1. GENERAL

1.1 General

.1 This section presents design guidelines for booster stations installed within the Black Mountain Irrigation District (BMID).

.2 Where the water utility infrastructure crosses private lands, the infrastructure must be located on legally designated right-of-way. Minimum right-of-way width to be 6.0 metres for buried pipe access.

.3 Right-of-way is required for routes for watermain, road access, and if required, electrical service to the booster station site.

.4 Location of building from property lines or right-of-way boundary is to exceed the minimum zoning requirement setback of the local municipal authority.

.5 Standard BMID right-of-way is to be used in the development of the right-of-way agreement.

1.2 Pre-Design/Design Requirements / Documentation

.1 The Developer must retain a Professional Engineer to design and certify the works. Engineer is to submit a Pre-design Report listing service area, booster station location, serviced number of lots and expected future development lots/units in this booster station service pressure zone;

.2 Report to be acceptable to BMID prior to proceeding with Detailed Design;

.3 Health Department Approval is to be obtained from the Public Health Engineer. Copy of the Approval is to be provided to BMID prior to construction.

.4 Design drawings for submission; keyplan, floor layout, piping schematic, structural drawing and details, and electrical and instrumentation drawings. Specifications to National Master Standard format to be required for station. Three sets of drawings to be submitted.

.5 Prior to construction, applicant to provide 3 sets of applicable shop drawings to BMID for review. Design calculations to be included with submission.

1.3 Booster Station Capacity

.1 In general, pump stations shall be designed to meet maximum daily demand with the largest pump out of service. Peak hour demand should be made up by on-line storage. If storage is not on-line, the pump station must meet peak hour demand with the largest pump out of service.

.2 Emergency pumping capability must be available if a sufficiently sized storage reservoir is not on-line.

1.4 Booster Station Building

.1 Station building is to be aesthetically pleasing. Split face concrete block, or approved alternate acceptable building type.

.2 Booster station building is to have ventilation and heating to BC Building Code for building classification.

.3 Floors and earth retaining walls are to be reinforced concrete.

.4 Entrance to booster station building is to be at grade. Door size is to allow largest piece of equipment to be removed and replaced. Lifting beams and hoists are required where there are heavy components installed.

.5 Provide floor drains.

.6 Address and pump station number signage to be provided on building exterior. Style and finish to match other BMID facilities.

.7 Building is to have exterior lights.

.8 Removable insulated winter covers on all louvers.

.9 All exterior doors must be connected to the alarm system, connected to the PLC.

.10 All exterior doors to be vandal resistant with lock set to match BMID standard.

.11 Wall mounted fire extinguisher to be mounted in the room

.12 Interior concrete walls to have 2x4 interior studs insulated with R-20 fibreglass bat insulation, vapour barrier and cover with 5/8" plywood one side smooth. Screwed in attachment.

.13 Interior paint is to be light shade.

.14 For total connected load of over 75 hp, separate control room required for pump station controls with window to pump room.

.15 Pedestal/desk is to be provided for O & M manuals and drawings. Locate in control room if applicable;

.16 Room to be well lit with halogen incandescent lighting, and emergency lighting.

.17 Separate room required if chlorination required at the pump station

.18 Pumps, piping and equipment to have minimum clearances of 700mm one side, 200mm opposite side and 1000mm from rotary equipment.

.19 Flexible victaulic couplings are to connect every rigid assembly of pipe section to allow flexibility and reduction of assembly stress.

.20 Flow arrows are required on all pipe sections.

.21 All conduit and electrical service to the centre areas in the station are to be run through pre-ducted conduit laid in the concrete floor.

1.5 Booster Station Controls

.1 Pumps to start and stop separately. Pumps to be supplied with lead, lag auto three position selector switch.
If reservoir is on-line, stop and start sequence to be controlled by reservoir levels
If pumps operate against a closed system, stop and start sequence is controlled by a pressure transmitter. VFDs are required on the pump motor and low flows to be provided by one Goulds V350 pressure tank or approved equal.

.2 Pumps to have soft-start starters, VFDs, or pump control valves as directed by BMID;

.3 Low pressure (discharge) override start plus alarm;

.4 Alarm acknowledge button;

.5 All PLC systems are to be designed and implemented with Control Microsystems SCADAPAC PLC/RTU equipment;

.6 Low pressure / no flow (suction) override stop;

.7 High water override start plus alarm;

.8 High pressure (discharge) override stop;

.9 All equipment alarms and status points are to be visible at the station and connected to the BMID's SCADA System. Alarm by-pass switch to be provided within station;

.10 Duplicate control cables to be installed between booster station and reservoir if distance is less than 300 metres. Each cable is to be one continuous piece and no splicing of the cable will be allowed.

.11 For distances greater than 300m, level signal by spread spectrum or UHF radio as directed by BMID.

.12 Human Machine Interface (HMI) to be provided at station if requested by BMID.

.13 Control valves required to dissipate and minimize surges;

1.6 Booster Station Instrumentation

.1 Programming will be carried out by BMID selected programmer at Developer's cost.

.2 Telemetry controls and equipment to be developed with consultation from the BMID and their advisor on instrumentation works.

.3 Power factor correction as required;

.4 Hour meters to record running time on each pump installed;

.5 Minimum instrumentation is to include magnetic flow meter, reservoir level, suction pressure and building temperature. Provide discharge pressure and disinfection residual as requested by BMID.

.6 Provide UPS for PLC, modem, HMI (if applicable), solenoid valves to maintain fire flow (if applicable), and level transmitters as directed by BMID;

.7 Automatic heating and ventilating is to be provided.

.8 Drainage provision for all internal areas of the pump station;

.9 Where gaseous chlorine systems are used, a chlorine leak detector is required;

.10 Electrical phase loss protection;

.11 The following is a minimum list of alarm, monitoring, control and shutdown outputs from Booster Station to include:

- .1 Intrusion alarm for door;
- .2 Low building temperature;
- .3 Pump status, on or off,
- .4 Pump selector status, on off or auto
- .5 Pump overload draw alarm;
- .6 Pump overheat alarm for pumps over 75 hp;
- .7 Metered flow rate from station;
- .8 Signal output to chlorinator (if chlorination equipment in station);
- .9 Pump running low flow alarm;
- .10 High flow alarm;
- .11 Low pump suction pressure alarm;
- .12 PLC failure;
- .13 Power failure;
- .14 Ground fault;
- .15 High sump level (building flood);
- .16 Discharge pressure alarm.

.12 Surge/lightning protection to be provided.

1.7 Pump Preferences

.1 Horizontal split case is preferred configuration for over 20 hp size.

.2 1750 rpm motor speed unless otherwise approved by BMID;

.3 Impeller is to be zinc-less bronze, stainless steel, or as approved by BMID.

.4 600 V, 3 phase for pumps over 5 hp.

1.8 Booster Station Access

.1 All season access road to be provided to allow maintenance vehicles to the booster station;

.2 Maximum road grade is to be 15%. Maximum crossfall on road is 3.0%.

.3 Minimum finished road width to be 4.0 metres;

.4 Minimum R.O.W. for roadway to be 6.0 metres;

.5 In rock areas, qualified geotechnical information is to be supplied with recommendations for rock scaling and debris risks.

.6 For above ground stations, chain link galvanized perimeter fence complete with suitable width lockable gate.

.7 Xeriscaping required around pump stations.

.8 Station site to have level ground access for maintenance vehicle and provide lifting strategy for pump equipment removal and replacement.

1.9 Disinfection Procedures

.1 If chlorination equipment is required, provide emergency eyewash and shower station and provide hot water tank for shower station. Three gallon under-the-sink mounted model is suitable;

.2 Disinfection of infrastructure components is to be to most recent version of AWWA Standard C652 and to special requirements of the BMID. A minimum of two successive samples taken at 24 hour intervals indicating zero (0) coliform growth and zero (0) coliform background is to be provided to BMID.

.3 Chlorinate only after all pipeworks and other water infrastructure components are functional and accepted by BMID. Disinfect station pipeworks within one week prior to commissioning. If chlorination is undertaken and station is not commissioned in the next 7 days, then repeat of disinfection may be required.

.4 Dispose of highly chlorinated water in accordance with allowed practices by the Ministry of Water Land and Air Protection and the Ministry of Sustainable Resources guidelines.

1.10 Commissioning

.1 Sign-off required by supplier, contractor and consultant for all major pieces of equipment including pumps, flow meters, genset, etc. Signed sheets to be included within the O & M Manuals.

.2 Sign-off for station commissioning to be performed with signatures required by the Contractor performing the disinfection, the Engineer/Consultant certifying the installation, and a representative from the BMID.

.3 Notification is to be provided to BMID staff with one weeks notice prior to station start up and demonstration. Major equipment suppliers, mechanical and electrical / instrumentation contractors along with consultant are to be present at the commissioning.

.4 Two sets of sealed As built drawings to be submitted.

.5 Operations and Maintenance Manual to be provided at the completion of installation. Three (3) copies of 3-ring binder are to be provided to BMID. All data is also to be provided digitally in “pdf” format. Hard covered, plastic jacket, cardboard dividers denoting Table of Contents and Sections. Operations and Maintenance manuals, hard bound with the name of station embossed on the cover. Manuals to include:

.1 As constructed drawings 11 x 17” size;

.2 Equipment layout drawings;

.3 Electrical, control, and alarm wiring diagrams;

.4 Operating instructions for the station and for all equipment;

.5 Maintenance instructions for all equipment, including frequency of maintenance tasks;

.6 Suppliers list;

.7 Equipment data sheets;

.8 Equipment parts list;

.9 Provide head/capacity curves for pumps. Non-witnessed certified pump curves provided for pumps greater than 75hp;

.10 Standard and emergency operating procedures.