ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

Report On

Air Pollution in Novokuznetsk:

- Federal Regulations and Policies
- Program to Monitor, Model and Enforce

by

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1.0 Introduction

Section 2 0 of this report presents a general overview of the regulatory structure and approach employed for the management and regulation of air pollution in Russia Regulatory authority at the Federal, Oblast and municipal level (in this case Novokuznetsk) is discussed Construction and operation permits, ambient air quality standards, emissions standards and mechanisms of compliance and enforcement are addressed It should be noted that materials presented in this report are based primarily on information collected at the municipal level Claims vary as to where certain authorities lie, particularly as regards approval of permits

Section 3 0 provides general recommendations for a cost-effective program for improving Air Quality attainment and enforcement, many of these recommendations will be addressed through Task 4 of the NVK Subproject

2.0 Regulatory Program

Current regulations at the Federal, Oblast and municipal levels remain artifacts of the centralized nature of the former Soviet system An understanding of the past is necessary to make better sense of the present situation, and to design a program for the future which draws on appropriate existing organizations, is cost-effective, is politically and economically acceptable, and considers acute and chronic health effects

2 1 Historical Basis

The existing system for air quality management is fairly uniform in its approach through the regions, Oblasts and districts as it is for the most part inherited from the former Soviet Union The first legislation to address air quality in what is now the Russian Federation was the 1949 decree of the USSR Council of Ministers, entitled "Concerning Measures for Combatting Air Pollution and the Betterment of Sanitary-Hygienic Conditions of Populated Places" The decree was the enabling legislation for the development of national air pollutant standards for urban areas

The abundance of legislation enacted in the 1960's and 1970's reflected the growing concern over the serious impacts of air and other pollutants, and the recognition of the apparent inability to rectify the situation Important laws issued during that time include "Fundamental Legislation of the USSR and Union Republics on Health Protection", 1969, "Concerning Measures for the Further Improvement of Nature Protection and the Rational Use of Natural Resources", 1972, "On the Strengthening of Nature Protection and the Improvement of the Use of Natural Resources", 1972, "On Additional Measures for Strengthening of the Protection of Nature and the Improvement the Use of Natural Resources", 1978, Article 18 of

the 1977 USSR Constitution, and finally the "USSR Law on the Protection of the Atmospheric Air", 1980, which represented the culmination of years of development and debate, and considered regulations and regulatory structures in place in the "developed capitalist countries"

2 2 Current Regulatory Program

Establishment of air pollution standards, pollutant measurement systems, demonstration of compliance, and implementation of enforcement measures is the responsibility of a quiltwork of Ministries, agencies, committees and organizations, often redundant, overlapping, at odds politically if not in purpose, and oftentimes uncertain of or unable to demonstrate basis for jurisdictions or authorities claimed Environmental laws in Russia have been primarily in the form of declarations, rather than clear, specific requirements Organizations at the Ministry levels are propagated at the regional, oblast and municipal levels A general schematic of the regulatory program, from the office of the President down to the local Environment Protection and Natural Resource Committee inspectors, is presented in Figure 2 1 The figure is neither all-inclusive or definitive, but rather presents the organization as described by individuals at the local committee level

As can be seen in Figure 2 1 important components what should be a coherent program are divided among four organizations, three of which do not formally connect until the Federal level, the fourth reporting directly to the office of the President Starting at the local level, the Sanitary Department is responsible for measurement of impacts on populated areas and general epidemiology The department reports to the City Sanitary Unification, which reports to the Kemerovo Sanitary Inspection Center, which reports to the Sanitary Epidemiology Inspection Committee of Russia, which reports to the President Under a separate chain of command the Novokuznetsk Ecology and Extreme Situations Committee reports to the Municipal Administration, which reports to the Kemerovo Regional Administration, which reports to the Federal government Municipal inspectors report to the local Environment Protection and Natural Resources Committee (EPNRC), which reports to the Kemerovo State (or Regional) Committee of the same name, which reports to the Environment Protection Ministry, which reports to the Russian Government, which reports to the President Inspectors from the Kemerovo Committee provide oversight at the Oblast level, and may assist or function as local inspectors, as may be necessary Finally, the local Hydrometeorological Observatory, which collects meteorological data from local stations and nearby airfields, as well as runs the local air quality monitoring program, reports to the Oblast committee of the same name, which reports to the regional committee, which reports to the State Committee on Hydrometeorology and Environmental Inspection, which reports to the Russian Government, which reports to the President As can be seen, the first series of organizations is responsible for epidemiology, health effects, and population-oriented monitoring, the second for corrective measures when standards are exceeded, the third for inspection, compliance and enforcement and the fourth for operation of air pollutant and meteorological monitoring networks By comparison, all of these functions are served by the U S Environmental Protection Agency

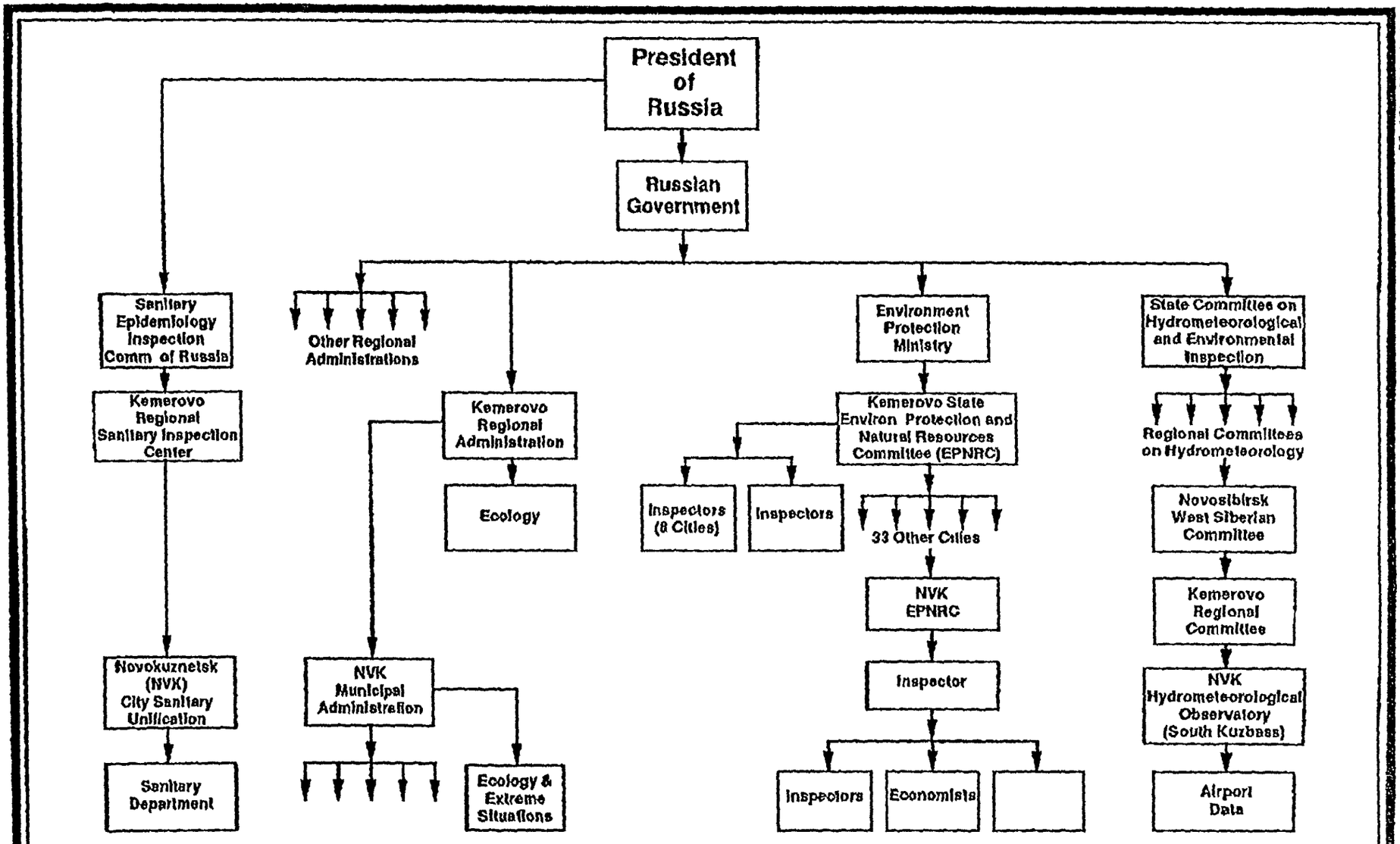

Figure 1
General Organization, Environmental Programs

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(USEPA), and approved state or local environmental agencies in the U S [with the exception of meteorological data, which in most cases is obtained from the National Weather Service (NWS)]

As can be deduced from the organizational description above, communications are often difficult, and bureaucratic procedures or objectives often impede progress

2 1 1 MPC, MPE and SPZ

The fundamental cornerstones for all activity to date are the concepts of Maximum Permissible Concentrations (MPC), which determine source-specific Maximum Permissible Emissions (MPE) and the extent of Sanitary Protection Zone (SPZ) Over 1,000 pollutants are regulated under the MPC scheme The standards are not routinely reevaluated in view of the current state of science with respect to health effects, and few have been changed during the past 20 years The Ministry of Public Health, State Committee on Standards, Sanitary Epidemiology Inspection Committee (which reports directly to the President of the Russian Federation), State Committee on Hydrometeorology and Environmental Inspection and the Environment Protection Ministry (or their respective predecessors) and other interested agencies are responsible for the development of the MPC's

Approximately 160 volatile organic compounds (VOC's) are currently considered to be a priority for control, however, any pollutant emitted (even in minor amounts) must obtain an MPC from the Ministry of Public Health (MPH), and if none exists the MPH must issue a temporary MPC and the regulated source must then pay for the development of an MPC (a questionable relationship between the polluter and the developer of the MPC) The enterprise must also engage in a two-stage process which requires technical and economic review and approval, as further discussed under Section 2 1 2 In short, the process results in changes in the enterprises's Project Book which also contains the relevant MPE's for the particular enterprise The change may require modifications or additions to the emissions control system and industrial processes, and can be time consuming and costly As a result this procedure is likely discourage an enterprise from pursuing innovative process changes which may improve energy efficiency and output, and thereby rendering the enterprise less competitive in the international market Given the number of pollutants regulated and requirements for consideration of synergistic effects, implementation of such an ambient concentration-based approach is unwieldy and difficult to enforce

The MPC for any given pollutant is based on expected or known health effects, which is similar to the concept employed in U S of primary standards designed to protect human health and welfare Unlike the US and other western programs, Russia has incorporated synergistic effects of combinations of mixtures of pollutants into the MPE calculations for air pollutant sources [similar to the concept of Pollutant Standards Index (PSI) used for short-

term health warnings in the US] This approach leads to more stringent limits on individual pollutants than would be imposed through regulation based on a pollutant-by-pollutant approach When a new source of air pollutants is proposed dispersion modeling is performed to determine predicted impacts In theory, the SPZ is a buffer zone in which air pollutant levels may exceed the MPC, and within which no residences are allowed Air pollutant emission impacts are managed by regulating the design of the source (process rates and stack height) and ultimately the maximum permissible emission rate (the MPE), a rate below which the MPC is not exceeded outside the SPZ

Reality departs painfully from theory In fact, during the great push for industrialization, following the revolution, as an integral and desired part of the development plan industrial complexes were constructed with worker housing contiguous to the industrial complex, within what is now often the SPZ

Predicted impacts, based upon scientifically sound mathematical modeling of the dispersion of atmospheric pollutants, are typically subject to many errors in Russia Reasons follow

- Long-term (one to five years) hourly meteorological data is required to obtain reasonably accurate dispersion modeling results Such data often does not exist for Russian cities Therefore, worst-case meteorology is employed and superimposed in all directions

- Existing air quality must be known in order, to establish a baseline to which predicted incremental impacts are to be added, to arrive at resulting air quality Such data is not always available, nor is it reliable, due to deficiencies in the monitoring and analysis programs Deficiencies include insufficient numbers of monitoring stations, improper siting of stations, and (most importantly) currently measurements are taken in accordance with federal guidelines which prescribe sampling for 20 minutes, three times daily, or a 24-hour composite value and then comparing those values to MPC standards Such monitoring schedules miss peak vehicular emissions, and nighttime and early morning inversion conditions, under which impacts are often highest

- Actual emission rates of existing sources and the proposed source must be known for use in the dispersion modeling The current emissions inventory system is not of sufficient quality or extent to be of use Currently emission rates for most existing sources are self-reported, and typically grossly under-reported, to avoid imposition of penalties for noncompliance Error is further increased through the convenient use of claimed emission rates and control device efficiencies, rather than actual emission rates and efficiencies

- Terrain and aerodynamic effects, such as plume impaction on terrain which meets or exceeds plume centerline elevation, and stack or building downwash, are not considered These effects can have profound impacts on areas near existing or proposed sources

2 1 2 Construction and Operation Permits

Currently, the process of applying for construction and operating permits for a new source or significantly modified existing source consists three steps The first step is Application for Approval of Construction Site (or expansion of existing facility), the second is performance of the Construction Design Economic Evaluation, and the third is the Application for Permit for Emissions

2 1 2 1 Application for Approval of Construction Design and Site (or Expansion of Existing Facility)

An overview of this process is presented in Figure 2 2 In the case of Novokuznetsk, and presumably other municipalities, the application is submitted to the Novokuznetsk EPNRC According to the municipal staff if the application is approved at this level, then the construction design is acceptable and no further action is required If disapproved, the application must be reworked or the case may be submitted to local authorities for arbitration If the finding of the arbitration is in favor of the applicant then the design is approved, if the permit is denied then the applicant may submit to the oblast for arbitration If the finding of the arbitration is in favor of the applicant then the design is approved, if the permit is denied then the applicant may revise the application and resubmit to the local EPNRC and restart the cycle or submit to the Russian Environment Protection Ministry for arbitration If the finding of the arbitration is in favor of the applicant then the design is approved, if the permit is denied then the applicant may revise the application and resubmit to the local EPNRC and restart the cycle or submit to the Federal court system for arbitration In every instance of denial, up to the Federal court, a denial may be overturned by favorable arbitration at the next higher level of authority At any point of rejection the application may be reworked and resubmitted to the local EPNRC

2 1 2 2 Construction Design Economic Evaluation

An overview of this process is presented in Figure 2 3 In this second phase the appropriate application is submitted to the municipal EPNRC, which forwards the application to the Oblast Technical Committee for review At this level the economic soundness of the application is evaluated The local government cannot approve or disapprove the application As is the case with the application for Construction Site and Design approval, if the oblast denies the permit application then arbitration may be requested at the oblast level, and so on up the line in the case of denial, to arbitration in the Federal court

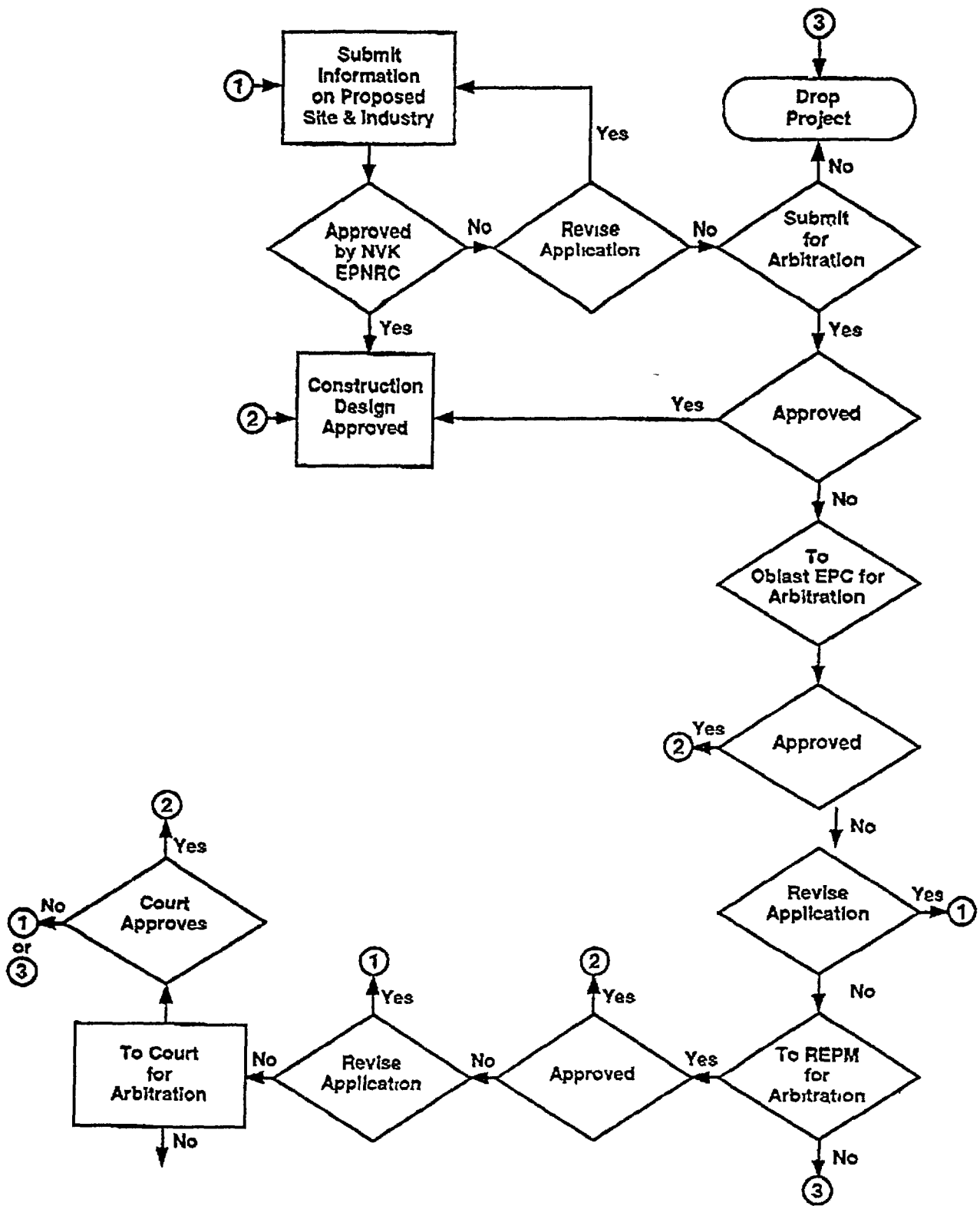

Figure 2
APPLICATION FOR APPROVAL OF CONSTRUCTION SITE AND DESING (OR EXPANSION OF EXISTING FACILITY)
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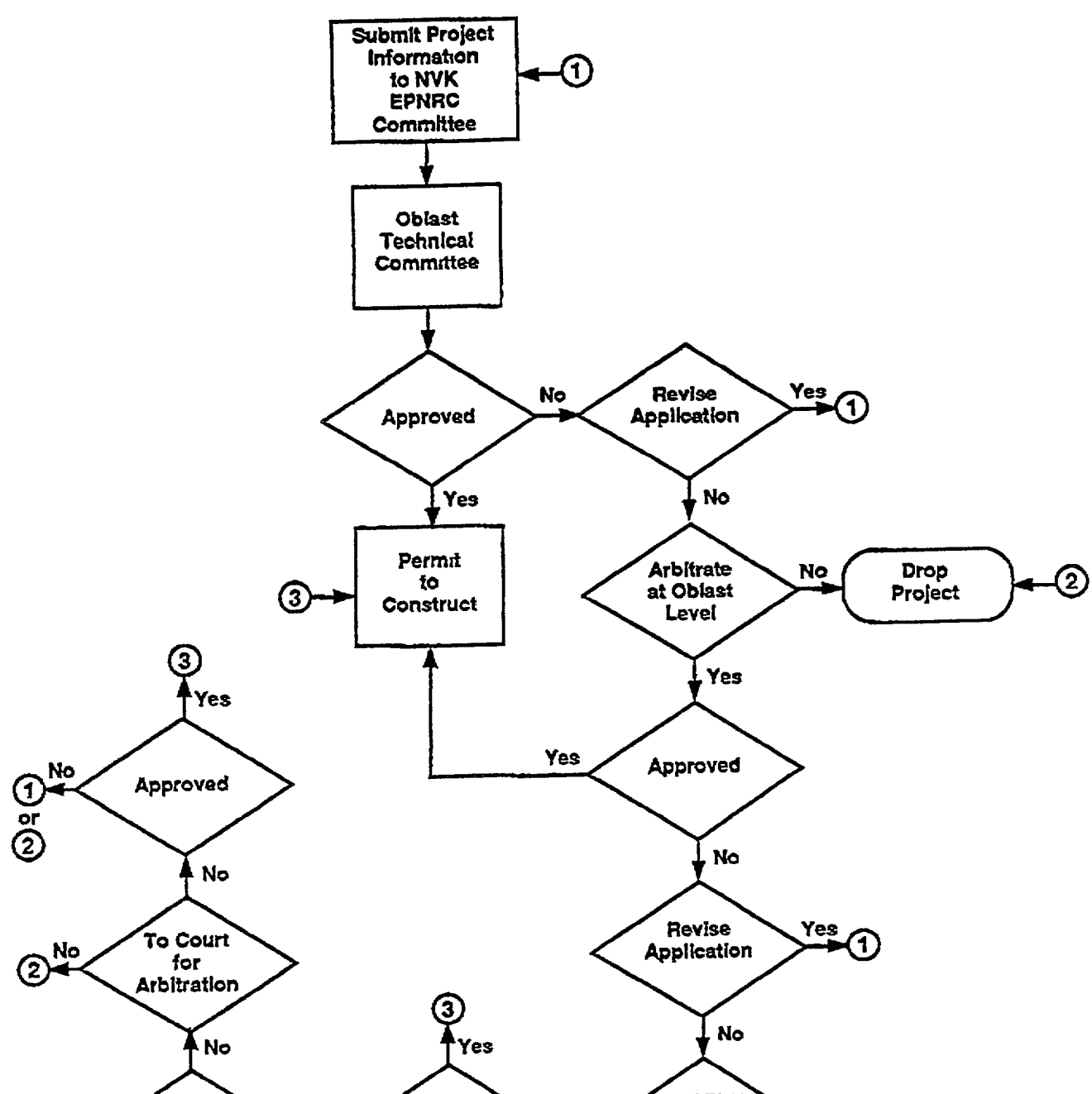

Figure 3
CONSTRUCTION DESIGN ECONOMIC EVALUATION

SOURCE ESE

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2 1 2 3 Application for Permit for Emissions (Maximum Permitted Emissions)

An overview of this process is presented in Figure 2 4 Under the current system there is no requirement for minimum emission controls for new or modified existing sources, if exceedance of the MPC beyond the SPZ is not predicted This approach encourages sources to request an MPE which is as high as possible so as to allow the source to operate at the maximum rated capacity, at the highest permissible level of emissions, even when reasonably available pollution control technologies may be available Furthermore, there is no limit (other than the inherent limits of structural engineering) on the height of exhaust stacks in Russia Therefore, enterprises are often built with stacks that exceed what is known as "good engineering practice" (GEP) in the US, to reduce impacts of pollutants in the vicinity of the enterprise and to avoid exceeding the MPC outside the SPZ The practice was employed in the US during the period of tall stacks construction, when the basic premise was "dilution is the solution to pollution" This practice does not reduce atmospheric loading or the effects of transport of key pollutants such as sulfur dioxide, oxides of nitrogen, volatile organic compounds and fine particles, and has been abandoned as a control method in the US

Under this process the application for Permit for Emissions (up to MPE) is submitted to the municipal EPNRC for approval If approved, the application is forwarded to the Oblast Technical Committee for review and approval If disapproved at the municipal level, the applicant may revise and resubmit There is no mechanism for arbitration at this level If the Oblast Technical Committee approves the permit application the permit is issued If the permit is denied, the applicant may revise and resubmit the application or request arbitration at the next highest level, which is the Russian Environment Protection Ministry If the finding of the arbitration is in favor of the applicant, the permit is issued If the permit is denied, the applicant may appeal to the Federal court If the court rules in favor of the applicant, the permit is granted

2 1 3 Compliance and Enforcement

Compliance is claimed primarily through self-reporting by the regulated enterprises Some source testing is done by local and oblast inspectors, but testing equipment is deficient or non-existent in most cases Sources typically report emissions based on calculations which employ assumptions of maximum design efficiency of the process involved as well as the emissions control devices (if any)

The pollution fees charged are very low in comparison to product value and control costs Fees charged are in theory distributed to the governing bodies by a formula which returns 90% of the fees to the oblast and local governments In the case of Novokuznetsk it is claimed that less than 10% is actually returned to the local government Pollution fees and penalties for exceeding the MPE limit are calculated using the following formula

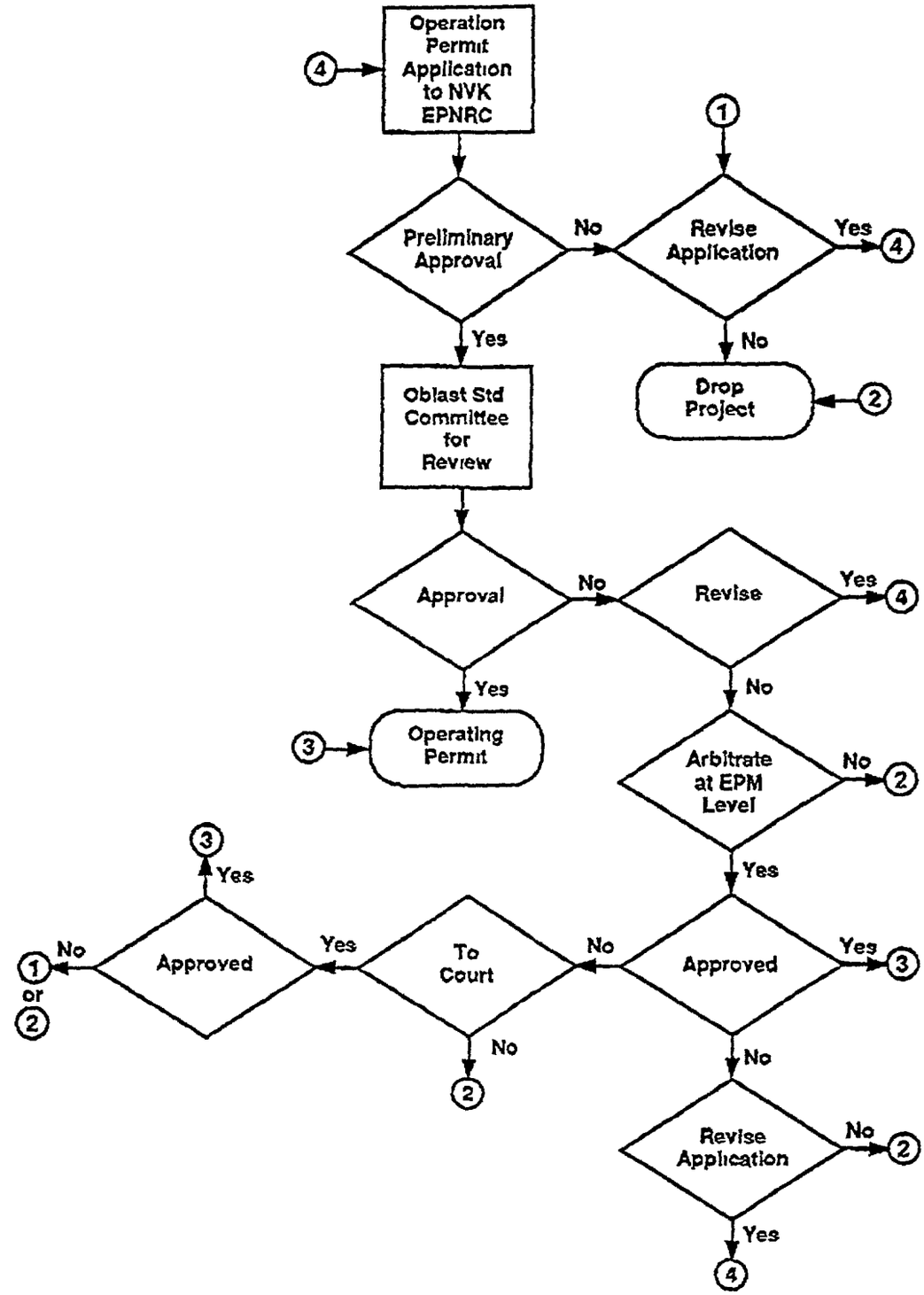

Figure 4
PERMIT FOR EMISSIONS (AT MAXIMUM DESIGN STANDARDS)

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Amount due =	[(PE)(F)]	+	[(AE-PE)(5F)]	+	[(AE-TS) x(25F)]
	AE ≤ PE (emissions fee)	+	up to AE ≤ TS (penalty,level 1)	+	after AE > TS (penalty, level 2)

Where PE = Permitted emission as tons per year
F = Fee for specific pollutant, as Rubles per ton
AE = Actual emissions, as reported by operator
TS = Temporary standard, first tier above permitted level

Coefficients are applied to the fee for each given pollutant to adjust for the ecological sensitivity of the area At current levels, emissions and penalty fees do little to encourage reduction of emissions as it is more economical on the short term to pay the fee and penalty rather than invest in control technology and/or process changes Furthermore, fees and penalties paid are apparently considered an operating expense rather than a reduction from operating income, thereby further reducing incentives to reduce emissions

Payment of fees and fines appears to be primarily a paper exercise The enterprise owes the fine, which is carried as an asset by the local government That asset is transferred, on paper, to the Federal government, which in turn redistributes it in its budgetary allocations, where it reappears as the basis for assets elsewhere, no money having ever been collected In the end it represents deficit spending, because the money is never collected but is rather carried on the books as an asset Furthermore, if the enterprise is losing money - and many are - the paper loss represented by the fees and fines simply increases the amount requested by the enterprise from the government to offset operating losses

Enforcement actions are rare, as onerous financial burdens or plant closures are on the short term more disruptive, and damaging to the local economies than are the short or long-term effects of unhealthy levels of air pollution Legislation which enables individuals to sue in the case of an enterprises's violation of standards is in place and several cases are pending, however the outcome and effect of this means of redress are unknown at this time

3.0 Recommendations

The following section presents general recommendations for the development of a cost-effective and incremental program for improved attainment and enforcement of air quality and air pollutant emissions standards at the municipal level Fundamental changes will be required at the Federal level as well, however those changes are not specifically addressed here

3 1 Permits

3 1 2 Construction Permits

The local environmental program is apparently authorized to unilaterally grant Construction and Design Permits Every effort should be made to secure accurate operational data required for the emissions inventory system Provision of such data could be a requirement of the permit application

3 1 3 Operating Permits

The local program is not authorized to issue Operating Permits, which are the permits to emit air pollutants However, the local program should institute procedures for systematic annual review of operating permits and operating reports, to assure compliance with permit requirements Independent estimates of emissions should be made using either actual source test results or by obtaining fuel input or process rate data, and applying the appropriate coefficient for estimation of uncontrolled emissions The approach is easy to state, but will be difficult to implement as it will be labor intensive in the early stages

3 2 Emissions Inventory

Whether or not regulations are changed and more stringent permitting requirements are implemented, an up-to-date, computerized inventory of sources of air pollutant emissions is required for the development and implementation of an effective air quality management program The following actions must be taken to develop such an inventory system

1 Produce computerized listing of all sources of air pollutants which have or within the past 5 years have had, permits to emit air pollutants Listing should include source name, ownership, number and location (grid coordinates) of stacks, processes which exhaust to the stack, fuel use or material process rates, operating schedule (seasonal, daily schedule, etc), stack height, stack diameter, discharge temperature and velocity, air pollutant removal devices installed, claimed efficiency of air cleaning devices, and emission rates (tested, estimated or assumed) as grams per second and tons per year (by pollutant)

Sources might initially be listed by name and tons per year emission rate, then prioritized by size, in descending order, for collection of detailed source information Source size groupings should be >1,000 tpy (any pollutant), 250-1,000, and less than 250 tpy

2 Develop procedure for annual update of inventory, based on data submitted for renewal of operating permit, and reported source test results and process rates

3 3 Emission Standards

The local program is not authorized to develop emission standards, i e , the MPE's However, use of improved atmospheric dispersion modeling techniques, if acceptable to higher authorities, could greatly improve the accuracy of predicted impacts, and would most likely result in lower MPE's for new sources and major modifications to existing sources

3 3 1 Compliance

Emissions testing is essential to air quality management, as this is the method by which the regulatory agency can conclusively determine whether emission rates are in compliance with applicable MPE's

1 The Novokuznetsk EPNRC currently has only a carbon monoxide (CO) monitoring device Source testing services must now be requested from the Kemerovo Oblast EPNRC, or arranged through private contractor

The EPNRC must be equipped with at least two sets of source testing equipment, consisting at least of devices suitable for the measurement of temperature, velocity, H2O, CO, CO2, particulate matter (PM), SO2, NOx, HF and H2S Additionally, efforts must be commenced to develop a means for certification of source testing firms so that, such services can be provided through the private sector

2 There is apparently no schedule for testing sources Efforts are primarily on an ad hoc basis, contingent upon observation of excessive smoke emissions A schedule of inspections and source testing should be established The schedule of inspections should be based upon the total emissions, inspecting largest sources first and then proceeding to smaller sources Smaller sources would then be inspected and tested, as more staffing and equipment resources become available

3 Opacity inspections should be made a regular part of the inspection procedure Even if notices of violation or penalties are not issued an inventory of violators, indicating severity and frequency, is essential to develop and prioritize corrective measures

The visual opacity test, was one of the first regulatory requirements for air pollution control in the U S and is still required for all major sources VE's are expressed as percent opacity (US Bureau of Mines, Circular 8333, Ringlemann Chart) The last is effective, a good first line of attack, and very inexpensive to implement Discussion of the appropriate % opacity on which to base regulations will require further investigation and discussion The US standard is typically 20% opacity

4 Development of an examination and certification process for commercial providers of source testing and visible emissions tests should be undertaken immediately Government will not be able to provide testing services for all permitted sources, therefore private sector providers should be encouraged and enabled to provide such services on a fee basis Results of testing would be submitted to the cognizant regulatory agency as a requirement of the current annual permit review and renewal process Testing fees would be paid by the pollutant source

5 Control device efficiencies must be verified This will be accomplished through the source testing program, as testing of the exhaust gases will be performed before and after the control device Current procedures employed by sources in calculating and reporting actual emissions assume the claimed efficiency of the control device rather than the actual efficiency Actual efficiency may be 2 to 10 time less than that claimed, thereby causing gross underestimation of emissions (and fees or penalties to be paid)

3 3 2 Enforcement

There appears to be no means of institutionalized enforcement at the local level While some older, less efficient and more polluting industries may in fact be closed, it is primarily an economic decision, not a matter of enforcement Fees and penalties, such that they are, may be negotiated with parts of the penalty to be paid as capital expenditures for installation of pollution control devices or process changes Enforcement is seriously limited by the lack of testing equipment, insufficient number of staff, and the absence of legal counsel necessary to pursue enforcement through the legal channels

3 4 Ambient Air Quality Monitoring

3 4 1 Monitoring Network

The current air monitoring system is outdated, not continuous in its operation (20-minute samples, 3 times daily), and is not efficient with respect to labor expended A system which is based on technology currently used in similar situations in the US is required if air pollution management is to be effectively implemented Recommended equipment is listed in Table 3 1 Necessary actions are as follow

1 Upgrade ambient air monitoring system to include continuous air pollutant monitoring devices at one upwind, one downwind and one center-city station Two mobile monitoring stations would also be desirable, for use in special studies, measurement of off-plume air quality, and measurement of air quality in the less frequent downwind directions as well as at the boundaries of and within Maximum Pollutant Concentration (MPC) zones

TABLE 3 1

EQUIPMENT NEEDS - NVK AIR QUALITY MANAGEMENT PROGRAM				
	Item	Quantity	Unit Cost (US)	Extended cost ($US)
1	*Source testing*			
	USEPA Method 1 - 5 Sampling System	1	10,000	10,000
	Sulfur Dioxide Measurement System	1	15,000	15,000
2	*Ambient Air Quality Monitoring*			
	Particle Sampler, 10 0 micron cutoff	3	4,000	12,000
	Continuous S02	2	9,000	18,000
	Multipoint Gas Calibrator	1	11,000	11,000
	Zero Air Supply	1	4,000	4,000
	Calibration Gases	1	2,000	2,000
	PM10 Calibration System	1	1,000	1,000
	Particle Sampler Filters	1	200	200
	386 PC, 200 MB, Math Coprocessor	1	3,000	3,000
	Inventory software (off shelf)	1	1,000	1,000
	Laser Jet Printer	1	700	700
	Data Logger	3	2,400	7,200
	Strip Chart Recorders (6 Channel)	3	1,500	4,500
	Monitoring Station Shelter	2	8,000	16,000
	Heating and Cooling System	3	1,200	3,600
	Transport Trailer (1)	2	2,000	4,000
	Uninterruptable Power Supply (UPS)	3	1,200	3,600
	LPG or Gasoline-Powered Electric Generator	1	4,000	4,000
	Digital Analytic Balance & Environmental Chamber	1	3,500	3,500
	Ion Specific Electrode System (HF)	1	1,000	1,000
3	*Meteorological Monitoring*			
	Meteorological Sensor Sets (WS/WD/RH/T/P)	2	2,500	5,000
	10-Meter Tower	2	600	1,200
	Meteorological Data Postprocessing and Reporting Software	1	5,000	5,000
4	*Atmospheric Dispersion Modeling*			
	486 PC, 33 + MH2, 200MB + HD, Color	1	3,500	3,500
	USEPA Modelling Software	1	2,000	2,000
	Laser Jet Printer	1	700	700
	Plotter (Color), 6-Pen or Laser	1	1,200	1,200
5	*Data Analysis*			
	Air Quality Management Software Package	1	3,000	3,000
	Database and Statistical Analysis Package	1	1,000	1,000
			TOTAL	**$147,900**

The existing monitoring system should be closed down immediately following acceptance testing and initiation of operation of the new system Data collected should be reported directly and electronically to a computerized central air quality data management facility

In the interim, site surveys, siting evaluations and site audits should be performed to determine if existing sites are properly located Sites should be relocated as necessary to obtain measurements of maximum use and validity until continuous monitoring system can be brought on-line It should be noted that the continuous monitoring system, as proposed for funding under the USAID Commodity Import Program (CIP), will require less manpower resources to operate than the current monitoring system, and will provide continuous (5-minute average and hourly) data as required for effective air quality management

3 4 2 Compliance

Air quality measurements are made by the Novokuznetsk Hydrometeorological Observatory and reported to the State Committee on Hydrometeorology and Environmental Inspection, through the chain of command of the Kemerovo Oblast and Novosibirsk West Siberian Committee There appears to be no specific action in response to measured violations of the standards

In theory the local observatory also observes or predicts atmospheric conditions which may cause intense pollutant impacts, and pollution sources are then required to reduce emissions during such episodes so as to reduce air pollutant levels Application of this approach was tried in the US but abandoned, as predictions are often inaccurate and industries are often not able to modify fuel input or process rates on short notice For the same reasons Russian approach seems to be of little use in reducing the severity of acute air pollution episodes

At this point local government can only document air quality, in hopes of building a case for definitive action on the part of a higher authority

3 4 3 Enforcement

There appear to be no enforcement mechanisms, such as requirements for source-specific reductions in emissions, sanctions imposed by higher levels of government, or withholding of Federal funding

3 5 Air Pollutant Dispersion Modeling

Atmospheric dispersion modeling is a reasonable and conservative surrogate for ambient air quality measurements The Novokuznetsk and Kemerovo Oblast EPNRC Committees do not have the necessary resources to perform modeling on the scale, or of the complexity required to begin development of a comprehensive air quality management program Appropriate

atmospheric dispersion modeling requires an accurate emissions inventory, regionally representative meteorological data, and software and hardware capable of handling the large arrays and complex series of iterative calculations required for atmospheric dispersion modeling These task must be undertaken concurrently

1 Relocate the existing meteorological stations to collect representative meteorological data, for the purpose of dispersion modeling, and begin to assemble the computerized data set of hourly observations which will be required for dispersion modeling

2 Develop an accurate emissions inventory, including information on parameters which must be considered for dispersion modeling

3 Obtain, compile and test appropriate dispersion models, on computers with sufficient speed, capacity and design to effectively support such modeling (486-based, color, 200 megabyte (M) hard drive, at least 8 M RAM)

4 Appropriate topographic maps should be obtained for the Novokuznetsk area, so as to provide terrain elevation information as required for dispersion modeling in complex terrain

5 Perform worst-case modeling for re-evaluation of Maximum Pollutant Concentration (MPC) zones around major sources Define all isopleths of concentration, back to the nearest impact of the source (i e , higher impacts will occur nearer the source than the MPC zone) Overlay concentration isopleths on population density and land use pattern information for areas inside the MPC Modeling study should also be used to determine actual impacts within the boundary defined by the MPC isopleth [the Sanitary Protection Zone (SPZ)] Modeling should consider individual sources and the cumulative effect of all sources which demonstrate significant impact in the SPZ or MPC zones

3 6 Air Quality Management Program Needs

3 6 1 Staffing

1 Legal staff in the City Administration, possible two attorneys and two legal assistants, should be delegated the responsibility to prosecute legal cases against industries which violate environmental standards or fail to pay required fees or penalties The positions would not be full-time in the beginning, but could become full-time positions as legal precedents are established and litigation becomes a more common form of resolving legal issues

2 The issue as to where the authority issue or deny permits should be resolved Both City and the Oblast claims this authority in certain circumstances

3 Additional staff should be added to the source inspection team, possibly four inspectors and two additional senior to mid-level engineers with relevant experience The workload for source inspections, source testing, and permit renewal reviews exceeds the current capacity of the local EPNRC

The regulatory agencies are not adequately equipped or staffed (nor should they be) to provide source testing services internally Development of a procedure for training, certification and licensing of private sector source testing service providers should be undertaken Such a system would be administered at the city or oblast level, and would be based solely on technical competence and possession of proper testing equipment

3 6 2 Equipment

Equipment needed immediately is as listed in Table 3 1 which follows It should be noted that the number of stations for which equipment has been requested has been reduced to three, due to the apparent limit of $US 150,000 placed on capital equipment purchases under Task Order 10 However, should the Commodity Import Program (CIP) request for ambient air quality monitoring equipment be approved this shortfall will be accommodated and installation of the full network will be possible

3 6 3 Training

Training currently projected includes hands on training in support of emissions inventory development, source inspection, VE reading, and ambient monitoring network operations (including equipment calibration and repair) Training will be provided for up to six technical staff and/or supervisors, primarily in Novokuznetsk, with approximately one month of training to be provided in the US for four appropriate local staff US-based training will include USEPA VE certification testing for two individuals, and attendance at up to three USEPA short-courses on dispersion modeling, source inspection and monitoring network operations

4.0 Interaction With Existing Organizations

Existing organizations which must collaborate to improve air quality and air quality management programs include the technical and regulatory structure in Russia, at the Federal, Regional, District, Oblast and Municipal levels, as well as outside organizations which are prepared to assist in the implementation of improvements (capital equipment purchases and technology transfer) in the environmental regulatory program in Novokuznetsk

It is imperative that more effort be focused on the Environment Protection Ministry By developing coherent programs and guidelines for compliance, enforcement, monitoring, standard setting, modeling and monitoring at the Ministerial level such programs can be uniformly propagated down to the municipal level Focusing on individual municipal programs, and engaging in little or no communication or interaction with organizations

between the municipal and Federal agencies, will produce much less benefit in return for the money spent It is good to learn more about operations at the municipal level, as such knowledge will be useful in developing and refining programs at the Federal level However, assistance and programs should not stop at the local level, but rather should directed toward the top (Federal) and bottom (local), with the intent of assuring effective and efficient cooperation between Federal and local organizations

It is likely that other agencies, organizations and donors will become more active in the provision of loans and assistance to Novokuznetsk, for the further development of energy efficiency and environmental programs Efforts should be made early in the process to catalogue, coordinate, and track such activities Efforts should also be made to assist in the solicitation of such assistance to provide maximum benefit to the programs under development in Novokuznetsk Agencies which should be communicated with include USAID, World Bank, CIDA, SIDA, GTZ, ODA, JICA and ADB Must also coordinate, early on, with the NVK 2010 program, to assure that there are no redundancies, incompatibilities or mutually exclusive considerations