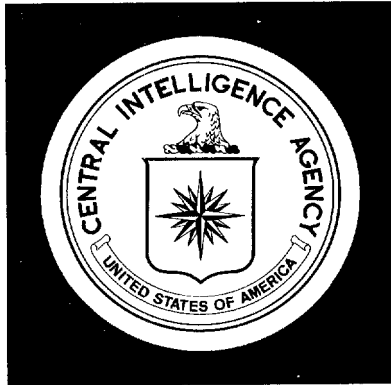


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DIRECTORATE OF
INTELLIGENCE

Intelligence Report

*The Kama - Vychegda - Pechora
River Reversal Scheme*

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CENTRAL INTELLIGENCE AGENCY

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THE KAMA-VYCHEGDA-PECHORA RIVER REVERSAL SCHEME

SUMMARY

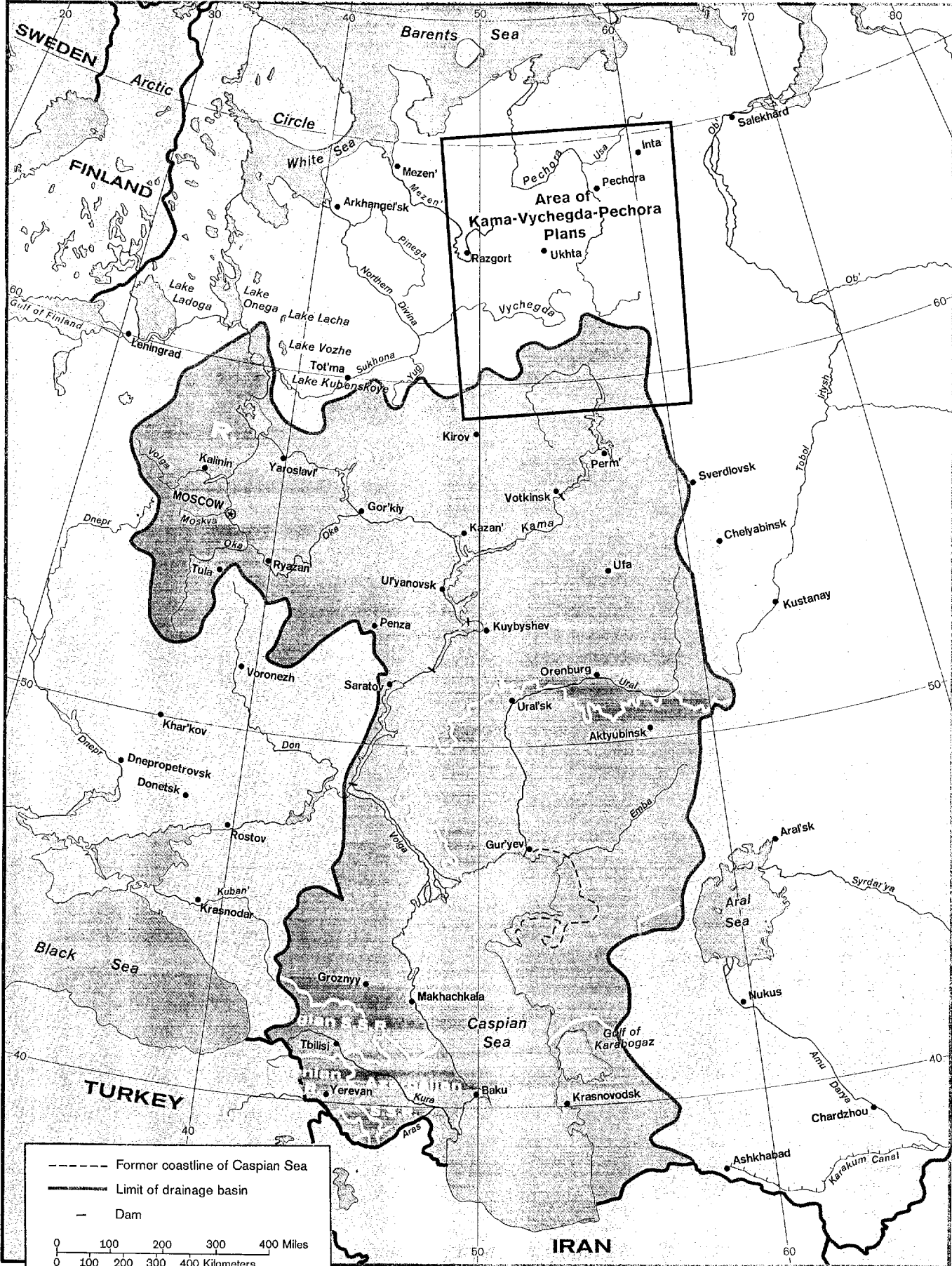
In an attempt to alleviate the acute and growing water shortages that afflict the lower Volga and Caspian basins, Soviet water management specialists have long sought relief in the European north. Much of this effort has been directed toward the development of plans designed to divert parts of the north-flowing Pechora and Vychegda rivers into the south-flowing Kama. The first of these Kama-Vychegda-Pechora (KVP) plans appeared in the middle 1930's; although accepted by the State Planning Committee (*Gosplan*) at that time, the advent of World War II brought work on the plan to a close.

A second KVP plan evolved from research completed by the Water Management Institute (*Gidroproekt*) of the Ministry of Power Stations in the period 1950-55. Following several years of subsequent discussion in official circles, it was finally published in the Soviet press in 1961. This version of the plan was widely criticized, largely because of its social, economic, and ecologic costs, and objections to it prompted the formulation of yet another proposal, which was submitted to *Gosplan* in 1968 and accepted as a plan by that body in the following year. It proposes the completion of the KVP project in stages, with a portion of one of the key canals being excavated by nuclear power. Nevertheless this version of the plan has also been subjected to criticism, and Soviet news media now suggest that it may have been put in abeyance pending consideration of other major reversal alternatives.

In the meantime the relationship of water supply to demand in the Volga-Caspian area grows more tenuous. The current deficit in that area, calculated to be 15-20 cubic kilometers a year, is expected to increase to about 50 cubic kilometers annually by 1985 and to 80-90 cubic kilometers by the year 2000. Completion of the KVP project would satisfy all current requirements and provide a surplus for some future increase in demand. Beyond 1985, however, the diversion of a number of additional streams would probably be necessary.

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USSR: Volga-Caspian Drainage Basin



THE KAMA-VYCHEGDA-PECHORA RIVER REVERSAL SCHEME

1. Although many of the grandiose transformation-of-nature proposals conceived during the Stalin era have met a justly deserved death, Soviet informational media continue to report on a number of them, including the Kama-Vycheгда-Pechora (KVP) river diversion scheme. The latest version of the scheme, like those that preceded it, is designed to provide the Volga and Caspian basins with a large supplemental supply of water. Interest in this proposal is motivated by concern about the water balance of the lower Volga and Caspian lowlands; the water supply, precariously marginal at best, appears to be worsening. Intake/evaporation ratios have been generally adverse for decades, and the demand for water in the Volga economic region—where centers of population, industry, and agriculture are expanding—is increasing at an alarming pace. Although it encompasses only 3 percent of the nation's territory, the region accounts for better than 7 percent of the gross industrial output and about 15 percent of the harvest of spring grains in the USSR. Support of the economy in the Volga area, however, has not been without costs, particularly for the Caspian Sea, the level of which has dropped 2.6 meters in the 35-year period ending in 1970; worse yet, a further drop of 1.6 meters is expected by the year 2000. Should this come to pass, already serious problems—the shallowing of port areas, pollution, and the deterioration of the fishing economy—will appreciably worsen.

2. Available data indicate that there is now a shortage of some 15-20 cubic kilometers of water a

NOTE—This report was prepared by the Office of Basic and Geographic Intelligence and coordinated within CIA.

year along the lower Volga and in the Caspian Basin.¹ Given the continuation of prevailing climatic conditions and current consumption trends, the deficit could reach 50 cubic kilometers by 1985, and by the end of the century it could approach 80-90 cubic kilometers of water annually. Preliminary surveys suggest that deficits of these magnitudes could be largely alleviated through the completion of the KVP project and the further diversion of other streams in the north of the European USSR.

The 1961 KVP Plan

3. Survey work on the upper Pechora and Kolva Rivers began as early as 1927, and this led to the completion and submission of the first KVP plan in the middle thirties. The State Planning Committee (*Gosplan*) approved the plan, recommending that work on it be continued. World War II interfered, however, and further consideration of the proposal was necessarily postponed until 1950. During the period 1950-55, the Water Management Institute (*Gidroproekt*) of the Ministry of Power Stations resumed the KVP planning effort, culminating its work with a proposal for the gravity-flow diversion of parts of the Pechora and Vycheгда rivers into the Kama. The proposal was carefully scrutinized along with a number of variants, and the newspaper *Vodnyy Transport* announced the approval of the scheme by the Technical Council of the Ministry of Construction of Power Stations on 26 January 1961. The 1961 KVP

¹One cubic kilometer of water is equal to 810,713 acre-feet. A deficit of 15 cubic kilometers (12,160,695 acre-feet) would be equal to about three times the amount of water normally impounded behind California's Shasta Dam.

USSR: 1961 KVP River Reversal Plan

Map 2

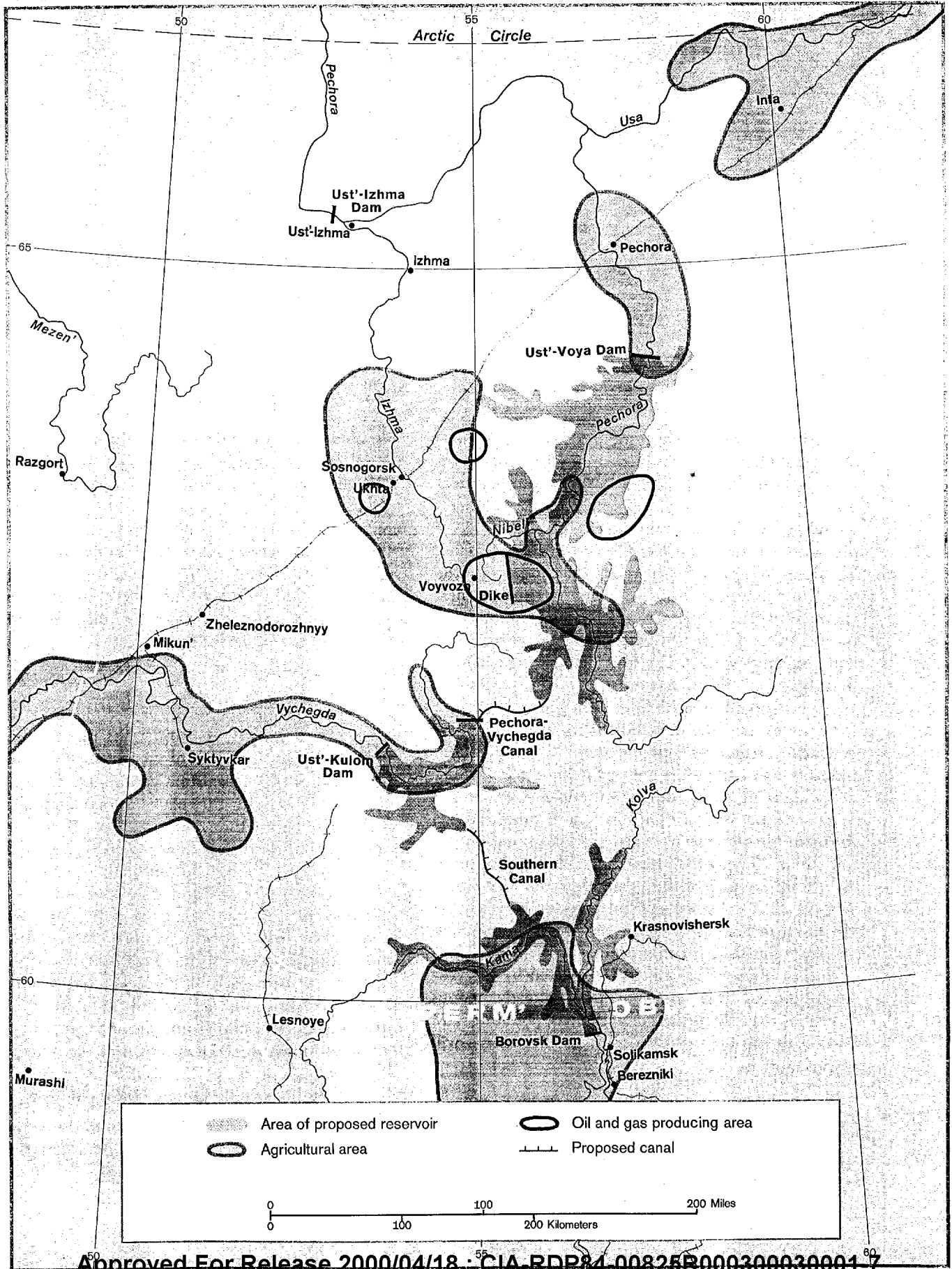


FIGURE 1. Proposed Structures: 1961 KVP Plan

Dams:	
Ust'-Voya.....	Height: 80 meters; Length: 12-14 kilometers; Head: about 70 meters; Type: earthen; Water release: none.
Ust'-Kulom.....	Height: 34 meters; Length: 2 kilometers; Head: about 30 meters; Type: earthen; Water release: 2.6 cubic kilometers annually; Passage around: Yes; Power installation: 46,500 kilowatts.
Borovsk.....	Height: 30 meters; Length: 4.8 kilometers; Head: about 18 meters; Type: earthen; Water release: 38-40 cubic kilometers annually; Passage around: navigation lock; Power installation: 700,000 kilowatts.
Ust'-Izhma.....	Height: 80 meters; Power: 1 million kilowatts.
Dike:	
Nibel'-Izhma Divide..	Height: 9-11 meters; Length: 16 kilometers; Type: earthen; Water release: none.
Canals:	
Pechora-Vycheгда....	Location: along course of Northern and Southern Mylva Rivers; Length: about 60 kilometers; Width: 250 meters; Depth: 18-30 meters.
Vycheгда-Kama.....	Location: along course of Northern and Southern Kel'tma Rivers; Length: about 100 kilometers; Width: 250 meters; Depth: 21-30 meters.

Plan (see Figure 1 and Map 2) proposed the construction of dams at or near Ust'-Voya on the Pechora, Ust'-Kulom on the Vycheгда, and Borovsk on the Kama, as well as a substantial dike on the Nibel'-Izhma drainage divide. An additional dam, to be constructed at a later date, was also proposed; it was to be placed downstream from Ust'-Voya, below the Pechora-Izhma confluence.

Benefits of the 1961 KVP Plan

4. Benefits to be derived from the proposed 1961 KVP Plan were tied to the filling of the three major reservoirs. Totalling 15,550 square kilometers in area (see Figure 2), these reservoirs were to contain enough water to provide for a sustained outflow of 38 cubic kilometers a year.² A diversion of this magnitude would have satisfied downstream requirements until about 1980, stabilizing the level of the Caspian Sea and improving the water balance in the lower Volga-Caspian area and sanitary conditions on the Volga, which is acutely polluted in the vicinity of large cities. It would have also permitted the production of an

²The amount of water to be diverted is subject to question. Radio reports in January 1961 spoke of the diversion of up to 40 cubic kilometers a year. At about that time a Soviet geographer, N. I. Shiskin, claimed that 40 to 42 billion cubic meters (40 to 42 cubic kilometers) a year could be diverted. Another Soviet geographer, S. L. Vendrov, making allowances for certain expected losses, stated in 1963 that the flow would be about 38 cubic kilometers a year. This figure was subsequently accepted by Philip M. Micklin, an American who has studied the problem extensively.

additional 11 billion kilowatt-hours annually at existing and proposed power stations and reduced the seasonal fluctuation in power production (the period of maximum flow on the Pechora and minimum flow on the Volga coincide). Completion of the power phase alone, some Soviet economists claimed, would justify the whole KVP proposal economically. Other benefits were also cited. The canals and reservoirs were to provide a new deep-water route into the northeastern part of the European USSR. This route was expected to stimulate economic activity, especially forestry, and encourage the shipment of coal from the Pechora fields to the Volga. Finally, the projected reservoirs were deemed ideal sites for the future development of a local fishing industry.

Criticism of the Plan

5. Despite the benefits that were to be derived from the completion of the 1961 proposal, many criticisms were directed against it. Geographers in particular, but also other natural scientists and economists, noted that completion of the project would be costly in terms of Komi ASSR resources. The most criticized feature was the proposal to flood much of the best agricultural land in the Komi ASSR. Only a small proportion of the total available land in this area is suitable for agriculture, and most of this is located along the Pechora and Vycheгда rivers, where the bulk of the population is situated. The flooding of these lands, therefore, would require resettlement of thousands of

FIGURE 2. Some Characteristics of the Combined KVP Reservoir (1961 Plan)*

	Unit	Reservoir Sections			
		Total	Pechora	Vychegda	Upper Kama
Reservoir area	km. ²	15,550	9,950	2,910	2,690
	%	100	64	18.7	17.3
Total capacity	km. ³	235	184.5	34.5	16.0
	%	100	78.5	14.7	6.8
Usable capacity	km. ³	56.5	33.7	11.4	11.4
	%	100	59.6	20.2	20.2
Ratio of usable to total capacity	%	24	18.3	33.0	71.2
Mean annual flow at dam sites	km. ³	70.1	34.1	8.3	27.7
Ratio of total capacity to flow	%	335.2	541	416	57.8
Ratio of usable capacity to flow	%	81	99	137	41
Population to be resettled		60,000	20,000	13,000	27,000
Land to be flooded:					
Cropland	ha.	13,500	1,400	4,300	7,800
Hay meadows	ha.	35,300	5,300	15,600	14,400
Pastures	ha.	4,400	1,000	1,000	2,400
Timber reserves to be flooded	million m. ³	79	52	18.5	8.5

*Vendrov, S. L., "Geographical Aspects of the Problem of Diverting Part of the Flow of the Pechora and Volga rivers to the Volga Basin," *Izvestiya Akademi Nauk SSSR, seriya geograficheskaya*, 1963, No. 2, pp. 35-45. (Arithmetical errors in source corrected.)

people. Those interested in preserving the agricultural assets of the Komi ASSR also looked with alarm on the low ratio of usable reservoir capacity to total reservoir capacity (see Figure 2). This ratio, a mere 24 percent, could be substantially improved, it was claimed, by redesigning the plan and including therein provisions for more and lower dams, dikes, and pumping stations.

6. Critics stated that completion of the 1961 plan would be unnecessarily wasteful of timber and mineral resources. Eighty-seven percent of the area proposed for inundation is covered by timber and brush, and much of the former is of commercial value; its removal prior to flooding would be essential in order to prevent the subsequent vegetative pollution of the water. The flooding of a portion of the Timan-Pechora gas and oil region would also present some problems. While it would not make the extraction of gas and oil in the area impossible, inundation would increase the cost of production and render the reservoirs subject to the danger of pollution through leakage and spillage.

7. It was also claimed that the impoundment of water might have an adverse affect on the area's climate, soil, vegetation, fish, and wildlife. Filling the reservoirs as planned, some Soviet researchers

speculated, could cause the modification of climate over an area of some 60,000 square kilometers. It was assumed that winters would then tend to be less continental, that is, warmer and more humid than formerly, and summers would be cooler, thus exercising a negative influence on plant growth.

8. The rise of the groundwater level around and near the reservoirs was viewed with a certain amount of apprehension. The expected rise in the water table could waterlog soils over a wide area and play havoc with the existing vegetation. Areas located on or near the Pechora were considered particularly susceptible to this danger. According to one estimate, the area thus threatened was equal in size to the reservoirs themselves.

9. The character of the proposed Ust'-Voya dam also raised a number of objections. Designed to completely contain the Pechora upstream from that point, it would adversely influence water life. Ecologists expressed concern about anadromous fish species such as the Atlantic salmon and the whitefish, which spawn on the middle and upper Pechora and its tributaries. With the construction of the Ust'-Voya and Ust'-Izhma dams, the catch of these fish would be reduced by 90 percent. Plan proponents countered this

argument by stating that such a loss, while real, would be compensated by the introduction of non-migratory fish into the reservoirs. Critics also claimed that the inundation of the area would destroy a prime wildlife range in which there is a diversity of tundra and taiga fauna, including moose, brown bear, European sable, ermine, and lynx.

10. It was further charged that the Ust'-Voya dam, if constructed to specifications, would have serious repercussions on downstream areas. The reduction of the flow of the Pechora at its mouth by 25 percent could cause an increase in the salt content and temperatures of the Arctic estuarian waters, thus upsetting the feeding and spawning habits of fish. The dam would also complicate transport on the lower Pechora, which would be destined to become only a trickle between Ust'-Voya and the confluence of the Pechora and Usa rivers. While an Ust'-Izhma dam would rectify this situation by creating a deep-water reservoir back to Ust'-Voya, there has never been any suggestion that a dam at this location would be built simultaneously with other elements of the KVP complex. More importantly, there was no assurance that a dam at Ust'-Izhma would be provided with a lock or a series of locks, required for the preservation of navigation around the dam.

11. One final criticism of the plan held that the reduction of the northward flow of fresh water could influence the icecap in the Arctic Basin unfavorably. Only a very delicate balance of nature keeps the icecap alive, and to this end the continued inflow of fresh water is essential. The fundamental concern, of course, is with the potential diminution or elimination of the icecap, either of which might cause catastrophic modifications of weather systems and shorelines around the world. The proposed diversion of Pechora water, however, does not seem to be of sufficient magnitude, of and by itself, to materially influence the melting of the icecap.

Modification of the Plan

12. As objections to the 1961 KVP Plan were being registered, a number of modifications emerged, some appearing as early as 1963. These modifications generally involved the construction of a somewhat lower dam at Ust'-Voya; a second dam upstream on the Pechora, in the vicinity of Troitsk-Pechorsk or Pokcha; the reduction of the inundated area; and the sequential completion of various parts of the plan, rather than simultaneous construction.

13. *Gidroproekt* submitted revised KVP plans to *Gosplan* in 1968. In this revision two options were suggested (see Map 3); one of these envisioned the simultaneous construction of the several sectors of the entire KVP project, sending waters, as in the 1961 plan, from the Pechora to the reservoir of the Vychehda and then by canal to the Kama. The other option, adopted by *Gosplan* in 1969, made the Pechora and Vychehda sectors of the overall plan independent of each other. In effect, this decision relegated the construction of the Vychehda reservoir and its structures, along with dams near Ust'-Izhma and Solikamsk, to the indefinite future. It also eliminated the need for the Pechora-Vychehda Canal.

14. The tapping of the Pechora, according to the revised plan, is to be accomplished in two stages. The first stage involves the construction of the Pokcha Dam, the Pechora-Kolva Canal, and the Bobyk Dam. The reservoir behind the Pokcha Dam is to have a capacity of 53 cubic kilometers. Completion of this stage of the project will provide the Volga with an additional 13 cubic kilometers of water each year. The second stage is to concentrate on the construction of the Ust'-Voya Dam. When complete, it will impound about 40 cubic kilometers of water. Pumping facilities near the Pokcha end of the reservoir are supposed to lift the water from one reservoir to the other, thus allowing a lower dam at Ust'-Voya and a considerably smaller reservoir. Completion of this phase of the project will provide the Volga with an additional 18 cubic kilometers of water each year.

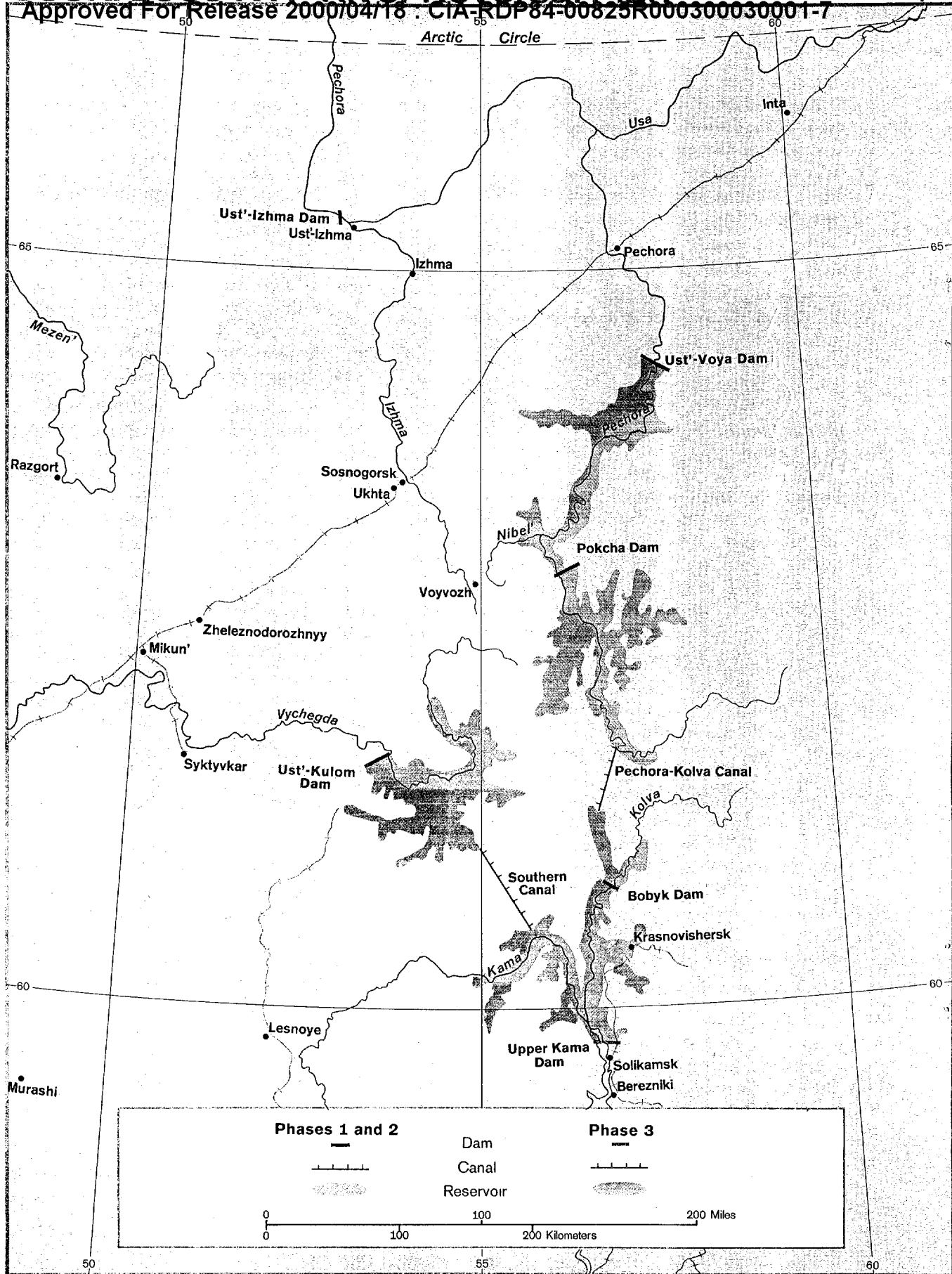
15. Should the Vychehda phase of the revised plan ever be implemented, the Volga would benefit by the receipt of another 5 cubic kilometers of water annually. This would depend on the construction of the Ust'-Kulom Dam and power facility, however, and the digging of the Southern (Vychehda-Kama) Canal. This phase of the plan also includes the formation of a Kama reservoir behind the proposed Upper Kama Dam. Given the completion of all these structures (see Figure 3) and reservoirs, the KVP complex would have the capacity to divert 36 cubic kilometers of water a year, an amount only slightly less than that projected by the 1961 plan.

16. In announcing *Gosplan's* approval of the first stage of the revised plan, *Vodnyy Transport* optimistically claimed that the resulting transfer of 13 cubic kilometers of water a year was "enough to stop the catastrophic drop in the level of the Caspian Sea,

USSR: 1969 KVP River Reversal Plan

Map 3

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FIGURE 3. Proposed Structures: 1969 KVP Plan

Dams:		
Phase 1.....	Pokcha.....	Height: 50 meters; Head: 40 meters; Type: earth filled with reinforced concrete spillway; Spillway capacity: 2,000 cubic meters of water per second.
	Bobysk.....	Height: 17 meters; Type: earth filled with reinforced concrete spillway; Spillway capacity: 3,000 cubic meters of water per second; Lock.
Phase 2.....	Ust'-Voya.....	Height: 60 meters; Head: 50 meters; Type: earth filled with reinforced concrete spillway; Spillway capacity: 1,300 cubic meters per second; Pumping station: near Pokcha (720 cubic meters per second).
Phase 3.....	Ust'-Kulom.....	Height: 40 meters; Type: earth filled; Power: 36,000-kilowatts.
	Ust'-Izhma.....	Data not available.
	Verkhnye Kamskiy....	Do.
Canals:		
Phase 1.....	Pechora-Kolva.....	Length: 117 kilometers; Type: gravity flow.
Phase 3.....	Vycheгда-Kama.....	Length: 110 kilometers.

to provide needed water for irrigation and urban water supply, as well as to improve navigation conditions on the rivers of the Volga basin." This optimism is scarcely justified when the benefits are considered in terms of previous assessments of need (current shortage approximates 15-20 cubic kilometers a year). It was also claimed that the passage of water through the turbines of three Kama and three Volga power stations would generate an additional 3 billion kilowatt hours of electricity annually. Other sources, in discussing the latest proposal, have been less enthusiastic, observing that although the revised plans may reduce the area to be inundated under the 1961 plan by about a third, they do not significantly lower the amount of lost agricultural land or reduce the number of people to be resettled. G. I. Granik, a Russian authority on the European north, is one who apparently remains unconvinced of the project's merit. In 1971 he claimed that *Gosplan*, in approving the revision, recognized the need for continued research on a number of pressing issues—including the relationship of the KVP complex to other national systems, the determination of its overall cost, and its impact on area resources and established productive forces. Such comments indicate that most of the objections raised against the 1961 KVP Plan are also being leveled against the 1969 revision.

17. There is no evidence to suggest that work will begin on the KVP complex in the immediate future, no obvious effort having been made thus far to assemble the necessary manpower and equipment. A

1971 explosion of what is presumed to have been a small nuclear device in the general vicinity of the proposed Pechora-Kolva Canal, however, may indicate continued Soviet interest in the project. For some time USSR scientists have been speaking of the use of nuclear energy to construct a 65-kilometer section of the Pechora-Kolva Canal, suggesting that about 250 charges, totaling 36 megatons, would be used to open up an area in which construction is hampered by complex masses of rock. The 1971 explosion, measuring 4.7 to 5.0 on the Richter scale, may therefore have constituted a test that is essential to the eventual construction of a part of the canal by this method. If so, work on the first stage of the long-delayed KVP complex, which promises a modest contribution of 13 cubic kilometers of water a year to the Volga, could begin at almost any time.

Proposed Alternatives

18. Within the past year a number of Soviet specialists have spoken favorably of the possible diversion of streams in other parts of the European north, west of the KVP area. One of these, I. A. Gerardi, chief technical manager of survey work being done to prepare for the diversion of rivers in the European North and Siberia, recently observed that the diversion of water from the Pechora would still require the flooding of large territories and the destruction of extensive tracts of forest in the Pechora and Kama basins. Therefore, he claimed, "parallel variants" including the diversion of water into the upper Volga from Lakes Kubenskoye, Lacha,

and Vozhe, and from the upper Sukhona, were being drafted. He also stated that proposals to divert water from Lake Onega into the Volga were being examined, and he suggested that eventually the potential of several other sources—including the northern Dvina, lower Vychegda, Pinega, Mezen', and Yug Rivers, as well as the basin of Lake Ladoga—would be determined. Expeditions are now known to be working in the northwest. One group is investigating a series of hydroengineering complexes in the region of Ust'-Vologodskoye (59°18'N., 40°09'E.). Another is surveying a site for a similar complex on the Sukhona River near Tot'ma. Geologists and topographers, furthermore, are surveying the courses of future canals, along which water from Lakes Vozhe and Lacha could flow into Lake Kubenskoye and then along the Porozovitsa River (59°50'N., 39°05'E.), the Severo-Dvinsk Canal, and the Volga-Baltic Canal into the Rybinsk Reservoir.

Outlook

19. As water supply and pollution problems proliferate along the Volga River and the Caspian Sea, the possibility of inter-regional water transfers becomes more intriguing. Clearly the need for additional water in this sector of the USSR is great, and the potential of the proposed source is more than adequate, at least for the present. Still the USSR appears to be on the horns of a dilemma: unless it proceeds with the KVP or some other comparable river-diversion scheme, the growth of industry and agriculture along the lower Volga could be seriously hampered; opting for this course, however, would inevitably involve economic and ecologic burdens for source areas in the European north. Nevertheless, the advantages to be realized in the continued development of an area that has been called the new Soviet heartland suggest that stream diversion could well be attempted within the foreseeable future.

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