

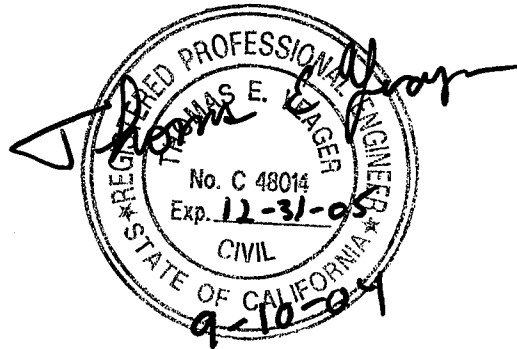
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North Monterey County Desalination Project

Monterey Peninsula Water Management District Decision Matrix

10 September 2004



Prepared for

Pajarao Sunny Mesa Community Services District

136 San Juan Road
Watsonville, CA 95076

K/J Project No. 985019.00

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Section 1: Introduction

1.1 Purpose

The purposes of this summary report are:

- To describe the boundaries, functions, and the current and future operations of the Pajaro Sunny Mesa Community Services District (District)
- To provide data that can be used by the staff of the Monterey Peninsula Water Management District (MPWMD) in order to compare various water resource development projects that could impact the MPWMD.

Staff will use this report to complete the matrix that they will present to the Board of Directors of the MPWMD at the Board meeting on September 29th. In addition it is anticipated that staff will include this full report in the Board packet assembled for the meeting on September 29th.

1.2 Background Material

The following sections provide data on the current operation of the District, and on the operation of the District once various expansions and acquisitions are finalized relative to providing water and sewer in North Monterey County.

1.2.1 Current District Operation

The District currently provides multiple governmental services, including retail water services, to unincorporated communities in North Monterey County. The District also provides street lighting and park maintenance services in Pajaro. There are approximately 430 commercial and residential accounts in Pajaro and 230 commercial and residential accounts in Sunny Mesa.

In addition, the District operates several mutual water companies, including the Vega Mutual Water system, on a contract basis. There are approximately 120 accounts in the Vega Mutual system.

1.2.2 Initial Boundary Expansion

In 2002, the District finalized a LAFCO process that expanded the District boundaries to serve:

- Large areas along Highway 1 from Salinas Road south to Struve Road
- The Hudson Landing area
- The Vega Road, Lewis Road, and San Miguel Canyon Road areas, including the Vega Mutual Water Company.

When service is provided to these areas, over 700 customers will be added to the District.

1.2.3 Pajaro County Sanitation District

Monterey County owns, operates and maintains various sewer districts throughout the County. These systems are maintained through the County's Department of Public Works. Due to staffing and funding issues, the County is in the process of divesting themselves of these sewer districts, and is in final negotiations for acquisition of the Pajaro County Sanitation District (PCSD) by the District. The PCSD is the largest of the sanitary sewer systems in the unincorporated area of the County. The Board of Supervisors has voted unanimously to transfer the PCSD system to the District.

The PCSD operates a wastewater collection and pumping system that discharges to the City of Watsonville. The PCSD serves all current water customers of the District and the Los Lomas area south of the District.

Once this acquisition is completed, over 1000 sewer accounts will be incorporated into the District's on-going operations

1.2.4 Alisal Water Company (ALCO) Bankruptcy Acquisitions

In September of 2003, the District submitted bids on the following water systems of the Alisal Water Company (ALCO) that were in bankruptcy proceedings:

- Moss Landing
- Vierra Canyon
- Langley/Pacifico
- Blackie Road
- NORMCO (Berta Canyon, Manzanita, Berta Way, and Coker Road).

The District's competitor in the bid process was the California-American Water Company (Cal-Am) that bid on the Moss Landing system. The District's bids were supported by the Monterey County Board of Supervisors and the Monterey Department of Environmental Health. In the spring of 2004, the bankruptcy judge awarded all systems to the District, including Moss Landing. The Cal-Am bid was over \$100,000 more for the Moss Landing system than the district's bid, but the local opposition was so overwhelmingly against the Cal-Am takeover that the bankruptcy judge awarded the systems to the District "in the public interest".

When the bankruptcy proceedings are complete, the District will serve over 500 additional customers.

1.2.5 Proposed Sphere Of Influence

Water service in North Monterey County is fragmented among a large number of poorly managed and underfunded private water companies. In order to provide an option of better management and better service, the Monterey County Local Agency Formation Commission

(LAFCO) is in the process of establishing an area of influence for the District. Figure 1 shows this area of influence as well as the current district boundaries and proposed sewer annexation.

1.2.6 Summary

In response to community concerns, the District has and is expanding their boundaries to provide quality water and wastewater services to area residents throughout North Monterey County from the Pajaro River to the area north of Salinas.

Section 2: Matrix Data

2.1 Introduction

The staff of the MPWMD presented an outline matrix to the District at a meeting in the District's office in Pajaro on September 2nd. This report provides the available information that can be used by the District staff to complete this matrix. Data is organized by the item numbers of the matrix.

2.2 Data

2.2.1 Project Description (Item 6)

The North Monterey Desalination Project consists of a two-stage desalination system (a nanofiltration membrane followed by the reverse osmosis (RO) system). Energy recovery is an integral part of this design.

The facility will be located on the property of Mr. Nader Agha (National Refractory Site), and will utilize the existing Refractory intake and outfall lines and/or the intake and outfall lines of Duke Energy's Moss Landing facility, if they are available.

In addition to the desalination plant, transmission pipelines will be constructed north to serve the District's customers, and south to the proposed aquifer storage and recovery (ASR) facility near Seaside (See Figure 2). No ASR or other storage facilities are proposed in this project as the ASR in the Seaside Basin is to be operated by the MPWMD.

This project may also include a significant (30+ acre) solar energy component.

2.2.2 Pilot Project (Item 7)

The required piloting worked will be managed by Dr. Val Frankel of Kennedy/Jenks in San Francisco (see attached resume). Dr. Frankel has built and operated pilot facilities in Sharm-El-Sheik, Egypt; Eliat, Israel; Ashkelon, Israel, and other locations. The pilot facility would be operated from 6 to 12 months.

2.2.3 Project Yield (Items 8, 9, 10, 11, 12 and 13)

Actual project yield is undetermined at this point. Each individual purveyor needs to identify their demand. Anticipated yield is estimated to be in the range of 20,000 to 30,000 acre-feet annually.

The yield will meet Order 95-10, and the RO facility can be phased in based on when demand actually occurs. The transmission line needs to be constructed initially to serve the ultimate demand.

2.2.4 Project Cost (Items 15, 16, 17, and 18)

The estimated project costs will be a function of the actual size of the facility to be built. The size of the facility is a function of the annual yield, and of the ability to continuously operate the facility. For example an annual yield of 20,000 acre-feet would require a plant with a capacity of 17.8 million gallons per day (MGD) if the plant operated 24 hours a day/365 days a year. However, if the operation were curtailed due to restrictions on the use of the intake and outfall lines of others (such as may be the case with Duke Power), the size of the RO facility would increase dramatically. If the RO plant could only be operated half time that the size of the facility would increase to 35.6 MGD.

For the District's planning purposes, a total project cost of cost of approximately \$162,000,000 can be used. This total includes an allowance of \$32,000,000 for contingencies. This is based on an 18 MGD desalination facility at a cost of \$4,500,000 per MGD of plant capacity. Table 1 provides a breakdown of the project components.

The biggest cost associated with operation of a desalination facility is the cost of power. To arrive at a power cost would require detailed negotiations with Duke Energy or others, but it is anticipated that a long-term power contract could be obtained for approximately \$0.05 to \$0.06/kw-hr. Power from a successful solar energy component will reduce costs, air pollution, and the use of fossil fuels.

2.2.5 Cost to Peninsula (Items 22, 23, 24)

The cost of water to all purchasers would be the same and would be based on the annual volume of water that is contracted for, and the annual volume delivered. There would be a capacity charge to cover capital costs based on the initial contract amount, and an annual usage charge based on the volume delivered. This would apply to the costs of the desalination facility and the transmission and pumping facilities.

There would be separate pumping and transmission facilities serving north and south Monterey County, and each area would be assessed separately for pumping facilities.

Future capacity could be purchased by a water purveyor based on the cost of construction at the time additional capacity is desired. The assessment for the cost of construction of the transmission line would be recalculated based on the revised capacity allocation.

2.2.6 Unit Cost and Customer Impact (Items 25, 26)

The anticipated cost of water to purchasers is \$1200 per acre-ft.

2.2.7 Financing Assumptions (items 29, 30, 31, and 32)

The District is a public entity that is eligible to sell long-term bonds or certificates of participation (COPS). The current municipal rates are approximately 5% for a 30-year term.

Because the District is a public agency, the District is also eligible for grants. Two sources of grant funding are the State of California, Department of Water Resources and the United States

Bureau of Reclamation. Application to these agencies will be submitted to defray the up-front costs of planning, environmental documentation, and pilot plant operation.

2.2.8 Timeline (Items 34-43)

Figure 3 presents a preliminary timeline for completion of this project.

2.2.9 Permits/Regulations (44-56)

The permitting for the North Monterey County Desalination Project and for the Coastal Water Project are the same with the following exceptions:

- The need for permits associated with stream crossings is less as only three stream crossings are planned, and they will be accomplished by directional drilling that does not impact sensitive areas.
- No CPUC permit is required
- No water rights permits are required as there is no ASR component to the North Monterey project
- The overall process is simplified as the District is the lead agency.

2.2.10 Site Control (Item 57, 58, and 59)

The North Monterey County Desalination project will be located on the National Refractory site. As the District has a lease agreement with the property owner, no alternative sites need to be investigated.

2.2.11 TMF Capabilities (Item 61)

The District currently has the technical, managerial, and financial (TMF) capacity as defined by the California Department of Health Services to operate their existing facilities. These facilities are permitted as System ID # 2710020 and #2700073, and were recently inspected by the State and no deficiencies noted.

The District also has annual audits performed, and no deficiencies have been noted in their audits.

The District recognizes that as their facilities expand that their overall TMF must be enhanced. Actions taken to enhance the management of the expanded water and sewer facilities include:

- Expanding the Board from 5 members to 7
- Hiring additional staff
- Outsourcing additional engineering and legal services to private parties.

2.2.12 Energy Interruptions (Item 62)

Energy interruptions will be addressed through backup generators and through the use of on-site solar power facilities if feasible.

2.2.13 Project Participants (Items 65, 66, 67, and 68)

Meetings have been held with the City of Monterey, DHS, MPWMD, MCWD, and FORA to discuss this project. The District Board has authorized the development of a Joint Powers Agreement (JPA) with MPWMD, but no action has been taken. On-going discussions are being held with FORA and MCWD.

2.2.14 Outreach Program (Item 71)

No formal public outreach program has been undertaken. Presentations have been made as requested to the following organizations:

- MPWMD
- City of Monterey
- Marina Coast Water District
- Fort Ord Reuse Authority
- California Department of Health Services

2.2.15 Capital Cost Detail (Items 76-104)

Table 1 presents a preliminary, planning level capital cost breakdown

2.2.16 O&M Cost Detail (Items 106-100)

It is anticipated that O&M cost will be in line with national and international averages. Current published O&M costs are as follows:

- Energy – \$ 0.68/1000 gallons
- Chemicals and labor – \$ 0.67/1000 gallons
- Membrane replacement – \$0.80/1000 gallons
- Total O&M – \$ 2.05/1000 gallons.

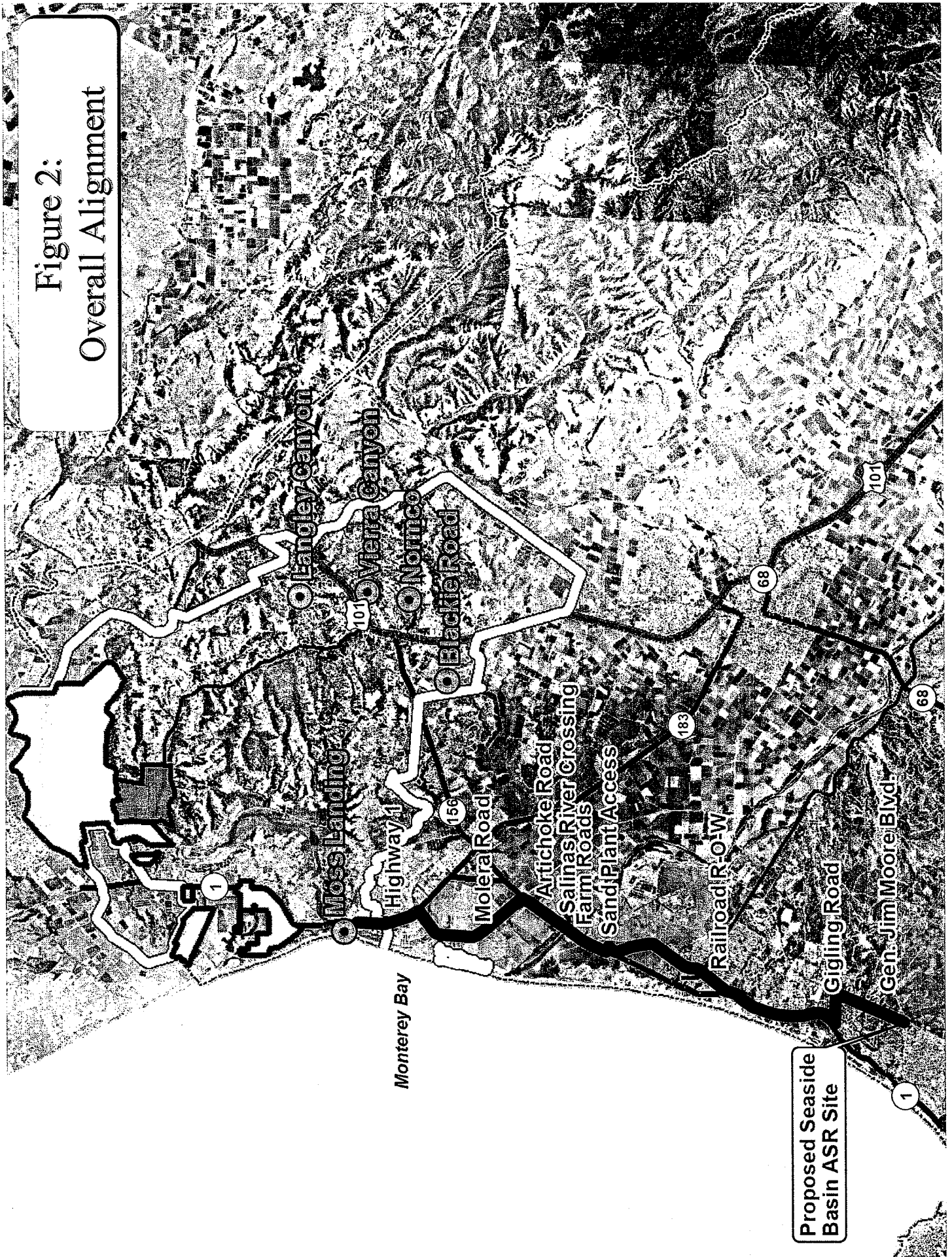
Not included in these costs are any corporate management fees. As the District is a local public entity, they would be no management fees associated with national or international offices.

As no mitigation measures can yet be defined, no costs for their O&M can be defined.

Figure 1:
Pajaro / Sunny Mesa Service Area



Figure 2:
Overall Alignment



**FIGURE 3
PROJECT SCHEDULE
NORTH MONTEREY COUNTY DESALINATION PROJECT**

TASK DESCRIPTION	2004				2005				2006				2007				2008			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PRE-DESIGN																				
Project Definition																				
CEQA Compliance																				
Obtain Permits																				
Pilot Plant Operation																				
Finalize Predesign Report																				
DESIGN																				
Desalination Plant																				
Storage & Pumping Facilities																				
Conveyance System																				
BIDDING & CONSTRUCTION																				
Desalination Plant																				
Storage & Pumping Facilities																				
Conveyance System																				

**TABLE 1
PRELIMINARY CAPITAL COST BREAKDOWN**

ITEM	QUANTITY	UNITS	COST	
DESALINATION COMPONENTS				\$74,000,000
Intake Pipeline Rehabilitation	1	Lump Sum	\$500,000	
Desalination Facility (18 MGD)	1	Lump Sum	\$72,000,000	
Outfall Pipeline Rehabilitation	1	Lump Sum	\$1,500,000	
PUMPING & STORAGE COMPONENTS				\$14,000,000
Finished Water Storage & Pumping Facilities	1	Lump Sum	\$14,000,000	
TRANSMISSION PIPELINE				\$16,830,000
Transmission Pipeline -- Paved/Hwy 1 R-O-W	20000	L.F.	\$5,000,000	
Transmission Pipeline -- Unpaved R-O-W	47900	L.F.	\$9,580,000	
Mojo Cojo Slough Crossing	500	L.F.	\$750,000	
Trembladero Slough Crossing	100	L.F.	\$250,000	
Salinas River Crossing	1000	L.F.	\$1,250,000	
OTHER				
Energy Facilities	Undetermined			
ASR Costs	None Proposed			
Distribution System Requirements	None Proposed			
Construction Subtotal			\$104,830,000	
ADMIN, LEGAL, ENGINEERING & ENVIRONMENTAL				\$24,635,050
Right-of-Way				
Environmental Review, Permits	3%	of Subtotal	\$3,144,900	
Mitigation Measures	Undetermined			
Design Engineering	10%	of Subtotal	\$10,483,000	
Construction Management	7.50%	of Subtotal	\$7,862,250	
Administration/Legal	3%	of Subtotal	\$3,144,900	
Profit	None		\$0	
Project Subtotal			\$129,465,050	
Contingencies	25%		\$32,366,263	\$32,366,263
Project Total			\$162,000,000	\$162,000,000



Val S. Frenkel, Ph.D., P.E.

Principal Process Engineer

Education

M.S., Civil Engineering/Water and Wastewater Treatment, Lvov Polytechnic University, Ukraine, 1978

Ph.D., Water and Ecology Science, Lvov Polytechnic University, Ukraine, 1983

Registrations

Professional Engineer, Ontario, Canada

Professional Engineer, Israel

Professional Summary

Dr. Frenkel has over 20 years of experience in engineering, with specific technical expertise in water and wastewater treatment and membrane technologies. His professional background includes creating new innovative processes, technologies and engineering concepts that resolve complex tasks and find non-standard, original solutions to clients' project issues. Dr. Frenkel's creative, cost-efficient approaches have resolved clients' technical problems during project construction and pilot plant testing. Dr. Frenkel has also authored several patents in the area of water and wastewater treatment.

In addition to his technical accomplishments, Dr. Frenkel is the recipient of numerous project management awards and has had a successful record of realizing project savings through technological alternatives.

His professional experience includes the following:

- *GE Water (formerly GLEGG), Guelph, Ontario.* As a Chief Process Engineer worked with clients to identify CTQs and create solutions. Managed Design Group that included designing projects/process, coordinating department activities, and preparing tender documentation. Established desalination market, including strategy, proposals, and process design. Implemented new, cost-saving technologies into the company. Managed large scale projects in all water treatment process areas, including conventional and membrane processes. Also responsible for training staff on the application of new technologies.
- *ZENON Environmental, Inc., Toronto, Ontario.* Responsible for technology and process for full-scale systems and pilot-plants. Designed projects/process; managed and supervised construction, and startup; solved troubleshooting problems (Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis); coordinated

department activities; revised projects; and optimized processes. Designed plant and system upgrades and R&D projects, developed new treatment technologies and applied patents, and trained staff on the application of new technologies.

- *EMS - Mekoroth, National Water Company, Israel.* Managed Process Division; designed projects/process for conventional and membrane technologies (Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis); coordinated departments activities; prepared tender documentation for treatment plants in various countries; developed market and marketing strategy; managed projects; supervised construction, start-up; trained technical personnel; wrote technical manuals.

Dr. Frenkel experience with **DESALINATION** Projects started in 1990 in the Middle East and it was continued in the Americas: Canada, United States and Mexico. He has been involved into all stages of more than 20 desalination projects performing the following duties:

- project management;
- project engineering including process and detailed design;
- pilot studies and process evaluation;
- equipment and instrumentation selection including corrosion evaluation;
- control and operation design;
- start-up and commissioning.

Brief list of Desalination projects is as follows:

- *Sea Water RO (SWRO) Desalination plant for the City of Eilat on the Red Sea in Israel.* The closest fresh water source is located more than 250 miles away and to deliver fresh water to the City of Eilat was a not reasonable option. The only possible water source is Red Sea with the water salinity TDS = 52,000 ppm. City had an old relatively small capacity desalination facility, which also restricted growth of this resort. The biggest challenges of this project were layout size limitations and energy cost. Dr. Frenkel developed unique design of the horizontal Media Filters with the side connections allowing to minimize number of Media Filters, to use minimum space when optimizing layout and at the same time to get uniform filtration and back-wash of the large Horizontal Media Filters 2.5 meters (8.3 ft) in diameter and 9 meters (30 ft) length. In cooperation with CALDER Corporation from Switzerland it was developed the energy saving concept using Pelton Wheel Type Energy Recovery Turbine (ERT), which allowed 30% energy return to the system. This approach became the industry standard for the energy recovery in the Desalination by Reverse Osmosis.
- *First Desalination Plant in the Gaza Strip for the City of Deir-El-Ballah.* The City's well, the only one source of the fresh water was built by British Military Corps in early 1930th. As water was drawn by decades, the salinity in the well increased significantly as a result of the Mediterranean Sea salty water intrusion with the salinity TDS = 32,000 ppm. The challenges for this project were to introduce Desalination plant without interruption of the water supply to the city and to use maximum the existing facilities. By applying the custom design, the existing water tower was retrofitted to the Forced Draft Decarbonator, the existing water line was retrofitted to the by-pass for the projected Desalination facility and the number of additional engineering custom approaches were taken, which allowed to build the

Desalination plant in 4 months and to start it overnight providing fresh water to the City. This project was honored by a number of International Awards including European Desalination Society and the opening ceremony was open by I. Rabin and Y. Arafat.

- *Sea Water RO (SWRO) Desalination plant for the City of Sharm-El-Sheikh on Red Sea in Sinai, Egypt.* This project was designed in Canada as part of the resort City of Sharm-El-Sheikh Municipal Water Supply Program under control of Egyptian Government. As an International resort with more than 50 International Hotels, city needed solution for the Drinking Water supply. A number of Hotels built own SWRO units, however most of them failed in operation when they were challenged by the effect of the 'red sea' when organics blows within 1-2 up to 3 weeks and water becomes of red color. That is why this sea is called Red Sea. When this happen, the small colloidal organics go through the pre-treatment, plug RO membranes making unable to operate Desalination facility, By applying unique pre-treatment design, the newly constructed SWRO plant which was built on the Built-Own-Operate-Transfer (BOOT) approach is well performing since its start in 1998. By using the same approach with Energy Recovery Turbine as for the City of Eilat, 30% of the energy is returning to the system. This particular SWRO was designed and built with electrical equipment including Motor Control Center and High Pressure Pump Motors down-sized by 30% counting recoverable energy, which resulted in significant savings for the project. When system started to operate, the former US President at that time, B. Clinton visited the facility when visiting Sharm-El-Sheikh to attend peace process meetings . Project was financed by the USAAID and Egyptian Government.

Affiliations

American Water Works Association, Candidate to the Board of Directors WFP
Association of Engineers, Architects and Graduates in Israel
European Desalination Society
Ontario Society of Professional Engineers
Professional Engineers Ontario
Water Environment Association of Ontario

Publications

Frenkel, V., 2004. *Membranes vs. Conventional Treatment in Municipal and Industrial Applications.* American Membrane Technology Biennial Conference, AMTA-2004, August 5-7, 2004, San Antonio, TX.

Argo, D., Frenkel, V., Pankratz, T., 2004. *Desalination Methods, Technology and Economics.* Desalination Conference, April 16, 2004, The Seminar Group, Santa Barbara, CA.

Frenkel, V. 2004. *The Future Role of Membranes in Wastewater Treatment.* HWEA-2004, Hawaiian Water Environmental Conference, Honolulu, HA.

Frenkel, V. 2003. *Consider Life-Cycle Costs in Designing or Upgrading Water Pretreatment Systems.* Power Engineering International Magazine, New York, NY.

Frenkel, V. 2002. *Use Pre-Treatment to Improve Process Water Treatment.* Chemical Engineering Magazine, New York, NY.

- Frenkel, V., Best G., 1998. *Effective Color and TOC Removal from Drinking Water by Microfiltration*. Environmental Science & Engineering, Canada.
- Frenkel, V., Mourato, D. 1998. *Application of Immersed Microfiltration Membranes for Drinking Water Treatment*, NSF International Conference, Washington, D.C.
- Frenkel, V. 1998. *Water Filtration – Fundamentals and Design*. Environmental Science & Engineering, Canada.
- Frenkel, V., Gourgi, T. 1995. *Water Treatment Systems Systems: Bed Filtration and Desalination by Reverse Osmosis (RO)*. E.M.S.-Mekoroth-Israel National Water Company, Israel.
- Frenkel, V., Gourgi, T. 1995. *Brackish Water RO Desalination Plant in the Gaza Strip*. "Desalination." Amsterdam, Holland.
- Frenkel, V., Gourgi, T. 1994. *Water Treatment Systems: Bed Filtration and Desalination by Reverse Osmosis (RO)*. E.M.S.-Mekoroth-Israel National Water Company.
- Frenkel, V. 1990. *Technical Recommendations for use of Coal Slag of Burshtyn Power Electric Station as a Filtering Material for Water Treatment and Procedure for Slag Studies*. Lvov.
- Frenkel, V. 1990. *The Method for the Free Space Determination in the Filter Media*. The Information Report # 1086 (Nvod-10), Lvov.
- Frenkel, V., Vasilyev, V. 1990. *The Method for Estimation of Free Space in the Filtering Materials*. The Information Report #1064 (Nvod-1), Lvov.
- Frenkel, V., Lozynsky, L. 1989. *The Filtering Material Made from the Coal Slag*. "Municipal Economy of Ukraine," #4. Kiev.
- Frenkel, V. 1988. *The Intensification of a Bio-Filter Properties*. The Information Report #14. Lvov.
- Frenkel, V., Vasilyev, V. 1987. *The Hygienic Estimation of Coal Slag as a Filtering Material for Water Treatment*. "Hygiene and Sanitary," #10. Moscow.
- Frenkel, V., Vasilyev, V. 1986. *The Hygienic Estimation of Water Treatment Methods and Level of Chemical Substances Setting*. Report of XI Ukrainian Hygienist Congress. Ministry of Health, Kiev.
- Chubatyuk, N., Frenkel, V., Vasilyev, V. 1986. *The Use of Coal Slags as a Filtering Material for Water Treatment Filters*. The Energy Review Magazine. Moscow.
- Dumsky, V., Frenkel, V., Vasilyev, V., Vasilyeva, L. 1986. *Recommendations for USSR Standard 2874-82 "Drinking Water Hygienic Requirements and Quality Control"*. in Lvov Region and Lvov Railway, Lvov.
- Frenkel, V., Vasilyev, V. 1986. *The Use of Coal Slag in Water Treatment Practice*. The Scientific and Technical Conference "The Complex Use of Burshtyn Electric Power Station's Ash and Coal Slag."

- Frenkel, V., Vasilyev, V. 1986. *The Coal Slag of the Power Electric Stations – The Effective Filtering Material for Water Treatment*. Report of State Symposium “Rational Utilization of Recycling Resources.” Donetsk Polytechnic Institute.
- Bobyk, I., Frenkel, V., Ivanova, O., Vasilyev, V. 1986. *Application and Sanitary-Hygienic Evaluation of Coal Slag as a Filtering Media for Water Treatment*. The Information List #86-090. Moscow.
- Frenkel, V., Vasilyev, V. 1986. *Water Protection in the USSR – The Most Important Economic Task*. The USSR Exhibition of Economic Achievements Report.
- Frenkel, V., Vasilyev, V., 1986. *The Hygienic Evaluation of Coal Slag of Burshtyn PEC as a Filtering Media for Drinking Water Treatment*. R&D Report #02860074797, Lvov State Medical Institute.
- Chura, D., Frenkel, V., Vasilyev, V. 1986. *Sanitary, Technical and Economical Evaluation of Coal Slag of Burshtyn Power Electric Station as a Filtering Media for Potable Water Treatment*. The Central Scientific and Technical Information House. Moscow.
- Chubatyuk, N., Frenkel, V., Vasilyev, V. 1986. *Use of Coal Slag as a Filtering Media for Water Treatment – The Economy and Rational Use of Raw Materials, Fuel, Energetic and Other Resources in the Building Industry*. The theses of State Conference Report. Kharkov.
- Frenkel, V., Vasilyev, V. 1985. *The Hygiene of Water Supply*. Lvov State Medical Institute. Lvov.