

Report

The Complex Politics of Foreign Assistance: Building the *Landysh* in the Russian Far East

CRISTINA CHUEN & TAMARA TROYAKOVA

*Cristina Chuen is a Research Associate at the Center for Nonproliferation Studies (CNS), Monterey Institute of International Studies, and a Ph.D. candidate in International Affairs at the University of California at San Diego, specializing in local government and center-region relations in Russia and China. Her recent publications include the co-authored "Russia's Blue Water Blues," in the **Bulletin of the Atomic Scientists** (January 2001), and an editorial in the **International Herald Tribune** on nuclear regulation in Russia. Tamara Troyakova is a Senior Researcher at the Institute of History, Archaeology, and Ethnography of Peoples of the Far East, Russian Academy of Sciences, in Vladivostok, Russia. She also served as Associate Professor at the Far Eastern State University (1995-1999) and the Far Eastern Commercial Institute (1992-1994) in Vladivostok. In addition, Ms. Troyakova was Visiting Fellow at CNS in 2000 and a Visiting Scholar at the George F. Kennan Institute for Advanced Russian Studies, Woodrow Wilson International Center for Scholars, in 1999.*

This report, based on extensive interviews and contemporaneous news accounts, examines the politics surrounding the construction of a Japanese-financed liquid radioactive waste (LRW) treatment plant in the Russian Far East. The facility removes radioactive contamination from water that has circulated in submarine nuclear reactors as coolant. The plant's processors compact the resulting radioactive sludge, and this solidified waste is cemented in barrels for further disposal, with clean water to be discharged.

While the project, located in Primorskiy Kray, one of Russia's Far Eastern provinces, was initiated as a result of environmental concerns, the processing of LRW also has constituted a potential bottleneck in the nuclear submarine dismantlement process. A total of 179 nuclear submarines have been decommissioned from the Russian Navy. Of these, 36 are nuclear-powered ballistic missile submarines (SSBNs), which the United States is helping

dismantle through the Cooperative Threat Reduction Program. Of the remaining 143 submarines, 87 still have nuclear fuel aboard, while the other 56 have been defueled but not dismantled.¹ These vessels pose a global proliferation threat, due to the large amounts of highly enriched uranium (HEU)—a key ingredient of nuclear weapons—contained in their nuclear fuel, a stockpile of fissile material that is not well-protected from theft or diversion.² The surest way to reduce this threat is by dismantling the submarines and storing the spent nuclear fuel in secure, well-guarded facilities. Dismantlement cannot occur, however, unless there is somewhere to put the LRW, spent fuel cores, and reactor compartments. Liquid radioactive waste treatment, therefore, is more than an environmental issue.

Despite seven years of attention and money dedicated to solving this problem, and the fact that construction of an LRW facility was expected to take only one or two

years, it is only in the past year that LRW processing facilities have begun operation in both Russia's Northern and Pacific Fleets. The problematic history of the *Landysh* (Lily of the Valley) LRW processing facility project in the Russian Far East thus offers an important lesson regarding the difficulties of international cooperation in the nuclear sphere. At least some of these problems could have been mitigated with better planning. For example, had project organizers committed themselves to informing the public at an early stage, they might have avoided or at least dissipated the perception among the local populace that the project was fraught with environmental hazards. Furthermore, had the foreign donor supporting the project better understood and involved local and regional actors, the cost overruns and greatly prolonged construction process could have been minimized—even given the inevitable competition between the large number of domestic actors. The organization of the original solicitation of bids and involvement of organizations from several states contributed to the confused process (See Table 1). Meanwhile, despite the large sums that have been spent, LRW remains a serious problem for the region.

BACKGROUND

The Zvezda Far Eastern Shipyard, founded in December 1954, is located in Bolshoy Kamen, Primorskiy Kray, approximately 25 kilometers east of Vladivostok. It was designed to repair and eventually dismantle Pacific Fleet nuclear submarines. According to plant designs from 1964, a LRW processing facility was to be built at the site. Soon thereafter, however, the Navy received Moscow's permission to dump low-level solid and LRW at sea, and the facility was never built. Dumping continued until 1993.³

Zvezda has underground storage facilities for LRW as well as tankers that dock periodically in the bay to remove LRW from nuclear-powered submarines. LRW is also stored in two containers within the plant's territory. However, the majority of the waste (about 1,996 cubic meters) is stored in two aging tankers, *TNT-5*, built in 1960 and officially decommissioned in 1992 with 400 cubic meters of LRW on board, and *TNT-27*.⁴ As of December 1994, monitors on the deck of *TNT-5* registered high radiation levels of 166 microrentgen/hour—that is, 150 microrentgens above normal (but still of minimal danger to humans).⁵ According to one source, in July 1997, *TNT-5* held nearly 800 metric tons of LRW; *TNT-27* stored about 900 metric tons; the *Pinega* processing ship (built to process waste but reportedly not used for that purpose)

held approximately 1,000 metric tons; and about 100 metric tons were housed on several other small vessels.⁶ The amount of LRW the Pacific Fleet produces annually has been reported to be as much as 5,000 metric tons.⁷

On December 29, 1972, the Soviet Union signed the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, commonly known as the "London Dumping Convention" and later renamed the "London Convention of 1972," which banned the dumping of medium- and high-level radioactive waste at sea. The Union of Soviet Socialist Republics (USSR) ratified the convention on November 17, 1975.⁸ Until its amendment in 1993, the London Convention prohibited the disposal at sea of high-level radioactive waste but allowed, by special permit, the dumping of other types of radioactive waste.⁹ In 1983, convention members instituted a voluntary moratorium on all radioactive waste dumping at sea.¹⁰ Nevertheless, the Soviet Union did not sign on to the moratorium and continued to dump its low-level LRW, mostly submarine reactor coolant, at sea.

INTERNATIONAL OUTCRY OVER DUMPING

On October 16, 1993, the leaky Pacific Fleet radioactive waste storage tanker *TNT-27* dumped 900 cubic meters of LRW into the Sea of Japan approximately 100 kilometers south of Nakhodka.¹¹ The Russian Navy informed the International Atomic Energy Agency (IAEA) of the event by letter shortly beforehand (October 7), and stated that the dumping was within safety limits established by the IAEA. Japan was not notified.¹² The international environmental organization Greenpeace filmed the dumping, leading to protests from Japan and South Korea. Ironically, just one week before, during a visit to Japan by Russian President Boris Yeltsin, Yeltsin and Japanese Prime Minister Morihiro Hosokawa signed an agreement to work to end nuclear contamination of the world's oceans.¹³ Still, Yeltsin warned Japan that dumping would continue until 1997.¹⁴ Greenpeace suggested that Russia was trying to rid itself of radioactive waste before the November 8, 1993, meeting of the London Convention.¹⁵

Not only did the dumping trigger an international outcry, but Japanese Foreign Minister Tsutomu Hata himself telephoned Russian Foreign Minister Andrey Kozyrev on the night of October 20 to lodge a formal protest. As a result, on October 21, Prime Minister Viktor Chernomyrdin issued a decision canceling the planned dumping of another 700 cubic meters of waste by the *TNT-5* tanker in

the following days. An important accompaniment to this cancellation was an appeal for foreign financial assistance to construct a low-level radioactive waste processing plant in the Russian Far East. Russian Minister of the Environment Viktor Danilov-Danilyan said that Chernomyrdin had ordered a feasibility study into the construction of a land-based processing facility, estimating that it would cost \$8.5 million. A joint Russian-Japanese working group was set up to propose specific steps to address the problem. Japan offered to help underwrite the project by releasing some of the \$100 million it had earmarked to help Russian nuclear disarmament.¹⁶

As many predicted, at the November 1993 meeting in London, contracting parties to the London Convention decided to prohibit sea dumping of all types of radioactive waste.¹⁷ The ban took effect without the adherence of the United Kingdom, France, China, Belgium, and Russia. Danilov-Danilyan reported at the meeting that without foreign financial help to build a waste treatment plant within 18 months, "Russia will almost certainly have to continue dumping."¹⁸ A Russian Federal Inspectorate for Nuclear and Radiation Safety (Gosatomnadzor) official indicated that Russia abstained from signing the amendment to the London Convention in order to "...retain the right to decide questions of radiological safety during the handling of waste in accordance with its national interests."¹⁹ Just how severe Russia's problems in handling and storing spent nuclear fuel and waste from submarines had become was clear from the shocking report that Danilov-Danilyan presented at the London meeting: "Existing temporary storage facilities...are overfilled, solid radioactive waste from vessels, ships and yards has been accumulating in containers in outdoor areas."²⁰

EARLY WRANGLING OVER SOLUTIONS

At Moscow's suggestion, Japan located a 6,800-metric ton Panamanian-registered chemical tanker to store the LRW. The Russian government rejected the vessel outright, however, saying that the tanker was not equipped with adequate radiation protection, and that the walls were too thin for use along Russia's icy coasts.²¹

With no workable solution in sight, on February 7, 1994, Primorskiy Kray's Intergovernmental Commission on Monitoring Adherence to Radiation Safety Norms determined that LRW stored on *TNT-5* should be dumped in the Sea of Japan the following May. Six weeks later, on March 24, Yevgeniy Stomatyuk, head of the Primorskiy Kray administration's Natural Resources Committee, said

that due to the critical condition of *TNT-5* and *TNT-27*, the following week the Primorskiy Kray administration would make a decision about resuming LRW dumping.²² A highly placed naval official reportedly stated that the situation in Primorskiy Kray was so bad that, if the regional branch of the Environmental Ministry approved the kray administration decision, he was prepared to permit the dumping of LRW into the Sea of Japan.²³

The critical situation onboard *TNT-5* was not the only factor moving the kray administration to make this threat. Equally at fault was the total inaction of the Russian government in pursuing the Japanese grant for the construction of an LRW treatment facility in Primorye. The Kray administration had organized a meeting in February 1994, entitled "On the choice of an optimal alternative for the storage and processing of low-level radioactive waste from 1994 through 1996," which resulted in two decisions: (1) to construct two 1,000-cubic-meter storage containers in May 1994 and several 115,000-cubic-meter containers in late 1994; (2) to design and construct a complex for processing LRW at Zvezda in one to two years. The administration then sent letters to the Russian government and to the Ministry of Foreign Affairs of Japan (MOFA) requesting that the project be included as a part of the international agreement on Japanese support to Russian nuclear disarmament.²⁴

At the first meeting in March 1994 between representatives of Goskomoboronprom (the State Committee on Defense Industries), Gosatomnadzor, the Russian Navy, the Ministries of the Economy and Internal Affairs, and the kray administration, Primorskiy Kray proffered the above solution (the construction of LRW storage facilities at Cape Sysoyeva and a processing facility at Zvezda), which was approved five days later and signed by Deputy Minister of Atomic Energy Nikolay Yegorov. Russia then suggested that Japan send the money it had promised, and Russia would solicit bids itself for the construction of the storage and processing facilities. The Japanese, however, wanted to make certain their money was well spent and insisted on a bidding process supervised by a non-Russian entity, as is required by Japanese law. A Russian-Japanese committee was formed to work out the details.²⁵ By the end of March, several firms, including Japan's Marubeni, Nissei, Nissho Iwai, Kanematsu, and Tomen corporations, had contacted the kray administration. Unfortunately, the kray's many appeals to Moscow to issue an official approval of the tender were met with silence. The region was further worried that the Japanese offer

might be rescinded if it were not acted upon before the Japanese fiscal year ended on March 31.²⁶

BATTLE OVER LRW CONTROL

The dumping threat made by regional officials was the beginning of a long-standing dispute between regional and federal governments over decisions related to the LRW issue. Disagreements over both financial flows and environmental risks jeopardized the project again and again, leading to outcomes unfavorable to all concerned. In late March 1994, after the Primorskiy Kray administration began to push for quick adoption of a Japanese plan, Nikolay Shapovalenko, head of Gosatomnadzor's Division on Oversight for the Radiation Safety of Installations of Defense Significance, argued that the kray administration did not have the right to decide to dump waste, since the issue was under the jurisdiction of the Russian federal government. Furthermore, he maintained, by leaning toward a Japanese LRW processing plant, Primorskiy Kray Governor Yevgeniy Nazdratenko was virtually rejecting the "...effective projects developed by the Far Eastern Division of the Russian Academy of Sciences (DVO RAN), the Radon Special Combine, and other organizations," all of them Russian. In this same vein, Shapovalenko contended that the Japanese technology would use two to three times the electricity needed by the Russian processing plants.²⁷ Instead, he pointed to a Russian plan to begin with a small mobile facility using sorbents to process 0.5 cubic meters of LRW per hour, and subsequently to construct both a permanent facility processing 2.5 cubic meters per hour as well as a plant to produce sorbents.²⁸ Shapovalenko appeared to be putting financial gain above environmental concerns.

Meanwhile, Primorskiy Kray's Stomatyuk continued to issue warnings about the necessity of emptying *TNT-5*. In April, he went so far as to declare that *TNT-5* was barely staying afloat, and that he could only guarantee the safety of LRW storage onboard for one more month.²⁹ Some experts suspected that indeed leaks into the bay had already occurred: gamma radiation levels near the vessel were dozens of times higher than background levels, and tests of the ocean floor below the tanker revealed elevated levels of cesium-137 and cobalt-90. According to Primorskiy Governor Yevgeniy Nazdratenko, in order to keep the crippled *TNT-5* afloat, the territorial administration had to resort to extraordinary measures.³⁰ The locals appeared to want a quick solution to the environmental problem and were not yet focused on financial gain.

In the ensuing years, disputes among central, regional, and local officials over which technologies to use to handle LRW, what companies would build an LRW processing facility, who would license and own the facility, and who would pay for the facility, as well as competition over the distribution of money and privileges, grew increasingly heated.

NEW PROPOSALS TO MOVE FORWARD

In April 1994, the Russian-Japanese Intergovernmental Commission tasked to address the Pacific Fleet LRW problem adopted the February 1994 Primorskiy Kray proposal to begin construction soon for a land-based low-level LRW facility with a storage capacity of 2,000 cubic meters at Cape Sysoyeva, south of Bolshoy Kamen. This facility would house the LRW stored at the time on the aged TNT tankers. The Japanese promised to donate approximately \$2.5 million for the facility. Simultaneously, design and construction of a turnkey mobile floating LRW processing facility (the future *Landysh*) was to start. This facility would cost nearly three times as much as the original proposal for a land-based facility. Deputy Minister of Atomic Energy Yegorov, head of the Russian delegation in the commission, endorsed these solutions as optimal, contingent upon full Japanese financing of the project. HE indicated they had the unified support of the Russian participants.³¹ On May 17, 1994, it became clear that Japan would indeed fund construction of the floating facility.³²

At that time, the responsibility for LRW on the TNT tankers docked near *Zvezda* fell to Goskomoboronprom, to which *Zvezda* was subordinate. This arrangement gave authorities in Primorskiy Kray some rights vis-à-vis the enterprise as well, in their role overseeing regional state enterprises. However, in 1994, central authorities transferred responsibility for the TNT tankers to the Pacific Fleet of the Russian Navy, with which the kray administration had no formal relationship, although it continued to assert its interests in solving the LRW issue. On May 27, 1994, under orders from Moscow, the Russian Navy towed the tankers to a less-populated military installation, designated Shkotovo-28, on Pavlovsk Bay. The Pacific Fleet, and Shkotovo-28 commander Vladimir Valuyev were reportedly unhappy with the arrival of the tankers. Both the regional authorities and the Pacific Fleet demanded that the central authorities grant \$50 million for the construction of a land-based LRW storage facility.³³

As of June 1994, local observers were pessimistic regarding the LRW issue. The Pacific Fleet's leadership did

not appear eager to undertake LRW processing. One local paper even printed an article stating that the fleet's LRW-processing vessel, the *Pinega*, had never been used for that purpose, although it had served in other capacities.³⁴

Positive developments seemed to ensue, however, in the summer of 1994 when the Pacific Fleet began to use new equipment to treat the LRW aboard the tankers. The steam-processing equipment, dubbed "Sharya," was developed by retired naval officer Vladimir Busygin and his company, EkoAtom. During two summer months, the Sharya test processed 300 metric tons of LRW, releasing treated water into the sea while the resulting radioactive sludge was cemented for transport to a storage facility.³⁵ Sharya was to process a total of approximately 3,000 cubic meters of LRW in the following two years, all part of experimental tests.³⁶ At about the same time, the *Pinega* was renovated.

By fall 1994, the situation once again deteriorated: the Cape Sysoyeva storage project was cancelled. Japanese scientists had discovered elevated radiation levels in the area and declared the region unfit for a storage site.³⁷ Some locals disputed the Japanese findings, but project authorization for Sysoyeva, already the site of the Pacific Fleet's only land-based permanent nuclear submarine waste storage facility, was never renewed.³⁸ Later research did indeed reveal high levels of radioactivity in the area.³⁹

Planning for the second project proposed by the Russian-Japanese Intergovernmental Commission in April 1994 moved ahead, however. At the end of the year, Primorskiy Kray officially announced an international solicitation of bids, or tender, for the construction of an LRW-processing facility. On behalf of the Japanese government, Japan's Marubeni Corporation chose the British consulting company Crown Agents to act as an independent expert for the purpose of evaluating any forthcoming proposals.⁴⁰ In accordance with Japanese requirements, only civilian firms were allowed to participate in the tender. Eight firms submitted bids during winter 1995. In late April 1995, however, Moscow insisted that the tender period be extended beyond a May deadline. Gosatomnadzor's Shapovalenko objected that none of the proposals submitted to the committee was for a closed cycle, and he suggested that Primorskiy Kray turn to Russian scientists. He claimed they had already developed waste management processes that could be brought to fruition for just 10 billion rubles (approximately \$2 million), instead of the \$20-25 million a foreign project might cost.

Yet Shapovalenko appeared to be referring to designs by local navy specialists, while Japan did not want to fund non-civilian projects. He urged, in addition, that Russian enterprises participate in the construction of the facility. As a result, the Ministry of Atomic Energy proposed to the Russian government that the first tender be cancelled and that a second be held.⁴¹ While Moscow's arguments were couched in terms of environmental protection, tender results had large financial implications: if Russian firms were involved in construction, they would profit.

MOSCOW DISPUTES CROWN AGENTS' CHOICE

As of the summer of 1995, regional authorities continued to emphasize environmental issues and the need for urgent action. In mid-July, Stomatyuk, head of Primorskiy Kray's Natural Resources Committee, once again threatened that the kray, however uncertain its authority, would direct the local naval representatives to renew dumping LRW in the Sea of Japan, explaining that the TNT tankers were again overflowing. He complained that the dispute between the Primorskiy Kray administration (acting as the contracting agent) and the Ministry of Atomic Energy (the general representative of the Russian participants in the project) over closing the tender and declaring a winner had stymied further action.⁴² Further, he averred that the Japanese side was extremely perplexed by the Russian actions.

According to Shapovalenko, Crown Agents had devised criteria agreeable to Moscow for determining the tender winner and then named the top proposal. Although both Japan and the Primorskiy Kray administration agreed with the Crown Agents' selection, Deputy Minister of Atomic Energy Yegorov and several Moscow experts preferred the project that had placed second.⁴³ They argued that the winning project was untested, did not include cementation of resulting wastes, and involved levels of manual labor that were too high, exposing workers to radiation.⁴⁴ Some observers argued later that since Japan had had no experience in treating LRW from submarines, it would not have been surprising if Japan's initial proposal were not the best technical solution.⁴⁵ On the other hand, kray administration representatives saw Moscow's refusal as most likely motivated by the desire to award the contract to a conglomerate comprised of primarily Russian participants.⁴⁶

Objecting to the delay, Stomatyuk pointed out that according to the rules of the tender, contract talks were to

be held with the winner and a final decision on whether to conclude a contract made immediately thereafter. Had Moscow not altered the process, he asserted, the kray administration would have signed a contract long before.⁴⁷ Instead, the tender had been extended from May 25 to July 25.⁴⁸

To add fuel to the fire, in late July, Japanese radio reported that during the winter, *TNT-5* had leaked LRW into the sea, resulting in elevated radiation readings in Pavlovsk Bay. The Russian Navy denied the charge.⁴⁹ Stomatyuk injected still further urgency into the situation in August, when he suggested that Japan might decide not to finance the LRW project. In his announcement that the tender had been extended a second time until September 20, Stomatyuk noted that the Japanese side had warned that if a winner was not declared by September 20, Tokyo would “close the tender.”⁵⁰

At the end of September, Crown Agents reportedly announced that the tender would be broken off. Yet, as of October 30, the Japanese Ministry of Foreign Affairs affirmed that consideration of submitted projects was still continuing, “...according to plan.”⁵¹

A WINNER IS DECLARED, BUT DISPUTES CONTINUE

In January 1996, the design that had originally placed second was declared the winner: the Russian AMATE consortium, Japan’s Tomen Corporation, and the Babcock & Wilcox Company—an operating unit of McDermott International that had experience in LRW filtration work for the U.S. Navy—signed a contract in Moscow for the construction of a floating LRW processing facility (see Table 1 below for firms and organizations involved in the project).⁵² Nevertheless, disputes persisted over whether international assistance was needed at all. The Pacific Fleet, which did not stand to benefit from the Japanese contract, continued to argue that Sharya could process all of the local LRW, while representatives of the Ministries of Atomic Energy and the Environment countered that Sharya could not handle that much LRW.⁵³

At first, the Primorskiy Kray administration tried not to alienate either side. In late May 1996, Primorskiy Kray Governor Nazdratenko praised Sharya and reported to the press that the kray had given the Far Eastern Branch of the Russian Academy of Sciences 60 million rubles (nearly \$12,000) to reward top scientists, but that the scientists had used all the money to create a working model of

Sharya, leaving them “fainting from hunger.”⁵⁴ Primorskiy Kray’s position regarding the Tomen/Babcock & Wilcox project was unclear, although Yuriy Demchenko, deputy chair of the kray’s Natural Resources Committee, suggested that Sharya would be used in some capacity, yet would not disrupt the agreement already made with Japan.⁵⁵ According to data then released by the Russian-Japanese Intergovernmental Commission, the new Tomen/Babcock & Wilcox complex (which the Japanese would eventually dub *Landysh*) would be able to process 7,000 cubic meters of LRW per year and would cost about \$25 million to construct. The facility would be mounted on a barge 63 meters long, 25 meters wide, and five meters high, to be docked in Bolshoy Kamen.⁵⁶

RADIOACTIVE WASTE IMPORT SCARE SETS LOCAL RESIDENTS AGAINST THE PROJECT

As these developments were unfolding, a new scandal broke out. For several months in early 1996, the Russian press had been speculating that Russia was planning to accept radioactive waste from foreign countries. Primorskiy Kray citizens feared the new facility might attract such waste and began to protest against turning their region into a radioactive dump. Objecting to the *Landysh*, opponents argued that the Pacific Fleet had only 1,500 cubic meters of LRW in storage and produced just 500 cubic meters per year. Project opponents suggested that the excess capacity in the *Landysh* design was intended for the processing of foreign LRW. They pointed to a *South China Morning Post* article, which quoted the director of the Taiwan Power Company (Taipower) as saying that he had signed a secret protocol with Russia and planned to export 2,500–5,000 barrels of nuclear power plant waste to Russia between June and August 1996.⁵⁷ Several news services had already reported that on May 20, 1995, Taipower signed a secret memorandum of understanding with Russia on the storage of Taiwanese nuclear waste in Russia, with a trial shipment to be sent in August. In actuality, the talks had been geared toward sending waste via Murmansk, in Russia’s Far North, to a waste plant in Moscow.⁵⁸ Moreover, it is not clear if the waste in question was solid or liquid; the reports citing liquid waste were in the minority. Despite Moscow’s denials that any talks with the Taiwanese were under way, in January 1996, Gosatomnadzor announced that it had prevented the conclusion of a contract to send radioactive waste from Taiwan to Russia for storage and possible processing. Meanwhile, Moscow’s Kurchatov In-

Table 1: Organizations Involved in the Landysh Project

FUNDING	Japanese Ministry of Foreign Affairs
CONTRACTING AGENT	Primorskiy Kray administration (first tender)
	State Committee on Defense Industries (Goskomoboronprom) Shipbuilding Directorate
AGENT OF JAPAN	Crown Agents (U.K.)
SUBCONTRACTORS	
Japan	Tomen
United States	Babcock & Wilcox
Russia	Amurskiy Shipyard
APPROVAL PROCESS	
Federal	Federal Inspectorate for Nuclear and Radiation Safety (Gosatomnadzor)
	Ministry of Atomic Energy (Minatom)
	Ministry of the Economy
	Ministry of Foreign Affairs
	State Committee on Defense Industries (Goskomoboronprom) Shipbuilding Directorate ⁶⁰
Regional	Primorskiy Kray administration
Local	Bolshoy Kamen legislature (Duma)
OTHERS INVOLVED	
Federal	Ministry of the Environment (Minprirody)
Regional	Zvezda Far Eastern Shipyard
	Russian Navy Pacific Fleet
	Far Eastern Division of the Russian Academy of Sciences (DVO RAN)

stitute stated that it had held talks with Taiwan on LRW processing research, not imports.⁵⁹

Despite the denials and Gosatomnadzor's intervention, local citizens became increasingly worried about the *Landysh* plans. According to a local paper, environmental assessments were to be carried out by Russia's Ministry of the Environment, not international environmental experts, and the construction timetable was unnecessarily hurried, leading to further safety worries.⁶¹

Deputy Minister of Atomic Energy Yegorov denied that the *Landysh* had ever been intended to process imported LRW, citing the Russian law *On Radioactive Waste*, which banned such imports. A few months later the local newspaper *Vladivostok* interviewed experts in Moscow on the issue. The scientists pointed out that Japan did not have nuclear submarines, and that the *Landysh* was specifically

designed to process nuclear submarine waste, not waste from nuclear power plants. According to Professor Stanislav Rubanov of the Krylov Central Scientific Research Institute in St. Petersburg, which conducts research on naval nuclear propulsion, the *Landysh* could handle only Russian or U.S. submarine LRW, not LRW resulting from power plants or from other states' nuclear submarines.⁶² Zvezda Director Valeriy Maslakov explained that *Landysh's* supposedly elevated capacity was in reality a safety measure and not intended to allow the treatment of foreign waste. The dismantlement of one nuclear submarine or service ship results in approximately 300 cubic meters of liquid waste, the director reported. Zvezda planned to dismantle 10 such vessels per year. Furthermore, the 3,000 cubic meters of LRW to be processed could require dilution if the LRW was too saline, and the state of LRW in the submarines subject to dismantlement

was not fully known. Therefore, the *Landysh* was designed with more than enough capacity.⁶³ This did not settle the debate, however, which continued in the press.⁶⁴

ENTER BOLSHOY KAMEN POLITICIANS

By mid-1996, a new group had become involved in the dispute over the *Landysh*: local politicians from the city of Bolshoy Kamen. The town's city council, or Duma, banned construction of a special dock for the *Landysh*, arguing that the facility could pollute coastal waters. Workers at Zvezda Shipyard and the nearby Era shipbuilding plant held meetings to support this decision, even though possible future contracts for submarine dismantlement at Zvezda required the construction of an LRW processing facility somewhere in Primorskiy Kray. The locals feared that the *Landysh* would make their harbor the center of all LRW work for the Pacific Fleet, a task that might otherwise have been handled at the Chazhma Ship Repair Facility, which was much closer to Cape Sysoyeva. Dismantlement might also have been handled at Chazhma. The Primorskiy Kray administration at the time argued that the Bolshoy Kamen decision had been made in violation of several regulations and indicated that it would seek to have Bolshoy Kamen reconsider its ban.⁶⁵

By December 1996, the Primorskiy Kray administration reversed course, coming out against the project and in support of the Bolshoy Kamen deputies. This happened after Moscow had decided to designate Goskomoboronprom the contracting agent, a role previously reserved for the Primorskiy Kray administration. As a result, the kray administration refused to send a representative to participate in contract negotiations, according to Ivan Melnichenko, head of the Goskomoboronprom Shipbuilding Directorate. Thus, Minatom formed a delegation that did not include kray representation, with Melnichenko at its head, a decision that would soon have unfortunate consequences.⁶⁶

Regional actors, such as the Pacific Fleet and scientists from the Far Eastern Division of the Russian Academy of Sciences—both with their own LRW processing designs—only stood to lose financially from the completion of the Japanese project. As for the kray administration, control by Moscow not only meant that money would not be flowing through local hands, but also that the locals would have to trust Moscow to monitor production and maintain the facility after Japanese participation ended. Thus, environmental concerns probably continued to be

a contributing factor to kray intransigence regarding the project.

Nevertheless, in January 1997, the project quickly moved ahead. Babcock & Wilcox designed the processing facility in cooperation with several Russian institutes, including the Onega Research and Design Bureau (in Severodvinsk, Arkhangelsk Oblast) and the OKBM Design Bureau (in Nizhniy Novgorod). By mid-1997, the Amurskiy Shipbuilding Plant in Komsomolsk-na-Amure, Khabarovsk Kray, was assembling the equipment.⁶⁷

Arguing that technical details had been worked out without the participation of local officials and in violation of several Russian laws, Primorskiy Natural Resources Committee chair Stomatyuk claimed that the Bolshoy Kamen deputies had the right to insist that they at least be consulted on the location of the facility. Furthermore, kray authorities protested that the *Landysh* would not clean LRW as thoroughly as Sharya and would require huge financial outlays for the purchase of sorbents abroad.⁶⁸ The Russian Pacific Fleet had also entered into the fray, reporting in December 1996 that it possessed approximately 3,000 metric tons of LRW in storage; that Sharya could process 60 cubic meters of LRW per day; and that a new processing facility was unnecessary.⁶⁹

In contrast, Boris Lesokhin, deputy director of the Onega Research and Design Bureau, said in an interview that the Sharya process resulted in concentrated liquid waste, the cementation of which would result in a volume as great as that of the processed LRW. While this result would be safer than leaving the LRW on the TNT tankers, he argued that it was hardly the best long-term solution.⁷⁰ Valeriy Kiselev, chief specialist at Moscow's Center for Scientific and Technical Information, contended that a new process invented by the scientists at the Far Eastern Division of the Russian Academy of Scientists, led by Valentin Sergiyenko, worked via absorption and only filtered out certain radionuclides, without removing chemical admixtures.⁷¹ In another interview, Melnichenko of Goskomoboronprom added that Russian experts working on the *Landysh* design had been asked to devise usable Russian sorbents, and that Sergiyenko had been invited to send materials, but had not responded.⁷²

By 1997, the town of Bolshoy Kamen had suffered several years of electricity shortages and labor problems, and relations with Moscow were increasingly strained. In the summer of 1997, shipyard workers blocked the

Trans-Siberian Railroad to protest nonpayment of wages. Moscow promised payment by January 1, 1998.⁷³ It was within this heated atmosphere that the Bolshoy Kamen Duma decided to hold a referendum on the *Landysh* issue on June 12, 1997. Despite the tense political mood, with the city administration, Zvezda, and Duma chair supporting the *Landysh* project, and the majority of the Duma fighting it,⁷⁴ only 44.2 percent of registered voters participated in the referendum, rendering it invalid (the law required a minimum of 50 percent participation).⁷⁵ Of those participating, 93.6 percent voted against the *Landysh*, many citing fears that LRW would be imported.

On June 17, 1997, the Bolshoy Kamen Duma issued a decision entitled *On preliminary coordination of the placement of a moorage wall for the LRW processing complex on the territory of the Zvezda Far Eastern Shipyard*. This decision rejected docking the *Landysh* at Zvezda.⁷⁶ In September, however, new evidence of LRW leaks in one of the ground-based storage tanks near the harbor appeared.⁷⁷ At the same time, Zvezda argued that it might not be allowed to dismantle nuclear submarines without a LRW processing facility (though at the time Zvezda was without work), and local politicians understood that the *Landysh* was likely to be built with or without local permission. These factors led the Duma to alter its position, and on October 13, 1997, the body issued a new decision, *On the placement of the floating complex for LRW processing*, approving the *Landysh* but requiring that construction of the complex comply with Russian legislation.⁷⁸ At the same time, the Duma issued a document signed by Bolshoy Kamen Mayor Anatoliy Karasev that approved placement of the moorage wall if the following conditions and guarantees were met:

1. State bodies must assist local authorities in solving employment problems in according with the law *On Closed Cities*.
2. An amount equivalent to 10 percent of construction expenses must be paid to the local budget for local development.
3. An amount equivalent to one percent of Zvezda's 1997 and 1998 state orders must be paid to the local budget for the creation of a sanitary-protective zone around the facility and for the protection of children's health.
4. A monitoring system must be created to monitor and to inform the population on the radiation situation.
5. A regional radioactive waste storage facility must be created in the Russian Far East.

6. The import of radioactive waste from abroad for processing and storage must be prohibited.

The Bolshoy Kamen administration was made responsible for the implementation of the decision.⁷⁹

Possible radioactive contamination of the environment was discussed at the national level as well. In a letter to State Environmental Committee Chair Vladimir Danilov-Danilyan, Russian Duma Environmental Committee Chair Tatyana Zolotnikova noted that a state environmental impact study on constructing a floating LRW processing facility at Bolshoy Kamen found that the project violated Russian environmental law on four counts.⁸⁰

During the run-up to the December 7, 1997, elections to the Primorskiy Kray Duma, many candidates emphasized the radioactive waste issue, staking out positions both for and against the *Landysh*. For instance, Vladimir Khalyavko proposed removing the LRW complex from the bay to a safe place far from residential areas and banning any LRW or solid radioactive waste (SRW) storage at Zvezda.⁸¹

PROBLEMS DELAY PROJECT AND INCREASE COSTS

In 1997, the *Landysh* project hit the first of many construction delays. Journalists reported that a computer system worth \$10,000 was stolen from the complex during its construction in Komsomolsk-na-Amure, Khabarovskiy Kray. The partially completed *Landysh* was finally towed to Vostok Shipyard in Bolshoy Kamen in November 1997.⁸² The projected start-up date for LRW processing slipped repeatedly from the original September 1997 projection—first to January 1998, then to November 1998, and eventually to October 2000. Although construction was completed in June 1998, the *Landysh* remained inoperational: the Russians refused to certify it until all “technical problems” were resolved. In addition, Russian specialists reportedly sent Babcock & Wilcox new requirements. For instance, according to the U.S. contractor, the original design specifications did not include all of the specific wastes contained in the LRW.⁸³ The Russians claimed that the Americans had not been as careful as they might have been.⁸⁴ Aleksander Kiselev, head of Zvezda's nuclear and radioactive security department, accused the U.S. specialists of delaying, rather than solving technical problems identified by the Russian side.⁸⁵ The Americans, for their part, suspected that the Russians were manufacturing problems in order to increase

money flowing to the project. Babcock & Wilcox took on significant costs itself, due to a clause in its subcontract with the Tomen Group that forced it to bear a considerable portion of the cost overruns.⁸⁶

In the fall of 1998, the facility began undergoing mooring trials, which had been delayed twice before—in September 1997 and January 1998. The trials were conducted according to a program agreed to by specialists from Russia and Babcock & Wilcox; the Zvezda shipyard, oversight agencies, and the Ministry of the Economy coordinated them.⁸⁷

Less than a year later, in August 1999, another incident involving LRW emphasized the importance of completing the *Landysh*. According to press reports, approximately 750 metric tons of LRW housed on the *Pinega* LRW processing vessel, docked in Bolshoy Kamen, leaked out of special storage tanks and into the unprotected hold of the ship. *Pinega* had rarely been used to process waste, particularly since an accident aboard a similar ship in the Northern Fleet several years earlier, but it had continued to house LRW.⁸⁸

Nevertheless, as of August 1999, the *Landysh* was still not ready. A reported 137 defects had yet to be remedied. Among other technical problems, local specialists pointed to the accelerated corrosion of metal pipes by seawater, as opposed to fresh water, noting that the U.S. contractor had not been aware of the difference. As a result, it was necessary to replace some piping. The *Landysh* had cost \$29 million by this stage.⁸⁹ Scientists at the Far Eastern Division of the Russian Academy of Sciences (DVO RAN) claimed that the *Landysh* designs used obsolete technology, based on energy-intensive evaporation technology invented in the 1950s—similar to the technique used on *Pinega*, except that waste products from the *Landysh* would be cemented, whereas *Pinega* waste was to be bitumenized.⁹⁰

Controversy over the issue continued into the year 2000, when Zvezda Director Maslakov denied continuing rumors that the *Landysh* technology was obsolete, noting that it was similar to that in current use in the United States, England, and France. He added that other inventions may in the long run prove better, but had yet to be licensed.⁹¹ One of these “other inventions” was most likely the new design, dubbed “Baryer,” or Barrier, which its inventors, Sergiyenko and other scientists at DVO RAN’s Institute of Chemistry, claimed would prove 3.5 times more effective than the *Landysh*. As yet, the scientists had neither the license nor the funds to bring the Baryer project to

fruition. Nor was it clear whether Baryer’s projected effectiveness would actually be borne out by tests.⁹²

OPERATION WITHOUT FULL LICENSE

In 2000, the *Landysh* was finally towed from Vostok Shipyard to the dock at Zvezda. The first tests using LRW were carried out on July 6,⁹³ and on August 16, Interfax reported that the tests were successful. The *Landysh* had been commissioned and would be operational in October 2000.⁹⁴ At present, specially trained civilians are operating the plant. The captain of the *Landysh*, Vladimir Petrovich Babko, commands a crew of 12. The facility has three diesel generators, which can provide energy for 30 days if shore-based power is unavailable. One hundred cubic meters of LRW result in seven cubic meters of solidified waste, which is cemented into barrels. As a rule, about 12 barrels are filled per shift. There are four waste holds in the *Landysh* itself. In addition, at Severniy Mol, 600 meters north of Zvezda, a temporary waste storage facility and a low-level SRW processing and compacting facility (which reduces the volume of SRW by 10 times) are being constructed. The temporary storage facility is designed to hold waste for up to one month, by which time it is to be loaded on railcars and sent to a permanent storage site. The level of radiation in the *Landysh* is a mere 10 microroentgens per hour.⁹⁵ The *Landysh* is intended to operate for 25 years.⁹⁶

The *Landysh* was officially certified as ready to begin operations on October 6, 2000, despite the fact that in August two deputies from the Bolshoy Kamen Duma, Mayya Kiriyenko and Sergey Nikitin, both members of the State Commission on PZO-500 (the official designation of the *Landysh*), refused to sign the state certification act (also known as the Acceptance Act), accepting the results of the hot testing. Instead, they issued a dissenting opinion demanding that technical work on the shoreline and certain other construction be completed before the *Landysh* begin operations. In particular, they insisted on construction of a long-term SRW storage site in the area. They argued that the current complex violated three acts: the Russian law *On environmental protection*; the December 27, 1997, government decree *On a floating LRW processing complex*; and the gubernatorial decree *On confirmation of the norms and rules for the acceptance and commissioning of completed constructions on Primorskiy Kray territory*.⁹⁷

While the deputies emphasized environmental arguments, they clearly wanted to obtain further financing for

local projects as well. There was also local conflict over improvements to the railroad between Bolshoy Kamen and Smolyanino, the route by which wastes would be sent to a permanent storage site, since some 69 people lived in the small village of Chaykino, through which the line was to pass. Chaykino was officially disbanded in 1963, but residents continue to live there nonetheless, and local officials were uncertain whether or how to move them out of the area, an expensive proposition.⁹⁸

Through the end of 2000, the safety of the *Landysh* continued to be the subject of some dispute in the Russian press. An article in *Moskovskiy komsomolets* argued that the long-term storage of solid wastes had not been solved, that some necessary on-shore equipment had not been completed, that LRW may be imported, and that dangers remained for Bolshoy Kamen residents.⁹⁹ *Izvestiya* wrote that the *Landysh* was ineffective, expensive to run (the article cites the figure of \$700,000 per year), and can only handle LRW with a particular salt content that contains no oil residues.

In opposition, Zvezda's chief engineer, Yuriy Shulgan, wrote an article disputing these arguments. He stated that questions about storing the solid waste resulting from LRW processing had been completely solved. According to legislation, he maintained, these wastes were the responsibility of the Far Eastern Federal Enterprise for Handling Radioactive Wastes (DalRAO), established in February 2000, and would be sent to the Radon waste storage facility in Khabarovskiy Kray. Further, he argued that the *Landysh* was a completely autonomous facility, which did not require any on-shore equipment. It has diesel generators to power operations, extra fuel and water, and temporary LRW storage facilities on board. As for dangers, Shulgan pointed out that only 0.0002 percent of the radioactivity resulting from submarine dismantlement would be handled by the *Landysh*, and that local residents were already thoroughly protected by existing Russian laws. He noted that all of the scientists and governmental experts on the State Commission on PZO-500 had signed the state certification act, and that the only two commission members who had refused to sign were Bolshoy Kamen Duma deputies with no technical expertise. As for alternatives, Shulgan argued that Sharya resulted in a lower volume of LRW with higher radioactivity, while the Baryer processing technology developed by scientists at DVO RAN's Institute of Chemistry had not proven capable of ridding LRW of chemicals. Russian environmental legislation, he

stated, would not allow the dumping of liquids with the resulting chemical concentrations.¹⁰⁰

The Acceptance Act by the State Committee on PZO-500 was part of the process of approval required by Gosatomnadzor before it would issue the necessary licenses to begin operation. Processing was finally allowed to begin on December 6, 2000, when Gosatomnadzor issued a waste processing license. Also issued was a Waste Package Certificate (allowing the offloading of drums of cemented radioactive waste), but to date the facility still awaits an Admissible Discharge authorization to discharge the treated liquid waste. This last license has been delayed due to a new procedure covering the discharge of tritium at coastal treatment facilities throughout Russia.¹⁰¹ According to a Japanese official, low levels of tritium and transuranic elements were reportedly detected on the *Landysh* at one point last year. Allegedly, sludge loaded with waste gave off alpha emitters. However, during hot testing, the level of alpha emitters was well below the minimum reportable limit.¹⁰² While the situation appears to have been resolved, and the Russians have assured contractors that they will not try to load and treat medium-level radioactive waste, it is no surprise that Gosatomnadzor is ensuring that there are systems to guarantee that tritium and transuranic elements are not present in treated waste.

POLITICS SURROUNDING LANDYSH REMAIN RADIOACTIVE

Late last year, arguments regarding the *Landysh* heated up once again. While some observers blamed the local Duma for having allowed the floating facility to dock at Zvezda, other local reporters pointed out that the terms of the Duma's agreement, from payments to the budget to the ban on temporary SRW storage in the city, were not being met.¹⁰³ Then the Duma scheduled Bolshoy Kamen mayoral elections for December 24, 2000, inflaming the political atmosphere still further. Local Duma Deputy Sergey Zharinov proposed holding a new referendum on the *Landysh* at the same time. Some local newspapers supported the initiative, claiming that in 1994 even Zvezda Director Maslakov had been against placing an LRW-processing facility in Bolshoy Kamen, a "densely populated" area.¹⁰⁴ Arguments were made that the public should receive more information on the facility, and that a referendum could help Bolshoy Kamen bargain with the government.¹⁰⁵ Public Prosecutor V. Portov officially

protested the September 29, 2000, Duma decision to discuss the Zharinov initiative on October 10, arguing that procedures to hold a referendum had been violated.¹⁰⁶ Nevertheless, after hearings the Duma voted on whether to schedule a referendum: three deputies voted for the referendum, three against, and three abstained, while two deputies were absent. Neither of the two deputies on the State Commission on PZO-500 voted for the referendum. With only three votes in its favor, the measure failed to pass.¹⁰⁷

Subsequently, Bolshoy Kamen mayoral candidate Vladimir Khalyavko proposed a “third” solution to the *Landysh* problem—neither banning the complex nor continuing the project as it stood. His plan contained five elements:

1. *Landysh* ownership would be transferred from the federal to the municipal government. Khalyavko argued that because it was a gift from “the Japanese people to the Russians as an example of friendship,” an ownership change would bring the plant closer to the people, the intended recipients of the gift.
2. If elected, Khalyavko would require the federal budget to transfer approximately 50 million rubles (about \$1.8 million) for maintenance to the local budget each year.
3. The Bolshoy Kamen administration would lease land from Zvezda and hire plant employees for technical service and monitoring: any owner of LRW—Zvezda, the Russian Navy, other Russian parties, or foreigners—would have to conclude an agreement on LRW processing with the city administration. The price of such work would be set in such an agreement.
4. The Bolshoy Kamen Duma would control processing prices and distribute revenues for guaranteed social services in accordance with the law *On Closed Cities*. The local Duma would also organize independent environmental impact assessments.
5. After one year of activity, the Duma would publish the results of the environmental impact assessments and all relevant proposals. If a local resident appealed for a referendum, it would be held.¹⁰⁸

The author of this plan, Khalyavko, is a former technician and deputy director at Zvezda, and director of the Gaydamak Shipyard. The Primorskiy branch of Yavlinskiy’s Yabloko Party supported him.

His chief opponent Anatoliy Karasev, also a former Zvezda employee, had been mayor of Bolshoy Kamen since 1996 and was a supporter of the *Landysh*. As neither man won over 50 percent of the votes on December

24, a run-off election was required. In the second round, held on January 14, 2001, Karasev was reelected with 50.53 percent of the votes to Khalyavko’s 42.33 percent.¹⁰⁹ While this election result gives the *Landysh* project a reprieve, it is likely that it will remain an issue in future elections—such as elections to the Primorskiy Kray Duma in December 2001, when the current Bolshoy Kamen Duma deputy, Ivan Rogovoy, is likely to be challenged by Vladimir Khalyavko.

In December 2000, during the time of the mayoral elections, the Zvezda administration began a special public relations campaign to promote the *Landysh* and assuage fears. Excursions were organized for local residents, and first of all for teachers. A Zvezda museum was opened to the public.¹¹⁰ While such measures may help alleviate fears of radiation from the facility, the struggle over control and financing is likely to continue. Legal questions remain. Moreover, there are still fears that foreign radioactive waste may be imported, and that problems may occur due to unsafe storage of solid radioactive waste byproducts. Finally, questions linger regarding the operation of the facility after Japan’s obligations are met.

CONCLUSIONS

A major lesson of the *Landysh* project is that effective coordination and communication between foreign donors, local actors, and all central government agencies involved in such an enterprise are critical. The setbacks that occurred in this project were not inevitable. Not only could delays have been largely avoided, but also local and regional actors could have played a coordinated role as project advocates. On the other hand, if concerned parties, such as Bolshoy Kamen politicians and the Primorskiy Kray administration, are left out of the negotiation process, one should expect they might well attempt to stymie the project or hold it hostage in order to obtain benefits.

In the *Landysh* case, disagreement regarding expectations was neither discovered nor addressed early in the negotiations. The objectives of each participant were different; it appears that little care was taken to ensure that objectives were met or pay-offs determined in advance to eliminate constant renegotiations. Local politicians and citizens proved to be a great stumbling block, although they might have been secured as allies. Had the benefits of the project been presented with conviction, concerned residents might have become advocates. The secrecy surrounding the project made it difficult to convince the public that it was not being duped. Failure to disclose informa-

tion at the outset rightly raised local concerns; later attempts to inform the public were difficult, as the locals had already begun to fear the project.

The lack of clarity in relations between the central government, regional and local authorities, and military departments made implementation of the *Landysh* project extremely difficult. The Japanese donors were unable to ensure that central authorities would inform the local public and cooperate with regional and local actors. Instead, local, regional, and central actors struggled over control of the venture. In projects with a strong local impact, it would behoove foreign donors to make direct contact with local actors, not to muddy the negotiation process, but to explain objectives and lay out what the locals can expect. The aim is to defuse possible local objections and minimize distrust. In the *Landysh* case, it might have helped the promoters' cause to explain that under Japanese law an international tender must be held, and that only civilian firms can participate. Local dissatisfaction over a process that appeared to favor foreign contractors and failed to choose a local Russian Navy invention would probably have been significantly mitigated.

Politics were not the only cause of project delays. As Babcock & Wilcox complained, it appears that the Russian federal government did not ensure that contractors had been given all necessary specifications before the facility was designed. Subsequent design changes led to delays and cost overruns. To minimize such risks, foreign donors can insist on agreements making the Russian side responsible for cost increases associated with specification changes, or alternatively, by contracting with a Russian organization to complete work on a fixed-price basis.

The *Landysh* is finally in operation, eliminating the backlog in LRW treatment that could otherwise have been a bottleneck in the submarine dismantlement process, while protecting the environment. That its construction took years more than technically necessary, triggering cost overruns reportedly in excess of \$15 million dollars, is an unfortunate reality that may be avoided in future projects by heeding the lessons learned here. We hope that a thorough understanding of the politics behind the *Landysh* project will help future donors and aid recipients alike understand each other, so that they may more confidently undertake the many projects that continue to be necessary to protect the Russian environment and to ensure

that would-be proliferators not obtain nuclear materials in Russia.

¹ Estimates based on material in the Monterey Institute of International Studies, Center for Nonproliferation Studies, *NIS Nuclear Profiles Database*, <<http://cns.miiis.edu/db/nisprofs/index.htm>>

² James Clay Moltz and Tamara C. Robinson, "Dismantling Russia's Nuclear Subs: New Challenges to Non-Proliferation," *Arms Control Today* 29 (June 1999), <<http://www.armscontrol.org/ACT/jun99/subjun99.htm>>.

³ Nina Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody"[What do you eat with liquid radioactive waste], *Vladivostok*, March 12, 1997, <<http://vl.vladnews.ru>>.

⁴ Figures on radiation levels vary. The authors have been unable to determine the density of stored LRW and have therefore not converted volume to weight. "V Primorskom Kraye planiruyetsya sozdat kompleks po ochildke zhidkikh radioaktivnykh otkhodov, zayavlyayut v Gosatomnadzore RF"[In Primorskiy Krai they plan to create a liquid radioactive waste cleaning complex, announces Russia's Gosatomnadzor], Interfax, March 29, 1994, in Integrum Techno, <<http://www.integrum.ru>>.

⁵ Vyacheslav Nedogonov, "Naydeno novoye primeneniye samogonnomu apparatu"[A new application for the still], *Moskovskiy Novosti*, December 8, 1994, in Integrum Techno, <<http://www.integrum.ru>>.

⁶ "Kak khoronat atomnyye submariny... na Dalnem Vostoke"[How nuclear submarines are buried in the Far East], *Yadernaya Bezopasnost*, July 15, 1997. While the volume of LRW on the smaller vessels is relatively low, the radioactivity of some of that LRW is high. According to Yuriy Ralin, in 1994, *PM-133* had just 46 cubic meters of LRW, but emitted .35 Curies of radiation, whereas the 794 cubic meters of waste on *TNT-5* emitted .776 Curies. *PEK-170* and *PEK-171* held 80 cubic meters of material, emitting .304 Curies. *Pinega's* 320 cubic meters emitted .64 Curies. The highest radiation levels were recorded on *PM-125*, which held 108 cubic meters of LRW emitting 21.6 Curies (three times the 7.044 Curies emitted by the 905 cubic meters of LRW aboard *TNT-27* in 1994). Yuriy Ralin, "Radiatsiya: v TNT-5 solominku my ishem, brevna ne zamechaya v 'Pinege'"[Radiation: we are looking for a straw on TNT-5, not noticing a log on 'Pinega'], *Novosti*, 1994.

⁷ Other reports cite the figure of 12,000 cubic meters. Much of the LRW produced each year remains in operating submarines. "Kak khoronat atomnyye submariny... na Dalnem Vostoke;" Yelena Matveyeva, "'Bomba' pod Bolshoy Kamen"[A 'bomb' under Bolshoy Kamen], *Moskovskiy novosti*, June 1, 1994, in Integrum Techno, <<http://www.integrum.ru>>.

⁸ UNEP Convention Summary, <<http://sedac.ciesin.org/pidb/register/reg-067.mrr.html>>.

⁹ IAEA Bulletin, <<http://www.iaea.org/cgi-bin/AT-mainsearch.cgi?sum=d13466>>.

¹⁰ Kirsti-Liisa Sjoebloom and Gordon S. Linsley, "The International Arctic Seas Assessment Project: Progress Report," <<http://www.iaea.org/worldatom/Periodicals/Bulletin/Bull372/sjoebloom.html>>.

¹¹ Nedogonov, "Naydeno novoye primeneniye samogonnomu apparatu;" Olivia Ward, "Nuclear Waste Dots Russian Landscape," *Toronto Star*, October 23, 1993, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Vera Romanova, "Dengi na mogilnik" [Money for a burial site], *Kommersant*, April 18, 2001, in Integrum Techno, <<http://www.integrum.ru>>.

¹² Teresa Watanabe and Richard Boudreaux, "Russian Nuclear Waste Sparks Feud," *Los Angeles Times*, October 19, 1993, p. 7, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Reuters, "Russia Readies 2nd 'Burial' of Nuclear Waste in Sea of Japan," *Los Angeles Times*, October 20, 1993, p. 20, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>.

¹³ Reuters, "Russia Readies 2nd 'Burial' of Nuclear Waste in Sea of Japan."

¹⁴ Watanabe and Boudreaux, "Russian Nuclear Waste Sparks Feud."

¹⁵ Nedogonov, "Naydeno novoye primeneniye samogonnomu apparatu."

¹⁶ Hugo Gurdon, "Russia Halts Radioactive Dumping in Sea of Japan," *Daily Telegraph*, October 22, 1993, p. 17, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Gillian Tett and William Dawkins, "Russia Bows

to Japan Pressure on Dumping,” *Financial Times*, October 22, 1993, p. 4, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Reuters, “Russia Readies 2nd ‘Burial’ of Nuclear Waste in Sea of Japan.”

¹⁷ Sjoebloom and Linsley, “The International Arctic Seas Assessment Project.”

¹⁸ Brad Knickerbocker, “Ban on Dumping Nuclear Waste at Sea,” *Christian Science Monitor*, November 15, 1993, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>.

¹⁹ Nikolay Shapovalenko, head of the Division on Oversight for the Radiation Safety of Installations of Defense Significance of the Russian Federal Inspectorate for Nuclear and Radiation Safety (Gosatombnadzor), as cited in “Administratsiya Primorskogo Kraya ne imeyet prava samostoyatelno priminat resheniye o sbrose radioaktivnykh otkhodov v Yaponskoye more, schitayut v Gosatombnadzore RF” [The Primorskiy Kray administration does not have the right to independently make a decision on the dumping of radioactive waste in the Sea of Japan, believes Russia’s Gosatombnadzor], Interfax, March 25, 1994, in Integrum Techno, <<http://www.integrum.ru>>.

²⁰ Nicholas Schoon, “Soviets Sank Nuclear Reactors in Shallow Seas; Russians Admit Radioactivity Equal to Half of Chernobyl Fall-out was Dumped,” *Independent*, November 10, 1993, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>.

²¹ “Japan to Help Russia Pay for Building N-waste Plant,” *Daily Yomiuri*, February 6, 1994, p. 1, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Japanese official (name withheld on request), interview by author, June 2001.

²² Nedogonov, “Naydeno novoye primeneniye samogonnomu apparatu;” and “Administratsiya Primorskogo Kraya ne imeyet prava.”

²³ “Administratsiya Primorskogo Kraya ne imeyet prava.”

²⁴ “Protokol soveshchaniya pri glave administratsii Primorskogo kraya Ye. Nazdratenko” [Protocol of a conference chaired by Primorskiy Kray administration head Ye. Nazdratenko], *ZATO*, September 28, 2000, p. 2.

²⁵ Kolesnichenko, “S chem yedyat zhidkiye radioaktivnyye otkhody.”

²⁶ Valeriya Sycheva and Denis Demkin, “Situatsiya v Primorye” [The situation in Primorye], *Kommersant-Daily*, March 25, 1994, in Integrum Techno, <<http://www.integrum.ru>>.

²⁷ “Administratsiya Primorskogo Kraya ne imeyet prava.”

²⁸ However, as of late March 1994, the Russian government had not begun funding the project. “V Primorskom Kraye planiruyetsya sozdat kompleks po ochestke zhidkikh radioaktivnykh otkhodov, zayavlyayut v Gosatombnadzore RF.”

²⁹ Yuriy Belyy, “Tankery s radioaktivnymi otkhodami: idet TNT, kachayetsya. Sdykhaty na khodu” [Tankers with radioactive waste: TNT rolls, pitches, and dies while on the move], *Novosti*, April 1, 1994, p. 2.

³⁰ Yuriy Ralin, “Radiatsiya: umru li ya, i nad mogiloyu gori-siyay, moya ‘Zvezda’” [Radiation: if I should die, let ‘Zvezda’ glow above my grave], *Novosti*, April 5, 1994, p. 3.

³¹ “Moskva predlagayet Yaponii puti resheniya problemy zhidkikh radioaktivnykh otkhodov” [Moscow suggests to Japan ways to solve the liquid radioactive waste problem], Interfax, April 23, 1994; Nedogonov, “Naydeno novoye primeneniye samogonnomu apparatu.”

³² Nedogonov, “Naydeno novoye primeneniye samogonnomu apparatu.”

³³ Ibid.

³⁴ Matveyeva, “‘Bomba’ pod Bolshey Kamen.”

³⁵ Nedogonov, “Naydeno novoye primeneniye samogonnomu apparatu.”

³⁶ Pacific Fleet Press Center and Interfax-Eurasia, “Radioaktivnykh otkhodov v Primore ostalos menshe” [Less radioactive waste remains in Primorye], *Vladivostok*, December 6, 1996, p. 1.

³⁷ Kolesnichenko, “S chem yedyat zhidkiye radioaktivnyye otkhody.”

³⁸ Oleg Zhunusov and Sergey Leskov, “Aleyet Vostok stat mertvym” [The East reddens and dies], *Izvestiya*, August 7, 1999, in Integrum Techno, <<http://www.integrum.ru>>.

³⁹ In late 2000, Russian scholars reported radiation levels of 0.15 to 2.4 microGrays per hour on 80 percent of facility territory, and levels of 2.4 to 600 microGrays per hour on the remaining 20 percent. A long-term examination indicated large releases of LRW every one to two years due to leaks from up to half of the storage facilities during severe weather. The territory and nearby aquifer, as well as the floor of Sysoyeva Bay, all emitted levels of radiation that exceeded ambient levels by tens to thousands of times. V.A. Danilyan,

V.L. Vysotskiy, and A.A. Maksimov, “Radio-ekologicheskaya obstanovka na territorii beregovykh tekhnicheskikh baz dalnevostochnogo regiona” [The radioecological condition of the territory of Far Eastern shore-based technical bases], *Atomnaya energiya* 89 (August 2000), pp. 160-166.

⁴⁰ Zhunusov and Leskov, “Aleyet Vostok stat mertvym.”

⁴¹ Natalya Gorodetskaya, “Radioaktivnyye otkhody opyat mogut okazatsya v Yaponskom more” [Radioactive waste could once again find itself in the Sea of Japan], *Segodnya*, July 15, 1995; “Vozmozhen novyy sbros v more zhidkikh radioaktivnykh otkhodov v Yaponskoye more – predstavitel administratsii Primorya” [Further dumping of liquid radioactive waste in to the Sea of Japan is possible – Primorskiy administration representative], Interfax, July 13, 1995; Yu. Vasilev, “A svoikh snova zadvinuli” [And they pushed for their men again], *Rybak Primorya*, June 7, 1996, <<http://ribak.vladivostok.com>>.

⁴² “Vozmozhen novyy sbros v more zhidkikh radioaktivnykh otkhodov v Yaponskoye more – predstavitel administratsii Primorya.”

⁴³ “Yaponskaya storona nedoumevayet po povodu pozitsii Rossii v voprose ob utilizatsii zhidkikh radioaktivnykh otkhodov na Dalnem Vostoke” [The Japanese side is puzzled by the Russian position on the question of liquid radioactive waste disposal in the Far East], Interfax, July 17, 1995.

⁴⁴ Kolesnichenko, “S chem yedyat zhidkiye radioaktivnyye otkhody.”

⁴⁵ Argument cited in James Clay Moltz, “Japanese Assistance to The Russian Nuclear Complex,” paper delivered to Conference on U.S.-Japan Cooperation in the Sustainable Development of the Russian Far East, Monterey Institute of International Studies, Monterey, California, April 14-15, 2000.

⁴⁶ The conglomerate, called AMATE (Association of Sea Atomic Techniques and Ecology), was created by several Russian government departments, including the Navy, the State Committee on Defense Industries (Goskomo-boronprom), the Ministries of Economics and the Environment, and the Russian Academy of Sciences, along with the Kurchatov Institute and the Metal-Conversion company, with the participation of U.S. and Japanese capital via a joint venture called BTW. Nina Kolesnichenko, “It is Possible ‘to Rule’ Over Radioactive Waste,” *Vladivostok*, May 23, 1996, p. 5.

⁴⁷ “Yaponskaya storona nedoumevayet po povodu pozitsii Rossii v voprose ob utilizatsii zhidkikh radioaktivnykh otkhodov na Dalnem Vostoke.”

⁴⁸ “Yaponiya mozhet otkazatsya ot finansirovaniya rabot po utilizatsii radioaktivnykh otkhodov na Dalnem Vostoke Rossii” [Japan may refuse to finance work on radioactive waste disposal in the Russian Far East], Interfax, August 4, 1995.

⁴⁹ “Press-tsentr Tikhookeanskogo flota nazyvayet informatsiyu yaponskogo radio ob utechke ZHRO s TNP-5 vymyslom” [The Pacific Fleet press center calls Japanese radio report on LRW leak from TNP-5 [sic] a fabrication], Interfax, July 24, 1995.

⁵⁰ “Yaponiya mozhet otkazatsya ot finansirovaniya rabot po utilizatsii radioaktivnykh otkhodov na Dalnem Vostoke Rossii.”

⁵¹ Vasily Golovnin, “MID Yaponii oproverg soobshcheniya o tom, chto Tokio prevzal ili reshil zatyanut mezhdunarodnyy tender na stroitelstvo v Primore obekta po pererabotke zhidkikh radioaktivnykh otkhodov” [Japan’s MOFA refuted announcement that Tokyo had broken off or decided to extend the international tender for construction of a radioactive waste processing facility in Primorye], TASS, October 30, 1995.

⁵² Vasilev, “A svoikh snova zadvinuli;” Moltz, “Japanese Assistance to the Russian Nuclear Complex.”

⁵³ Valentin Sergiyenko, deputy chair of the Far Eastern Branch of the Russian Academy of Sciences, argued that a Russian project, with which he was associated, was not only the cheapest, but also the best solution, while the method used in the foreign design was designed to handle only “sterile” water that did not include oils or other organic matter. Other observers do not support this view, although it may have been an accurate criticism of the Japanese design that placed first in the original tender. See Vasilev, “A svoikh snova zadvinuli.”

⁵⁴ Vasilev, “A svoikh snova zadvinuli.”

⁵⁵ Ibid.

⁵⁶ “Liquid Waste Disposal Facility is Soon to be Completed,” *Japan Atomic Energy Industrial Newsletter*, April 16, 1998.

⁵⁷ Oleg Kryuchek, “Rossiya, vozmozhno, budet pererabatyvat aziatskiye radioaktivnyye otkhody” [Russia may process Asian radioactive waste], *Segodnya*, April 19, 1996.

⁵⁸ Apparently, a Moscow-based firm had planned to send the waste via Murmansk to the Radon waste storage facility in Sergiyev Posad, a town about 50 kilometers northeast of Moscow. See NTV, January 6, 1996, in "Nuclear safety committee thwarts plans to process Taiwan nuclear waste in Russia," *BBC Summary of World Broadcasts*, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; "Taiwan and Russia to Sign Agreement on Storage of Nuclear Waste," Deutsche Presse-Agentur, May 20, 1995, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; "Taiwan Signs Nuclear Waste Accord With Russia," Agence France Presse, June 19, 1995, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>; Andrei Ivanov, "Industry Fights to Circumvent Nuclear Waste Law," *Inter Press Service*, December 6, 1995, in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com>>.

⁵⁹ NTV, "Nuclear safety committee thwarts plans."

⁶⁰ Goskomoboronprom was abolished and its functions absorbed by the Ministry of the Economy after a March 1997 cabinet reorganization. On May 25, 1999, the Russian Shipbuilding Agency was created by presidential edict. It took charge of naval shipyards, including *Zvezda*, from the Ministry of the Economy. Government Decree No. 665, *O Komissii Pravitelstva Rossiyskoy Federatsii po voyenno-promyshlennym voprosam*, 22 June 1999; in *The Legislation in Russia*, <<http://law.optima.ru>>.

⁶¹ Vasilev, "A svoikh snova zadvinuli."

⁶² Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody."

⁶³ Larisa Berdyanskaya, "'Landysh': oprovergayem mify" [*Landysh*: debunking the myths], *ZATO*, October 12, 2000, pp. 1-2.

⁶⁴ Such arguments regarding waste imports were rejected by a nuclear reactor specialist and a radiologist in an open letter printed in the local newspaper *Bolshoy Kamen*. These opponents argued that laws in Russia are easily changed, and they were skeptical that Minatom was not interested in importing foreign waste. Given current attempts to amend legislation to allow the import of spent nuclear fuel and Minatom's plans to reprocess that fuel in 20-30 years, this argument rang true. Furthermore, the two men disputed the notion that *Landysh* could not handle power reactor waste, citing the characteristics of the various types of waste as well as the Japanese and Korean need for a solution to their own radioactive waste problems. Finally, they questioned the wisdom of setting up a temporary solid radioactive waste storage facility (to handle the solid radioactive waste *Landysh* produces in cleaning LRW) in Bolshoy Kamen, noting that there was nothing so permanent in Russia as a "temporary" facility. See S. Trukhin and A. Lukyanets, "Kto pridumal ispolzovat ZhRO v kachestve produkta pitaniya?" [Who thought of using LRW as a foodstuff?], March 15, 1997, *Bolshoy Kamen*, as reprinted in *Boyevaya vakhta* 38, May 1997, p. 3.

⁶⁵ Vasilev, "A svoikh snova zadvinuli."

⁶⁶ Interview with Ivan Melnichenko, cited in Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody."

⁶⁷ V. Yefanov, "Vot vam, izbranniki, i 'Yurev den'!" [Elected officials, you're in a fine kettle of fish!], *Bolshoy Kamen*, December 11-17, 1997, p. 2; "Zhiteli Bolshogo Kamnya (Primore) vyskazalis protiv razmeshcheniya v gorode ustanovki po pererabotke radioaktivnykh otkhodov" [Residents of Bolshoy Kamen (Primorye) have spoken out against placing a radioactive waste processing facility in their city], Interfax, August 19, 1997.

⁶⁸ Yevgeniya Lents, "Ustanovka po utilizatsii zhidkikh radioaktivnykh otkhodov budet zapushchena v Primore v maye 1997 goda" [The liquid radioactive waste processing facility will go on-line in May 1997], TASS, December 2, 1996.

⁶⁹ "Ob utilizatsii zhidkikh radioaktivnykh otkhodov Tikhookeanskogo flota" [On the elimination of Pacific Fleet liquid radioactive waste], INFO-TASS, December 5, 1996, as cited in *Byulleten Tsentra Obshchestvennoy Informatsii po Atomnoy Energii* 3, 1997, p. 46.

⁷⁰ Interview with Boris Lesokhin, cited in Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody."

⁷¹ Interview with Valeriy Kiselev, cited in Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody."

⁷² Interview with Ivan Melnichenko, cited in Kolesnichenko, "S chem yedyat zhidkiye radioaktivnyye otkhody."

⁷³ "Kak khoronyat atomnyye submariny... na Dalnem Vostoke."

⁷⁴ Leonid Tsimbalyuk, "Primore - chernaya dyra bezzakoniy" [Primorye is a black hole of lawlessness], *Bolshoy Kamen*, December 4-10, 1997, p. 3; V.

Yefanov, "V chem udobstvo oppozitsionnogo sostoyaniya?" [Why is an opposing stance convenient?] *Bolshoy Kamen*, April 3-9, 1998, p. 3.

⁷⁵ Nina Kolesnichenko, "Zhit nam kak dano?" [How are we to live?], *Vladivostok-Bolshoy Kamen*, October 13, 2000, p. 1.

⁷⁶ "Zhiteli Bolshogo Kamnya (Primore) vyskazalis protiv razmeshcheniya v gorode ustanovki po pererabotke radioaktivnykh otkhodov."

⁷⁷ Moltz, "Japanese Assistance to the Russian Nuclear Complex."

⁷⁸ Viktor Mikhaylov, "Kak vysech samogo sebya" [How to shoot yourself in the foot], *Vzmorye*, July 11, 2000, p. 2.

⁷⁹ Viktor Mikhaylov, "Kak vysech samogo sebya;" Nina Kolesnichenko, "Plavuchemu kompleksu po pererabotke ZhRO - v Bolshom Kamne byt" [A floating LRW processing complex will be located in Bolshoy Kamen], *Vladivostok*, October 22, 1997, p. 4.

⁸⁰ The four violations included: (1) the project lacked a solution for long-term storage of solid radioactive waste (SRW), a violation of article 34, paragraph 1 of the Russian law *On environmental protection*; (2) the project violated article 54, paragraph 5 of the same law, which bans storage of radioactive waste near residential areas, since the project foresaw prolonged storage of radioactive waste in Bolshoy Kamen; (3) the project was not coordinated with the Kray administration, as stipulated by article 54, paragraph 2 of the same law; (4) the project was not discussed with the local population, in violation of article 41, paragraph 2 of the law *On environmental protection*, article 28 of the Land Code, and article 14 of the law *On environmental impact studies*. Despite these violations and other problems mentioned in the environmental impact study, the expert commission that conducted the study endorsed the project, which, in turn, violated article 16, paragraph 5 of the Russian law *On environmental impact studies*. Zolotnikova requested that Danilov-Danilyan review this decision and take measures to bring the project into compliance with Russian law. Tatyana Zolotnikova, "15 iyunya budet referendum i nuzhno nayti 74 milliona rubley dlya etogo" [On June 15 there will be a referendum, and 74 million rubles must be found for it], *Bolshoy Kamen*, May 2-8, 1997, p. 1.

⁸¹ Vladimir Khalyavko, "Osnovnyye napravleniya deyatelnosti" [My primary activities], *Bolshoy Kamen*, December 4-10, 1997, p. 2.

⁸² Yefanov, "Vot vam, izbranniki, i 'Yurev den'!" [Elected officials, you're in a fine kettle of fish!]; "Zhiteli Bolshogo Kamnya (Primore) vyskazalis protiv razmeshcheniya v gorode ustanovki po pererabotke radioaktivnykh otkhodov" [Residents of Bolshoy Kamen (Primorye) have spoken out against placing a radioactive waste processing facility in their city].

⁸³ Interviews cited in Moltz, "Japanese Assistance to the Russian Nuclear Complex."

⁸⁴ Nina Kolesnichenko, "Na 'Landyshe' radiatsiyey i ne pakhnet" [It doesn't smell of radiation on *Landysh*], *Vladivostok*, August 4, 1998, <<http://vl.vladnews.ru>>.

⁸⁵ Nina Kolesnichenko, "Kogda zatsvetet 'Landysh'" [When will the *Landysh* begin to blossom?], *Vladivostok*, July 7, 1999, p. 6.

⁸⁶ Moltz, "Japanese Assistance to the Russian Nuclear Complex."

⁸⁷ Kolesnichenko, "Na 'Landyshe' radiatsiyey i ne pakhnet."

⁸⁸ Zhunusov and Leskov, "Aleyet Vostok stat mertvym."

⁸⁹ *Ibid.* Who bears responsibility for the cost overruns remains in dispute.

⁹⁰ *Ibid.*

⁹¹ Larisa Berdyanskaya, "'Landysh' - oprovergayem mify."

⁹² Meanwhile, the Defense Ministry's Radiation and Nuclear Safety Inspectorate gave DVO RAN scientists permission to pump LRW off *Pinega* for use in their laboratory model based on the Baryer design. Viktor Glushchenko, Director of the Institute of Chemistry, claimed that the Baryer technology was cheaper than the U.S. process. However, the capacity of the experimental complex was only 300 liters per day. To construct a bigger complex, Vladivostok scientists would need special permission. Minatom, however, was reportedly not interested in approving or financing Baryer. Zhunusov and Leskov, "Aleyet Vostok stat mertvym;" Viktor Glushchenko, "It Our Pleasure to Report to Primorye Residents," *Vladivostok*, May 24, 1996, p. 3.

⁹³ "Aktiven 'Landysh' ili net?" [Is *Landysh* operational or not?], *Vzmorye*, July 11, 2000, p. 2.

⁹⁴ "Liquid Nuclear Waste Processing Vessel Commissioned in Russian Far East," Interfax, August 16, 2000

⁹⁵ Berdyanskaya, "'Landysh': oprovergayem mify."

⁹⁶ “‘Landysh’ With Pure Dew,” *Bolshoy Kamen*, August 11, 2000, p. 1.

⁹⁷ Larisa Berdyanskaya, “Osoboye mneniye deputatov: ‘ne soglasny!’” [The dissenting opinion of some deputies: ‘we disagree!’], *ZATO*, August 24, 2000, p. 6.

⁹⁸ Tamara Shesterova, “ChAYKIno v tumane” [Chaykino is in a fog], *Vzmore*, July 11, 2000, p. 2.

⁹⁹ Andrey Zhuravlev, “Yadernaya svalka–yuzhnoye Primore mozhet stat mestom zakhoroneniya radioaktivnykh otkhodov” [A nuclear dump – southern Primorye may become a radioactive waste storage site], *Moskovskiy komsomelets vo Vladivostoke*, August 24-31, 2000, p. 2.

¹⁰⁰ Yuriy Shulgan, “Alternativa ‘Landyshu’ tolko odin – raznos radioaktivnosti po poberezhyu” [There is only one alternative to ‘Landysh’ – dumping radioactivity along the shore], *Vladivostok*, September 15, 2000, <<http://vl.vladnews.ru>>.

¹⁰¹ Representative of contractor (name withheld by request), e-mail correspondence with author, May 2001.

¹⁰² *Ibid.*

¹⁰³ Mikhaylov, “Kak vysech samogo sebya.”

¹⁰⁴ *Zvezda*, as cited in Viktor Mikhaylov, “My dolzhny vyskazat svoye mneniye eshche raz” [We should state our opinion one more time], *Vzmore*, October 10, 2000, p. 2; Tamara Shesterova, “Pokayaniye, ili Chto s ‘Landyshem’ delat budem?” [Repentance, or What should we do with *Landysh*?] *Vzmore*, Octo-

ber 17, 2000, pp. 1-2.

¹⁰⁵ Mikhaylov, “My dolzhny vyskazat svoye mneniye eshche raz.”

¹⁰⁶ “Protest na postanovleniue Dumy ZATO g. B. Kamen No. 166-P ot 29.09.2000 goda ‘Ob initsiative deputata Dumy S.V. Zharinova’” [Protest against Bolshoy Kamen decree 166-P, September 29, 2000, ‘On Duma deputy S.V. Zharinov’s initiative’], *ZATO*, October 19, 2000, p. 1.

¹⁰⁷ The three who voted for the referendum were B. Ulazovskiy, S. Zharinov, and G. Banteyeva; the three against were V. Antoshin, S. Nikitin, and N. Kulygin; and the three who abstained were M. Kiriyenko, V. Tyulin, and N. Starovoyt. Larisa Berdyanskaya, “Provedeniye referendum besmyslenno – k takomu vyvodu prishli deputaty” [The deputies conclude that conducting a referendum makes no sense], *ZATO*, October 19, 2000, p. 1.

¹⁰⁸ “Ya, ty, on, ona, ZhRO i ZATO: Obrashcheniye kandidata v mery Khalyavko Vladimira Grigorevicha k izbiratelyam, Dume, administratsii ZATO” [I, you, he, she, LRW, and the closed city: Vladimir Grigorevich Khalyavko’s appeal to voters, the Duma, and the closed city administration], *ZATO*, December 14, 2000, p. 2; V. Khalyavko, “My, ZhRO i ZATO!” [We, LRW, and the closed city], *Vzmorye*, December 14, 2000, p. 2.

¹⁰⁹ “Vybor sdelan: pobedil Anatoliy Karasev” [The choice has been made: Anatoliy Karasev has won], *ZATO*, 18 January 2001, p. 1.

¹¹⁰ Svetlana Fedorenko, “Luchshe odin raz uvidet...” [Better to see one time...], *Vzmorye*, December 13, 2000, p. 2.