to control flooding and the course of the waterways are located along all of North Vietnam's major rivers, but they are most important and most fully developed along the Red River. The Red River dike system begins near Viet Tri, only 43 feet above sea level, although about 100 miles inland at the northwest head of the Delta. The great amount of silt brought down from the mountains and deposited along the river beds in the Red River Delta has raised the waterways above the surrounding countryside in many places and requires a constant elevation of the restraining walls. In some areas -- particularly around Hanoi -- the height of the dikes reaches 40 feet. The primary system of dikes is backed up by a secondary system, between 4 and 22 feet high, that runs parallel to the main dikes. This

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* Photography provides the first evidence of natural flooding in the area east of Hanoi as a result of rising water levels.

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secondary system is often designed to localize and minimize damage if the primary dikes are breached. A tertiary system of smaller dikes has also been built to divide the rice-growing plains into compartments and to assist irrigation. These small dikes also control the level of small streams and local waterways. Additionally, the river dike system is complemented by small, natural or man-made dikes along the coast which keep out brackish seawater.

Dams and Locks

6. In addition to the dikes, dams to control flooding and irrigation are located throughout North Vietnam, primarily in the Red River Delta. Most of the dams are made of packed earth and are small, being less than 60 feet long and less than 10 feet high. The few larger dams are constructed of concrete and often have gates to permit through navigation of watercraft.

7. The Song Thai Binh River is the only major waterway in the Red River Delta with navigation locks to control water levels and facilitate transport along otherwise unnavigable stretches. These locks control water traffic to Thai Nguyen. A number of secondary waterways in the Delta have navigation locks, but these waterways do not handle significant amounts of traffic for urban centers. In the Panhandle, a large number of small locks are found in and around Thanh Hoa and Vinh, but only a few have significance for waterway transport.

Recurring Floods

8. In the past, heavy rains during July and August, when the river rises to a seasonal peak, have frequently caused breaches in the levees resulting in extensive floods and destruction to property and agricultural crops. Although there have been only a limited number of major breaches in the dikes since the mid-1940s, heavy rains have continued to cause frequent and substantial losses to the rice crop. In addition, minor breaks occur somewhere in the dike system almost every year.

9. The August 1971 floods that hit the Red River Delta rank with the most serious ever recorded. An estimated 1.1 million acres of riceland were seriously flooded -- sufficient to destroy the entire crop in that area (see Figure 1). The floods resulted from extremely heavy rainfall in August, which came on the heels of higher than normal precipitation in July. In mid-August, storms took out a one-half-mile section of a levee in a suburb of Hanoi -- and closed the Hanoi-Dong Dang railroad. At the height of the flooding, four major breaches occurred in the primary dikes along the Red River, and two of them -- near Yen Vien and north of Hai Duong -- inundated vast areas of riceland. The area of heavy flooding continued to

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expand through late September, probably because prolonged soaking and high water pressure had undermined the secondary dike systems. The floods receded gradually in October, but during the last week of the month, rains from a deteriorating tropical storm caused renewed flooding over large areas.

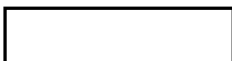
10. Apart from immediate rice losses, the floods produced extensive longer term physical damage. The enormous force of water unleashed through breaches in the primary dikes caused widespread erosion far beyond obvious scouring effects in the proximity of the breach. Long stretches of irrigation canals were cut, and the press reported many washed out pumping stations, which account for the sustained period of inundation. Flood water everywhere deposited silt in drainage ditches, further upsetting water control. The prolonged inundation during the floods probably caused subtle undermining that will not show until the facilities are again subject to heavy flooding. In the case of the primary dike systems, weakened areas may not be apparent until late summer. Although the odds are probably against a repetition of the 1971 disaster during this wet season, the fear of floods throughout the Delta nevertheless will be accentuated because of the probably weakened dike system.

Resiliency of the System to Bombing

11. It would be difficult and require a major effort to achieve disruption of North Vietnam's water control system, particularly the primary dike system, by aerial bombing even if such bombing were intended. Coordinated attacks would be necessary against selected targets, such as specific locks, dams, and areas of dikes. Moreover, bomb damage would then have effect only during the relatively short periods of high water - normality in July and August. Even then, the effects of such bombing could be countered by the ability of the North Vietnamese to react against breaches in the system, an ability which has been highly developed as a result of their lifelong battle against floods.

12. Damage to the locks would have little effect on either North Vietnam's transport or water control systems. Inland watercraft could be diverted to waterways not dependent on locks. Cargoes intended for water transport could be sent by the many alternative land routes paralleling the inland water network. Because of accidental bomb damage during the 1965-68 period, specific locks were rendered inoperative, without noticeable effect on water transport or flooding in the area.

13. Some of North Vietnam's dams could be breached during periods of high water, when water current velocity and depth are greatest and create maximum pressure. The prospects for causing any widespread flood damage or disruption of water transport are limited, however, because the dams

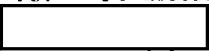


in North Vietnam are, for the most part, very small and retain only a relatively small quantity of water. Moreover, earthen dams can be repaired quickly with primitive materials, and almost no construction machinery is required.

14. The major dike systems are particularly resistant to bomb damage. Those in the primary system could be breached only by a series of overlapping craters across the entire broad tops of the dike. Dikes along the bank of the Red River near Hanoi are 80 feet wide at the flood line and some 200 feet at the base. Moreover, the lips of the bomb craters would have to be sufficiently lower than the surface of the river to initiate the flow and subsequent scouring action of water rushing through the breach to break the Red River dikes at any one point. In a concerted effort to achieve breaching of a primary levee, a large number of bombs in a very concentrated area would be required. The destruction of one of the significant dikes could not occur from one or two unconnected bomb craters.

Hanoi's Claims Versus Actual Damage

15. Since the early weeks of the US air interdiction program over North Vietnam, Hanoi has undertaken to convince the world that the dikes of the Red River are a direct and deliberate target of US bombing. North Vietnam's official press agencies and radio services have repeatedly described alleged US bombing attacks on the dike system. On 30 June, for example, The Phan My, North Vietnam's Deputy Minister of Hydraulics, was quoted in official newspapers as saying 20 bombing attacks were made on dikes during the month. More than 40 specific allegations were made by the North Vietnamese in April and May. Foreign diplomats, newsmen, and, most recently, the actress Jane Fonda have been escorted to dikes to view specific damage -- most of it around Hai Duong, east of Hanoi. A French correspondent in Hanoi has claimed that "a dozen US jets" staged an attack on 11 July on a dike system outside the "village" of Nam Sach (presumably the district of Nam Sach north of the city of Hai Duong). Actress Jane Fonda was also taken to Nam Sach to view the same damage.

16. To assess these accusations, a detailed examination has been made of  photography of the North Vietnamese Red River Delta. Dikes cratered by bombs were detected at 12 locations (see Figure 1 and the table) four of which were just north of Hai Duong (see Figure 2 and the Appendix) and were probably in the areas visited by some Western observers. In no case have the craters caused flooding. That there has been no deliberate bombing effort against dikes is evident from the scattered locations of the damaged points. Destruction of the dikes around Hanoi would probably result in the greatest damage to North Vietnam's economy

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North Vietnam: Cratered Dikes in Red River Delta

| Place | Coordinates | | Damage | Targets in Area |
|-----------------------|-------------|-----------|---|---|
| | N | E | | |
| North of Hai Duong | 21-02-30 | 106-18-30 | One crater on dike; one nearby. | Road with bridge over small canal. Petroleum pipeline one mile away (was also hit and interdicted by one bomb). |
| Hai Duong | 20-57-30 | 106-18-30 | Two craters on dike; several craters alongside. | Adjacent to petroleum pipeline at a river crossing. |
| North of Hai Duong | 21-03-30 | 106-19-30 | One crater on dike; a few alongside; several in the area. | Petroleum pipeline one mile away. |
| Hai Duong East | 20-58-30 | 106-23-30 | One crater on dike; several craters alongside. | At the approach to Hai Duong East Bridge. SAM site off end of bridge. |
| Thai Binh | 20-27-00 | 106-21-00 | Craters on and along dike. | Adjacent storage area. |
| Phu Ly | 20-33-00 | 105-55-00 | Bypass road on dike hit several times. | Bridge and bypass nearby/adjacent. |
| North of Phu Ly | 20-37-30 | 105-55-00 | Several craters on dike; many craters in area. | No fixed targets apparent; log rafts in waterway; nearby lines of communication. |
| Nam Dinh | 20-24-00 | 106-10-00 | At least one crater on dike, several alongside. | Adjacent probable petroleum storage area. |
| South of Nam Dinh | 20-21-30 | 106-10-30 | One crater alongside dike. | Adjacent industry/storage. |
| South of Nam Dinh | 20-20-00 | 106-10-30 | One crater on dike, main dike behind it a short distance was not touched. | Nearby road/water transloading area. |
| Southeast of Nam Dinh | 20-14-30 | 106-15-00 | Several craters on and along dike. | No fixed target in the area; near water transport line. |
| South of Thai Binh | 20-14-00 | 106-22-00 | Two craters along the side of the dike; many others in area. | Adjacent to bridge. |

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and logistics effort, but none of the damage has been in this area. Nearly all damage has been scattered considerably below Hanoi and has also been below the areas of major breaks resulting from the 1971 floods. If an effort were launched to inflict maximum damage to the dike system, it would have focused on the same areas in which the 1971 floods inundated the rice-rich areas located further upstream from the points actually bomb-damaged.

17. Detailed analysis of all locations, particularly the Hai Duong area, clearly suggests that the bomb damage resulted from stray bombs as a part of attacks on nearby targets of military value. All identified points of dike damage are located within close range of specific targets of direct or indirect military value. Of the 12 locations where damage has occurred, 10 are close to identified fixed targets such as petroleum pipelines and storage facilities. The remaining two damaged points are both adjacent to road and river transport lines, valid logistics targets. Because a large number of North Vietnamese dikes serve as bases for roadways, the maze which they create throughout the Delta makes it almost inevitable that air attacks directed against transportation targets cause scattered damage to dikes.

18. There are no signs of destruction -- as reported by Hanoi-based newsmen -- of vital dike portions stretching several miles. In relation to the dikes, the craters are of minor size, and no flooding has occurred as a result of the damage. Although water levels are not at their highest, the absence of leakages through the craters indicates that damage was limited.

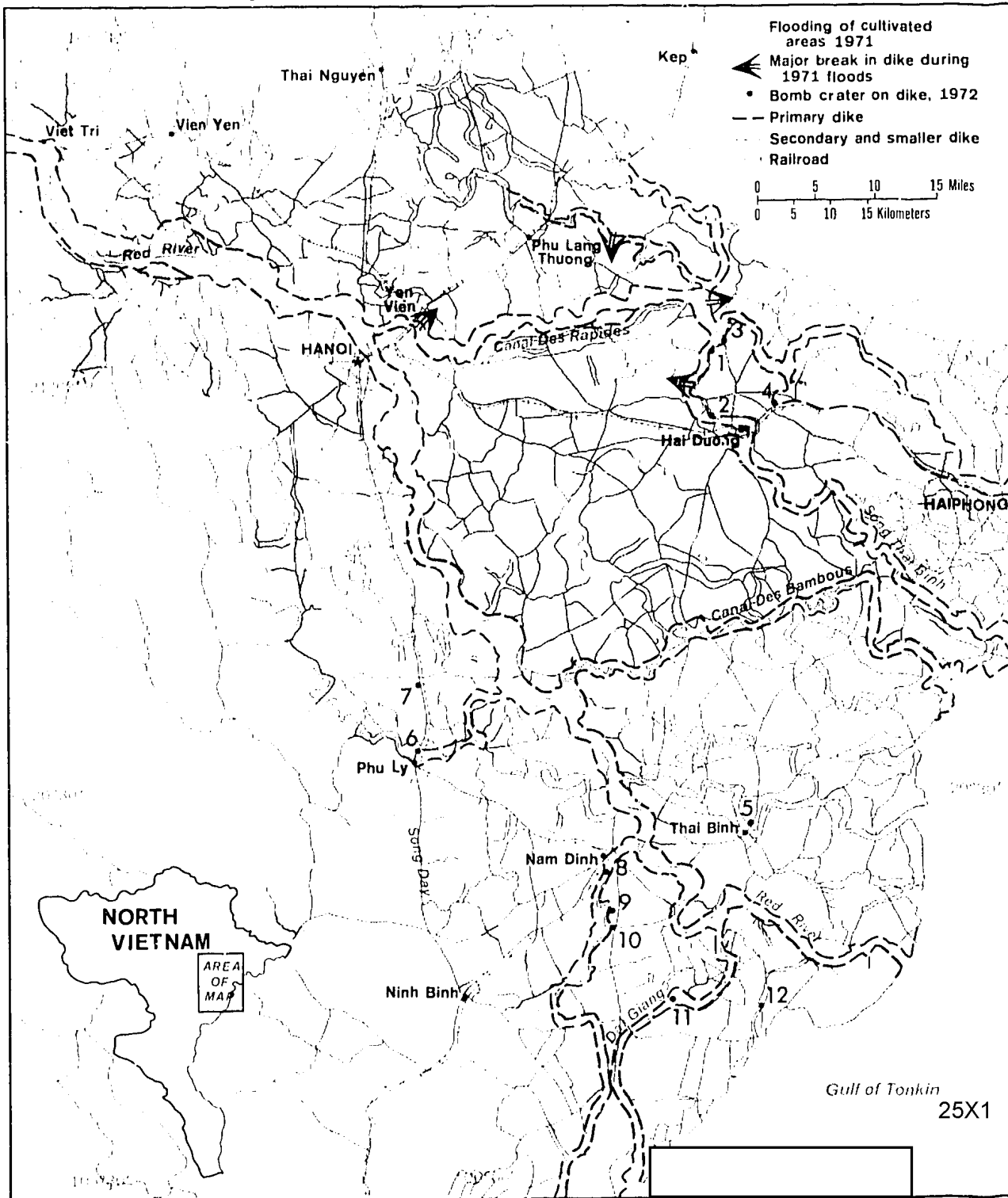
Requirements for Repair

19. The damage has occurred before the flood period, and, if repair efforts are begun soon, reconstruction can be completed before erosion would become serious. The bomb craters verified by photography can be repaired easily with a minimum of local labor and equipment. A crew of less than 50 men with wheelbarrows and hand tools probably could repair in one day the largest crater observed. The work could be completed even more rapidly if small trucks were used. Repairs to all the dikes could be completed within a week. Local labor historically mobilizes to strengthen and repair dikes to avoid serious flooding. An occasional bomb falling on a dike does not add significantly to the burden of annual repair work normally required. North Vietnam's greater current problem is to ensure that the massive damage caused by the 1971 floods has been repaired to the extent necessary to guarantee against a repetition of that disaster.

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North Vietnam Water Control System

Figure 1



APPENDIX

Notes on Figure 2

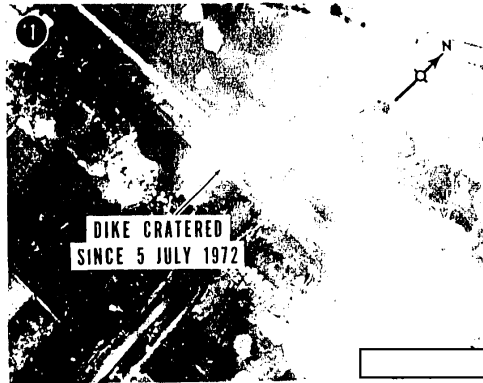
A photographic search of the Red River Delta area has revealed several craters on or near dikes in the area around Hai Duong. The district of Nam Sach, just north of Hai Duong, has been specifically mentioned in press reports as being near recently bombed dikes. The dikes along the Song Thai Binh were damaged in three areas (see Items 1-3) and along the Song Binh in one area (see Item 4).

The damage to the dikes in the Hai Duong area occurred in the period 4-11 July 1972. All the damaged sections of dikes are close to valid military-related targets. The damage along the Song Thai Binh (Items 1-3) appears to have resulted from strikes against the petroleum pipeline. The damage along the Song Binh was adjacent to the Hai Duong Highway and Rail Bridge and is within a half mile of a SAM site.

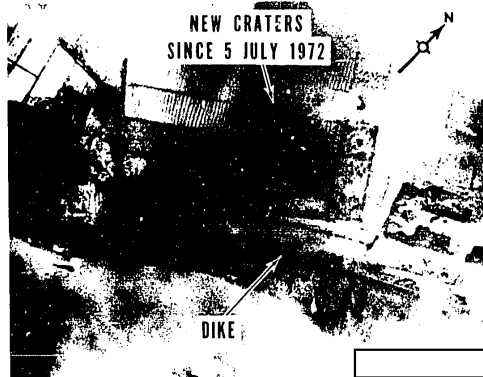
Damage to the dikes in the Hai Duong area is not serious, has not caused flooding, and could be quickly repaired. For example, the damaged dike noted in Item 1 shows the most serious damage but, because it would only entail replacing some 200 cubic yards of materials, would take only about 24 hours to repair. The labor-intensive nature of such repair and past North Vietnamese performance in repairing bomb-damaged facilities of all types indicate that the task would be an easy one. Craters located in fields alongside dikes, as seen in the photographs, would not materially weaken the dikes and thus would not require filling.

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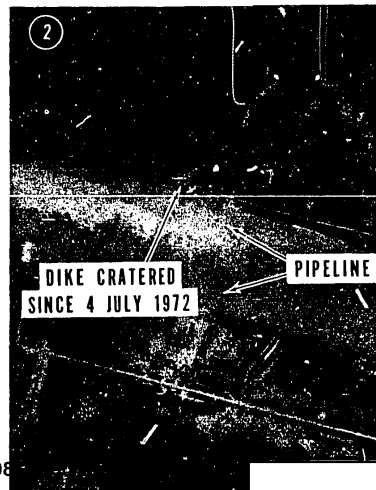
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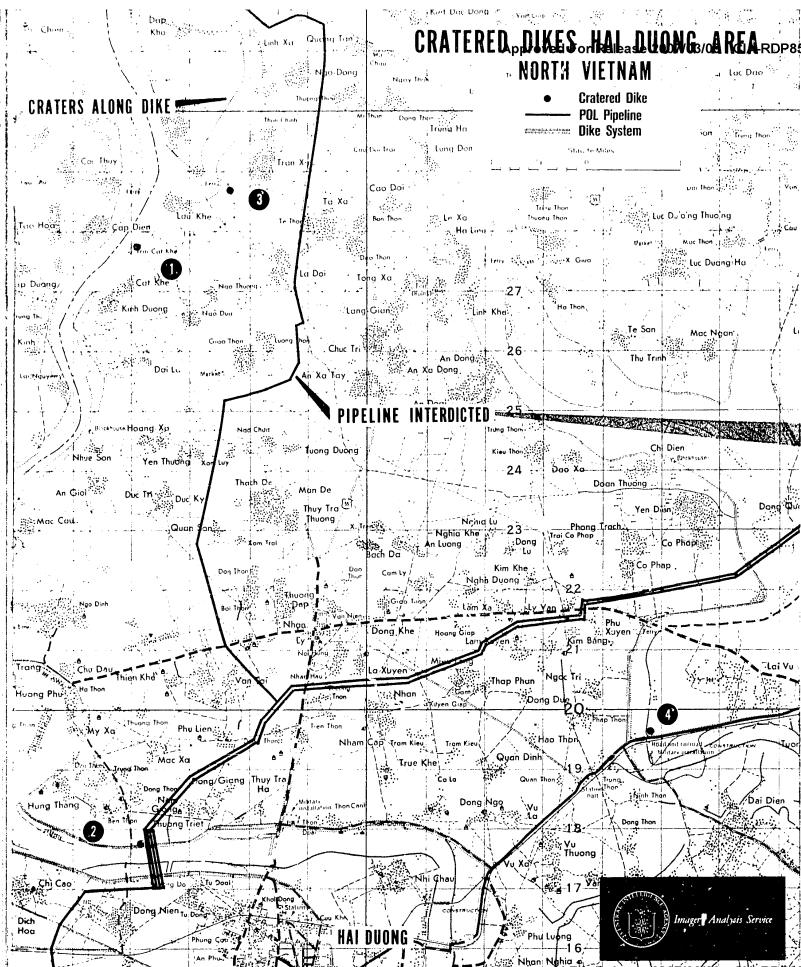
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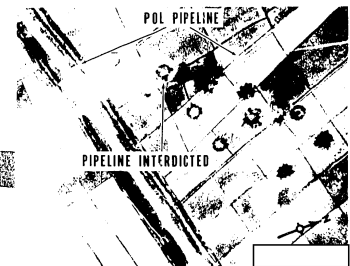
**CRATERED DIKES HAI DUONG AREA
NORTH VIETNAM**

● Cratered Dike
POL Pipeline
Dike System

CRATERS ALONG DIKE



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