

WATER IN MINING 2010 CONGRESS
TECHNICAL AND SOCIAL PROGRAMME

Sheraton Santiago Hotel & Convention Center

WEDNESDAY, 9 JUNE

14:00-19:00 Registration

18:00-18:30 Authors and Session Chairs Coordination Meeting. *San Cristóbal Ballroom A*

SAN CRISTÓBAL BALLROOMS B & C

19:00-20:00 Inauguration Ceremony

Welcoming words. Jacques Wiertz, WIM 2010 Technical Coordinator, Universidad de Chile

Opening address. *Water in Mining: Industry Vision.* Francisco Costabal, WIM 2010 Chairman, President, Consejo Minero

20:00-21:30 Welcome reception, Courtesy of Degrémont. *Foyer*

THURSDAY, 10 JUNE

SAN CRISTÓBAL BALLROOMS B & C

08:20-08:30 Announcements

08:30-10:00 Plenary Session I

Chair: Jacques Wiertz, Universidad de Chile

08:30-09:00 **Development of Water Management Policies in the Arid and Semi-arid Areas of South America**

Christopher Beggs and Marcela Venegas, Schlumberger Water Services, Chile; Luís Ribeiro, Ana Buxo and João Nascimento, CVRM Instituto Superior Técnico, Portugal

09:00-09:30 **Sal or Desal: Sea Water Supply Options for the Mining Industry**

Raymond Philippe, Richard E. Dixon and Silvana dal Pozzo, Hatch, Chile

09:30-10:00 **Framework for Assessing Cumulative Effects of Mining Operations on Groundwater Systems**

Paul Howe, SKM, Australia; Chris J. Moran and Sue Vink, Sustainable Minerals Institute, The University of Queensland, Australia

10:00-10:50 Poster Session / Coffee Break, courtesy of Chile Registros. Foyer and San Cristóbal Ballroom A

	SAN CRISTÓBAL BALLROOM B	SAN CRISTÓBAL BALLROOM C
10:50-12:30	<p><u>Session 01</u> WATERSHED MANAGEMENT Chair: John McCartney, Schlumberger Water Services, Chile</p>	<p><u>Session 02</u> DESALINATION Chair: Richard Dixon, Hatch, Chile</p>
10:50-11:10	<p>Development and Application of Water Quality Indices in the Elqui River Basin, North-Central Chile <u>Luís Ribeiro</u>, Ana Buxo and João Nascimento, CVRM – Instituto Superior Técnico, Portugal; Nicole Kretschmer, CEAZA, Chile; Jorge Oyarzún, and Hugo Maturana, CAZALAC, Chile; Ricardo Oyarzún, CEAZA and Universidad de La Serena, Chile; Tobias Rötting, HERO Group, University of Newcastle, UK; Guido Soto and Manuel Soto, CAZALAC, Chile</p>	<p>Assessing the Behaviour and Dispersion of Desalination Discharge into Spencer Gulf, South Australia <u>Peter S. Yeates</u> and Jason P. Antenucci, Centre for Water Research, The University of Western Australia; Michael E. Barry, Daniel A. Botelho and Tony B. McAlister, BMT WBM Pty Ltd, Australia; James Brook, Arup Pty Ltd, Australia</p>
11:10-11:30	<p>Evaluation of Sources of Water to Lagoons, Salar de Atacama Basin: An Isotope and Geochemical Approach <u>Ramon Aravena</u>, University of Waterloo, Canada; Joaquin Salas, Ona Cornella, Jordi Guimerà and Wolf von Igel, Amphos XXI Consulting, Spain; Edwin Guzmán and Corrado Tore, Sociedad Química y Minera, Chile</p>	<p>Alternative Intake Designs to Reduce Cost of Sea Water Desalination Systems for Mine Water Supply <u>Thomas M. Missimer</u> and Robert G. Maliva, Schlumberger Water Services, USA</p>
11:30-11:50	<p>GIS-Based Water Balance Analysis of the Huarmey Basin, Peru <u>Saul Montoya</u>, Robin Dufour, Katty Barzola and Daniel Bay, MWH, Peru</p>	<p>Long Term Experiences with Internally Staged Designs (ISD) in Large SWRO Desalination Plants <u>Renato G. Ramos</u>, Dow Brasil Industrial Ltda, Brazil; Verónica García, Dow Water & Process Solutions, Germany</p>
11:50-12:10	<p>Watershed Management in Arid Zones with Mining: The CAMINAR Project in the Elqui River Basin, Chile Guido Soto, Manuel Soto and Michelle Señoret, CAZALAC, Chile; Jaime Amezaga and Tobias Rötting, HERO Group, University of Newcastle, UK; Luís Ribeiro, Ana Buxo, Paula Mendes and João Nascimento, Instituto Superior Técnico, Portugal; Christopher Beggs and Marcela Venegas, Schlumberger Water Services, Chile; Nicole Kretschmer and Karine Orth, CEAZA, Universidad de La</p>	<p>Flexible and Sustainable Water Supply: Sea Water Desalination Vessel Options and Analysis <u>Lisa Henthorne</u>, Water Standard, USA; José Pesce, Grupo Latino, Chile</p>

	Serena, Chile; Jorge Oyarzún, Hugo Maturana and <u>Ricardo Oyarzún</u> , Universidad de La Serena, Chile	
12:10-12:30	A Socially Sustainable Approach for the Intensive Use of Aquifers in Northern Chile <u>Orlando J. Acosta</u> , Cía Minera Doña Inés de Collahuasi, Chile	The Use of Saturation Indexes to Predict Scaling of CaCO₃ in Sea Water Reverse Osmosis Systems (SWRO) <u>Rubén Muñoz</u> , UNESCO-IHE Institute for Water Education, The Netherlands and SKM, Chile; Jan Schippers, Gary Amy, Maria Kennedy and Tarek Waly, UNESCO-IHE, Institute for Water Education, Department of Urban Water and Sanitation, The Netherlands; Geert J. Witkamp, Delft University of Technology, The Netherlands

12:30-14:00 Lunch. *Pedro de Valdivia Ballroom, Level Z*

	SAN CRISTÓBAL BALLROOM B	SAN CRISTÓBAL BALLROOM C
14:00-16:00	<u>Session 03</u> WATER SUPPLY Chair: Lisa Henthorne, Water Standard, USA	<u>Session 04</u> EFFLUENT CHARACTERISATION & TREATMENT Chair: Ricardo Oyarzún, Universidad de La Serena, Chile
14:00-14:20	Water Supply for the Quellaveco Project <u>John McCartney</u> and David Sellars, Schlumberger Water Services, Chile; Aldo Brigneti, Anglo American Quellaveco, Peru	Neutralisation of Acidity and Attenuation of Metals in Wastewaters Using Mineral-Based By-Products <u>Laura A. Wendling</u> , Grant B. Douglas, Shandel Coleman and Yuan Zheng, CSIRO Land and Water, Australia
14:20-14:40	Saline Groundwater: An Alternative for the Sustainable Exploitation of Andean Highland Groundwater Reserves Orlando J. Acosta, Cía Minera Doña Inés de Collahuasi, Chile; Pablo Rengifo and <u>Edgardo Dzogolyk</u> , GeoHidrología Consultores, Chile	Mine Water Treatment Using Recycled Concrete and Magnetite <u>James D. Navratil</u> and Andrew C. Akin, Hazen Research, USA
14:40-15:00	Use of Deep Groundwater Reserves: Practical Experience in Deep Water Production <u>Pablo Rengifo</u> and Edgardo Dzogolyk, GeoHidrología Consultores, Chile; Orlando J. Acosta, Cía Minera Doña Inés de Collahuasi, Chile	Hydrotalcite Formation for Contaminant Removal from Ranger Mine Wastewaters <u>Grant B. Douglas</u> and Laura A. Wendling, CSIRO Land and Water, Australia; Ron Pleysier, Parker Centre for Integrated Hydrometallurgy Solutions, Australia

15:00-15:20	Analysis and Technico-Economic Optimisation of a Long Distance Water Recovery System Jorge Serey and <u>Arnaldo Santander</u> , JRI Ingeniería, Chile	Commerical Metal Recovery and Sulphate Reduction with Biotechnology-Based Processes <u>Jacco Huisman</u> and Martijn Olde Weghuis, Paques B.V., The Netherlands
15:20-15:40	Selection of Pipeline Corrosion Control Strategy and Impact on Economics of Water Conveyance Sergio González and Marcelo Encalada, Hatch, Chile; <u>Stephen Daughney</u> and Tony Vece, Hatch, Canada	Modern Water Management for the Minerals Industry <u>Subasish Dutt</u> and Chris Hughes-Narborough, Aker Solutions, UK; <u>Fredi Lokiec</u> , IDE Technologies, Israel
15:40-16:00	Risks of Severe Drought in the Chilean Mining Industry <u>Juan Rayo</u> , Ramon Fuentes and Jorge Ipinza, JRI Ingeniería, Chile	Purification of AMD with a Multi-Staged Process Based on Nanofiltration – Avoiding Environmentally Harmful Discharge and Enabling Reuse of Valuable Components Thomas Peters, Consultant, Germany

16:00-16:30 Coffee Break, Foyer and San Cristóbal Ballroom A

	SAN CRISTÓBAL BALLROOM B	SAN CRISTÓBAL BALLROOM C
16:30-18:30	<u>Session 05 WATER BALANCE & EFFICIENT USE</u> Chair: Stephen Foot, Antofagasta Minerals, Chile	<u>Session 06 NATURAL RESOURCE QUANTIFICATION & PROTECTION</u> Chair: Ramon Aravena, University of Waterloo, Canada
16:30-16:50	Developing Water Balance Models as an Operation Tool for Sustainable Mine Water Management Sarah Gosling, SKM, Australia	Hydrogeologic Conceptual Model for the Collahuasi Mine Area, Chile <u>Mark J. Thomasson</u> and Staffan W. Schorr, Montgomery & Associates, USA; Lyle A. Davis and Michael J. Rosko, Montgomery & Associates, Chile; Orlando J. Acosta, Cía Minera Doña Inés de Collahuasi, Chile
16:50-17:10	Effective Use of Aquifer Storage and Recovery Technology for Mine Process Water Supply in Chile <u>Robert G. Maliva</u> and Thomas M. Missimer, Schlumberger Water Services, USA	Impact of the Ionic Strength on the Estimation of the pH of the Concentrate in Sea Water Reverse Osmosis (SWRO) <u>Rubén Muñoz</u> , UNESCO-IHE Institute for Water Education, The Netherlands, and SKM, Chile; Jan Schippers, Gary Amy, Maria Kennedy and Tarek Waly, UNESCOo-IHE, Institute for Water Education, Department of Urban Water and Sanitation, The Netherlands; Geert J. Witkamp, Delft University of Technology, The Netherlands
17:10-	Saving Water and Aqueous Waste in the Production of	Hydro-Geochemical Modelling to Simulate Natural Attenuation and

17:30	Concentrated Phosphoric Acid Raul Raiter, Arafura Resources, Australia; <u>Baruch Grinbaum</u> , Bateman Advanced Technologies, Israel	Remediation in Acid Mine Drainage Clara Sena, <u>Jorge Molinero</u> , Fidel Grandia, David Arcos, Cristina Domènech and Mireia Grivé, Amphos XXI Consulting, Spain
17:30-17:50	Saving Water in Stripping of Uranium <u>Baruch Grinbaum</u> , Bateman Advanced Technologies, Israel	Dewatering for the Peñasco Open Pit, Peñasquito Mine, Mexico Jeremy Dowling and <u>Kent Lang</u> , Schlumberger Water Services, USA; Terry Munson, Gold Corp Minera Peñasquito, Mexico
17:50-18:10	Water Evaporation Reduction Studies at Lomas Bayas in Northern Chile, Joint University and Industry Project <u>María E. Taboada</u> , Teófilo Graber, Héctor Galleguillos and <u>Luis Cáceres</u> , Universidad de Antofagasta, CICITEM, Chile; <u>María C. Hernández</u> , Pamela Garrido and Oscar Benavente, Universidad Católica del Norte, CICITEM, Chile	Selecting Solid-Bowl Scroll Centrifuge Technology for Solid-Liquid Separation Tasks in Mining Stefan Koppe, Flottweg AG, Germany
18:10-18:30	Water Balance Studies in Iron Ore Mine Sites in the Quadrilátero Ferrífero, Brazil Marcelo M. Diniz, Francisco E. Silva, Flávia A. Nascimento, Ana P. Vianna, Márcio F. Resende and Aloysio P. Saliba, Golder Associates, Brazil; Maria L. Santos, Vale, Brazil; <u>Andre M. Rocci</u> , Hydrogeologist, Brazil	

19:30-22:30 Reception and Congress Dinner, courtesy of Agbar Medioambiente. Pedro de Valdivia Ballroom. Level Z

FRIDAY, 11 JUNE

SAN CRISTÓBAL BALLROOMS B & C

08:20-08:30 Announcements

08:30-09:30 Plenary Session II

Chair: Claire Cote, SMI, The University of Queensland, Australia

08:30-09:00 Water Accounting in Mining: How well do International Systems Work for the Mining Sector?

Anne-Marie Fleury, International Council for Mining & Metals (ICMM), UK

09:00-09:30 **Advances in Technology for Effective Mine Water Management**
 Graham Sim, General Electric Water & Process Technologies, Australia

09:30-10:00 Special poster presentation

Jacques Wiertz, WIM 2010 Technical Coordinator, Universidad de Chile

10:00-10:50 Poster Session / Coffee Break, courtesy of Xrosswater. Foyer and San Cristóbal Ballroom A

	SAN CRISTÓBAL BALLROOM B	SAN CRISTÓBAL BALLROOM C
10:50-12:30	<u>Session 07 WATER MANAGEMENT</u> Chair: Peter Yeates, The University of Western Australia	<u>Session 08 GROUNDWATER MODELLING</u> Chair: Paul Howe, SKM, Australia
10:50-11:10	Improving Overall Usage of Water in Mining – A Sustainable Development Approach Philip Bangerter, Hatch, Australia; <u>Richard E. Dixon</u> and Mariana Villegas, Hatch, Chile	Feasibility Assessment of a Mine Closure Plan by Using Hydrogeological Models (La Respina, Spain) Clara Sena and <u>Jorge Molinero</u> , Amphos XXI Consulting, Spain
11:10-11:30	Estimating Global Water Withdrawals due to Copper Mining <u>A.J. Gunson</u> , Bern Klein and Marcello Veiga, Norman B. Keevil Institute of Mining Engineering, University of British Columbia, Canada	Assessment of Tailings Seepage from an In-pit Tailings Storage Facility (TSD) Using a 3D Groundwater Flow Model <u>Christoph Wels</u> and Reinhard Zapata, Robertson GeoConsultants, Canada
11:30-11:50	Water Management at Cerro Vanguardia, Santa Cruz, Argentina Fernando Salomone, Cerro Vanguardia, Argentina	Results of a 3-Dimensional Finite Element Groundwater Flow Model for the Rosario Pit Area, Collahuasi Mine, Chile <u>Mark Thomasson</u> , Staffan Schorr, Montgomery & Associates, USA; Lyle Davis and Michael Rosko, Montgomery & Associates, Chile; Orlando J. Acosta, Cía Minera Doña Inés de Collahuasi, Chile
11:50-12:10	Water Management in Tropical Nickel Laterite Heap Leach Projects Mark Steemson, <u>Carola Sepulveda</u> and Mark Smith, Vector Engineering, Australia	Hydraulic Tomography for Accurate Characterisation of Subsurface Hydraulic Heterogeneity <u>Walter A. Illman</u> and Steven J. Berg, University of Waterloo, Canada
12:10-12:30	Multisectoral Water Resources Management: Copiapó Case and its Contribution to the Mining Industry	Groundwater Flow Modelling Applications in Mining: Scopes and Limitations

<u>Felipe García</u> and Andrea González, JRI Ingeniería, Chile; Juan Pablo Saavedra, CORPOA, Chile	<u>Claudia Martínez</u> and Karem de la Hoz, SRK Consulting, Chile; Cristian Pereira, SRK Consulting, USA
---	---

12:30-14:00 Lunch. *Pedro de Valdivia Ballroom, Level Z*

SAN CRISTÓBAL BALLROOMS B & C

14:00-15:00 Plenary Session III

Chair: Rinaldo Mancin, IBRAM, Brazil

14:00-14:30 **The GARD Guide: A Mining Industry Collaboration to Prevent Acid Rock Drainage**

Terrence Chatwin, International Network for Acid Prevention (INAP), USA; Rens Verburg, Golder Associates, USA

14:30-15:00 **Progressing towards Sustainability: From Water Efficiency to Water Effectiveness at Collahuasi Mine**

Claire M. Cote and Chris J. Moran, Sustainable Minerals Institute, The University of Queensland, Australia; Orlando J. Acosta, Cia Minera Doña Inés de Collahuasi, Chile

15:00-16:00 Session 09 GOOD PRACTICES – CASE STUDIES

Chair: Orlando J. Acosta, Cia Minera Doña Inés de Collahuasi, Chile

15:00-15:20 **Water Supply and Water Use at Codelco Norte**

Álvaro Hernández, Codelco, Chile

15:20-15:40 **Peñasquito Mining Project in Zacatecas, Mexico: A Hydrogeological Challenge**

Miguel Rangel-Medina, IDEAS S.C., Mexico; Armando Escarcega, Gold Corp Inc, Mexico

15:40-16:00 **Assessment of Post-Closure Flooding of Bonanza Ledge Open Pit in British Columbia, Canada**

Reinhard Zapata and Christoph Wels, Robertson GeoConsultants, Canada; Justin Bourne, Lorax Environmental, Canada

16:00-16:30 Closing Session. Final comments and congress balance

Jacques Wiertz, Technical Coordinator; Carlos Barahona, Executive Director

16:30-18:00 **Farewell Reception.** *Foyer*

POSTER PRESENTATIONS

Identification of Minerals in Soils from the Antofagasta Region for Application in Mining Wastewater Treatment

Paola Agüero, Constanza Fariña and Naldy Miranda, Universidad Católica del Norte, Chile; Nelson Alarcón and Bárbara Fuentes, Centro para el Desarrollo de Tecnologías de Explotación Sustentable de Recursos Hídricos en Zonas Áridas (CEITSAZA), Chile

Selecting Solid-Bowl Scroll Centrifuge Technology for Solid-Liquid Separation Tasks in Mining

Stefan Koppe, Flottweg AG, Germany

Use of Numerical Groundwater Modelling for Mine Dewatering Assessment

Claudia Martinez and Vladimir Ugorets, SRK Consulting, USA

Probabilistic Risk Assessment (PRA) Applied to Environmental Mine Waste Management

Paolo Trincherro and Anne Delos Amphos XXI Consulting, Spain; Daniel M. Tartakovsky, Department of Mechanical and Aerospace Engineering, University of California, USA; Daniel Fernandez-Garcia, Diogo Bolster, Technical University of Catalonia, Spain; Marco Dentz, Departamento de Geociencias, Instituto de Diagnóstico Ambiental y Estudios del Agua (IDEA-CSIC), Spain; Xavier Sanchez-Vila, Technical University of Catalonia, Spain; Jorge Molinero, Amphos XXI Consulting, Spain

The Potential Impact of Climate Change on the Quellaveco Project Water Supply

John McCartney and David Sellars, Schlumberger Water Services, Chile; Aldo Brigneti, Anglo American Quellaveco, Peru

Water Production at the “El Coloso” Reverse Osmosis Plant, Minera Escondida, Chile

Miguel Angel Sanz, Degremont, Spain

Water Sanitation at Molybdenum Removal Plant (PAMo), El Teniente, Codelco, Chile

Elias Trauman, Degremont, Argentina

Development of a Textural ARD Index for Predicting Acid and Metalliferous Drainage

Anita Parbhakar-Fox, CODES, University of Tasmania, Australia; Mansour Edraki, CMLR, University of Queensland, Australia; Dee Bradshaw and Steve Walters, JKMRRC, SMI, University of Queensland, Australia

An Effluent Free, Commercially Attractive and Sustainable Solution to Acid Mine/Rock Drainage

Chris Grobler, Darryl Howard, Trisha Mithal, Mike Meiring and Richard Doyle, Earth Metallurgical Solutions, South Africa

Results of a 3-Dimensional Finite Element Groundwater Flow Model for the Rosario Pit Area, Collahuasi Mine, Chile

Mark Thomasson, Staffan Schorr, Montgomery & Associates, USA; Lyle Davis and Michael Rosko, Montgomery & Associates, Chile; Orlando J. Acosta, Cía Minera Doña Inés de Collahuasi, Chile

New Technology for Industrial Water Clarification

Augusto Reijer, Equiip, Chile

Water Management at Cerro Vanguardia, Santa Cruz, Argentina

Fernando Salomone, Cerro Vanguardia, Argentina

Purification of AMD with a Multi-Staged Process Based on Nanofiltration – Avoiding Environmental Harmful Discharge and Enabling Reuse of Valuable Components

Thomas Peters, Consultant, Germany

Water in Mining Industry – From Supply to Reuse

Young Chul Choi, Pranay Mane, Chunwoo Lee and Mainor Vega, Doosan Hydro Technology, USA; Won-Young Ahn and Junho Lim, Doosan Heavy Industries & Construction, South Korea

Calama and Quillagua Oasis: One History in Common, Two Contrasts, a Different Ending?

José de la Torre, Héctor Rojas, Matías Sánchez, Ignacio Delfino, Universidad Arturo Prat, Chile; Nelson Tapia, Xstrata Lomas Bayas, Chile

Importance of Pre-Treatment Systems in Sea Water Reverse Osmosis (SWRO) Desalination Plants, Case Studies

Oscar Alvarado, Cadagua, Spain

Water Retained in Tailings: How to Reduce it?

Sergio Barrera and Javiera Ortiz, Arcadis Geotécnica, Chile

STUDENT POSTERS

Water Evaporation Modelling in Mining Processes

Tania Ibañez, Pamela Garrido and María Cecilia Hernández, Universidad Católica del Norte, Chile

Chloride Removal from Brackish Groundwater by an Electrochemical Oxidation Processes for their Use in the Mining Industry

Naldy Miranda and Javier R. Quispe, Universidad Católica del Norte, Chile

Evaluation and Application of the Australian “Water Miner” Water Accounting Methodology at Los Pelambres (MLP) Mine

Cristóbal Barrientos, Universidad de La Serena, Chile

Hydrogeology of the Paipote Creek Basin

María Eliana Lorca and Diego Morata, Universidad de Chile

Technical Potential of Water Footprint as a Sustainability Indicator for the Mining Industry in Chile

Manuel A. Garcés and Marcelo A. Olivares, Universidad de Chile

Decontamination of Heavy Metals from Acid Waters Generated in Mining Activity Using Microencapsulation of Commercial Extractants

Claudio Araneda and Fernando Valenzuela, Universidad de Chile

Study on the Use of Water in Copper Production Processes

Pia Hernández, María Elisa Taboada, Karen Pastene and Elsa Flores, Universidad de Antofagasta

Modelling of Copper Slurries in Distribution Boxes

Francisca Jalil and Álvaro Valencia, Universidad de Chile