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ADRIATIC METALS PLC

VARES PROJECT ESIA

WATER AND WASTEWATER MANAGEMENT PLAN

October 2021

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ADRIATIC METALS PLC

VARES PROJECT ESIA

WATER AND WASTEWATER MANAGEMENT PLAN

October 2021

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1 INTRODUCTION

This Water and Wastewater Management Plan (WWP) follows the recommendations made within Chapter 5.7 of the Environmental and Social Impact Assessment (ESIA) for Adriatic Metal's Vares project, in Bosnia (hereafter referred to as "the Project").

This Water Management Plan describes the process for managing water through the construction and operational phases at the site. It provides detail on the specific operational conditions as determined from water permits and authorisations; the local community requirements; the site social and environmental characteristics; and all operational programs and management plans required to manage water on site. The plan addresses the surface water and groundwater environment. It should be used as an integral part of the Environmental and Social Management System. The Plan should be reviewed annually and/or in response to any changes in site specific conditions, permits, or incidents.

The proposed measures have been identified in accordance with regulatory requirements listed in the Legal and Other Requirement Register (LAORR) and ESIA commitments. The plan is also aligned with the overall E&S management plan and Adriatic's Management System.

2 PROJECT DESCRIPTION

The Project broadly consists of underground polymetallic mining at Rupice, the haulage of ore via a purpose-built haul route 24.5km to the Vares Processing Plant, processing of ore and the movement of tailings back to Rupice for paste backfill. Waste rock will be stockpiled at Rupice, before being used as part of backfill. Tailings not used in backfill will be stored in a dry stack facility, designed to meet the capacity requirements across the life of mine, located in a valley south of the processing plant. The final lead-silver and zinc concentrates will be transported to a rail loadout facility in Vareš and then onwards for further refinement and sale. The Project layout is shown in Figure 2.1.

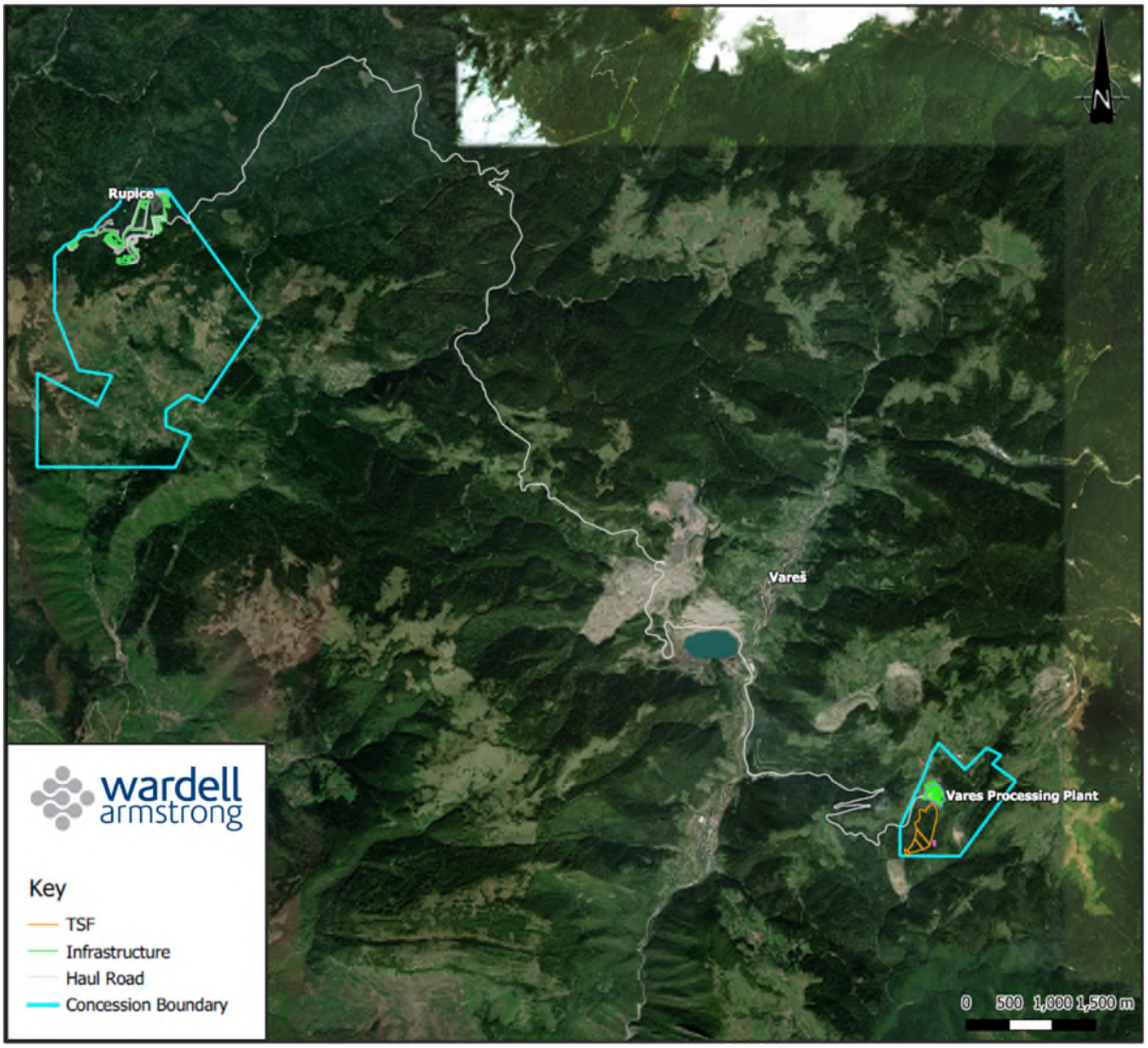

Figure 2.1: Vares Project Layout

A provisional water balance has been developed for the Project as part of the engineering studies. The supply requirements and source are shown in Table 2.1.

Table 2.1:Water Supply and Requirements		
Project Component	**Water Requirement**	**Water Source**
Rupice	5.5 l/s (472 m^3/d) with maximum water demand of 7.58 l/s (655.25 m^3/d).	Existing municipality supply, partially constructed, on the Bukovica spring source: the 'Mrestilište Studeni potok', which has available yield in the range of 8 to 15 l/s.
Vares Processing Plant	5.4 l/s (466m^3/d)	JKP d.o.o. Vares (JKP) reticulated supply into dedicated receiving tank and pipeline, currently operational. The supply is sized up to 9l/s.

For Rupice, the project will require a preliminary water permit, a water consent and a final consent issued by Vares Municipality. Permitting, consenting and final detailed project design will be provided by JKP d.o.o. Vares (Municipality Company) who are licensed for this level of engineering.

Note that the project water demand at VPP is almost entirely consumptive i.e. a net negative water demand as water is used along with flotation reagents in the processing plant and continuously lost in entrained moisture content in concentrate product and tailings leaving the plant. Water will be provided under licence or contract with JKP to ensure an assured reliable supply with minimal change to the existing utility footprint.

3 SUMMARY OF KEY ACTIONS

below summarises the water features requiring specific actions, which are described in further detail thereafter Table 3.1.

Table 3.1: Water and Wastewater Management Plan - Key Actions				
I.D	**Action item**	**Summary of Action**	**Rationale for Action**	**Timing**
WWP.01	Assurance of Water Supply VPP	JKP Design and assurance contracts. Maintenance and monitoring including contingencies for drought conditions.	Third party water supply, requirements for system rehabilitation, infrastructure limitations in network, little to no recourse for project water recycling.	Detailed design stage ahead of commissioning.
WWP.02	Assurance of Water Supply Rupice	JKP Design and assurance contracts. Maintenance and monitoring including contingencies for drought conditions. Control rules associated with minimum environmental flows in both the Vruci Potok and Borovica for ongoing use of the smaller water supply systems.	Third party water supply, requirements for system development, infrastructure limitations in network, catchments already experiencing water stress.	Detailed design stage ahead of commissioning.
WWP.03	Water classes and treatment	Ensure compliance for each water class, detailed design required for sewage and ARD systems. Temporary arrangements for construction. Ongoing compliance monitoring.	Multiple water streams including impacted water as well as non-contact water.	Construction and operation phases.
WWP.04	Water storage	Potential demand and supply imbalances and ESIA commitments necessitate use of water storage. Capacities are needed for assurance and supply reliability. Pond capacities need to be designed to maximise effective storage whilst accepting that rainfall extremes have the potential to exceed capacity, therefore storage ponds cannot be designed to attenuate all run-off and surface borne water.	Each site will require its own stand-alone reliable supply as well as retention of excess storm water. Water storage at different scales is therefore needed to maintain continuity of water services.	Construction and operation phases.

Table 3.1: Water and Wastewater Management Plan - Key Actions				
I.D	**Action item**	**Summary of Action**	**Rationale for Action**	**Timing**
WWP.05	Managed Release Water	Water that has been treated and is of suitable quality to be discharged to the environment is termed managed release water. The project does not use natural dilution within receiving water courses as the means of attenuating potentially harmful contaminant loadings. The range of discharges from the project are varied. Treatment specifications for waste water flows will need to be designed to be protective of receiving water quality without recourse to dilution.	To maintain conformance with project guidelines and standards for water release.	Detailed design stage ahead of commissioning.
WWP.06	Water Balancing	Demand analysis and a detailed water balance should be developed and updated during the detailed design, construction, commissioning and operational phases.	To ensure that there is sufficient supply to meet demand and that systems are working within their optimum performance limits as well as ensuring sufficient storage and treatment capacity is retained.	Detailed design stage ahead of commissioning.
WWP.07	Water Accounting	Evaluation of actual water use against design, development of closed loop systems promoting higher efficiency. Year on year continual improvement, metering.	Year on year assessment and demand analysis of water use and improvement of water efficiency promoting higher efficiency and ensuring adequate retention of water or capacity to meet demand forecasts.	Construction and Operations
WWP.08	Specific operational requirements	Control and training schemes are necessary for the operation of the site's drainage system.	Develop control rules for the drainage system. Water consumption targets shall be set. Need a rational system for checking leaks, high levels, potential reuse and minimising risk of flooding or non-containment.	Construction and Operations

Table 3.1: Water and Wastewater Management Plan - Key Actions				
I.D	**Action item**	**Summary of Action**	**Rationale for Action**	**Timing**
WWP.09	Operational Monitoring	Water demand shall be continuously metered and monitored. The Contract Mining Company shall forecast monthly usage requirements, review their usage on a monthly basis and compare it to the forecast. Review the running totalised flow on a monthly basis and compare it to agreed water demand targets. An inspection regime shall be created for all water distribution pipelines and equipment. Suitable procedures shall be put in place for the maintenance of any pumps, filters or other equipment	Detect contamination, non conformance. Adequate design, construction and operational controls should be defined to avoid comingling of treated, raw and recycled water.	Construction and Operations
WWP.10	Permits and authorisations	Secure abstraction licenses (temporary) required for dewatering and water supply and discharge including any large scale continuous pump tests. Abstraction license along with Contract/ Memorandum of Understanding to confirm permanent supply allocation. Wastewater discharge licence and annual data reporting.	Necessary to maintain operations proficiently so as to maintain the authorisation.	Construction and Operations
WWP.11	Data management	Recorded data on water quality sampling, water usage, water discharges, compliance requirements, water forecasting and water recycling along with other hydrometric data including the control levels of major storage facilities, release regimes and the water accounting system.	Necessary for ensuring that the data quality is acceptable, reliable and meets project standards for repeatability and certification	Construction and Operations

Table 3.1: Water and Wastewater Management Plan - Key Actions				
I.D	**Action item**	**Summary of Action**	**Rationale for Action**	**Timing**
WWP.12	Risk, Contingency and Emergency Response	Formal water risk and mitigation approaches to supply security, drought estimation and determination of contingency measures, vulnerability assessment for surface water, groundwater and receiving downstream waters including undertaking spill modelling, point source contamination risk assessment and assessment of ARD / Dam break TSF water risk. Further systematic water balance and modelling runs to determine risk of schedule slippage and concurrency of peak demands. Efficiency management and Flood risk drainage and operational surface water control.	Minimisation of disruption / outage is paramount for the continued uninterrupted operation of the operations. Following risk analysis, contingency planning should be developed to specify the necessary water infrastructure aspects that require stand-by or additional capacity (such as back-up pumps), or concept alternatives i.e. back-up treatment or storage. Emergency response planning is necessary for Flood risk and extreme event simulation.	Detailed design stage ahead of commissioning.

4 OUTLINE OF PROJECT WATER REQUIREMENTS AND INTERACTIONS

4.1 General

The project water demand varies throughout the construction and operation phases as personnel numbers change, ore production ramps up and activities and seasonal requirements also modify water demand. The demand will be determined based on expected number of persons and average daily usage for different user groups. A variety of different water classes are also defined for the project ranging from untreated water used for low-grade purposes such as dust suppression, to potable supply and a range of domestic and process effluents requiring treatment prior to disposal or re-use. Detail is provided on this in subsequent sections of this plan.

In summary, the overall water concept for the project comprises:

- Water will be sourced from existing or refurbished privately owned reticulated supply sources (JKP). Confirmatory work to complete the design and arrangement for the supply will be part of the forward work programme.
- The water will be pumped to small 'day-tank' sized reservoirs at the project sites (Rupice and Vares Processing Plant, VPP) via pipeline that will generally follow existing route alignments and new roads.
- Water abstraction will be designed to avoid any impacts on water supply to the communities and ecological receptors in the vicinity of the sites. Further testing of water quality, adequacy of supply versus demand and arrangements for a take-off agreement will be undertaken as part of the forward work programme, although feasibility level understanding of these has now been attained.
- Cost-effective efficiency measures will be implemented to minimise water use where practicable.
- Water treatment and management infrastructure will be designed and operated in accordance with the different types of project water class. Levels of treatment and management will be defined on the basis of meeting acceptable discharge standards taking into account the site specific conditions.
- Any? alteration of the physical plot area of the project facilities will have effects on surface and groundwater hydrology and the project will undertake necessary design and monitoring to ensure that adverse impacts to the receiving water environment are minimised.

4.2 Framework

Sustainable water management that takes into account existing water user requirements and equitable arrangements and protection of the natural environment is integral to the Project. It is also recognised across all the project elements that reliable water supply and management is essential to achieve business performance.

The WWP sets out the guiding principles for the project in terms of water supply, efficiency in usage, discharge requirements, protection of the environment and continued use of water sources by the surrounding communities.

Table 4.1: Water Management Objectives and Requirements		
Objective	**Activities Completed**	**Recommended Further Management Tasks**
Manage water abstractions during construction and operation to protect sensitive habitats and species, water dependent ecosystem services, and community users.	Confirm long term sustainable yield	Undertake life-of-mine monitoring to ensure water supply sources are being effectively managed for long-term sustainability.
	Implement measures for the retention of minimum environmental/ ecological flows in surface waters.	
	Implement measures to protect water dependent ecosystem services.	
	Implement measures to protect community water sources.	
Implement cost effective efficiency measures to minimise water use during construction and operation.	Maximise the re-use and recycling of water throughout the project life-cycle.	Develop water efficiency targets and implement performance monitoring.
	Develop and implement cost effective measures for reducing water use.	
Manage water to minimise flooding, ensure sustainable drainage of project infrastructure and minimise impacts on communities and habitats.	Undertake pre-construction evaluation of hydrological conditions to inform the design.	As part of construction management, manage overland flows and ground conditions to minimise sedimentation and prevent pollution to downstream watercourses.
	Develop a Water Management System to maintain natural flows, prevent sedimentation, protect downstream communities and restore quality to pre-disturbance conditions.	
	Design structures to maintain natural flow and habitat conditions, and allow natural regeneration of function.	Implement maintenance programmes to ensure structures and drainage systems perform effectively.
	Design structures to convey the 1:100 year flood event and be resilient to climate change. The TSF facility hydrology is being designed to more stringent standards (1 in 200 and 1 in 10,000-year flood return intervals).	Implement compliance monitoring to ensure project targets are being met.
Implement effective discharge management and monitoring to protect receiving waters in the long-term.	Undertake pre-construction surveys to inform the development of discharge design and monitoring requirements.	Implement effective monitoring procedures to manage long- term potential downstream impacts.
	Develop and implement site specific criteria for the protection of sensitive habitats and/or downstream communities.	Ensure compliance with Project Standards for effluent discharges.
	Develop Acid Rock Drainage (ARD) plans for the effective control of discharge requirements in critical asset at Rupice.	
NB: Specific requirements have been committed to as part of the ESIA and are provided in the ESMP		

As stated in the previous section, the management plan provides a central reference that articulates how water will be managed, what are the key elements to achieve good performance and the corresponding project sensitivities, risks and opportunities. The plan in effect links together the corporate strategic requirements from the Strategy with site specific conditions and requirements. The plan cross-references a number of other specific

subject matter documents and materials such as specifications for discharge and water quality, design and engineering documents for water infrastructure, specific hydrological models, ESIA and clearly identifies the linkages to these supporting plans or operating schemes.

This Water Management Plan shall be supported by a series of Water Operational Schemes. There is considered to be a sufficient degree of coherency in the major issues and their management at the sites that one over-arching plan will suffice.

From the project ESIA a number of key water priorities were recognised, as listed below, which the water management plan will address:

- Aspects associated with water quality of the Mala River which has a Priority Biodiversity Area status and a fresh-water ecological interface;
- Water resource management and the maintenance of reliable supply including adequate storage, supply–demand balancing and assessment of sustainability of the source works including aspects of supply management and recycling; and
- Hydrology, flood defence and drainage that adequately protects project personnel, assets and infrastructure whilst ensuring that the hydrology and ecological services for the wider area are not unduly disrupted.

Responsibility for water management is apportioned amongst the project entities with associated monitoring, compliance and resourcing expectations outlined in this document.

The plan is organised to cover the following management measures:

- The specific operational conditions required to meet water permits and authorisations;
- The local community requirements for water;
- The site social and environmental characteristics; and
- The operational programs and management plans required to manage water on site.

There are key aspects of the project's interaction with the water environment that represent risks to the project (i.e., flood risk and water supply management) as well as opportunities that can be realised for the project (i.e., enhanced stakeholder relations through long-term sustainable protection of water resources). Water management is therefore a key issue for the integrity of the operations in relation to the water environment and there are a number of commitments that have been established within the project ESIA that relate to water management to safeguard public and ecological health, obtain and maintain water permits and licences and demonstrate competence and a high standard in water handling i.e. controlling discharges, treatment and preventing pollution.

4.3 Principles

The aims and objectives of the water management plan are best achieved through incorporation of key guiding principles in engineering design, these are outlined below:

- water supply - manage water abstractions during construction and operation to protect other water stakeholders including communities and water dependant ecosystem services;
- efficiency in usage - implement cost effective efficiency measures to minimise water use during construction and operation;
- discharge requirements - implement effective discharge management and monitoring to protect receiving waters in the long-term; and
- protection of the environment and the continued use of water sources by the surrounding communities - manage water to minimise flooding, ensure sustainable drainage of project infrastructure and minimise impacts on communities and habitats.
- Closure and post-closure stages of the project must ensure wet infrastructure (drainage and ponds), rebounding water levels i.e. from mine dewatering, hydrochemistry and other water quality aspects (erosion and sedimentation) do not leave liabilities that would cause the water environment to persistently fail in meeting EU Water Framework Directive objectives. The project should ensure the post-closure hydrology emulates as much as possible the pre-project hydrological regime and there should be no requirement for permanent, managed interventions such as dewatering or active treatment that have to be run in perpetuity.

4.4 Links to Other Plans

The water management plan should be read in conjunction with the following documents:

- ZT520182 - MM1477 Vares Project Environmental and Social Impact Assessment (ESIA), WAI, Sept. 2021;
- ZT520186 – MM1498 Rev 2.0, Basis of Design Water Systems, WAI, August 2021; and
- ZT520182 - MM1477 Rev 2.0, Biodiversity Action Plan, WAI Sept. 2021.
- Surface Mineral Waste Disposal Plan, ADT, Sep 2021

4.5 Roles and Responsibilities

Throughout the life of the project, there will be multiple entities that will be responsible for the monitoring and management of water. Responsibilities will depend on the phase of the project, which is broken down into Construction, Commissioning and Operational phases.

The nominated undertakers involved in this management plan are identified below:

- Adriatic Metals – owner/operator;
- Eastern Mining – Bosnian operational subsidiary with environmental and operations teams;
- Construction Contractor(s) – multiple local contractors used for construction; and
- Contract Mining Company – Initial mine development will be undertaken by a local contractor with subsequent mining development by an international mining contractor.

It is the responsibility of each nominated undertaker to use this management plan to develop detailed procedures for each of the management and monitoring requirements outlined herein. Adriatic will be responsible for the following activities associated with water management water supply / hydrogeological investigation associated with project development, as follows:

- Investigations and studies;
- Infrastructure;
- Water supply / hydrogeological investigation;
- Environmental investigations and reports;
- External relations;
- Landowner liaison and access;
- Community awareness and media;
- Community relations and development programs; and
- Project permitting and approvals.

The Construction Contractor(s) will be responsible for the following activities associated with water management:

- Verification of locally compliant engineering design;
- Conformance of the DFS engineering specifications and design standards when implemented at the construction stage;
- Discipline engineering (all);
- Engineering management;
- Project management including project forecasting which may be taken to include water demand and release forecasting; and
- Construction and commissioning services.

The Contract Mining Company will be responsible for the following activities associated with water management:

- Initial mine development;
- Life of mine operations, including resource/ore reserve and waste planning and scheduling;
- Management of KPIs and Risk registers;
- Systems and procedures including HSEC; and
- Demand management and use of utilities such as 3rd-party water and waste services.

5 KEY ACTION ITEMS

5.1 WWP.01 – Assurance of Water Supply Sustainability, VPP

Background

The VPP operations will use a dedicated third-party water supply provided by the utility company JKP using existing pipeline infrastructure sourced from the Lalića Mlin spring which has a reported capacity of between 6 to 15 l/s which also supplies water to the neighbouring villages of Pržići, Tisovci, Bijelo Broje, Mir and Stupni Do. The project water requirement is expected to be in the order of 5l/s which appears well within the network capacity. Water will be provided under licence or contract with JKP to ensure an assured reliable supply with minimal change to the existing utility footprint.

However given the project demand does represent a sizeable portion of the overall source capacity, and furthermore it is understood that source works are affected seasonally and in drought years by available groundwater recharge it is essential that further confirmation is obtained from JKP that both project supply reliability is assured and that supply redistribution across the JKP network with a reported overall excess capacity in the order of 40 to 60 l/s can be deployed in times of need by JKP across the Vares municipality and individually in villages.

Actions

1. The project water demand at VPP is almost entirely consumptive i.e. a net negative water demand as water is used along with flotation reagents in the processing plant and continuously lost in entrained moisture content in concentrate product and tailings leaving the plant. The scope for increased water efficiency and water conservation within the VPP is therefore limited. JKP must therefore provide confirmation that drought condition deployment, scheduled and unscheduled maintenance and increased external demand from other catchment users can be managed through their network infrastructure and supervisory control (SCADA) systems.

2. Maintenance of the system is imperative in terms of source works (borehole rehabilitation, secondary standby pumps, and line infrastructure).

3. Monitoring: Water metering at the source works, the inlet manifold to the site, the inlet manifold to the processing plant needs to be maintained throughout. This is to ensure water usage, unaccounted for losses (leakage) and overall system demand can be monitored and rectified as necessary. JKP will need to present a drought-order water system management plan to confirm contingency is available to meet demand and confirm that sufficient deployable yields are sustainable during low flow, or high demand conditions.

5.2 WWP.02 – Assurance of Water Supply Sustainability, Rupice

Background

The Rupice operations requires 5.5 l/s (475 m3/d) with a potential maximum water demand of 7.58 l/s and will use a dedicated third party water supply provided by the utility company JKP using a refurbished pumpstation and new pipeline infrastructure sourced from the Bukovica spring source. The source works requires design, reconstruction and commissioning before use. Additionally, a neighbouring fish farm property near the source works is owned by JKP and leased to a private operator. The water used at the fish farm is the overflow from the catchment. The pump and "catchment" are before the outlet for the fish farm. The rehabilitation of the pump therefore requires an impact appraisal and mitigation measures (if necessary) to ensure the existing tenant's enterprise can be maintained.

Water from the Bukovica source works pump station will be pumped 8km to the Rupice Mine Concession and discharged to a 180m3 (c. 6 hours water supply) reservoir tank at the top of the Kiprovac ridge which provides a header tank for balancing inflow and outflow and gravity drainage to the various mine users. In addition, existing pipework and pumps from the exploration abstraction systems already established by Eastern Mining will be retained. These pump intermittently low volumes from Vruci Potok and the Borovica river (Sastavce tank). These small, ad-hoc abstractions will be retained during operations in case of contingency supply requirements.

Actions

1. The project water demand at Rupice is mainly consumptive as water is used in the main for paste backfill, dust suppression, mine operations and shotcrete batching. The scope for increased water efficiency and water conservation at Rupice is therefore limited. JKP must therefore provide confirmation that drought condition deployment, scheduled and unscheduled maintenance and increased external demand from other catchment users can be managed through their network infrastructure and SCADA systems for the new Bukovica source works.

2. Maintenance of the system is imperative in terms of source works (secondary standby pumps and line infrastructure).

3. Monitoring: Water metering at the source works, the inlet manifold to the site reservoir, the exit manifold from the reservoir needs to be maintained throughout. The smaller ad-hoc supply sources also need metering. This is to ensure water usage, unaccounted for losses (leakage) and overall system demand can be monitored and rectified as necessary. JKP will need to present a drought-order water system management plan to confirm contingency is available to meet demand and confirm that sufficient deployable yields are sustainable during low flow, or high demand conditions. The use of these smaller systems needs to be regulated to control rules associated with minimum environmental flows in both the Vruci Potok and Borovica. The minimum flows, or environmentally acceptable flows (termed 'EPP'), must be maintained in streams and rivers particularly following damming and abstraction works but also related to other development activities such as sedimentation and catchment alteration,

to ensure that streams and rivers continue providing sufficient flow for ecological services. The EPPs have been calculated for each watercourse and are presented in the project water basis of design, based on the available length of record at the time of writing. Longer term flow monitoring is required to confirm the EPP values are robust.

5.3 WWP.03 – Water classes and treatment

Background

The water management system will be designed to independently manage a range of different water classes. Each class of water differs according to its composition which dictates the way it can be managed to promote water efficiency, optimise water reuse and reduce the water footprint of the project. The water classes for the project are presented in Table 5.1.

Table 5.1: Project Water Classes and Treatment			
Water Class	**Description**	**Main Water Quality**	**Required Treatment**
Raw Water	Raw water (or freshwater) is natural water available for use which is sourced from clean/natural rainfall catchments and includes the JKP sources and the smaller existing Rupice sources.	Source dependent, the expectation is that the JKP sources (groundwater) are of good quality there will be suspended sediment, ionic and microbial loadings in the ad-hoc sources.	Raw water abstracted from the sources will not undergo treatment.
Managed Release Water	Water that has been treated (at all levels) and can be discharged to the environment. This may include dewatering from the mine.	Below all discharge criteria applicable to a given site	Dependent on particular water class and source
Fire Water	Water that will be held in storage for use for emergencies	Raw water requiring a periodic replenishment following drills and evaporation losses	N/A
Potable Water	For drinking, cooking and cleaning purposes	Below WHO drinking water quality criteria	Disinfection, potabilisation
Service Water	Water available for industrial use (e.g. maintenance, processing, dust suppression)	Low levels of contaminants (if any)	N/A
Non-Contact Water	Runoff (or stormwater) which has been collected after its contact with low risk catchments (roads, admin areas, etc.) leading to a change in water physical characteristics only (no major change in chemistry).	High sediment load (high TSS)	Attenuation through sedimentation traps, screening and swales only
Treatment Effluent	Effluent water out of treatment plants	Treated to meet discharge criteria	Not anticipated, if high ionic concentrations occur at the VPP then off-site disposal of a quantum (to refresh) will be undertaken to an appropriate receiving facility
Reuse Water	(or Recycled Water) Effluent water which has a suitable quality to be recycled and reused through the Service Water system	Low levels of contaminants (if any)	N/A
Grey Water	Water from various use areas (domestic or industrial) which can be recycled and reused through the Service Water system with minimum of treatment (storage, settling and stabilization)		N/A
Sewage	Water from all forms of ablutions, kitchens, medical facilities, floor drains and domestic cleaning	High microbial concentration, pathogens and greases	Sewage treatment
Impacted Water	Rainfall (or stormwater) and seepage water which has been collected after its contact with high risk catchments (e.g. stockpile, waste dumps) leading to a significant change in the water chemistry.	High sediment load, high metal content and significant change in chemistry from raw water	Managed using a single stage conventional low density lime neutralization plant treatment process
Other Process Water	Water required for industrial processes at the site which then becomes industrial effluent and must be contained in the sealed drainage system	High levels of contaminants, oils	

Actions

1. The project water classes and their respective treatment requirements need to be managed to ensure compliance to the project standards (for discharge and maintaining good water quality and aquatic environment status in the receiving waters).
2. Treatment systems for sewage and ARD water (and potentially minewater inflows) require detailed design and commissioning.
3. The Construction Contractor will require temporary, skid-mounted wastewater treatment systems run on electrical power generation sets at Rupice. At Veovaca, sufficient ablutions and treatment capacity from the existing JKP sewerage network will be employed.
4. Monitoring: Water quality within the settlement pond(s), catch drains and the Mala River, Vruci Potok and Borovica downstream from the pond(s) and site will be monitored during construction and operation of the Rupice, VPP and TSF facilities to ensure contaminants entering the drainage system are being treated correctly prior to water being released into the Mala River.
5. The surface water monitoring points established in the ESIA that need to be maintained for surveillance during construction and operations are identified below:

Table 5.2: Surface Water Monitoring to be retained during Construction and Operations

Catchment	Monitoring Identifier	Description
VPP	PPV-4	Mala River upstream of VPP and TSF
	PPV-3	Mala River below existing TSF and VPP
	PPV-10	Mala River upstream of new TSF
	PPV-11	Mala River downstream of new TSF
Rupice	PP-I	Borovica - downstream of Sastavce tank
	PP-II	Borovica – downstream of Borovica Donja
	PP-III	Borovica – upstream of Sastavce tank (east tributary)
	PP-IV	Borovica – upstream of Sastavce tank (west tributary)
	PP-V	Vruci Potok
	Spring Vruci Potok	Public spring on road
	Spring Borovica Donja	Resident's spring

6. Monitoring should be conducted monthly during construction works and quarterly during operations with results reported in the Annual Environmental Monitoring Report. The parameters for monitoring should include the organic, inorganic and microbial suite with physico-chemical parameters as currently established (the current stream-lined parameter list). Modification to the monitoring should be reviewed on an as needed basis including frequency and parameters. For example, if indications of contamination are observed, monitoring frequency should be increased and additional indicator parameters used in order to identify contaminant source to rectify the non-compliance.
7. Additional surface water monitoring points over and above those established in the ESIA (using the same sampling and analytical programme) that should be undertaken for surveillance during construction and operations are identified below:

Table 5.3: New Surface Water Monitoring to be commissioned for Construction and Operations		
Catchment	**Monitoring Identifier**	**Description**
VPP	PPV-xxx	Bukov Potok exit culvert below new TSF
Rupice	PP-xxx	Bukovica downstream of JKP abstraction

8. Solid wastes generated from the water treatment systems including sanitary sludges and ARD contaminated lime wastes will need to be managed either through off-site disposal or purpose built contained facilities on-site.
9. The Mala River is known to support white clawed crayfish. It is possible that the Bukovica stream supports stone crayfish[1]. In order to ensure no net loss of these species PBF, it will be necessary to prevent impacts to the quality and quantity of water within the Mala River and the Bukovica as a result of the project. More detail is provided in the project Biodiversity Action Plan (BAP). One key mitigation is the design and construction of a settlement pond(s) downstream from the proposed TSF to ensure any runoff from construction is captured and treated appropriately before reaching the Mala River. The pond(s) will be designed to the appropriate engineering specification (see TSF design report, water balance).

5.4 WWP.04 – Water Storage

Background

Water demand is variable and therefore sufficient storage is necessary to be able to provide supply assurance to meet short term and long-term high demand requirements.
Specific assumptions for sizing of the storage facilities are provided below, which may be subject to revision and change through detailed design and pending selection of water infrastructure.

Actions

1. A raw water supply store is included in the design, this acts as the primary storage facility for make-up water in the system. Confirmation of the adequacy of this storage is required at detailed design stage.
2. A raw water tank will follow a construction sequence involving preparation of the site, ensuring proper foundations and dewatering as necessary, lining, erection of the tanks and the installation of accessories and corrosive protection.
3. A potable water treatment tank is required which should have capacity to provide sufficient water to cover short term supply peaks i.e. in the order of days giving regard to maximum shelf life period for potable water;
4. Potential demand and supply imbalances and ESIA commitments necessitate use of recycled water from sedimentation ponds. Recycled flows need to be capable of supplying dust suppression demands.
5. At least two firewater storage reservoirs are required, one at VPP and the other at Rupice.

[1] Confirmatory surveys are ongoing.

6. Pond capacities need to be designed to maximise effective storage and re-use however it is accepted that rainfall extremes have the potential to exceed capacity, therefore storage ponds cannot be designed to attenuate all run-off and surface borne water (for example for sediment control). Ponds will be shaped to facilitate settling of suspended solids and culverts will be used to minimise disruption to existing drainage paths. Pond invert and bank height levels need to be designed to facilitate sufficient water storage and appropriate release of water during wet conditions.

Table 5.4: Minimum Requirements for Key Water Storage Facilities	
Item	**Minimum Storage**
Raw Water supply to treatment plant	1 day
Potable Water	2 days
Fire Water	120 m^3

5.5 WWP.05 – Managed Release Water

Background

Treatment systems will comprise:

- Sediment control of contact water so that water may be either released or recycled as per water operational requirements.
- Potabilisation to include treatment for human consumption (in accordance with WHO guidelines). In addition to drinking this covers all domestic water demands (laundry, washing, toilet flushing etc).
- Sewage water treatment through a STP; and
- Oily water and ARD treatment facilities.

Water that has been treated and is of suitable quality to be discharged to the environment is termed managed release water. It is important to note that the project has committed to not use natural dilution within receiving water courses as the means of attenuating potentially harmful contaminant loadings. The range of discharges from the project are varied and may include the following classes:

- Non-Contact water – run-off that is not severely impacted and has come into contact only with low risk catchments;
- Treatment effluent – treated water that is able to be discharged;
- Excess reuse water – the retention of water for recycling is an integral part of the water balance, it is envisaged that extreme storm events will lead to overflows and managed release of the recycling water held in storage;
- Grey water – the term grey water is useful to consider because it represents a separate class of water from black water or sewage with arguably more opportunity for re-use as it requires less treatment and sanitary control. However this opportunity can only be realized if grey and black water systems are operated separately;
- Sewage; effluent from the project's toilet blocks, personnel ablutions and other sanitary waste streams which may include laundry and food preparation facilities.

- ARD impacted water – metalliferous and potentially low pH leachate will be generated from the stockpiles and form 'contact-water'. Control schemes have been designed for this form of drainage to cater for extreme weather events in terms of sufficient storage capacity to attenuate peak flows and an active (low density) lime treatment system to neutralise the water and precipitate out as sludge, the majority of metals; and
- Process water – requiring separate treatment from the other release water streams due to its chemical origin which could be incompatible with the functioning of other systems (toxic shock).

Further managed release streams include dewatering from the mine. Dewatering disposal options have currently been identified as:

- Re-use and recirculation in the mine for mine services water;
- Infiltration back into the mine system; and
- Combination with ARD water from the stockpiles if necessary.

An estimate of the dewatering discharge requirement equates to a flow rate of approximately 750 m^3/day.

Construction and operational stage sewage flows require treatment to meet discharge criteria as listed below.

Table 5.5: IFC Guidelines for Treated Sanitary Sewage Discharges

Pollutant	Unit	Guideline Value
pH (acidity)	S.U.	6 – 9
Biological Oxygen Demand (BOD)	mg/l	30
Chemical Oxygen Demand (COD)	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	per 100 ml	400

Actions

1. Treatment specifications for other waste-water flows will need to be designed to be protective of receiving water quality without recourse to dilution. Cross references for environmental water quality criteria are listed in the water Basis of Design (WAI, 2021) which will be updated as part of the legal register process.

5.6 WWP.06 – Water Balancing

Background

The Project water use during construction and operations is presented in the water Basis of Design and illustrates how the various water types may interact and determines the input-output-storage water balance and candidate areas for improved water efficiency or additional capacity and operational flexibility.

Actions

1. Demand analysis and a detailed water balance should be developed and updated during the detailed design, construction, commissioning and operational phases to ensure that there is sufficient supply to meet demand and that systems are working within their optimum performance limits as well as ensuring sufficient storage and treatment capacity is retained.

5.7 WWP.07 – Water Accounting

Background

The variety of water classes and potential water limitations during seasonal and peak activity periods necessitate consideration of recycling and/ or alternative sources and promote the use of a project water accounting system. The system would comprise:

- Monitoring, metering and development of zonal budgets,
- Evaluation of actual water use against design,
- Development of closed loop systems promoting higher efficiency,
- Year on year assessment and demand analysis of water use and improvement of water efficiency promoting higher efficiency and ensuring adequate retention of water or capacity to meet demand forecasts.

Actions

1. The Project will develop and keep under review, water use targets in line with the project EMP system, which will include relevant policies, these shall include key indicators measured and recorded for each functional area (eg processing plant, TSF, paste backfill etc) using metering and records. Key parameters will be monitored at appropriate level of characterisation:

- Water abstraction rate;
- Water recycling rate;
- Water disposal rate;
- Net consumption rate (calculated for water losses (evaporation, dust suppression etc);
- Water harvesting rate; and
- Water quality indicators.

2. It has been assumed that the water accounting framework is established and monitored by the Eastern Mining Environment Team. Any required remedial measures will be implemented by the Contract Mining Company.

5.8 WWP.08 Specific Operational Requirements for Water Efficiency and Water Management

Background

Detailed water operational requirements including a control and training scheme are necessary for the operation of the site's drainage system which may comprise a series of retention ponds, sluices, weirs and penstocks that ensure the optimum storage and free-board is maintained in the sites surface water storage and drainage system.

Additional operational procedures are recommended to utilise potentially good quality water arising from operations such as dewatering.

Actions

1. Freeboard, outflow and control rules for the release and regulation of water from the drainage system.
2. Monthly water consumption targets shall be set by the operator in conjunction with the Contract Mining Company. These shall be based on the previous month's consumption figures and the construction activities scheduled for the current month.
3. The Contract Mining Company in conjunction with the owner shall put in place procedures to monitor the usage and status of potable and service water on a daily basis and shall act on the occurrence of anomalous high or low usages or levels. This shall include system walk downs to check for leaks, investigation and identification of high water users and other water saving initiatives as appropriate.
4. The Contract Mining Company in conjunction with Adriatic shall ensure that, where appropriate, greywater and blackwater recycling measures are installed and properly maintained to ensure maximum benefit and to minimise the water demand.
5. Where possible, the project shall reuse clean serviceable non-contact water for subsequent low-grade uses such as dust suppression subject to it meeting suitable water quality criteria.

5.9 WWP.09 – Operational Monitoring (non Environmental)

Background

Water demand shall be continuously metered and monitored. The Contract Mining Company shall forecast monthly usage requirements, review their usage on a monthly basis and compare it to the forecast.

The Contract Mining Company shall be responsible for monitoring their use of all water (potable, service, fire and demineralized water). They shall review the running totalised flow on a monthly basis and compare it to agreed water demand targets.

An inspection regime shall be created for all water distribution pipelines and equipment to visually inspect for any possible leakage. Suitable procedures shall be put in place for the maintenance of any pumps, filters or other equipment.

Actions

1. The Contract Mining Company shall undertake water quality testing of the water distribution networks. They shall also establish procedures to periodically sample the water quality of all drainage within their facilities to determine the hydrocarbon/contaminant content. Water shall meet the requirements of the relevant legislation, standards and guidelines. The sampling shall monitor levels of BTEX, phenol, gasoline, diesel, fuel oils, kerosene, heat transfer fluids, transformer oils, lube oils and hydraulic oils.

2. Wherever possible, wastewater shall be reused or recycled. This should be set out in a development plan as part of the project CEMP (Construction Environment Management Plan) of which the Contract Mining Company has responsibility and shall establish procedures to monitor any greywater and blackwater flows on the site. They shall also undertake water quality testing of any recycled greywater and blackwater to ensure that it meets the requirements of the legislation, standards and guidelines.

3. Adequate design, construction and operational controls should be defined to avoid comingling of treated raw and recycled water.

4. Maintenance activities that require drainage of water from the water distribution pipelines or equipment shall be undertaken so that the drainage is collected and disposed of at suitable facilities.

5. Water quality will be regularly monitored against compliance with relevant storm water quality standards prior to release of retained surface water. Extreme rain events that exceed pond capacities are expected to be sufficiently diluted and will not impact the natural water courses if overspills occur. Ponds will be shaped to facilitate settling of suspended solids.

6. Groundwater levels in relation to the possible inflow into the underground mine require monitoring. Piezometers have shown rapid responses to rainfall and seasonal (snow melt) events indicating that some rapid infiltration and recharge mechanisms could exist. Groundwater monitoring of water levels and groundwater quality should be maintained throughout mining to evaluate hydraulic responses, indications of potential inflow and development of water quality changes as a result of mining on the groundwater system.

5.10 WWP.10 – Permits and authorisations

Background

The key authorisations relating to water management are outlined below. Adriatic will be responsible for securing the permit and it is the Contract Mining Company's responsibility to maintain operations proficiently so as to maintain the authorisation:

- Abstraction licenses (temporary) required for dewatering and water supply and discharge including any large scale continuous pump tests.
- Abstraction license along with Contract/ Memorandum of Understanding to confirm permanent supply allocation.
- Wastewater discharge licence
- Annual data necessary to calculate the royalty payments owing to cover water usage and wastewater discharges.

Actions

1. Operate in a manner conducive to the protection of the environment and in particular take measures to prevent water contamination and protect water resources;
2. Any discharge to the environment must comply with the requirements set out in a given activity's authorisation;
3. All wastewater must be processed prior to discharge;
4. All water consumption/abstraction/extraction must be metered and monitored;
5. All data regarding water resources management must be transmitted to the competent authority;
6. All water consumers must contribute to investment and maintenance of national hydraulics facilities, in proportion to its water consumption;
7. In the event of illegal use of water, penalties will be applied;
8. Water permits can be removed at any moment following non-compliance with permit requirements;
9. Data necessary to calculate the royalty amounts linked to water usage and wastewater discharges must be provided to the competent authority each year before 31st January;
10. Royalties for water extraction/abstraction must be paid based on consumption;
11. Royalties for water discharges is based on the overall volume discharged and the types and quantities of pollutants in the discharge waters; and
12. Retain on-file the documents necessary to justify water usage and wastewater discharges during inspections and audits which may be performed at any time.

5.11 WWP.11 – Data management

Background

The Contract Mining Company is responsible for ensuring that the data quality is acceptable, reliable and meets project standards for repeatability and certification.

Recorded data on water quality sampling, water usage, water discharges, compliance requirements, water forecasting and water recycling along with other hydrometric data including the control levels of major storage facilities, release regimes and the water accounting system must be recorded and updated into an appropriate relational database to enable quick access and interrogation

5.12 WWP.12 – Risk, Contingency and Emergency Response

Background

A formal water risk identification process has not been undertaken and it is recommended this is developed as part of the ESMS (ahead of construction)
The key theme areas that are emerging as water risk issues for the project are listed below (not in any ranked order of risk):

- Supply security - confirmation of supply source under a variety of hydrological and demand scenarios;
- Drought estimation and determination of contingency measures;
- Vulnerability assessment for surface water, groundwater and receiving downstream waters including undertaking spill modelling, point source contamination risk assessment and assessment of ARD / Dam break TSF water risk;
- Further systematic water balance and modelling runs to determine risk of schedule slippage and concurrency of peak demands;
- Efficiency management – although low to moderate reliance is given to re-use of water to supply a variety of operational requirements with moderate to low grade requirements. A reliable water efficiency assessment should be undertaken to confirm the recycling and re-use assumptions; and
- Flood risk drainage and operational surface water control.

Actions

1. Minimisation of disruption / outage is paramount for the continued uninterrupted operation of the operations. Following risk analysis contingency planning should be developed to specify the necessary water infrastructure aspects that require additional sparing, additional capacity, or concept alternatives i.e. back-up treatment or storage.
2 Emergency response planning: for instance in relation to flood risk response (largely mitigated in design by the sizing of drainage infrastructure for high intensity/low frequency events), detection of leakage and/or spillage of contaminated fluids, or contingencies for maintaining water supply during drought conditions.

3 Flood risk and extreme event simulation – it is recommended that modelling including time-stepped 2d analysis is undertaken of flood risk / climate change effects along with emergency response process including time of flooding, egress and access routes analysis, critical infrastructure and assets analysis.
4 Contamination and loss of containment – principally associated with a spill risk of the ARD catch pond and fuel storage facilities.
5 Sufficient resources need to be allocated to ensure training including out-reach to external water stakeholders:
6 Community led programs need to be considered in the ongoing Social and Environmental Management Plan that should establish targets and monitor progress for achieving community water systems noting the generally poor level of sanitation, infrastructure and water supply assurance during drought / end of summer conditions.
7 Appropriate logical framework methods should be applied to monitor performance of the assistance programme that may also include indirect support to local government, utilities and development agencies through the delivery of training and awareness raising campaigns in the planning and provision of community water supply and sanitation.
8 Ensure a training and communications policy is in place to inform employees on the project understand and commit to water conservation practices that this species will gain from the forest restoration work and as such monitoring is unlikely to be necessary.

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