# APPENDICES

# Appendix 2 - A Key Vietnamese Legal Documents Governing Binh Duong Water Plant Project

| No. | Documents | Key content |
|---|---|---|
| **Investment Conditions and Procedures** | | |
| **General** | | |
| 1 | Law 59/2005/QH11 | Regulating investment activities for business purposes, rights and obligations of investors and Vietnamese government's guarantee about such rights and obligations; encouragement of investment and investment incentives; state administration of investment activities in Vietnam. |
| 2 | Decree 108/2006/ND-CP | Detailing and guiding the implementation of a number of articles of the November 29, 2005 Law on Investment regarding investment activities for business purposes; rights and obligations of investors; guarantees for legitimate rights and interests of investors; investment encouragement and incentives; and state management of investment in Vietnam. |
| 3 | Resolution 49/2010/QH12 | List of projects and works of national importance to be submitted to the National Assembly for decision on their investment. |
| **BOT Regulations** | | |
| 4 | Decree 108/2009/ND-CP | Regulating investment in the form of BOT, BTO and BT contracts. |
| 5 | Decree 24/2011/ND-CP | Amending and supplementing a number of articles of Decree No. 108/2009/ND-CP on investment in the form of BOT, BTO and BT contracts. |
| 6 | Circular 03/2011/TT-BKHDT | Guiding a number of provisions of the government's Decree No. 108/2009/ND-CP on investment in the form of BOT, BTO, BT contracts. |
| **PPP Regulations** | | |
| 7 | Decision 71/2010/QD-TTg | Regulations on pilot investment in the public-private partnership form. |
| **Government Guarantee** | | |
| 8 | Decree 15/2011/ND-CP | Providing the provision of government guarantee; management of government guarantee and responsibilities of agencies in the provision and management of government guarantee for domestic and foreign loans, including issue of domestic and international bonds |
| **Project Company's Organization and Management** | | |
| 9 | Law 60/2005/QH11 | Regulations on establishment, management organization, and operation of limited liability company, joint stock company, partnership and private enterprises. |
| 10 | Decree 43/2010/ND-CP | Regulations on company registration. |
| 11 | Decree 102/2010/ND-CP | Guiding in detail a number of articles of the Law on Enterprises regarding the establishment, management organization, operation, reorganization and dissolution of enterprises. |
| 12 | Circular 01/2013/TT-BKHDT | Specifying the contents of documentation, the order, procedure, and some issues related to the registration of enterprises. |

| No. | Documents | Key content |
|---|---|---|
| **Water Industry** | | |
| 13 | Decision 81/2006/QD-TTg | Approving the national strategy on water resources to 2020. |
| 14 | Law 17/2012/QH13 | Providing regulations on management, protection, exploitation and use of water resources, as well as the prevention of, combat against and overcoming of harmful effects caused by water in Vietnam. |
| 15 | Decree 117/2007/ND-CP | Regulating activities in the domains of production, supply and consumption of clean water under the complete concentrated water supply systems in urban areas, rural areas, industrial parks, export processing zones, hi-tech parks and economic zones; the rights and obligations of organizations, individuals and households engaged in activities related to clean water production, supply and consumption in the Vietnamese territory. |
| 16 | Decree 124/2011/ND-CP | Amending and supplementing some Articles of Decree No.117/2007/ND-CP dated July 11, 2007 by the Government on the production, supply, and consumption of clean water. |
| 17 | Decree 149/2004/ND-CP | Regulating the issuance, extension, change, invalidation and withdrawal of permits for water resource exploration, exploitation and use, or discharge of wastewater into water source. |
| 18 | Decree 38/2011/ND-CP | Amending and supplementing a number of articles of Decree 149/2004/ND-CP. |
| 19 | Circular 02/2005/TT-BTNMT | Detail guidelines on: granting and issuing, renewing, amending, suspending and revoking licenses for groundwater exploration, groundwater abstraction and utilization, surface water exploitation and utilization, and waste water discharge into water sources including rivers, streams, coastal waters, reservoirs, lakes, ponds; the regulation of application forms and dossiers, and the form of licenses. |
| 20 | Circular 01/2008/TT-BXD | Guiding the implementation of Decree 117/2007/ND-CP on clean water production, supply and consumption. |
| 21 | 75/2012/TTLT-BTC-BXD-BNNPTNT | Guiding principles and method of determination and competence to decide water consumption price in the urban areas, industrial zones and rural areas. |
| 22 | Circular 88/2012/TT-BTC | Promulgating together with this Circular the consumption price bracket of domestic clean water. |
| 23 | Circular 04/2009/TT-BYT | National Technical Regulation on the Drinking Water Quality. |
| 24 | Decision 14/2004/QĐ-BXD | Cost standards (material) for calculation of water production costs. |
| 25 | Decision 11/2011/QĐ-UBND | Promulgating water price for household and business consumption in Binh Duong Province |
| **Environmental Protection Regulations** | | |
| 26 | Law 52/2005/QH11 | Providing for environmental protection; for policies, measures and resources for environmental protection; and for the rights and obligations of organizations, households and individuals for environmental protection. |
| 27 | Decree 80/2006/ND-CP | Detailing and guiding the implementation of a number of articles of the Law on Environmental Protection regarding environmental standards; strategic environmental assessment; environmental impact assessment and environmental protection commitments; environmental protection in production, business and services; hazardous waste management; and disclosure of environmental information and data. |

| No. | Documents | Key content |
|---|---|---|
| 28 | Decree 21/2008/ND-CP | Amending and supplementing a number of articles of the Government's Decree No. 80/2006/ND-CP dated August 9, 2006, detailing and guiding the implementation of a number of articles of the Law on Environmental Protection |
| **Construction Regulations** | | |
| 29 | Law 16/2003/QH11 | Prescribes construction activities; and rights and obligations of organizations and individuals that invest in the construction of works and conduct construction activities. |
| 30 | Law 38/2009/QH12 | Amending and supplementing a number of articles of the Construction Law 16/2003/QH11 |
| 31 | Law 61/2005/QH11 | Regulates tendering activities in order to select contractors for provision of consultancy services, for procurement of goods, and for construction and installation for tender packages belonging to the following projects:<br>▪ Investment and development projects financed by the State as to thirty (30) per cent or more;<br>▪ Projects financed by the State for procurement of assets for the purpose of maintaining regular activities of State bodies;<br>▪ Projects financed by the State for procurement of assets for the purpose of renovation or major repairs to equipment, production lines, building works and factories of State owned enterprises in which investment has already been made |
| 32 | Decree 12/2009/ND-CP | Guiding the implementation of the Construction Law regarding the formulation, evaluation and approval of investment projects on the construction of works; the implementation of investment projects on the construction of works; and capability conditions of organizations and individuals engaged in construction activities |
| 33 | Decree 83/2009/ND-CP | Amending and supplementing a number of articles of the Government's Decree No. 12/2009/ND-CP on management of work construction investment projects |
| 34 | Decree 64/2012/ND-CP | Prescribing the conditions, order, procedures, and competence to grant construction permits; supervision of the construction under the construction permits; rights and responsibilities of organizations and individuals involved in construction permit issue and construction management under construction permits |
| 35 | Decree 85/2009/ND-CP | Guiding the Bidding Law and the selection of construction contractors under the Construction Law. |
| 36 | Decree 68/2012/NĐ-CP | Amending and supplementing a number of articles of the Government's Decree No. 85/2009/NĐ-CP dated September 15, 2009, guiding the implementation of the Law on Bidding and the selection of bidders in accordance with the Law on Construction. |
| 37 | Circular 10/2012/TT-BXD | Guiding in detail some contents of Decree 64/2012/ND-CP dated September 04, 2012 of the Government concerning issuance of construction permits. |
| 38 | Circular 04/2010/TT-BKH | Detailing dossiers of requirements on appointment of construction and installation contractors. |
| 39 | Circular 01/2010/TT-BKH | Detailing the making of construction and installation bidding dossiers. |
| 40 | Circular 05/2010/TT-BKH | Detailing the making of goods procurement bidding dossiers. |
| 41 | Circular 06/2010/TT-BKH | Detailing the making of consultancy service bidding dossiers. |

| No. | Documents | Key content |
|---|---|---|
| **Foreign Exchange Control** | | |
| 42 | Ordinance 28/2008/PL-UBTVQH11 | Governing foreign exchange activities in Vietnam. |
| 43 | Decree 160/2006/ND-CP | Detailing the implementation of a number of articles of the Ordinance on Foreign Exchange regarding foreign exchange activities of residents and nonresidents in current transactions, capital transactions, use of foreign exchange, provision of foreign exchange services, foreign currency markets and foreign exchange rates as well as the management of gold import and export in Vietnam. |
| 44 | Circular 186/2010/TT-BTC | Guiding the remittance abroad of profits earned by foreign organizations and individuals from direct investment in Vietnam. |
| **Project Legal Basis** | | |
| 45 | Letter No. 1797/TTg-KNT of the Prime Minister | Approving in principle for construction of the pipeline system from Phuoc Hoa Lake to the central of Binh Duong Urban Zone. |
| 46 | Letter No. 399/QBND-SX of Binh Duong People's Committee | Approving for BIWASE to be the investor to construct the pipeline system from Phuoc Hoa Lake to the central of Binh Duong Urban Zone. |
| **Labor and Wage Regulations** | | |
| 47 | Law 10/2012/QH13 | Specifying the labor standards; the rights, obligations and responsibilities of the employees, the employers, the labor representative organizations, the employer representative organizations in the labor relation and other relations directly related to the labor relation, the State management of labor. |
| 48 | Decree 34/2008/ND-CP | Regulating the employment and administration of foreigners working in Vietnam; the order and procedures for issuance of work permits and the use of work permits; and the responsibilities of foreigners, employers and State bodies in the employment and administration of foreigners working in Vietnam. |
| 49 | Decree 46/2011/ND-CP | Amending, supplementing some Articles of the Decree No. 34/2008/ND-CP dated March 25. 2008 of the Government on employment and administration of foreign employees working in Vietnam. |
| 50 | Decree 103/2012/ND-CP | Stipulating the region-based minimum wage levels applied to laborers working for companies, enterprises, cooperatives, cooperative groups, farms, households and individuals and agencies, organizations employing laborers. |
| 51 | Circular 31/2011/TT-BLDTBXH | Guiding the implementation of Decree 34/2008/ND-CP and Decree 46/2011/ND-CP on employment and administration of foreign employees working in Vietnam. |
| 52 | Circular 29/2012/TT-BLDTBXH | Guiding the implementation of region-based minimum wage levels for laborers working for enterprises, companies, enterprises, cooperatives, cooperative groups, farms, households and individuals and agencies, organizations employing laborers. |

# Appendix 5 - A Water Use Projection

## 1. New Residential Area and Existing Urban Area

***Year 2012***

Table 6

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 1 | 107 | 16 | 2 | 2 | 20 | 2 | 22 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 1 | 128 | 19 | 2 | 3 | 24 | 2 | 26 |
| 32 | Lai Hung Res. area | 7,464 | 1 | 75 | 11 | 1 | 2 | 14 | 1 | 15 |
| 33 | Royal Town area | 10,864 | | 0 | | | | | | |
| 34 | Lai Hung Resettlement area | 2,052 | | 0 | | | | | | |
| | **Total A** | **91,892.0** | | **310** | | **4.6** | **7.0** | **58.1** | **5.8** | **63.9** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **0.0** | | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | | 0 | | | | | | |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | | 0 | | | | | | |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | | 0 | | | | | | |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 50 | 6,080 | 912 | 91 | 137 | 1,140 | 114 | 1,254 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 4 | 488 | 73 | 7 | 11 | 92 | 9 | 101 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 4 | 251 | 38 | 4 | 6 | 47 | 5 | 52 |
| 43 | Res. area Hamlet 5C | 14,440 | | 0 | | | | | | |
| 44 | Res. area Hamlet 5A | 12,824 | | 0 | | | | | | |
| 45 | Res. area Hamlet 5B | 7,092 | | 0 | | | | | | |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 4 | 422 | 63 | 6 | 9 | 79 | 8 | 87 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 4 | 488 | 73 | 7 | 11 | 92 | 9 | 101 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 4 | 404 | 61 | 6 | 9 | 76 | 8 | 83 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 4 | 513 | 77 | 8 | 12 | 96 | 10 | 106 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 4 | 570 | 85 | 9 | 13 | 107 | 11 | 117 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 4 | 408 | 61 | 6 | 9 | 77 | 8 | 84 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 4 | 418 | 63 | 6 | 9 | 78 | 8 | 86 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 4 | 238 | 36 | 4 | 5 | 45 | 4 | 49 |
| | **Total C** | **162,728.0** | | **10,280.0** | | **154.2** | **231.3** | **1,927.7** | **192.8** | **2,120.4** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 55 | Suoi Tre Res. area | 8,932 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 1 | 89 | 13 | 1 | 2 | 17 | 2 | 18 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 1 | 87 | 13 | 1 | 2 | 16 | 2 | 18 |
| 59 | Hoa Loi Res. area | 5,268 | 1 | 53 | 8 | 1 | 1 | 10 | 1 | 11 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **229** | | **3.4** | **5.1** | **42.9** | **4.3** | **47.2** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 5 | 521 | 78 | 8 | 12 | 98 | 10 | 107 |
| 61 | Hoa Loi Resettlement area | 3,840 | 5 | 192 | 29 | 3 | 4 | 36 | 4 | 40 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 5 | 113 | 17 | 2 | 3 | 21 | 2 | 23 |
| 63 | Phu My Resettlement area | 3,624 | 5 | 181 | 27 | 3 | 4 | 34 | 3 | 37 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 5 | 257 | 39 | 4 | 6 | 48 | 5 | 53 |
| 65 | Phu Chanh Resettlement area | 5,944 | 5 | 297 | 45 | 4 | 7 | 56 | 6 | 61 |
| 66 | New Urban area | 152,056 | 2 | 3,041 | 456 | 46 | 68 | 570 | 57 | 627 |
| | **Total E** | **183,296.0** | | **4,602** | | **69.0** | **103.6** | **863.1** | **86.3** | **949.4** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **15,421** | | **231** | **347** | **2,892** | **289** | **3,181** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 266,039 | 44 | | 17,559 | 1,756 | 2,634 | 21,948 | 2,195 | 24,143 |
| 2 | Ben Cat | 284,507 | 5 | | 2,134 | 213 | 320 | 2,667 | 267 | 2,934 |
| 3 | Tan Uyen | 242,659 | 1 | | 364 | 36 | 55 | 455 | 45 | 500 |
| 4 | Thuan An City | 455,559 | 44 | | 30,067 | 3,007 | 4,510 | 37,584 | 3,758 | 41,342 |
| 5 | Di An City | 356,409 | 44 | | 23,523 | 2,352 | 3,528 | 29,404 | 2,940 | 32,344 |
| | **Total** | **793,205** | | | **73,646** | **7,365** | **11,047** | **92,058** | **9,206** | **101,264** |
| | **Grand total Z + F** | | | | | **104,445** | | | | |

***Year 2015***

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 1 | 269 | 40 | 4 | 6 | 50 | 5 | 56 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 1 | 40 | 6 | 1 | 1 | 8 | 1 | 8 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 1 | 119 | 18 | 2 | 3 | 22 | 2 | 24 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 5 | 535 | 80 | 8 | 12 | 100 | 10 | 110 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 1 | 52 | 8 | 1 | 1 | 10 | 1 | 11 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 5 | 641 | 96 | 10 | 14 | 120 | 12 | 132 |
| 32 | Lai Hung Res. area | 7,464 | 5 | 373 | 56 | 6 | 8 | 70 | 7 | 77 |
| 33 | Royal Town area | 10,864 | 1 | 109 | 16 | 2 | 2 | 20 | 2 | 22 |
| 34 | Lai Hung Resettlement area | 2,052 | 1 | 21 | 3 | 0 | 0 | 4 | 0 | 4 |
| | **Total A** | **91,892.0** | | **2,159** | | **32.4** | **48.6** | **404.7** | **40.5** | **445.2** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 1 | 100 | 15 | 2 | 2 | 19 | 2 | 21 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **100** | | **1.5** | **2.3** | **18.8** | **1.9** | **20.6** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 1 | 36 | 5 | 1 | 1 | 7 | 1 | 7 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 1 | 34 | 5 | 1 | 1 | 6 | 1 | 7 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 1 | 41 | 6 | 1 | 1 | 8 | 1 | 9 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 60 | 7,296 | 1,094 | 109 | 164 | 1,368 | 137 | 1,505 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 10 | 1,221 | 183 | 18 | 27 | 229 | 23 | 252 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 10 | 626 | 94 | 9 | 14 | 117 | 12 | 129 |
| 43 | Res. area Hamlet 5C | 14,440 | 1 | 144 | 22 | 2 | 3 | 27 | 3 | 30 |
| 44 | Res. area Hamlet 5A | 12,824 | 1 | 128 | 19 | 2 | 3 | 24 | 2 | 26 |
| 45 | Res. area Hamlet 5B | 7,092 | 1 | 71 | 11 | 1 | 2 | 13 | 1 | 15 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 10 | 1,054 | 158 | 16 | 24 | 198 | 20 | 217 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 10 | 1,221 | 183 | 18 | 27 | 229 | 23 | 252 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 10 | 1,010 | 152 | 15 | 23 | 189 | 19 | 208 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 10 | 1,282 | 192 | 19 | 29 | 240 | 24 | 264 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 10 | 1,424 | 214 | 21 | 32 | 267 | 27 | 294 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 10 | 1,021 | 153 | 15 | 23 | 191 | 19 | 211 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 10 | 1,045 | 157 | 16 | 24 | 196 | 20 | 216 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 10 | 596 | 89 | 9 | 13 | 112 | 11 | 123 |
| | **Total C** | **162,728.0** | | **18,250** | | **273.8** | **410.7** | **3,422.6** | **342.3** | **3,764.9** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 1 | 119 | 18 | 2 | 3 | 22 | 2 | 25 |
| 55 | Suoi Tre Res. area | 8,932 | 1 | 89 | 13 | 1 | 2 | 17 | 2 | 18 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 1 | 69 | 10 | 1 | 2 | 13 | 1 | 14 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 5 | 447 | 67 | 7 | 10 | 84 | 8 | 92 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 5 | 433 | 65 | 6 | 10 | 81 | 8 | 89 |
| 59 | Hoa Loi Res. area | 5,268 | 5 | 263 | 40 | 4 | 6 | 49 | 5 | 54 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **1,420** | | **21.3** | **32.0** | **266.3** | **26.6** | **292.9** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 10 | 1,042 | 156 | 16 | 23 | 195 | 20 | 215 |
| 61 | Hoa Loi Resettlement area | 3,840 | 10 | 384 | 58 | 6 | 9 | 72 | 7 | 79 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 10 | 226 | 34 | 3 | 5 | 42 | 4 | 47 |
| 63 | Phu My Resettlement area | 3,624 | 10 | 362 | 54 | 5 | 8 | 68 | 7 | 75 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 10 | 515 | 77 | 8 | 12 | 97 | 10 | 106 |
| 65 | Phu Chanh Resettlement area | 5,944 | 10 | 594 | 89 | 9 | 13 | 111 | 11 | 123 |
| 66 | New Urban area | 152,056 | 5 | 7,603 | 1,140 | 114 | 171 | 1,426 | 143 | 1,568 |
| | **Total E** | **183,296.0** | | **10,726** | | **160.9** | **241.4** | **2,011.3** | **201.1** | **2,212.4** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **32,655** | | **490** | **735** | **6,124** | **612** | **6,736** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 314,469 | 50 | | 23,585 | 2,359 | 3,538 | 29,481 | 2,948 | 32,430 |
| 2 | Ben Cat | 427,718 | 10 | | 6,416 | 642 | 962 | 8,020 | 802 | 8,822 |
| 3 | Tan Uyen | 285,875 | 5 | | 2,144 | 214 | 322 | 2,680 | 268 | 2,948 |
| 4 | Thuan An City | 542,578 | 50 | | 40,693 | 4,069 | 6,104 | 50,867 | 5,087 | 55,953 |
| 5 | Di An City | 424,489 | 50 | | 31,837 | 3,184 | 4,776 | 39,796 | 3,980 | 43,775 |
| | **Total** | **1,995,129** | | | **104,675** | **10,468** | **15,701** | **130,844** | **13,084** | **143,928** |
| | **Grand total Z + F** | **150,664** | | | | | | | | |

*Year 2020*

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 5 | 1,346 | 202 | 20 | 30 | 252 | 25 | 278 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 5 | 200 | 30 | 3 | 5 | 38 | 4 | 41 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 5 | 593 | 89 | 9 | 13 | 111 | 11 | 122 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 15 | 1,606 | 241 | 24 | 36 | 301 | 30 | 331 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 5 | 260 | 39 | 4 | 6 | 49 | 5 | 54 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 15 | 1,924 | 289 | 29 | 43 | 361 | 36 | 397 |
| 32 | Lai Hung Res. area | 7,464 | 15 | 1,120 | 168 | 17 | 25 | 210 | 21 | 231 |
| 33 | Royal Town area | 10,864 | 5 | 543 | 81 | 8 | 12 | 102 | 10 | 112 |
| 34 | Lai Hung Resettlement area | 2,052 | 5 | 103 | 15 | 2 | 2 | 19 | 2 | 21 |
| | **Total A** | **91,892.0** | | **7,695** | | **115.4** | **173.1** | **1,442.6** | **144.3** | **1,586.8** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 5 | 500 | 75 | 8 | 11 | 94 | 9 | 103 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **500** | | **7.5** | **11.3** | **93.8** | **9.4** | **103.1** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 5 | 180 | 27 | 3 | 4 | 34 | 3 | 37 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 5 | 172 | 26 | 3 | 4 | 32 | 3 | 36 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 5 | 207 | 31 | 3 | 5 | 39 | 4 | 43 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 70 | 8,512 | 1,277 | 128 | 192 | 1,596 | 160 | 1,756 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 20 | 2,442 | 366 | 37 | 55 | 458 | 46 | 504 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 20 | 1,253 | 188 | 19 | 28 | 235 | 23 | 258 |
| 43 | Res. area Hamlet 5C | 14,440 | 5 | 722 | 108 | 11 | 16 | 135 | 14 | 149 |
| 44 | Res. area Hamlet 5A | 12,824 | 5 | 641 | 96 | 10 | 14 | 120 | 12 | 132 |
| 45 | Res. area Hamlet 5B | 7,092 | 5 | 355 | 53 | 5 | 8 | 66 | 7 | 73 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 20 | 2,109 | 316 | 32 | 47 | 395 | 40 | 435 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 20 | 2,442 | 366 | 37 | 55 | 458 | 46 | 504 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 20 | 2,021 | 303 | 30 | 45 | 379 | 38 | 417 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 20 | 2,565 | 385 | 38 | 58 | 481 | 48 | 529 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 20 | 2,848 | 427 | 43 | 64 | 534 | 53 | 587 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 20 | 2,042 | 306 | 31 | 46 | 383 | 38 | 421 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 20 | 2,090 | 314 | 31 | 47 | 392 | 39 | 431 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 20 | 1,192 | 179 | 18 | 27 | 224 | 22 | 246 |
| | **Total C** | **162,728.0** | | **31,793** | | **476.9** | **715.4** | **5,961.4** | **596.1** | **6,557.5** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 5 | 594 | 89 | 9 | 13 | 111 | 11 | 123 |
| 55 | Suoi Tre Res. area | 8,932 | 5 | 447 | 67 | 7 | 10 | 84 | 8 | 92 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 5 | 345 | 52 | 5 | 8 | 65 | 6 | 71 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 15 | 1,340 | 201 | 20 | 30 | 251 | 25 | 276 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 15 | 1,300 | 195 | 19 | 29 | 244 | 24 | 268 |
| 59 | Hoa Loi Res. area | 5,268 | 15 | 790 | 119 | 12 | 18 | 148 | 15 | 163 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **4,816** | | **72.2** | **108.3** | **902.9** | **90.3** | **993.2** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 20 | 2,085 | 313 | 31 | 47 | 391 | 39 | 430 |
| 61 | Hoa Loi Resettlement area | 3,840 | 20 | 768 | 115 | 12 | 17 | 144 | 14 | 158 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 20 | 452 | 68 | 7 | 10 | 85 | 8 | 93 |
| 63 | Phu My Resettlement area | 3,624 | 20 | 725 | 109 | 11 | 16 | 136 | 14 | 149 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 20 | 1,030 | 154 | 15 | 23 | 193 | 19 | 212 |
| 65 | Phu Chanh Resettlement area | 5,944 | 20 | 1,189 | 178 | 18 | 27 | 223 | 22 | 245 |
| 66 | New Urban area | 152,056 | 15 | 22,808 | 3,421 | 342 | 513 | 4,277 | 428 | 4,704 |
| | **Total E** | **183,296.0** | | **29,057** | | **435.8** | **653.8** | **5,448.1** | **544.8** | **5,992.9** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **73,861** | | **1,108** | **1,662** | **13,849** | **1,385** | **15,234** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 413,250 | 60 | | 37,193 | 3,719 | 5,579 | 46,491 | 4,649 | 51,140 |
| 2 | Ben Cat | 861,314 | 20 | | 25,839 | 2,584 | 3,876 | 32,299 | 3,230 | 35,529 |
| 3 | Tan Uyen | 374,058 | 10 | | 5,611 | 561 | 842 | 7,014 | 701 | 7,715 |
| 4 | Thuan An City | 726,092 | 60 | | 65,348 | 6,535 | 9,802 | 81,685 | 8,169 | 89,854 |
| 5 | Di An City | 568,062 | 60 | | 51,126 | 5,113 | 7,669 | 63,907 | 6,391 | 70,298 |
| | **Total** | **2,942,776** | | | **185,117** | **18,512** | **27,767** | **231,396** | **23,140** | **254,535** |
| | **Grand total Z + F** | | | | | **269,769** | | | | |

***Year 2025***

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 15 | 4,038 | 606 | 61 | 91 | 757 | 76 | 833 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 15 | 600 | 90 | 9 | 14 | 113 | 11 | 124 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 15 | 1,780 | 267 | 27 | 40 | 334 | 33 | 367 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 25 | 2,676 | 401 | 40 | 60 | 502 | 50 | 552 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 15 | 780 | 117 | 12 | 18 | 146 | 15 | 161 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 25 | 3,206 | 481 | 48 | 72 | 601 | 60 | 661 |
| 32 | Lai Hung Res. area | 7,464 | 25 | 1,866 | 280 | 28 | 42 | 350 | 35 | 385 |
| 33 | Royal Town area | 10,864 | 15 | 1,630 | 244 | 24 | 37 | 306 | 31 | 336 |
| 34 | Lai Hung Resettlement area | 2,052 | 15 | 308 | 46 | 5 | 7 | 58 | 6 | 63 |
| | **Total A** | **91,892.0** | | **16,884** | | **253.2** | **379.9** | **3,165.6** | **316.6** | **3,482.1** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 15 | 1,500 | 225 | 23 | 34 | 281 | 28 | 309 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **1,500** | | **22.5** | **33.8** | **281.3** | **28.1** | **309.4** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 15 | 540 | 81 | 8 | 12 | 101 | 10 | 111 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 15 | 517 | 78 | 8 | 12 | 97 | 10 | 107 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 15 | 621 | 93 | 9 | 14 | 116 | 12 | 128 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 80 | 9,728 | 1,459 | 146 | 219 | 1,824 | 182 | 2,006 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 30 | 3,664 | 550 | 55 | 82 | 687 | 69 | 756 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 30 | 1,879 | 282 | 28 | 42 | 352 | 35 | 388 |
| 43 | Res. area Hamlet 5C | 14,440 | 15 | 2,166 | 325 | 32 | 49 | 406 | 41 | 447 |
| 44 | Res. area Hamlet 5A | 12,824 | 15 | 1,924 | 289 | 29 | 43 | 361 | 36 | 397 |
| 45 | Res. area Hamlet 5B | 7,092 | 15 | 1,064 | 160 | 16 | 24 | 199 | 20 | 219 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 30 | 3,163 | 474 | 47 | 71 | 593 | 59 | 652 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 30 | 3,664 | 550 | 55 | 82 | 687 | 69 | 756 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 30 | 3,031 | 455 | 45 | 68 | 568 | 57 | 625 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 30 | 3,847 | 577 | 58 | 87 | 721 | 72 | 793 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 30 | 4,272 | 641 | 64 | 96 | 801 | 80 | 881 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 30 | 3,064 | 460 | 46 | 69 | 574 | 57 | 632 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 30 | 3,136 | 470 | 47 | 71 | 588 | 59 | 647 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 30 | 1,788 | 268 | 27 | 40 | 335 | 34 | 369 |
| | **Total C** | **162,728.0** | | **48,068** | | **721.0** | **1,081.5** | **9,012.5** | **901.3** | **9,913.8** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 15 | 1,782 | 267 | 27 | 40 | 334 | 33 | 368 |
| 55 | Suoi Tre Res. area | 8,932 | 15 | 1,340 | 201 | 20 | 30 | 251 | 25 | 276 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 15 | 1,036 | 155 | 16 | 23 | 194 | 19 | 214 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 25 | 2,233 | 335 | 33 | 50 | 419 | 42 | 461 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 25 | 2,166 | 325 | 32 | 49 | 406 | 41 | 447 |
| 59 | Hoa Loi Res. area | 5,268 | 25 | 1,317 | 198 | 20 | 30 | 247 | 25 | 272 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **9,874** | | **148.1** | **222.2** | **1,851.3** | **185.1** | **2,036.4** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 30 | 3,127 | 469 | 47 | 70 | 586 | 59 | 645 |
| 61 | Hoa Loi Resettlement area | 3,840 | 30 | 1,152 | 173 | 17 | 26 | 216 | 22 | 238 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 30 | 678 | 102 | 10 | 15 | 127 | 13 | 140 |
| 63 | Phu My Resettlement area | 3,624 | 30 | 1,087 | 163 | 16 | 24 | 204 | 20 | 224 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 30 | 1,544 | 232 | 23 | 35 | 290 | 29 | 319 |
| 65 | Phu Chanh Resettlement area | 5,944 | 30 | 1,783 | 267 | 27 | 40 | 334 | 33 | 368 |
| 66 | New Urban area | 152,056 | 25 | 38,014 | 5,702 | 570 | 855 | 7,128 | 713 | 7,840 |
| | **Total E** | **183,296.0** | | **47,385** | | **710.8** | **1,066.2** | **8,884.9** | **888.5** | **9,773.4** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **123,711** | | **1,856** | **2,783** | **23,195** | **2,320** | **25,515** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 472,126 | 70 | | 49,573 | 4,957 | 7,436 | 61,967 | 6,197 | 68,163 |
| 2 | Ben Cat | 1,257,600 | 30 | | 56,592 | 5,659 | 8,489 | 70,740 | 7,074 | 77,814 |
| 3 | Tan Uyen | 424,116 | 15 | | 9,543 | 954 | 1,431 | 11,928 | 1,193 | 13,121 |
| 4 | Thuan An City | 763,130 | 65 | | 74,405 | 7,441 | 11,161 | 93,006 | 9,301 | 102,307 |
| 5 | Di An City | 597,039 | 65 | | 58,211 | 5,821 | 8,732 | 72,764 | 7,276 | 80,041 |
| | **Total** | **3,514,010** | | | **248,324** | **24,832** | **37,249** | **310,405** | **31,041** | **341,446** |
| | **Grand total Z + F** | | | | | **366,961** | | | | |

***Year 2030***

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 25 | 6,730 | 1,010 | 101 | 151 | 1,262 | 126 | 1,388 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 25 | 1,000 | 150 | 15 | 23 | 188 | 19 | 206 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 25 | 2,966 | 445 | 44 | 67 | 556 | 56 | 612 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 35 | 3,746 | 562 | 56 | 84 | 702 | 70 | 773 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 25 | 1,300 | 195 | 20 | 29 | 244 | 24 | 268 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 35 | 4,488 | 673 | 67 | 101 | 842 | 84 | 926 |
| 32 | Lai Hung Res. area | 7,464 | 35 | 2,612 | 392 | 39 | 59 | 490 | 49 | 539 |
| 33 | Royal Town area | 10,864 | 25 | 2,716 | 407 | 41 | 61 | 509 | 51 | 560 |
| 34 | Lai Hung Resettlement area | 2,052 | 25 | 513 | 77 | 8 | 12 | 96 | 10 | 106 |
| | **Total A** | **91,892.0** | | **26,071** | | **391.1** | **586.6** | **4,888.5** | **488.9** | **5,377.4** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 25 | 2,500 | 375 | 38 | 56 | 469 | 47 | 516 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **2,500** | | **37.5** | **56.3** | **468.8** | **46.9** | **515.6** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 25 | 900 | 135 | 14 | 20 | 169 | 17 | 186 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 25 | 862 | 129 | 13 | 19 | 162 | 16 | 178 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 25 | 1,035 | 155 | 16 | 23 | 194 | 19 | 213 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 90 | 10,944 | 1,642 | 164 | 246 | 2,052 | 205 | 2,257 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 40 | 4,885 | 733 | 73 | 110 | 916 | 92 | 1,007 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 40 | 2,506 | 376 | 38 | 56 | 470 | 47 | 517 |
| 43 | Res. area Hamlet 5C | 14,440 | 25 | 3,610 | 542 | 54 | 81 | 677 | 68 | 745 |
| 44 | Res. area Hamlet 5A | 12,824 | 25 | 3,206 | 481 | 48 | 72 | 601 | 60 | 661 |
| 45 | Res. area Hamlet 5B | 7,092 | 25 | 1,773 | 266 | 27 | 40 | 332 | 33 | 366 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 40 | 4,218 | 633 | 63 | 95 | 791 | 79 | 870 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 40 | 4,885 | 733 | 73 | 110 | 916 | 92 | 1,007 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 40 | 4,042 | 606 | 61 | 91 | 758 | 76 | 834 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 40 | 5,130 | 769 | 77 | 115 | 962 | 96 | 1,058 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 40 | 5,696 | 854 | 85 | 128 | 1,068 | 107 | 1,175 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 40 | 4,085 | 613 | 61 | 92 | 766 | 77 | 842 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 40 | 4,181 | 627 | 63 | 94 | 784 | 78 | 862 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 40 | 2,384 | 358 | 36 | 54 | 447 | 45 | 492 |
| | **Total C** | **162,728.0** | | **64,342** | | **965.1** | **1,447.6** | **12,063.7** | **1,206.4** | **13,270.0** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 25 | 2,970 | 446 | 45 | 67 | 557 | 56 | 613 |
| 55 | Suoi Tre Res. area | 8,932 | 25 | 2,233 | 335 | 33 | 50 | 419 | 42 | 461 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 25 | 1,726 | 259 | 26 | 39 | 324 | 32 | 356 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 35 | 3,126 | 469 | 47 | 70 | 586 | 59 | 645 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 35 | 3,032 | 455 | 45 | 68 | 569 | 57 | 625 |
| 59 | Hoa Loi Res. area | 5,268 | 35 | 1,844 | 277 | 28 | 41 | 346 | 35 | 380 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **14,931** | | **224.0** | **336.0** | **2,799.6** | **280.0** | **3,079.6** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 40 | 4,170 | 625 | 63 | 94 | 782 | 78 | 860 |
| 61 | Hoa Loi Resettlement area | 3,840 | 40 | 1,536 | 230 | 23 | 35 | 288 | 29 | 317 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 40 | 904 | 136 | 14 | 20 | 170 | 17 | 186 |
| 63 | Phu My Resettlement area | 3,624 | 40 | 1,450 | 217 | 22 | 33 | 272 | 27 | 299 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 40 | 2,059 | 309 | 31 | 46 | 386 | 39 | 425 |
| 65 | Phu Chanh Resettlement area | 5,944 | 40 | 2,378 | 357 | 36 | 53 | 446 | 45 | 490 |
| 66 | New Urban area | 152,056 | 35 | 53,220 | 7,983 | 798 | 1,197 | 9,979 | 998 | 10,977 |
| | **Total E** | **183,296.0** | | **65,717** | | **985.7** | **1,478.6** | **12,321.7** | **1,232.2** | **13,553.8** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **173,561** | | **2,603** | **3,905** | **32,542** | **3,254** | **35,797** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 541,833 | 80 | | 65,020 | 6,502 | 9,753 | 81,275 | 8,127 | 89,402 |
| 2 | Ben Cat | 1,853,318 | 40 | | 111,199 | 11,120 | 16,680 | 138,999 | 13,900 | 152,899 |
| 3 | Tan Uyen | 484,069 | 20 | | 14,522 | 1,452 | 2,178 | 18,153 | 1,815 | 19,968 |
| 4 | Thuan An City | 802,057 | 70 | | 84,216 | 8,422 | 12,632 | 105,270 | 10,527 | 115,797 |
| 5 | Di An City | 627,494 | 70 | | 65,887 | 6,589 | 9,883 | 82,359 | 8,236 | 90,594 |
| | **Total** | **4,308,770** | | | **340,844** | **34,084** | **51,127** | **426,055** | **42,605** | **468,660** |
| | **Grand total Z + F** | | | | | **504,457** | | | | |

***Year 2035***

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 35 | 9,422 | 1,413 | 141 | 212 | 1,767 | 177 | 1,943 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 35 | 1,400 | 210 | 21 | 32 | 263 | 26 | 289 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 35 | 4,152 | 623 | 62 | 93 | 779 | 78 | 856 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 35 | 3,746 | 562 | 56 | 84 | 702 | 70 | 773 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 35 | 1,820 | 273 | 27 | 41 | 341 | 34 | 375 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 45 | 5,771 | 866 | 87 | 130 | 1,082 | 108 | 1,190 |
| 32 | Lai Hung Res. area | 7,464 | 45 | 3,359 | 504 | 50 | 76 | 630 | 63 | 693 |
| 33 | Royal Town area | 10,864 | 35 | 3,802 | 570 | 57 | 86 | 713 | 71 | 784 |
| 34 | Lai Hung Resettlement area | 2,052 | 35 | 718 | 108 | 11 | 16 | 135 | 13 | 148 |
| | **Total A** | **91,892.0** | | **34,190** | | **512.9** | **769.3** | **6,410.8** | **641.1** | **7,051.9** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 35 | 3,500 | 525 | 53 | 79 | 656 | 66 | 722 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **3,500** | | **52.5** | **78.8** | **656.3** | **65.6** | **721.9** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 35 | 1,260 | 189 | 19 | 28 | 236 | 24 | 260 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 35 | 1,207 | 181 | 18 | 27 | 226 | 23 | 249 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 35 | 1,449 | 217 | 22 | 33 | 272 | 27 | 299 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 100 | 12,160 | 1,824 | 182 | 274 | 2,280 | 228 | 2,508 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 50 | 6,106 | 916 | 92 | 137 | 1,145 | 114 | 1,259 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 50 | 3,132 | 470 | 47 | 70 | 587 | 59 | 646 |
| 43 | Res. area Hamlet 5C | 14,440 | 35 | 5,054 | 758 | 76 | 114 | 948 | 95 | 1,042 |
| 44 | Res. area Hamlet 5A | 12,824 | 35 | 4,488 | 673 | 67 | 101 | 842 | 84 | 926 |
| 45 | Res. area Hamlet 5B | 7,092 | 35 | 2,482 | 372 | 37 | 56 | 465 | 47 | 512 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 50 | 5,272 | 791 | 79 | 119 | 989 | 99 | 1,087 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 50 | 6,106 | 916 | 92 | 137 | 1,145 | 114 | 1,259 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 50 | 5,052 | 758 | 76 | 114 | 947 | 95 | 1,042 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 50 | 6,412 | 962 | 96 | 144 | 1,202 | 120 | 1,322 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 50 | 7,120 | 1,068 | 107 | 160 | 1,335 | 134 | 1,469 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 50 | 5,106 | 766 | 77 | 115 | 957 | 96 | 1,053 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 50 | 5,226 | 784 | 78 | 118 | 980 | 98 | 1,078 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 50 | 2,980 | 447 | 45 | 67 | 559 | 56 | 615 |
| | **Total C** | **162,728.0** | | **80,612** | | **1,209.2** | **1,813.8** | **15,114.8** | **1,511.5** | **16,626.3** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 35 | 4,158 | 624 | 62 | 94 | 780 | 78 | 858 |
| 55 | Suoi Tre Res. area | 8,932 | 35 | 3,126 | 469 | 47 | 70 | 586 | 59 | 645 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 35 | 2,416 | 362 | 36 | 54 | 453 | 45 | 498 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 35 | 3,126 | 469 | 47 | 70 | 586 | 59 | 645 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 35 | 3,032 | 455 | 45 | 68 | 569 | 57 | 625 |
| 59 | Hoa Loi Res. area | 5,268 | 45 | 2,371 | 356 | 36 | 53 | 444 | 44 | 489 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **18,229** | | **273.4** | **410.2** | **3,418.1** | **341.8** | **3,759.9** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 50 | 5,212 | 782 | 78 | 117 | 977 | 98 | 1,075 |
| 61 | Hoa Loi Resettlement area | 3,840 | 50 | 1,920 | 288 | 29 | 43 | 360 | 36 | 396 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 50 | 1,130 | 170 | 17 | 25 | 212 | 21 | 233 |
| 63 | Phu My Resettlement area | 3,624 | 50 | 1,812 | 272 | 27 | 41 | 340 | 34 | 374 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 50 | 2,574 | 386 | 39 | 58 | 483 | 48 | 531 |
| 65 | Phu Chanh Resettlement area | 5,944 | 50 | 2,972 | 446 | 45 | 67 | 557 | 56 | 613 |
| 66 | New Urban area | 152,056 | 45 | 68,425 | 10,264 | 1,026 | 1,540 | 12,830 | 1,283 | 14,113 |
| | **Total E** | **183,296.0** | | **84,045** | | **1,260.7** | **1,891.0** | **15,758.5** | **1,575.8** | **17,334.3** |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **220,576** | | **3,309** | **4,963** | **41,358** | **4,136** | **45,494** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 624,096 | 90 | | 84,253 | 8,425 | 12,638 | 105,316 | 10,532 | 115,848 |
| 2 | Ben Cat | 2,137,080 | 50 | | 160,281 | 16,028 | 24,042 | 200,351 | 20,035 | 220,386 |
| 3 | Tan Uyen | 557,257 | 25 | | 20,897 | 2,090 | 3,135 | 26,121 | 2,612 | 28,734 |
| 4 | Thuan An City | 842,970 | 75 | | 94,834 | 9,483 | 14,225 | 118,543 | 11,854 | 130,397 |
| 5 | Di An City | 659,502 | 75 | | 74,194 | 7,419 | 11,129 | 92,743 | 9,274 | 102,017 |
| | **Total** | **4,820,906** | | | **434,459** | **43,446** | **65,169** | **543,074** | **54,307** | **597,381** |
| | **Grand total Z + F** | | | | | **642,876** | | | | |

*Year 2040*

| No. | City District/town | Population as planned | Utilization factor (%) | Population | Water demand of households 150l/capita/day (m3/day) | Water demand of administrative agencies 10% x (5) (m3/day) | Water demand of businesses 15% x (5) (m3/day) | Total water demand (5)+(6)+(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | | | |
| 26 | Res. area 5F Hamlet 5 (LU) | 26,920 | 45 | 12,114 | 1,817 | 182 | 273 | 2,271 | 227 | 2,499 |
| 27 | Res. area 5C Hamlet 5 (LU) | 4,000 | 45 | 1,800 | 270 | 27 | 41 | 338 | 34 | 371 |
| 28 | Res. area 5D Hamlet 5 (LU) | 11,864 | 45 | 5,339 | 801 | 80 | 120 | 1,001 | 100 | 1,101 |
| 29 | Res. area 5B Hamlet 5 (LU) | 10,704 | 45 | 4,817 | 723 | 72 | 108 | 903 | 90 | 993 |
| 30 | Res. area 5E Hamlet 5 (LU) | 5,200 | 45 | 2,340 | 351 | 35 | 53 | 439 | 44 | 483 |
| 31 | Res. area 5A Hamlet 5 (LU) | 12,824 | 55 | 7,053 | 1,058 | 106 | 159 | 1,322 | 132 | 1,455 |
| 32 | Lai Hung Res. area | 7,464 | 55 | 4,105 | 616 | 62 | 92 | 770 | 77 | 847 |
| 33 | Royal Town area | 10,864 | 45 | 4,889 | 733 | 73 | 110 | 917 | 92 | 1,008 |
| 34 | Lai Hung Resettlement area | 2,052 | 45 | 923 | 139 | 14 | 21 | 173 | 17 | 190 |
| | **Total A** | **91,892.0** | | **43,380** | | **650.7** | **976.1** | **8,133.8** | **813.4** | **8,947.2** |
| **B** | **An Tay area** | | | | | | | | | |
| 36 | Rach Bap Res. area | 10,000 | 45 | 4,500 | 675 | 68 | 101 | 844 | 84 | 928 |
| | Bac Ben Cat Urban area | | | 0 | | | | | | |
| | **Total B** | **10,000.0** | | **4,500** | | **67.5** | **101.3** | **843.8** | **84.4** | **928.1** |
| **C** | **My Phuoc area** | | | | | | | | | |
| 37 | Cau Do Res. area | 3,600 | 45 | 1,620 | 243 | 24 | 36 | 304 | 30 | 334 |
| 38 | My Phuoc 3 Res. area (Biconsi) | 3,448 | 45 | 1,552 | 233 | 23 | 35 | 291 | 29 | 320 |
| 39 | My Phuoc 4 Res. area (Thien Phu) | 4,140 | 45 | 1,863 | 279 | 28 | 42 | 349 | 35 | 384 |
| 40 | My Phuoc expanded Resettlement area | 12,160 | 100 | 12,160 | 1,824 | 182 | 274 | 2,280 | 228 | 2,508 |
| 41 | Res. area Hamlet 3(TH) | 12,212 | 60 | 7,327 | 1,099 | 110 | 165 | 1,374 | 137 | 1,511 |
| 42 | Thoi Hoa Resettlement housing area | 6,264 | 60 | 3,758 | 564 | 56 | 85 | 705 | 70 | 775 |
| 43 | Res. area Hamlet 5C | 14,440 | 45 | 6,498 | 975 | 97 | 146 | 1,218 | 122 | 1,340 |
| 44 | Res. area Hamlet 5A | 12,824 | 45 | 5,771 | 866 | 87 | 130 | 1,082 | 108 | 1,190 |
| 45 | Res. area Hamlet 5B | 7,092 | 45 | 3,191 | 479 | 48 | 72 | 598 | 60 | 658 |
| 46 | Res. area Hamlet 2 (TH) | 10,544 | 60 | 6,326 | 949 | 95 | 142 | 1,186 | 119 | 1,305 |
| 47 | Res. area Hamlet 3A (TH) | 12,212 | 60 | 7,327 | 1,099 | 110 | 165 | 1,374 | 137 | 1,511 |
| 48 | Res. area Hamlet 3B (TH) | 10,104 | 60 | 6,062 | 909 | 91 | 136 | 1,137 | 114 | 1,250 |
| 49 | Res. area Hamlet 1 (TH) | 12,824 | 60 | 7,694 | 1,154 | 115 | 173 | 1,443 | 144 | 1,587 |
| 50 | My Phuoc 3 Res. area (TH) | 14,240 | 60 | 8,544 | 1,282 | 128 | 192 | 1,602 | 160 | 1,762 |
| 51 | Res. area Hamlet 6 (TH) | 10,212 | 60 | 6,127 | 919 | 92 | 138 | 1,149 | 115 | 1,264 |
| 52 | Res. area Hamlet 5 (CPH) | 10,452 | 60 | 6,271 | 941 | 94 | 141 | 1,176 | 118 | 1,293 |
| 53 | Res. area Hamlet 7 (CPH) | 5,960 | 60 | 3,576 | 536 | 54 | 80 | 671 | 67 | 738 |
| | **Total C** | **162,728.0** | | **95,667** | | **1,435.0** | **2,152.6** | **17,938.0** | **1,793.8** | **19,731.8** |
| **D** | **Expanded VSIP II area** | | | | | | | | | |
| 54 | Res. area Hamlet 4 (TB) | 11,880 | 45 | 5,346 | 802 | 80 | 120 | 1,002 | 100 | 1,103 |
| 55 | Suoi Tre Res. area | 8,932 | 45 | 4,019 | 603 | 60 | 90 | 754 | 75 | 829 |
| 56 | Res. area Hamlet 1 (Vinh Tan) | 6,904 | 45 | 3,107 | 466 | 47 | 70 | 583 | 58 | 641 |
| 57 | Res. area Hamlet 4 (Vinh Tan) | 8,932 | 45 | 4,019 | 603 | 60 | 90 | 754 | 75 | 829 |
| 58 | Res. area Hamlet 5 (VT) | 8,664 | 45 | 3,899 | 585 | 58 | 88 | 731 | 73 | 804 |
| 59 | Hoa Loi Res. area | 5,268 | 55 | 2,897 | 435 | 43 | 65 | 543 | 54 | 598 |
| 35 | Cong Xanh University area | | | 0 | | | | | | |
| | **Total D** | **50,580.0** | | **23,287** | | **349.3** | **524.0** | **4,366.5** | **436.6** | **4,803.1** |
| **E** | **New City area** | | | | | | | | | |
| 60 | Hoa Loi Res. area | 10,424 | 60 | 6,254 | 938 | 94 | 141 | 1,173 | 117 | 1,290 |
| 61 | Hoa Loi Resettlement area | 3,840 | 60 | 2,304 | 346 | 35 | 52 | 432 | 43 | 475 |
| 62 | Dinh Hoa Resettlement area | 2,260 | 60 | 1,356 | 203 | 20 | 31 | 254 | 25 | 280 |
| 63 | Phu My Resettlement area | 3,624 | 60 | 2,174 | 326 | 33 | 49 | 408 | 41 | 448 |
| 64 | Tan Vinh Hiep Resettlement area | 5,148 | 60 | 3,089 | 463 | 46 | 69 | 579 | 58 | 637 |
| 65 | Phu Chanh Resettlement area | 5,944 | 60 | 3,566 | 535 | 53 | 80 | 669 | 67 | 736 |
| 66 | New Urban area | 152,056 | 55 | 83,631 | 12,545 | 1,254 | 1,882 | 15,681 | 1,568 | 17,249 |
| | | | | | | | | | | |
| | **Grand total A+B+C+D+E = Z** | **498,496** | | **269,208** | | **4,038** | **6,057** | **50,477** | **5,048** | **55,525** |
| **F** | **Existing Urban area** | | | | | | | | | |
| 1 | Thu Dau Mot city | 720,913 | 100 | | 108,137 | 10,814 | 16,221 | 135,171 | 13,517 | 148,688 |
| 2 | Ben Cat | 2,470,575 | 60 | | 222,352 | 22,235 | 33,353 | 277,940 | 27,794 | 305,734 |
| 3 | Tan Uyen | 641,986 | 30 | | 28,889 | 2,889 | 4,333 | 36,112 | 3,611 | 39,723 |
| 4 | Thuan An City | 885,970 | 80 | | 106,316 | 10,632 | 15,947 | 132,895 | 13,290 | 146,185 |
| 5 | Di An City | 693,144 | 80 | | 83,177 | 8,318 | 12,477 | 103,972 | 10,397 | 114,369 |
| | **Total** | **5,412,587** | | | **548,872** | **54,887** | **82,331** | **686,090** | **68,609** | **754,699** |
| | **Grand total Z + F** | | | | | **810,224** | | | | |

## 2. Industrial Park

***Year 2012***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Bau Bang IP | 1,000 | 699.2 | 1.75 | 45 | 551 | 55 | 606 |
| | **Total A** | **1,000** | **699** | | | **551** | **55** | **606** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 1 | 45 | 168 | 17 | 185 |
| 9 | Rach Bap IP | 279 | 188.2 | | | | | |
| 10 | Mai Trung IP | 51 | 34.6 | | | | | |
| 11 | Viet Huong II IP | 250 | 168.6 | | | | | |
| | **Total B** | **1,080** | **765** | | | **168** | **17** | **185** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 75 | 45 | 9,325 | 933 | 10,258 |
| 13 | My Phuoc II IP | 477 | 333.0 | 60 | 45 | 8,991 | 899 | 9,890 |
| 14 | My Phuoc III IP | 978 | 655.7 | 30 | 45 | 8,852 | 885 | 9,737 |
| 15 | Thoi Hoa IP | 202 | 134.6 | | | | | |
| | **Total C** | **2,034** | **1,400** | | | **27,168** | **2,717** | **29,885** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 10 | 45 | 3,039 | 304 | 3,343 |
| | **Total D** | **1,008** | **675** | | | **3,039** | **304** | **3,343** |
| **E** | **New City area** | | | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 15 | 45 | 1,000 | 100 | 1,100 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 15 | 45 | 578 | 58 | 636 |
| 21 | VSIP II IP | 345 | 231.2 | 35 | 45 | 3,641 | 364 | 4,006 |
| 22 | Kim Huy IP | 214 | 144.7 | 15 | 45 | 977 | 98 | 1,074 |
| 23 | Song Than III IP | 534 | 327.4 | 15 | 45 | 2,210 | 221 | 2,431 |
| 24 | Dai Dang IP | 274 | 166.0 | 15 | 45 | 1,121 | 112 | 1,233 |
| 25 | Mapletree Hi-Tech Park | 75 | 52.4 | 5 | 45 | 118 | 12 | 130 |
| | **Total E** | **1,780** | **1,155** | | | **9,644** | **964** | **10,608** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 78 | 45 | 11,088 | 1,109 | 12,197 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 90 | 45 | 1,015 | 102 | 1,117 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 90 | 45 | 1,307 | 131 | 1,438 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 90 | 45 | 1,914 | 191 | 2,105 |
| | **Total F** | **623** | **420** | | | **15,324** | **1,532** | **16,856** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 90 | 45 | 5,658 | 566 | 6,224 |
| 2 | Song Than II PI | 279 | 217.6 | 90 | 45 | 8,812 | 881 | 9,694 |
| 3 | Binh Duong IP | 17 | 14.1 | 87 | 45 | 551 | 55 | 606 |
| 4 | Dong An IP | 138 | 112.3 | 92 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 82 | 45 | 1,484 | 148 | 1,633 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 70 | 45 | 3,521 | 352 | 3,873 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 86 | 45 | 728 | 73 | 800 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 81 | 45 | 1,480 | 148 | 1,628 |
| | **Total G** | **964** | **733.6** | | | **26,907** | **2,691** | **29,597** |
| | **Grand total** | **8,489** | **5,849** | | | **82,801** | **8,280** | **91,081** |

***Year 2015***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Cay Truong IP | 500 | 345.0 | | | | | |
| 3 | Bau Bang IP (MR) | 1,500 | 1,005.0 | | | | | |
| 4 | Bau Bang IP | 1,000 | 699.2 | 20 | 45 | 6,293 | 629 | 6,922 |
| 5 | Lai Hung IP | 1,000 | 690.0 | | | | | |
| 6 | Lai Hung Industrial group | 78 | 53.0 | | | | | |
| | **Total A** | **4,078** | **2,792** | | | **6,293** | **629** | **6,922** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 10 | 45 | 1,683 | 168 | 1,851 |
| 8 | An Tay IP (MR) | 850 | 578.0 | | 45 | 0 | 0 | 0 |
| 9 | Rach Bap IP | 279 | 188.2 | 5 | 45 | 423 | 42 | 466 |
| 10 | Mai Trung IP | 51 | 34.6 | 20 | 45 | 311 | 31 | 343 |
| 11 | Viet Huong II IP | 250 | 168.6 | 30 | 45 | 2,276 | 228 | 2,504 |
| | **Total B** | **1,930** | **1,343** | | | **4,694** | **469** | **5,163** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 85 | 45 | 10,568 | 1,057 | 11,625 |
| 13 | My Phuoc II IP | 477 | 333.0 | 70 | 45 | 10,490 | 1,049 | 11,538 |
| 14 | My Phuoc III IP | 978 | 655.7 | 40 | 45 | 11,803 | 1,180 | 12,983 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 5 | 45 | 303 | 30 | 333 |
| | **Total C** | **2,034** | **1,400** | | | **33,163** | **3,316** | **36,480** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 20 | 45 | 6,079 | 608 | 6,686 |
| 17 | Tan Binh IP | 350 | 241.5 | | 45 | 0 | 0 | 0 |
| 18 | Binh Lap IP | 500 | 340.0 | | | | | |
| | **Total D** | 128 | 89.0 | | | **6,079** | **608** | **6,686** |
| **E** | **New City area** | **1,986** | **1,346** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 25 | 45 | 1,666 | 167 | 1,833 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 25 | 45 | 963 | 96 | 1,059 |
| 21 | VSIP II IP | 345 | 231.2 | 45 | 45 | 4,682 | 468 | 5,150 |
| 22 | Kim Huy IP | 214 | 144.7 | 25 | 45 | 1,628 | 163 | 1,791 |
| 23 | Song Than III IP | 534 | 327.4 | 25 | 45 | 3,683 | 368 | 4,052 |
| 24 | Dai Dang IP | 274 | 166.0 | 25 | 45 | 1,868 | 187 | 2,054 |
| 25 | Mapletree Hi-Tech Park | 75 | 52.4 | 15 | 45 | 354 | 35 | 389 |
| | **Total E** | **1,780** | **1,155** | | | **14,843** | **1,484** | **16,328** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 100.0 | 45 | 2,126 | 213 | 2,339 |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| 4 | Dong An IP | 138 | 112.3 | 92.4 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **11,537** | **7,934** | | | **111,832** | **11,183** | **123,015** |

***Year 2020***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Cay Truong IP | 500 | 345.0 | | 45 | 0 | 0 | 0 |
| 2 | Long Hoa IP | 1,380 | 952.2 | | | | | |
| 3 | Bau Bang IP (MR) | 1,500 | 1,035.0 | 5 | 45 | 2,329 | 233 | 2,562 |
| 4 | Bau Bang IP | 1,000 | 699.2 | 30 | 45 | 9,439 | 944 | 10,383 |
| 5 | Lai Hung IP | 1,000 | 690.0 | 5 | | | | |
| 6 | Lai Hung Industrial group | 78 | 53.0 | 5 | 45 | 119 | 12 | 131 |
| | **Total A** | **5,458** | **3,774** | | | **11,887** | **1,189** | **13,076** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 20 | 45 | 3,365 | 337 | 3,702 |
| 8 | An Tay IP (MR) | 850 | 578.0 | 5 | 45 | 1,301 | 130 | 1,431 |
| 9 | Rach Bap IP | 279 | 188.2 | 15 | 45 | 1,270 | 127 | 1,397 |
| 10 | Mai Trung IP | 51 | 34.6 | 30 | 45 | 467 | 47 | 514 |
| 11 | Viet Huong II IP | 250 | 168.6 | 40 | 45 | 3,035 | 303 | 3,338 |
| | **Total B** | **1,930** | **1,343** | | | **9,438** | **944** | **10,382** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 95 | 45 | 11,812 | 1,181 | 12,993 |
| 13 | My Phuoc II IP | 477 | 333.0 | 80 | 45 | 11,988 | 1,199 | 13,187 |
| 14 | My Phuoc III IP | 978 | 655.7 | 50 | 45 | 14,753 | 1,475 | 16,229 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 15 | 45 | 909 | 91 | 999 |
| | **Total C** | **2,034** | **1,400** | | | **39,462** | **3,946** | **43,408** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 40 | 45 | 12,157 | 1,216 | 13,373 |
| 17 | Tan Binh IP | 350 | 241.5 | 5 | 45 | 543 | 54 | 598 |
| 18 | Binh Lap IP | 500 | 345.0 | 5 | 45 | 776 | 78 | 854 |
| | **Total D** | 128 | 89.0 | 5 | | **13,477** | **1,348** | **14,825** |
| **E** | **New City area** | **1,986** | **1,351** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 40 | 45 | 2,666 | 267 | 2,932 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 40 | 45 | 1,541 | 154 | 1,695 |
| 21 | VSIP II IP | 345 | 231.2 | 55 | 45 | 5,722 | 572 | 6,294 |
| 22 | Kim Huy IP | 214 | 144.7 | 40 | 45 | 2,605 | 260 | 2,865 |
| 23 | Song Than III IP | 534 | 327.4 | 40 | 45 | 5,893 | 589 | 6,483 |
| 24 | Dai Dang IP | 274 | 166.0 | 40 | 45 | 2,988 | 299 | 3,287 |
| 25 | Mapletree Hi-Tech Park | 75 | 52.4 | 30 | 45 | 707 | 71 | 778 |
| | **Total E** | **1,780** | **1,155** | | | **22,122** | **2,212** | **24,334** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 100.0 | 45 | 2,126 | 213 | 2,339 |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| 4 | Dong An IP | 138 | 112.3 | 92.4 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **12,917** | **8,916** | | | **143,145** | **14,315** | **157,460** |

***Year 2025***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Cay Truong IP | 500 | 345.0 | 5 | 45 | 776 | 78 | 854 |
| 2 | Long Hoa IP | 1,380 | 952.2 | 10 | 45 | 4,285 | 428 | 4,713 |
| 3 | Bau Bang IP (MR) | 1,500 | 1,035.0 | 15 | 45 | 6,986 | 699 | 7,685 |
| 4 | Bau Bang IP | 1,000 | 699.2 | 45 | 45 | 14,159 | 1,416 | 15,575 |
| 5 | Lai Hung IP | 1,000 | 690.0 | 15 | 45 | 4,658 | 466 | 5,123 |
| 6 | Lai Hung Industrial group | 78 | 53.0 | 15 | 45 | 358 | 36 | 394 |
| | **Total A** | **5,458** | **3,774** | | | **31,221** | **3,122** | **34,344** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 35 | 45 | 5,889 | 589 | 6,478 |
| 8 | An Tay IP (MR) | 850 | 578.0 | 15 | 45 | 3,902 | 390 | 4,292 |
| 9 | Rach Bap IP | 279 | 188.2 | 25 | 45 | 2,117 | 212 | 2,329 |
| 10 | Mai Trung IP | 51 | 34.6 | 40 | 45 | 623 | 62 | 685 |
| 11 | Viet Huong II IP | 250 | 168.6 | 50 | 45 | 3,794 | 379 | 4,173 |
| | **Total B** | **1,930** | **1,343** | | | **16,324** | **1,632** | **17,956** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 100 | 45 | 12,434 | 1,243 | 13,677 |
| 13 | My Phuoc II IP | 477 | 333.0 | 90 | 45 | 13,487 | 1,349 | 14,835 |
| 14 | My Phuoc III IP | 978 | 655.7 | 65 | 45 | 19,179 | 1,918 | 21,097 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 30 | 45 | 1,817 | 182 | 1,999 |
| | **Total C** | **2,034** | **1,400** | | | **46,916** | **4,692** | **51,608** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 55 | 45 | 16,716 | 1,672 | 18,388 |
| 17 | Tan Binh IP | 350 | 241.5 | 15 | 45 | 1,630 | 163 | 1,793 |
| 18 | Binh Lap IP | 500 | 345.0 | 15 | 45 | 2,329 | 233 | 2,562 |
| | **Total D** | 128 | 89.0 | 15 | | **20,675** | **2,068** | **22,743** |
| **E** | **New City area** | **1,986** | **1,351** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 55 | 45 | 3,665 | 367 | 4,032 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 55 | 45 | 2,119 | 212 | 2,330 |
| 21 | VSIP II IP | 345 | 231.2 | 70 | 45 | 7,283 | 728 | 8,011 |
| 22 | Kim Huy IP | 214 | 144.7 | 55 | 45 | 3,581 | 358 | 3,939 |
| 23 | Song Than III IP | 534 | 327.4 | 55 | 45 | 8,103 | 810 | 8,913 |
| 24 | Dai Dang IP | 274 | 166.0 | 55 | 45 | 4,109 | 411 | 4,519 |
| 25 | Mapletree Hi-Tech Park | 75 | 52.4 | 45 | 45 | 1,061 | 106 | 1,167 |
| | **Total E** | **1,780** | **1,155** | | | **29,921** | **2,992** | **32,913** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 100.0 | 45 | 2,126 | 213 | 2,339 |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| 4 | Dong An IP | 138 | 112.3 | 92.4 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **12,917** | **8,916** | | | **191,818** | **19,182** | **210,999** |

***Year 2030***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 3 | Bau Bang IP (MR) | 1,500 | 1,035.0 | 25 | 45 | 11,644 | 1,164 | 12,808 |
| 4 | Bau Bang IP | 1,000 | 699.2 | 60 | 45 | 18,878 | 1,888 | 20,766 |
| 5 | Lai Hung IP | 1,000 | 690.0 | 25 | 45 | 7,763 | 776 | 8,539 |
| 6 | Lai Hung Industrial group | 78 | 53.0 | 25 | 45 | 596 | 60 | 656 |
| | **Total A** | **5,458** | **3,774** | | | **49,779** | **4,978** | **54,757** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 50 | 45 | 8,413 | 841 | 9,254 |
| 8 | An Tay IP (MR) | 850 | 578.0 | 30 | 45 | 7,803 | 780 | 8,583 |
| 9 | Rach Bap IP | 279 | 188.2 | 40 | 45 | 3,388 | 339 | 3,726 |
| 10 | Mai Trung IP | 51 | 34.6 | 45 | 45 | 701 | 70 | 771 |
| 11 | Viet Huong II IP | 250 | 168.6 | 65 | 45 | 4,932 | 493 | 5,425 |
| | **Total B** | **1,930** | **1,343** | | | **25,236** | **2,524** | **27,759** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 100 | 45 | 12,434 | 1,243 | 13,677 |
| 13 | My Phuoc II IP | 477 | 333.0 | 100 | 45 | 14,985 | 1,499 | 16,484 |
| 14 | My Phuoc III IP | 978 | 655.7 | 75 | 45 | 22,130 | 2,213 | 24,343 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 45 | 45 | 2,726 | 273 | 2,998 |
| | **Total C** | **2,034** | **1,400** | | | **52,274** | **5,227** | **57,501** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 70 | 45 | 21,275 | 2,128 | 23,403 |
| 17 | Tan Binh IP | 350 | 241.5 | 30 | 45 | 3,260 | 326 | 3,586 |
| 18 | Binh Lap IP | 500 | 345.0 | 25 | 45 | 3,881 | 388 | 4,269 |
| | **Total D** | 128 | 89.0 | 25 | | **28,417** | **2,842** | **31,258** |
| **E** | **New City area** | **1,986** | **1,351** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 70 | 45 | 4,665 | 467 | 5,132 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 70 | 45 | 2,696 | 270 | 2,966 |
| 21 | VSIP II IP | 345 | 231.2 | 85 | 45 | 8,843 | 884 | 9,728 |
| 22 | Kim Huy IP | 214 | 144.7 | 70 | 45 | 4,558 | 456 | 5,014 |
| 23 | Song Than III IP | 534 | 327.4 | 70 | 45 | 10,313 | 1,031 | 11,344 |
| 24 | Dai Dang IP | 274 | 166.0 | 70 | 45 | 5,229 | 523 | 5,752 |
| 25 | Mapletree Hi-Tech Park | 75 | 52.4 | 60 | 45 | 1,415 | 141 | 1,556 |
| | **Total E** | **1,780** | **1,155** | | | **37,720** | **3,772** | **41,492** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 100.0 | 45 | 2,126 | 213 | 2,339 |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| | | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| 4 | Dong An IP | 138 | 112.3 | 92.4 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **12,917** | **8,916** | | | **240,185** | **24,019** | **264,204** |

***Year 2035***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Cay Truong IP | 500 | 345.0 | 25 | 45 | 3,881 | 388 | 4,269 |
| 2 | Long Hoa IP | 1,380 | 952.2 | 30 | 45 | 12,855 | 1,285 | 14,140 |
| 3 | Bau Bang IP (MR) | 1,500 | 1,035.0 | 35 | 45 | 16,301 | 1,630 | 17,931 |
| 4 | Bau Bang IP | 1,000 | 699.2 | 70 | 45 | 22,025 | 2,202 | 24,227 |
| 5 | Lai Hung IP | 1,000 | 690.0 | 35 | 45 | 10,868 | 1,087 | 11,954 |
| 6 | Lai Hung Industrial group | 78 | 53.0 | 35 | 45 | 835 | 83 | 918 |
| | **Total A** | **5,458** | **3,774** | | | **66,764** | **6,676** | **73,441** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 60 | 45 | 10,095 | 1,010 | 11,105 |
| 8 | An Tay IP (MR) | 850 | 578.0 | 40 | 45 | 10,404 | 1,040 | 11,444 |
| 9 | Rach Bap IP | 279 | 188.2 | 50 | 45 | 4,235 | 423 | 4,658 |
| 10 | Mai Trung IP | 51 | 34.6 | 55 | 45 | 856 | 86 | 942 |
| 11 | Viet Huong II IP | 250 | 168.6 | 75 | 45 | 5,690 | 569 | 6,259 |
| | **Total B** | **1,930** | **1,343** | | | **31,280** | **3,128** | **34,408** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 100 | 45 | 12,434 | 1,243 | 13,677 |
| 13 | My Phuoc II IP | 477 | 333.0 | 100 | 45 | 14,985 | 1,499 | 16,484 |
| 14 | My Phuoc III IP | 978 | 655.7 | 90 | 45 | 26,556 | 2,656 | 29,211 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 60 | 45 | 3,634 | 363 | 3,998 |
| | **Total C** | **2,034** | **1,400** | | | **57,609** | **5,761** | **63,369** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 85 | 45 | 25,834 | 2,583 | 28,417 |
| 17 | Tan Binh IP | 350 | 241.5 | 45 | 45 | 4,890 | 489 | 5,379 |
| 18 | Binh Lap IP | 500 | 345.0 | 35 | 45 | 5,434 | 543 | 5,977 |
| | **Total D** | 128 | 89.0 | 40 | | **36,158** | **3,616** | **39,774** |
| **E** | **New City area** | **1,986** | **1,351** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 85 | 45 | 5,665 | 566 | 6,231 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 85 | 45 | 3,274 | 327 | 3,602 |
| 21 | VSIP II IP | 345 | 231.2 | 95 | 45 | 9,884 | 988 | 10,872 |
| 22 | Kim Huy IP | 214 | 144.7 | 85 | 45 | 5,535 | 553 | 6,088 |
| 23 | Song Than III IP | 534 | 327.4 | 85 | 45 | 12,523 | 1,252 | 13,775 |
| 24 | Dai Dang IP | 274 | 166.0 | 85 | 45 | 6,350 | 635 | 6,984 |
| 25 | Mapletree High-Tech Park | 75 | 52.4 | 75 | 45 | 1,769 | 177 | 1,945 |
| | **Total E** | **1,780** | **1,155** | | | **44,999** | **4,500** | **49,499** |
| | **Grand total A + B + C + D + E** | **11,330** | **7,762** | | | **236,810** | **23,681** | **260,491** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| | | | | | | | | |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| 4 | Dong An IP | 138 | 112.3 | 92.4 | 45 | 4,672 | 467 | 5,139 |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **14,903** | **10,267** | | | **283,570** | **28,357** | **311,927** |

***Year 2040***

Table 7

| No. | Name of Industrial Park | Planning area ( Ha) | Available area for rent (Ha) | Utilization factor (%) | Water supply standard 45m3/day/ha (m3/day) | Total water demand (5)*(6)*(7) (m3/day) | Water leak and loss 10% x (8) (m3/day) | Plant capacity (m3/day) |
|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| **A** | **Bau Bang area** | | | | | | | |
| 1 | Cay Truong IP | 500 | 345.0 | 35 | 45 | 5,434 | 543 | 5,977 |
| 2 | Long Hoa IP | 1,380 | 952.2 | 40 | 45 | 17,140 | 1,714 | 18,854 |
| 3 | Bau Bang IP (MR) | 1,500 | 1,035.0 | 50 | 45 | 23,288 | 2,329 | 25,616 |
| 4 | Bau Bang IP | 1,000 | 699.2 | 85 | 45 | 26,744 | 2,674 | 29,419 |
| 5 | Lai Hung IP | 1,000 | 690.0 | 50 | 45 | 15,525 | 1,553 | 17,078 |
| 6 | Lai Hung Industrial group | 78 | 53.0 | 50 | 45 | 1,193 | 119 | 1,312 |
| | **Total A** | **5,458** | **3,774** | | | **89,323** | **8,932** | **98,255** |
| **B** | **An Tay area** | | | | | | | |
| 7 | An Tay IP | 500 | 373.9 | 75 | 45 | 12,619 | 1,262 | 13,881 |
| 8 | An Tay IP (MR) | 850 | 578.0 | 55 | 45 | 14,306 | 1,431 | 15,736 |
| 9 | Rach Bap IP | 279 | 188.2 | 65 | 45 | 5,505 | 550 | 6,055 |
| 10 | Mai Trung IP | 51 | 34.6 | 70 | 45 | 1,090 | 109 | 1,199 |
| 11 | Viet Huong II IP | 250 | 168.6 | 90 | 45 | 6,828 | 683 | 7,511 |
| | **Total B** | **1,930** | **1,343** | | | **40,348** | **4,035** | **44,382** |
| **C** | **My Phuoc area** | | | | | | | |
| 12 | My Phuoc I IP | 377 | 276.3 | 100 | 45 | 12,434 | 1,243 | 13,677 |
| 13 | My Phuoc II IP | 477 | 333.0 | 100 | 45 | 14,985 | 1,499 | 16,484 |
| 14 | My Phuoc III IP | 978 | 655.7 | 100 | 45 | 29,507 | 2,951 | 32,457 |
| 15 | Thoi Hoa IP | 202 | 134.6 | 75 | 45 | 4,543 | 454 | 4,997 |
| | **Total C** | **2,034** | **1,400** | | | **61,468** | **6,147** | **67,615** |
| **D** | **Tan Uyen area** | | | | | | | |
| 16 | VSIP II expanded area | 1,008 | 675.4 | 95 | 45 | 28,873 | 2,887 | 31,761 |
| 17 | Tan Binh IP | 350 | 241.5 | 60 | 45 | 6,521 | 652 | 7,173 |
| 18 | Binh Lap IP | 500 | 345.0 | 50 | 45 | 7,763 | 776 | 8,539 |
| | **Total D** | 128 | 89.0 | 55 | | **43,156** | **4,316** | **47,472** |
| **E** | **New City area** | **1,986** | **1,351** | | | | | |
| 19 | Dong An II + Expansion IP | 205 | 148.1 | 100 | 45 | 6,665 | 666 | 7,331 |
| 20 | Phu Gia IP (Viet E.M.A.X) | 133 | 85.6 | 100 | 45 | 3,852 | 385 | 4,237 |
| 21 | VSIP II IP | 345 | 231.2 | 100 | 45 | 10,404 | 1,040 | 11,444 |
| 22 | Kim Huy IP | 214 | 144.7 | 100 | 45 | 6,512 | 651 | 7,163 |
| 23 | Song Than III IP | 534 | 327.4 | 100 | 45 | 14,733 | 1,473 | 16,206 |
| 24 | Dai Dang IP | 274 | 166.0 | 100 | 45 | 7,470 | 747 | 8,217 |
| 25 | Mapletree High-Tech Park | 75 | 52.4 | 100 | 45 | 2,358 | 236 | 2,594 |
| | **Total E** | **1,780** | **1,155** | | | **51,993** | **5,199** | **57,192** |
| **F** | **Thuan An district** | | | | | | | |
| 1 | VSIP I Industrial Park | 473 | 315.9 | 87.1 | 45 | 12,379 | 1,238 | 13,617 |
| 2 | Viet Huong Industrial Park | 36 | 25.1 | 100.0 | 45 | 1,128 | 113 | 1,241 |
| 3 | An Thanh Industrial group | 46 | 32.3 | 100.0 | 45 | 1,452 | 145 | 1,597 |
| 4 | Binh Chuan Industrial group | 68 | 47.3 | 100.0 | 45 | 2,126 | 213 | 2,339 |
| | **Total F** | **623** | **420** | | | **17,085** | **1,709** | **18,794** |
| **G** | **Di An district** | | | | | | | |
| 1 | Song Than I IP | 178 | 139.7 | 100.0 | 45 | 6,287 | 629 | 6,916 |
| 2 | Song Than II PI | 279 | 217.6 | 99.5 | 45 | 9,744 | 974 | 10,718 |
| 3 | Binh Duong IP | 17 | 14.1 | 97.4 | 45 | 617 | 62 | 679 |
| | | | | | | | | |
| 5 | Tan Dong Hiep A IP | 50 | 40.2 | 100.0 | 45 | 1,810 | 181 | 1,991 |
| 6 | Tan Dong Hiep B IP | 163 | 111.8 | 77.7 | 45 | 3,906 | 391 | 4,296 |
| 7 | Binh An Textile and Garment IP | 26 | 18.8 | 96.0 | 45 | 812 | 81 | 893 |
| 8 | Tan Binh I Industrial group | 55 | 38.5 | | 45 | 0 | 0 | 0 |
| 9 | Tan Dong Hiep manufacturing zone | 58 | 40.6 | 100.0 | 45 | 1,827 | 183 | 2,010 |
| | **Total G** | **964** | **733.6** | | | **29,675** | **2,967** | **32,642** |
| | **Grand total** | **12,917** | **8,916** | | | **333,047** | **33,305** | **366,352** |

# Appendix 5 - B Hydraulic Calculation and Cost Estimate for Raw Water Transmission Pipeline

1. Hydraulic Calculation

Hydraulic Calculation for transmission pipeline is conducted employing Hazen-Williams formula. The formula is expressed for full flow in a circular pipe as follow.

$J = 6.824 \times (V/C)^{1.852} \times D^{-1.167}$

Where; J : Hydraulic Gradient, V : Velocity (m/s), C : Flow Coefficient, D : Diameter of pipe (m)

(1) Basic Figures for calculation

Flow, Diameter, Velocity, Flow Coefficient and Hydraulic Gradient for calculation

First Pipe

| Flow | | Diameter (m) | Velocity (m/s) | Flow Coefficient (C) | Hydraulic Gradient (J) |
|---|---|---|---|---|---|
| ($m^3$/day) | ($m^3$/s) | | | | |
| 686,400 | 7.944 | 2.6 | 1.497 | 130 | 0.000574 |

Second Pipe

| Flow | | Diameter (m) | Velocity (m/s) | Flow Coefficient (C) | Hydraulic Gradient (J) |
|---|---|---|---|---|---|
| ($m^3$/day) | ($m^3$/s) | | | | |
| 457,600 | 5.296 | 2.3 | 1.275 | 130 | 0.000492 |

(2) Calculation of Required water level of Connection Chamber and Total Pump Head of Intake Pumping Station


Loss of Pressure

First Pipe

| From | To | Q (m3/d) | Diameter (m) | Length (m) | J | Loss of Pressure (m) |
|---|---|---|---|---|---|---|
| Pump | WWTP | 686,400 | 2.6 | 23,858.5 | 0.000574 | 13.69 |

Second Pipe

| From | To | Q (m3/d) | Diameter (m) | Length (m) | J | Loss of Pressure (m) |
|---|---|---|---|---|---|---|
| Pump | WWTP | 457,600 | 2.3 | 23,858.5 | 0.000492 | 11.74 |

1) Calculation for Required water level of Connection Chamber

| Item | First Pipe | Second Pipe |
|---|---|---|
| a. Loss of pressure along the pipeline | $H_1$= 13.69 m | $H_1$=11.74 m |
| b. Excessive pressure at Receiving Tank (WTP) | $H_2$= 2.00 m | $H_2$= 2.00 m |
| c. Standby pressure (=10% of $H_1$) | $H_3$= 1.38 m | $H_3$= 1.18 m |
| d. $H = H_1 + H_2 + H_3$ | H =17.07 m | H =14.92 m |
| e. Additional hight to clear the highest point of theline($H_4$) | 0.0 | 2.0 |
| f. Required water level of Connection Chamber = The level at the receiving tank (34.7 m) +H+$H_4$ | 34.7 m + H (17.1m) = 51.8m | 34.7 m + H (14.9 m)+2.00 = 51.6m |

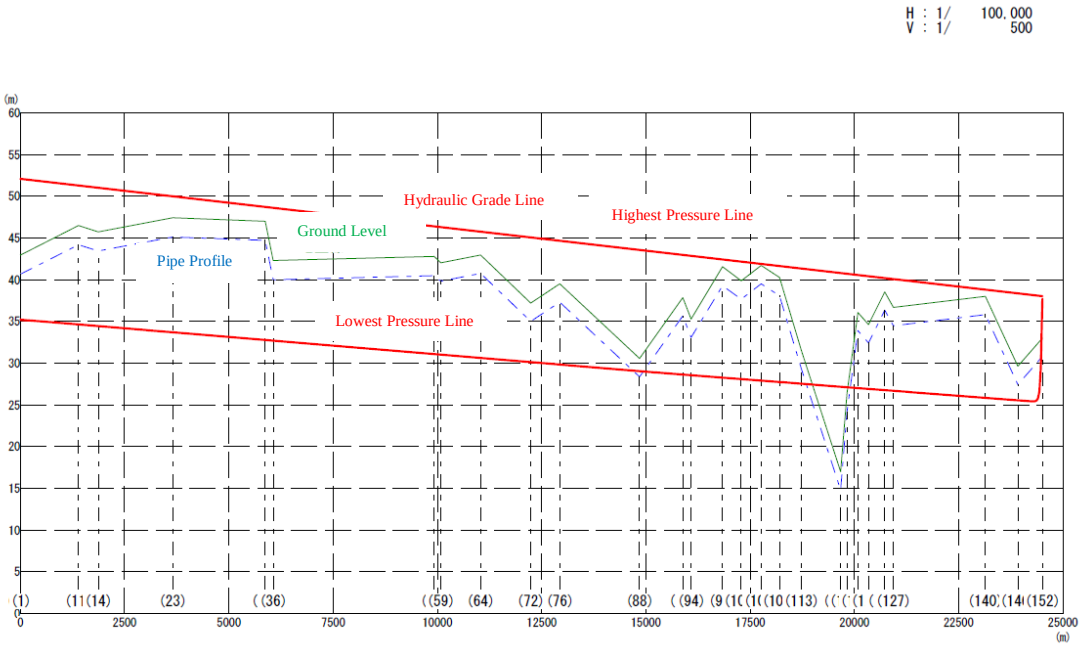
2) Calculation for required total pump head of Intake Pumping Station with Connection Chamber

| Item | First Pipe | Second Pipe |
|---|---|---|
| a. Difference in level between Connection Chamber and low water level at intake | $H_1$= 51.8-37.0 =14.8 m | $H_1$=51.6-37.0 =14.6 m |
| b. Excessive pressure at Connection Chamber | $H_2$= 2.0 m | $H_2$= 2.0 m |
| c. Pumping Station internal loss | $H_3$ = 3.0 m | $H_3$ = 3.0 m |
| d. Required total pump head $H = H_1 + H_2 + H_3$ | H = 19.8 m | H = 19.6 m |

3) Check for Water Hammer for the transmission line from Intake Pumping Station without Connection Chamber and Counter Measure

a. From Intake Pumping Station to WTP
Flow Rate : 686,400$m^3$/d = 477$m^3$/minute
Number of Pump : 4
Flow Rate per Pump :119.2$m^3$/minute

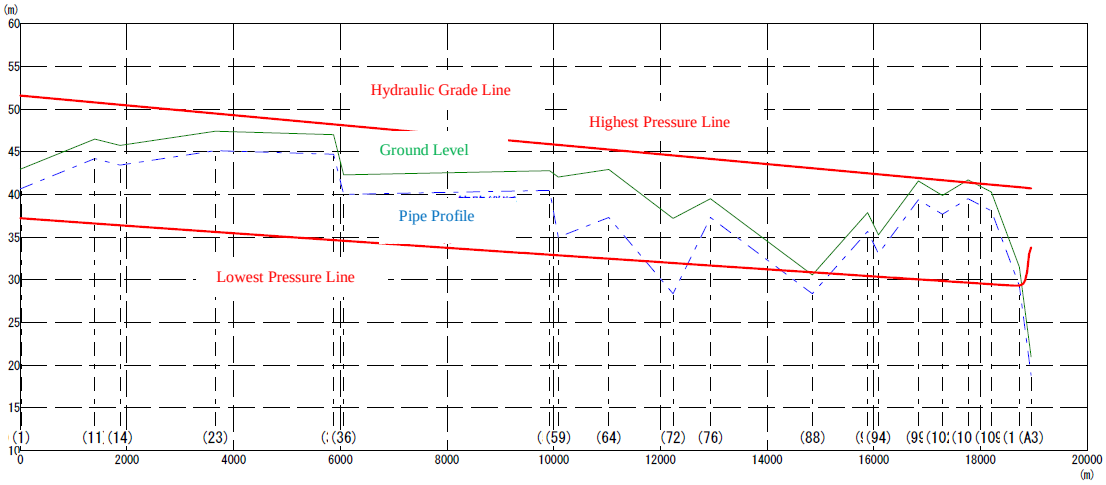
As shown in the Figure below, negative pressure is less than -10 m, and thus preventive measure for water hammer is not required.



b. From Intake Pumping Station to Regulating Reservoir
Flow Rate : 686,400m$^3$/d = 477m$^3$/minute
Number of Pump : 4
Flow Rate per Pump : 119.2 m$^3$/minute

As shown in the Figure below, negative pressure is generated about -14m around 18km downstream from Intake Pumping Station and water column separation occurs, and thus preventive measure for water hummer is required.

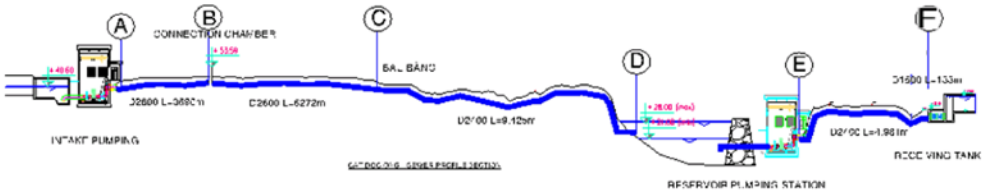
H : 1/ 80, 000
V : 1/ 500




Mechanical solution with attaching a fly wheel is not effective, as the area occurring negative pressure is beyond the effective reach of fly wheel.

As the above results, attaching a fly wheel at Intake pumping station is not effective and installing a surge tank (connection chamber) is the most reliable way to isolate the downstream pipeline from water hammering.

(3) From Regulating Reservoir Pumping Station to WTP




Loss of Pressure

First and Second Pipe

| From | To | Q (m3/d) | Diameter (m) | Length (m) | J | Loss of Pressure (m) |
|---|---|---|---|---|---|---|
| Pump | WWTP | 343,200 | 1.8 | 5,285.5 | 0.000954 | 5.043 |

Third and fourth Pipe

| From | To | Q (m3/d) | Diameter (m) | Length (m) | J | Loss of Pressure (m) |
|---|---|---|---|---|---|---|
| Pump | WWTP | 228,800 | 1.5 | 5,285.5 | 0.001094 | 5.782 |

1) Calculation for required total pump head of Regulating Reservoir Pumping Station

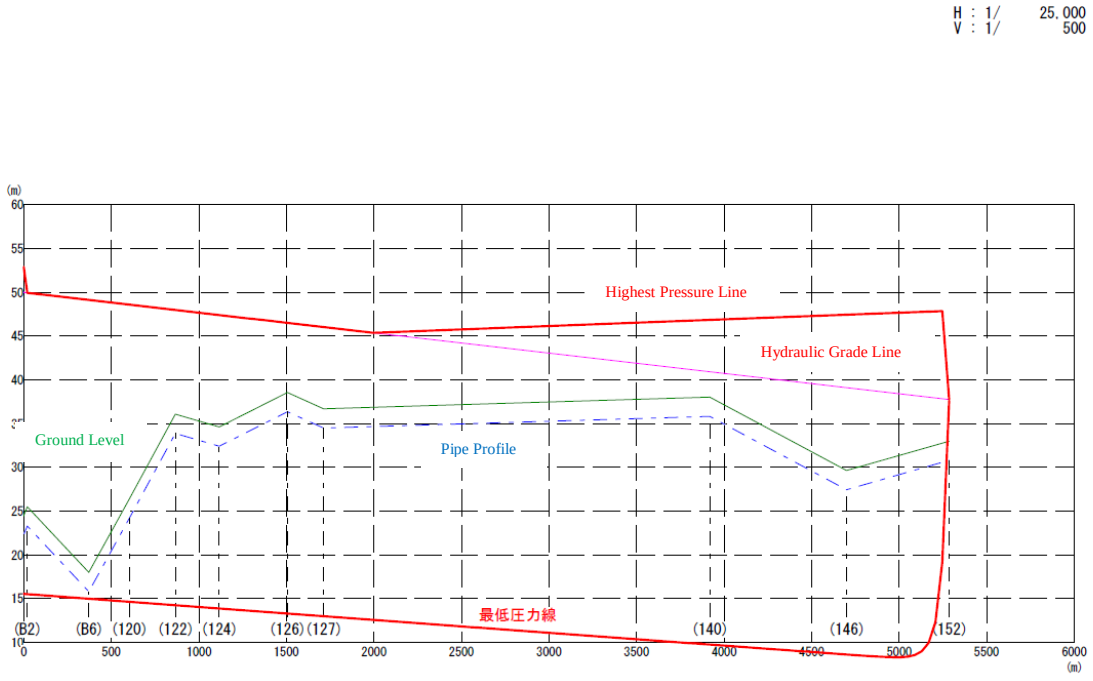
| Item | First and Second Pipe | Third and fourth Pipe |
|---|---|---|
| a. Loss of pressure along the pipeline | $H_1$= 5.05 m | $H_1$= 5.79 m |
| b. Difference in level between Receiving Tank of WTP (34.70) and dead water level at Regulating Reservoir (21.00) | $H_2$= 13.70 m | $H_2$= 13.70 m |
| c. Excessive pressure at Receiving Tank | $H_3$= 2.00 m | $H_3$= 2.00 m |
| d. Pumping Station internal loss | $H_4$ = 3.00 m | $H_4$ = 3.00 m |
| e. Required total pump head $H = H_1 + H_2 + H_3 + H_4$ | H = 23.75 m | H = 24.49 m |

2) Check for Water Hammer for the transmission line from Regulating Reservoir Pumping Station and Counter Measure

a. From Regulating Reservoir Pumping Station to WTP
Flow Rate : 343,200$m^3$/d = 238$m^3$/minute
Number of Pump : 2
Flow Rate per Pump : 119.2 $m^3$/minute

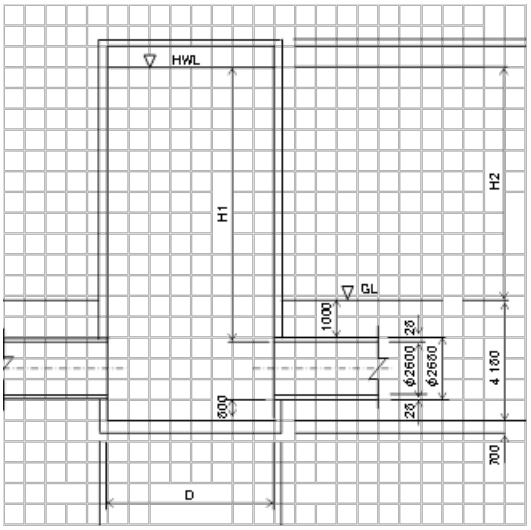
As shown in the Figure below, negative pressure is generated about -16m around 1,500m downstream from Regulating Reservoir Pumping Station and water column separation occurs, and thus preventive measure for water hammer is required.

Mechanical solution with attaching a fly wheel is not practical, as over 7,000 kg of wheel is required. Installing a surge tank (connection chamber) or one-way surge tank is considerable. One-way surge tank with 9m height is recommendable instead of connection chamber with 16m height.



(4) Design of Connection Chamber

Basic feature of connection chamber

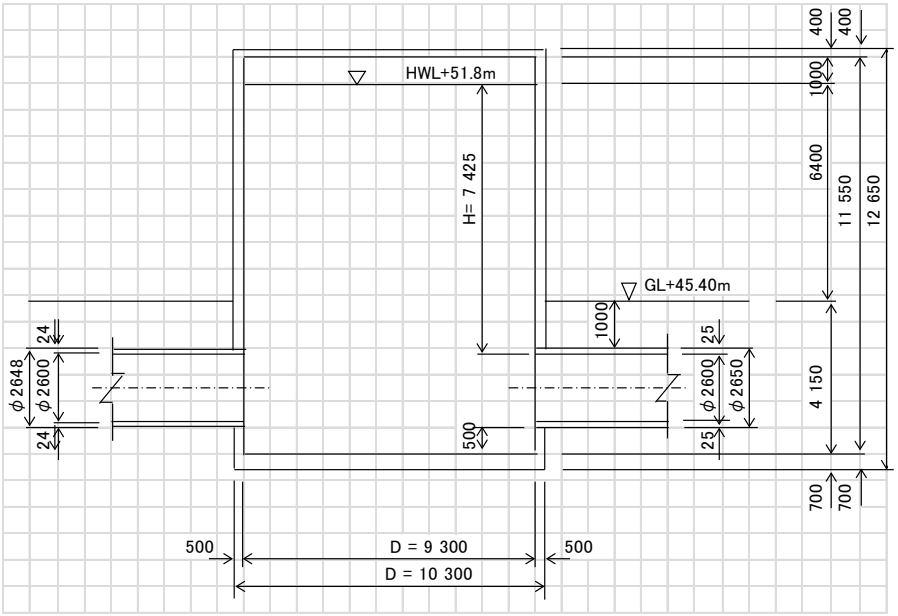



1) The dimension of connection camber

Calculation for connection Chamber

| Item | First Pipe | Second Pipe |
|---|---|---|
| a. Required capacity | 715 $m^3$ | 477 $m^3$ |
| b. GL | +45.40 m | +45.40m |
| c. HWL | +51.8 m | +51.6 m |
| d. H1 | 7.425 m | 7.225 m |
| e. D | 9.30m | 6.01 m |
| f. H2 | 6.400 m | 6.200m |

Dimension of connection camber Connection

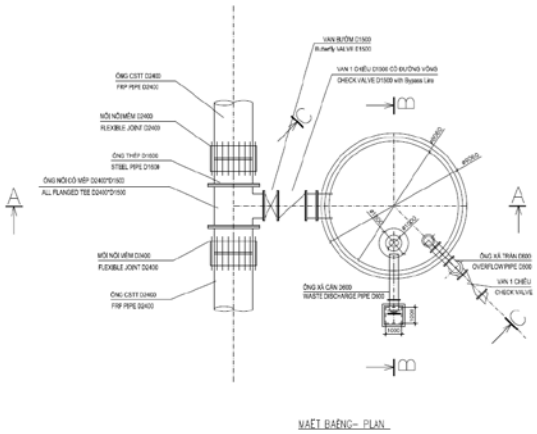


(5) Design of One-Way Surge Tank

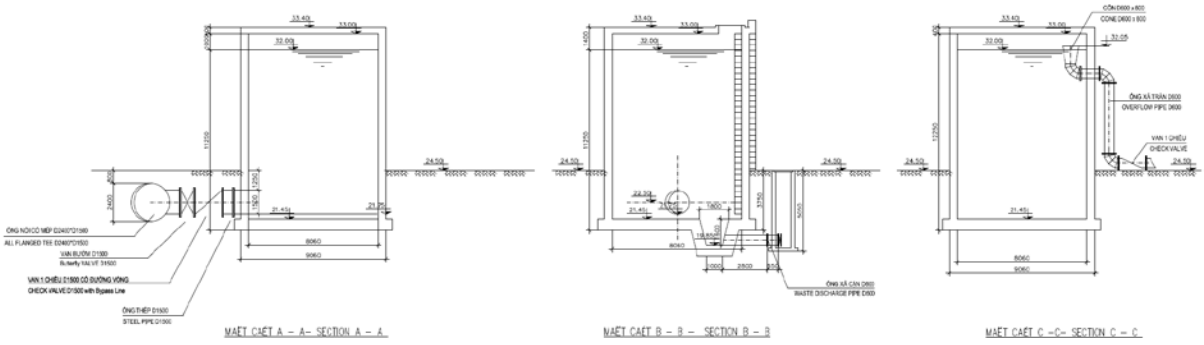
1) The dimension of One-way Surge Tank

Calculation for One-way Surge Tank

| Item | First and Second Pipe | Third and fourth Pipe |
|---|---|---|
| g. Required capacity | 523 $m^3$ | 523 $m^3$ |
| h. GL | +24.50 m | +24.50 m |
| i. HWL | +32.00 m | +32.00 m |
| j. H1 | 8.75 m | 8.75 m |
| k. D | 8.06 m | 8.06 m |
| l. H2 | 7.50 m | 7.50 m |



MẶT BẰNG– PLAN



MẶT CẮT A – A– SECTION A – A

MẶT CẮT B – B – SECTION B – B

MẶT CẮT C –C– SECTION C – C

2. Hydraulic Calculation for Phase 1

(1) Basic Figures for calculation

Flow, Diameter, Velocity, Flow Coefficient and Hydraulic Gradient for calculation

First Pipe in Phase 1

| From | To | Q (m3/d) | Diameter (m) | Length (m) | J | Loss of Pressure (m) |
|---|---|---|---|---|---|---|
| Pump | WWTP | 343,200 | 2.6 | 23,858.5 | 0.000159 | 3.79 |

(2) Calculation for Required water level of Connection Chamber

1) Required water level to clear critical point (critical point is 5,534.4 m downstream with GL = 47.2 (m)

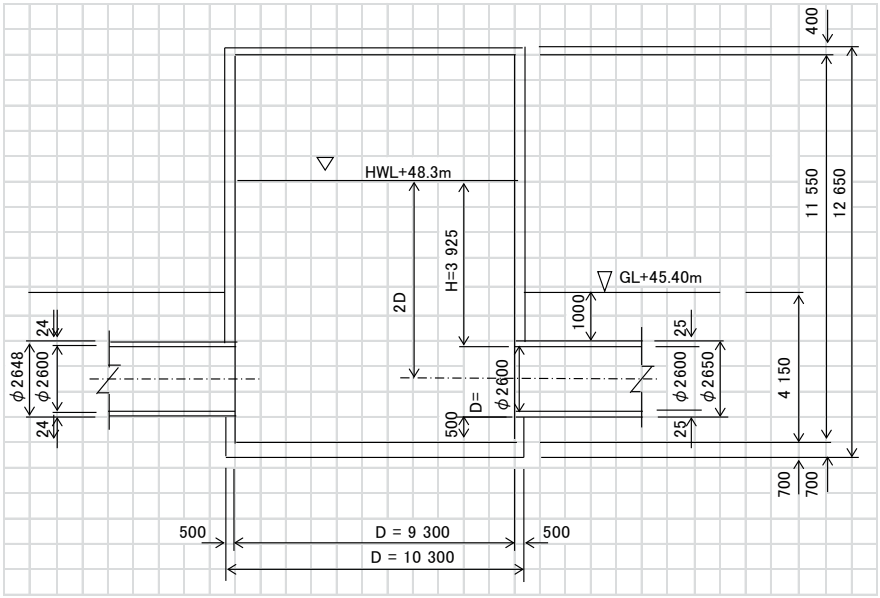
| Item | First Pipe |
|---|---|
| g. Loss of pressure along the pipeline for 5,534.4 m | $H_1$= 0.88 m |
| h. Ground level at critical point | 47.2m |
| i. Required water level of Connection Chamber $_4$ | 48.08m |

2) Safety suction level

2 D from center of outflow pipe

= 2 x 2.6 + 45.40 – (1.0 + 0.025 + 2.6/2)

= 48.275 (m) (48.3m)



3) Calculation for required total pump head of Intake Pumping Station (Phase 1)

| Item | First Pipe |
|---|---|
| e. Difference in level between Connection Chamber and low water level at intake | $H_1$= 48.3-37.0 =11.3 m |
| f. Excessive pressure at Connection Chamber | $H_2$= 2.0 m |
| g. Pumping Station internal loss | $H_3$ = 3.0 m |
| h. Required total pump head $H = H_1 + H_2 + H_3$ | H = 16.3 m |

4) Intake Pumping Station

**Description of Intake Pumping Station for Phase 1**

| | |
|---|---|
| Flow rate: | 3.972$m^3$/sec = 343,200$m^3$/day |
| Number of pumps: | - 3 pumps including 1 standby in Phase I |
| Total pump head | - 16.3 m |
| Dimensions: | W24.0m x L36.0m |

3. Cost Estimate for Alternatives of Raw Water Transmission System
   1) Construction Cost of Pipeline and Pumping Station

Case G-1

| Pipe Dia (mm). | Depth(m) | Material | Length (m) | Unit Cost (VND) | Amount (VND) | Amount (USD) |
|---|---|---|---|---|---|---|
| 2600 | 3-4 | FRP | | 44,033,436 | | |
| 2600 | 4-5 | FRP | 672.1 | 45,761,113 | 30,756,044,047 | |
| 2600 | 5-6 | FRP | 264.2 | 65,956,788 | 17,425,783,390 | |
| 2600 | 6-7 | FRP | 690.0 | 70,724,225 | 48,799,715,250 | |
| 2600 | 7-8 | FRP | 1642.1 | 75,491,662 | 123,964,858,170 | |
| 2600 | 8-9 | FRP | 2165.2 | 81,812,931 | 177,141,358,201 | |
| 2600 | 9-10 | FRP | 2297.6 | 84,595,046 | 194,365,577,690 | |
| 2600 | 10-11 | FRP | 1742.0 | 86,814,865 | 151,231,494,830 | |
| 2600 | 11-12 | FRP | 2446.3 | 89,490,837 | 218,921,435,294 | |
| 2600 | 12-13 | FRP | 2842.7 | 91,709,135 | 260,701,557,536 | |
| 2600 | 13-14 | FRP | 4188.0 | 93,927,432 | 393,368,086,579 | |
| | | | | | 0 | |
| 1800 | 3-4 | SP | 5285.5 | 34,677,152 | 183,286,086,896 | |
| others | | | | | 34,978,605,707 | |
| Pipe Total | | | 24,235.7 | | 1,834,940,603,590 | 87,910,917 |
| | | | | | | |
| Pumping Station | | M&E | JNY | 716,352,000 | | 7,800,000 |
| | | C & A | VND | | 26,570,407,586 | 1,272,972 |
| One-way Surge Tank | | | | | 7,539,092,435 | 361,193 |
| Pumping Station Total | | | | | 34,109,500,021 | 9,434,166 |
| Regulating Reservoir | | | | | 194,250,706,274 | 9,306,436 |
| Ground Total | | | | | | 106,651,520 |

P-2

| Pipe Dia (mm). | Depth(m) | Material | Length (m) | Unit Cost (VND) | Amount (VND) | Amount (USD) |
|---|---|---|---|---|---|---|
| 2600 | 3-4 | | | 65,977,625 | 0 | |
| 2600 | 4-5 | DIP | 18,301.3 | 67,253,849 | 1,230,832,866,704 | |
| 2600 | 5-6 | | | | 0 | |
| 1800 | 3-4 | SP | 5285.5 | 34,677,152 | 183,286,086,896 | |
| others | | | | | 42,423,568,608 | |
| Pipe Total | | | 23,586.8 | | 1,456,542,522,208 | 69,782,089 |
| Grit Chamber | | | | | 13,805,748,808 | 661,425 |
| Intake Pumping Station | | M & E | JNY | 707,168,000 | | 7,700,000 |
| | | C & A | VND | | 27,799,262,544 | 1,331,846 |
| Connection Chamber | | | | | 8,075,959,355 | 386,914 |
| | | | | | 35,875,221,899 | 9,418,761 |
| | | | | | | |
| Reservoir Pumping Station | | E &M | JNY | 716,352,000 | | 7,800,000 |
| | | C & A | VND | | 26,570,407,586 | 1,272,972 |
| One-way Surge Tank | | | | | 7,539,092,435 | 361,193 |
| | | | | | 34,109,500,021 | 9,434,166 |
| Pumping Station Total | | | | | | 18,852,927 |
| Regulating Reservoir | | | | | 194,250,706,274 | 9,306,436 |
| Ground Total | | | | | | 98,602,878 |

P-3

| Pipe Dia (mm). | Depth(m) | Material | Length (m) | Unit Cost (VND) | Amount (VND) | Amount (USD) |
|---|---|---|---|---|---|---|
| 2600 | 3-4 | | | 65,977,625 | 0 | |
| 2600 | 4-5 | DIP | 23,858.5 | 67,253,849 | 1,604,575,956,367 | |
| 2600 | 5-6 | | | | 0 | |
| others | | | | | 48,137,278,691 | |
| Pipe Total | | | 23,858.5 | | 1,652,713,235,058 | 79,180,512 |
| Intake Pumping Station | | M & E | JNY | 707,168,000 | | 7,700,000 |
| | | C & A | VND | | 27,799,262,544 | 1,331,846 |
| Connection Chamber | | | | 8,075,959,355 | 8,075,959,355 | 386,914 |
| Pumping Station Total | | | | | | 9,418,761 |
| | | | | | | |
| Regulating Reservoir | | | | | 292,854,338,601 | 14,030,478 |
| Ground Total | | | | | | 102,629,751 |

2) O&M Cost for Pumping Station

Pumping Station

| Pumping Station | Intake Pumping Station | Regulating Reservoir Pumping Station | Remarks |
|---|---|---|---|
| Flow ($m^3$/minutes) | 119 | 119 | |
| Pump Head (m) | 20m | 24m | |
| Number of Pump (No.) | 3 (1:Stund-by) | 3 (1:Stund-by) | |
| Pump Power (kw) | 360 | 500 | |
| Operation (hr/day) | 24 | 24 | |
| Efficiency | 0.8 | 0.8 | |
| Power Consumption (kw/year) | 5,045,760 | 7,008,000 | |
| Electricity Cost (USD/year) | 398,870 | 553,986 | VND1,650/kwh |
| M&E Initial Cost (USD) | 7,700,000 | 7,800,000 | |
| M&E Repair Cost (USD/year) | 77,000 | 78,000 | 1 % of Initial cost |
| O&M Cost except Manpower (USD/Year) | 475,870 | 631,986 | |

Alternative Case

| Item | Case G-1 | Case P-2 | Case P-3 |
|---|---|---|---|
| Electricity Cost | 0.554 | 0.953 | 0.399 |
| E&M Replace Cost | 0.078 | 0.155 | 0.077 |
| Annual O&M Cost (Except Man Power) | 0.632 | 1.108 | 0.476 |

# Appendix 5 - C National Technical Regulation on Drinking Water Quality QCVN01-2009/BYT

SOCIALIST REPUBLIC OF VIETNAM

## QCVN 01 : 2009/BYT

## NATIONAL TECHNICAL REGULATION ON DRINKING WATER QUALITY

**HANOI – 2009**

## Preface:

QCVN 01: 2009/BYT is compiled by Department of Preventive Medicine & Environment and promulgated by MOH's Minister at the Circular No.04/2009/TT-BYT dated 17th June 2009.

# NATIONAL TECHNICAL REGULATION ON THE DRINKING WATER QUALITY

## PART I. GENERAL RULES

### I. Applicable scope

This Technical Regulation stipulates limits of quality criteria for water used for drinking and processing food (hereinafter called drinking water).

### II. Applicable subject

This Technical Regulation applies to institutions, organizations, individuals and households who exploit, trade drinking water, including piped water providers for domestic purposes with capacity of 1,000 $m^3$/day or above (hereafter called water providers).

### III. Explanation of words/phrases

*In this Regulation, following words/phrases will be thoroughly understood as:*

1. Perceptible criteria are elements on color and taste which are felt by human senses.

2. AOAC stands for *Association of Official Analytical Chemists*.

3. SMEWW stands for *Standard Methods for the Examination of Water and Waste Water*.

4. US EPA stands for *United States Environmental Protection Agency*.

5. TCU stands for *True Color Unit*.

6. NTU stands for *Nephelometric Turbidity Unit*.

7. pCi/l stands for *Picocuri per litre*.

## PART II. STIPULATIONS ON TECHNICAL AREAS

Table on the limits of quality parameters:

| Or. | Parameter | Unit | Maximum limit | Testing method | Examination Level |
|---|---|---|---|---|---|
| **I. Perceptible parameters and inorganic constituents** | | | | | |
| 1. | Color (*) | TCU | 15 | TCVN 6185 - 1996 (ISO 7887 - 1985) or SMEWW 2120 | A |
| 2. | Taste and odour (*) | - | No strange taste & odour | Perceptible, or SMEWW 2150 B and 2160 B | A |

| | | | | | |
|---|---|---|---|---|---|
| 3. | Turbidity (*) | NTU | 2 | TCVN 6184 - 1996 (ISO 7027 - 1990) or SMEWW 2130 B | A |
| 4. | pH(*) | - | Within 6,5-8,5 | TCVN 6492:1999 or SMEWW 4500 - $H^+$ | A |
| 5. | Hardness, calculated by $CaCO_3$(*) | mg/l | 300 | TCVN 6224 - 1996 or SMEWW 2340 C | A |
| 6. | Total Dissolved Solid (TDS) (*) | mg/l | 1000 | SMEWW 2540 C | B |
| 7. | Aluminum(*) | mg/l | 0,2 | TCVN 6657 : 2000 (ISO 12020 :1997) | B |
| 8. | Ammoniac(*) | mg/l | 3 | SMEWW 4500 - $NH_3$ C or SMEWW 4500 - $NH_3$ D | B |
| 9. | Antimony | mg/l | 0,005 | US EPA 200.7 | C |
| 10. | Total Arsenic | mg/l | 0,01 | TCVN 6626:2000 or SMEWW 3500 - As B | B |
| 11. | Barium | mg/l | 0,7 | US EPA 200.7 | C |
| 12. | Boron and boric acid | mg/l | 0,3 | TCVN 6635: 2000 (ISO 9390: 1990) or SMEWW 3500 B | C |
| 13. | Cadmium | mg/l | 0,003 | TCVN6197 - 1996 (ISO 5961 - 1994) or SMEWW 3500 Cd | C |
| 14. | Chloride (*) | mg/l | 250 300(**) | TCVN6194 - 1996 (ISO 9297 - 1989) or SMEWW 4500 - $Cl^-$ D | A |
| 15. | Total Chromium | mg/l | 0,05 | TCVN 6222 - 1996 (ISO 9174 - 1990) or SMEWW 3500 - $Cr^-$ | C |
| 16. | Total Copper (*) | mg/l | 1 | TCVN 6193 - 1996 (ISO 8288 - 1986) or SMEWW 3500 - Cu | C |
| 17. | Cyanide | mg/l | 0,07 | TCVN 6181 - 1996 (ISO 6703/1 - 1984) or SMEWW 4500 - $CN^-$ | C |
| 18. | Flouride | mg/l | 1,5 | TCVN 6195 - 1996 (ISO10359 - 1 - 1992) or SMEWW 4500 - $F^-$ | B |
| 19. | Hydrogen sulfide(*) | mg/l | 0,05 | SMEWW 4500 - $S^{2-}$ | B |
| 20. | Total Iron ($Fe^{2+}$ + $Fe^{3+}$)(*) | mg/l | 0,3 | TCVN 6177 - 1996 (ISO 6332 - 1988) or SMEWW 3500 - Fe | A |
| 21. | Lead | mg/l | 0,01 | TCVN 6193 - 1996 (ISO 8286 - 1986) SMEWW 3500 - Pb A | B |
| 22. | Total Manganese | mg/l | 0,3 | TCVN 6002 - 1995 (ISO 6333 - 1986) | A |
| 23. | Total Mercury | mg/l | 0,001 | TCVN 5991 - 1995 (ISO 5666/1-1983 - ISO 5666/3 -1983) | B |

| | | | | | |
|---|---|---|---|---|---|
| 24. | Molybdenum | mg/l | 0,07 | US EPA 200.7 | C |
| 25. | Nickel | mg/l | 0,02 | TCVN 6180 -1996 (ISO8288 -1986)<br>SMEWW 3500 - Ni | C |
| 26. | Nitrate | mg/l | 50 | TCVN 6180 - 1996<br>(ISO 7890 -1988) | A |
| 27. | Nitrite | mg/l | 3 | TCVN 6178 - 1996<br>(ISO 6777-1984) | A |
| 28. | Selenium | mg/l | 0,01 | TCVN 6183-1996 (ISO 9964-1-1993) | C |
| 29. | Sodium | mg/l | 200 | TCVN 6196 - 1996<br>(ISO 9964/1 - 1993) | B |
| 30. | Sulfate (*) | mg/l | 250 | TCVN 6200 - 1996<br>(ISO9280 - 1990) | A |
| 31. | Zinc (*) | mg/l | 3 | TCVN 6193 - 1996<br>(ISO8288 - 1989) | C |
| 32. | Permanganate | mg/l | 2 | TCVN 6186:1996 or<br>ISO 8467:1993 (E) | A |
| **II. Content of organic substances** | | | | | |
| ***a.* Chlorinated alkenes** | | | | | |
| 33. | Carbon tetrachloride | µg/l | 2 | US EPA 524.2 | C |
| 34. | Dichloromethane | µg/l | 20 | US EPA 524.2 | C |
| 35. | 1,2 Dichloroethane | µg/l | 30 | US EPA 524.2 | C |
| 36. | 1,1,1 - Trichloroethane | µg/l | 2000 | US EPA 524.2 | C |
| 37. | Vinyl chloride | µg/l | 5 | US EPA 524.2 | C |
| 38. | 1,2 Dichloroethene | µg/l | 50 | US EPA 524.2 | C |
| 39. | Trichloroethene | µg/l | 70 | US EPA 524.2 | C |
| 40. | Tetrachloroethene | µg/l | 40 | US EPA 524.2 | C |
| ***b.* Aromatic hydrocarbons** | | | | | |
| 41. | Phenol and derivatives of Phenol | µg/l | 1 | SMEWW 6420 B | B |
| 42. | Benzene | µg/l | 10 | US EPA 524.2 | B |
| 43. | Toluene | µg/l | 700 | US EPA 524.2 | C |
| 44. | Xylenes | µg/l | 500 | US EPA 524.2 | C |
| 45. | Ethyl benzene | µg/l | 300 | US EPA 524.2 | C |
| 46. | Styrene | µg/l | 20 | US EPA 524.2 | C |
| 47. | Benzo(a)pyrene | µg/l | 0,7 | US EPA 524.2 | B |
| ***c.* Chlorinated benzenes** | | | | | |
| 48. | Monochlorobenzens | µg/l | 300 | US EPA 524.2 | B |
| 49. | 1,2- Dichlorobenzene | µg/l | 1000 | US EPA 524.2 | C |
| 50. | 1,4- Dichlorobenzene | µg/l | 300 | US EPA 524.2 | C |
| 51. | Trichlorobenzene | µg/l | 20 | US EPA 524.2 | C |
| ***d. Groups of complex organic substances*** | | | | | |
| 52. | Di(2-etylhexyl) adipate | µg/l | 80 | US EPA 525.2 | C |

| | | | | | |
|---|---|---|---|---|---|
| 53. | Di(2-etyhlexyl) phtalat | µg/l | 8 | US EPA 525.2 | C |
| 54. | Acrylamide | µg/l | 0,5 | US EPA 8032A | C |
| 55. | Epiclohydrin | µg/l | 0,4 | US EPA 8260A | C |
| 56. | Hexacloro butadiene | µg/l | 0,6 | US EPA 524.2 | C |
| **III. Pesticides** | | | | | |
| 57. | Alachlor | µg/l | 20 | US EPA 525.2 | C |
| 58. | Aldicarb | µg/l | 10 | US EPA 531.2 | C |
| 59. | Aldrin/Dieldrin | µg/l | 0,03 | US EPA 525.2 | C |
| 60. | Atrazine | µg/l | 2 | US EPA 525.2 | C |
| 61. | Bentazone | µg/l | 30 | US EPA 515.4 | C |
| 62. | Carbofuran | µg/l | 5 | US EPA 531.2 | C |
| 63. | Chlordane | µg/l | 0,2 | US EPA 525.2 | C |
| 64. | Chlorotoluron | µg/l | 30 | US EPA 525.2 | C |
| 65. | DDT | µg/l | 2 | SMEWW 6410B, or SMEWW 6630 C | C |
| 66. | 1,2 - Dibromo - 3 Chloropropane | µg/l | 1 | US EPA 524.2 | C |
| 67. | 2,4 - D | µg/l | 30 | US EPA 515.4 | C |
| 68. | 1,2 - Dichloropropane | µg/l | 20 | US EPA 524.2 | C |
| 69. | 1,3 - Dichloropropene | µg/l | 20 | US EPA 524.2 | C |
| 70. | Heptachlor & heptachlor epoxide | µg/l | 0,03 | SMEWW 6440C | C |
| 71. | Hexachlorobenzene | µg/l | 1 | US EPA 8270 - D | C |
| 72. | Isoproturon | µg/l | 9 | US EPA 525.2 | C |
| 73. | Lindane | µg/l | 2 | US EPA 8270 - D | C |
| 74. | MCPA | µg/l | 2 | US EPA 555 | C |
| 75. | Methoxychlor | µg/l | 20 | US EPA 525.2 | C |
| 76. | Methachlor | µg/l | 10 | US EPA 524.2 | C |
| 77. | Molinate | µg/l | 6 | US EPA 525.2 | C |
| 78. | Pendimetalin | µg/l | 20 | US EPA 507, US EPA 8091 | C |
| 79. | Pentaclorophenol | µg/l | 9 | US EPA 525.2 | C |
| 80. | Permethrin | µg/l | 20 | US EPA 1699 | C |
| 81. | Propanil | µg/l | 20 | US EPA 532 | C |
| 82. | Simazine | µg/l | 20 | US EPA 525.2 | C |
| 83. | Trifuralin | µg/l | 20 | US EPA 525.2 | C |
| 84. | 2,4 DB | µg/l | 90 | US EPA 515.4 | C |
| 85. | Dichloprop | µg/l | 100 | US EPA 515.4 | C |
| 86. | Fenoprop | µg/l | 9 | US EPA 515.4 | C |
| 87. | Mecoprop | µg/l | 10 | US EPA 555 | C |
| 88. | 2,4,5 - T | µg/l | 9 | US EPA 555 | C |
| **IV. Disinfectants and disinfectant by-products** | | | | | |
| 89. | Monochloramine | µg/l | 3 | SMEWW 4500 - Cl G | B |

| | | | | | |
|---|---|---|---|---|---|
| 90. | Chlorine residue | mg/l | Within 0,3 - 0,5 | SMEWW 4500Cl or US EPA 300.1 | A |
| 91. | Bromate | µg/l | 25 | US EPA 300.1 | C |
| 92. | Chlorite | µg/l | 200 | SMEWW 4500 Cl or US EPA 300.1 | C |
| 93. | 2,4,6 Trichlorophenol | µg/l | 200 | SMEWW 6200 or US EPA 8270 - D | C |
| 94. | Formaldehyde | µg/l | 900 | SMEWW 6252 or US EPA 556 | C |
| 95. | Bromoform | µg/l | 100 | SMEWW 6200 or US EPA 524.2 | C |
| 96. | Dibromchlorometane | µg/l | 100 | SMEWW 6200 or US EPA 524.2 | C |
| 97. | Bromodichlorometane | µg/l | 60 | SMEWW 6200 or US EPA 524.2 | C |
| 98. | Chloroform | µg/l | 200 | SMEWW 6200 | C |
| 99. | Dichloroacetic acid | µg/l | 50 | SMEWW 6251 or US EPA 552.2 | C |
| 100. | Tricloroacetic acid | µg/l | 100 | SMEWW 6251 or US EPA 552.2 | C |
| 101. | Chloral hydrate (trichloroacetaldehyde) | µg/l | 10 | SMEWW 6252 or US EPA 8260 - B | C |
| 102. | Dichloroacetonitrile | µg/l | 90 | SMEWW 6251 or US EPA 551.1 | C |
| 103. | Dibromoacetonitrile | µg/l | 100 | SMEWW 6251 or US EPA 551.1 | C |
| 104. | Trichloroacetonitrile | µg/l | 1 | SMEWW 6251 or US EPA 551.1 | C |
| 105. | Cyano chlorite (as $CN^-$) | µg/l | 70 | SMEWW 4500J | C |
| **V. Radioactive constituents** | | | | | |
| 106. | Gross α activity | pCi/l | 3 | SMEWW 7110 B | B |
| 107. | Gross β activity | pCi/l | 30 | SMEWW 7110 B | B |
| **VI. Micro-organism** | | | | | |
| 108. | Total Coliform | Bacterial/100ml | 0 | TCVN 6187 - 1,2 :1996 (ISO 9308 - 1,2 - 1990) or SMEWW 9222 | A |
| 109. | E.coli or thermo-tolerant coliform | Bacterial/100ml | 0 | TCVN6187 - 1,2 : 1996 (ISO 9308 - 1,2 - 1990) or SMEWW 9222 | A |

Note:

- (*) perceptible parameters.

- (**) Applicable to maritime areas and islands.

- Both Nitrate and Nitrite might possibly create Methaemoglobin. Thus, in case both substances exist in drinking water, then the concentration (C) of each substance in compared with maximum limit is not allowed to exceed 1 and is calculated by following formula :**C**nitrate/max limit of Nitrate + **C**nitrite/max limit of Nitrite $\leq$ 1

## PART III.
## FREQUENCY OF WATER QUALITY MONITORING/INSPECTION

**I. Monitoring/inspection prior to the use of water sources**

- Testing of all parameters under A, B, C levels to be carried out by water providers.

**II. Regular monitoring**

1. For parameters under A level:

a) Test at least 01 time per week, to be done by water providers ;

b) Test, monitor and experiment at least 01 time per month by functional agencies.

2. For parameters under B level:

a) Test at least 01 time per 6 months, to be done by water providers;

b) Test, monitor and experiment at least 01 time per 6 months by functional agencies.

3. For parameters under C level:

a) Test at least 01 time per 2 years, to be done by water providers;

b) Test, monitor and experiment at least 01 time per 2 years by functional agencies

**III. Unscheduled monitoring/inspection**

1. Following circustances are required to have urgent monitoring/inspection:

a) The results of testing of water sources' hygiene or epicdemic investigations reveal that water sources have potentially risks to contamination.

b) Environmental incidents appeared, which might negatively impact to the hygienic quality of water sources;

c) Other specific requirements.

## PART IV.
## IMPLEMENTATION ARRANGEMENTS

**I. Responsibilities of water providers:**

1. Ensure water quality and carry out the testing/monitoring as per stipulations in this Technical Regulation.

2. Subject to the testing, monitoring/inspection of functional agencies.

**II. Responsibilities of provincial Department of Health**

Provincial DOHs will be responsible to provide guidance, inspection/monitoring on the compliance of this Technical Regulation of relevant organizations, institutions, individuals who

involve in the process of exploitation, production and trading water for drinking purposes within the provincity/city.

**III. Responsibilities of Ministry of Health**

MOH will lead relevant agencies/institutions to provide guidance, inspection/monitoring on the compliance of this Technical Regulation.

**IV. In case of possible changes/supplementation or adjustment of stipulations in this Technical Regulation, the new/revised regulatory document issued by MOH's Minister will be followed.**

# Appendix 5 - D Preliminary Engineering Design for Regulating Reservoir at Ong Te Stream

## 1. Regulating Reservoir

### (1) Reservoir Location

The regulating reservoir is planned to construct at Ong Te Stream which belongs to the territory of Tan Hung Commune, Ben Cat District, Binh Duong Province and is at the geographical coordinates of 11°12'19'' north latitude and 106°39'15'' east longitude. It runs along the National Highway No.13 and is 37 km away from Thu Dau Mot town to the north.

### (2) Reservoir Functions

1) Reservoir Functions

The functions of the regulating reservoir are followings;

- Ensure the stable and continuous water supply for urban area and industrial parks in the Northern Part of Binh Duong Province when water resource is stopped supplying from Phuoc Hoa – Dau Tieng Canal due to inspection and maintenance.
- Discharge water to the downstream river with no negative impact for the downstream environment in Ong Te Stream.

2) Construction Process and Reservoir Volume

Based on the approval by Hydraulic Project Investment & Construction Management Board No. 9, Ministry of Agriculture and Rural Development with Decision No. 307 QD-BQL9 signed on May 23, 2012, 2 to 3 days capacity of NBDWTP is employed for planning of regulating reservoir. The construction process and the reservoir volume are determined as shown in **Table 1.1**.

- Phase I: Construct the Ong Te Stream intercepting dam to create the reservoir with 1,000,000 $m^3$ of useful volume. NBDWTP capacity is 312,000 $m^3$/day.
- In the future; When NBDWTP capacity increases to 1,200,000 $m^3$/day, the dam body will be heighten to increase the reservoir volume to 2,500,000 $m^3$.

**Table 1.1 Storage Volume and Water Level**

| Phase | WTP Capacity | Storage Volume | Dead Water Level | Normal Water Level | Flood Water Level | Inundation Area | |
|---|---|---|---|---|---|---|---|
| | | | | | | Elevation | Area |
| Phase I | 312,000$m^3$/day | 1,000,000$m^3$ | 21.0m | 24.5m | 25.7m | 26.0m | 53.0 ha |
| In the future | 1,200,000$m^3$/day | 2,500,000$m^3$ | 21.0m | 27.5m | 29.0m | 29.0m | 91.5 ha |

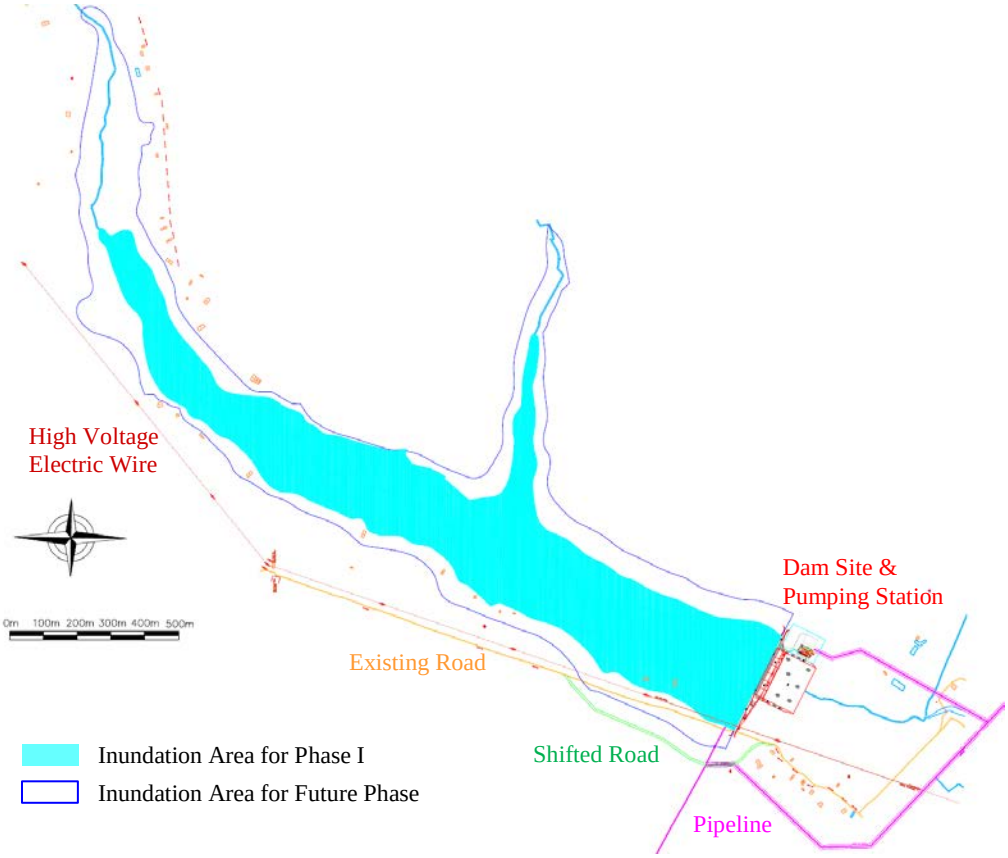



**Figure 1.1 Inundation Area of Regulating Reservoir**

**(3) Works Grade and Design Criteria**

1) Works Grade

According to hydraulic works classification of National Code of hydraulic works QCVN04-05:2012/BNNPTNT, the grade of the regulating reservoir is classified as follows;

- Phase I; Water supply volume is 3.61 $m^3$/s (312,000 $m^3$/day) which correspond to class II ranging from 2 to 10 $m^3$/s.
- In the future; Water supply volume is 13.9 $m^3$/s (1,200,000 $m^3$/day) which correspond to class I ranging from 10 to 20 $m^3$/s.

2) Design Criteria

Based on the above works grade, the design criteria of the regulating reservoir are determined according to the regulations of National Code of hydraulic works QCVN04-05:2012/BNNPTNT as shown in the **Table 1.2**.

**Table 1.2 Design Criteria of the Regulating Reservoir**

| No. | Item | Unit | Value | |
|---|---|---|---|---|
| | | | Phase I | In the future |
| 1 | Guaranteed water supply probability | % | 95 | 95 |
| 2 | Design flood frequency | % | 1 | 0.5 |
| 3 | Check flood frequency | % | 0.2 | 0.1 |
| 4 | Drought flood frequency for construction | % | 10 | 5 |
| 5 | Design wind frequency<br>- Normal water level<br>- Design flood water level | % | <br>2<br>25 | <br>2<br>25 |
| 6 | Allowed stable safety factor [k]<br>(According to design standard 14 TCN 157-2005 for compacted earth fill dam):<br>- Normal case<br>- Special case | - | <br><br><br>1.35<br>1.15 | <br><br><br>1.5<br>1.2 |
| 7 | Safety height of the main dam<br>- Gravity concrete dam<br>- Earth fill dam for normal water level | m | <br>0.6<br>1.2 | <br>0.8<br>1.5 |

**(4) Dam Site Location**

1) Comparison of Dam Site Alternatives

Two alternatives of the dam site location are selected for the construction of the river intercepting dam to create the reservoir as shown in **Table 1.3**and **Figure 1.2**.

**Table 1.3 Comparison of Dam Site Alternatives**

| Item | Location 1 | Location 2 |
|---|---|---|
| Location | About 300 m away from the confluent of Ong Te Stream and Bong Trang Stream to the upstream | About 300 m away from the location 1 and 100 m away from the high voltage electric pole No. 3299 to the upstream |
| Advantage | - Favourable construction conditions due to near transportation route.<br>- Inundation area is smaller than that of location 2. | - Not affect the high voltage electric pole No. 3299. |
| Disadvantage | - The high voltage electric pole No. 3299 is located in planned regulating reservoir. | - Inundation area is bigger than that of location 1.<br>- The pipeline after the pumping station is additionally prolonged 300 m. |
| Inundation area | 91.5 ha in the future phase | 145.2 ha in the future phase |

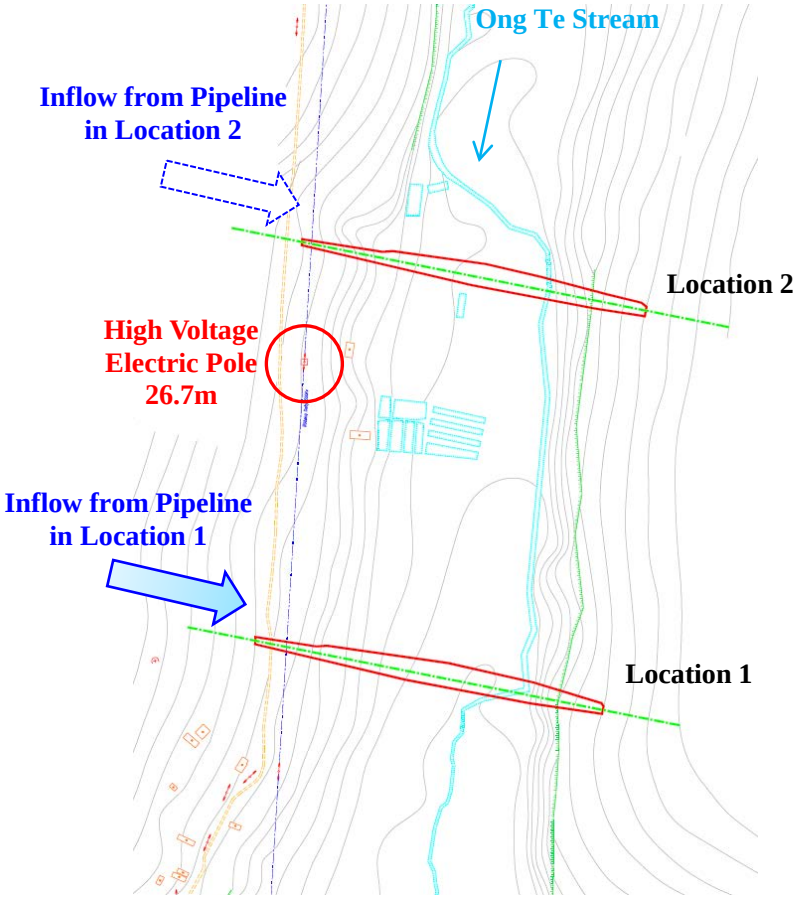



**Figure 1.2 Alternatives of Dam Site Location**

2) High Voltage Electric Pole

JICA Survey Team proposed alternatives shown in **Figure 1.3** to prevent the high voltage electric pole No. 3299 from the storage water in Location 1 and discussed with the administrator of the electric pole, Electricity Transmission Company No.4 –EVN.

Current information obtained from Electricity Transmission Company No.4 –EVN are;

- Alternative E1 and E2 that the concrete base or wall would be constructed around the electric pole to prevent it from the storage water are not feasible for them, because it is difficult to execute the maintenance works around the electric pole.
- Alternative E3 that dam embankment in front of the high voltage electric pole is constructed depending on storage water level, is more feasible to prevent it from storage water.
- Replacement works need more detailed consideration due to the time restriction and high voltage.

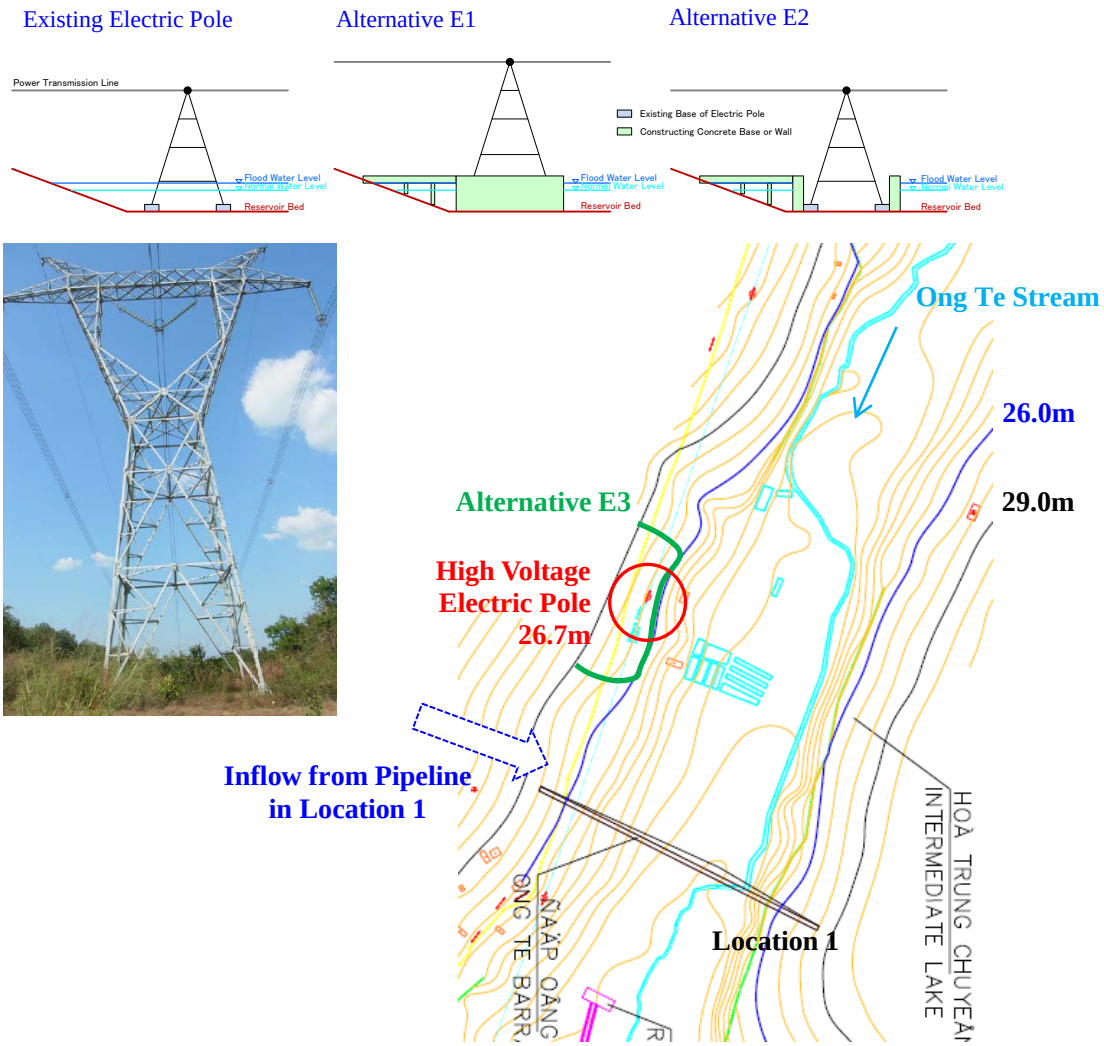



**Figure 1.3 Alternatives of High Voltage Electric Pole**

3) Conclusion of Dam Site Location

Location 1 is selected as a conclusion of the dam site location based on the following reasons;

- The storage water doesn't affect the high voltage electric pole in Phase I project.
- Replacement works or construction of dam embankment in front of the high voltage electric pole will be implemented by the future phase.

**(5) Hydrological Conditions**

Ong Te Stream length is about 10km and the total basin area is about 48 km$^2$. The Basins have two types of land use; one part is the poor forest which concentrates along the river. The rest is rubber plantation and agricultural cultivation. The climate clearly divides into two seasons; dry and rainy seasons. The inflow in Ong Te Basin depends on the season variation.

Hydrological prameters in Ong Te rservoir are shown is **Table 1.4** based on the meteorological and hydrological observation data and calculation.

**Table 1.4 Hydrological Parameters in Ong Te Reservoir**

| No. | Parameter | Symbol | Unit | Value |
|---|---|---|---|---|
| 1 | Basin area | Flv | $km^2$ | 48.0 |
| 2 | Basin average rainfall | Xo | mm | 1900.0 |
| 3 | Long-term average flow | Qo | $m^3/s$ | 1.22 |
| 4 | Annual flow module | Mo | $l/s.km^2$ | 25.4 |
| 5 | Annual flow depth | Yo | mm | 800.0 |
| 6 | Annual discharge, P = 85%, | $Q_{85\%}$ | $m^3/s$ | 0.847 |
| 7 | Annual total flow, P = 85% | $W_{85\%}$ | $106m^3$ | 26.725 |
| 8 | Evaporation losses of the reservoir | ΔZ | mm | 508 |
| 9 | Design flood discharge, P = 1% | $Q_{1\%}$ | $m^3/s$ | 346 |
| 10 | Design flood discharge, P = 0.5% | $Q_{0.5\%}$ | $m^3/s$ | 398 |
| 11 | Check flood discharge, P = 0.2% | $Q_{0.2\%}$ | $m^3/s$ | 470 |
| 12 | Check flood discharge, P = 0.1% | $Q_{0.1\%}$ | $m^3/s$ | 526 |
| 13 | Total sludge deposit per year | V | $m^3$/year | 13,732 |

**(6) Capacity of the Reservoir**

1) Storage Curve of the Reservoir

The relationship between storage volume, surface area and water level are calculated based on the topographic survey data in the past study as shown in **Table 1.5**.

**Table 1.5 Relationship between Storage Volume, Surface Area and Water Level**

| Water Level Z(m) | Surface Area F(ha) | Volume $W(10^6 m^3)$ |
|---|---|---|
| 20 | 7.4 | 0.074 |
| 21 | 13.0 | 0.176 |
| 22 | 20.9 | 0.345 |
| 23 | 27.8 | 0.589 |
| 24 | 36.0 | 0.908 |
| 25 | 42.6 | 1.301 |
| 26 | 52.9 | 1.778 |
| 27 | 62.9 | 2.357 |
| 28 | 76.2 | 3.052 |
| 29 | 91.5 | 3.879 |
| 30 | 106.3 | 4.858 |
| 31 | 126.8 | 6.023 |

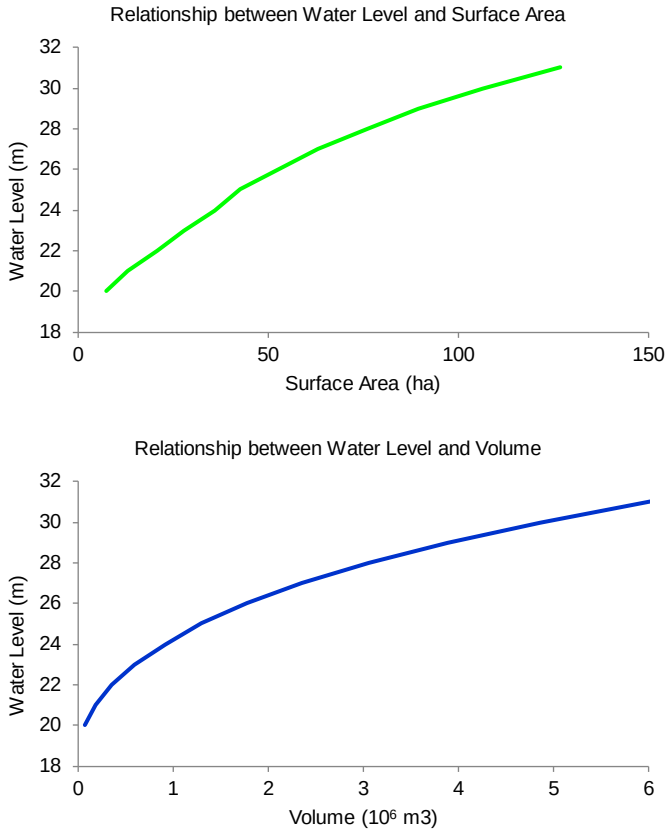



**Figure 1.4 Relationship between Storage Volume, Surface Area and Water Level**

2) Dead Water Level

The annual sludge deposit volume is estimated about 13,732 $m^3$ by the hydrological calculation. Based on the relationship between storage volume and water level, the reservoir can store the sludge for 13 years, when the dead water level is 21.0m. In consideration of the dam scale, the dead water level is determined to 21.0m. It is necessary to check the sludge storage volume and dredge the sludge as needed after commencement of the operation.

3) Capacity of the Reservoir

On the basis of the dead volume and the useful volume, the normal water level is defined as the following **Table 1.6**.

**Table 1.6 Capacity of the Reservoir**

| No. | Parameter | Unit | Value | |
|---|---|---|---|---|
| | | | Phase I | In the future |
| 1 | Normal water level | m | 24.5 | 27.5 |
| 2 | Dead water level | m | 21.0 | 21.0 |
| 3 | Total volume (normal water level) | $m^3$ | 1,200,000 | 2,700,000 |
| 4 | Dead volume | $m^3$ | 200,000 | 200,000 |
| 5 | Useful volume | $m^3$ | 1,000,000 | 2,500,000 |

**(7) Design Outline of the Reservoir**

1) Flood Spillway and Stilling Basin

Based on the flood discharge, the flood water level of the reservoir and the length and depth of the stilling basin are calculated as shown in the following **Table 1.7**.

**Table 1.7 Dimension of Spillway and Stilling Basin**

| No. | Parameter | Unit | Value | |
|---|---|---|---|---|
| | | | Phase I | In the future |
| 1 | Overflow level | m | 24.5 | 27.5 |
| 2 | Design flood discharge | $m^3$ | 346 | 398 |
| 3 | Check flood discharge | $m^3$ | 470 | 526 |
| 4 | Design flood water level | m | 25.6 | 28.7 |
| 5 | Check flood water level | m | 25.71 | 28.96 |
| 6 | Spillway width | m | 153 | 153 |
| 7 | Stilling basin length | m | 10.0 | 10.0 |
| 8 | Stilling basin depth | m | 1.0 | 1.0 |
| 9 | Bank level in downstream | m | 21.5 | 23.0 |

2) Main Dam

There are two material alternatives for the main dam; earth fill dam and gravity concrete dam. The dam crest is defined according to the design standard 14 TCN 157-2005 for compacted earth fill dam and the design standard 14 TCN 56-88 for concrete and reinforced concrete dam as shown in **Table 1.8**.

**Table 1.8 Dimension of Main Dam**

| No. | Parameter | Unit | Phase I | | In the future | |
|---|---|---|---|---|---|---|
| | | | Concrete dam | Earth dam | Concrete dam | Earth dam |
| 1 | Dam crest level | M | 27.0 | 27.0 | 30.0 | 30.0 |
| 2 | Dam bed level at lowest place | M | 19.0 | 19.0 | 19.0 | 19.0 |
| 3 | Highest dam height | M | 8.0 | 8.0 | 11.0 | 11.0 |
| 4 | Dam length | M | 214 | 207 | 382 | 350 |
| 5 | Dam crest width | M | 7.0 | 7.0 | 7.0 | 7.0 |

3) Intake Tower

The water intake tower is installed 10m away from the dam body in the reservoir. The water is taken directly from the intake tower to the downstream pumping station through the pipeline.

- Intake tower dimension; 15.0 x 15.0 x 9 m
- Number of gate; 2
- Gate dimension; 6.0 x 3.0 m
- Number of bar screen; 2
- Number of fine screen; 2
- Number of pipeline through dam; 2 (1 for Phase I and 1 for future phase)
- Pipeline diameter; D = 2,400 mm

**(8) Dam Material**

The main dam height for the regulating reservoir is less than 15 m in future phase and relatively low scale. In order to consider the optimal alternative, two alternatives for dam material are studied.

1) Alternative1; Gravity Concrete Dam

The main dam is made of concrete M150 and covered around by reinforced concrete M200. Because the dam ground is weak soil and load-bearing capacity is smaller than ground stress, the ground treatment must be carried out by reinforced concrete pile M300.

2) Alternative2; Earth Fill Dam

The earth fill dam body consists of a poor permeability soil (permeability coefficient kt $\leq 10^{-5}$cm/s). The upstream surface in the earth fill dam is consolidated by ashlar with 30 cm

thickness for erosion protection. The downstream surface in the earth fill dam is planted with grass.
Water proof treatment is carried out by taking off the 2nd layer soil and replacing it with the soil that has poor permeability (permeability coefficient kt $\leq 10^{-5}$ cm/s).

3) Comparison of Dam Material Alternatives
Two alternatives of the dam material are compared as shown in **Table 1.9**. Both dams have the structural stability as a result of water proof, erosion protection for dam body and ground load bearing capacity. The earth fill dam needs a complicated connection work with spillway and intake pipeline due to different materials, but is much cheaper than the gravity concrete dam. On the other hand, the gravity concrete dam needs a complicated construction work for ground treatment with many piles and is more expensive than the earth fill dam.

**Table 1.9 Comparison of Dam Material Alternatives**

| Item | Gravity Concrete Dam | Earth Fill Dam |
|---|---|---|
| Dam Body | - Water proof and erosion protection by concrete material. | - Water proof and erosion protection by poor permeability soil and consolidated surface of ashlar. |
| Ground Load Bearing | - Maintain the load bearing capacity as a result of ground treatment with reinforced concrete piles. | - Specific weight is relatively small, so load bearing capacity is enough. |
| Construction Work | - Simple connection work with spillway due to same material.<br>- Complicated construction work for ground treatment with many piles. | - Complicated connection work with spillway and intake pipeline due to different material. |

**Table.1.10 Required Capacity and Construction Cost for Reservoir at Ong Te Stream**

| Phase | WTP Capacity | Required Capacity of Reservoir ($m^3$) | Normal Water Level (m) | Flood Water Level (m) | Inundation Area (ha) | Construction Cost (Million USD) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Concrete Dam | Earth Fill Dam |
| Phase I | 312,000 | 1,000,000 | 24.5 | 25.7 | 53.0 | 9.3 | 5.8 |

## 2. Regulating Reservoir Pumping Station

Layout plan of Regulating Reservoir Pumping Station with One-Way Surge Tank is shown in **Figure 2.1**.

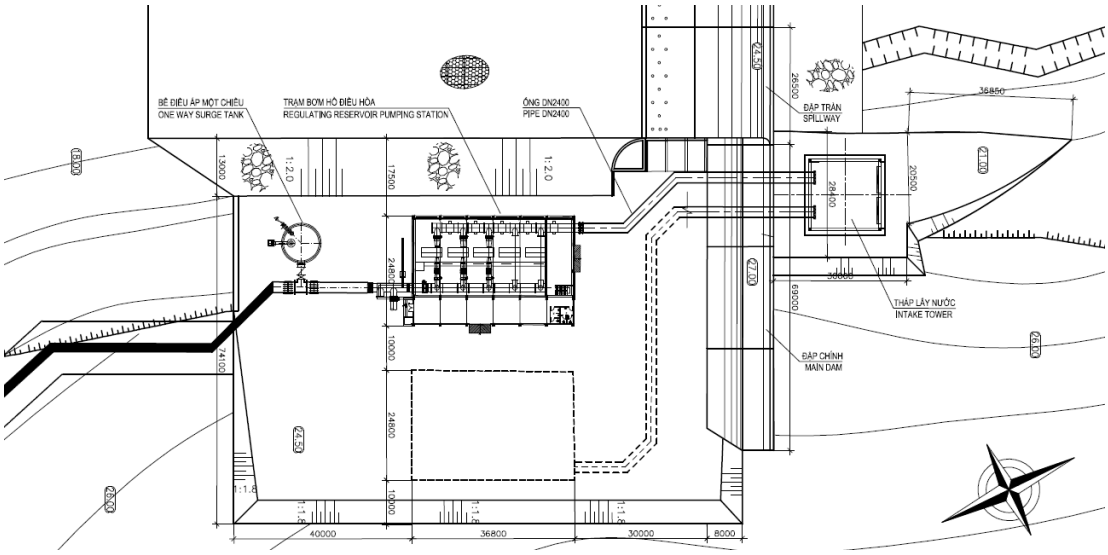



**Figure 2.1 Layout of Regulating Reservoir Pumping Station with One-Way Surge Tank**

### (1) Regulating Reservoir Pumping Station

Required total pump head of Regulating Reservoir Pumping Station is estimated in **Table 2.1** Loss of pressure along pipeline with capacity of 343,200 $m^3$/d is calculated from hydraulic gradient of 0.0009543 in **Appendix 5 - B**.

Loss of head along the pipeline from Regulating Reservoir Pumping Station to NBDWTP = 5,286 (m) x 0.0009543 = 5.04 (m).

**Table 2.1 Calculation for Required Total Pump Head of Regulating Reservoir Pumping Station in Phase I**

| Item | Phase I |
|---|---|
| a. Loss of pressure along the pipeline | $H_1$= 5.04m |
| b. Difference in level between Receiving Tank of WTP (34.70) and dead water level at Regulating Reservoir (21.00) | $H_2$= 13.70 m |
| c. Excessive pressure at Receiving Tank | $H_3$= 2.00 m |
| d. Pumping Station internal loss | $H_4$ = 3.00 m |
| e. Required total pump head $H = H_1 + H_2 + H_3 + H_4$ | H = 23.74 m |

**Table 2.2**shows the description of Regulating Reservoir Pumping Station.

**Table 2.2 Description of Regulating Reservoir Pumping Station in Phase I**

| | |
|---|---|
| Flow rate: | 3.61$m^3$/sec = 312,000$m^3$/day |
| Number of pumps: | - 3 pumps including 1 standby in Phase I<br>- 2 pumps in future |
| Total pump head | - 22.7 m |
| Dimensions: | W18m x L44.0m |

### (2) One-Way Surge Tank

One-Way Surge Tank is installed to mitigate adverse effects of water hummer to pipeline by pump operation and to keep required water head to convey raw water through pipeline from Regulating Reservoir Pumping Station to North Binh Duong Water Treatment Plant (NBDWTP).

The required water heads and structural figures of One-Way Surge Tank installed just after Regulating Reservoir Pumping Station are summarized in **Figure 2.2**. Detailed calculation for required water level is given in **Appendix 5 - B**.

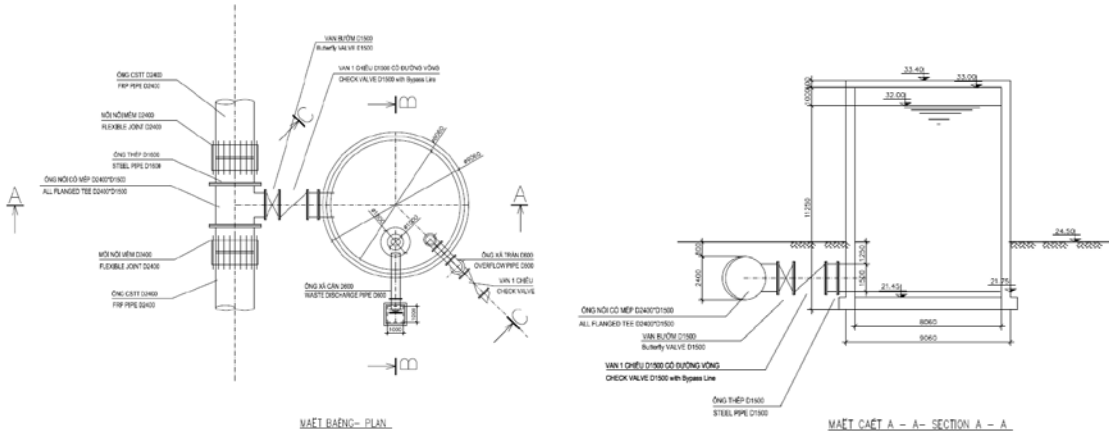



**Figure 2.2 Dimensions of One-Way Surge Tank**

# Appendix 5 - E Preliminary Engineering Design for Regulating Reservoir at Intake Site

## 1. Regulatory Background and Required Capacity

"TCXDVN 33:2006 :Water Supply - Distribution System and Facilities Design Standard" requires at least 70% of water supply for 3 days for class I of Reliability Level of the water supply system.

On the other hand, "Technical Process of Maintenance and Operation of the Work (temporary – second publish) No. 315D-12-B01B" prepared by Hydraulic Engineering Consultants Corporation No. II (HEC II ) proposed that Phuoc Hoa – Dau Tieng canal needs to be periodically dried water once in 2 to 5 years for inspection and repair. The proposal of drying water for inspection was approved by Hydraulic Project Investment & Construction Management Board No. 9, Ministry of Agriculture and Rural Development by Decision No. 307 QD-BQL9 signed on May 23, 2012.

Based on the above approval, "Option Study" proposed regulating reservoir with 2 to 3 days capacity of WTP. The capacity of reservoir depends on the agreement between BIWASE and Dau Tieng - Phuoc Hoa Irrigation Mining Limited Liability Company in which maximum period of dried water for inspection and maintenance.

When the maximum period of dried water in the agreement is assumed to be 2 or 3 days, required capacities of reservoir for 70% of normal supply for 3days stipulated in "TCXDVN 33:2006 :Water Supply - Distribution System and Facilities Design Standard" depend on production capacity of NBDWTP and are calculated in Table below. Because NBDWTP service area can be covered by other 3 WTPs of Thu Dau Mot, Di An, and Tan Hiep.

**Table 1 Required Capacity of Reservoir at Intake Point**

| Production Capacity ($m^3$/d) | | (c)=(a)+(b) Total ($m^3$/d) | (d)=(c)x0.7 Required Minimum Production Capacity ($m^3$/d) | (e)=((d)-(a))x3 Required Capacity of Reservoir ($m^3$) | (f)=((d)-(a))x3-(b) Required Capacity of Reservoir ($m^3$) |
|---|---|---|---|---|---|
| (a) Thu Dau Mot Di An Tan Hiep | (b) NBDWTP | | | | |
| 421,600 | 150,000 | 571,600 | 400,120 | 0 | 0 |
| 421,600 | 300,000 | 721,600 | 505,120 | 250,560 | 0 |
| 421,600 | 600,000 | 1,021,600 | 715,120 | 880,560 | 280,560 |
| 421,600 | 1,000,000 | 1,421,600 | 995,120 | 1,720,560 | 720,560 |

(e) Dried water period in canal for 3 days

(f) Dried water period in canal for 2 days

## 2. Size of Reservoir at Intake Point

During emergency period of water dried in the canal, full or 70 % supply will be guaranteed to consumers. The sizes and areas required for reservoir of each case at intake point are calculated for two days of water dried period in the canal in the table below. Average depth of reservoir is assumed to be 7 m with effective depth of 3.5 m.

**Table 2 Dimension of Reservoir at Intake Point**

| Emergency Case | Suspended Period of Canal | Production Capacity of NBDWTP ($m^3$/d) | Required Capacity of Reservoir ($m^3$) | Reservoir with Stone Masonry Wall with Slope | | Reservoir with Concrete Retaining Wall | |
|---|---|---|---|---|---|---|---|
| | | | | Length of one side of Wall (m) | Area (ha) | Length of one side of Wall (m) | Area (ha) |
| Case A (Full Supply) | 2 days | 600,000 | 1,200,000 | 657 | 43.2 | 623 | 38.8 |
| | | 1,000,000 | 2,000,000 | 827 | 68.4 | 794 | 63.0 |
| Case B (70% Supply) | 2 days | 150,000 | 0 | - | - | - | - |
| | | 300,000 | 0 | - | - | - | - |
| | | 600,000 | 280,560 | 354 | 12.5 | 321 | 10.3 |
| | | 1,000,000 | 720,560 | 525 | 27.6 | 491 | 24.1 |

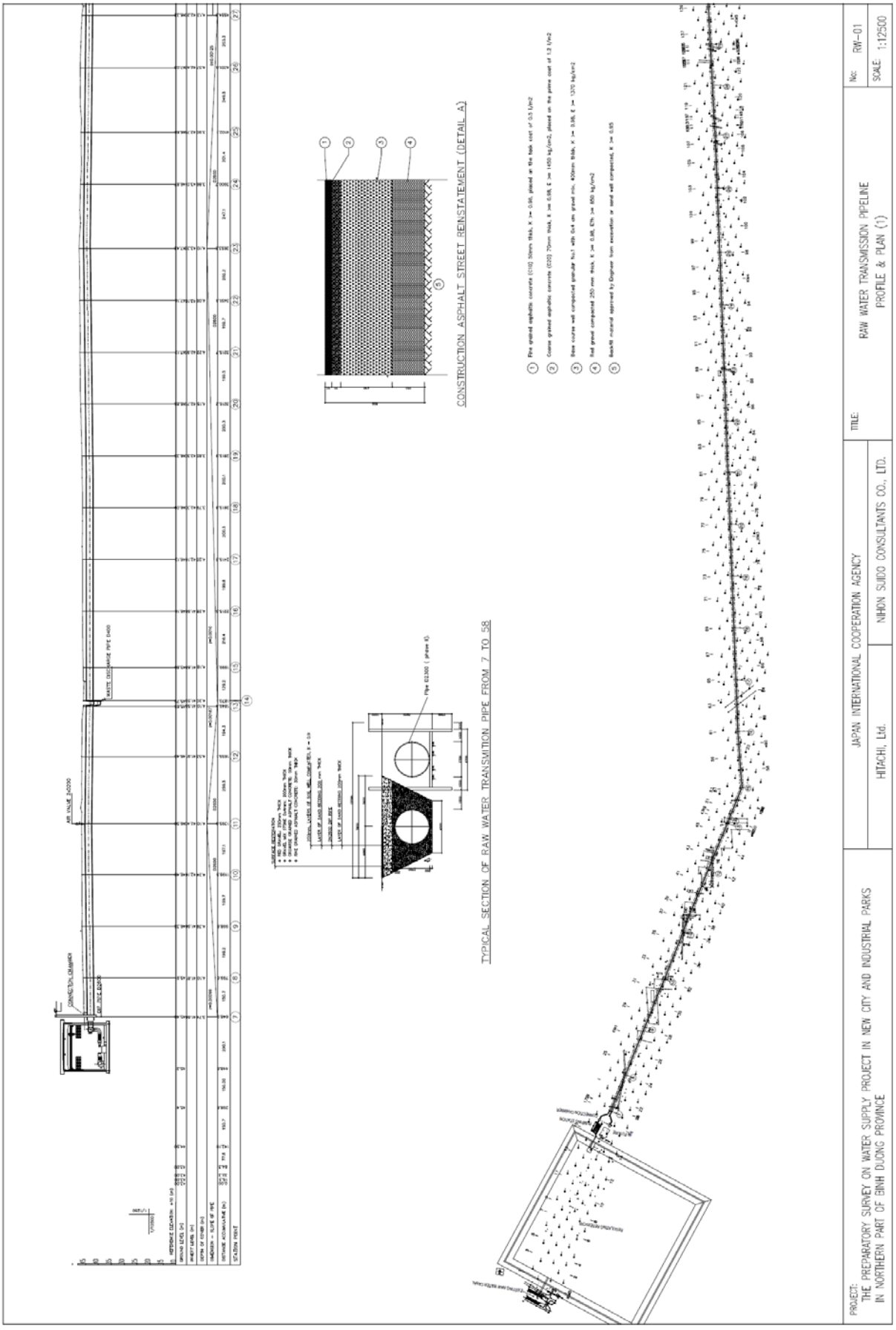
## 3. Construction Cost of Reservoir at Intake Point

Construction costs for various volumes of reservoir at intake point are estimated in Table below.

**Table 3 Construction Cost of Reservoir at Intake Point**

| Required Capacity of Reservoir ($m^3$) | Reservoir with Stone masonry Wall with slope | | | | Reservoir with Concrete Retaining Wall | | | |
|---|---|---|---|---|---|---|---|---|
| | Length of one side of Wall (m) | Area (ha) | Construction Cost | | Length of one side of Wall (m) | Area (ha) | Construction Cost | |
| | | | Billion VND | Million USD | | | Billion VND | Million USD |
| 1,000,000 | 606 | 36.7 | 112.8 | 5.5 | 572 | 32.7 | 292.9 | 14.0 |
| 1,200,000 | 657 | 43.2 | 131.1 | 6.3 | 623 | 38.8 | 327.8 | 15.7 |
| 2,000,000 | 827 | 68.4 | 202.3 | 9.7 | 794 | 63.0 | 453.4 | 21.7 |
| 250,560 | 339 | 11.5 | 38.4 | 1.8 | 305 | 9.3 | 130.6 | 6.3 |
| 880,560 | 573 | 32.8 | 101.6 | 4.9 | 539 | 29.1 | 271.0 | 13.0 |
| 1,720,560 | 772 | 59.6 | 178.1 | 8.5 | 739 | 54.6 | 411.5 | 19.7 |
| 280,560 | 354 | 12.5 | 41.7 | 2.0 | 321 | 10.3 | 139.1 | 6.7 |
| 720,560 | 525 | 27.6 | 86.3 | 4.1 | 491 | 24.1 | 240.1 | 11.5 |

# Appendix 6 - A Plan and Profile for Raw Water Transmission Pipeline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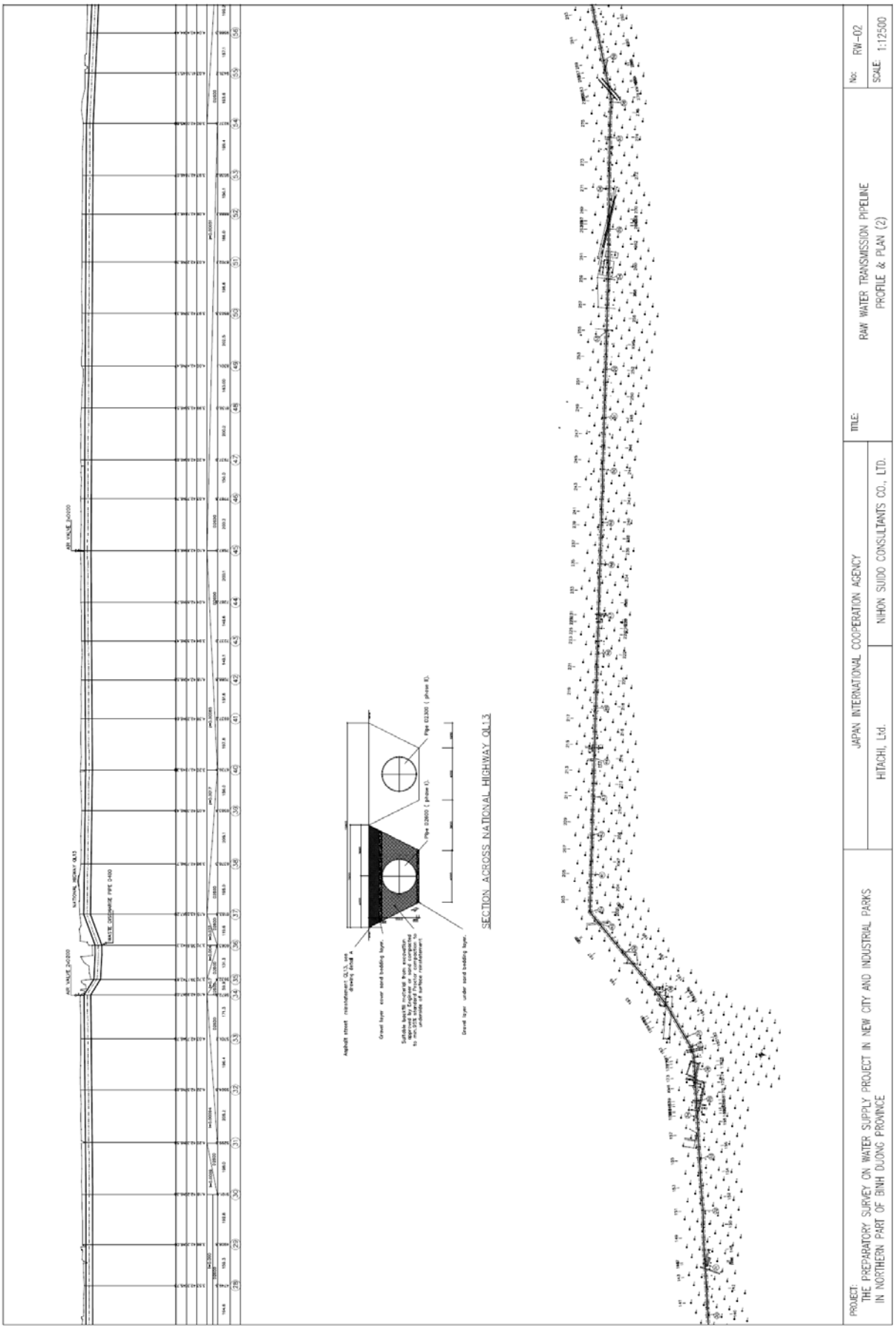
TYPICAL SECTION OF RAW WATER TRANSMITION PIPE FROM 7 TO 58
PROJECT:
THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE
JAPAN INTERNATIONAL COOPERATION AGENCY
HITACHI, Ltd.
NIHON SUIDO CONSULTANTS CO., LTD.
TITLE:
RAW WATER TRANSMISSION PIPELINE
PROFILE & PLAN (1)
No: RW-01
SCALE: 1:12500


SECTION ACROSS NATIONAL HIGHWAY QL13
PROJECT:
THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE
JAPAN INTERNATIONAL COOPERATION AGENCY
HITACHI, Ltd.
NIHON SUIDO CONSULTANTS CO., LTD.
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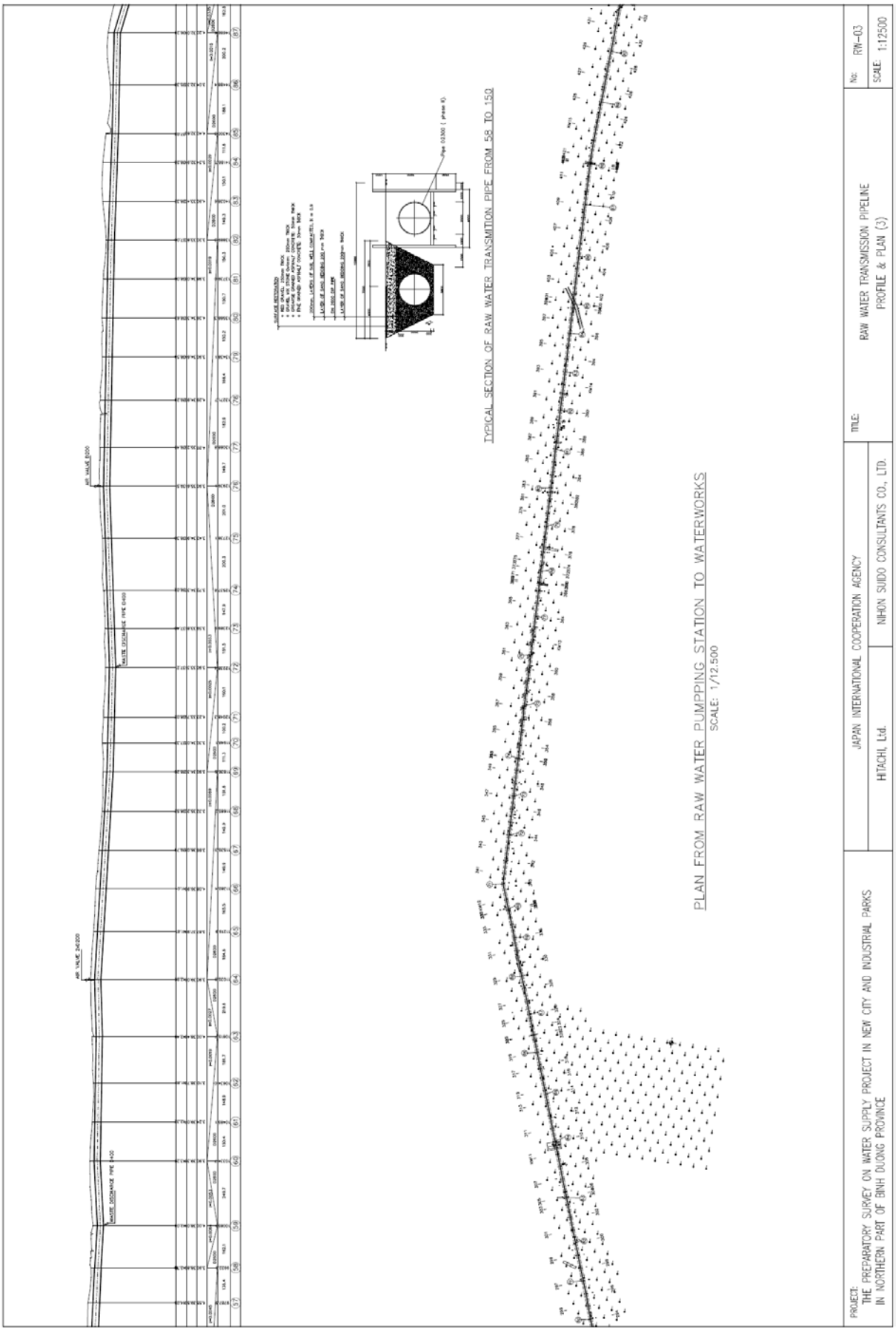
RAW WATER TRANSMISSION PIPELINE
PROFILE & PLAN (2)
No: RW-02
SCALE: 1:12500


TYPICAL SECTION OF RAW WATER TRANSMITTION PIPE FROM 58 TO 150
PLAN FROM RAW WATER PUMPING STATION TO WATERWORKS
SCALE: 1/12,500
PROJECT:
THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE
JAPAN INTERNATIONAL COOPERATION AGENCY
HITACHI, Ltd.
NIHON SUIDO CONSULTANTS CO., LTD.
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RAW WATER TRANSMISSION PIPELINE
PROFILE & PLAN (3)
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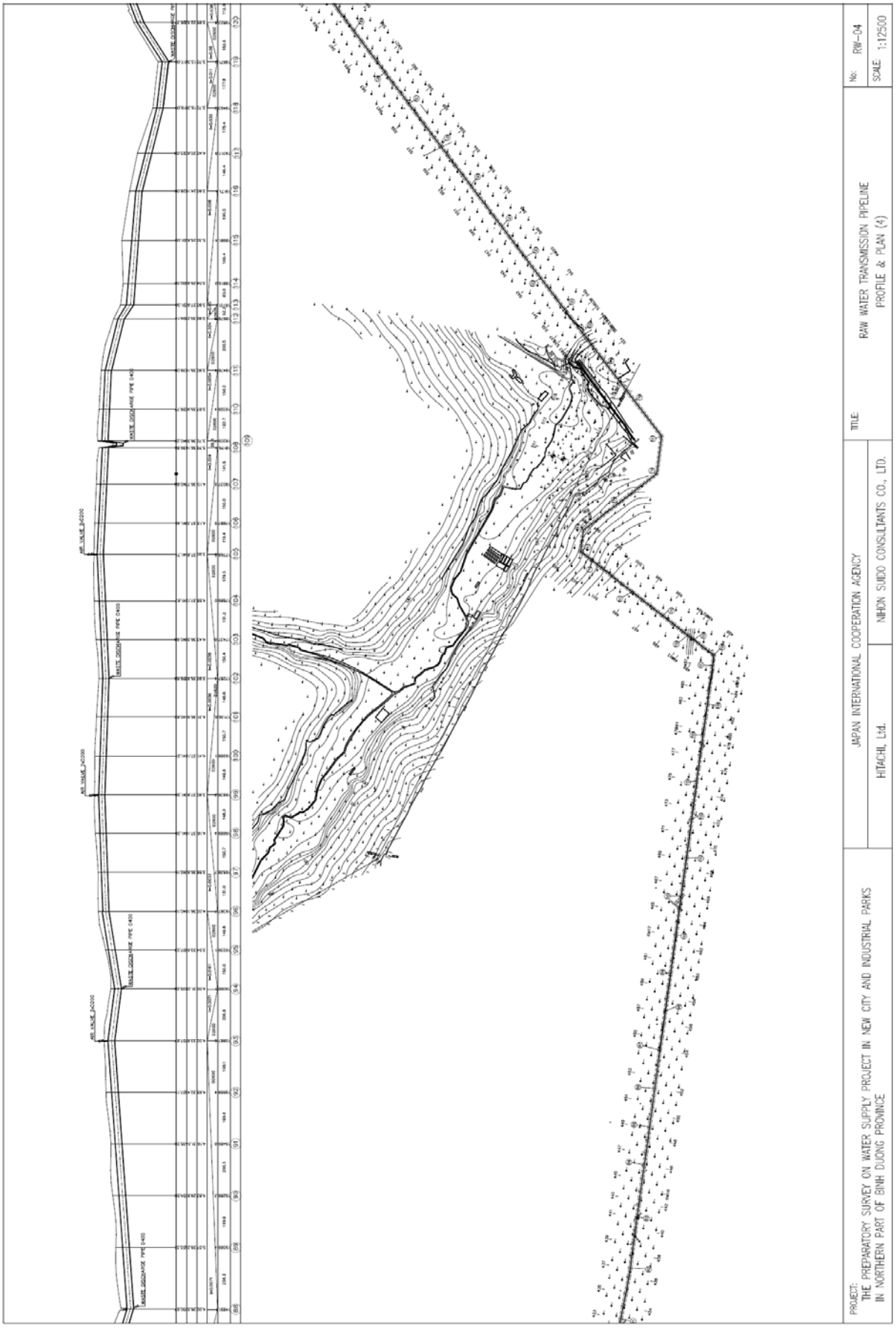
PROJECT:
THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE
JAPAN INTERNATIONAL COOPERATION AGENCY
HITACHI, Ltd.
NIHON SUIDO CONSULTANTS CO., LTD.
TITLE:
RAW WATER TRANSMISSION PIPELINE
PROFILE & PLAN (4)
No: RW-04
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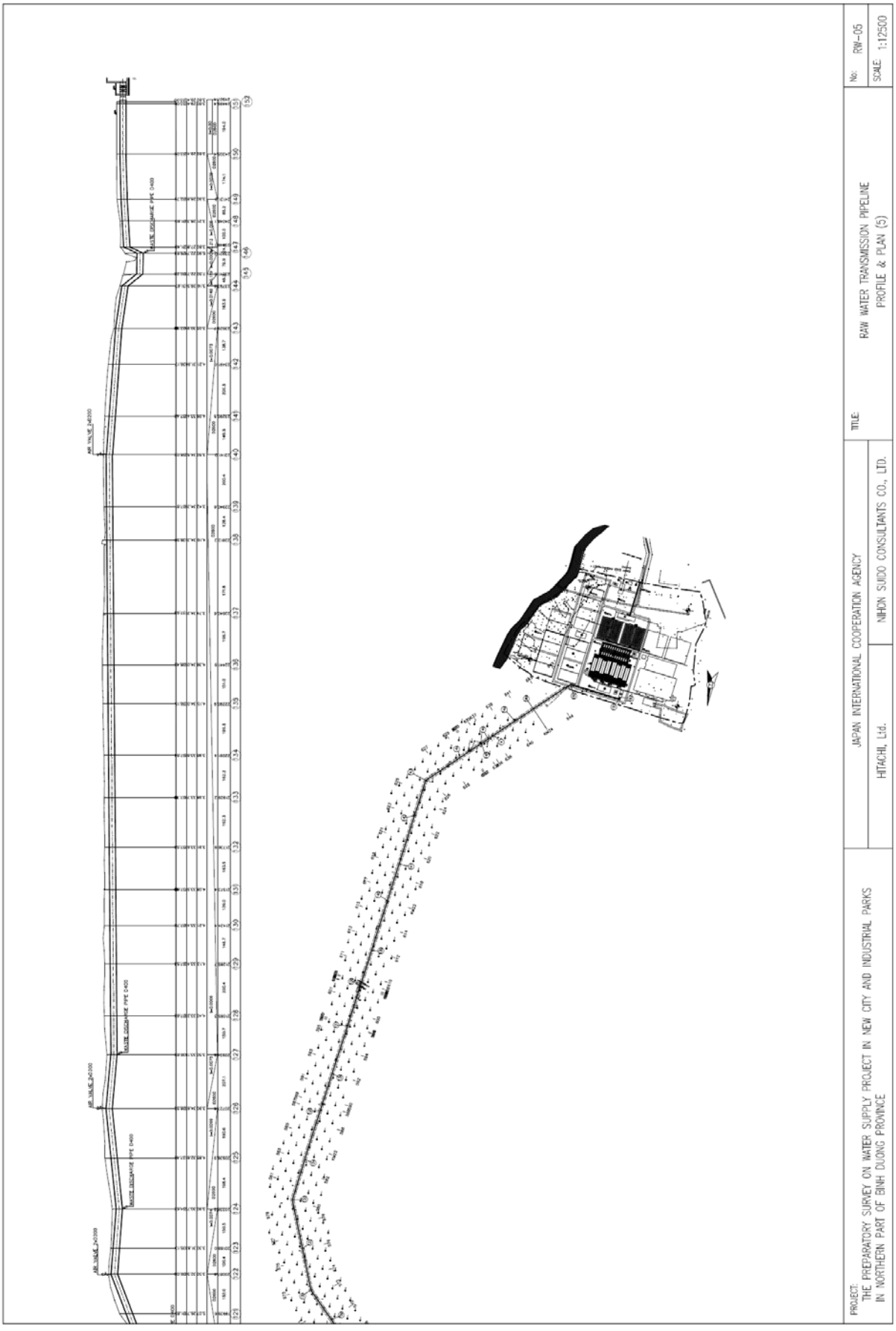

PROJECT:
THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE
JAPAN INTERNATIONAL COOPERATION AGENCY
HITACHI, Ltd.
NIHON SUIDO CONSULTANTS CO., LTD.
TITLE:
RAW WATER TRANSMISSION PIPELINE
PROFILE & PLAN (5)
No: RW-05
SCALE: 1:12500

# Appendix 6 - B Hydrological Conditions and Design Basis for Regulating Reservoir

## 1. Hydrological Conditions

### 1.1. River Characteristic

Based on the topographic map which scale is 1: 25,000 prepared by the General Department of Surveying and Mapping under the Ministry of Natural Resources and Environment, the river characteristic of Ong Te Stream is shown in the following table.

**Table 1.1 Basin Morphologic Characteristics**

| Location | Basin Area F ($km^2$) | River Length $L_S$ (km) | Average Slope of River Bed $J_S$ (‰) | Average Slope of Basin $J_{Sd}$ (‰) |
|---|---|---|---|---|
| Ong Te basin | 48.0 | 10.0 | 4.0 | 150.0 |

### 1.2. Meteorological elements

Meteorological elements are defined referring to Volume 4 of Specialized report, Part 4A Hydrometeorology of headwork, No. 315C-03-B01 published in July 2004 by Hydraulic Engineering Consultants Corporation II (HEC II).

**(1) Basin Rainfall**

Basin average rainfall is defined as $X_o$ = 1900 mm based on Water Resources Atlas by General Department of Hydro-meteorology.

The maximum daily rainfall in Ong Te basin is calculated by the maximum daily rainfall data in Binh Long station. The results are shown in the following table.

**Table 1.2 Maximum Daily Rainfall corresponding to Design Probability**

| P (%) | 0.1 | 0.2 | 0.5 | 1.0 | 5.0 | 10 |
|---|---|---|---|---|---|---|
| $X_P$ (mm) | 378.0 | 343.6 | 299.0 | 266.0 | 192.0 | 161.0 |

### 1.3. Hydrological Elements

**(1) Annual Flow**

**a) Long-term Average Flow**

Long-term average flow $Q_o$ is calculated by the following formula.

$$Q_o = \frac{Y_o * F}{1000 * T}$$

Where;

F: Basin area,

T: The number of seconds per one year,

$Y_o$: Long-term average equivalent runoff, which is calculated by the following formula,

$Y_o = X_o - 1100 = 1900 - 1100 = 800$ mm.

The annual flow characteristics in Ong Te basin are shown in the following table.

**Table 1.3 Long-term Average Flow in Ong Te basin**

| F ($km^2$) | $X_o$ (mm) | $Q_o$ ($m^3/s$) | $M_o$ ($l/s.km^2$) | $Y_o$ (mm) |
|---|---|---|---|---|
| 48.0 | 1900 | 1.22 | 25.4 | 800 |

**b) Design Annual Flow**

- Variation coefficient of annual flow; Cv = 0.3,

- Bias coefficient of annual flow, Cs; According to Norm QP.TL C6-77, if there are not any annual flow documents in a basin, the bias coefficient is calculated by Cs = 2Cv empirically.

The annual flow corresponding to design probability is shown in the following table.

**Table 1.4 Design Annual Flow in Ong Te basin**

| F ($km^2$) | $Q_o$ ($m^3/s$) | Cv | Cs | $Q_P$ ($m^3/s$) | | | |
|---|---|---|---|---|---|---|---|
| | | | | $Q_{80\%}$ | $Q_{85\%}$ | $Q_{90\%}$ | $Q_{95\%}$ |
| 48.0 | 1.22 | 0.3 | 0.6 | 0.905 | 0.847 | 0.779 | 0.685 |

**Table 1.5 Monthly Design Average Flow in Ong Te basin (Unit: $m^3/s$)**

| P (%) | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average | 0.308 | 0.154 | 0.088 | 0.117 | 0.272 | 0.716 | 1.486 | 3.071 | 3.258 | 2.756 | 1.678 | 0.711 | 1.218 |
| 50 | 0.299 | 0.150 | 0.086 | 0.114 | 0.264 | 0.694 | 1.442 | 2.978 | 3.159 | 2.673 | 1.627 | 0.690 | 1.181 |
| 75 | 0.241 | 0.121 | 0.069 | 0.092 | 0.214 | 0.562 | 1.166 | 2.409 | 2.556 | 2.162 | 1.316 | 0.558 | 0.956 |
| 80 | 0.229 | 0.115 | 0.066 | 0.087 | 0.202 | 0.532 | 1.104 | 2.280 | 2.419 | 2.047 | 1.246 | 0.528 | 0.905 |
| 85 | 0.214 | 0.107 | 0.061 | 0.082 | 0.189 | 0.498 | 1.034 | 2.136 | 2.267 | 1.918 | 1.167 | 0.495 | 0.847 |
| 90 | 0.197 | 0.099 | 0.057 | 0.075 | 0.174 | 0.458 | 0.951 | 1.964 | 2.084 | 1.763 | 1.073 | 0.455 | 0.779 |
| 95 | 0.173 | 0.087 | 0.050 | 0.066 | 0.153 | 0.403 | 0.836 | 1.727 | 1.833 | 1.551 | 0.944 | 0.400 | 0.685 |

**(2) Flood Discharge**

**a) Peak Design Flood Discharge**

The peak flood discharge is calculated by the empiric formula of Alecxayep according to Norm QP.TL C6-77 for calculation of design hydrological characteristics.

$$Q_{MAX} = \alpha * \overline{\psi}(\tau_a) * X_p * F = q * F$$

Where;

$\alpha$: Discharge coefficient ($\alpha$=16.67),

$\overline{\psi}(\tau_a)$: Rainfall reduction curve corresponding to flow concentration time in the similar basin,

$\tau_a$: Flow concentration time in the similar basin,

$X_P$: Maximum daily rainfall corresponding to design probability,

F: Basin area,

q: Maximum discharge module.

Flow concentration time is calculated by the following formula.

$$\tau_a = \tau_{sa} + \tau_{da}$$

$$\tau_{sa} = \frac{1000L_a}{m_a J_a^{1/3} F_a^{1/4} q_{pa}^{1/4}} = \frac{1000L_a}{V_a q_{pa}^{1/4}}$$

Where;

$\tau_{sa}$ : Water concentration time in river bed of the similar basin,

$\tau_{da}$ : Water concentration time on the slope of the similar basin,

$L_a$, $m_a$, $J_a$, $F_a$, $q_{pa}$: Specific parameters in the similar basin,

$V_a$: Flow velocity in the river of the similar basin.

The calculated results of peak design flood discharge in Ong Te basin are shown in the following table.

**Table 1.6 Peak Design Flood Discharge in Ong Te basin**

| P (%) | 0.1 | 0.2 | 0.5 | 1.0 | 5.0 | 10 |
|---|---|---|---|---|---|---|
| Q($m^3$/s) | 526 | 470 | 398 | 346 | 232 | 193 |

**b) Total Design Flood Discharge**

The total flood discharge is calculated by the empirical formula according to Norm QP.TL C6-77 as follows.

$$W_P = X_P * \varphi * F$$

Where;

$X_p$: Maximum daily rainfall corresponding to design probability,

φ: Discharge coefficient (φ=0.6),

F: Basin area.

The calculated results of total design flood discharge in Ong Te basin are shown in the following table.

**Table 1.7 Total Design Flood Discharge in Ong Te basin**

| P (%) | 0.1 | 0.2 | 0.5 | 1.0 | 5.0 | 10 |
|---|---|---|---|---|---|---|
| W($10^3m^3$) | 10,886 | 9,896 | 8,611 | 7,661 | 5,530 | 4,637 |

**c) Design flood process**

The design flood process in Ong Te basin is shown in the following table.

**Table 1.8 Design flood process in Ong Te basin**

| Time (hour) | Flood discharge according to frequencies Q ($m^3/s$) | | | | | |
|---|---|---|---|---|---|---|
| | 0.1% | 0.2% | 0.5% | 1.0% | 5.0% | 10.0% |
| 1 | 2.7 | 2.1 | 1.3 | 0.8 | 0.0 | 0.0 |
| 2 | 111.5 | 93.3 | 71.1 | 56.0 | 26.8 | 18.2 |
| 3 | 365.1 | 316.6 | 256.0 | 213.7 | 122.8 | 86.7 |
| 4 | 519.5 | 459.4 | 383.3 | 329.0 | 208.0 | 156.5 |
| 5 | 539.0 | 483.0 | 410.0 | 357.0 | 241.0 | 189.0 |
| 6 | 442.6 | 404.2 | 352.9 | 314.1 | 225.1 | 193.0 |
| 7 | 337.9 | 313.0 | 279.4 | 253.3 | 191.1 | 162.5 |
| 8 | 244.0 | 227.8 | 205.5 | 188.6 | 149.5 | 131.9 |
| 9 | 166.0 | 157.2 | 145.2 | 135.4 | 112.4 | 101.0 |
| 10 | 113.4 | 107.7 | 101.1 | 95.2 | 80.8 | 75.4 |
| 11 | 74.1 | 70.9 | 68.0 | 65.3 | 58.1 | 54.9 |
| 12 | 47.6 | 45.8 | 44.2 | 43.2 | 40.5 | 39.5 |
| 13 | 30.7 | 30.0 | 29.0 | 28.5 | 27.4 | 27.5 |
| 14 | 20.5 | 19.8 | 18.6 | 18.7 | 18.7 | 18.7 |
| 15 | 13.6 | 13.6 | 13.4 | 13.1 | 12.6 | 13.0 |
| 16 | 7.9 | 7.6 | 8.3 | 8.7 | 9.0 | 8.9 |
| 17 | 5.2 | 5.3 | 5.3 | 5.2 | 6.3 | 6.7 |
| 18 | 2.7 | 3.0 | 3.4 | 3.6 | 3.7 | 4.6 |
| 19 | 2.1 | 2.0 | 1.9 | 1.9 | 2.7 | 2.9 |
| 20 | 1.5 | 1.5 | 1.5 | 1.4 | 1.7 | 2.1 |
| 21 | 0.9 | 1.0 | 1.0 | 1.1 | 1.1 | 1.3 |
| 22 | 0.3 | 0.4 | 0.6 | 0.7 | 0.8 | 0.9 |
| 23 | 0.0 | 0.0 | 0.2 | 0.3 | 0.6 | 0.7 |
| 24 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.5 |
| 25 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 |
| 26 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |

## 1.4. Sedimentation

### (1) Suspended Solids

+ Long-term average flow: $Q_o = 1.22 m^3/s$,
+ SS amount: $\rho_o = 300\ g/m^3$,
+ Total SS amount: 11,542 ton,
+ Specific gravity of SS: 1.2 $ton/m^3$,
+ Annual deposit volume: 9,618 $m^3$.

### (2) Bed Load (Dislodged Sludge)

+ Total bed load amount: 4,617 ton (40% of suspended solids),
+ Specific gravity: 1.6 $ton/m^3$,
+ Annual bed load volume: 2,886 $m^3$.

**(3) Bank Erosion Volume**

+ Annual bank erosion volume: 1,250 $m^3$ (empirically 10% of suspended solids and bed load volume).

**(4) Total Annual Sediments in Ong Te Reservoir**

$V_s$ = 9,618 + 2,886 + 1,250 = 13,754 $m^3$

### 1.5. Spillway Discharge and Water Level in Stilling Basin

The relationship between spillway discharge and water level in stilling basin is calculated by the hydraulic formula of uniform flow based on the cross-section of stilling basin.

$$Q = \frac{1}{n}.\omega.R^{2/3}.J^{1/2}$$

The calculation results of the relationship between spillway discharge and water level in stilling basin are shown in the following table.

**Table 1.9 Relationship between Spillway Discharge and Water Level in Stilling Basin**

| $Z_S$ (m) | 17.0 | 17.5 | 18.0 | 18.5 | 19.0 | 19,5 | 20.0 | 20.5 | 21.0 |
|---|---|---|---|---|---|---|---|---|---|
| $Q_S$ ($m^3$) | 0.0 | 2.79 | 17.7 | 51,9 | 114 | 223 | 363 | 531 | 729 |

## 2. Dimension of Dam

### 2.1. Flood Spillway

**(1) Spillway Type and Width**

The spillway scale depends on the spillway type and the maximum water level in the reservoir when discharging the design flood.

Two spillway types are usually installed in the reservoir, which are gated spillway and un-gated spillway. Un-gated spillway is suitable for Ong Te reservoir based on the following reasons;

+ It is not necessary to install gates and close-open devices.

+ It is not necessary to arrange the staff for frequent observation of water level and operation of gates and close-open devices.

+ Un-gated spillway has a low possibility of incident caused by trees and floating objects.

**a) Phase I**

The flood water level in Phase I must be lower than 26.5 m to prevent the high voltage electric pole from storage water

Regarding spillway scale, there are three alternatives for spillway width, which are Bt = 100 m, 150 m and 200 m. The flood water level in the reservoir is calculated by the calculation formula of spillway discharge as follows.

$$Q = m * Bt * \sqrt{2g} * H^{3/2}$$

Where;

Q: Spillway discharge,

m: Spillway discharge coefficient,

Bt: Spillway width,

g: Acceleration of gravity

H: Head on the spillway crest.

**Table 2.1 Flood Water Level corresponding to Spillway Width in Phase I**

| No. | Case | Unit | Flood water level (m) | | |
|---|---|---|---|---|---|
| | | | Bt=100 m | Bt=150 m | Bt=200 m |
| 1 | Spillway crest level (normal water level) | m | 24.50 | 24.50 | 24.50 |
| 2 | Design flood water level (P=0.5%) | m | 25.95 | 25.6 | 25.41 |
| 3 | Check flood water level (P=0.1%) | m | 26.01 | 25.71 | 25.45 |

Based on the above results, it is shown that the alternative of Bt = 100 m which flood water level is nearly 26.0 m will not ensure the safety of the high voltage electric pole. On the other hand, flood water levels for Bt = 150 m and 200 m are lower than 26.50 m. In conclusion, Bt = 150 m for the spillway width in Phase I is selected as a result of construction cost.

**b) In the future**

In the future, the expansion of the spillway will make many changes and affect the works quality. Therefore, the spillway width will be kept with 150 m in Phase I, and only the spillway crest will be heighten to the normal water level of 27.5 m in the future.

The calculation results of spillway hydraulics in the future are shown in the following table.

**Table 2.2 Flood Water Level in the Future**

| No. | Case | Unit | Flood water level (m) |
|---|---|---|---|
| 1 | Spillway crest level (normal water level) | m | 27.50 |
| 2 | Design flood water level (P=0.5%) | m | 28.70 |
| 3 | Check flood water level (P=0.1%) | m | 28.96 |

Because the normal water level is 27.5 m, the foundation of the high voltage electric pole will flood. Therefore, replacement works or construction of dam embankment in front of the high voltage electric pole will be implemented by the future phase.

**(2) Stilling Basin Dimension**

Based on the geological conditions of the river bed which composed of weak soil, the stilling basin is required for energy dissipation in the downstream of the dam.

Since the size of the stilling basin cannot be changed in the future, the design criteria for the future phase are used for designing the stilling basin as follows.

+ Design discharge: Q = 398 m3/s

+ Spillway crest level: Ht = 27.5 m

The dimension of the stilling basin is defined as follows;

+ Stilling basin length

$$lb = \beta * ln$$

$$ln = 4.5 * hc$$

Where;

lb: Stilling basin length,

β: Coefficient (usually 0.9 is selected),

ln: Length of direct hydraulic jump without flooding,

hc: Conjugate depth after hydraulic jump.

As a result, stilling basin length is lb = 10.0 m.

+ Stilling basin depth

$$d = \sigma * hc - h_h - \Delta Z$$

Where:

d: Stilling basin depth,

σ: Coefficient,

$h_h$: Downstream depth when the reservoir has not been dug yet,

hc: Conjugate depth after hydraulic jump, calculated with the bed level of the stilling basin,

ΔZ: Difference of water head at the outlet gate of the stilling basin, calculated by the following formula,

$$\Delta Z = \frac{Q^2}{2g.\varphi'^2.\omega_h^2} - \frac{\alpha.Q^2}{2g.\omega_b^2}$$

As a result, stilling basin depth is d = 1.0 m.

## 2.2. Main Dam

### (1) Dam Crest Level

There are two material alternatives for the main dam, which are earth fill dam and gravity concrete dam. The dam crest is defined by the following formula according to the design standard 14 TCN 157-2005 for compacted earth fill dam and the design standard 14 TCN 56-88 for concrete and reinforced concrete dam.

$$C_{n,d,c} = H_{n,d,c} + \Delta h + h_{sl} + a_{n,d,c}$$

Where;

$C_{n,d,c}$: Non-overflow section level,

$H_{n,d,c}$: Normal water level(n), Design flood water level(d), Check flood water level(c),

Δh: Backwater level due to wind,

$h_{sl}$: Wave run-up level on the dam face,

$a_{n,d,c}$: Safe height.

Safe height is selected as follows;

+ Earth fill dam

**Table 2.3 Safe Height for Earth Dam**

| Case | Safe height a (m) | |
|---|---|---|
| | Phase I (Class II) | In the future (Class I) |
| Normal water level | 1.2 | 1.5 |
| Design flood water level | 1.0 | 1.0 |
| Check flood water level | 0.3 | 0.5 |

+ Reinforced concrete dam

- For the Phase I (Class II): a = 0.6 m,
- For the future phase (Class I): a = 0.8 m.

The calculation results of the dam crest level are shown in the following table.

**Table 2.4 Main Dam Crest Level for Concrete Dam and Earth Dam**

| Case | Dam crest level (m) | | | |
|---|---|---|---|---|
| | Phase I (Class II) | | In the future (Class I) | |
| | Concrete dam | Earth dam | Concrete dam | Earth dam |
| Normal water level | 26.33 | 27.45 | 29.62 | 30.54 |
| Design flood water level | 26.66 | 26.64 | 29.79 | 29.75 |
| Check flood water level | 27.00 | 26.15 | 29.46 | 29.46 |

Based on the above calculation results, the dam crest level is selected as follows.

**Table 2.5 Dam Crest Level**

| Dam crest level (m) | | | |
|---|---|---|---|
| Phase I (Class II) | | In the future (Class I) | |
| Concrete dam | Earth dam | Concrete dam | Earth dam |
| 27.0 | 27.0<br>+ 0.6 (breakwater) | 30.0 | 30.0<br>+ 0.6 (breakwater) |

**(2) Dam face**

**a) Gravity Concrete Dam**

The dam face for concrete dam is selected as follows;

+ Upstream face: Vertical form,

+ Downstream face: m = 1:0.8 (including future phase),

**b) Earth Fill Dam**

The dam face for earth dam is selected as follows;

+ Upstream face: m = 1:3.0,

+ Downstream face: m = 1:2.5.

The upstream surface in the earth fill dam is consolidated by ashlar with 30 cm thickness for erosion protection. The downstream surface in the earth fill dam is planted with grass.

## 3. Technical Solution

### 3.1. Ground Treatment

**(1) Permeability**

Because the dam foundation is located on the 2nd layer soil composed of sand mainly with strong permeability, the water-proof treatment must be implemented to ensure the dam stability.

**a) Gravity Concrete Dam**

Reinforced concrete piles are driven through the 2nd layer soil to the 4th layer soil for the water-proof treatment.

**b) Earth Fill Dam**

The 2nd layer soil is taken off and replaced with the soil that has poor permeability (permeability coefficient $kt \leq 10^{-5}$ cm/s) for the water-proof treatment.

**(2) Load-bearing capacity**

**a) Gravity Concrete Dam**

Because the load-bearing capacity is smaller than the ground stress by the dam body due to weak soil in dam foundation, the reinforced concrete pile M300 are driven to ensure load-bearing capacity.

Based on the calculation results of the dam base stability, the dimension and the number of piles are defined as follows;

+ Pile dimension: (0.35 x 0.35 x 10.5) m,

+ Number of piles at one dam section: 70 piles.

### 3.2. Technical Method for Heightening the Dam in the Future

**a) Gravity Concrete Dam**

The technical treatment method in the future is to heighten the dam crest to the required level (30.0 m) by concrete. The dam foundation must be constructed to meet the dam stability requirements for the future phase when the dam is constructed in Phase I.

**b) Earth Fill Dam**

The dam heightening work requires more complicated technique when compared to the concrete dam. The following methods must be implemented;

+ Use the dam crest of Phase I as a banquette at the upstream,

+ Heighten the dam crest by backfilling the downstream face downward,

+ Extend the drainage system of the downstream face,

+ Heighten two separation walls between the earth dam and the spillway by the new reinforced concrete wall beside the old one.

## 3.3. Flood Spillway

### (1) Cross-Section Shape of Spillway

There are many kinds of cross-section shapes of spillway. The practical section type of Ophixerop is the most suitable one based on the condition in Ong Te reservoir as the following reasons;

+ Largest water discharge capacity,

+ The downstream face made of concrete is not damaged and the dam is not vibrated when discharging flood.

### (2) Ground Treatment of Spillway

#### a) Permeability

Because the spillway foundation is located on the 2nd layer soil composed of sand mainly with strong permeability, the water-proof treatment must be implemented to ensure the spillway stability.

Reinforced concrete piles are driven through the 2nd layer soil to the 4th layer soil for the water-proof treatment.

#### b) Load-bearing capacity

Because the load-bearing capacity is smaller than the ground stress by the spillway due to weak soil in spillway foundation, the reinforced concrete pile M300 are driven to ensure load-bearing capacity.

Based on the calculation results of the spillway base stability, the dimension and the number of piles are defined as follows;

+ Pile dimension: (0.35 x 0.35 x 10.5) m,

+ Number of piles at one dam section: 80 piles.

## 4. Dimension of Regulating Reservoir

**Table 4.1 Dimension of Regulating Reservoir for Concrete Dam and Earth Dam**

| No. | Criteria name | Unit | Earth fill dam | | Gravity concrete dam | |
|---|---|---|---|---|---|---|
| | | | Phase I | In the future | Phase I | In the future |
| **I** | **Regulating reservoir** | | | | | |
| 1 | Basin area | $km^2$ | 48.0 | 48.0 | 48.0 | 48.0 |
| 2 | Normal water level | m | 24.5 | 27.5 | 24.5 | 27.5 |
| 3 | Dead water level | m | 21.0 | 21.0 | 21.0 | 21.0 |
| 4 | Design flood water level | m | 25.6 | 28.7 | 25.6 | 28.7 |
| 5 | Check flood water level | m | 25.71 | 28.96 | 25.71 | 28.96 |
| 6 | Whole capacity (normal water level) | $10^6m^3$ | 1.2 | 2.7 | 1.2 | 2.7 |
| 7 | Dead capacity | $10^6m^3$ | 0.2 | 0.2 | 0.2 | 0.2 |
| 8 | Useful capacity | $10^6m^3$ | 1.0 | 2.5 | 1.0 | 2.5 |
| 9 | Inundation Area (flood water level) | ha | 53.0 | 91.5 | 53.0 | 91.5 |
| **II** | **Main dam** | | | | | |
| 1 | Dam crest level | m | 27.0 | 30.0 | 27.0 | 30.0 |
| 2 | Dam bed level at lowest place | m | 19.0 | 19.0 | 19.0 | 19.0 |
| 3 | Highest dam height | m | 8.0 | 11.0 | 8.0 | 11.0 |
| 4 | Dam length (not including spillway) | m | 214 | 382 | 207 | 350 |
| 5 | Dam crest width | m | 7.0 | 7.0 | 7.0 | 7.0 |
| **III** | **Flood spillway** | | | | | |
| 1 | Overflow level | m | 24.5 | 27.5 | 24.5 | 27.5 |
| 2 | Design flood discharge | $m^3/s$ | 346 | 398 | 346 | 398 |
| 3 | Check flood discharge | $m^3/s$ | 470 | 526 | 470 | 526 |
| 4 | Spillway width (including two piers) | m | 153 | 153 | 153 | 153 |
| **IV** | **Intake tower for pumping station** | | | | | |
| 1 | Dimension: B x L x H | m | 15x15x9 | 15x15x9 | 15x15x9 | 15x15x9 |

## 5. Existing Regulating Reservoir for WTP

### (1) Kenh Dong Reservoir

- Location; Along Kenh Dong Canal leads raw water from Dau Tieng Reservoir
- Purpose; Water supply for Kenh Dong WTP
- Volume; 1,200,000m3
- WTP Capacity; 200,000m3/day
- Material; Soil with concrete slab reinforcing inside surface of dam
- Height; 4.5m (water depth)
- Visiting Date; March 21, 2013
- Interview with; Mr.Vo Quang Chau, Vice General Director, Saigon Water Corporation (SAWACO)

Mr.Ha Van Sang, General Director, Kenh Dong Water Supply Joint Stock Co


Inside Surface of Dam Body


Crest of Dam Body


Intake Facility


Transmission Facility from Kenh Dong Canal

**Photo 5.1 Kenh Dong Reservoir**

**(2) Suoi Cam Reservoir**

- Location; Suoi Cam Stream, Binh Phuoc Province
- Purpose; Water supply for Dong Xoai WTP and irrigation
- Volume; 1,700,000m3
- WTP Capacity; 10,000m3/day
- Material; Soil with rock reinforcing upstream surface of dam
- Height; 15m (dam body)
- Visiting Date; March 21, 2013


Upstream Surface of Dam Body


Crest of Dam Body


Intake Facility


Flood Spillway

**Photo 5.2 Suoi Cam Reservoir**

## 6. Minutes of Meeting with Electricity Transmission Company No.4 – NPT

<table>
<tr><td colspan="4">The Preparatory Survey on Water supply project in New City and industrial parks in northern part of Binh Duong Province/ Khảo sát chuẩn bị cho Dự án cấp nước tại Thành Phố Mới và các khu công nghiệp phía Bắc tỉnh Bình Dương</td></tr>
<tr><td>Minutes of Meeting:<br>Biên Bản cuộc họp</td><td></td><td colspan="2">No./:<br>Date: 6th March 2013</td></tr>
<tr><td rowspan="5"></td><td>1. Mr. Huỳnh Hữu Phúc</td><td colspan="2">Electricity Transmission Company No.4 – NPT/ Công ty Truyền Tải Điện 4 – NPT</td></tr>
<tr><td>2. Mr. Nguyễn Văn Thiều</td><td colspan="2">NPT/ Công ty Truyền Tải Điện 4 – NPT</td></tr>
<tr><td>3. Mr. Lê Văn Hoàng</td><td colspan="2">NPT/ Công ty Truyền Tải Điện 4 – NPT</td></tr>
<tr><td>4. Mr. Tatsuya Tobe</td><td colspan="2">JICA Survey Team/Đoàn Nghiên Cứu JICA</td></tr>
<tr><td>5. Ms. Vũ Hồng Nhung</td><td colspan="2">Interpreter/Phiên dịch</td></tr>
<tr><td>Commencement/Bắt đầu: 14:00</td><td>Closure/Kết thúc: 15:00</td><td>Place/Địa điểm: Công ty Truyền Tải Điện 4 – NPT</td><td>Recorded by/Ghi bởi: Tatsuya Tobe</td></tr>
</table>

Content of the meeting/Nội dung cuộc họp:

After the discussion of the issues related to the alternative for the high voltage electric pole:
Sau khi thảo luận các vấn đề liên quan đến phương án bảo vệ trụ điện cao thế:

| | |
|---|---|
| + Đoàn Nghiên Cứu JICA đề xuất xây dựng bệ bê tông hoặc tường bê tông bao quanh trụ điện cao thế số 3299 của đường dây 500KV Pleiku – Phú Lâm để chống ngập trụ điện trong khu vực hồ chứa nước dự kiến.<br>Công ty TT Điện 4 cho biết ý kiến về đề xuất trên:<br>+ Việc xây dựng bệ bê tông nâng cao trình hoặc tường bê tông quanh trụ điện là không khả thi cho Công ty TT Điện 4.<br>+ Vì rất khó tiến hành công tác bảo trì quanh trụ điện do không gian xung quanh vị trí trụ điện hạn chế.<br>+ Việc thay mới trụ điện đòi hỏi phải cân nhắc các chi tiết do thời gian hạn chế và điện thế cao.<br><br>+ Khoảng cách hiện hữu từ chân đế đến đỉnh trụ điện cao thế phải được giữ nguyên.<br>+ Xây đập bê tông để bao quanh 03 mặt chắn nước của trụ 3299, đảm bảo không ảnh hưởng đến kết cấu móng trụ và vận hành của đường dây:<br>• Khoảng cách tối thiểu từ đỉnh đập đến dây điện cao thế phải lớn hơn 10m.<br>• Khoảng cách tối thiểu từ chân trụ điện cao thế ra chân đập phải lớn hơn 21m. | + JICA Survey Team suggested that the concrete base or wall is constructed around the high voltage electric pole No. 3299 of 500KV electric wire from Pleiku - Phu Lam to prevent it from the storage water in planned regulating reservoir.<br>NPT gave comments on the above suggestion:<br>+ Construction of concrete base or wall around the high voltage electric pole is not feasible for NPT.<br>+ Because it is difficult to execute the maintenance around the high voltage electric pole due to narrow space.<br>+ Replacement work for the pole needs more detailed consideration due to time restriction and high voltage.<br>+ The existing distance from base to top of the high voltage electric pole must be kept.<br>+ A concrete dam should be built covering 03 water retaining faces of electric pole No. 3299, to ensure that reserved water will not affect on pole foundation structure and operation of electric line"<br>• Minimum distance from the dam crest to the electric wire must be more than 10m.<br>• The minimum distance from the foot of high voltage electric pole to the dam embankment must be more than 21m. |

| | |
|---|---|
| + Phương án khác được đề xuất là vị trí đập sẽ dời về phía thượng lưu của trụ điện cao thế, phương án này khả thi hơn đối với Công ty TT Điện 4. | + The another alternative that the dam site is shifted to upstream of the high voltage electric pole is more feasible for NPT. |

**Signed by/Ký bởi:**

PTC4's representative
**Đại diện Công ty Truyền Tải Điện 4**

**Team Member of JICA Survey Team**
**Thành viên Đoàn Nghiên Cứu Khảo Sát JICA**

# Appendix 6 - C Evaluation Simulation for Introduction Effect of Water Distribution Control System

## 1 Precondition of the simulation

### (1) Goal End Pressure

As shown in **Figure1.1**, the goal pressure is assumed to be 200kPA from the analysis of current pump operation. Pump operation data for all day is generated based on a sample screen of pump operation settings in Tan Hiep Water Treatment Plant. Then the data is input to network flow analysis. The calculated end pressure trend at the furthest point showed that the minimum pressure there is about 200kPA.

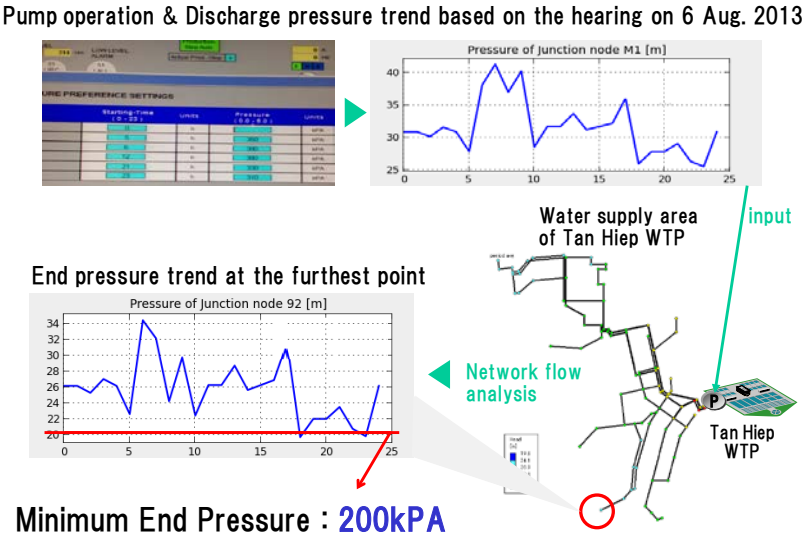
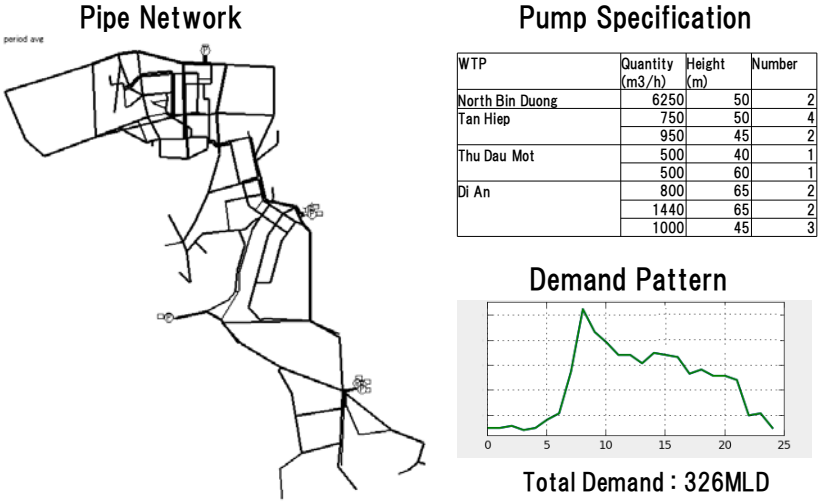



**Figure 1.1 Estimation of Current Goal End Pressure**

### (2) Pipe Network, Distribution Facilities, and Demand

Pipe Network data is based on the distribution main that is required for the North Binh Duong water treatment plant to operate at 300,000 m3/day. Total demand is about 326,000 m3 / day, which is supposed to be that amount in early period after the new treatment plant starts operation. Distribution facilities in each treatment plant is assumed on the consideration of facility planning by that period.




| WTP | Quantity (m3/h) | Height (m) | Number |
|---|---|---|---|
| North Bin Duong | 6250 | 50 | 2 |
| Tan Hiep | 750 | 50 | 4 |
| | 950 | 45 | 2 |
| Thu Dau Mot | 500 | 40 | 1 |
| | 500 | 60 | 1 |
| Di An | 800 | 65 | 2 |
| | 1440 | 65 | 2 |
| | 1000 | 45 | 3 |

**Figure 1.2 Simulation Data**

## 2 Simulation Result

### (1) Case 1

All water treatment plant are controlled independently with current method. BIWASE headquarter monitor all plants and coordinate them as necessary. Discharge pressure is decided by operator in each plant. Many red nodes appears in the pressure distribution map, which means that pressure level is rather high.

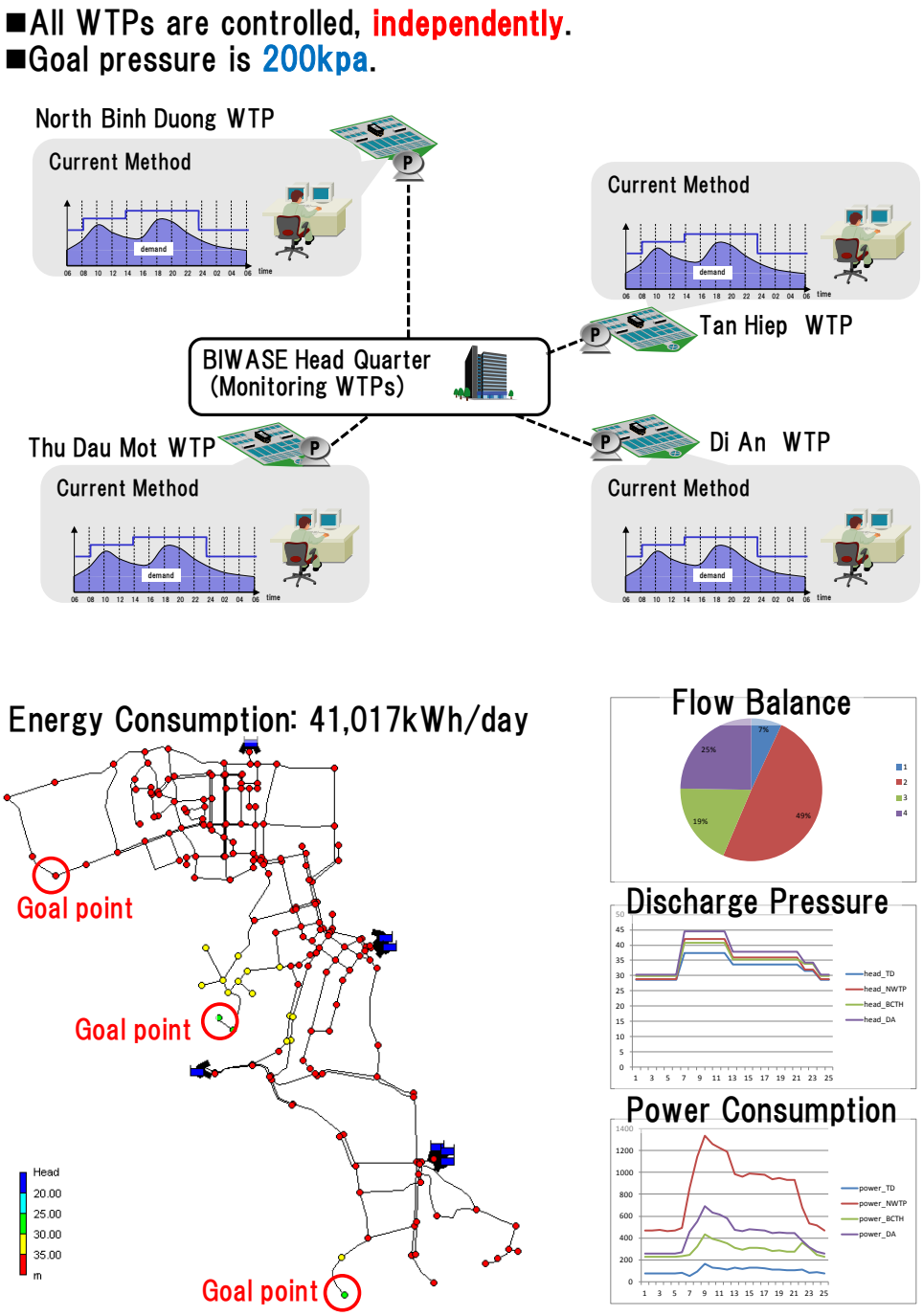



**Figure 2.1 Case1**

**(2) Case 2**

In this case, the advanced control method is applied only to North Binh Duong water treatment plant. In the pressure distribution map, many red nodes around North Binh Duong has changed into yellow from the case1. On the trend graph, red line represents North Binh Duong. The discharge pressure is accurately controlled to follow demand pattern. The energy consumption is 3.9% reduced comparing to the case1.

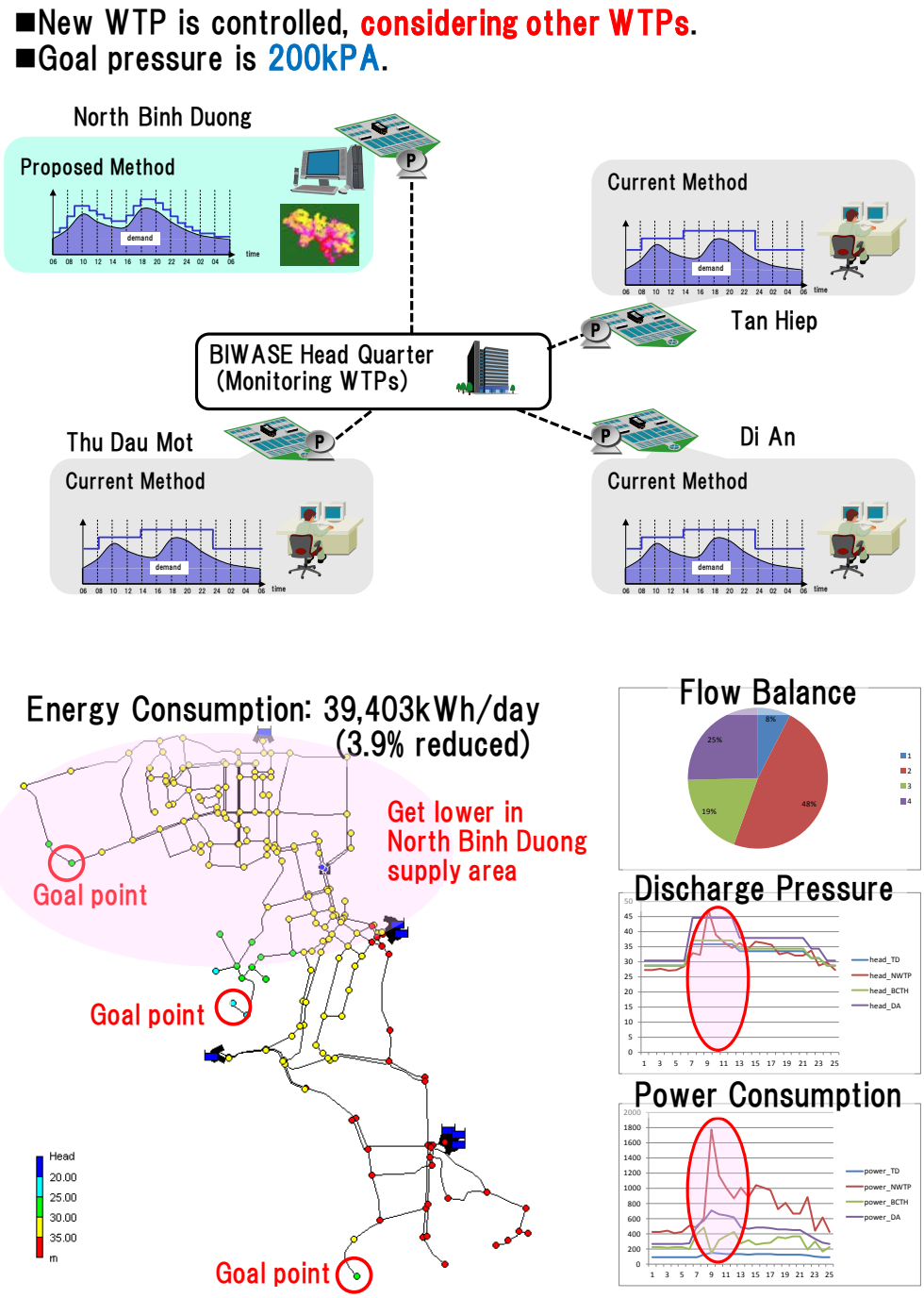



**Figure 2.2 Case 2**

**(3) Case 3(1)**

All water treatment plants introduce the advanced control method and they are controlled centrally from one place. It is possible to implement the centralized control place both in the head quarter and in North Binh Duong water treatment plant. In the pressure distribution map, yellow nodes increased in other supply areas. In the trend graph, every discharge pressure follow demand pattern.

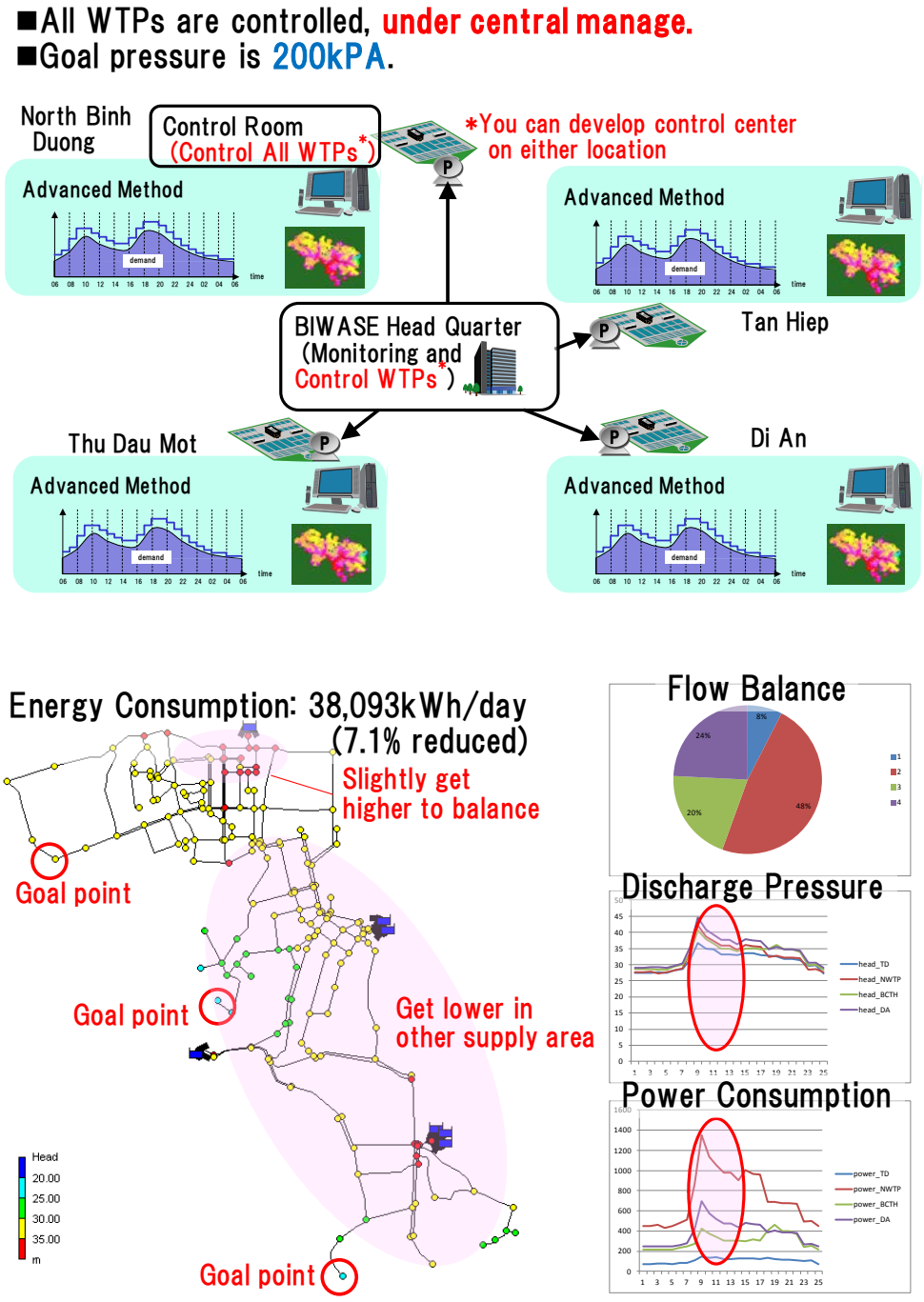



**Figure 2.3 Case 3(1)**

**(4) Case 3(2)**

Same as case3(1), all water treatment plant introduce the advanced control method. The goal pressure is 180kPA, which is still lower assuming energy-saving operation. Generally, goal pressure tend to be set a little higher just in case. However, since the advanced method can control accurately, it is possible to set goal pressure lower than usual. Total energy consumption is 12.9% reduced.

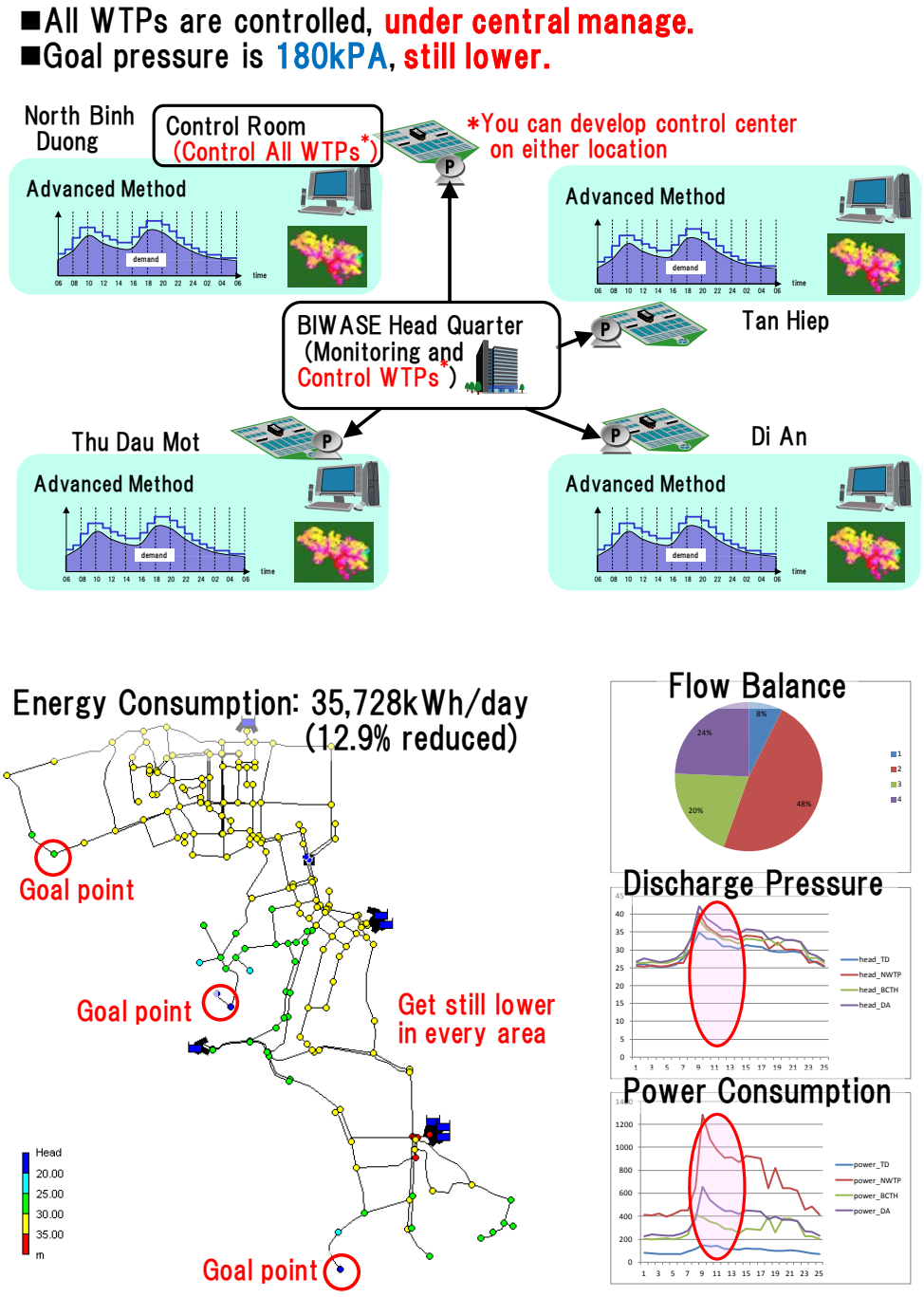



**Figure 2.4 Case 3(2)**

# Appendix 7 - A Environmental and Social Consideration Checklist

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
|---|---|---|---|---|
| 1 Permits and Explanation | (1) EIA and Environmental Permits | (a) Have EIA reports been already prepared in official process?<br>(b) Have EIA reports been approved by authorities of the host country's government?<br>(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?<br>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government? | (a) N<br>(b) N<br>(c) N/A<br>(d) N | (a) The reports will be prepared by the end of 2015.<br>(b) The reports should be approved by filling the draft reports.<br>(c) Conditions are unknown before the approval<br>(d) No additional approvals are necessary. |
| | (2) Explanation to the Local Stakeholders | (a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?<br>(b) Have the comment from the stakeholders (such as local residents) been reflected to the project design? | (a) Y<br>(b) Y | (a) By holding the stakeholder meetings, adequate explanation was done and stakeholders agreed on the project components basically.<br>(b) Comments and requests from the stakeholders are already considered and corresponded in the suvey. The countermeasures are disclosed in reports. |
| | (3) Examination of Alternatives | (a) Have alternative plans of the project been examined with social and environmental considerations? | (a) Y | (a) Alternative plans are examined for water resouce, pipeline routes, raw water maintenance and location of WTP. |
| 2 Pollution Control | (1) Air Quality | (a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken?<br>(b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards? | (a) N/Y<br>(b) Y | (a) By complying safety standard concentration of chlorine (i.e. 0.02mg/m3), air pollution should not occur. / For accident prevention, leakage monitoring system will be installed.<br>(b) By utilising closed system (no emission to atmosphere), the chlorine concentrations comply with the standards. |
| | (2) Water Quality | (a) Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards? | (a) Y | (a) In the current design, no effluents are to be produced (closed system). |
| | (2)' Water Quality (from checklist for Hydropower, Dam, Reservoir) | (a) Does the water quality of dam pond/reservoir comply with the country's ambient water quality standards? Is there a possibility that proliferation of phytoplankton and zooplankton will occur?<br>(b) Does the quality of water discharged from the dam pond/reservoir comply with the country's ambient water quality standards?<br>(c) Are adequate measures, such as clearance of woody vegetation from the inundation zone prior to flooding planned to prevent water quality degradation in the dam pond/reservoir?<br>(d) Is there a possibility that reduced the river flow downstream will cause water quality degradation resulting in areas that do not comply with the country's ambient water quality standards?<br>(e) Is the discharge of water from the lower portion of the dam pond/reservoir (the water temperature of the lower | (a) Y<br>(b) Y<br>(c) Y<br>(d) N<br>(e) N/A | (a) According to the water quality test results, the water has good quality and the standards should be complied. It is planned to circulate dam water periodically to prevent nutrient enrichment.<br>(b) As described above, the water quality is good and the standards will be complied.<br>(c) Clearance of vegetation is planned.<br>(d) It is planned to maintain water amount during and after the construction as before.<br>(e) Discharge method is not yet fixed and should be studied in the Detailed Design. |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
|---|---|---|---|---|
| | | portion is generally lower than the water temperature of the upper portion) planned by considering the impacts to downstream areas? | | |
| | (2)" Water Quality (from checklist for Forestry) | (a) Is there a possibility that the use of chemicals, such as fertilizers, and agrochemicals will cause water pollution?<br>(b) Where facilities, such as forest products manufacturing facilities are installed, do effluents from the facilities comply with the country's effluent standards and ambient water quality standards? | (a) N<br>(b) N | (a) No chemicals are planned to be used at the site.<br>(b) There is no manufacturing facility in the area. |
| | (3) Wastes | (a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations? | (a) Y | (a) The sludge can be disposed in BIWASE-owned landfill and it is rather valuable resource and sellable. |
| | (4) Noise and Vibration | (a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards? | (a) Y | (a) The transmittion pump will be installed in the intake facility building and noise will not reach the boundary of the residential area. |
| | (5) Subsidence | (a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence? | (a) N/A | (a) No groundwater will be exploited. |
| | (6) Soil Contamination (from checklist for Forestry) | (a) Are adequate measures taken to prevent contamination of soil and groundwater by use of chemicals, such as agrochemicals?<br>(b) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans? | (a) N<br>(b) N/A | (a) It is not planned to use chemicals.<br>(b) As above |
| 3 Natural Environment | (1) Protected Areas | (a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas? | (a) N | (a) No protected areas exist in Binh Duong Province. |
| | (2) Ecosystem | (a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?(b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?(d) Is there a possibility that the amount of water used | (a) N(b) N(c) N(d) N | (a) The sites are all within secondary forests or agricultural lands.(b) No protected habitats are expected (confirmed by related agencies) and EIA study will be conducted.(c) As above(d) Water resource is canal water and no impacts to natural environment is expected. |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
|---|---|---|---|---|
| | | (e.g., surface water, groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms? | | |
| | (2)' Ecosystem (from checklist for Forestry) | (a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?<br>(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?<br>(c) Is there a possibility that changes in localized micro-meteorological conditions, such as solar radiation, temperature, and humidity due to a large-scale timber harvesting will affect the surrounding vegetation?<br>(d) Is there a possibility that a large-scale timber harvesting will result in loss of breeding and feeding grounds for wildlife?<br>(e) In the case of reforestation projects, is there a possibility that mono-species plantations will adversely affect wildlife habitats? Is there a possibility that mono-species plantations will cause outbreaks of pests?<br>(f) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?<br>(g) Isn't an illegal deforestation associated with the project being carried out, or is an acquisition of the forest certification by the project<br>proponent being carried out? | (a) N<br>(b) N<br>(c) Y<br>(d) N<br>(e) N/A<br>(f) N<br>(g) N | (a) The sites are all within secondary forests or agricultural lands.<br>(b) No protected habitats are expected and will be examined by field studies.<br>(c) The issue should be studied in the EIA.<br>(d) Wildlife is not expected and will be examined by field studies<br>(e) No reforestation is planned.<br>(f) The site is an old reservoir and natural ecosystem is not expected to exist. It will be studied in the EIA<br>(g) Deforestation will be managed by the project proponent after legal land acquisition. |
| | (3) Hydrology | (a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows? | (a) N | (a) Water resource is canal water and no impacts to aquatic environment is expected. |
| | (4) Topography and Geology (from checklist for Hydropower, Dam, Reservoir) | (a) Is there a possibility that reductions in sediment loads downstream due to settling of suspended particles in the reservoir will cause impacts, such as scouring of the downstream riverbeds and soil erosion? Is there a possibility that sedimentation of the reservoir will cause loss of the storage capacity, water logging upstream, and formation of sediment deposits at the reservoir entrance? Are the possibilities of the impacts studied, and adequate prevention measures taken?<br>(b) Is there a possibility that the project will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas (especially in run of the river generation | (a) N<br>(b) N | (a) Turbidity of the existing river is very low and problems concerning sediment will not be likely to occur.<br>(b) Topographic alteration will not take place in large-scale because the site was a reservoir. |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
|---|---|---|---|---|
| | | projects and geothermal power generation projects)? | | |
| | (5) Management of Abandoned Sites | (a) Are adequate restoration and revegetation plans considered for the harvested areas? In particular, are adequate measures taken to prevent soil runoff from the harvested areas?<br>(b) Is a sustainable management system for the harvested areas established?<br>(c) Are adequate financial provisions secured to manage the harvested areas? | (a) Y<br>(b) Y<br>(c) Y | (a) The reservoir is a permanent land use and managed by PMU<br>(b) As above<br>(c) As above |
| 4 Social Environment | (1) Resettlement | (a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?<br>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?<br>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?<br>(d) Is the compensations going to be paid prior to the resettlement?<br>(e) Is the compensation policies prepared in document?<br>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?<br>(g) Are agreements with the affected people obtained prior to resettlement?<br>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?<br>(i) Are any plans developed to monitor the impacts of resettlement?<br>(j) Is the grievance redress mechanism established? | (a) Y<br>(b) Y<br>(c) Y<br>(d) Y<br>(e) Y<br>(f) Y<br>(g) Y<br>(h) Y<br>(i) Y<br>(j) Y | (a) Mitigation measures to avoid impacts were taken in the ARP.Thus, involuntary resettlement will be caused in 2 components(raw water pipelines and the regulating reservoir) but compensation will be given in order to minimize the impact to the DPs.<br>(b) PAPs joined in public consultation with PMU and LFDC where Resettlement Plan was fully revealed.<br>(c) LFDC has a survey about the price of the land, house, etc. every year. Compensation price and rehabilitation will be stipulated in ARP.<br>(d)They pay compensation to the DPs 30days or more in advance.<br>(e) Compensation Policy is Included in the ARP<br>(f) Special asistance,such as special allowance,vocational training and income restoration for the vulnerable groups are stipulated in ARP.<br>(g) PAPs agreed in public consultation already.<br>(h) BIWASE will set up PMU as a main institution. The PMU is a permanent agency. The budget form PPC includes the cost estimation of ARP.<br>(i) The Monitoring is planned.<br>(j)The grievance redress mechanism will be established in each government level. |
| | (2) Living and Livelihood | (a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?<br>(b) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water | (a) Y<br>(b) N | (a) Resettlement will take place and adequate compensation will be given to PAPs.<br>(b) Water resource is canal water and no impacts to aquatic environment is expected. |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
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| | | area uses? | | |
| | (2)' Living and Livelihood (from checklist for Hydropower, Dam, Reservoir) | (a) Is there any possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?<br>(b) Is there any possibility that the project causes the change of land uses in the neighboring areas to affect adversely livelihood of local people?<br>(c) Is there any possibility that the project facilities adversely affect the traffic systems?<br>(d) Is there any possibility that diseases, including infectious diseases, such as HIV, will be brought due to the immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?<br>(e) Is the minimum flow required for maintaining downstream water uses secured?<br>(f) Is there any possibility that reductions in water flow downstream or seawater intrusion will have impacts on downstream water and land uses?<br>(g) Is there any possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?<br>(h) Is there any possibility that fishery rights, water usage rights, and common usage rights, etc. would be restricted? | (a) Y<br>(b) N<br>(c) N<br>(d) N<br>(e) Y<br>(f) N<br>(g) N<br>(h) N | (a) Resettlement will take place and adequate compensation will be given to PAPs.<br>(b) Change of land use will take place but adequate compensation will be given to PAPs.<br>(c) The project area does not encompass public roads.<br>(d) The project proponent will have consultation with the Department of Health who has special program for prevention of infectious diseases.<br>(e) The water flow will be maintained and will not change.<br>(f) The water flow will be maintained and will not change.<br>(g) The reservoir is for water supply whose treatment methods include sanitation by chlorination. Water-related diseases will not be introduced.<br>(h) Any right will not be restricted because no change is expected in the downstream reach. |
| | (3) Heritage | (a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws? | (a) N | (a) Cultural buildings are all along the main road and the pipline route is planned detouring the road. |
| | (4) Landscape | (a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken? | (a) N | (a) Basically, the facilities are built in gum tree fields. The reservoir is constructed in the old reservoir site and no significant change will occur. |
| | (5) Ethnic Minorities and Indigenous Peoples | (a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?<br>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected? | (a) N/A<br>(b) N/A | (a) Existance of ethnic minorities will be confirmed by ARP. Lifestyle of them are no longer unique at present in Binh Duong Province, in either case.<br>(b) Even though ethnic minorities may inhabit, the land is either the secondary forest or the agricultural land (no traditional land). |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
|---|---|---|---|---|
| | (6) Working Conditions | (a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?<br>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?<br>(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?<br>(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents? | (a) Y<br>(b) Y<br>(c) Y<br>(d) Y | (a)(b) Safety requirements will be complied with according to Circular No22/2010/TT-BXD<br>(c) Adequate program will be held by consultation with the Local PCs<br>(d) As above |
| 5 Others | (1) Impacts during Construction | (a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?<br>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?<br>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?<br>(d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts? | (a) Y<br>(b) N/A<br>(c) Y<br>(d) Y | (a) Any possible impacts are considered and mitigations are suggested in the EMP. The examples are as follows.<br>i) Noise / Vibration - Drive construction vehicles slowly when transferring soil. Maximize use of low-vibration & low-noise machineries.<br>ii) Turbid water - Monitor potential impacts<br>iii) Dust - Use watering agents to prevent or reduce dust. Drive construction vehicles slowly with load covers.<br>iv) Wastes - Institute a regular solids waste collection and disposal program. Ensure adequate number of latrines at camp cleaned regularly.<br>(b) The sites are all within secondary forests or agricultural lands and no impacts on ecosystem are expected.<br>(c) Construction activities can cause inconvenience to inhabitants and the countermeasures for impact minimization such as detouring pipeline routes from populated places were agreed in the stakeholder meeting.<br>(d) Construction along R13 can cause significant impact to surrounding society. In order to minimize the impact, alternative route through agricultural lands is adopted. |

| Category | Environmental Item | Main Check Items | Yes: Y<br>No: N | Confirmation of Environmental Considerations<br>(Reasons, Mitigation Measures) |
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| | (2) Monitoring | (a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?<br>(b) What are the items, methods and frequencies of the monitoring program?<br>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?<br>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities? | (a) Y<br>(b) Y<br>(c) Y<br>(d) Y | (a) The monitoring plan was prepared and shown in the final report.<br>(b) The contents of monitoring are specified at Article 25 [11]; Circular 12/2011/TT-BTNMT. The examples of the (items / methods / frequencies) are;<br>- Dust / TSP or PM10/ twice with an interval greater than 2 months<br>- Noise & Vibration / Decibel (dBa) levels / As above<br>- Surface water quality / Turbidity / As above<br>- Soil contamination / As, Cd, Cu, Pb, Zn / quarterly<br>- Worker & public safety / Number of worker and public injuries / quarterly<br>(c) The monitoring framework is designated. Main implement unit is PMU in cooperation with the contractor and/or the environmental consultant. The budget should be covered by the construction fee. The monitoring will be supervised by authorities such as DONRE, BDPPC, PMU or Consultant.<br>(d) Format and frequency of reports are specified at Article 25 [11]; Circular 12/2011/TT-BTNMT and required to be submitted to the regulatory authorities. |
| 6 Note | Reference to Checklist of Other Sectors | (a) Where necessary, pertinent items described in the Dam and River Projects checklist should also be checked. | (a) Y | (a) Dam and River Projects checklists are also referred but the project does not have significant impacts that the checklists describe. |
| | Note on Using Environmental Checklist | (a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming). | (a) N/A | (a) The project does not have possibility of significant adverse impacts on transboundary or global issues |

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

## Appendix 8 - A Abbreviated Resettlement Plan

# ABBRIVIATED RESETTLEMENT PLAN

THE PREPARATORY SURVEY ON WATER SUPPLY PROJECT IN NEW CITY AND INDUSTRIAL PARKS IN NORTHERN PART OF BINH DUONG PROVINCE IN THE SOCIALIST REPUBLIC OF VIETNAM

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## Annex

## TABLE INDEX



## LIST OF FIGURES

## ABBREVIATIONS

| | |
|---|---|
| ARP | Abbreviated Resettlement Plan |
| BIWASE | Binh Duong Water Supply – Sewerage - Environment Co., Ltd.<br>Binh Duong Water Supply & Drainage Environment One-Member Company Ltd. |
| CPC | Commune People's Committee |
| CSRP | Compensation, Support and Resettlement Plan |
| DMS | Detailed Measurement Survey |
| DONRE | Department of Natural Resources and Environment |
| DPC | District People's Committee |
| EA | Executing Agency |
| JICA | Japan International Cooperation Agency |
| JICA GL | JICA Guidelines for Environmental and Social Considerations |
| LFDC | Land Fund Development Center |
| LURC | Land User Rights Certificate |
| ODA | Official Development Assistance |
| PAH | Project Affected Household |
| PAP | Project Affected Person |
| PC | People's Committee |
| PMU | Project Management Unit |
| PPC | Provincial People's Committee |
| PPP | Public Private Partnerships |
| RAP | Resettlement Action Plan |
| SES | Socio-Economic Survey |
| VND | Vietnam Dong |
| WB | World Bank |
| WTP | Water Treatment Plant |

## DEFINITION OF TERMS

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| Cut-off date | This refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAP. Persons not covered in the census are not eligible for compensation and other entitlements, unless they can show proof that (i) they have been inadvertently missed out during the census and the DMS; or (ii) they have lawfully acquired the affected assets following completion of the census and the DMS and prior to the conduct of the detailed measurement survey (DMS). |
| Detailed Measurement Survey (DMS) | This is the process where all fixed assets (i.e. lands used for residence, commerce, agriculture, including ponds; dwelling units; stalls and shops; secondary structures, such as fences, tombs, wells; trees with commercial value; etc.) and sources of income and livelihood inside the Project right-of-way are measured, detailed survey, level of lose identified and list of affected people as well as their replacement costs calculated. Additionally, the severity of impact to the affected assets and the severity of impact to the livelihood and productive capacity of PAPs will be determined. |
| Entitlement | Refers to a range of measures comprising compensation, income restoration support, transfer assistance, income substitution, relocation support, etc. which are due to the PAPs, depending on the type and severity of their losses, to restore their economic and social base. |
| Host Community | Means the community already in residence at a proposed resettlement or relocation site. |
| Income restoration | This is the re-establishment of sources of income and livelihood of the affected households. |
| Land Acquisition | Refers to the process whereby an individual, household, firm or private institution is compelled by a public agency to alienate all or part of the land it owns or possesses to the ownership and possession of that agency for public purposes in return for compensation at replacement costs. |
| Project Affected Persons | In the context of involuntary resettlement, Project Affected Persons (PAP) are those who are physically relocated (relocation, loss of residential land, or loss of shelter) and/or economically displaced (loss of land, assets, access to assets, income sources, or means of livelihood) as a result of (i) involuntary expropriation of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.<br>In the case of affected household, it includes all members |

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| | residing under one roof and operating as a single economic unit, who are adversely affected by a project or any of its components. |
| Relocation | This is the physical relocation of a PAP from her/his pre-project place of residence and/or business. |
| Replacement cost | Means the amount of cash or kind needed to replace an asset and is the value determined as compensation for:<br>i. Agricultural land at the pre-project or pre-displacement level, whichever is higher and is based on productive value; and residential or commercial land based on market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of any registration and transfer taxes;<br>ii. Land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes;<br>iii. Houses and other related structures based on current market prices of materials, transportation of materials to construction site, cost of labour and other essential costs as well as taxes. In determining replacement cost, depreciation of assets and value of salvaged building materials are not taken into account and no deductions are made for the value of benefits to be derived from the project or transaction costs;<br>iv. Crops, trees and other perennials based on current market value; and<br>v. Other assets (i.e. income, cultural or aesthetic resources) based on replacement cost or cost of mitigating measures. |
| Replacement Cost Study | This refers to the process involved in determining replacement costs of affected land and assets based on empirical data. |
| Seriously Affected Households | This refers to affected households who will (i) lose 20% or more of total productive land and/or assets, and/or (ii) have to relocate; and/or (iii) lose 20% or more of their total income sources due to the Project. |
| Vulnerable Groups | These are distinct groups of people who might suffer disproportionately or face the risk of being further marginalized by the effects of resettlement and specifically include: (i) female headed households with dependents, (ii) disabled household heads, (iii) poor households, (iv) policy households such as martyr households, households with invalid or agent orange persons, and (v) landless households, (vi) indigenous people or ethnic minorities. |

## PART 1 EXECUTIVE SUMMARY

**Overview of the Project.** For ensuring adequate water for the development of the province, especially in the Northern part of Binh Duong in which many industrial parks and new city of the province are located, The Water Supply Project in the New City and Industrial Complex in the Northern Part of Binh Duong Province (herein after referred to as "the Project") is conducted basing on the Public Private Partnerships (PPP) between the BIWASE and JICA. The Project consists of 05 major components such as: i) Raw Water Pipeline I (between the existing canal and regulating reservoir) with an Intake Facility, ii) Raw Water Regulating Reservoir with a Pumping Station, iii) Raw Water Pipeline II (between the pumping station and WTP), iv) WTP and v) Distribution Mains. Some of the planned sites for facilities are occupied, so land acquisition with resettlement issue is in progress.

In order to be funded by the Japan International Cooperation Agency (JICA), Abbreviated Resettlement Plan (ARP) should be conducted in compliance with the JICA Guidelines for Environmental and Social Considerations (JICA GL). This report as "Abbreviated Resettlement Plan" is prepared to summarize the result of RAP complied with JICA GL. Since JICA GL refers to World Bank Policy, its references are also described in this report.

This draft report is prepared by the JICA Survey Team in the preparatory survey for the Project before the Alternative is fixed, so it is described based on general ideas and should be modified in accordance with the future situation.

The Project aims to ensure the needs of water supply and environment sanitation for the Binh Duong northern area; Existing Supply for Urban areas; Thu Dau Mot, Ben Cat, Tan Uyen, Thuan An and Di An, New Housing areas and Industrial Parks areas; An Tay, My Phuoc I, II, III, IV, VSIP I, Expanded VSIP II, and New City, and Bau Bang area for raw water supply.

**Scope of Land Acquisition and Resettlement Impacts**. There are around 500 of households who are acquired their land. Total of acquired area is 1,304,830m$^2$. There is no any school, health and religion facilities as well as the architects are affected by the Project.

**Legal and Policy Framework**. The legal and policy framework for compensation, resettlement and rehabilitation under the Project is defined by the relevant laws and regulations of the Government of Viet Nam and the JICA's policy on Involuntary Resettlement in 2010. Where there are gaps between the Vietnam legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA's Policy.

**Objectives of Compensation and Entitlements**. The overall objective of the compensation and entitlement policy for the Project is to ensure that all people affected by the Project will be able to restore their pre-project conditions while the poor and vulnerable households will be able to improve their pre-project living standards and income-earning capacity through compensation for the loss of physical and non-physical assets and, as required, other assistance and rehabilitation measures. Compensation will be based on the principle of replacement cost while additional assistance in cash and in-kind will also be provided depending on the severity of impacts. Income restoration measures or programs for severely affected and vulnerable households will be designed and implemented in consultation with PAPs during ARP updating.

**Project Policies.** The basic principle applied in this ARP is that all PAPs must be "supported in their efforts to improve their living standards, income-generating capacity and production to at least the same as or better than their standards of living before the project implementation. The lack of a legal basis for land use does not bar affected households from the entitlements of economic recovery

compensation and/or support. Affected assets must be compensated on the basis of their replacement cost.
The cut-off-date for eligibility for entitlement is the day after completing the detailed measure survey (DMS). Affected Persons and local communities have been informed of the cut-off date. Accordingly, after this date new invest lands/assets in the Project's affected areas will not eligible to receive any compensation and/or support from the Project.

**Mitigation Measures.** In the process of preparing the Project, there was close cooperation between the technical consultant and the social consultant to achieve the Project's two objectives of promoting the efficiency of the investment in the Project and minimizing land acquisition. Accordingly, there are 08 mitigation measures proposed, include (i) Recommended the different alternatives, (ii) Disseminating Information about the Project's policy and entitlements to gain people's participation and support, (iii) Compensation for PAPs based on the replacement cost, (iv) conduct closely monitoring and evaluating activities, including internal monitoring if necessary, (v) all trees and crops will be harvested before land acquisition, (vi) Particularly pay intention to the vulnerable groups which include none-land household, poor, loneliness elderlies, disabled persons, policy households (vii) Beside the compensation according the replacement cost, the project will provide assistances such as livelihood stability assistance, support for vocational training and career change, income restoration of these households, (viii) Encourage the contractors to use the local labors and attract the members in working-age of PAPs to work long-term for the Project. In addition, further comprehensive studies and recommendations for resolving negative social and cultural impacts.

**Ethnicity, Vulnerability and Gender Issues.** All affected households are Kinh. The census identified 22 households who are considered vulnerable households as the household head or members of the household fall on one or more types of vulnerability: female-headed household, elderly households, and poor households as defined by the Ministry of Invalids and Social Affairs (MOLISA), policy households, households with Agent Orange persons, none-land households. These vulnerable households will be particularly paid attention by the Project. They are invited to the community meetings during ARP implementation to disseminate on the Project's policies and collect their expectations, to ensure that their special needs and concerns are identified and addressed and that restoration or improvement of their socio-economic conditions will be carefully monitored.

**Entitlements of PAPs.** The project entitlements developed correspond to the impacts identified during the census and detailed measure survey. Entitlements adopted are based on the JICA's policies, the Government Decisions, and the results of consultation with PAPs (to ensure that losses are restored, if not improved). Entitlements for each type of PAPs are based on the types and levels of losses. Unit rates presented in the ARP and Entitlement Matrix basing on the replacement cost units evaluated by Binh Duong PPC.

All households to be displaced in the affected areas attended the public consultations to receive information, consider the levels of the Project impact, and present their recommendations for the plan for their new lives. Information obtained during the consultations was used to establish project resettlement policies and assist in making the compensation plans for the Project's implementation.
06 public consultation meetings were held by the LFDC, covered 100% of PAPs (53.5% participants was men and 46.5% was women). Content of the meetings were major focused on consultation of Project's related policies (compensation procedures, income & livelihood restoration programs, resettlement selections, etc), expectation of PAPs. On the other hand, the meetings also introduced to PAPs the project's information (such as project components & investment targets, time for land clearance, compensation and resettlement, entitlement and benefits of relocation PAPs and etc). Public consultation result showed that, 100% PAPs agreed with the project's policy.

**Relocation and Resettlement of** P**APs.** The displaced household expected to resettle by themselves and that is why it is no necessary to prepare a resettlement site.

**Income Rehabilitation Measures.** Some income rehabilitation measures are applied in this Project such as (i) Assistance for Living and Production Rehabilitation for the affected households with agricultural land, without agricultural land, or business and production; (ii) Assistance for the poor households and the other vulnerable groups; (iii) Assistance for Vocational Training and Job Creation;

**Implementation Arrangements and Capacity Building Interventions.** PMU will be responsible to prepare the ARP and submit to JICA for approval and PMU responsible for implementing and monitoring on the ARP implementation with the support from LFDC.

**Grievance Redress Mechanism.** A well-defined grievance redress and resolution mechanism was established to address the grievances and complaints of PAPs regarding land acquisition, compensation and resettlement in a timely and satisfactory manner. PAPs are entitled to lodge complaints regarding any aspect of the land acquisition and resettlement requirements; compensation policy, entitlements, rates and payment; and, strategies and procedures for resettlement including assistance from livelihood & income restoration programs. A four-stage procedure for redress of grievances is provided in the main report. The grievance mechanism was also disclosed to PAPs during consultations with them.
In the implementation of the ARP, complaints will be resolved in accordance with the approved procedure in the ARP. All complaints from PAPs will be resolved fairly and quickly by authorities at levels and project staff. There will be no administrative charge for the settlement of complaints or for redressing grievances.

**Monitoring and Evaluation.** Regular monitoring will be undertaken by the PMU will submit quarterly progress reports to JICA.

**Resettlement Budget.** The total budget for implementing this ARP is VND 444,581,108,000,. This amount covers compensation and allowances, design and implementation of income restoration measures, administration cost and contingency. As cost of land acquisition and resettlement will be paid by the Viet Nam government.

**Implementation Plan.** The compensation has been paid to the affected households part by part since December, 2012. And it is expected to complete the compensation payment and the site clearance in Mar, 2014. The PMU will not allow construction activities in specific sites until all resettlement activities have been satisfactorily completed, agreed rehabilitation assistance is in place, and that the site is free of all encumbrances.

# PART 2 GENERAL INTRODUTION

## 2.1 Overview of the Project

For ensuring adequate water for the development of the province, especially in the Northern part of Binh Duong in which many industrial parks and new city of the province are located, The Water Supply Project in the New City and Industrial Complex in the Northern Part of Binh Duong Province (herein after referred to as "the Project") is conducted basing on the Public Private Partnerships (PPP) between the BIWASE and JICA. The Project consists of 05 major components are: i) Raw Water Intake Facilities; ii) Raw Water Transmission Pipeline; iii) Regulating Reservoir; iv) North Binh Duong Water Treatment Plant; and v) Distribution Mains. Some of the planned sites for facilities are occupied, so land acquisition with resettlement issue is in progress.

The Project aims to ensure the needs of water supply and environment sanitation for the Binh Duong northern area; Existing Supply for Urban areas; Thu Dau Mot, Ben Cat, Tan Uyen, Thuan An and Di An, New Housing areas and Industrial Parks areas; An Tay, My Phuoc I, II, III, IV, VSIP I, Expanded VSIP II, and New City, and Bau Bang area for raw water supply..

In order to be funded by the Japan International Cooperation Agency (JICA), Abbreviated Resettlement Plan (ARP) should be conducted in compliance with the JICA Guidelines for Environmental and Social Considerations (JICA GL). This report as "Abbreviated Resettlement Plan" is prepared to summarize the result of RAP complied with JICA GL. Since JICA GL refers to World Bank Policy, its references are also described in this report.
This draft report is prepared by the JICA Survey Team in the preparatory survey for the Project before the Option is fixed, so it is described based on general ideas and should be modified in accordance with the future situation.

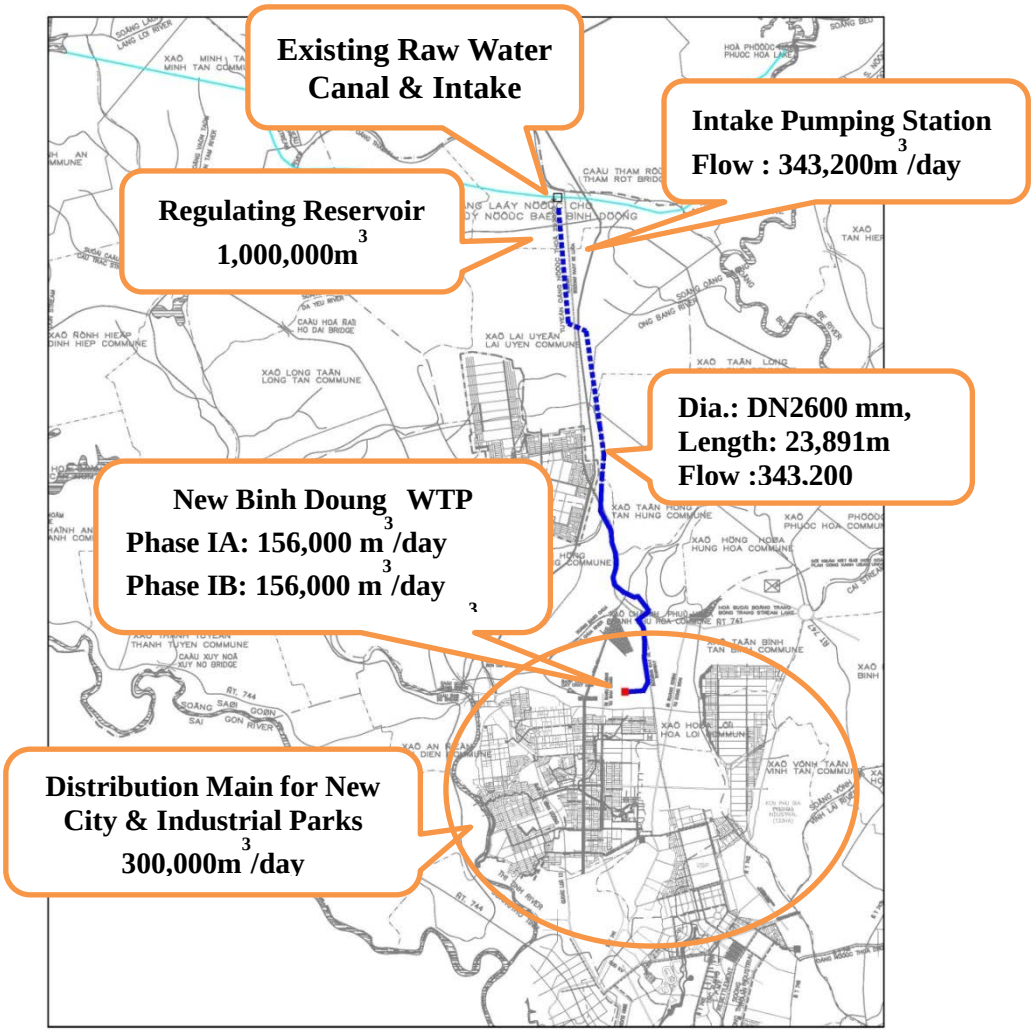
## 2.2 Outline of the Project Components

Main components of the project are: i) Raw Water Intake Facilities; ii) Raw Water Transmission Pipeline; iii) Regulating Reservoir; iv) North Binh Duong Water Treatment Plant; and v) Distribution Mains. Some of the planned sites for facilities are occupied, so land acquisition with resettlement issue is in progress. Summary of Facilities Proposed forFor Water Supply Development of Northern Binh Duong Province is shown in **Table 1** and **Figure 1**.

**Table 1 Summary of Facilities Proposed**
**For Water Supply Development of Northern Binh Duong Province**

| Facility | Capacity of the Facilities | |
|---|---|---|
| | Phase I with 300,000 $m^3$/d of NBDWTP | Final Stage with 1,000,000 $m^3$/d of NBDWTP |
| Regulating Reservoir | 1,000,000 $m^3$ near intake facility | 2,000,000 $m^3$ near intake facility |
| Intake Pumping Station | Pump: 3 pumps including 1 standby<br>Flow : 3.97$m^3$/sec = 343,200$m^3$/day<br>Head: 13.3 m | Pump: 5 pumps including 1 standby<br>Flow : 3.97$m^3$/sec = 343,200$m^3$/day<br>Head: 13.3 m |
| Raw Water Pipeline | Dia.: DN2600 mm, Length: 23,891m<br>Flow :343,200 $m^3$/day<br>Pressurized main from Regulating Reservoir to NBDWTP | Dia.: DN2600 mm, length: 23,891m,<br>Dia.: DN2300 mm, length: 23,891m<br>Flow:1,144,000$m^3$/d<br>Pressurized main from Regulating Reservoir to NBDWTP |
| NBDWTP | Capacity<br>Phase IA: 156,000 $m^3$/day<br>Phase IB: 156,000 $m^3$/day<br>Total of Phase I: 312,000 $m^3$/d | Capacity : 1,040,000 $m^3$/d |
| Distribution Main | DN 400 - 2500, Length: 48.58 km | DN 300 - 2500, Length: 299.33 km |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 1 Summary of Facilities Proposed for Water Supply Development of Northern Binh Duong Province**

### 2.3 Objectives of the ARP

The overall objectives of this resettlement policy are (i) to avoid, if not, minimize resettlement impacts; (ii) if impacts are unavoidable, ARP is prepared in a way to ensure that affected persons are not worse off; rather, they should be able to at least maintain or otherwise improve their pre-project living standards and income-earning capacity.

### 2.4 Socio-economic Conditions of the Project Area

#### 2.4.1 About Binh Duong province

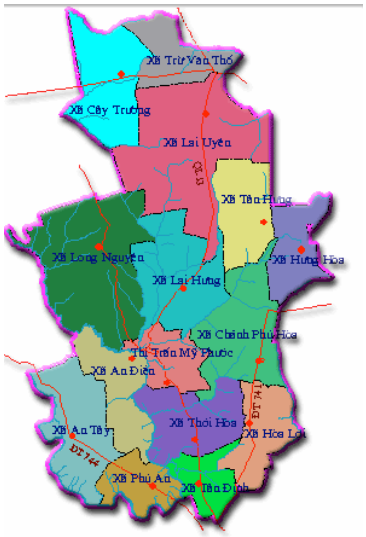
Binh Duong is a province located in the southern key economic zone, its economic growth is very fast. Especially the industrial sector is strongly developing compared to other provinces in the economic quadrangle in particular and the country in general. Province's economic growth rate is quite high and stable during the period 2005-2010, GDP per capita increased by 14%/year and continue to maintain high growth rates in the period 2010-2020.

With an open policy, incentives and calling for domestic and foreign investment in Binh Duong province, over the years, a series of industrial parks have been established and put into operation. Binh Dương currently has 28 industrial parks has been approved by the Government with a total area of 8,925 ha and 5,337 ha of leased IPs' land.

Along with the development of the industry, is the development of the urban population is increasing rapidly. Beside Thu Dau Mot Town, Di An Town, Thuan An Town and the existed towns such as Uyen Hung, My Phuoc, Dau Tieng and Phuoc Vinh, now Binh Duong is forming the new urban areas with total area of 7,554 ha. The province is investing to build the administrative center of the city Binh Duong locates in the Industry - Services – Urban Complex with scale 1,000 ha. The survey data of 2008, the population in the project area nearly 1.2 million people. Mechanical speed of population growth in the region is a large fluctuations is proportional to the industrial development of the province. Forecast for the years, the population growth rate of approximately 7.3%/year. It is expected that by 2020, the population concentrated in urban areas, urban clusters and nearby industrial parks in the province of nearly is 2.3 million people.
In these accomplishments, Ben Cat District have a large role in the process of economic restructuring in the province, namely planning, urban and industrial development with high efficiency, such as: the Industrial zones My Phuoc 1, 2, 3, Industrial Zones Bau Bang, Lai Hung, An Tay, Rach Bap, Thoi Hoa, Tan Dinh Viet Huong, ...

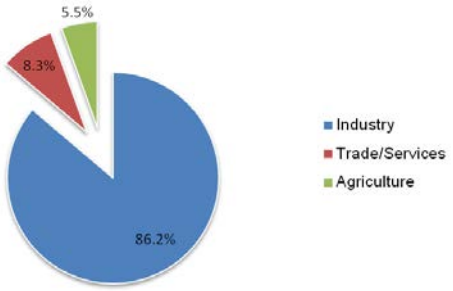
### 2.4.2 About Ben Cat District

Ben Cat district consists of 01 town and 14 communes. The whole population of the District is 151,097 persons.
Ben Cat District is located in the southern key economic region; the district center is away from Thu Dau Mot Town 20km, away from Ho Chi Minh City 50km, with National Highway13acrossing. The district has large reserves of non-metallic minerals such as kaolin, clay for brick, red gravel; rich surface water and ground water, with 2 rivers Saigon and Thi Tinh flowing through the district area, the weather is good all year.
System of waterways, roads developed links the districts in the province and Ho Chi Minh City. Ben Cat has great potential for development of industrial crops, fruit trees and industrial parks construction planning, industrial complexes, is prerequisite for industrial production. The total natural area is 584.37km$^2$.




Source: http://eng.binhduong.gov.vn
**Figure 2 Map of Ben Cat District**

**Economic Conditions of Ben Cat district**
GDP Growth in 2012 is 16.9%. Industry sector play a key role in this district. Economic structure is developing and shifting towards increasing the proportion of industry and services in GDP. In 2012, Industry presents for 86.2% of economic structure, the rests are services (8.3%), agriculture (5.5%).




Source: JICA Survey Team
**Figure 3 Economic Structure in Ben Cat District**

Up to now, the district have 08 industrial zones, with total area is 4,086 ha and 18 urban or residential areas with total area is 4,744 ha.
Average income: 35,500,000 VND or 1,730 USD per person per year (2012, Ben Cat's DPC)

## PART 3 LEGAL FRAMEWORKS AND ENTITLEMENT POLICY

The legal and policy framework for compensation, resettlement and rehabilitation under the Project is defined by the relevant laws and regulations of the JICA and the Viet Nam Government. Where there are gaps between the Vietnam legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA's Policy.

### 3.1 Vietnamese Laws, Decrees, and Circulars

1. The Constitution of the Socialist Republic of Viet Nam (1992) confirms the right of citizens to own and protect the ownership of a house. In addition, the Government has enacted a number of laws, decrees and regulations that constitute the legal framework for land acquisition, compensation and resettlement. The principal documents include:

* Decree No.197/2004/ND-CP, on compensation, rehabilitation and resettlement in the event of land recovery by the State, as amended by Decree No.17/2006/ND-CP;

* Decree 69/2009/ND-CP of 13/8/2009 (Supplementary Regulations Regarding Land Use Planning, Land Pricing, Land Acquisition, Compensation, Assistance and Resettlement) amends Decree No. 197/2004/ND-CP, extends eligibility and provides additional entitlements, compensation and assistance over previous legislation.

* Circular No.14/2009/TT-BTNMT dated 01/10/2009 of Ministry of Natural Resources and Environment regulated details on compensation, assistances and resettlement and procedures for land acquisition, handing over land, land lease takes effect;

* The Land Law No. 13/2003/QH11, providing a comprehensive land administration law;

* Decrees No. 188/2004/ND-CP and 123/2007, specifying the methods for land pricing and land price frameworks in the event of land recovery by the State. There is also Decree No.84/2007/ND-CP, which stipulates issue of LURC, land acquisition, land use right implementation, procedure of compensation, and assistance in the event of land recovery by the state and grievance redress.

2. Other laws, decrees and regulations relevant to land management, land acquisition and resettlement include the Construction Law 16/2003/QH11 on compensation and relocation of people affected by ground clearance for investment projects, Decree 16/2005-ND-CP on the implementation of the Construction Law, Decree 182/2004/ND-CP on penalties for administrative violations in land issues, Decree 198/2004/ND-CP on land use fees.

3. Laws, decrees and decisions relevant to public disclosure of information include Land Law, No.13/2003/QH11, Article 39, requiring disclosure of information to affected people prior to recovery of agricultural and non-agricultural land of, respectively, 90 and 180 days minimum and Decision 3037/QD-BGTVT, 2003, making the Project Management Unit (PMU) together with the Resettlement Committee responsible for public disclosure through mass media of the Project policies and the extent of site clearance to local people, particularly those that will be affected. The Decree 69/2009/ND-CP, Article 29, regulated about introduction of location and notice of land acquisition.

4. Decrees relevant to protection and preservation of cultural property include Decree No.172/1999/ND-CP, Article 25, requiring that sites currently recognized for cultural and historical

preservation and that are situated within the boundaries of waterway safety corridors, should be kept intact according to current legal regulations.

### 3.2 Binh Duong Province Regulations on Resettlement

Binh Duong Province Regulations on Resettlement is followings;

• Decision No. 87/2009/QĐ-UBND dated 21 December 2009 on compensation, assistance and resettlement in Binh Duong Province. This decision applied the Decree No. 69/2009/ND-CP of the Central Government.

• Decision No. 58/2011/QĐ-UBND dated 19/12/2011 regulated on unit price on compensation, assistance for housing, asset, architecture, trees and crops when the State acquires land in Binh Duong Province in 2012.

• Decision No. 67/2011/QĐ-UBND, issued the regulation on of land price adjustment coefficient (K) in 2012 in Binh Duong province

### 3.3 JICA Guideline on Involuntary Resettlement

JICA's policy on involuntary resettlement is summarized in **Table 2**:

**Table 2 JICA's Policy on Involuntary Resettlement**

The key principle of JICA policies on involuntary resettlement is summarized below.

**I.** Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

**II.** When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

**III.** People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.

**IV.** Compensation must be based on the full replacement cost as much as possible.

**V.** Compensation and other kinds of assistance must be provided prior to displacement.

**VI.** For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

**VII.** In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

**VIII.** Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.

**IX.** Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principle based on World Bank OP 4.12 is as follows

X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.)

XI. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. Provide support for the transition period (between displacement and livelihood restoration.

XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (

XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated

resettlement plan is to be prepared.
In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

Description of "replacement cost" is as follows.

| | | |
|---|---|---|
| Land | Agricultural Land | The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes. |
| | Land in Urban Areas | The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes. |
| Structure | Houses and Other Structures | The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes. |

Source: JICA GL

## 3.4 The Comparison between JICA Guideline and Vietnamese Laws and Decrees

The contents of JICA GL on involuntary resettlement are compared with the Government's Laws and Decrees. The differences between the Government's Laws and Decrees and JICA GL with regard to resettlement and compensation for this Project, and how to address these gaps are shown in **Table 3**.

**Table 3 Comparison Table between JICA Guideline and Laws of Vietnam**

| No. | JICA GL | Laws of Vietnam | JICA GL not covered by Laws of Vietnam | Counter-measures |
|---|---|---|---|---|
| 1. | Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL) | "Location options should be in line with construction planning and provide solutions to minimize the social and environmental impacts" and "assessment of conditions and reasoning for selected location". Decision 48/2008/QD-TT on development of F/S | Alternatives | Alternatives were considered in FS and EIA report |
| 2. | When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL) | Decision 48/2008/QD-TT | Equivalent | Not necessary |
| 3. | People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL) | Decision 48/2008/QD-TT | Equivalent | Not necessary |
| 4. | Compensation must be based on the full replacement cost as much as possible. (JICA GL) | Decision 48/2008/QD-TT | Equivalent | Not necessary |
| 5. | Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL) | Land hand over: "Within twenty (20) days after being fully paid the compensation and support money, the person having land recovered shall hand over land to the compensation and ground clearance organization." (Article 29; Circular 14/2009/TT-BTNMT) dated 01 October 2009 | Equivalent | Not necessary |
| 6. | For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL) | The scale-criterion is not yet specified for involuntary resettlement. | Specific countermeasures for large-scale resettlement | Abbreviated resettlement plan will be adopted because DP are |

| No. | JICA GL | Laws of Vietnam | JICA GL not covered by Laws of Vietnam | Counter-measures |
|---|---|---|---|---|
| | | | | estimated less than 200. |
| 7. | In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL) | RAP should include information of public consultation.<br>Decision 48. Issuing general guidelines on feasibility study reports of projects using ODA funds of the 5 bank group | Equivalent | Not necessary |
| 8. | When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL) | Not properly specified.<br>RAP should include information of public consultation.<br>Decision 48. Issuing general guidelines on feasibility study reports of projects using ODA funds of the 5 bank group | Language designation | Explanations were given in local language |
| 9. | Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL) | Not specified | Participation promotion | Participation of affected people is promoted (Described in 12 in this report, check) |
| 10. | Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL) | Properly specified at Article 138 of Land Law (2003); Article 63 & 64, Decree 84/2007/ND-CP and Decree 136/2006/ND-CP | Equivalent | Not necessary |
| 11. | Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6) | An initial baseline survey is not specified.<br>Decree 136/2006/ND-CP | Cut-off-date specification | Cut-off-date shall be defined |
| 12. | Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15) | Compensation will be paid to current users of land recovered by the State who fully satisfy the conditions specified in Clauses 1, 2, 3, 4, 5, 7, 9, 10 and 11, Article 8 of Decree No. 197/2004/ND-CP and Articles 44, 45 and 46 of Decree No. 84/2007/ND-CP.<br>For land users who are ineligible for compensation, provincial level PC shall consider these cases in order to provide support. | Similar | Eligibility is defined. |
| 13. | Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11) | "Land used for a certain purpose which is recovered by the State shall be compensated with new land with the same use purpose," Decree 69; Article 14[2] Compensation and support principles | Preference specification | Livelihoods of displaced persons are basically land-based. |
| 14. | Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6) | Supports include: (i) support for relocation and resettlement in case of recovery of residential land; (ii) support for life and production and stabilization; (iii) support for job-change training and job creation in case of recovery of agricultural land; (iv) support | Covered | Not necessary |

| No. | JICA GL | Laws of Vietnam | JICA GL not covered by Laws of Vietnam | Counter-measures |
|---|---|---|---|---|
| | | upon recovery of agricultural land in residential areas or garden or pond land not recognized as residential land and other supports. Article 17; Decree 69. | | |
| 15. | Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8) | Not specified. | Vulnerable groups specification | PPCs are in charge of attention in the process of important decisions |
| 16. | For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25) | Not specified. | Preparation of ARP | Preparation of ARP |
| 17. | Threshold of serious effect to the household income source due to agricultural land acquisition (WB OP4.12 P) | Losing over 30% of agricultural land | Losing over 20% of agricultural land. | Losing 20% or more of their total productive land |

Source: JICA Survey Team

### 3.5 The Project's Land Acquisition and Resettlement Policy

With consideration of Item 3.4., The Project's principles are shown as following.

(i) The Government of Vietnam will use the Project Resettlement Policy (the Project Policy) for the Project specifically because existing national laws and regulations have not been designed to address involuntary resettlement according to international practice, including JICA's policy. The Project Policy is aimed at filling-in any gaps in what local laws and regulations cannot provide in order to help ensure that PAPs are able to rehabilitate themselves to at least their pre-project condition. This section discusses the principles of the Project Policy and the entitlements of the PAPs based on the type and degree of their losses. Where there are gaps between the Vietnam legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA's Policy.

(ii) Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

(iii) Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

(iv) Compensation and rehabilitation support will be provided to any PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:

・Standard of living adversely affected;

・Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or permanently;

・Income earning opportunities, business, occupation, work or place of residence or habitat adversely affected temporarily or permanently; or

・Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.

(v) All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or

adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.

(vi) PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.

(vii) People temporarily affected are to be considered PAPs and resettlement plans address the issue of temporary acquisition.

(viii) Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.

(ix) The resettlement plans will be designed in accordance with Vietnam's National Involuntary Resettlement Policy and JICA's Policy on Involuntary Resettlement.

(x) The Resettlement Plan will be translated into local languages and disclosed for the reference of PAPs as well as other interested groups.

(xi) Payment for land and/or non-land assets will be based on the principle of replacement cost.

(xii) Compensation for PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.

(xiii) Replacement lands, if the preferred option of PAPs, should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.

(xiv) Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.

(xv) The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, women, children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.

(xvi) PAPs will be involved in the process of developing and implementing resettlement plans.

(xvii) PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.

(xviii) Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government.

(xix) Displacement does not occur before provision of compensation and of other assistance required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and

start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.)

(xx) Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.

(xxi) Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the resettlement management system.

Cut-off-date of Eligibility

The cut-off-date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAPs and be eligible to Project entitlements. In the Project, cut-off dates for titleholders will be the date of notification under the land acquisition and for non-titled holders will be the beginning date of the population census. This date has been disclosed to each affected village by the relevant local governments and the villages have disclosed to their populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of Project entitlements

Principle of Replacement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the cut-off-date will be based on the principle of replacement cost. Replacement cost is the amount calculated before displacement, which is needed to replace an affected asset without depreciation and without deduction for taxes and/or costs of transaction as follows:

a. Productive Land based on actual current market prices that reflect recent land sales in the area, and in the absence of such recent sales, based on recent sales in comparable locations with comparable attributes, fees and taxes or in the absence of such sales, based on productive value;

b. Residential land based on actual current market prices that reflect recent land sales, and in the absence of such recent land sales, based on prices of recent sales in comparable locations with comparable attributes; fees and taxes.

c. Existing local government regulations for compensation calculations for building, crops and trees will be used wherever available.

d. Houses and other related structures based on actual current market prices of affected materials;

e. Annual crops equivalent to current market value of crops at the time of compensation;

f. For perennial crops, cash compensation at replacement cost that should be in line with local government regulations, if available, equivalent to current market value given the type and age at the time of compensation payment.

g. For timber trees, cash compensation at replacement cost that should be in line with local government regulations, if available, will be equivalent to current market value for each type, age and relevant productive value at the time of compensation based on the diameter at breast height of each tree.

## PART 4 THE NEED OF LAND ACQUISITION AND RESETTLEMENT

### 4.1 The Need of Land Acquisition and Resettlement

Some of the planned sites for facilities are occupied, so land acquisition with resettlement issue is in progress. The land acquisition related to both 04 component of the project; i) Raw Water Intake Facilities; ii) Raw Water Transmission Pipeline; iii) Regulating Reservoir; and iv) North Binh Duong Water Treatment Plant.

### 4.2 Mitigation Measures

Along with positive impacts on socio-economic development and social lives, the Project will also cause negative impacts to households involved in land acquisition and site clearance, and in the area through which the Project passes. Identifying the negative impacts of land acquisition and site clearance, and proposing mitigation measures, is essential to eliminate or reduce negative impacts.

During Project preparation and design, the resettlement consultant has been closely cooperated with the PMU to minimize the impacts of the project on the lives of people in the project area. To mitigate the impacts on these households, in the Project and ARP implementation process, the following mitigation measures have been and would be applied:

In the Project preparation stage, technical and social teams have worked together to reduce the social impacts of the Project. Appropriate technical designs and construction alternatives have been made to avoid or detour around residential areas, acquiring public land without structures thereon, etc. Avoiding impacts is the Project's most effective mitigation measure and avoids any original negative impacts. At the same time, the technical consultant recommended the different alternatives to choose an optimal one, minimizing land acquisition and resettlement impacts. If negative impacts on properties are unavoidable, adequate compensation plans will be made to at least cover or restore any damages.
In the early stages of the Project's preparation, activities for disseminating information about the Project, land acquisition, site clearance, compensation and resettlement have been widely propagated to gain people's participation and support. On the other hand, getting the right information from the initial phase will help people prepare spirit and facilities for expected impacts from the project. The LFDC conducted public consultations over the project sites to (i) publicize project information and (ii) publicize some projected impacts, land acquisition and compensation scale, compensation and support for production. After populating project information, many opinions were exchanged. In general, local people strongly supported the Project and hoped that it would be soon executed to solve the social issues during construction period.

During implementation for compensation, the PAPs are compensated according to the replacement cost (market price). The unit price for compensation is surveyed by the LFDC and submits to the PPC for approval. Beside market price - based-compensating, the PAPs also get assistance depending on the level of impacts, socio-economic situation of the PAPs. Monitoring and evaluating activities for compensation and site clearance are closely implemented to mitigate the impacts arising from construction.
For the households with their trees and crops affected, they would harvest their trees and crops before land acquisition. They are also informed about the cut-off date of the project to stop cultivating on the affected land.
Particularly pay attention to the vulnerable group, including the poor, loneliness elderlies, single female headed households, disable persons, none-land person. Some PAPs who have no LURC and PAPs who eligible to acquire LURC but have yet receive LURC, the project implementation may strongly impact to those groups. Therefore, full compensation, supports and legally entitlements for them would be taken into account in ARP preparation stage. Especially, the majorities of displaced households are low-income households without land ownership and belong to the vulnerable group, so in the process of ARP implementation, they must be consulted and prioritized choosing income restoration programs.
To the agricultural and business households, beside the compensation according the replacement cost, the ARP will provide assistances such as livelihood stability assistance, support for vocational training and career change, and income restoration for them, etc.

In the construction stage, the Project will encourage the contractors to use the local labors in order to raise jobs and income for people in the project area, especially poor households and directly relocated households by the project.

# PART 5 SCOPE OF LAND ACQUISITION AND RESETTLEMENT

A complete census and detailed measure survey (DMS) have been being conducted in the project area since March, 2012. The DMS determined the corridor of impact by juxtaposing project technical design drawings applicable at the time with cadastral maps of each affected commune. A preliminary list of affected land plots and their owners was accordingly derived from the cadastral records of each area.
The DMS collected data on all affected land and assets (structures, trees, and crops) as well as affected businesses by measuring and enumerating land and other assets with presence of affected households' representatives. The collected DMS data of each household is recorded in one minute with signatures of task team members and household's representative. The Socio-Economic Survey (SES) was conducted on a 100% relocated households, and 20% remaining households.

## 5.1 Scope of Land Acquisition and Resettlement

### 5.1.1 Impacts on Land

There are around 500 of households who are acquired their land. Total of acquired area is 1,679,830m$^2$. There is no any school, health and religion facilities as well as the architects are affected by the Project.

**Table 4 Summary of land acquisition and resettlement**

| Work Items | | Acquired (m$^2$) | | | | Number of relocated households | Number of relocated Persons |
|---|---|---|---|---|---|---|---|
| | | Residential Land | Agricultural Land | Public Land | TOTAL | | |
| 1 | Raw Water Intake Facilities | 0 | 10,500 | 0 | 10,500 | 0 | 0 |
| 2 | Raw Water Transmission Pipeline | 2,000 | 259,330 | 120,000 | 381,330 | 9 | 32 |
| 3 | Regulating Reservoir | 1,500 | 899,140 | 74,360 | 975,000 | 18 | 60 |
| 4 | North Binh Duong Water Treatment Plant | 0 | 310,900 | 2,100 | 313,000 | 0 | 0 |
| **Total** | | **3,500** | **1,479,870** | **196,460** | | | |
| | | **0.2%** | **88.1%** | **11.7%** | **1,679,830** | **27** | **92** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.1.2 Impacts on Housing

There are total 27 displaced houses due to land acquisition with total of using area 1,890m$^2$. In which, there are 9 houses are under the Raw Water Pipeline Component, and 18 houses are under Reservoir Component. All affected houses are private-own, include 5 permanent ones and 22 semi-permanent ones.

### 5.1.3 Impacts on Other Objects and Architectures

Project causes the impacts on the other objects and architectures. Summary is shown in **Table 5**.

**Table 5 Summaries on Impacts on the Other Objects and Architectures**

| No | Work Items | Toilet-Detached | Kitchen-Detached | Bath Room | Animal Stall | Ground, pavement | Graves | Water Pipeline |
|---|---|---|---|---|---|---|---|---|
| | | piece | $m^2$ | piece | $m^2$ | $m^2$ | piece | m |
| 1 | Raw Water Intake Facilities | - | - | - | - | - | - | - |
| 2 | Raw Water Transmission Pipeline | 9 | 135.0 | 9 | 40.0 | 30.0 | 1 | - |
| 3 | Regulating Reservoir | 18 | 270.0 | 18 | 50.6 | 184.0 | - | 500.0 |
| 4 | North Binh Duong Water Treatment Plant | - | - | - | - | - | - | - |
| **Total** | | 27 | 405.0 | 27 | 90.6 | 214.0 | 1 | 500.0 |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.1.4 Impacts on Trees and Crops

Project causes the impacts on the rubber trees. Besides, the Project also causes the impact on some other trees such as cashews, peppers.

**Table 6 Impacts on Trees and Crops**

| No | Work Items | Rubber Trees over 10 year olds | Rubber Trees from5 to 10 year olds | Rubber Trees under 5 year olds | Pepper | Cashew | Crops |
|---|---|---|---|---|---|---|---|
| | | Tree | Tree | Tree | Tree | Tree | m2 |
| 1 | Raw Water Intake Facilities | 25,000 | 30 | - | - | - | 2,000 |
| 2 | Raw Water Transmission Pipeline | 1,800 | 4,800 | 7,150 | 300 | - | - |
| 3 | Regulating Reservoir | 6,000 | 15,650 | 24,420 | 47,070 | 88,140 | - |
| 4 | North Binh Duong Water Treatment Plant | 2,400 | 6,660 | 8,325 | - | - | - |
| **Total** | | **35,200** | **27,140** | **39,895** | **47,370** | **88,140** | **2,000** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.1.5 Impacts on Business

There are one household doing small business which have to relocate their business location. This household has no registered certificate and using family labour instead of hiring labours from outside. Business Income is only the secondary source of the household. Average income from business of this household is under 500,000 dong per month.

### 5.1.6 Impacts on Institutions and Organizations

There is no any institution and organization affected by the Project.

### 5.1.7 Impacts on Public Works

There is no any public work affected by the Project

### 5.1.8 Impacts on cultural structures Heritages

There are not any cultural structures and heritages such as pagodas, temples, historical vestiges, cultural heritage or nature reserve area affected by the project.

### 5.1.9 Temporary Impacts

Besides 500 permanently affected households, the project may temporarily impact some households in the project area during project construction. However, optimal technical design and construction methods will be applied to avoid or minimize causing damage to production and business as well as the lives of local people. Any losses due to temporary impacts occurring during construction will be determined and compensated as per the entitlement matrix.

## 5.2 Socio-economic Profile of PAP

To find out about the socioeconomic conditions, a socioeconomic survey by the questionnaires was conducted with the participation of 100% relocated households (27 households) and 20% other affected households (86 households).

### 5.2.1 Household Population and Labor Force

According to the survey, total population of surveyed households is 461 persons. The average household size is 4.1 persons per household. It is different from household size between the project components: Raw Water Intake Facilities Component and Reservoir Components have average population size is 3.8 person per household and Water Transmission Pipeline and North Binh Duong Water Treatment Plant components are 4.2. and 4.3 person per household. By age category, there are 41.4% of members of the households are in the working – age (from 18 to 55 years old), dependant rate is 51.6% (29.8% under 18 years old and 21.8% from 56 years old or more). Number of average labour per household is 1.97. Table 7 shows the household population that will be affected by land acquisition in wards and communes by the components.

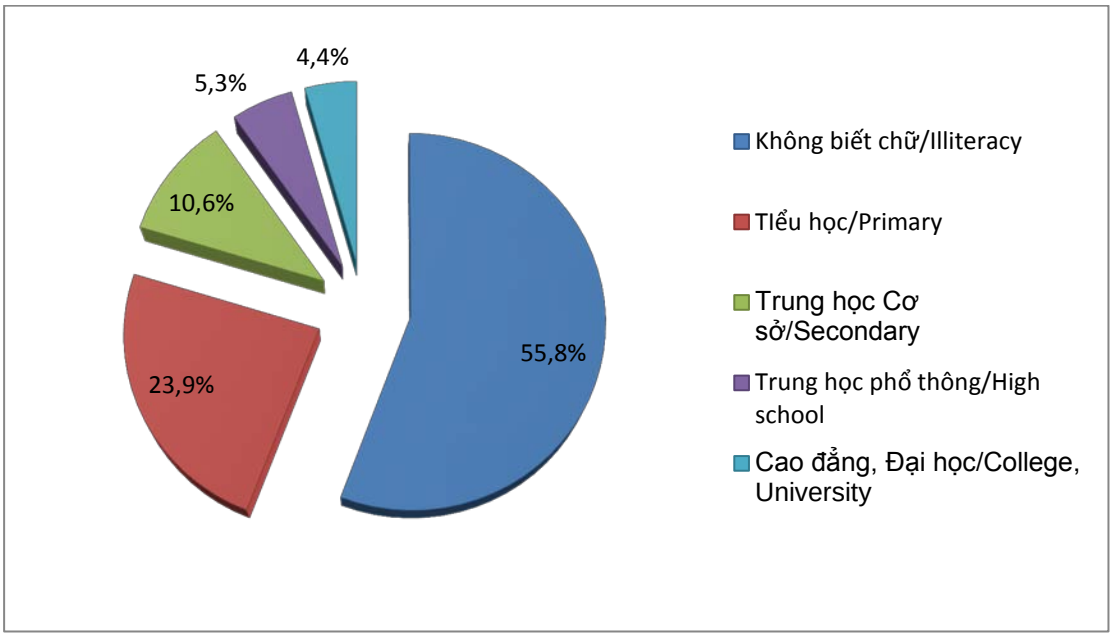
**Table 7 Household Population and Size**

| No | Work Items | HHs | Individuals | No. of Male | No.of Women | No.of labours in HHs | Size of HHs |
|---|---|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | 5 | 19 | 10 | 9 | 9 | 3.8 |
| 2 | Raw Water Transmission Pipeline | 47 | 195 | 96 | 99 | 58 | 4.2 |
| 3 | Regulating Reservoir | 29 | 109 | 54 | 55 | 33 | 3.8 |
| 4 | North Binh Duong Water Treatment Plant | 32 | 138 | 68 | 70 | 41 | 4.3 |
| **TOTAL** | | **110** | **461** | **228** | **233** | **141** | **4.1** |
| **Rate** | | **20** | **-** | **49.5** | **50.5** | **30.6** | **-** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.2.2 Education

According to the survey, the education of the surveyed persons is generally very low. Illiteracy rate presents for 55.8%. Primary education rate presents for 23.9% and secondary one presents for 10.6%. High school rate accounts 5.3% only. College or university accounts for 4.4% only and it is high concentrated in the Water Treatment Component where has living standard is much higher than other project sites.




Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

**Figure 4 Education of Affected Household**

Detailed education by component is shown in the **Table 8**:

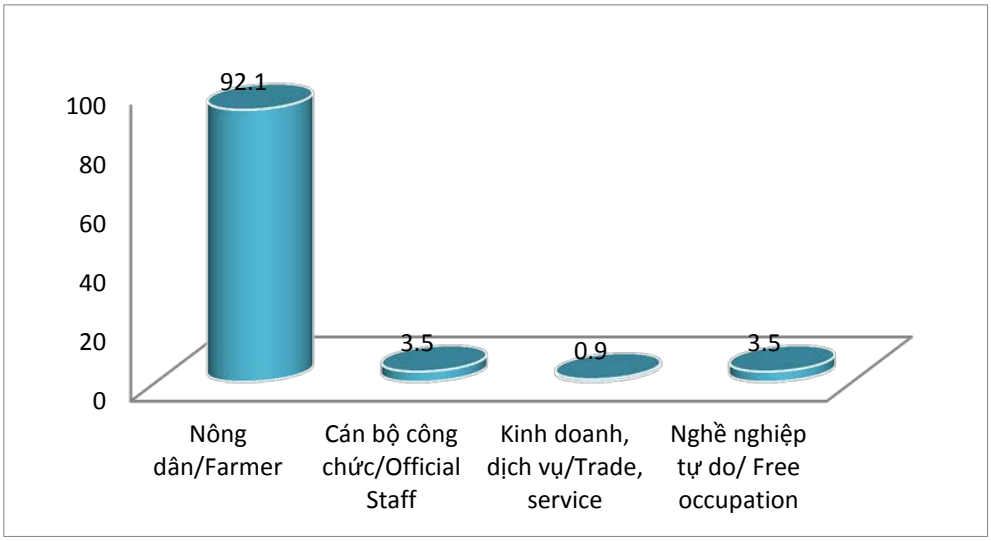
**Table 8 Education of affected households**

| No | Work Items | | Illiteracy | Primary School | Secondary School | High School | College or University |
|---|---|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | Quantity | 3 | 1 | 1 | 0 | 0 |
| | | Rate | 60.0 | 20.0 | 20.0 | 0.0 | 0.0 |
| 2 | Raw Water Transmission Pipeline | Quantity | 31 | 7 | 5 | 2 | 2 |
| | | Rate | 65.9 | 14.9 | 10.6 | 4.3 | 4.3 |
| 3 | Regulating Reservoir | Quantity | 13 | 12 | 2 | 1 | 1 |
| | | Rate | 44.8 | 41.5 | 6.9 | 3.4 | 3.4 |
| 4 | North Binh Duong Water Treatment Plant | Quantity | 16 | 7 | 4 | 3 | 2 |
| | | Rate | 50.0 | 21.9 | 12.5 | 9.4 | 6.2 |
| **TOTAL** | | Quantity | **63** | **27** | **12** | **6** | **5** |
| | | Rate | **55.8** | **23.9** | **10.6** | **5.3** | **4.4** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.2.3 Household Occupation

Most of interviewees are farmers (presents 92.1%). Main occupation of these households are growing and harvest the rubber gums. There are only 3.5% are state officials, and 3.5% are free occupations. Occupation structure of affected households is shown at the chart below:




Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

**Figure 5 Occupation structure of affected households**

Details are showed at the **Table 9**.

**Table 9 Occupation of affected households**

| No | Work Items | Farmers | State Officials | Business, services | Free Occupations |
|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | 4 | 0 | 1 | 0 |
| 2 | Raw Water Transmission Pipeline | 40 | 3 | 0 | 4 |
| 3 | Regulating Reservoir | 87 | 0 | 0 | 0 |
| 4 | North Binh Duong Water Treatment Plant | 31 | 1 | 0 | 0 |
| **TOTAL** | | **103** | **4** | **1** | **4** |
| **Rate** | | **92.1** | **3.5** | **0.9** | **3.5** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.2.4 Living Standards, Income and Expenditure

*a) Income of Affected Households*

According to surveyed result, average income per capita of affected household is very high, at VND4.112.000/month. Average income per capita from 3 million to 5 million per month presents 31.9% and from 5 million per month or more presents 29.2%. Average income from 1 million to 2 million per month presents 16.8%. Average income per capita under 1 million dong presents 6.2% only.

**Table 10 Average Income of Affected Households**

Unit: Vietnam dong

| No | Work Items | 500,000-1,000,000 | 1,000,000-2,000,000 | 2,000,000-3,000,000 | 3,000,000 - 5,000,000 | 5,000,000 or more |
|---|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | 0 | 1 | 1 | 2 | 1 |
| 2 | Raw Water Transmission Pipeline | 6 | 9 | 11 | 11 | 10 |
| 3 | Regulating | 0 | 4 | 5 | 12 | 8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Reservoir | | | | | |
| 4 | North Binh Duong Water Treatment Plant | 1 | 5 | 1 | 11 | 14 |
| **TOTAL** | | **7** | **19** | **18** | **36** | **33** |
| **Rate** | | **6.2** | **16.8** | **15.9** | **31.9** | **29.2** |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

Most of income source of affected households come from gum trees (78.9%), only 9.6% from trade or business or service and 8.9% from salary.

**Table 11 Structure of Income Sources of Affected Households**

| Income Source | Raw Water Intake Facilities | Raw Water Transmission Pipeline | Regulating Reservoir | North Binh Duong Water Treatment Plant | % Total |
|---|---|---|---|---|---|
| Agriculture (Gum Trees) | 58.0 | 78.4 | 81 | 74.2 | |
| Salary | 0.0 | 9.1 | 8.8 | 5.1 | |
| Business/Services | 41.4 | 9.8 | 8.8 | 19.8 | |
| Allowance/Giving | 0.6 | 0.4 | 0.3 | 0.1 | |
| Free Occupation | 0.0 | 2.3 | 1.1 | 0.8 | |

Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

*b) Expenditure of Affected Households*

Expenditure on food accounts for a large proportion of the expenditure structure of affected households (52.9%), following is expenditure on education (21.8%) and clothing, transportation and customs (accounting for 11.9%). Expenditure distribution are shown in the table below:

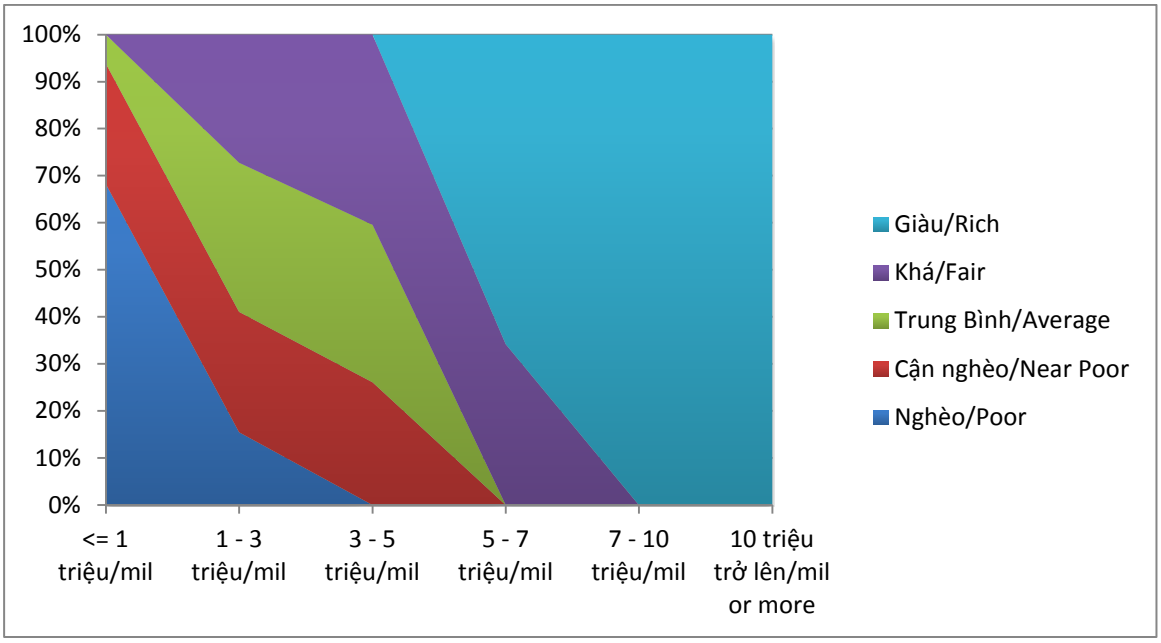
**Table 12 Structure of Expenditure of Households**

| Expense items | Raw Water Intake Facilities | Raw Water Transmission Pipeline | Regulating Reservoir | North Binh Duong Water Treatment Plant |
|---|---|---|---|---|
| Food | 52.0 | 62.0 | 55 | 44.5 |
| School | 22.0 | 16.5 | 15.3 | 30.1 |
| Health | 3.3 | 3.1 | 3.1 | 2.8 |
| Travel, clothes, customs | 12.5 | 10.7 | 13.0 | 12.4 |
| Electricity | 2.3 | 1.6 | 1.7 | 3 |
| Others | 7.9 | 6.1 | 11.9 | 7.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

*c) Evaluation of Classification*

There are significant differences in per capita income, per capita expenditures and accumulation between the Project components. In other words, there are significant differences in living standards between the areas under the Project's different components. Income, expenditure and accumulation of the Wastewater Treatment Plant component are significantly higher than the remaining components. Income, expenditure and accumulation of the Raw Water Pipeline component are lowest in comparison to other component.




Source: JICA Survey Team(This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

**Figure 6 Level of Expenditure by Poor/None Poor Classification**

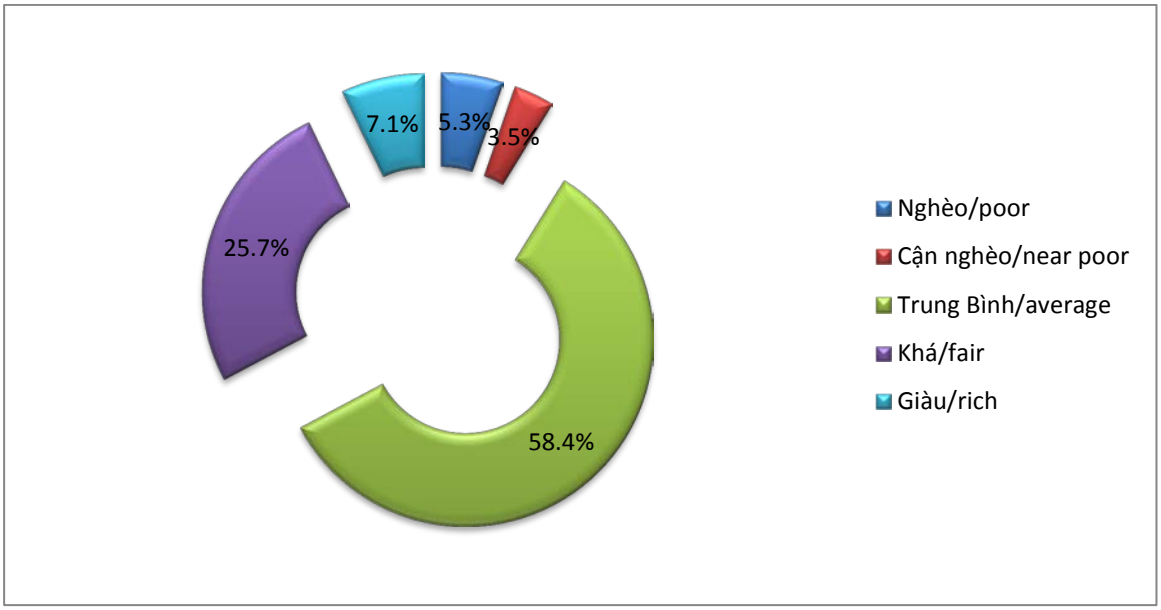
**Table 13 Monthly Income, Expenditure and Accumulation of the Households by Component**

Unit: Vietnam dong

| No. | Work Items | Monthly Income | Monthly Expenditure | Monthly Accumulation |
|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | 3,019,000 | 2,562,000 | 456,000 |
| 2 | Raw Water Transmission Pipeline | 3,625,000 | 2,225,000 | 1,400,000 |
| 3 | Regulating Reservoir | 4,410,000 | 2,644,000 | 1,767,000 |
| 4 | North Binh Duong Water Treatment Plant | 5,388,000 | 3,359,000 | 2,028,000 |
| | **Total** | **4,180,000** | **2,564,000** | **1,616,000** |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

The analysis showed that the accumulation of the surveyed households is generally quite high, especially in the WTP where having a large of the rubber tree area. Through the investigator's classification based on income, expenditure and living accommodations, most households have an average living standard (58.4%) and fair one presents 25.7%, and rich household portion is 7.1%. However, the rich-poor gap is also shown quite clearly the project area. 32.8% of households have fair and rich living standards and wealth, while 8.8% of the households have poor living standard, in other words, these are under vulnerable group. Therefore, it is necessary for the Project to specially pay its attention to this group, priority and special support for them, avoid impoverishment.




Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

**Figure 7 Living Standard Classification of Households According to Surveyor's Evaluation**

**Table 14 Living Standard Classification of Households According to Surveyor's Evaluation**

| No. | Work Items | | Poor | Near Poor | Average | Fair | Rich | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | Quantity | 1 | 0 | 3 | 1 | 0 | 1 |
| | | Rate % | 20.0 | 0.0 | 60.0 | 20.0 | 0.0 | 20.0 |
| 2 | Raw Water Transmission Pipeline | Quantity | 4 | 2 | 26 | 13 | 2 | 4 |
| | | Rate % | 8.5 | 4.3 | 55.3 | 27.6 | 4.3 | 8.5 |
| 3 | Regulating Reservoir | Quantity | 0 | 1 | 19 | 6 | 3 | 0 |
| | | Rate % | 0.0 | 3.4 | 65.5 | 20.7 | 10.3 | 0.0 |
| 4 | North Binh Duong Water Treatment Plant | Quantity | 1 | 1 | 18 | 9 | 3 | 1 |
| | | Rate % | 3.1 | 3.1 | 56.3 | 28.1 | 9.4 | 3.1 |
| | Total | Quantity | 6 | 4 | 66 | 29 | 8 | 6 |
| | | Rate % | 5.3 | 3.5 | 58.4 | 25.7 | 7.1 | 5.3 |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

### 5.2.5 Accommodations and home comforts

Another indicator is the living means and accomodations of the households which can help categorizing living standards more objectively when based on observations and interviews by the investigators. Table below gives quite detailed description of the means and facilities of living of households from the sample survey results.

**Table 15 Furnitures of the Surveyed Households**

**(%)**

| | Raw Water Intake Facilities | Raw Water Transmission Pipeline | Regulating Reservoir | North Binh Duong Water Treatment Plant | % Total |
|---|---|---|---|---|---|
| Bicycle | 0.0 | 6.4 | 13.8 | 28.1 | 14.2 |
| Motorbike | 60.0 | 89.4 | 93.1 | 100.0 | 92.0 |
| Car | 0.0 | 2.1 | 3.4 | 34.4 | 11.5 |
| Air Conditioner | 20.0 | 2.1 | 6.8 | 20.7 | 8.8 |
| Washing Machine | 20.0 | 25.5 | 51.7 | 78.1 | 46.9 |
| Bed/Wood Furniture | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Television | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Telephone Set | 0.0 | 0.0 | 0.0 | 0.0 | 97.3 |
| Mobile Phone | 100.0 | 95.7 | 96.6 | 100.0 | 3.5 |
| CD/DVD player | 0.0 | 0.0 | 10.4 | 3.1 | 6.2 |
| Computer | 20.0 | 0.0 | 3.4 | 15.6 | 100.0 |
| Rice-Cooker | 100.0 | 91.5 | 100.0 | 100.0 | 95.6 |
| Gas Cooker | 60.0 | 98.0 | 89.7 | 100.0 | 93.8 |
| Refrigerator | 80.0 | 89.4 | 3.4 | 100.0 | 14.2 |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

According to the survey result, the most common accommodations are bed/wood furniture (100.0%), television (100.0%), rice-cooker (100.0%), mobile phone (97.3%), gas cooker (95.6%), fridge (93.8%). The expensive living home comforts are common in the Water Treatment Plant Component but not common in another components. Also in this component, car rate presents 11.5% and washing machine rate is 46.9%. This shown a clear difference in living standards between the households in this component in comparision to the remaining components.

### 5.2.6 Socio-economic Profile of Vulnerable Group

Households are under vulnerable group include i) poor households; ii) landless households; single women headed households; iii) households with martyrs or invalid persons; iv) households with disabled persons and the other persons who are entitled from the Viet Nam government's social policies.
A summary of other vulnerable PAPs households is presented in the **Table16**.

**Table 16 Summary of other vulnerable PAPs**

| No. | Work Items | | Poor | Single Woman-Headed HHs | HHs with Invalid Persons | Others | % Total |
|---|---|---|---|---|---|---|---|
| 1 | Raw Water Intake Facilities | Quantity | 1 | 0 | 1 | 1 | 3 |
| | | Rate | 33.3 | 0.0 | 33.3 | 33.3 | 60.0 |
| 2 | Raw Water Transmission Pipeline | Quantity | 0 | 0 | 5 | 4 | 9 |
| | | Rate | 0.0 | 0.0 | 55.6 | 44.4 | 19.1 |
| 3 | Regulating Reservoir | Quantity | 2 | 1 | 2 | 2 | 7 |
| | | Rate | 28.6 | 14.2 | 28.6 | 28.6 | 24.1 |
| 4 | North Binh Duong Water Treatment Plant | Quantity | 1 | 0 | 2 | 0 | 3 |
| | | Rate | 33.3 | 0.0 | 66.7 | 0.0 | 9.4 |
| | **Total** | **Quantity** | **4** | **1** | **10** | **7** | **22** |
| | | **Rate** | **3.5** | **0.9** | **8.8** | **6.2** | **19.5** |

Source: JICA Survey Team (This table will be updated by BIWASE because Regulating Reservoir's location will be changed)

The above table shows that rate of vulnerable group is relatively high in the project area (present 19.5%) and scattered in all project components. The process of land acquisition should be paid its attention to and special support for these groups so that they can recover their economic and lives as quickly as possible.

### 5.2.7 Issue of Ethnic Minorities

There are no affected Ethnic Minorities in this Project.

### 5.2.8 Gender Issues

During project implementation, the attentions should be paid to women to:

- Ensure women participation in meetings and consultations in HIV/AIDs protection and prevention of women trafficking;
- Ensure payments to be paid directly or with presence of the women;
- Ensure the grievances to be solved satisfactorily for both men and women;
- Ensure women to be enjoyed the income and livelihood restoration programs;
- Ensure jobs creation for the local women in the project to be a priority.

## PART 6 COMPENSATION POLICY

### 6.1 Objectives for Resettlement

The objectives of the Vietnamese legislation governing resettlement and rehabilitation of displaced persons, and that of JICA's Policy concerning involuntary resettlement, have been adapted for the preparation of this Abbreviated Resettlement Plan (ARP). The objectives are set out below. Where there are gaps between the Vietnam legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Vietnamese law and JICA's Policy.

The main objective of the ARP is to ensure that all PAPs will be compensated for their losses at replacement cost.

### 6.2 Eligibility

Any person who at the cut-off-date was located within the area affected by the project, its components, or other project's parts thereof, and would;
(a) The person have formal legal rights to land (including customary and traditional rights recognized under the Vietnamese laws); or
(b) The person does not have formal legal rights to land at the time the census begins but have a claim to such land or assets - provided that such claims are recognized under the laws of Vietnam or become recognized through processes identified in the resettlement plan; or
(c) The person does not have legal nor recognizable by law rights to the land they are occupying or land have properties/assets within the project areas before the cut-off date.

Persons covered under (a) and (b) are provided compensation for the land they lose and other assistance at full replacement cost. Persons covered under (c) are provided resettlement assistance in lieu of compensation for the land they occupy, and other assistance, as necessary, to achieve the objectives set in this ARP, if they occupy the project area prior to the cut-off date. Persons who encroach on the area after the cut-off date are not entitled to compensation or other form of resettlement assistance. All persons in (a), (b) or (c) are provided compensation for loss of assets other

than land.

### 6.3 Principles of Resettlement

The principle for resettlement policy in the Project will be as follows:
(i) Acquisition of land and other assets, and resettlement of people will be minimized as much as possible.
(ii) All PAPs residing, working, doing business or cultivating land within the recovered area under the Project as of the cut-off-date are entitled to be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-Project living standards, income earning capacity and production levels. Lack of legal rights to the assets lost will not bar the PAP from entitlement to such rehabilitation measures.
(iii) Compensation for loss of land and trees at replacement cost
(iv) Adequate budgetary support will be fully committed and be made available to cover the costs of land acquisition and resettlement and rehabilitation within the agreed implementation period. Physical resources for resettlement and rehabilitation will be made available as and when required.
(v) Civil works contractors will not be issued a notice of possession or a notice to proceed for any sub-project unless the Government has
a. Completed, satisfactorily and in accordance with the approved ARP for that sub-project, compensation payments, and
b. Entitlements will be provided to PAPs no later than one month prior to expected start-up of civil works at the respective project site.
(vi) Institutional arrangements will ensure effective and timely design, planning, consultation and implementation of the ARP.

### 6.4 Cut-off Date

For the Project, the cut-off-date for eligibility for entitlement is defined as the completion of the measurement survey on affected land. The survey is based on the preliminary scheme design. Should the design be developed further to require more, or different land, the inventory of loss will be updated and the cut-off date revised in accordance. Those whose livelihood activities may be affected by temporary land acquisition as the result of civil works will also receive compensation and assistance.

### 6.5 Site Preparation and Relocation

Through the consultation meetings, the relocated households expected and can arrange to resettle by themselves, therefore, it would have no resettlement site to be prepared.
In case the PAPs arise the need of resettlement land, the Project will provide the resettlement land lots will full infrastructure meeting their needs.

### 6.6 Rehabilitation

The project ensures to fully compensate and to assist for affect land/assets/works basing on replacement price. Besides, the policies of rehabilitation supports for affected person will be implemented based on the JICA's and Viet Nam Government's policies, to ensure their livelihood is equal or better in comparison to the Pre-project. The rehabilitation includes;

(i) Supports for Living and Production Stabilization (include supports for PAPs with affected agricultural land, supports for PAPs with affected business and production, support for relocating and temporary residence, support for temporary impacts on production and business,
(ii) (ii)Support for Vocational Training and Job Creation, and
(iii) (iii) Special supports for the affected vulnerable groups.

Details of the rehabilitation activities is listed in the **Table 17**.

## 6.7 Project Entitlements

The Entitlement Matrix, presented in **Table 17**, covers the impacts currently identified during project preparation. It covers also the impacts which could arise during the construction period.

**Table 17 Entitlement Matrix**

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| **I. LAND** | | | | | |
| 1 | Productive land (agricultural, orchard land, aquaculture, garden) | Losing less than 20% of total landholding, remaining unaffected portion is viable for productive use | a. Owners with LURC, eligible to acquire LURC according to Government regulations, or otherwise legalizable under Government regulations | (i) Cash compensation for acquired land at replacement cost which is equivalent to current market price and free from transaction costs (e.g., taxes, certification, administration costs);<br>(ii) Assistances for the PAPs affected their productive land, see the item III below<br>(iii) For none-land affected assets, see item II below. | If the area of the remaining land is not viable, and if the PAP so agrees, then the remaining portion of land will be acquired according to the project's compensation/ assistance regime.<br>PAPs are obliged to pay pre-existing outstanding financial obligations to the state related to affected land from land compensation.<br>Affected households to be notified at least 3 months prior to the date that the land will actually be acquired by the Project |
| | | | b. User with lease or temporary right | (i) No compensation for land, but compensation for investment costs for land and/or remaining contract period;<br>(ii) Compensation for non-land affected assets, see item II below. | LFDC will determine the value of investments on the affected land in consultation with the PAP. |
| | | | c. Non-titled user not eligible to become legalized | (i) No compensation for land;<br>(ii) Compensation for non-land assets (crops, trees and structures), see item II below.<br>(iii) If the PAP is classified as poor and directly use the land they are entitled to receive cash assistance as per PPC decision. | |
| | | Losing 20% or more of total landholding (Entire land affected or the remaining unaffected portion is not viable for productive use) | a. Owners with LURC, eligible to acquire LURC according to Government regulations, or otherwise legalizable under Government regulations. | (i) Due to limitation of agricultural land, affected households will get compensate by cash for the lost land at replacement cost which is equivalent to current market price and free from transaction costs (e.g., taxes, certification, administration costs);<br>(ii) If loss is equivalent to 20% or more of total agricultural land: assistance for livelihood restoration programs will be provided;<br>(iii)Assistances for the PAPs affected their productive land, see the item III below. | Affected households to be notified at least 3 months prior to the date that the land will actually be acquired by the Project; |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | (iv) Compensation for non-land affected assets, see item II below.<br>(v) Entitle for allowances due to severe loss, see item 8 and 10 below. | |
| | | | b. User with lease or temporary right | (i) No compensation for land, but compensation for investment costs for land and/or remaining contract period;<br>(ii) Compensation for non-land affected assets, see item II below. | LFDC will determine the value of investments on the affected land in consultation with the PAP. |
| | | | c. Non-titled user and not eligible to become legalized | (i) No compensation for land;<br>(ii) Compensation for non-land assets (crops, trees and structures) See item II below.<br>(iii) If the PAP is classified as poor and they directly use the land they are entitled to cash assistance as per PPC decision. | |
| | | Temporary loss | Land users regardless of tenure status. | (i) Cash compensation based on average productivity of three years multiplied by the duration of using time. The amount of the compensation will not be less than the minimum wage for those whose labor is displaced from the affected land.<br>(ii) Full restoration of affected land to pre-impact conditions.<br>(iii) PAPs being thus displaced for periods in excess of one year will be entitled to participate in vocational training programs. | Temporary impacts will be minimized by reducing the area used, utilizing areas being permanently acquired for the project where feasible and reducing the time of the temporary acquisition as much as possible. |
| **2** | Residential land | Residential land with structures where remaining land is sufficient to rebuild a house and not requiring relocation. | a. Owners with LURC, eligible to acquire LURC according to Government regulations, or otherwise legalizable under Government regulations. | (i) Cash compensation for the portion to be acquired permanently at replacement cost which is equivalent to current market price and free from transaction costs (e.g., taxes, certification, and administration costs).<br>(ii) Compensation for non-land affected assets see items II below. | Minimum permitted residential lot size to rebuild house is according to provincial regulations (100m2).<br>Affected household to be notified at least 6 months prior to the date that the land will actually be acquired by the Project |
| | | | b. Non-titled user and not eligible to become legalized. | (i) No compensation for land,<br><br>(ii) Compensation for non-land assets (structures, crops and trees), see item II below. | |
| | | Residential land with structures where remaining land is insufficient | a. Owners with LURC, eligible to acquire LURC according to Government regulations, or | **Relocated households are entitled to selecting one of the following options:**<br>***Cash compensation***<br>(i) Cash compensation at replacement cost which is equivalent to current market | Resettlement sites are to have adequate infrastructure and access to social services.<br>Depending on the area, category and location of affected land, PAPs may be entitled to additional resettlement lots as |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | to rebuild a house. | otherwise legalizable under Government regulations. | price and free from transaction costs (e.g., taxes, certification, and administration costs) if PAPs refusing receive a plot of resettlement land.<br><br>(ii) Those entitled to receive a resettlement lot, but choose self-relocation shall receive a lot infrastructure development grant as per relevant provincial decision.<br>(iii) Entitle for allowances associated with relocation of house, see item 9 below<br>(iv) Assistance for livelihood stabilization.<br>***Residential plot at a resettlement site***<br>(v) Relocated households shall be entitled to provision of at least one standard resettlement lot;<br>(vi) Relocated households whose directly work on agricultural production (land-based income) will be given preference to resettle near the former residence. These households will also be paid compensation by cash and support priority to resettle in the new residence at least equal to or better than the former residence.<br>(vii) Where extended families jointly reside on the same acquired lot and would be eligible for separate household registration books, or if there are multiple households jointly holding the same LURC then additional resettlement lots will be granted with an equivalent value.<br>(viii) PAPs who receive resettlement land but the value of the compensation and assistance is higher than the value of a standard lot in resettlement site, shall receive the balance of the value of the lot as assistance. If they do not receive a resettlement lot they will receive the equivalent value of the difference between the amount of compensation/ assistance and the minimum value of one resettlement lot as cash. [ND 69/2009:19(1)]<br>(ix) PAPs who have no other | specified in the relevant PPC's decision.<br>Where the entitlement for number of lots granted are less than the actual number of households of an extended family living separately on the acquired land, favorable consideration will be given to grant priority access of remaining households to purchase resettlement plots and facilitate suitable payment arrangements as needed.<br>The allocation of resettlement lots will be taken account of the needs of extended families to be co-located. In this regard, special attention will be paid to the elderly residing separately, female headed households and vulnerable PAPs.<br>Affected household to be notified at least 6 months prior to the date that the land will actually be acquired by the Project |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | places of residence will be provided with residential land or houses for resettlement.<br>In case their compensation and support amount is smaller than the value of a minimum quota, PAPs will receive the difference as resettlement support. If refusing to receive residential land or houses in resettlement areas, PAPs are entitled to a cash amount equivalent to such difference. | |
| | | | b. Land users without LURC and whose land use is not legalizable. | (i) No compensation for land.<br>(ii) Entitled to participate in livelihood restoration programs.<br>(iii) Those displaced from land they are residing on prior to the cut-off date, have no alternative accommodation and who are otherwise ineligible for a resettlement lot shall be favorably considered in accordance with Decision of PPC.<br>(iv) Compensation for non-land affected assets see items II below.<br>(v) Entitle for allowances associated with relocation of houses, see item 7 below. | Affected household to be notified at least 6 months prior to the date that the land will actually be acquired |
| | | Residential land with no residential structures | Owners with LURC, or eligible to acquire LURC according to Government regulations | (i) Cash compensation for the portion of the land to be acquired permanently at replacement cost. | If the remaining portion of the land is less than minimum permitted residential lot size then the entire lot will be acquired and compensated. |
| 3 | Public land | | | (i) No compensation for affected public land. The project will be supported for the acquired public land of the commune or ward by decision of the PPC.<br>(ii) Compensate for the non-land assets according to the market price. | |
| **II** | **STRUCTURES, CROPS & TREES** | | | | |
| 4 | House and other structures | Houses and other structures partially affected and the remaining is still used | Owner of structures regardless of tenure status | (i) Cash compensation at replacement cost equivalent to current market prices without depreciation or deductions for salvaged building materials for the affected portion at the time of compensation.<br>(ii) Compensate for repair cost equal to the actual cost of repair (materials and labor).<br>(iii)For allowances, see item 7 below | |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | Houses and other structures totally affected or partly affected but the remaining is not used | Owner of structures regardless of tenure status | (i) Cash compensation at replacement cost equivalent to current market prices without depreciation or deductions for salvaged building materials for the entire structure at the time of compensation.<br>(ii) Compensate for repair costs equal to the actual payments (labor & materials)<br>(iii)For allowances, see item 7 below | PAPs who affected the houses, but have no land shall be favorably considered for assistance. |
| | | Business structures | Owner of structures regardless of tenure status | (i) Cash compensation at replacement cost equivalent to current market prices without depreciation or deductions for salvaged building materials for the entire structure at the time of compensation.<br>(ii) Other business assets (not structures): Owners of businesses will be considered (by PPC) to be assisted with relevant costs of not fixed business assets (material and equipment) remaining at the time of displacement. The PPC will decide on assistance based on each specific case after receiving a request from the owner of the business.<br>(iii)For allowances, see item 10 below | Affected business structures built after the cut-off date shall not be compensated. |
| | | Graves | Affected household | (i) All costs for excavation, relocation and reburial will be reimbursed in cash. | For ownerless affected graves, compensation will be given to Commune PCs to relocate them to a local cemetery.<br>Graves to be exhumed and relocated in culturally sensitive and appropriate manner. |
| 5 | Crops, trees, and aquaculture products | Loss of or damage to trees/crops | Owners regardless of tenure status | (i) Cash compensation for annual crops and aquaculture products equivalent to current market value of crops/aquaculture products at the time of compensation;<br>(ii) For perennial crops and trees, cash compensation at replacement cost equivalent to current market value given the type, age and productive value (future production) at the time of compensation.<br>(iii) Timber trees are compensated by cash, based on diameter at breast height at current market value. | PAPs have the right to use salvageable trees.<br>PAPs will be notified at least 3 months prior to land acquisition.<br>PAPs will receive cash compensation based on market cost of ripened crops/fruit for any un-harvested crops that were planted prior to the land acquisition announcement.<br>No compensation for trees/crops is going to harvest. |
| 6 | Public facilities | Loss of or damage to assets | Relevant agencies | Cash compensation to cover the cost of restoration or repair the facilities | Relocation or reconstruction of public facilities will be done with minimal disruption to public service. |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| **III** | **ASSISTANCEs** | | | | |
| 7 | Displacement from residential housing | Severe impacts on house | Relocating households regardless of tenure status | ***Transport allowance*** as follows:<br>(i) The relocated households also get support for relocation with VND3.000.000 for each household to relocate within 10km or less and VND5.000.000 to relocate within over 10km.<br>(ii) For the political organizations or offices: Getting support for relocating fee;<br>(iii) For the other organizations which are eligible to get compensation for land and assets: Get supports for the actual costs for relocating, dismantling, and installing when they are relocated.<br>(iv) For those without alternative accommodation and are: shall be arranged the temporarily residence or receive assistant in cash at VND2.000.000 in 06 months during awaiting for resettlement house;<br>(v) For the households who are acquired their land entitled to get a residential land or house expecting to get cash to be self- resettled, they will get assistances according to the regulations besides getting compensation.<br>(vi) The persons who are using the state-owned house (hiring houses or self-managed houses of agencies) if relocate:<br>- Be compensated for the costs of self-improvement, repairing, upgrading, and the level of compensation is made by the Province's PC.<br>- Be hired house according to the state-owned rent price in the resettlement areas with an area equivalent to the former hiring area.<br>- For the cases without resettlement houses, PAPs will be supported in cash to self-resettle, level of assistance equivalent to 60% of the land value and 60% of the value of the current hiring house.<br>(vii) The PAPs who are | Transport allowance to be provided to PAPs displaced from rented accommodation and those temporarily displaced from owned residential accommodation in addition to those permanently displaced from owned accommodation. |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | unstate-owned hiring house if relocate:<br>- Support for relocating as resettlement relocating.<br>- Support for livelihood and production stabilization last for 6 months with 30kg of rice per capita per month at an average price at the time of support.<br><br>(vii) PPC will review and decide on the higher assistance level for the cases as the follows:<br>- House hiring lasts for a long time (6 months or more)<br>- The affected households who have many members or many affected households are living in a family<br>- Hiring the office for organization(s) or business locations/ production facilities for businesses<br><br>***Vocational training and income restoration***<br>(viii) Household members whose livelihoods are impacted due to relocation are entitled to participate in livelihood restoration programs including:<br>• Any one vocational training course within the province free of charge;<br>• Income restoration programs sponsored under the project. | |
| 8 | Loss of income/ livelihood due to loss of agricultural land | Losing 20% or more of total agricultural land and/or relocation | PAPs directly farming affected land | ***Stabilization allowance***<br>(i) losing 20-<70% of agricultural land: Cash grant at VND 500.000 per person per month for a period of 6 months if not required to relocate and for a period of 12 months if required to relocate and for a period of 24 months for the households relocating to the extremely difficult area of agriculture.<br>(ii) losing 70-100% of agricultural land: Cash grant at VND 500.000 per person per month for a period of 12 months if not required to relocate and for a period of 24 months if required to relocate and for a period of 36 months for the households relocating to the extremely difficult area of agriculture.<br><br>***Job creation and vocational*** | PAPs not eligible for compensation of affected agricultural land will be entitled to stabilisation allowance, income restoration allowance, and vocational training assistance.<br>However, the above does not affect the entitlements that vulnerable PAHs are otherwise eligible for under ARP entitlements. |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | ***training allowance*** (see item 9 below)<br><br>***Agricultural extension services***<br>• PAPs compensated by land-for-land shall receive technical and material support to promote their farming production. The type of agricultural extension services provided shall be based on consultations with the respective PAPs. | |
| 9 | Job creation and vocational training allowance | Losing agricultural land located outside residential/urban area | PAPs directly cultivate on affected land | Cash support equivalent to 1.3 - 3 times of the current market value of the agricultural land acquired depending on land position but not excess the quota of agricultural land allocation in locality. | |
| 10 | Loss of Income/ livelihood due to relocation of business | Severe impacts on businesses (20% or more of total of income) | PAPs losing business Income | ***Business stabilization allowance***<br>(i) For registered businesses:<br>- Business with revenue less than VND 10 million per month, cash assistance equivalent to 10% of revenue within 6 months.<br>- Business with revenue from VND10 million or more per month, cash assistance according to actual income within 6 months, but not less than VND6 million per household.<br>- Enterprises are stopped producing or business by the Project:<br>Cash assistance based on actual profits within 3 months. Revenue and profits are calculated according to average of the most recent year with confirmation from the tax office.<br><br>(ii) For non-registered businesses:<br>Cash assistance equivalent to 50% of monthly revenue for a period of 3 months certified by local taxation if PAP pay taxes and duties.<br>If PAPs not paid taxes and duties, they need collecting the local authority and community's endorsement of revenue.<br><br>***Business rental assistance***<br>Due to early relocation request that affected | Affected business owners may nominate an immediate family member at working-age to participate in vocational training in lieu of themselves. |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | businesses renting business premises will be entitled to cash assistance following decision of PPC. | |
| | | | Employees losing their job in affected businesses | ***Allowance for employees***<br>(i) Employees with minimum 6 working months through labor contracts employed by registered businesses:<br>Cash allowance equivalent to 70% of pre-tax wage for the duration of cessation of the affected business or 3 months, which every period is less, according to the confirmation from the tax office.<br>(ii) Workers did not sign labor contracts with the enterprises or business households but have worked at least 6 months:<br>Support in cash equivalent to 70% of monthly-paid salary on average of last 6 months, with the endorsement of the local taxation on the employment and wages status if enterprises or business households paid tax.<br>If no pay tax, enterprises or business households need collecting local authority & community on the employment and wages of such PAPs. Time for support is 3 months.<br><br>***Vocational training and income restoration***<br>(iii) All owners/partners of the affected business (registered or non-registered), if in need, are entitled to participation in:<br>• any one vocational training course within the province free of charge;<br>• Income restoration programs sponsored under the project. | Local community and PC of ward/commune where the affected business located will certify employment status and wage of affected employees without labor contracts. |
| 11 | Support for affected agricultural land | Affected land is located next to residential land parcel with houses but not classified as residential land | Eligible owner | PAPs whose garden land, pondage which is located on the same land lot having a residential house but not classified as residential land; garden land, pondage on the same land lot having separate house; garden land, pondage on the same land lot having house located along a canal and traffic road;<br>In addition to the compensation based on agricultural land price of | |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | orchard land, are entitled to assistance from 20% to 50% of the value of residential land (at replacement cost), depending on the land position, in the locality of the affected land. The maximum area calculated for this assistance is not larger than 5 times the quota of residential land allocation in the local area. | |
| 12 | Support affected agricultural land located within or next to residential area or wards | Affected land is located within or next to resident area or wards | Eligible owner | Assistance from 20% to 50% of average price of residential land (at replacement cost), depending on the land position, in the locality of the affected land. The maximum area calculated for this assistance is not larger than 5 times the quota of residential land allocation in the local. | |
| **IV** | **SPECIAL ASSISTANCE** | | | | |
| 13 | Higher risks of impoverishment/ hardship due to loss of resource base/ relocation. | Loss of land and non-land assets and relocation. | Affected vulnerable groups regardless of severity of impacts | ***Special Assistance***<br>- Heroic Vietnamese Mothers, Heroes of the People's Armed Forces, Labor Heroes get assistance VND5,000,000 per household;<br>- War invalids, martyrs' families (father, mother, wife, husband, children are martyrs) get assistance VND3,000,000 per household;<br>- Families with people whom contributed to the revolution, revolutionary veterans home, families with retirement state officials and beneficiaries of other regularly social assistance get assistance at VND2,000,000 per person per household.<br>- In case of a household with many people get the assistance as above, the Project only assist for the person who get the highest level.<br>- For the particular case, LFDC submit their propose to the PPC for approval<br><br>***Vocational training and income restoration***<br>In addition to other income restoration, entitlements mentioned elsewhere vulnerable and female headed households are entitled to:<br>• One additional vocational training course per household | Several other cases belonging to the vulnerable group need consider to assist, such as landless households, poor households, single women headed households with dependants, the disabled and the other cases are entitled assistances following Vietnam Government Policy. |

| No | Impact | Level Of Impact | Eligible Persons | Entitlements | Implementation Issues |
|---|---|---|---|---|---|
| | | | | member at working-age within the province free of charge;<br>• Additional income restoration program assistance sponsored under the project. | |
| 14 | Progressive Bonus | | Relocated households who hand over their affected land to the project on time | The relocated PAPs who hand over their affected land on time shall receive an incentive bonus of VND1 million – 3million million per household | |
| 15 | Other assistances | | | PPC will consider supporting for other cases, such as: Land user without land title and not eligible for legalization, the recovered leased ahead of time. Tenants who be recovered before the expiration. | |

Source: JICA Survey Team

## PART 7 GRIVANCE REDNESS PROCEDURE

PAPs will be able lodge their complaints regarding any aspect of compensation policy, rates, land acquisition, resettlement and entitlements relating to rehabilitation assistance programs. Complaints by PAPs can be lodged verbally or in written form, but if they are lodged verbally, the committee to which it is lodged will write it down during the first meeting with the PAPs. PAPs will be exempted from administrative and legal fees.

A four-stage procedure for redressing grievances is proposed as follows:

Stage 1- Complaints from PAPs regarding any aspect of the resettlement program or losses not previously addressed shall first be lodged verbally or in written form at the PC at the commune level. The complaint can be discussed in an informal meeting with the plaintiff and the chairperson of the PC at commune level. The PC at the commune level will be responsible for resolving the issue within 15 days from the day it is lodged.
Stage 2 - If no understanding or amicable solution can be reached, or if the PAP receives no response from the Commune PC within 15 days of registering the complaint, he/she can appeal to the DPC. The DPC will provide a decision within 15 days of the registering of the appeal.
Stage 3 - If the PAP is not satisfied with the decision of the DPC or its representative, or, in the absence of any response by the DPC, the PAPs can appeal to the PPC. The PPC will provide a decision on the appeal within 15 days from the day it is lodged with the PPC.
Stage 4 - If the PAP is still not satisfied with the decision of the PPC on appeal, or in absence of any response from the PPC within the stipulated time, the PAPs may submit his/her case to the district court.

## PART 8 INSTITUTIONAL ARRANGEMENTS

### 8.1 Land Acquisition and Resettlement Procedures

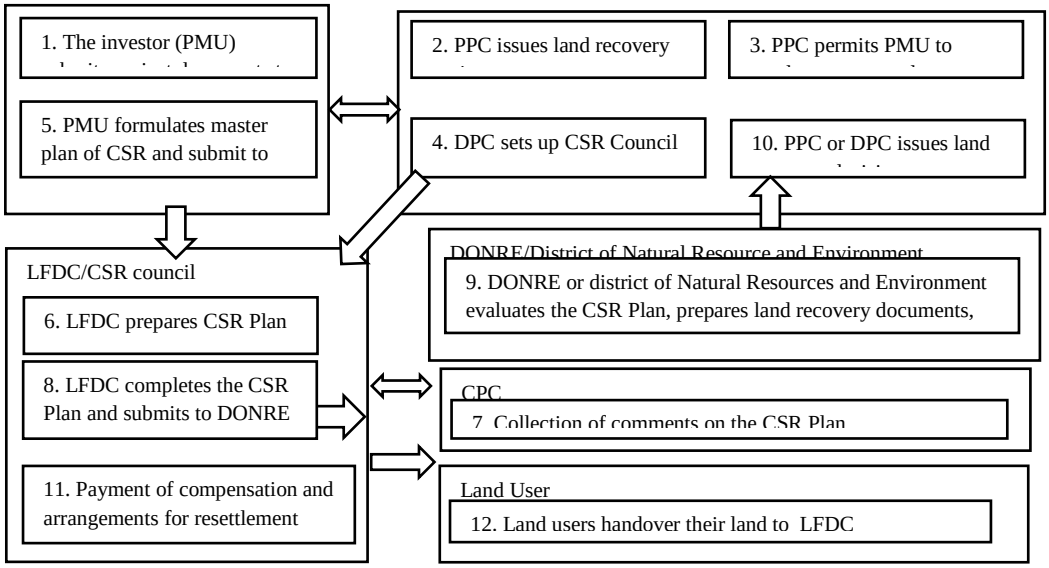
Land acquisition and resettlement procedure are based on the Decree 69/2009/ND-CP, section 4 described as in **Table 18**. Relationship of organization is described as in **Figure 8**.

**Table 18 Major procedures of Land Acquisition and Resettlement**

| | Major Procedures | Responsible Organization | Remarks |
|---|---|---|---|
| 1 | The investor (PMU) submits project documents to PPC | PMU, PPC | - |
| 2 | PPC issues land recovery notice | PPC or DPC | Reasons, area and location, etc., information disclosure by local mass media |
| 3 | PPC permits PMU to conduct survey and measurement | PPC | CPC shall coordinate with PMU for the survey and measurement |
| 4 | DPC sets up CSR Council | DPC or LFDC | - |
| 5 | PMU formulates master plan of CSR and submit to PPC for approval | PMU | Following Decree No.197/2004/ND-CP and No.17/2006/DN-CP |
| 6 | LFDC prepares CSR Plan | LFDC | 1) Names and address of land users, 2) area, type, location of the land, assets loss, 3) land and house prices, no. of households, 4) compensation and supports amounts, 5) resettlement arrangement |
| 7 | Collection of comments on the CSR Plan | CPC | More than 20 days, posted up at CPC office and the areas where to be recovered land and replacement |
| 8 | LFDC completes the CSR Plan and submits to DONRE | LFDC, DONRE | - |
| 9 | DONRE or district of Natural Resources and Environment evaluates the CSR Plan, prepares land recovery documents, and submits to PPC | DONRE or district of Natural Resources and Environment, PPC, DPC | - |
| 10 | PPC or DPC issues land recovery decision | PPC, DPC | - |
| 11 | Payment of compensation and arrangements for resettlement | CSR Council or LFDC | - |
| 12 | Land users handover their land to LFDC | Land Users | Within 20 days after receiving compensation |

Source: Decree 69/2009/ND-CP, Section 4, JICA Survey Team

Note: PC-People's Committee, PPC-Provincial PC, DPC-District PC, CPC-Commune PC, CSR-Compensation, Support and Resettlement, LFDC-Land Fund Development Center, DONRE- Department of Natural Resources and Environment, PMU- Project Management Unit




Source: JICA Survey Team

**Figure 8 Relationship of organization**

## 8.2 Institutional Arrangements

The implementation of resettlement activities requires the involvement of agencies at the national, provincial, district and commune level. The provisions and policies of the ARP will form the legal basis for the implementation of resettlement activities during the Project. The Project Management Unit (PMU) can agree with the PAPs on their compensation payment options for losses, following the provisions in the ARP.

The following is a general overview of key responsibilities with respect to land acquisition and resettlement at/for each level/unit involved in Project implementation.

1) Binh Duong Water Supply and Sewerage – Environment Co.LTD (BIWASE)
BIWASE is responsible as the Executing Agency (EA) for overall coordination and direction of the Project, including the implementation of the ARP. The BIWASE is responsible for preparing the ARP for the Project. The latter includes decisions relating to compensation rates and rehabilitation assistance measures for PAPs. The BIWASE is also responsible for providing the budget for resettlement compensation. BIWASE is responsible for implementation of the Project as the Investor.
After detailed engineering designs have been completed, the number of PAPs will be revised, and compensation unit rates and allowances will be updated for all categories of lost assets, based on replacement cost surveys carried out during project implementation. Following approval by JICA of the updated ARP, the BIWASE will be responsible for directing and supervising ARP implementation. This will include ensuring speedy resolution of any grievances voiced by PAPs or town/district authorities. Based on local requirements for implementing resettlement, in each project implementation stages, the BIWASE will delegate responsibilities for resettlement implementation to agencies at the appropriate level, in accordance with Decree No. 197/2004/ND-CP and Decree 69/2009/ND-CP.
2) The Project Management Unit (PMU)
The BIWASE will set up PMU for daily project implementation. The PMU will include technical, institutional, social and resettlement, administrative management, and representatives of accounting divisions. Key responsibilities of the PMU will include, but not be limited to, the following:

(i) Updating the ARP at the time of project implementation, when the detailed design is available, and then submitting the updated ARP to JICA for approval.
(ii) Coordinating civil works with land acquisition and resettlement activities;
(iii) Instigating information campaigns, in accordance with established Project guidelines. This includes preparation and distribution of the public information booklet, and stakeholder consultation with the PAPs. It includes having primary responsibility for letters, forms and other relevant documents, although the preparation of these may be delegated as required;
(iv) Developing the mechanisms through which resettlement disbursements and compensation payments for PAPs will be made, and preparing any associated documents that may be required;
(v) Coordinating with other departments for the effective implementation of the ARP, as approved for the project, and in compliance with the JICA resettlement principles and objectives. This will include ensuring that rehabilitation measures and supporting activities are properly implemented;
(vi) Ensuring a timely resettlement budget flow for the delivery of compensation payments and the rehabilitation of PAPs, and providing the compensation payments to the PAPs, and
(vii) Implementing project accounting and auditing with respect to resettlement implementation, and preparing and submitting regular progress reports to the BIWASE and PPC on the civil works and status of ARP activities.

3) Ben Cat District People's Committee (DPC)
The Ben Cat District People's Committees will be responsible for identification of land and trees loss and assigning functional tasks for the various agencies. The District People's Committee (DPC) will be responsible for the DMS in collaboration with town/commune People's Committees.

4) Land Fund Development Center (LFDC)
Land Fund Development Center responsible for conducting the loss survey of land and assets, consultation with affected communities and organizations, making compensation plans, submits to the DONRE for approval and pay compensation, and site clearance for the Project.

5) Commune People's Committees (CPC)
Commune People's Committees will be responsible for the following:

(i) Assigning concerned ward/commune officials/professionals to carry out all resettlement activities in its ward/commune;
(ii) Assisting other bodies/agencies, including the PMU, in the dissemination of project information and facilitating public meetings and consultation with PAPs;
(iii) Assisting other agencies, including the PMU, in census surveys, a replacement cost survey, DMS and other resettlement related activities;
(iv) Checking and confirming the legal status of affected land, houses, structures and other assets/losses of organizations; and
(v) Ensuring the PAPs grievances redress mechanisms are appropriate and properly put in place, documenting PAPs grievances and maintaining records of PAPs grievances, and assisting and advising PAPs with respect to the speedy redress of grievances.

### 8.3 Institutional Capacity

If necessary, specific training courses on resettlement will be required for an agency involved.

## PART 9 IMPLEMENTATION SCHEDULE

The implementation schedule is as follows:

(i) Updating Compensation Rates.
During the preparation of CSRP process, the PMU will update unit rates at replacement cost for all categories of loss. This will be done in consultation with PAPs and local government agencies.

(ii) Detailed Measurement and Census Survey.
These surveys will serve as a basis for compensation and updating ARP. Data will be computerized by the PMU.

(iii) Pricing Application and Compensation to PAPs.
DPC will be responsible for price application (calculating payments on the basis of the market survey) and preparing compensation charts for each affected commune/district. Unit prices, quantity of affected assets, PAPs' entitlements, etc. will be subject to verification by the PMU and PPC before being posted in each commune for people to review and comment on. All compensation forms must be checked and signed by the APs to indicate their agreement.

(iv) Compensation will be handled under the supervision of representatives of Commune/Town People's Committee, DPC and representatives of PAPs.

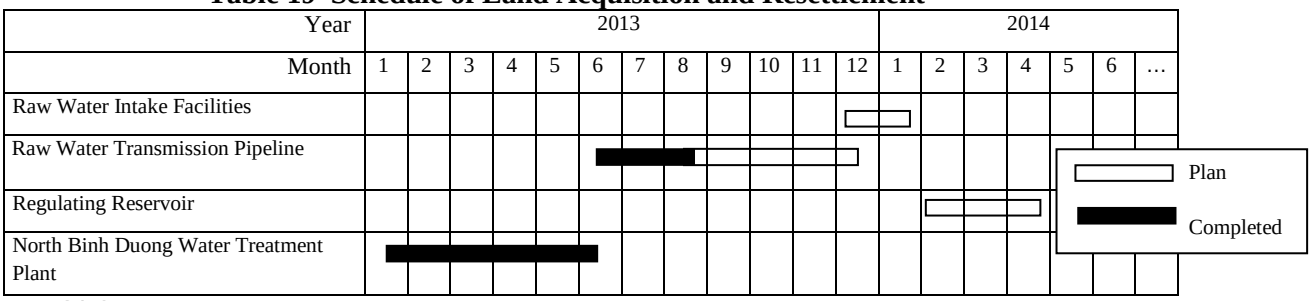
PMU shall ensure that civil works contractors are not issued a notice of possession of site for construction works until PMU has (i) satisfactorily completed, in accordance with the approved ARP, compensation payments and relocation to new sites; and (ii) ensured that required rehabilitation assistance is in place and the area required for civil works is free of all encumbrances.

The compensation has been paid to the affected households part by part since December, 2012. And it is expected to complete the compensation payment and the site clearance in Mar, 2014. The PMU will not allow construction activities in specific sites until all resettlement activities have been

satisfactorily completed, agreed rehabilitation assistance is in place, and that the site is free of all encumbrances.

Land acquisition is implemented. Schedule of land acquisition and resettlement is **Table 19**;

**Table 19 Schedule of Land Acquisition and Resettlement**




Source: JICA Survey Team

## PART10 COST ESTIMATE AND BUDGET

### 10.1 Flow of Funds

Funds for compensation and implementation of the plan will be from PMU and PPC. PMU will be responsible for channeling funds for the compensation for land acquisition and resettlement to the Binh Duong PPC (or Binh DuongLFDC) that will be responsible for making payments directly to displaced persons.

### 10.2 Adjustment for Inflation

The rates for compensation and cash entitlements for rehabilitation as well as allowances payable to displaced persons will be adjusted annually, based on the current annual inflation rate. PPC will determine the annual inflation rates and all cash entitlements.

### 10.3 Compensation Prices

#### 10.3.1 Prices for land

Unit Prices for land compensation, assistance and resettlement are based on the Decisions below:
- Decision 87/2009/QD-UBND dated 21/12/ 2009 on compensation, assistance and resettlement policies when the State acquire land in Binh Duong Province.
- Decision 66/2011/QD-UBND dated 20/12/2011 of Binh Duong PPC on Unit Price of Land in 2012;
- Decision 67/2011/QD-UBND dated 20/12/2011 of Binh Duong PPC on adjust of Unit Price in 2012 in Binh Duong Province.

Land unit price of each project area is specified in the **Annex E** of this ARP. These rates have been found acceptable by the owners.

### 10.3.2 Prices for trees and crops

Decision No.58/2011/QĐ-UBND dated 19/12/2011, of Binh Duong PPC stipulates compensation rates for trees and crops. These prices apply in all of Binh Duong province.

### 10.3.3 Allowances

Based on Decision No. 31/2009/QĐ-UBND, a cash allowance of 3 times the compensation rate for agriculture land is required. This allowance applies only to cultivated land. This allowance intends to cover the eventual cost of training in case the land owner has to change of career.

### 10.4 Cost estimates

**Table 20** presents the cost estimates for ARP at December 2012. This amount covers administration and implementation activities. A contingency of 10% has been added.

**Table 20 Implementation Costs of ARP**

| No | CONTENT | COST(VND) |
|---|---|---|
| 1 | A. Compensation, support costs | 354,594,175,000 |
| 2 | B. Cost of implementation of compensation | 12,377,775,000 |
| 3 | C. Cost of project management | 6,690,322,000 |
| 3.1 | Cost of project appraisal | 75,500,000 |
| 3.2 | Cost of project preparation | 1,652,243,000 |
| 3.3 | Cost of appraisal, approval of finalization : A x 0.1% | 452,388,000 |
| 3.4 | Cost of audit : A x 0.15% | 678,583,000 |
| 3.5 | Other related costs: | 3,831,108,000 |
| 4 | D. Contingency of Spiraling price : A x 10% (10% per year x 1 year) | 35,459,418,000 |
| 5 | E. Contingency of unexpected occurred quantity: A x 10% | 35,459,418,000 |
| | Total cost of implementation(A+B+….+E) | 444,581,108,000 |

Source: CSRP

## PART11 MONITORING AND EVALUATION

### 11.1 Monitoring

Monitoring is the continuous process of assessing project implementation in relation to agreed schedules, the use of inputs, and the provision of infrastructure and services by the Project. Monitoring provides all stakeholders with continuous feedback on implementation. It identifies actual or potential successes. It also identifies problems as early as possible to facilitate timely correction during project operation. Monitoring has two purposes:

(i) to verify that project activities have been effectively completed including quantity, quality, and timeliness, and
(ii) to assess whether and how well these activities are achieving the stated goal and purpose of the Project.

Regular monitoring of the ARP implementation will be conducted by the PMU.

### 11.2 Monitoring Report

Monitoring of the implementation of the ARP will be the responsibility of the PMU. The implementing agencies will oversee the progress in resettlement preparation and implementation through regular progress reports.

The main indicators that will be monitored regularly are:
(i) payment of compensation to PAPs in various categories, according to the compensation policy described in the ARP;
(ii) public information dissemination and consultation procedures;
(iii) adherence to grievance procedures and outstanding issues requiring management's attention; and
(iv) coordination and completion of resettlement activities in context of the awarding of civil works contracts.

PMU will submit a quarterly monitoring report to the PPC on the progress of the implementation of the ARP. The internal monitoring reports shall include the following topics:
(i) the number of PAPs, by category of impact per component, and the status of compensation payment and relocation and income restoration for each category;
(ii) the amount of funds allocated for operations or for compensation, and the amount of funds disbursed for each;
(iii) the eventual outcome of complaints and grievances and any outstanding issues requiring action by management;
(iv) implementation problems, and
(v) revised actual resettlement implementation schedules.

## PART 12 PUBLIC PARTICIPATION, CONSULTATION, AND GRIEVANCE MECHANISMS

### 12.1 Objectives of Public Information and Consultation

Information dissemination to PAPs and involved agencies is an important part of sub-project preparation and implementation. Consultation with PAPs and ensuring their active participation will reduce the potential for conflicts and minimize the risk of project delays. The objectives of the public information and consultation program are as follows:
(i) to ensure that both local authorities and representatives of PAPs, are included in the planning and decision-making processes. The PMU will work closely with the PPC, the DPC and the Commune PC during project implementation.
(ii) to fully share information about the proposed project components and activities with the PAPs;
(iii) to obtain information about the needs and priorities of the PAPs, as well as information about their reactions to proposed policies and activities;
(iv) to ensure that PAPs are able to make fully informed decisions that will directly affect their incomes and living standards, and that they will have the opportunity to participate in activities and decision-making about issues that will directly affect them;
(v) to obtain the co-operation and participation of the PAPs and communities in activities necessary for resettlement planning and implementation, and
(vi) to ensure transparency in all activities related to land acquisition, resettlement, and rehabilitation.
(vii) to ensure that basically all PAPs should be informed in advance of public consultation and all or parts of PAPs should be accepted to the consultation meetings.

## 12.2 Consultation during Project Preparation

A consultation with local authorities and affected persons were organized from 08/03/2011. The consultation meetings will be continuously organized after that. In these meetings, local authorities and administrative leaders at all levels and potential affected people are informed about the proposed project and its objectives and various components. They are thoroughly consulted and actively participated in discussions about their demands for development and their priorities, as well as their awareness of the Project's objectives. PAPs are consulted about impacts and applicable measures to minimize negative impacts and improve the benefits for local residents. Local authorities are also consulted about their agreement with and commitment to implementing the Project's resettlement policies. Summary of consultation results is attached in the annex of the ARP.
In the meantime, the PMU combined with LFDC also conducted community consultations (meeting with the affected communities) to disseminate information includes characteristics of the project, scope of land acquisition, policy on resettlement (essentially concept of replacement costs), schedule of work, grievances mechanism as well as collect information about demographic status, sources of income, expectations for compensation prices, etc. After the Project is officially approved, project information including the project objectives and components and policy, were published via the national and local presses and televisions as well as the PPC's papers to disseminate to the project areas.
In general, 100% people and other stakeholder agreed to implement the Project.

### 12.2.1 Information Dissemination and Consultation

During project implementation, the PMUs will undertake the following:
(i) Disseminate information to and consult with PAPs throughout the life of the Project.
(ii) Update the provincial unit prices, and confirms the land acquisition requirements and impact on properties through a DMS, carried out in consultation with PAPs.

The DPC will then apply prices, calculate compensation entitlements, and complete the Compensation Forms for each affected household. Information on entitlements will then be presented on an individual basis to PAPs in a DMS follow-up visit to each household.
The Compensation Form, showing a household's affected assets and compensation entitlements, will then need to be signed by the PAPs to indicate their agreement with the assessment. Any complaints the PAPs have about the contents of the form will be recorded at the time.

### 12.2.2 Public Meetings

During ARP preparation process for the Project, the LFDC have been conducted community meetings in affected wards/communes to provide additional information for PAPs and create opportunities for them to participate in open discussions about resettlement policies and procedures. The ward or commune PCs or resettlement consulting groups held meetings to consider and resolve issues related to compensation policies, household land use status, and land use origins. There are 06 community meetings were organized, summaries on community meetings are showed in the **Table 21**.

The affected communes were consulted about following issues:

a. Representative of each affected household should participate in the measurement and inventory of their assets, and sign in minute of inventory.
b. Affected households receive the detailed calculation list of compensation, assistance for livelihood and production stablelization for review and check the information.
c. Any complaint of the PAPs on the compensation plan will be collected and considered carefully based on the real situation, include the issues related to the compensation price.

d. After that, the city RC will calculate compensation based on the determined prices and complete the compensation plan for affected assets. The PMU together with the city RC will present information on entitlements for PAPs in the next consultation.
e. Next, the compensation plan shall clearly state affected assets and the compensation to which PAPs are entitled, and this shall be signed by the PAPs to show their agreement with the evaluation results. Any questions of PAPs on the contents of the plan shall be noted at this time.
f. Sending PAPs letters and/or questions related to the ARPs to inform them about the plans and clearly explain the consequences of each plan.
g. Each household has the right to reflect, raise their questions related to resettlement such as prices, installment payments and procedures for documenting ownership in the new place, etc. Their questions will be resolved satisfactorily and timely.
h. Requesting PAPs confirm their choice of resettlement areas and the location of the resettlement areas. It is necessary to introduce to the PAPs about the resettlement areas.
i. Requesting PAPs to state services clearly they are currently using such as education, health care, and markets, and the distance they travel for these services.
j. Consultation with affected people about their desire to the support and recovery plan. This section applies for severely affected and vulnerable PAPs. The RC will inform PAPs about the plan and their entitlement to technical assistance before requesting them to present their desires for restoration assistance clearly.

**Table 21 Community Meeting Consultations**

| Project communes | Time | Location | Number of Meeting | Total of Participants | In which, female |
|---|---|---|---|---|---|
| Tru Van Tho | 15/3/2011 | PPC's Office | 1 | 53 | 24 |
| Tan Hung | 12/3/2011 | PPC's Office | 1 | 53 | 26 |
| Lai Uyen | 11/3/2011 | PPC's Office | 1 | 74 | 34 |
| Chanh Phu Hoa | 9&26/3/2011 | PPC's Office | 2 | 119 | 60 |
| Lai Hung | | PPC's Office | 1 (Institute of Gum Tree Research) | 2 | |
| | | | **6** | **301** | **144** |

Source: JICA Survey Team

### 12.2.3 Information Disclosure

Beside the public consultation for the PAPs and the communities in the project area, , the ARP will be available at the PMU office (address: BIWASE, No.11 Ngô Văn Trị, Phu Loi Ward, Thu Dau Mot Town, Binh Duong Province), Ben Cat district PC, Project Commune PC's Offices (Trừ Văn Thố, Tân Uyên, Tân Hưng, Lai Hưng, Lai Uyên, Chánh Phú Hòa).
The main content is designed as a brochure to provide information for each affected household. The mass media, directly is the ward and village's radio system, disseminate the information of the project's policies.

**Annex A Minutes of Public Meetings and Consultations**

**Summary of Community Consultation Meetings**

| **Date, Venue & Participants** | **Main Issues raised by PAPs** | **Responses of representatives of relevant agencies** |
|---|---|---|
| **Mar 8th, 2011**<br>**Lai Hung Commune's PC, Ben Cat District, Binh Duong Province**<br>*Number of Participants: 7*<br>Representatives of Lai Hung Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 02 representatives from Institute of Rubber Research Lai Khe.<br>*Consultation contents:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Lai Hung commune).<br>- Introduced policies on compensation, assistance and resettlement for the Project affected Persons (PAPs);<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | Mr.Huynh Huu Hien<br>- PAPs agreed with the land acquisition plan of the State;<br>- Requiring to conduct detailed measurement survey to report to the management level | - Agreed with opinion of the representatives of Institute of Rubber Research Lai Khe |
| **Mar 9th, 2011**<br>**Chanh Phu Hoa Commune's PC, Ben Cat District, Binh Duong Province**<br>*Number of Participants: 102*<br>Representatives of Chanh Phu Hoa Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 89 PAPs.<br>*Consultation contents:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Chanh Phu Hoa commune).<br>- Introduced policies on compensation, assistance and resettlement for the PAPs;<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | - PAPs mainly concern about compensation prices, specific time for compensation, time for relocation, resettlement sites. | - Representative of Ben Cat District LFDC explained on compensation price of each position, each area and coefficient K of land price. |
| | - PAPs concern about compensation policy for mostly affected housing | - Mr.Nguyen Van De, vice director of LFDC explained about compensation policy for affected housing |
| | - PAPs concern about compensation policy for affected rubber trees | - Mr.Nguyen Van De, vice director of LFDC explained about compensation policy for affected trees |

| **Date, Venue & Participants** | **Main Issues raised by PAPs** | **Responses of representatives of relevant agencies** |
|---|---|---|
| **Mar 11th, 2011**<br>**Lai Uyen Commune's PC, Ben Cat District, Binh Duong Province**.<br>*Number of Participants: 86*<br>Representatives of Lai Uyen Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 74 PAPs.<br>*Consultation contents:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Lai Uyen commune).<br>- Introduced policies on compensation, assistance and resettlement for the PAPs;<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | - PAPs agreed with the land acquisition plan of the State; | - Mr.Nguyen Van De, vice director of LFDC explained about compensation policy for affected trees |
| | - PAPs concern about the compensation and assistance policies | - Mr.Nguyen Van De, vice director of LFDC explained about compensation policy for affected trees |
| **Mar 12th, 2011**<br>**Tan Hung Commune's PC, Ben Cat District, Binh Duong Province**.<br>*Number of Participants: 63*<br>Representatives of Tan Hung Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 53 PAPs.<br>*Consultation content:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Tan Hung commune).<br>- Introduced policies on compensation, assistance and resettlement for the PAPs;<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | - PAPs agreed with the land acquisition plan of the State;<br>- Requiring to conduct detailed measurement survey soon to stabilize PAPs' life and production | - Will conduct detailed measurement survey as soon as possible |

| **Date, Venue & Participants** | **Main Issues raised by PAPs** | **Responses of representatives of relevant agencies** |
|---|---|---|
| **Mar 15th, 2011**<br>**Tru Van Tho Commune's PC, Ben Cat District, Binh Duong Province**<br>*Number of Participants: 62*<br>Representatives of Tru Van Tho Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 53 PAPs.<br>*Consultation contents:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Tru Van Tho commune.<br>- Introduced policies on compensation, assistance and resettlement for the PAPs;<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | - PAPs agreed with the land acquisition plan of the State;<br>- Requiring to conduct detailed measurement survey soon | - Will conduct detailed measurement survey as soon as possible |
| **Mar 26th, 2011**<br>**Chanh Phu Hoa Commune's PC, Ben Cat District, Binh Duong Province**<br>*Number of Participants: 40*<br>Representatives of Chanh Phu Hoa Commune's PC, Ben Cat District LFDC, representatives of BIWASE and 30 PAPs.<br>*Consultation contents:*<br>- Information dissemination of the Project (leaflets, brief introduction of the Project such as benefits of the Project, planning sites, land acquisition area, affected households in Chanh Phu Hoa commune).<br>- Introduced policies on compensation, assistance and resettlement for the PAPs;<br>- Plan on compensation and land clearance plan<br>- Grievance redness mechanism. | Mr.Le Quoc Cuong:<br>- PAPs concern about the compensation and assistance policies<br>- The land owners should join during conducting loss inventory | - Compensation plan is detailed in the master plan on the compensation, assistance and resettlement for the project which sent to the PAPs;<br>- Agreed that the land owners should join during conducting loss inventory |
| | Mr.Le Minh Sang:<br>PAPs concern about compensation policy for affected rubber trees, should be based on annual unit price | - Land position and unit price is detailed in the master plan on the compensation, assistance and resettlement for the project which sent to the |

| **Date, Venue & Participants** | **Main Issues raised by PAPs** | **Responses of representatives of relevant agencies** |
|---|---|---|
| | Mr.Le Van Luong:<br>- Want to know about land position and unit price before conduct loss inventory | PAPs |

## Annex B Monitoring Form

### Preparation of Resettlement Site (where necessary)

| No. | Explanation of site (e.g. Area, No of resettlement HH,etc) | Status (Completed(date)/not compleated) | Deatails (Site Selection, identification of candidate site, discussion with PAPs, Development of the Site, etc) | Expected Date of Completion |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |

### Public Consultation

| No. | Date | Place | Contents of the consultation/ main comments and answer |
|---|---|---|---|
| 1 | | | |
| 2 | | | |

### Resettlement Activity

| Resettlement Activity | Planned/ total | Unit | Progress in Quantity | | | Progress in % | | Expected Date of Completion | Responsible Organization |
|---|---|---|---|---|---|---|---|---|---|
| | | | During the Quarter | Till the Last Quarter | Up to the Quarter | Till the Last Quarter | Up to the Quarter | | |
| Preparation of RAP | | | | | | | | | |
| Employment of Consultants | | Man-month | | | | | | | |
| Implementation of Census Survey | | | | | | | | | |
| Approval RAP | | | Date of Approval; | | | | | | |
| Finalized PAPs List | | No.of PAPs | | | | | | | |
| (i)Progress of Compensation Payment | | | | | | | | | |
| Lot 1 | | No.of HH | | | | | | | |
| Lot 2 | | No.of HH | | | | | | | |
| Progress of Land Acquisition | | | | | | | | | |
| Lot 1 | | ha | | | | | | | |
| Lot 2 | | ha | | | | | | | |
| Progress of Assets Replacement | | | | | | | | | |
| Lot 1 | | No.of HH | | | | | | | |
| Lot 2 | | No.of HH | | | | | | | |
| Progress of Relocation People | | | | | | | | | |
| Lot 1 | | No.of HH | | | | | | | |
| Lot 2 | | No.of HH | | | | | | | |
| (ii) Progress of Information dissemination and public Meeting | | | | | | | | | |
| Lot 1 | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Lot 2 | | | | | | | | | |
| (iii) Grievance Redness | | | | | | | | | |
| Member of Grievance Redness | | Nos. | | | | | | | |
| Receiving complain | | | | | | | | | |
| Disposing off complain | | | | | | | | | |
| Assist HH in replacement | | | | | | | | | |
| (iv) adjust a schedule with construction | | | | | | | | | |
| Lot 1 | | | | | | | | | |
| Lot 2 | | | | | | | | | |
| | | | | | | | | | |

# Annex C Template for Socio-Economic Survey

## SOCIO – ECONOMIC QUESTIONNAIRES OF AFFECTED HOUSEHOLDS

Code: | | | |

Project Name:
Component:
……..……..
Commune/Ward: ……...Hamlet/Quarter:
……..…….
Name of Investigator:
Date of survey:...../...../.....

### I. GENERAL OF INTERVIEWEE AND HOUSEHOLD:

**C1. Full Name of Interviewee**: …….....

**C2. Occupation (look at Code (d) in C8):** ……

| | | |
|---|---|---|
| 1.Farmers; | 6.Solders, Security; | 11. Unemployment; |
| 2.Wokers; | 7. Unstable Employment ; | 12. Housekeeper; |
| 3.State Officials ; | 8. Students/Pupil ; | 13. Disabled Persons; |
| 4.Retires; | 9. Handicraft;; | 14. Others |
| 5.Businessmen; | 10. Under School Age ; | |

**C3a. Gender:** 1. Male 2. Female

**C3b. Year of Birth:** …….

**C3c. Education**

| | |
|---|---|
| 0. Illteracy | 3. High School |
| 1. Primary | 4. College/University |
| 2. Secondary | 5. Post Graduate |

**C4. Group:.....**

**C5. Vulnerable Household:** 1. Yes ➔ C6 2. No➔C7

**C6. If YES, in detailed:**

1. Poor Household (Certificated) 2. Disabled Household
3. Invalid or “revolution” household 4. Invalid of “revolution” household

5. Loneliness Elder
6. Loneliness Household
7. Single woman (with dependant)
8. Other:.....

**C7. Displaced or not ?**

1. Yes
2. No

**C8. Information of Members of the household:** Scale of household:..... persons

| No | Relationship with head of household (a) | Group | Gender (b) | Year of birth | Education (c) | Main Occupation (d) | Average General Income per month (dong/month/person) |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |

***Code:(a): Relationship with head of household:*** 1.Head; 2.Husband/wife; 3.Children; 4.Father/mother; 5.Grand mother/Grand father; 6.Niece; 7.Sibling; 8.Relative.
***(b):Gender:*** 1.Male; 2.Female
***(c):Education:*** 1.Illteracy; 2.Primary; 3. Secondary; 4.High School; 5. College/University; 6. Post Graduate
***(d):Occupation:*** 1.Farmers; 2.Workers; 3. State Officials; 4.Retires; 5.Businessmen; 6.Solders, Securityi; 7. Unstable Employment; 8.Students/Pupil; 9.Handicraft; 10.Under School Age; 11.Unemployment; 12.Housekeeper; 13.Disabled Persons; 14.Elders; 15.Others.

**C9a. Income Source of household:**

| *No* | *Income Source (estimate)* | *Amount (dong/household/month)* |
|---|---|---|
| 1 | From Salary | |
| 2 | From farming/forest/aquaculture | |
| 3 | From business/service | |
| 4 | From gift/assistance, etc | |
| 5 | From other source | |
| 6 | ***Total of Income Source*** | |

**C9b. Household living standard according to the classification of commune/ward:**

1. Poor
2.Near Poor
3. Average
4. Fair
5. Rich

**C10. Expenditure Average of of Households per month (dong/month):**

| *No* | *Expenditure(estimate)* | *Amount (dong/household/month)* |
|---|---|---|
| 1 | Food | |
| 2 | School | |
| 3 | Health | |

| | | |
|---|---|---|
| 4 | Electricity | |
| 5 | Water | |
| 6 | Sanitation, Security Fees | |
| 7 | Expenditure for production/business/service | |
| 8 | Traveling, shopping, wedding, etc. | |
| 9 | Other cost | |
| 10 | ***Total of Expenditure*** | |

## II. ACCOMODATIONS

### C11. Available Accommodation of the Household

| Name of Asset | Quantity | Name of Asset | Quantity |
|---|---|---|---|
| 1. Bycicle | | 8. Telephone | |
| 2. Motorbike | | 9. Mobile | |
| 3. Car | | 10. Video/CD | |
| 4. Air Condition | | 11. Computer | |
| 5. Washing Machine | | 12. Rice Cooker | |
| 6. Bed/board/wood furniture | | 13. Gas Cooker | |
| 7. Television | | 14. Fridge | |

## III. LAND

**C12. LURC for Residential land**

1. Tittled 2. Legalizable 3. None-tittle

**C13. LURC for Agricultural land**

1. Tittled 2. Legalizable 3. None-tittle

**C14. LURC for Pond/Lake/Garden land**

1. Tittled 2. Legalizable 3. None-tittle

**C15. LURC for Forest/mountain land**

1. Tittled 2. Legalizable 3. None-tittle

### C16. Source of land or house:

1. Inheritance
2. Issued by the State
3. Renting land
4. Buying
5. Other.....

### C17. Expectations of the affected household of compensation, assistance and resettlement:

**a):.....**

**.....**

**.....**

**.....**

**b):.....**

**.....**

**.....**

**.....**

**c):.....**

**.....**

**.....**

**.....**

## IV. EVALUATION OF THE INVESTIGATOR:

……
……..
……
……..
……
……..

*Bình Dương, date_____month_____year_____*

| **Investigator** | **Head of Hamlet/Quarter** |
|---|---|
| *(Signature, name)* | *(Signature, name)* |

**Annex D Template of Loss Inventory**

"MINUTE OF DETAILED MEASURE SURVEY FOR AFFECTED LAND/ASSETS
OF THE HOUSEHOLDS OR THE AGENCIES/ORGANIZATIONS"

No:……../BBKK
Project Name :
Component: …….
Name of Head of Household: …… Man (female): …….
Commune/ward:…….Hamlet/quarter: …….
Group: ….. …Occupation: ……..…….. No. of member: ……..…… No. of labour:…….

Economic Situation: Wealthy Average Poor "Policy" family

Members take part in the Survey:

Mr (Mrs): ……..- Position: ……...……

Mr (Mrs) : ……..- Position: ……...……

Mr (Mrs): …… - Position: ……...……

Mr (Mrs): ……..……- Position: ……...……

Mr (Mrs): ……...…. - Position: ……...……

Mr (Mrs): ……..……- Position: ……...……

Mr (Mrs): ……...……. - Position: ……...……

Mr (Mrs): ……...……. - Position: ……...……

Mr (Mrs): ……..…… - Position: ……...……

Representative of affected persons (voted by the affected households)

Mr (Mrs): ……

After survey, detailed measure, we agree to set the minute of affected land and assets of the households named ..... As the follows:

## I. Land

If the land has a conlict or not ? Yes No

State of Own: Legal Legalizable Non-titled

| No | Type of land | LURC | | Position | Total of Area ($m^2$) | Lost Area ($m^2$) | % lost land | In which | | Vialbe to use on remaining land | Unit Price (dong) | Ammount (dong) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | | | | | Permanent lost | Temporary lost ($m^2$) | | | |
| *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* | *(11)* | *(12)* | *(13)* |
| ***I*** | ***Resident Land*** | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ***II*** | ***Argricultural Land*** | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ***III*** | ***Pond, garden*** | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ***IV*** | ***Forest Land*** | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ***V*** | ***Other Land*** | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| **Total** | | | | | | | | | | | | **-** |

**Description of land situation**
(can take a photo or drawing)

**Source of land:**

## II. ACQUIRRED ASSETS AND OBJECTS ON THE LAND

| No | House, works (housing category) | Unit | Size | Goal of using | Area of using ($m^2$) | Compensated Area ($m^2$) | Remaining land ($m^2$) | Unit Price (đồng) | Ammount (đồng) |
|---|---|---|---|---|---|---|---|---|---|
| *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
| 1 | Main house (preliminary description) | | | | | | | | |
| 2 | Sub-Objects (Cook, toilet) | | | | | | | | |
| 3 | Other works | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| **Total** | | | | | | | | | |

## III . AFFECTED TREES AND CROPS

| No | Name of Tree | Group | Unit | Quantity | Unit Price | Ammount |
|---|---|---|---|---|---|---|
| ***I*** | ***Wood trees*** | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| ***II*** | ***Fruit trees*** | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| ***III*** | ***Other tree*** | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| ***IV*** | ***Crops*** | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| | | | | | | |
| **Total** | | | | | | |

## IV. GRAVE

| No | Type | Unit | Size | Quantity | Unit Price | Ammount |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Total | | | | | | |

## V.AFFECTED OTHERS (included income):

| No | Type of lost | Unit | Quantiy | Compensation Cost | Note |
|---|---|---|---|---|---|
| | **Renting house** | | | | |
| | | | | | |
| | **Renting location for business** | | | | |
| | | | | | |
| | **Renting land** | | | | |
| | | | | | |
| | **Lost income from business** | | | | |
| | | | | | |
| | **Lost income from production** | | | | |
| | | | | | |
| | **Lost income from other source** | | | | |
| | | | | | |
| | **Other (detailed)** | | | | |
| | | | | | |

Note:

## VI: BUSINESS ACTIVITIES AND NUMBER OF STAFF

a. Registered or None-Registered Business?
1-Registered, no of register:……2-None-Registered (Small bunisess)

b. If none-registered bussiness, how much average income after tax in recent 6 months is?

c. If none-registered bussiness, how much average revenue in recent 6 months is?

d. Hire staff:

| No | Name of Staff | Occupation | Working State | Note |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## V. CLASSIFICATION OF AFFECTED HOUSEHOLDS

1. Type of Impact :
   1.Affected Agricultaral land ≥ 10%
   2. Affected resident land but viable to use on the remaining land
   3. Affected resident land and must relocate (resettlement)
   4. Business household

5. Poor household
6. Policy household

2. Expectation of Affected Households
Relocate to the resettment site
Free Resettlement
In need of job transition
Get assistance by cash without vocational training
Other need:

……..

## VI . ASSISTANCE IN ACCORDANCE WITH THE PROJECT POLICY

| No | Assistance | Unite | Quantiy | Unit | Ammount |
|---|---|---|---|---|---|
| 1 | Relocation | | | | |
| 2 | Resettlement | | | | |
| 3 | Renting house | | | | |
| 4 | Agricultural land | | | | |
| 5 | Livelihood and production stablilazation | | | | |
| 6 | Job transition and | | | | |
| 7 | Invalid (or "revolution") household | | | | |
| 8 | Business assistance | | | | |
| 9 | Other assistance | | | | |
| **Total** | | | | | |

## VII . BUGGET OF COMPENSATION, ASSISTANCE AND RESETTLEMENT:

Total of Budget:

By word :

In which:

| | |
|---|---|
| Land: | đồng |
| None-landed Assets, Objects on land: | đồng |
| Tree/crop: | đồng |
| Assistance: | đồng |

This minute will be set in 3 versions, these are equipvalent in legal, in which the Thanh Hoa City Site Clearance and Resettlement Department (RC) keeps 2 versions. Head of affected household keep one version

Representative of The LFDC — Representative of Commune/Ward People's Commitee

(Signature, Stamp) — (Signature, Stamp)

Members — Representative of Affected Person

Head of Household

Signature, Name — (Signature, name)

(Signature, name)

1 ……..

2 ……..

3 ……..

4 ……..

5 ……..

6 ……..

7 ……..

8 ……..

## Annex E Land Unit Price in the Project Area

### A. Rural Residential Land

**1. Trừ Văn Thố commune**

| Position | Standard Price (dong/$m^2$) | Coefficient Đ | coefficient K | Unit Price (dong/$m^2$) |
|---|---|---|---|---|
| **Road DT750 (T-junction to border of Long Hoa commune):** | | | | |
| Position 1 | 1.200.000 | 0,7 | 1,2 | 1.008.000 |
| Position 2 | 880000 | 0,7 | 1,2 | 739.200 |
| Position 3 | 550000 | 0,7 | 1,2 | 462.000 |
| Position 4 | 330000 | 0,7 | 1,2 | 277.200 |
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 940.000 | 0,6 | 1,2 | 676.800 |
| Position 2 | 610.000 | 0,6 | 1,2 | 439.200 |
| Position 3 | 420.000 | 0,6 | 1,2 | 302.400 |
| Position 4 | 330.000 | 0,6 | 1,2 | 237.600 |

**2. Lai Uyen commune**

| Position | Standard Price (dong/$m^2$) | Coefficient Đ | coefficient K | Unit Price (dong/$m^2$) |
|---|---|---|---|---|
| **National Road 13 (From border of My Phuoc Town to Tham Rot Bridge):** | | | | |
| Position 1 | 1.200.000 | 0,9 | 1,2 | 1.296.000 |
| Position 2 | 880.000 | 0,9 | 1,2 | 950.400 |
| Position 3 | 550.000 | 0,9 | 1,2 | 594.000 |
| Position 4 | 330.000 | 0,9 | 1,2 | 356.400 |
| **Road ĐH – 612 (From Bia Bàu Bàng to Bố Lá T-junction)** | | | | |
| Position 1 | 940.000 | 0,8 | 1,2 | 902.400 |
| Position 2 | 610.000 | 0,8 | 1,2 | 585.600 |
| Position 3 | 420.000 | 0,8 | 1,2 | 403.200 |
| Position 4 | 330.000 | 0,8 | 1,2 | 316.800 |
| **Road ĐH – 613 (From Bia Bàu Bàng to Tân Long)** | | | | |
| Position 1 | 940.000 | 0,7 | 1,2 | 789.600 |
| Position 2 | 610.000 | 0,7 | 1,2 | 512.400 |
| Position 3 | 420.000 | 0,7 | 1,2 | 352.800 |
| Position 4 | 330.000 | 0,7 | 1,2 | 277.200 |
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 940.000 | 0,6 | 1,2 | 676.800 |
| Position 2 | 610.000 | 0,6 | 1,2 | 439.200 |
| Position 3 | 420.000 | 0,6 | 1,2 | 302.400 |
| Position 4 | 330.000 | 0,6 | 1,2 | 237.600 |

**3. Tân Hưng commune**

| Position | Standard Price (dong/$m^2$) | Coefficient Đ | coefficient K | Unit Price (dong/$m^2$) |
|---|---|---|---|---|
| **Road ĐH – 612 (From Bia Bàu Bàng to Bố Lá T-junction)** | | | | |
| Position 1 | 1.200.000 | 0,8 | 1,2 | 902.400 |
| Position 2 | 880000 | 0,8 | 1,2 | 585.600 |
| Position 3 | 550000 | 0,8 | 1,2 | 403.200 |
| Position 4 | 330000 | 0,8 | 1,2 | 316.800 |
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 940.000 | 0,6 | 1,2 | 676.800 |

| | | | | |
|---|---|---|---|---|
| Position 2 | 610.000 | 0,6 | 1,2 | 439.200 |
| Position 3 | 420.000 | 0,6 | 1,2 | 302.400 |
| Position 4 | 330.000 | 0,6 | 1,2 | 237.600 |

**4. Lai Hưng commune**

| | | | | |
|---|---|---|---|---|
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 940.000 | 0,6 | 1,2 | 676.800 |
| Position 2 | 610.000 | 0,6 | 1,2 | 439.200 |
| Position 3 | 420.000 | 0,6 | 1,2 | 302.400 |
| Position 4 | 330.000 | 0,6 | 1,2 | 237.600 |

**5. Chánh Phú Hòa commune**

| **Position** | **Standard Price (dong/m$^2$)** | **Coefficient Đ** | **coefficient K** | **Unit Price (dong/m$^2$)** |
|---|---|---|---|---|
| **Road 2/9 (7B) (intersection Ông Giáo to ĐT 741):** | | | | |
| Position 1 | 1.200.000 | 0,7 | 1,3 | 1.092.000 |
| Position 2 | 880000 | 0,7 | 1,3 | 800.800 |
| Position 3 | 550000 | 0,7 | 1,3 | 500.500 |
| Position 4 | 330000 | 0,7 | 1,3 | 300.300 |
| **Road ĐH 605 (intersection Ông Giáo to ĐT 741) (T-junction Ông Kiểm)** | | | | |
| Position 1 | 1.200.000 | 0,7 | 1,2 | 1.008.000 |
| Position 2 | 880000 | 0,7 | 1,2 | 739.200 |
| Position 3 | 550000 | 0,7 | 1,2 | 462.000 |
| Position 4 | 330000 | 0,7 | 1,2 | 277.200 |
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 940.000 | 0,6 | 1,2 | 676.800 |
| Position 2 | 610.000 | 0,6 | 1,2 | 439.200 |
| Position 3 | 420.000 | 0,6 | 1,2 | 302.400 |
| Position 4 | 330.000 | 0,6 | 1,2 | 237.600 |

**B. Productive and none-agriculture land in rural**

| **Position** | **Standard Price (dong/m$^2$)** | **Coefficient Đ** | **coefficient K** | **Unit Price (dong/m$^2$)** |
|---|---|---|---|---|
| **National Road 13 (From border of My Phuoc Town to Tham Rot Bridge):** | | | | |
| Position 1 | 840.000 | 0,9 | 1,2 | 907.200 |
| Position 2 | 620.000 | 0,9 | 1,2 | 669.600 |
| Position 3 | 390.000 | 0,9 | 1,2 | 421.200 |
| Position 4 | 230.000 | 0,9 | 1,2 | 248.400 |
| **Road DT750 (T-junction to border of Long Hoa commune):** | | | | |
| Position 1 | 840.000 | 0,7 | 1,2 | 705.600 |
| Position 2 | 620.000 | 0,7 | 1,2 | 520.800 |
| Position 3 | 390.000 | 0,7 | 1,2 | 327.600 |
| Position 4 | 230.000 | 0,7 | 1,2 | 193.200 |
| **Road 2/9 (7B) (intersection Ông Giáo to ĐT 741):** | | | | |
| Position 1 | 840.000 | 0,7 | 1,3 | 764.400 |
| Position 2 | 620.000 | 0,7 | 1,3 | 564.200 |
| Position 3 | 390.000 | 0,7 | 1,3 | 354.900 |
| Position 4 | 230.000 | 0,7 | 1,3 | 300.300 |
| **Road ĐH 605 (intersection Ông Giáo to ĐT 741) (T-junction Ông Kiểm)** | | | | |
| Position 1 | 840.000 | 0,7 | 1,2 | 705.600 |
| Position 2 | 620.000 | 0,7 | 1,2 | 520.800 |

| | | | | |
|---|---|---|---|---|
| Position 3 | 390.000 | 0,7 | 1,2 | 327.600 |
| Position 4 | 230.000 | 0,7 | 1,2 | 193.200 |
| **Road ĐH – 612 (From Bia Bàu Bàng to Bố Lá T-junction)** | | | | |
| Position 1 | 660.000 | 0,8 | 1,2 | 633.600 |
| Position 2 | 430.000 | 0,8 | 1,2 | 412.800 |
| Position 3 | 290.000 | 0,8 | 1,2 | 278.400 |
| Position 4 | 230.000 | 0,8 | 1,2 | 220.800 |
| **Road ĐH – 613 (From Bia Bàu Bàng to Tân Long)** | | | | |
| Position 1 | 660.000 | 0,7 | 1,2 | 554.400 |
| Position 2 | 430.000 | 0,7 | 1,2 | 361.200 |
| Position 3 | 290.000 | 0,7 | 1,2 | 243.600 |
| Position 4 | 230.000 | 0,7 | 1,2 | 193.200 |
| **Rural Road with 4m width or more** | | | | |
| Position 1 | 660.000 | 0,6 | 1,2 | 475.200 |
| Position 2 | 430.000 | 0,6 | 1,2 | 309.600 |
| Position 3 | 290.000 | 0,6 | 1,2 | 208.800 |
| Position 4 | 230.000 | 0,6 | 1,2 | 165.600 |

**C. Agricultural Land**

**1. Trừ Văn Thố Commune**

**Road DDT750 (T-junction Trừ Văn Thố to border of Long Hòa commune):**

- Annual crop land:
  - + Position 1: 140.000 dong/$m^2$
  - + Position 2: 110.000 dong/$m^2$
  - + Position 3: 95.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 150.000 dong/$m^2$
  - + Position 2: 130.000 dong/$m^2$
  - + Position 3: 110.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$

**Rural Road with 4m width or more:**

- Annual crop land:
  - + Position 1: 100.000 dong/$m^2$
  - + Position 2: 90.000 dong/$m^2$
  - + Position 3: 80.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 130.000 dong/$m^2$
  - + Position 2: 100.000 dong/$m^2$
  - + Position 3: 90.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$

**2. Lai Uyên Commune:**

Road 13 (border of Mỹ Phước Town to Tham Rớt Bridge)

- Annual crop land:
  - + Position 1: 140.000 dong/$m^2$
  - + Position 2: 110.000 dong/$m^2$
  - + Position 3: 95.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 150.000 dong/$m^2$
  - + Position 2: 130.000 dong/$m^2$

+ Position 3: 110.000 dong/$m^2$
+ Position 4: 80.000 dong/$m^2$

**Road ĐH-612 (Bia Bàu Bàng to T-Junction Bố Lá):**

- Annual crop land:
  + Position 1: 100.000 dong/$m^2$
  + Position 2: 90.000 dong/$m^2$
  + Position 3: 80.000 dong/$m^2$
  + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  + Position 1: 130.000 dong/$m^2$
  + Position 2: 100.000 dong/$m^2$
  + Position 3: 90.000 dong/$m^2$
  + Position 4: 80.000 dong/$m^2$

**Road ĐH-613 (Bia Bàu Bàng to Tân Long)**

- Annual crop land:
  + Position 1: 100.000 dong/$m^2$
  + Position 2: 90.000 dong/$m^2$
  + Position 3: 80.000 dong/$m^2$
  + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  + Position 1: 130.000 dong/$m^2$
  + Position 2: 100.000 dong/$m^2$
  + Position 3: 90.000 dong/$m^2$
  + Position 4: 80.000 dong/$m^2$

**Rural Road with 4m width or more:**

- Annual crop land:
  + Position 1: 100.000 dong/$m^2$
  + Position 2: 90.000 dong/$m^2$
  + Position 3: 80.000 dong/$m^2$
  + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  + Position 1: 130.000 dong/$m^2$
  + Position 2: 100.000 dong/$m^2$
  + Position 3: 90.000 dong/$m^2$
  + Position 4: 80.000 dong/$m^2$

**3. Tân Hưng commune**

**Road ĐH-612 (Bia Bàu Bàng to T-Junction Bố Lá):**

- Annual crop land:
  + Position 1: 100.000 dong/$m^2$
  + Position 2: 90.000 dong/$m^2$
  + Position 3: 80.000 dong/$m^2$
  + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  + Position 1: 130.000 dong/$m^2$
  + Position 2: 100.000 dong/$m^2$
  + Position 3: 90.000 dong/$m^2$
  + Position 4: 80.000 dong/$m^2$

**Rural Road with 4m width or more:**

- Annual crop land:
  + Position 1: 100.000 dong/$m^2$
  + Position 2: 90.000 dong/$m^2$
  + Position 3: 80.000 dong/$m^2$
  + Position 4: 70.000 dong/$m^2$

- Perennial tree land:
  - + Position 1: 130.000 dong/$m^2$
  - + Position 2: 100.000 dong/$m^2$
  - + Position 3: 90.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$

**4. Lai Hưng commune:**

**Rural Road with 4m width or more:**

- Annual crop land:
  - + Position 1: 100.000 dong/$m^2$
  - + Position 2: 90.000 dong/$m^2$
  - + Position 3: 80.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 130.000 dong/$m^2$
  - + Position 2: 100.000 dong/$m^2$
  - + Position 3: 90.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$

**5. Chánh Phú Hòa commune**

**Road 2/9 (7B) intersection Ông Giáo to ĐT 741:**

- Annual crop land:
  - + Position 1: 140.000 dong/$m^2$ x 1,2 (coefficient K) = 168.000 dong/$m^2$
  - + Position 2: 110.000 dong/$m^2$ x 1,2 (coefficient K) = 132.000 dong/$m^2$
  - + Position 3: 95.000 dong/$m^2$ x 1,2 (coefficient K) = 114.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$ x 1,2 (coefficient K) = 84.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 150.000 dong/$m^2$ x 1,2 (coefficient K) = 180.000 dong/$m^2$
  - + Position 2: 130.000 dong/$m^2$ x 1,2 (coefficient K) = 156.000 dong/$m^2$
  - + Position 3: 110.000 dong/$m^2$ x 1,2 (coefficient K) = 132.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$ x 1,2 (coefficient K) = 96.000 dong/$m^2$

**Road ĐH 605 (intersection Ông Giáo to ĐT 741 (T-Junction)):**

- Annual crop land:
  - + Position 1: 140.000 dong/$m^2$ x 1,2 (coefficient K) = 168.000 dong/$m^2$
  - + Position 2: 110.000 dong/$m^2$ x 1,2 (coefficient K) = 132.000 dong/$m^2$
  - + Position 3: 95.000 dong/$m^2$ x 1,2 (coefficient K) = 114.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$ x 1,2 (coefficient K) = 84.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 150.000 dong/$m^2$ x 1,2 (coefficient K) = 180.000 dong/$m^2$
  - + Position 2: 130.000 dong/$m^2$ x 1,2 (coefficient K) = 156.000 dong/$m^2$
  - + Position 3: 110.000 dong/$m^2$ x 1,2 (coefficient K) = 132.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$ x 1,2 (coefficient K) = 96.000 dong/$m^2$

**Rural Road with 4m width or more:**

- Annual crop land:
  - + Position 1: 100.000 dong/$m^2$ x 1,2 (coefficient K) = 120.000 dong/$m^2$
  - + Position 2: 90.000 dong/$m^2$ x 1,2 (coefficient K) = 108.000 dong/$m^2$
  - + Position 3: 80.000 dong/$m^2$ x 1,2 (coefficient K) = 96.000 dong/$m^2$
  - + Position 4: 70.000 dong/$m^2$ x 1,2 (coefficient K) = 84.000 dong/$m^2$
- Perennial tree land:
  - + Position 1: 130.000 dong/$m^2$ x 1,2 (coefficient K) = 156.000 dong/$m^2$
  - + Position 2: 100.000 dong/$m^2$ x 1,2 (coefficient K) = 120.000 dong/$m^2$
  - + Position 3: 90.000 dong/$m^2$ x 1,2 (coefficient K) = 108.000 dong/$m^2$
  - + Position 4: 80.000 dong/$m^2$ x 1,2 (coefficient K) = 96.000 dong/$m^2$

**Annex F PAHs inventory**

**The List of PAH in WTP**

| No | No of profile | Name | Address | Acquired area ($m^2$) | Note |
|---|---|---|---|---|---|
| 1 | | Lê Thị Nga | 150, hamlet 5, Chánh Phú Hòa commune | 10,190.60 | Gum land |
| 2 | | Lê Quốc Cường | Kp1, Mỹ Phước, Town | 4,447.00 | Gum land |
| 3 | | Nguyễn Văn Hơi | Hòa Lợi commune | 6,375.50 | Gum land |
| 4 | | Ngô Văn Nhị | Hamlet 1A, Chánh Phú Hòa commune | 5,974.00 | Empty land |
| 5 | | Võ Văn Bình | Hamlet 4, Chánh Phú Hòa commune | 10,671.70 | Empty land |
| 6 | | Huỳnh Thi Ngọc | Hamlet 1, Chánh Phú Hòa commune | 5,514.00 | Gum land |
| 7 | | Trương Văn Ân | Hamlet 2, Chánh Phú Hòa commune | 6,718.86 | Gum land |
| 8 | | Lê Văn Sung | 166, Hamlet 4, group 6, Chánh Phú Hòa commune | 7,501.50 | Empty land |
| 9 | | Nguyễn Thị Mỹ | Hamlet 2, Chánh Phú Hòa commune | 5,568.72 | Gum land |
| 10 | | Huỳnh Văn Đeo | Kp3, Mỹ Phước, Town | 6,768.22 | Gum land |
| 11 | | Thượng Văn Sĩ | Hamlet 1B, Chánh Phú Hòa commune | 12,122.80 | Empty land |
| 12 | | Nguyễn Văn Lỹ | Chánh Phú Hòa commune | 14,195.00 | Gum land |
| 13 | | Lê Thị Vàng (đại diện Huỳnh Văn Việt) | Chánh Phú Hòa commune | 4,544.00 | Empty land |
| 14 | | Nguyễn Văn Huề | Chánh Phú Hòa commune | 23,232.00 | Gum land |

| No | No of profile | Name | Address | Acquired area ($m^2$) | Note |
|---|---|---|---|---|---|
| 15 | | Nguyễn Văn Anh | Chánh Phú Hòa commune | 5,388.00 | Empty land |
| 16 | | Lê Minh Sang | Chánh Phú Hòa, commune | 13,194.00 | Empty land |
| 17 | | Trương Văn Bá | Chánh Phú Hòa, commune | 7,426.60 | Gum land |
| 18 | | Phạm Thị Gái | Chánh Phú Hòa, commune | 72,188.50 | Gum land |

# Appendix 9 - A Breakdown of Construction Cost

*Exchange rate: VND 1.0 = JPY 0.0044, US$ 1.0 = JPY 91.84*

## (1) Regulating Reservoir

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| **A** | | | **Earth Dam** | | | | | | **114,482,460,006** | **5,484,787** | **503,722,824** |
| | | | 100.00 | **%** | | | | | | | |
| **A** | 1 | | Construction Costs | | | | | | 114,482,460,006 | 5,484,787 | 503,722,824 |
| **A** | 1 | 1 | Excavated soil | 1 | 2,708,746 | $m^3$ | 28,969 | VND/$m^3$ | 78,470,532,965 | 3,759,477 | 345,270,345 |
| | | | 520.2*520.2*8.9 | | 2,408,412 | | | | | | |
| | | | 4*542.6*(0.5*(1+8.9)*22.4) | | 240,654 | | | | | | |
| | | | 4*552.6*(0.5*(3+10.5)*4) | | 59,681 | | | | | | |
| | | | 4*572.6*(0.5*(21.52+3)*13) | | 365,044 | | | | | | |
| **A** | 1 | 2 | Backfilled soil with K>=0.97 | 1 | 665,379 | $m^3$ | 14,222 | VND/$m^3$ | 9,463,294,928 | 453,381 | 41,638,498 |
| **A** | 1 | 3 | Concrete, grade 200 | 1 | 1,259 | $m^3$ | 2,015,600 | VND/$m^3$ | 2,537,301,779 | 121,561 | 11,164,128 |
| | | | 4*542.6*(0.4+0.18) | | 1,259 | | | | | | |
| **A** | 1 | 4 | Concrete, grade 150 | 1 | 416 | $m^3$ | 1,850,000 | VND/$m^3$ | 769,896,000 | 36,885 | 3,387,542 |
| | | | 4*520.2*0.4*0.5 | | 416 | | | | | | |
| **A** | 1 | 5 | Lined Stone | 1 | 12,805 | $m^3$ | 205,643 | VND/$m^3$ | 2,633,328,933 | 126,161 | 11,586,647 |
| | | | 4*542.6*(23.6*0.25) | | 12,805 | | | | | | |
| **A** | 1 | 6 | Stone for drainage | 1 | 7,683 | $m^3$ | 417,866 | VND/$m^3$ | 3,210,555,590 | 153,816 | 14,126,445 |
| | | | 4*542.6*(23.6*0.15) | | 7,683 | | | | | | |
| **A** | 1 | 7 | Filter Sand | 1 | 10,244 | $m^3$ | 349,254 | VND/$m^3$ | 3,577,854,827 | 171,413 | 15,742,561 |
| | | | 4*542.6*(23.6*0.2) | | 10,244 | | | | | | |
| **A** | 1 | 8 | Grass | 1 | 41,011 | $m^2$ | 120,398 | VND/$m^2$ | 4,937,604,773 | 236,558 | 21,725,461 |
| | | | 4*553.6*18.52 | | 41,011 | | | | | | |
| **A** | 1 | 9 | Surrounding road | 1 | 2,186 | m | 2,567,000 | VND/m | 5,612,488,800 | 268,891 | 24,694,951 |
| | | | 2*(546.6+546.6) | | 2,186 | | | | | | |
| **A** | 1 | 10 | Reinforcing steel bar | 1 | 101 | ton | 21,353,190 | VND/ton | 2,150,406,310 | 103,025 | 9,461,788 |
| **A** | 1 | 11 | Steel for mechanical work | 1 | 32 | ton | 34,714,488 | VND/ton | 1,119,195,101 | 53,620 | 4,924,458 |

## (2) Raw Water Intake Pumping Station

### 1) Phase 1A

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 2 | | **Raw Water Intake Pumping Station** | | | | | | **129,052,862,544** | **6,182,846** | **567,832,595** |
| | | | | | | | | | | | |
| **A** | 2 | | Construction Costs | | | | | | 27,799,262,544 | 1,331,846 | 122,316,755 |
| **A** | 2 | 1 | Excavation | 1 | 70.9 | $100m^3$ | 3,370,167 | VND/$100m^3$ | 239,012,209 | 11,451 | 1,051,654 |
| **A** | 2 | 2 | Back-fill | 1 | 90.3 | $100m^3$ | 3,913,873 | VND/$100m^3$ | 353,229,502 | 16,923 | 1,554,210 |
| **A** | 2 | 3 | Lean concrete, d= 0.1-0.15m | 1 | 140.4 | $m^3$ | 2,200,000 | VND/$m^3$ | 308,880,000 | 14,798 | 1,359,072 |
| **A** | 2 | 4 | R/C foundation base, d= 0.8-1m | 1 | 763.2 | $m^3$ | 6,400,000 | VND/$m^3$ | 4,884,480,000 | 234,013 | 21,491,712 |
| **A** | 2 | 5 | R/C walls, d= 0.8-1 m | 1 | 771.6 | $m^3$ | 6,400,000 | VND/$m^3$ | 4,937,932,800 | 236,573 | 21,726,904 |
| **A** | 2 | 6 | R/C columns | 1 | 72.2 | $m^3$ | 6,400,000 | VND/$m^3$ | 461,990,400 | 22,134 | 2,032,758 |
| **A** | 2 | 7 | R/C Beams | 1 | 69.6 | $m^3$ | 6,400,000 | VND/$m^3$ | 445,440,000 | 21,341 | 1,959,936 |
| **A** | 2 | 8 | R/C floor, covering slab d=0.15m | 1 | 135.4 | $m^3$ | 6,400,000 | VND/$m^3$ | 866,816,000 | 41,529 | 3,813,990 |
| **A** | 2 | 9 | Mass concrete | 1 | 669.2 | $m^3$ | 4,200,000 | VND/$m^3$ | 2,810,707,200 | 134,659 | 12,367,112 |
| **A** | 2 | 10 | Brick work | 1 | 98.5 | $m^3$ | 1,200,000 | VND/$m^3$ | 118,176,000 | 5,662 | 519,974 |
| **A** | 2 | 11 | Tile work | 1 | 216.0 | m2 | 330,000 | VND/m2 | 71,280,000 | 3,415 | 313,632 |
| **A** | 2 | 12 | Doors&Windowns | 1 | 410.5 | m2 | 2,300,000 | VND/m2 | 944,104,000 | 45,231 | 4,154,058 |
| **A** | 2 | 13 | Ladder steel | 1 | 5.0 | set | 28,400,000 | VND/set | 142,000,000 | 6,803 | 624,800 |
| **A** | 2 | 14 | Fence&landscaping | 1 | 1.0 | L/S | 4,800,000,000 | VND | 4,800,000,000 | 229,965 | 21,120,000 |
| **A** | 2 | 15 | Other parts built in = 30%*(2.1-2.14) | 1 | 1.0 | L/S | 6,415,214,433 | VND | 6,415,214,433 | 307,349 | 28,226,944 |
| **A** | 2 | | Mechanical & Electrical Equipment | | | | | | 101,253,600,000 | 4,851,000 | 445,515,840 |
| **A** | 2 | 16 | Mechanical & Electrical Equipment | 1 | 1.0 | L/S | 101,253,600,000 | VND | 101,253,600,000 | 4,851,000 | 445,515,840 |
| **A** | 3 | | **Connection Chamber** | | | | | | **8,075,959,355** | **386,914** | **35,534,221** |
| | | | | | | | | | | | |
| **A** | 3 | | Construction Costs | | | | | | 4,142,636,101 | 198,471 | 18,227,599 |
| **A** | 3 | 1 | Excavation | 1 | 4.3 | $100m^3$ | 3,370,167 | VND/$100m^3$ | 14,444,871 | 692 | 63,557 |
| **A** | 3 | 2 | Back-fill | 1 | 3.6 | $100m^3$ | 3,913,873 | VND/$100m^3$ | 14,010,101 | 671 | 61,644 |
| **A** | 3 | 3 | Lean concrete, d= 0.1m | 1 | 7.9 | $m^3$ | 2,200,000 | VND/$m^3$ | 17,270,000 | 827 | 75,988 |
| **A** | 3 | 4 | R/C foundation base, d= 0.8m | 1 | 62.8 | $m^3$ | 6,400,000 | VND/$m^3$ | 401,920,000 | 19,256 | 1,768,448 |
| **A** | 3 | 5 | R/C walls, d= 0.8m | 1 | 383.8 | $m^3$ | 6,400,000 | VND/$m^3$ | 2,456,020,582 | 117,666 | 10,806,491 |
| **A** | 3 | 6 | R/C floor, covering slab d=0.4m | 1 | 25.4 | $m^3$ | 6,400,000 | VND/$m^3$ | 162,777,600 | 7,799 | 716,221 |
| **A** | 3 | 7 | Ladder steel | 1 | 2.0 | set | 35,100,000 | VND/set | 70,200,000 | 3,363 | 308,880 |
| **A** | 3 | 8 | Waste discharge manhole | 1 | 1.0 | LS | 50,000,000 | VND | 50,000,000 | 2,395 | 220,000 |
| **A** | 3 | 9 | Other parts built in = 30%*(A.1.1 - A.1.8) | 1 | 1.0 | L/S | 955,992,946 | VND | 955,992,946 | 45,801 | 4,206,369 |
| **A** | 3 | | Mechanical Equipment | | | | | | 3,933,323,254 | 188,443 | 17,306,622 |
| **A** | 3 | 10 | Coupling D2600 | 1 | 1.0 | Set | 180,303,397 | VND/set | 180,303,397 | 8,638 | 793,335 |
| **A** | 3 | 11 | Valve D2600 | 1 | 1.0 | Set | 2,900,000,000 | VND/set | 2,900,000,000 | 138,937 | 12,760,000 |
| **A** | 3 | 12 | Steel bend $45^0$ D2600 | 1 | 1.0 | Set | 66,097,284 | VND/set | 66,097,284 | 3,167 | 290,828 |
| **A** | 3 | 13 | Steel pipe D2600 | 1 | 3.0 | m | 89,932,800 | VND/m | 269,798,400 | 12,926 | 1,187,113 |
| **A** | 3 | 14 | Steel pipe D600 | 1 | 12.0 | m | 7,670,423 | VND/m | 92,045,076 | 4,410 | 404,998 |
| **A** | 3 | 15 | Valve D600 | 1 | 1.0 | Set | 102,241,000 | VND/set | 102,241,000 | 4,898 | 449,860 |
| **A** | 3 | 16 | Check Valve D600 | 1 | 1.0 | Set | 184,033,800 | VND/set | 184,033,800 | 8,817 | 809,749 |
| **A** | 3 | 17 | Steel bend $90^0$ D600 | 1 | 3.0 | Set | 33,048,642 | VND/set | 99,145,926 | 4,750 | 436,242 |
| **A** | 3 | 18 | Steel Reducer D800x600 | 1 | 1.0 | Set | 39,658,371 | VND/set | 39,658,371 | 1,900 | 174,497 |

2) Phase 1B

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 2 | | **Raw Water Intake Pumping Station** | | | | | | **59,466,400,000** | **2,849,000** | **261,652,160** |
| | | | | | | | | | | | |
| A | 2 | | Mechanical & Electrical Equipment | | | | | | 59,466,400,000 | 2,849,000 | 261,652,160 |
| A | 2 | 16 | Mechanical & Electrical Equipment | 1 | 1.0 | L/S | 59,466,400,000 | VND | 59,466,400,000 | 2,849,000 | 261,652,160 |

(3) Raw Water Pipeline

| Pipe Dia (mm). | Depth(m) | Material | Length (m) | Unit Cost (VNI | Amount (VND) | Amount (USD) |
|---|---|---|---|---|---|---|
| 2600 | 3-4 | | | 65,977,625 | 0 | |
| | 4-5 | DIP | 23,858.5 | 67,253,849 | 1,604,575,956,367 | |
| | 5-6 | | | | 0 | |
| others | | | | | 48,137,278,691 | |
| Pipe Total | | | 23,858.5 | | 1,652,713,235,058 | 79,180,512 |

In case of FRP

| Pipe Dia (mm). | Depth(m) | Material | Length (m) | Unit Cost (VNI | Amount (VND) | Amount (USD) |
|---|---|---|---|---|---|---|
| 2600 | 3-4 | FRP | | 44,033,436 | 0 | |
| | 4-5 | FRP | 23,858.5 | 45,761,113 | 1,091,791,514,511 | |
| | 5-6 | FRP | | 65,956,788 | 0 | |
| others | | | | | 34,978,605,707 | |
| Pipe Total | | | 23,858.5 | | 1,126,770,120,218 | 53,982,889 |

(4) Water Treatment Plant

1) Phase 1A + Phase 1B

| No. | Description | FC Portion | LC Portion | Combined Equivalent Total |
|---|---|---|---|---|
| | | JPY | VND | JPY |
| | | | | |
| (1) | Receiving and Distribution Tank | | 5,724,408,016 | 25,187,395 |
| (2) | Mixing Well, Flocculation & Sedimentation Basins | | 140,685,267,915 | 619,015,179 |
| (3) | Filters | | 97,154,514,219 | 427,479,863 |
| (4) | Distribution Reservoirs | | 120,458,810,324 | 530,018,765 |
| (5) | Distribution Pumping Station | | 46,609,545,177 | 205,081,999 |
| (6) | Activated Carbon and Lime Building | | 5,307,500,000 | 23,353,000 |
| (7) | PAC Building | | 1,215,000,000 | 5,346,000 |
| (8) | Chlorine Building | | 3,045,000,000 | 13,398,000 |
| (9) | Sludge Lagoon | | 13,104,000,000 | 57,657,600 |
| (10) | Wastewater Basin | | 3,196,800,000 | 14,065,920 |
| (11) | Administration Building | | 10,545,600,000 | 46,400,640 |
| (12) | Power Substation | | 2,272,500,000 | 9,999,000 |
| (13) | Generator Room | | 922,500,000 | 4,059,000 |
| (14) | Workshop & Ware House | | 1,215,000,000 | 5,346,000 |
| (15) | Garage | | 273,000,000 | 1,201,200 |
| (16) | Guard House | | 135,000,000 | 594,000 |
| (17) | Other mechanical work | | 16,450,000,000 | 72,380,000 |
| (18) | Other electrical work | | 11,600,000,000 | 51,040,000 |
| (19) | Yard piping work | | 76,578,898,640 | 336,947,154 |
| (20) | Earth work&Fence | | 34,930,700,485 | 153,695,082 |
| (21) | Landscaping work | | 6,450,000,000 | 28,380,000 |
| (22) | Mechanical & Electrical Work | 6,127,792,000 | 0 | 6,127,792,000 |
| **Base Cost** | **Total** | **6,127,792,000** | **597,874,044,776** | **8,758,437,797** |

## 2) Phase 1A

| No. | Description | FC Portion | LC Portion | Combined Equivalent Total |
|---|---|---|---|---|
| | | JPY | VND | JPY |
| | | | | |
| (1) | Receiving and Distribution Tank | | 5,724,408,016 | 25,187,395 |
| (2) | Mixing Well, Flocculation & Sedimentation Basins | | 70,342,633,957 | 309,507,589 |
| (3) | Filters | | 48,577,257,110 | 213,739,931 |
| (4) | Distribution Reservoirs | | 60,229,405,162 | 265,009,383 |
| (5) | Distribution Pumping Station | | 46,609,545,177 | 205,081,999 |
| (6) | Activated Carbon and Lime Building | | 5,307,500,000 | 23,353,000 |
| (7) | PAC Building | | 1,215,000,000 | 5,346,000 |
| (8) | Chlorine Building | | 3,045,000,000 | 13,398,000 |
| (9) | Sludge Lagoon | | 13,104,000,000 | 57,657,600 |
| (10) | Wastewater Basin | | 3,196,800,000 | 14,065,920 |
| (11) | Administration Building | | 10,545,600,000 | 46,400,640 |
| (12) | Power Substation | | 2,272,500,000 | 9,999,000 |
| (13) | Generator Room | | 922,500,000 | 4,059,000 |
| (14) | Workshop & Ware House | | 1,215,000,000 | 5,346,000 |
| (15) | Garage | | 273,000,000 | 1,201,200 |
| (16) | Guard House | | 135,000,000 | 594,000 |
| (17) | Other mechanical work | | 16,450,000,000 | 72,380,000 |
| (18) | Other electrical work | | 11,600,000,000 | 51,040,000 |
| (19) | Yard piping work | | 61,263,118,912 | 269,557,723 |
| (20) | Earth work&Fence | | 34,930,700,485 | 153,695,082 |
| (21) | Landscaping work | | 6,450,000,000 | 28,380,000 |
| (22) | Mechanical & Electrical Work | 3,077,785,600 | 0 | 3,077,785,600 |
| **Base Cost** | **Total** | **3,077,785,600** | **403,408,968,819** | **4,852,785,063** |

## 3) Phase 1B

| No. | Description | FC Portion | LC Portion | Combined Equivalent Total |
|---|---|---|---|---|
| | | JPY | VND | JPY |
| | | | | |
| (2) | Mixing Well, Flocculation & Sedimentation Basins | | 70,342,633,957 | 309,507,589 |
| (3) | Filters | | 48,577,257,110 | 213,739,931 |
| (4) | Distribution Reservoirs | | 60,229,405,162 | 265,009,383 |
| (19) | Yard piping work | | 15,315,779,728 | 67,389,431 |
| (22) | Mechanical & Electrical Work | 3,050,006,400 | 0 | 3,050,006,400 |
| **Base Cost** | **Total** | **3,050,006,400** | **194,465,075,957** | **3,905,652,734** |

## 4) Cost breakdown of Phase 1A

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D | | | **Water treatment plant** | | | | | | **1,102,905,696,092** | **52,839,559** | **4,852,785,063** |
| D | 1 | | **Receiving Tank** | | | | | | **5,724,408,016** | **274,253** | **25,187,395** |
| | 1 | | Construction Costs | | | | | | 5,724,408,016 | 274,253 | 25,187,395 |
| D | 1 | 1 | Excavation | 1 | 28.0 | 100m³ | 3,370,167 | VND/100m³ | 94,493,234 | 4,527 | 415,770 |
| D | 1 | 2 | Back-filling | 1 | 25.1 | 100m³ | 3,913,873 | VND/100m³ | 98,314,347 | 4,710 | 432,583 |
| D | 1 | 3 | Crushed stone, 0.2m | 1 | 64.9 | m³ | 2,200,000 | VND/m³ | 142,692,000 | 6,836 | 627,845 |
| D | 1 | 4 | Lean concrete, 0.1m | 1 | 32.4 | m³ | 6,400,000 | VND/m³ | 207,552,000 | 9,944 | 913,229 |
| D | 1 | 5 | R/C foundation base, d=0.6m | 1 | 194.6 | m³ | 6,400,000 | VND/m³ | 1,245,312,000 | 59,662 | 5,479,373 |
| D | 1 | 6 | R/C walls, d=0.3 - 0.5m | 1 | 332.6 | m³ | 6,400,000 | VND/m³ | 2,128,934,400 | 101,996 | 9,367,311 |
| D | 1 | 7 | R/C channels | 1 | 5.3 | m³ | 6,400,000 | VND/m³ | 34,124,800 | 1,635 | 150,149 |
| D | 1 | 8 | R/C floor, covering slab d=0.15 - 0.2 m | 1 | 70.6 | m³ | 6,400,000 | VND/m³ | 451,968,000 | 21,654 | 1,988,659 |
| D | 1 | 9 | Other parts built-in = 30%*(C.1.1-C.1.8) | 1 | 1.0 | L/S | 1,321,017,234 | VND | 1,321,017,234 | 63,289 | 5,812,476 |
| D | 2 | | **Mixing well, Plocculation&Sedimentation basins** | | | | | | **70,342,633,957** | **3,370,074** | **309,507,589** |
| D | 2 | | Construction Costs | | | | | | 70,342,633,957 | 3,370,074 | 309,507,589 |
| D | 2 | 1 | Excavation | 1 | 78.6 | 100m³ | 3,370,167 | VND/100m³ | 264,870,823 | 12,690 | 1,165,432 |
| D | 2 | 2 | Back-filling | 1 | 9.2 | 100m³ | 3,913,873 | VND/100m³ | 35,934,806 | 1,722 | 158,113 |
| D | 2 | 3 | Crushed stone, 0.2m | 1 | 1,456.1 | m³ | 2,200,000 | VND/m³ | 3,203,383,040 | 153,472 | 14,094,885 |
| D | 2 | 4 | Lean concrete, 0.1m | 1 | 728.0 | m³ | 6,400,000 | VND/m³ | 4,659,466,240 | 223,232 | 20,501,651 |
| D | 2 | 5 | R/C foundation base, d=0.6m | 1 | 4,757.0 | m³ | 6,400,000 | VND/m³ | 30,444,902,400 | 1,458,597 | 133,957,571 |
| D | 2 | 6 | R/C walls, d=0.3 - 0.5m | 1 | 2,131.5 | m³ | 6,400,000 | VND/m³ | 13,641,605,120 | 653,561 | 60,023,063 |
| D | 2 | 7 | R/C Floors, d=0.3 - 0.4m | 1 | 161.5 | m³ | 6,400,000 | VND/m³ | 1,033,472,000 | 49,513 | 4,547,277 |
| D | 2 | 8 | R/C channels | 1 | 78.4 | m³ | 6,400,000 | VND/m³ | 501,760,000 | 24,039 | 2,207,744 |
| D | 2 | 9 | Mass concrete | 1 | 77.2 | m³ | 4,200,000 | VND/m³ | 324,324,000 | 15,538 | 1,427,026 |
| D | 2 | 10 | Other parts built-in = 30%*(C.2.1-C.2.9) | 1 | 1.0 | L/S | 16,232,915,529 | VND | 16,232,915,529 | 777,709 | 71,424,828 |
| D | 3 | | **Filters** | | | | | | **48,577,257,110** | **2,327,308** | **213,739,931** |
| D | 3 | | Construction Costs | | | | | | 48,577,257,110 | 2,327,308 | 213,739,931 |
| D | 3 | 1 | Excavation | 1 | 84.3 | 100m³ | 3,370,167 | VND/100m³ | 284,130,517 | 13,613 | 1,250,174 |
| D | 3 | 2 | Back-filling | 1 | 23.9 | 100m³ | 3,913,873 | VND/100m³ | 93,589,008 | 4,484 | 411,792 |
| D | 3 | 3 | Crushed stone, 0.2m | 1 | 677.0 | m³ | 2,200,000 | VND/m³ | 1,489,357,056 | 71,354 | 6,553,171 |
| D | 3 | 4 | Lean concrete, 0.1m | 1 | 338.5 | m³ | 6,400,000 | VND/m³ | 2,166,337,536 | 103,788 | 9,531,885 |
| D | 3 | 5 | R/C foundation base, d=0.8m | 1 | 2,632.9 | m³ | 6,400,000 | VND/m³ | 16,850,313,216 | 807,289 | 74,141,378 |
| D | 3 | 6 | R/C walls, d=0.4 - 0.7m | 1 | 1,824.6 | m³ | 6,400,000 | VND/m³ | 11,677,459,200 | 559,460 | 51,380,820 |
| D | 3 | 7 | R/C Floors, d=0.3 - 0.4m | 1 | 646.3 | m³ | 6,400,000 | VND/m³ | 4,136,056,320 | 198,156 | 18,198,648 |
| D | 3 | 8 | R/C channels | 1 | 69.1 | m³ | 6,400,000 | VND/m³ | 442,112,000 | 21,181 | 1,945,293 |
| D | 3 | 9 | Mass concrete | 1 | 54.2 | m³ | 4,200,000 | VND/m³ | 227,766,000 | 10,912 | 1,002,170 |
| D | 3 | 10 | Other parts built-in = 30%*(C.3.1-C.3.9) | 1 | 1.0 | L/S | 11,210,136,256 | VND | 11,210,136,256 | 537,071 | 49,324,600 |
| D | 4 | | **Distribution water reservoir (02 units)** | | | | | | **60,229,405,162** | **2,885,555** | **265,009,383** |
| D | 4 | | Construction Costs | | | | | | 60,229,405,162 | 2,885,555 | 265,009,383 |
| D | 4 | 1 | Excavation | 2 | 119.8 | 100m³ | 3,370,167 | VND/100m³ | 807,410,878 | 38,683 | 3,552,608 |
| D | 4 | 2 | Back-filling | 2 | 89.0 | 100m³ | 3,913,873 | VND/100m³ | 697,012,009 | 33,393 | 3,066,853 |
| D | 4 | 3 | Lean concrete, 0.1m | 2 | 253.5 | m³ | 2,200,000 | VND/m³ | 1,115,224,000 | 53,430 | 4,906,986 |
| D | 4 | 4 | R/C foundation base, d=0.6 m | 2 | 1,512.3 | m³ | 6,400,000 | VND/m³ | 19,357,593,600 | 927,411 | 85,173,412 |
| D | 4 | 5 | R/C walls, d=0.5 m | 2 | 1,308.7 | m³ | 6,400,000 | VND/m³ | 16,750,720,000 | 802,517 | 73,703,168 |
| D | 4 | 6 | R/C columns | 2 | 266.5 | m³ | 6,400,000 | VND/m³ | 3,411,763,200 | 163,456 | 15,011,758 |
| D | 4 | 7 | R/C floor, covering slab d=0.3 m | 2 | 68.9 | m³ | 6,400,000 | VND/m³ | 881,280,000 | 42,222 | 3,877,632 |
| D | 4 | 8 | Other parts built-in = 20%*(C.4.1-C.4.7) | 2 | 1.0 | L/S | 8,604,200,737 | VND | 17,208,401,475 | 824,444 | 75,716,966 |
| D | 5 | | **Distribution Pumping station** | | | | | | **46,609,545,177** | **2,233,036** | **205,081,999** |
| D | 5 | | Construction Costs | | | | | | 46,609,545,177 | 2,233,036 | 205,081,999 |
| D | 5 | 1 | Excavation | 1 | 238.4 | 100m³ | 3,370,167 | VND/100m³ | 803,420,736 | 38,491 | 3,535,051 |
| D | 5 | 2 | Back-fill | 1 | 188.8 | 100m³ | 3,913,873 | VND/100m³ | 738,909,554 | 35,401 | 3,251,202 |
| D | 5 | 3 | Lean concrete, d= 0.2m | 1 | 521.4 | m³ | 2,200,000 | VND/m³ | 1,147,080,000 | 54,956 | 5,047,152 |
| D | 5 | 4 | R/C foundation base, d= 1m | 1 | 2,464.0 | m³ | 6,400,000 | VND/m³ | 15,769,600,000 | 755,512 | 69,386,240 |
| D | 5 | 5 | R/C walls, d= 0.8-1 m | 1 | 1,438.1 | m³ | 6,400,000 | VND/m³ | 9,203,712,000 | 440,944 | 40,496,333 |
| D | 5 | 6 | R/C columns | 1 | 213.4 | m³ | 6,400,000 | VND/m³ | 1,365,504,000 | 65,420 | 6,008,218 |
| D | 5 | 7 | R/C Beams | 1 | 323.1 | m³ | 6,400,000 | VND/m³ | 2,067,968,000 | 99,075 | 9,099,059 |
| D | 5 | 8 | R/C floor, covering slab d=0.15-0.2m | 1 | 404.3 | m³ | 6,400,000 | VND/m³ | 2,587,200,000 | 123,951 | 11,383,680 |
| D | 5 | 9 | Pump thrust block concrete | 1 | 126.0 | m³ | 4,200,000 | VND/m³ | 529,200,000 | 25,354 | 2,328,480 |
| D | 5 | 10 | Brick work | 1 | 449.0 | m³ | 1,200,000 | VND/m³ | 538,752,000 | 25,811 | 2,370,509 |
| D | 5 | 11 | Tile work | 1 | 1,155.0 | m2 | 330,000 | VND/m2 | 381,150,000 | 18,261 | 1,677,060 |
| D | 5 | 12 | Doors&Windowns | 1 | 190.0 | m2 | 2,300,000 | VND/m2 | 437,000,000 | 20,936 | 1,922,800 |
| D | 5 | 13 | Ladder steel | 1 | 10.0 | set | 28,400,000 | VND/set | 284,000,000 | 13,606 | 1,249,600 |
| D | 5 | 14 | Other parts built in = 30%*(C.5.1-C.5.13) | 1 | 1.0 | L/S | 10,756,048,887 | VND | 10,756,048,887 | 515,316 | 47,326,615 |
| D | | | **Buildings** | | | | | | **41,231,900,000** | **1,975,396** | **181,420,360** |
| D | 6 | | **Activated Carbon and Lime building** | | | | | | **5,307,500,000** | **254,279** | **23,353,000** |
| D | 6 | | Construction Costs | | | | | | 5,307,500,000 | 254,279 | 23,353,000 |
| D | 6 | 1 | Construction costs | 1 | 965.0 | m² | 5,500,000 | VND/m² | 5,307,500,000 | 254,279 | 23,353,000 |
| D | 7 | | **PAC building** | | | | | | **1,215,000,000** | **58,210** | **5,346,000** |
| D | 7 | | Construction Costs | | | | | | 1,215,000,000 | 58,210 | 5,346,000 |
| D | 7 | 1 | Construction costs | 1 | 162.0 | m² | 7,500,000 | VND/m² | 1,215,000,000 | 58,210 | 5,346,000 |
| D | 8 | | **Chlorine building** | | | | | | **3,045,000,000** | **145,884** | **13,398,000** |
| D | 8 | | Construction Costs | | | | | | 3,045,000,000 | 145,884 | 13,398,000 |
| D | 8 | 1 | Construction costs | 1 | 406.0 | m² | 7,500,000 | VND/m² | 3,045,000,000 | 145,884 | 13,398,000 |
| D | 9 | | **Sludge Lagoon** | | | | | | **13,104,000,000** | **627,805** | **57,657,600** |
| D | 9 | | Construction Costs | | | | | | 13,104,000,000 | 627,805 | 57,657,600 |
| D | 9 | 1 | Construction costs | 1 | 10,920.0 | m² | 1,200,000 | VND/m² | 13,104,000,000 | 627,805 | 57,657,600 |
| D | 10 | | **Wastewater Basin** | | | | | | **3,196,800,000** | **153,157** | **14,065,920** |
| D | 10 | | Construction Costs | | | | | | 3,196,800,000 | 153,157 | 14,065,920 |
| D | 10 | 1 | Construction costs | 1 | 666.0 | m² | 4,800,000 | VND/m² | 3,196,800,000 | 153,157 | 14,065,920 |
| D | 11 | | **Administration building** | | | | | | **10,545,600,000** | **505,233** | **46,400,640** |
| D | 11 | | Construction Costs | | | | | | 10,545,600,000 | 505,233 | 46,400,640 |
| D | 11 | 1 | Construction costs | 1 | 1,352.0 | m² | 7,800,000 | VND/m² | 10,545,600,000 | 505,233 | 46,400,640 |
| D | 12 | | **Power substation** | | | | | | **2,272,500,000** | **108,874** | **9,999,000** |
| D | 12 | | Construction Costs | | | | | | 2,272,500,000 | 108,874 | 9,999,000 |
| D | 12 | 1 | Construction costs | 1 | 303.0 | m² | 7,500,000 | VND/m² | 2,272,500,000 | 108,874 | 9,999,000 |
| D | 13 | | **Generator building** | | | | | | **922,500,000** | **44,196** | **4,059,000** |
| D | 13 | | Construction Costs | | | | | | 922,500,000 | 44,196 | 4,059,000 |
| D | 13 | 1 | Construction costs | 1 | 123.0 | m² | 7,500,000 | VND/m² | 922,500,000 | 44,196 | 4,059,000 |
| D | 14 | | **Ware house & workshop building** | | | | | | **1,215,000,000** | **58,210** | **5,346,000** |
| D | 14 | | Construction Costs | | | | | | 1,215,000,000 | 58,210 | 5,346,000 |
| D | 14 | 1 | Construction costs | 1 | 162.0 | m² | 7,500,000 | VND/m² | 1,215,000,000 | 58,210 | 5,346,000 |
| D | 15 | | **Garage building** | | | | | | **273,000,000** | **13,079** | **1,201,200** |
| D | 15 | | Construction Costs | | | | | | 273,000,000 | 13,079 | 1,201,200 |
| D | 15 | 1 | Construction costs | 1 | 42.0 | m² | 6,500,000 | VND/m² | 273,000,000 | 13,079 | 1,201,200 |
| D | 16 | | **Guard building** | | | | | | **135,000,000** | **6,468** | **594,000** |
| D | 16 | | Construction Costs | | | | | | 135,000,000 | 6,468 | 594,000 |
| D | 16 | 1 | Construction costs | 1 | 18.0 | m² | 7,500,000 | VND/m² | 135,000,000 | 6,468 | 594,000 |
| D | | | **Overall Installations** | | | | | | **130,693,819,397** | **6,261,463** | **575,052,805** |
| D | 17 | | **Other mechanical work** | | | | | | **16,450,000,000** | **788,110** | **72,380,000** |
| D | 17 | 1 | Firefighting equipment (pump, etc.) | 1 | 1.0 | L/S | 3,200,000,000 | VND | 3,200,000,000 | 153,310 | 14,080,000 |
| D | 17 | 2 | Septic tank | 1 | 1.0 | L/S | 750,000,000 | VND | 750,000,000 | 35,932 | 3,300,000 |
| D | 17 | 3 | Plumbing, drainage, sanitation | 1 | 1.0 | L/S | 12,500,000,000 | VND | 12,500,000,000 | 598,868 | 55,000,000 |
| D | 18 | | **Other Electrical work** | | | | | | **11,600,000,000** | **555,749** | **51,040,000** |
| D | 18 | 1 | Security camera/ITV camera | 1 | 1.0 | L/S | 500,000,000 | VND | 500,000,000 | 23,955 | 2,200,000 |
| D | 18 | 2 | Security system (alarm, etc.) | 1 | 1.0 | L/S | 800,000,000 | VND | 800,000,000 | 38,328 | 3,520,000 |
| D | 18 | 3 | Fire alarm, sprinkler | 1 | 1.0 | L/S | 2,200,000,000 | VND | 2,200,000,000 | 105,401 | 9,680,000 |
| D | 18 | 4 | Communication and sound system | 1 | 1.0 | L/S | 450,000,000 | VND | 450,000,000 | 21,559 | 1,980,000 |
| D | 18 | 5 | Lightning system | 1 | 1.0 | L/S | 2,850,000,000 | VND | 2,850,000,000 | 136,542 | 12,540,000 |
| D | 18 | 6 | Outdoor lighting system | 1 | 1.0 | L/S | 4,800,000,000 | VND | 4,800,000,000 | 229,965 | 21,120,000 |
| D | 19 | | **Yard Piping work** | | | | | | **61,263,118,912** | **2,935,080** | **269,557,723** |
| D | 19 | 1 | - Subtoal | 1 | 1.0 | L/S | 61,263,118,912 | VND | 61,263,118,912 | 2,935,080 | 269,557,723 |
| D | 20 | | **Earth work&Fence** | | | | | | **34,930,700,485** | **1,673,509** | **153,695,082** |
| D | 20 | 1 | - Subtoal | 1 | 1.0 | L/S | 34,930,700,485 | VND | 34,930,700,485 | 1,673,509 | 153,695,082 |
| D | 21 | | **Landscaping work** | | | | | | **6,450,000,000** | **309,016** | **28,380,000** |
| D | 21 | 1 | - Subtoal | 1 | 1.0 | L/S | 6,450,000,000 | VND | 6,450,000,000 | 309,016 | 28,380,000 |
| D | 22 | | **Mechanical & Electrical Equipment** | | | | | | **699,496,727,273** | **33,512,474** | **3,077,785,600** |
| D | 22 | 1 | Mechanical & Electrical Equipment | 1 | 1.0 | L/S | 699,496,727,273 | VND | 699,496,727,273 | 33,512,474 | 3,077,785,600 |

## 5) Cost breakdown of Phase 1B

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D | | | **Water treatment plant** | | | | | | **887,648,348,684** | **42,526,707** | **3,905,652,734** |
| D | 2 | | **Mixing well, Plocculation&Sedimentation basins** | | | | | | **70,342,633,957** | **3,370,074** | **309,507,589** |
| D | 2 | | Construction Costs | | | | | | 70,342,633,957 | 3,370,074 | 309,507,589 |
| D | 2 | 1 | Excavation | 1 | 78.6 | 100m³ | 3,370,167 | VND/100m³ | 264,870,823 | 12,690 | 1,165,432 |
| D | 2 | 2 | Back-filling | 1 | 9.2 | 100m³ | 3,913,873 | VND/100m³ | 35,934,806 | 1,722 | 158,113 |
| D | 2 | 3 | Crushed stone, 0.2m | 1 | 1,456.1 | m³ | 2,200,000 | VND/m³ | 3,203,383,040 | 153,472 | 14,094,885 |
| D | 2 | 4 | Lean concrete, 0.1m | 1 | 728.0 | m³ | 6,400,000 | VND/m³ | 4,659,466,240 | 223,232 | 20,501,651 |
| D | 2 | 5 | R/C foundation base, d=0.6m | 1 | 4,757.0 | m³ | 6,400,000 | VND/m³ | 30,444,902,400 | 1,458,597 | 133,957,571 |
| D | 2 | 6 | R/C walls, d=0.3 - 0.5m | 1 | 2,131.5 | m³ | 6,400,000 | VND/m³ | 13,641,605,120 | 653,561 | 60,023,063 |
| D | 2 | 7 | R/C Floors, d=0.3 - 0.4m | 1 | 161.5 | m³ | 6,400,000 | VND/m³ | 1,033,472,000 | 49,513 | 4,547,277 |
| D | 2 | 8 | R/C channels | 1 | 78.4 | m³ | 6,400,000 | VND/m³ | 501,760,000 | 24,039 | 2,207,744 |
| D | 2 | 9 | Mass concrete | 1 | 77.2 | m³ | 4,200,000 | VND/m³ | 324,324,000 | 15,538 | 1,427,026 |
| D | 2 | 10 | Other parts built-in = 30%*(C.2.1-C.2.9) | 1 | 1.0 | L/S | 16,232,915,529 | VND | 16,232,915,529 | 777,709 | 71,424,828 |
| D | 3 | | **Filters** | | | | | | **48,577,257,110** | **2,327,308** | **213,739,931** |
| D | 3 | | Construction Costs | | | | | | 48,577,257,110 | 2,327,308 | 213,739,931 |
| D | 3 | 1 | Excavation | 1 | 84.3 | 100m³ | 3,370,167 | VND/100m³ | 284,130,517 | 13,613 | 1,250,174 |
| D | 3 | 2 | Back-filling | 1 | 23.9 | 100m³ | 3,913,873 | VND/100m³ | 93,589,008 | 4,484 | 411,792 |
| D | 3 | 3 | Crushed stone, 0.2m | 1 | 677.0 | m³ | 2,200,000 | VND/m³ | 1,489,357,056 | 71,354 | 6,553,171 |
| D | 3 | 4 | Lean concrete, 0.1m | 1 | 338.5 | m³ | 6,400,000 | VND/m³ | 2,166,337,536 | 103,788 | 9,531,885 |
| D | 3 | 5 | R/C foundation base, d=0.8m | 1 | 2,632.9 | m³ | 6,400,000 | VND/m³ | 16,850,313,216 | 807,289 | 74,141,378 |
| D | 3 | 6 | R/C walls, d=0.4 - 0.7m | 1 | 1,824.6 | m³ | 6,400,000 | VND/m³ | 11,677,459,200 | 559,460 | 51,380,820 |
| D | 3 | 7 | R/C Floors, d=0.3 - 0.4m | 1 | 646.3 | m³ | 6,400,000 | VND/m³ | 4,136,056,320 | 198,156 | 18,198,648 |
| D | 3 | 8 | R/C channels | 1 | 69.1 | m³ | 6,400,000 | VND/m³ | 442,112,000 | 21,181 | 1,945,293 |
| D | 3 | 9 | Mass concrete | 1 | 54.2 | m³ | 4,200,000 | VND/m³ | 227,766,000 | 10,912 | 1,002,170 |
| D | 3 | 10 | Other parts built-in = 30%*(C.3.1-C.3.9) | 1 | 1.0 | L/S | 11,210,136,256 | VND | 11,210,136,256 | 537,071 | 49,324,600 |
| D | 4 | | **Distribution water reservoir (02 units)** | | | | | | **60,229,405,162** | **2,885,555** | **265,009,383** |
| D | 4 | | Construction Costs | | | | | | 60,229,405,162 | 2,885,555 | 265,009,383 |
| D | 4 | 1 | Excavation | 2 | 119.8 | 100m³ | 3,370,167 | VND/100m³ | 807,410,878 | 38,683 | 3,552,608 |
| D | 4 | 2 | Back-filling | 2 | 89.0 | 100m³ | 3,913,873 | VND/100m³ | 697,012,009 | 33,393 | 3,066,853 |
| D | 4 | 3 | Lean concrete, 0.1m | 2 | 253.5 | m³ | 2,200,000 | VND/m³ | 1,115,224,000 | 53,430 | 4,906,986 |
| D | 4 | 4 | R/C foundation base, d=0.6 m | 2 | 1,512.3 | m³ | 6,400,000 | VND/m³ | 19,357,593,600 | 927,411 | 85,173,412 |
| D | 4 | 5 | R/C walls, d=0.5 m | 2 | 1,308.7 | m³ | 6,400,000 | VND/m³ | 16,750,720,000 | 802,517 | 73,703,168 |
| D | 4 | 6 | R/C columns | 2 | 266.5 | m³ | 6,400,000 | VND/m³ | 3,411,763,200 | 163,456 | 15,011,758 |
| D | 4 | 7 | R/C floor, covering slab d=0.3 m | 2 | 68.9 | m³ | 6,400,000 | VND/m³ | 881,280,000 | 42,222 | 3,877,632 |
| D | 4 | 8 | Other parts built-in = 20%*(C.4.1-C.4.7) | 2 | 1.0 | L/S | 8,604,200,737 | VND | 17,208,401,475 | 824,444 | 75,716,966 |
| D | 19 | | **Yard Piping work** | | | | | | **15,315,779,728** | **733,770** | **67,389,431** |
| D | 19 | 1 | - Subtoal | 1 | 1.0 | L/S | 15,315,779,728 | VND | 15,315,779,728 | 733,770 | 67,389,431 |
| D | 22 | | **Mechanical & Electrical Equipment** | | | | | | **693,183,272,727** | **33,210,000** | **3,050,006,400** |
| D | 22 | 1 | Mechanical & Electrical Equipment | 1 | 1.0 | L/S | 693,183,272,727 | VND | 693,183,272,727 | 33,210,000 | 3,050,006,400 |

## (5) Distribution Mains

| Element No. | | | Element Description | Number | Quantity | Unit | Total cost estimation without VAT | VND/Unit | Value [VND] | Value [USD] | Value [JPY] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **F** | | | **Distribution Mains** | | | | | | **891,000,800,833** | **42,687,321** | **3,920,403,524** |
| | | | | | | | | | | | |
| F | 1 | 1 | HDPE Pipe D400, As Type1 | 1 | *4,222.0* | m | 6,703,191 | | 28,300,873,776 | 1,355,878 | 124,523,845 |
| F | 1 | 2 | HDPE Pipe D400 | | | 100m | | | 670,319,133 | 32,115 | 2,949,404 |
| F | 1 | 3 | HDPE Pipe D400, 1m length | 1 | 100.0 | 100m | 3,242,482 | VND/100m | 324,248,160 | 15,535 | 1,426,692 |
| F | 1 | 4 | Sluice Valve, PN10, DN400 | 1 | 1.5 | 100m | 52,164,000 | VND/100m | 78,246,000 | 3,749 | 344,282 |
| F | 1 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 1 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 1 | 7 | As Type1 for D400 | 1 | 100.0 | 100m | 2,629,381 | VND/100m | 262,938,093 | 12,597 | 1,156,928 |
| F | 2 | 1 | HDPE Pipe D400, As Type2 | 1 | *2,126.0* | m | 6,973,910 | | 14,826,532,751 | 710,330 | 65,236,744 |
| F | 2 | 2 | HDPE Pipe D400 | | | 100m | | | 697,391,004 | 33,412 | 3,068,520 |
| F | 2 | 3 | HDPE Pipe D400, 1m length | 1 | 100.0 | 100m | 3,242,482 | VND/100m | 324,248,160 | 15,535 | 1,426,692 |
| F | 2 | 4 | Sluice Valve, PN10, DN400 | 1 | 1.5 | 100m | 52,164,000 | VND/100m | 78,246,000 | 3,749 | 344,282 |
| F | 2 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 2 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 2 | 7 | As Type2 for D400 | 1 | 100.0 | 100m | 2,900,100 | VND/100m | 290,009,965 | 13,894 | 1,276,044 |
| F | 3 | 1 | HDPE Pipe D500, As Type1 | 1 | *2,497.0* | m | 9,094,392 | | 22,708,697,797 | 1,087,960 | 99,918,270 |
| F | 3 | 2 | HDPE Pipe D500 | | | 100m | | | 909,439,239 | 43,571 | 4,001,533 |
| F | 3 | 3 | HDPE Pipe D500, 1m length | 1 | 100.0 | 100m | 4,880,046 | VND/100m | 488,004,551 | 23,380 | 2,147,220 |
| F | 3 | 4 | Sluice Valve, PN10, DN500 | 1 | 1.0 | 100m | 93,895,200 | VND/100m | 93,895,200 | 4,498 | 413,139 |
| F | 3 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 3 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 3 | 7 | As Type1 for D500 | 1 | 100.0 | 100m | 3,226,526 | VND/100m | 322,652,607 | 15,458 | 1,419,671 |
| F | 4 | 1 | Ductile Iron Pipe D600, As Type1 | 1 | *3,400.0* | m | 11,872,567 | | 40,366,728,151 | 1,933,946 | 177,613,604 |
| F | 4 | 2 | Ductile Iron Pipe D600 | | | 100m | | | 1,187,256,710 | 56,881 | 5,223,930 |
| F | 4 | 3 | Ductile Iron Pipe D600, 1m length | 1 | 100.0 | 100m | 7,375,709 | VND/100m | 737,570,945 | 35,337 | 3,245,312 |
| F | 4 | 4 | Butterfly Valve, PN10, DN600 | 1 | 1.0 | 100m | 102,241,440 | VND/100m | 102,241,440 | 4,898 | 449,862 |
| F | 4 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 4 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 4 | 7 | As Type1 for D600 | 1 | 100.0 | 100m | 3,425,574 | VND/100m | 342,557,446 | 16,412 | 1,507,253 |
| F | 5 | 1 | Ductile Iron Pipe D600, As Type2 | 1 | *11,581.0* | m | 12,226,584 | | 141,596,067,998 | 6,783,784 | 623,022,699 |
| F | 5 | 2 | Ductile Iron Pipe D600 | | | 100m | | | 1,222,658,389 | 58,577 | 5,379,697 |
| F | 5 | 3 | Ductile Iron Pipe D600, 1m length | 1 | 100.0 | 100m | 7,375,709 | VND/100m | 737,570,945 | 35,337 | 3,245,312 |
| F | 5 | 4 | Butterfly Valve, PN10, DN600 | 1 | 1.0 | 100m | 102,241,440 | VND/100m | 102,241,440 | 4,898 | 449,862 |
| F | 5 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 5 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 5 | 7 | As Type2 for D600 | 1 | 100.0 | 100m | 3,779,591 | VND/100m | 377,959,124 | 18,108 | 1,663,020 |
| F | 6 | 1 | Ductile Iron Pipe D600, As Type3 | 1 | *1,743.0* | m | 12,937,104 | | 22,549,372,506 | 1,080,327 | 99,217,239 |
| F | 6 | 2 | Ductile Iron Pipe D600 | | | 100m | | | 1,293,710,413 | 61,981 | 5,692,326 |
| F | 6 | 3 | Ductile Iron Pipe D600, 1m length | 1 | 100.0 | 100m | 7,375,709 | VND/100m | 737,570,945 | 35,337 | 3,245,312 |
| F | 6 | 4 | Butterfly Valve, PN10, DN600 | 1 | 1.0 | 100m | 102,241,440 | VND/100m | 102,241,440 | 4,898 | 449,862 |
| F | 6 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 6 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 6 | 7 | As Type3 for D600 | 1 | 100.0 | 100m | 4,490,111 | VND/100m | 449,011,149 | 21,512 | 1,975,649 |
| F | 7 | 1 | Ductile Iron Pipe D800, As Type1 | 1 | *3,496.0* | m | 16,927,458 | | 59,178,392,337 | 2,835,202 | 260,384,926 |
| F | 7 | 2 | Ductile Iron Pipe D800 | | | 100m | | | 1,692,745,776 | 81,098 | 7,448,081 |
| F | 7 | 3 | Ductile Iron Pipe D800, 1m length | 1 | 100.0 | 100m | 11,068,514 | VND/100m | 1,106,851,374 | 53,029 | 4,870,146 |
| F | 7 | 4 | Butterfly Valve, PN10, DN800 | 1 | 1.0 | 100m | 198,640,400 | VND/100m | 198,640,400 | 9,517 | 874,018 |
| F | 7 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 7 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 7 | 7 | As Type1 for D800 | 1 | 100.0 | 100m | 3,823,671 | VND/100m | 382,367,122 | 18,319 | 1,682,415 |
| F | 8 | 1 | Ductile Iron Pipe D800, As Type2 | 1 | *3,137.0* | m | 17,323,124 | | 54,342,638,670 | 2,603,524 | 239,107,610 |
| F | 8 | 2 | Ductile Iron Pipe D800 | | | 100m | | | 1,732,312,358 | 82,994 | 7,622,174 |
| F | 8 | 3 | Ductile Iron Pipe D800, 1m length | 1 | 100.0 | 100m | 11,068,514 | VND/100m | 1,106,851,374 | 53,029 | 4,870,146 |
| F | 8 | 4 | Butterfly Valve, PN10, DN800 | 1 | 1.0 | 100m | 198,640,400 | VND/100m | 198,640,400 | 9,517 | 874,018 |
| F | 8 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 8 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 8 | 7 | As Type2 for D800 | 1 | 100.0 | 100m | 4,219,337 | VND/100m | 421,933,704 | 20,215 | 1,856,508 |
| F | 9 | 1 | Ductile Iron Pipe D1000, As Type2 | 1 | *6,426.0* | m | 23,147,635 | | 148,746,699,467 | 7,126,366 | 654,485,478 |
| F | 9 | 2 | Ductile Iron Pipe D1000 | | | 100m | | | 2,314,763,453 | 110,899 | 10,184,959 |
| F | 9 | 3 | Ductile Iron Pipe D1000, 1m length | 1 | 100.0 | 100m | 16,539,345 | VND/100m | 1,653,934,509 | 79,239 | 7,277,312 |
| F | 9 | 4 | Butterfly Valve, PN10, DN1000 | 1 | 0.5 | 100m | 292,118,400 | VND/100m | 146,059,200 | 6,998 | 642,660 |
| F | 9 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 9 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 9 | 7 | As Type2 for D1000 | 1 | 100.0 | 100m | 5,098,829 | VND/100m | 509,882,863 | 24,428 | 2,243,485 |
| F | 10 | 1 | Ductile Iron Pipe D1200, As Type2 | 1 | *1,478.0* | m | 30,325,780 | | 44,821,502,510 | 2,147,372 | 197,214,611 |
| F | 10 | 2 | Ductile Iron Pipe D1200 | | | 100m | | | 3,032,577,978 | 145,289 | 13,343,343 |
| F | 10 | 3 | Ductile Iron Pipe D1200, 1m length | 1 | 100.0 | 100m | 22,109,271 | VND/100m | 2,210,927,094 | 105,924 | 9,728,079 |
| F | 10 | 4 | Butterfly Valve, PN10, DN1200 | 1 | 0.5 | 100m | 525,813,120 | VND/100m | 262,906,560 | 12,596 | 1,156,789 |
| F | 10 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 10 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 10 | 7 | As Type2 for D1200 | 1 | 100.0 | 100m | 5,538,574 | VND/100m | 553,857,443 | 26,535 | 2,436,973 |
| F | 11 | 1 | Ductile Iron Pipe D1500, As Type1 | 1 | *6,170.0* | m | 36,881,021 | | 227,555,900,553 | 10,902,068 | 1,001,245,962 |
| F | 11 | 2 | Ductile Iron Pipe D1500 | | | 100m | | | 3,688,102,116 | 176,695 | 16,227,649 |
| F | 11 | 3 | Ductile Iron Pipe D1500, 1m length | 1 | 100.0 | 100m | 26,835,270 | VND/100m | 2,683,526,970 | 128,566 | 11,807,519 |
| F | 11 | 4 | Butterfly Valve, PN10, DN1500 | 1 | 0.5 | 100m | 876,355,200 | VND/100m | 438,177,600 | 20,993 | 1,927,981 |
| F | 11 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 11 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 11 | 7 | As Type1 for D1500 | 1 | 100.0 | 100m | 5,615,107 | VND/100m | 561,510,666 | 26,902 | 2,470,647 |
| F | 12 | 1 | Ductile Iron Pipe D1500, As Type2 | 1 | *2,254.0* | m | 37,464,108 | | 84,444,098,591 | 4,045,667 | 371,554,034 |
| F | 12 | 2 | Ductile Iron Pipe D1500 | | | 100m | | | 3,746,410,763 | 179,488 | 16,484,207 |
| F | 12 | 3 | Ductile Iron Pipe D1500, 1m length | 1 | 100.0 | 100m | 26,835,270 | VND/100m | 2,683,526,970 | 128,566 | 11,807,519 |
| F | 12 | 4 | Butterfly Valve, PN10, DN1500 | 1 | 0.5 | 100m | 876,355,200 | VND/100m | 438,177,600 | 20,993 | 1,927,981 |
| F | 12 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 12 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |
| F | 12 | 7 | As Type2 for D1500 | 1 | 100.0 | 100m | 6,198,193 | VND/100m | 619,819,313 | 29,695 | 2,727,205 |
| F | 13 | 1 | Ductile Iron Pipe D1500, As None | 1 | *50.0* | m | 31,265,914 | | 1,563,295,725 | 74,897 | 6,878,501 |
| F | 13 | 2 | Ductile Iron Pipe D1500 | | | 100m | | | 3,126,591,450 | 149,793 | 13,757,002 |
| F | 13 | 3 | Ductile Iron Pipe D1500, 1m length | 1 | 100.0 | 100m | 26,835,270 | VND/100m | 2,683,526,970 | 128,566 | 11,807,519 |
| F | 13 | 4 | Butterfly Valve, PN10, DN1500 | 1 | 0.5 | 100m | 876,355,200 | VND/100m | 438,177,600 | 20,993 | 1,927,981 |
| F | 13 | 5 | Stop Valve, PN10, DN50 | 1 | 0.7 | 100m | 3,920,000 | VND/100m | 2,744,000 | 131 | 12,074 |
| F | 13 | 6 | Air Valve, PN10, DN50 | 1 | 1.0 | 100m | 2,142,880 | VND/100m | 2,142,880 | 103 | 9,429 |

# Appendix 10-A Project Cost Estimation of North Binh Duong Water Treatment Plant

**A.1 Project Cost before Design Change and Increased Scope of Work (April 2011** Options Study by World Bank**)**

Unit: USD Million (Exchange Rate: VND20,893/US$, JY80.0/USD)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Total Investment by Water Sector (BIWASE+SPC) | Intake Gate 600,000m$^3$/d | Raw Water Pipeline Canal to Reservoir | Regulation Reservoir | Raw Water Pipeline Reservoir to WTP | Pumping Station | WTP 300,000m$^3$/d | Transport & distribution network-2015 (Priority Inv.) |
| EPC Cost | 215.8 | not included | 37.7 | 3.1 | 12.5 | 1.7 | 120.0 | 40.8 |
| Finance Cost | 40.5 | (-) | 7.1 | 0.6 | 2.3 | 0.3 | 22.5 | 7.7 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 256.3 | 0 | 44.8 | 3.7 | 14.8 | 2.0 | 142.5 | 48.5 |

**A.2 Project Cost after Design Change and Scope of Work (July 2013** Interim Report, Cost Estimation in March 2013**)**

Unit: USD Million (Exchange Rate: VND20,873/US$, JY91.84/USD, In Case of Direct Loan)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPC Cost | 326.8 | not included | ← | 101.3 | → | 18.0 | 103.7 | 103.8 |
| Finance Cost | 59.2 | (-) | ← | 17.0 | → | 3.3 | 19.5 | 19.4 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 386.0 | not included | ← | 118.3 | → | 21.3 | 123.2 | 123.2. |

**A.3 Project Cost after Design Change and Scope of Work (Dec. 2013,** Cost Estimation in March 2013**)**

Unit: USD Million (Exchange Rate: VND20,873/US$, In Case of Direct Loan)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| EPC Cost | 260.0 | not included | ← | 75.5 | → | 19.4 | 113.6 | 51.5 |
| Finance Cost | 43.0 | (-) | ← | 12.4 | → | 3.2 | 18.8 | 8.6 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 303.0 | not included | ← | 87.9 | → | 22.6 | 132.4 | 60.1. |

**A.4 G-1 Project Cost (Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

Unit: USD Million (Exchange Rate: VND20,873/US$, JY91.84/USD, In Case of Direct Loan)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Total Investment (BIWASE+SPC) | Intake Gate 600,000m$^3$/d | Raw Water Pipeline Canal to Reservoir | Regulating Reservoir | Raw Water Pipeline Reservoir to WTP | Pumping Station | WTP 300,000m$^3$/d | Transport & distribution (-2015 Priority Inv.) |
| Sub Total | 297.1 | not included | ← | 120.3 | → | 10.8 | 111.2 | 54.8 |
| P.F. Cost | 25.2 | (-) | ← | 0.0 | → | 2.2 | 23.0 | 0.0 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 322.3 | not included | ← | 120.3 | → | 13.0 | 134.2 | 54.8 |

**A.5 P-3 Project Cost (Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

Unit: USD Million (Exchange Rate: VND20,873/US$, JY91.84/USD, In Case of Direct Loan)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Sub Total | 272.7 | not included | ← | 95.9 | → | 10.8 | 111.2 | 54.8 |
| P.F. Cost | 25.2 | (-) | ← | 0.0 | → | 2.2 | 23.0 | 0.0 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 297.9 | not included | ← | 95.9 | → | 13.0 | 134.2 | 54.8 |

**A.6 P-3 Project Cost after Material Change of Pipeline (July. 2015** Final Report, Cost Estimation in March 2013**)**

Unit: USD Million (Exchange Rate: VND20,873/US$, JY91.84/USD, In Case of Direct Loan)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Total Investment (BIWASE+SPC) | Intake Gate 600,000m$^3$/d | Raw Water Pipeline Canal to Reservoir | Regulating Reservoir | Raw Water Pipeline Reservoir to WTP | Pumping Station | WTP 300,000m$^3$/d | Transport & distribution (-2015 Priority Inv.) |
| Sub Total | 304.9 | not included | ← | 128.1 | → | 10.8 | 111.2 | 54.8 |
| P.F. Cost | 25.2 | (-) | ← | 0.0 | → | 2.2 | 23.0 | 0.0 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 330.1 | not included | ← | 128.1 | → | 13.0 | 134.2 | 54.8 |

**A.7 P-3 Project Cost after Material Change of Pipeline (July. 2015** Final Report, Adjusted Cost Estimation in March 2015**)**

Unit: USD Million (Exchange Rate: VND21,255/US$, JY119.03/USD, In Case of Direct Loan)

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Sub Total | 284.9 | not included | ← | 127.2 | → | 8.9 | 94.4 | 54.4 |
| P.F. Cost | 21.1 | (-) | ← | 0.0 | → | 1.8 | 19.3 | 0.0 |
| E I A & R A P | not included | (-) | (-) | (-) | (-) | (-) | (-) | (-) |
| Total | 306.0 | not included | ← | 127.2 | → | 10.7 | 113.7 | 54.4 |

# Appendix 10-B Demarcation between the Public and the Private Sector

**B.1 Project Cost before Design Change and Increased Scope of Work (April 2011** Options Study by World Bank**)**

Unit: USD Million

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Total Investment Sharing BIWASE/SPC | Intake Gate 600,000$m^3$/d | Raw Water Pipeline Canal to Reservoir | Regulating Reservoir | Raw Water Pipeline Reservoir to WTP | Pumping Station | WTP 300,000$m^3$/d | Transport & distribution network-2015 (Priority Inv.) |
| Option 1 | 0.0/256.3 | not included | SPC | SPC | SPC | SPC | SPC | SPC |
| Option 2 | 48.5/207.8 | not included | SPC | SPC | SPC | SPC | SPC | BIWASE |
| Option 3 | 111.8/144.5 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.2 Project Cost after Design Change and Scope of Work (July 2013** Interim Report, Cost Estimation in March 2013**)**

Unit: USD Million

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Option 1 | 0.0/386.0 | not included | SPC | SPC | SPC | SPC | SPC | SPC |
| Option 2 | 123.2/262.8 | not included | SPC | SPC | SPC | SPC | SPC | BIWASE |
| Option 3 | 241.5/144.5 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.3 Project Cost after Design Change and Scope of Work (Dec. 2013**, Cost Estimation in March 2013**)**

Unit: USD Million

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | Total Investment Sharing Public/Private | Intake Gate 600,000$m^3$/d | Raw Water Pipeline Canal to Reservoir | Regulating Reservoir | Raw Water Pipeline Reservoir to WTP | Pumping Station | WTP 300,000$m^3$/d | Transport & distribution network-2015 (Priority Inv.) |
| Option 1 | 0.0/303.0 | not included | SPC | SPC | SPC | SPC | SPC | SPC |
| Option 2 | 60.1/242.9 | not included | SPC | SPC | SPC | SPC | SPC | BIWASE |
| Option 3 | 148.0/155.0 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.4 G-1 Project Cost (Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

Unit: USD Million

| Scope Items | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Option 3 | 175.1/147.2 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.5 P-3 Project Cost (Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Option 3 | 150.7/147.2 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.6 P-3 Project Cost after Material Change of Pipeline (July. 2015** Final Report, Cost Estimation in March 2013**)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Option 3 | 182.9/147.2 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

**B.7 P-3 Project Cost after Material Change of Pipeline (July. 2015** Final Report, Adjusted Cost Estimation in March 2015**)**

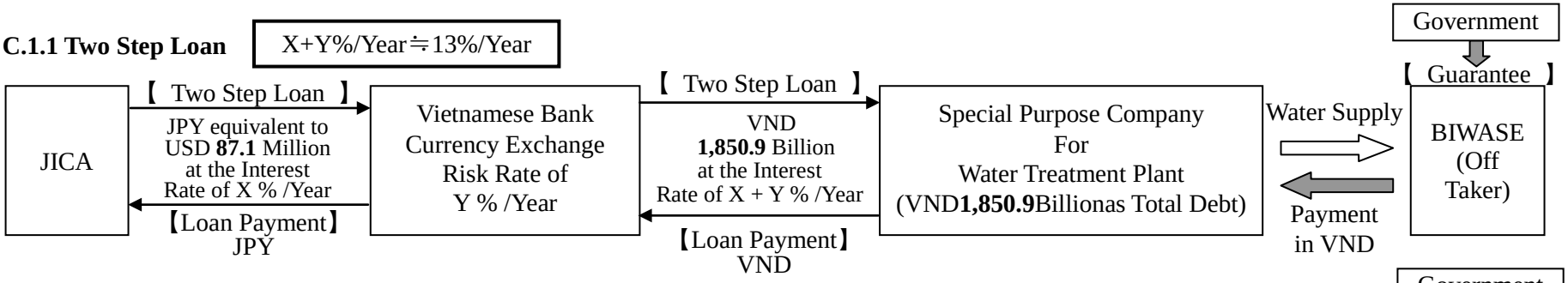
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Option 3 | 181.6/124.4 | not included | BIWASE | BIWASE | BIWASE | SPC | SPC | BIWASE |

# Appendix 10-C Financial Structure and Bulk Water Supply Tariff

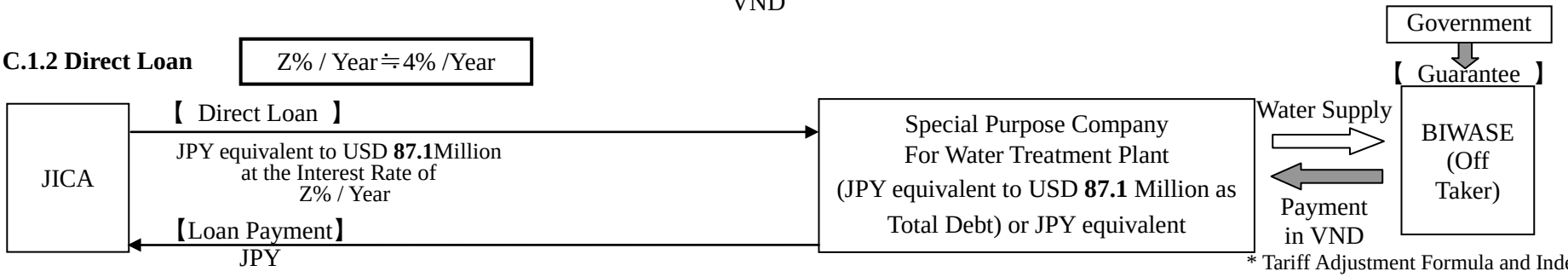
**(July. 2015** Final Report, Adjusted Cost Estimation at March 2015**,** Exchange Rate: VND21,255/US$, JY119.03/USD, In Case of Direct Loan)

**C.1 JICA PSIF Financial Structure (P-3 Option 3 Project Cost of US$124.4 Million basis, 70% loan portion of USD87.1Million)**

**C.1.1 Two Step Loan** X+Y%/Year≒13%/Year

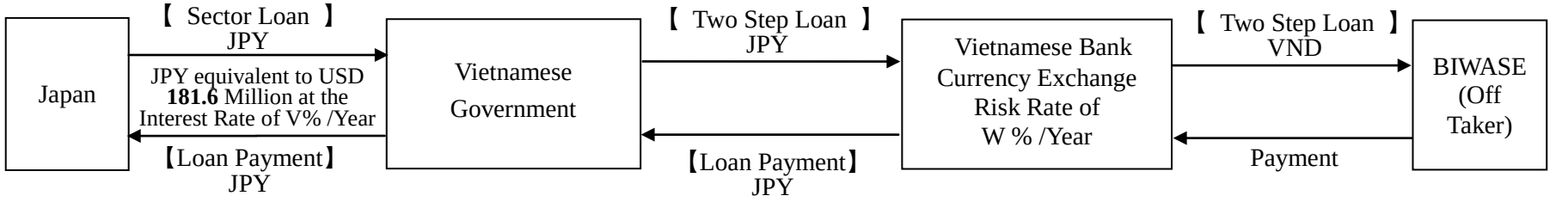



**C.1.2 Direct Loan** Z% / Year≒4% /Year




* Tariff Adjustment Formula and Index to be settled for VND/JPY Exchange Rate Change

**C.2 Japan ODA Sector Loan Financial Structure (Project Cost of US$ 150.7Million)** V%+W%/Year ≒6%/Year



# Appendix 10-D Water Supply Tariff

## D.1 300,000m$^3$/d with Two Step Loan

Unit: USD/m$^3$ (P0 - Current Price excludes VAT, but includes Intake Fee in SPC)

| | G-1(2013) | P-3(2013) | P-3(2015) |
|---|---|---|---|
| SPC Scope | 0.353 | 0354 | 0.321 |
| BIWASE Scope | 0.106 | 0.091 | 0.110 |
| Total | 0.459 | 0.445 | 0.430 |

Unit: VND/m$^3$ (P0 - Current Price excludes VAT, but includes Intake Fee in SPC)

| G-1 | P-3 | P-3(2015) |
|---|---|---|
| 7,380 | 7,380 | 6,820 |
| 2,210 | 1,900 | 2,330 |
| 9,590 | 9,280 | 9,150 |

## D.2 300,000m3/d with Direct Loan

| | G-1(2013) | P-3(2013) | P-3(2015) |
|---|---|---|---|
| SPC Scope | 0.253 | 0254 | 0.237 |
| BIWASE Scope | 0.106 | 0.091 | 0.110 |
| Total | 0.359 | 0.345 | 0.347 |

| G-1 | P-3 | P-3(2015) |
|---|---|---|
| 5,290 | 5,300 | 5,050 |
| 2,210 | 1,900 | 2,330 |
| 7,500 | 7,200 | 7,380 |

## D.3 150,000m3/d with Two Step Loan

| | G-1(2013) Phase1/Phase2 | P-3(2013) Phase1/Phase2 | P-3(2015) Phase1/Phase2 |
|---|---|---|---|
| SPC Scope | 0.397/ 0.336 | 0.397/ 0.336 | 0.365 / 0.298 |
| BIWASE Scope | 0.211/ - | 0.182/ - | 0.219/ - |
| Total | 0.608/ 0.336 | 0.579 / 0.336 | 0.584/ 0.298 |

| G-1 Phase1/Phase2 | P-3 Phase1/Phase2 | P-3(2015) Phase1/Phase2 |
|---|---|---|
| 8280/ 7010 | 8,290/ 7,010 | 7,760/ 6,330 |
| 4420/ - | 3,800/ - | 4,660/ - |
| 12700/ | 12,090/ 7,010 | 12,420/ 6,330 |

## D.4 150,000m3/d with Direct Loan

| | G-1(2013) Phase1/Phase2 | P-3(2013) Phase1/Phase2 | P-3(2015) Phase1/Phase2 |
|---|---|---|---|
| SPC Scope | 0.284 / 0.235 | 0.284/ 0.235 | 0.268/ 0.216 |
| (Base Tariff) | (0.216) /(0.175) | (0.216) /(0.175) | (0.197)/(0.154) |
| (Heavy Repair) | (0.026) /(0.017) | (0.026) /(0.017) | (0.027)/(0.018) |
| (Raw Water Fee) | (0.042)/ (0.042) | (0.042)/ (0.042) | (0.044)/ (0.044) |
| BIWASE Scope | 0.212 / - | 0.183/ - | 0.219/ - |
| Total | 0.495/ 0.235 | 0.466/ 0.235 | 0.487/ 0.216 |

| G-1 Phase1/Phase2 | P-3 Phase1/Phase2 | P-3(2015) Phase1/Phase2 |
|---|---|---|
| 5,920 / 4,900 | 5,920 / 4,900 | 5,690/ 4,590 |
| (4,500) /(3,660) | (4,500) /(3,660) | (4,190)/(3,280) |
| (540) /(360) | (540) /(360) | (570)/(380) |
| (880)/ (880) | (880)/ (880) | (930)/ (930) |
| 4,420 / - | 3,810 / - | 4,660/ - |
| 10,340 / 4,900 | 9,730/4,900 | 10,350/ 4,590 |

# Appendix 10-E SPC Cash Flow Summary (150,000m3/d P-3 Phase1 Option3 with Direct Loan)

**(Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

**E.1. SPC Cash Flow Summary with the Tariff of VND 5,920/m$^3$ (FIRR 14.1%)**

Unit: VND Billion/Year (Average)

| The Year from PCOD (*1) | 2020-2023 | 2024-2031 | 2032-2033 | 2034-2039 | 2040-2044 |
|---|---|---|---|---|---|
| Revenue | 369 | 460 | 525 | 582 | 564 |
| Expenditure | 281 | 322 | 338 | 349 | 322 |
| O&M(*2) | 136 | 181 | 217 | 250 | 253 |
| Depreciation | 73 | 78 | 78 | 78 | 66 |
| Interest Paid | 52 | 44 | 28 | 10 | 0 |
| Others | 21 | 20 | 15 | 8 | 4 |
| Profit before CIT(*3) | 87 | 138 | 187 | 234 | 241 |
| CIT(*4) | 0 | 7 | 19 | 47 | 45 |
| Profit after CIT | 87 | 131 | 168 | 187 | 196 |
| Cash Flow from Operation | 240 | 268 | 286 | 282 | 259 |

| | | | | | |
|---|---|---|---|---|---|
| Repayment of Borrowing | 48 | 74 | 99 | 106 | 0 |
| Interest Paid on Borrowing | 52 | 44 | 28 | 10 | 0 |
| Dividend | 83 | 110 | 102 | 105 | 181 |

(*1) PCOD: Plant Commercial Operation Date

(*2) O&M: Operation & Maintenance

(*3) CIT: Corporate Income Tax

(*4) CIT from PCOD 1st-4th year: 0%, 5th -13th year: 5%,
14th -15th year: 10%, 16th years - : 20%

**E.2. SPC Cash Flow Summary with the Tariff of VND 5,690/m$^3$ (FIRR 14.2%)**

**(July. 2015** Final Report, Adjusted Cost Estimation in March 2015**)**

Unit: VND Billion/Year (Average)

| The Year from PCOD (*1) | 2022-2025 | 2026-2034 | 2035-2036 | 2037-2042 | 2043-2047 |
|---|---|---|---|---|---|
| Revenue | 339 | 453 | 521 | 578 | 597 |
| Expenditure | 261 | 323 | 344 | 358 | 354 |
| O&M(*2) | 137 | 197 | 236 | 271 | 291 |
| Depreciation | 62 | 71 | 71 | 71 | 63 |
| Interest Paid | 44 | 40 | 27 | 12 | 0 |
| Others | 18 | 15 | 10 | 4 | 0 |
| Profit before CIT(*3) | 79 | 131 | 178 | 221 | 243 |
| CIT(*4) | 0 | 7 | 18 | 22 | 21 |
| Profit after CIT | 79 | 125 | 160 | 199 | 222 |
| Cash Flow from Operation | 207 | 250 | 268 | 285 | 281 |

| | | | | | |
|---|---|---|---|---|---|
| Repayment of Borrowing | 41 | 66 | 88 | 99 | 0 |
| Interest Paid on Borrowing | 44 | 40 | 27 | 12 | 0 |
| Dividend | 75 | 96 | 92 | 109 | 183 |

(*1) PCOD: Plant Commercial Operation Date

(*2) O&M: Operation & Maintenance

(*3) CIT: Corporate Income Tax

(*4) CIT from PCOD 1st-4th year: 0%, 5th -13th year: 5%,
14th -15th year: 10%, 16th years - : 10%

# Appendix 10-F Tariff Reduction Items to be Studied

**(Sept. 2014** Draft Final Report, Cost Estimation in March 2013**)**

**F.1 300,000m$^3$/d**

| Items | Target (28th Nov.2012) | Review (Interim Rep. Aug 2013) | Review (Draft Final Rep. Sept. 2014) |
|---|---|---|---|
| a. Water Tariff | ＞VND 10,447/m$^3$(＞US$ 0.5/m$^3$) | ＜VND 6,200/m$^3$(＜US$ 0.3/m$^3$) | ＜VND 5,300 /m$^3$ (＜US$ 0.254/m$^3$) |
| b. Project Cost | ＜USD 207.8Million as Option 2 | ＜USD 144.5Million as Option 3 | ＜USD 147.2 Million as Option 3 |
| c. O&M Cost | ＜VND 2,230/m$^3$ (＜US$ 0.1068/m$^3$) | ＜VND 1,920/m$^3$ (＜US$ 0.0920/m$^3$) | ＜VND 2,391/m$^3$ (＜US$ 0.1145m$^3$) |
| d. Water Supply and Take or Pay Contract | Off-Taker Obligation to take 90% of produced water to be checked | Off-Taker Obligation to take 90% of produced water to be checked | Off-Taker Obligation to take 95% of produced water to be checked |
| e. Loan Interest Rate | ＜15.0%/Year (Two Step) | ＜5.0%/Year (Direct) | ＜4.0%/Year (Direct) |
| f. Loan Tenor | 2.5(Construction)+15Years | 2.5(Construction)+20Years | 2.5(Construction)+20Years |

**F.2 2x150,000m$^3$/d (Phase1 + Phase2)**

| Items | Phase1 (Draft Final Rep. Sept. 2014) | Phase2 (Draft Final Rep. Sept. 2014) |
|---|---|---|
| a. Water Tariff | ＜VND 5,920 /m$^3$ (＜US$ 0.2836/m$^3$) | ＜VND 4,900 /m$^3$ (＜US$ 0.2348/m$^3$) |
| b. Project Cost | ＜USD 83.2Million as Option 3 | ＜USD 63.3Million as Option 3 |
| c. O&M Cost | ＜VND 2,603/m$^3$ (＜US$ 0.1247m$^3$) | ＜VND 2,206/m$^3$ (＜US$ 0.1057m$^3$) |
| d. Water Supply and Take or Pay Contract | Off-Taker Obligation to take 95% of produced water to be checked | Off-Taker Obligation to take 95% of produced water to be checked |
| e. Loan Interest Rate | ＜4.0%/Year (Direct) | ＜4.0%/Year (Direct) |
| f. Loan Tenor | 2.5(Construction)+20Years | 2.5(Construction)+20Years |

# Appendix 10-F Tariff Reduction Items to be Studied

**(July. 2015** Final Report, Adjusted Cost Estimation in March 2015**)**

**F.3 300,000m$^3$/d**

| Items | Review (Draft Final Rep. July. 2015) |
|---|---|
| a. Water Tariff | ＜VND 5,050/m$^3$ (＜US$ 0.237/m$^3$) |
| b. Project Cost | ＜USD 124.4Million as Option 3 |
| c. O&M Cost | ＜2,519VND/m$^3$ (＜0.1185US$ m$^3$) |
| d. Water Supply and Take or Pay Contract | Off-Taker Obligation to take 95% of produced water to be checked |
| e. Loan Interest Rate | ＜4.0%/Year (Direct) |
| f. Loan Tenor | 2.5(Construction)+20Years |

**F.4 2x150,000m$^3$/d (Phase1 + Phase2)**

| Items | Phase1 (Final Rep. July. 2015) | Phase2 (Final Rep. July. 2015) |
|---|---|---|
| a. Water Tariff | ＜VND 5,690/m$^3$ (＜0.268US$ /m$^3$) | ＜VND 4,590/m$^3$ (＜0.216US$ /m$^3$) |
| g. Project Cost | ＜USD72.5Million as Option 3 | ＜USD51.9Million as Option 3 |
| h. O&M Cost | ＜2,743VND /m$^3$ (＜0.1291US$ m$^3$) | ＜2,324VND /m$^3$ (＜0.1093US$ m$^3$) |
| i. Water Supply and Take or Pay Contract | Off-Taker Obligation to take 95% of produced water to be checked | Off-Taker Obligation to take 95% of produced water to be checked |
| j. Loan Interest Rate | ＜4.0%/Year (Direct) | ＜4.0%/Year (Direct) |
| k. Loan Tenor | 2.5(Construction)+20Years | 2.5(Construction)+20Years |

# Appendix 10 - G Risks and Countermeasures in Binh Duong Water Plant Project

**Phase**:
A. Project Planning & Design Phase: Planning & Design, → SPC Settlement → Equity Procurement → Loan Arrangement,
B. Construction Phase: Financial Closure, → Commencement → Under Construction → Completion
C. Commercial Operation Phase: In Operation

| NO. | Risk Allocation | Phase | Event | Description | Countermeasures |
|---|---|---|---|---|---|
| A. Project Planning & Design Phase | | | | | |
| 1 | **BIWASE/BDPC** | Planning & Design | Objection by the local residents etc. | Consensus for implementation of the project cannot be reached. | 1. Under BOT contract, BDPC is to be responsible for the local residents' issues etc.<br>2. The residents of the project site and the surrounding area need to have sufficient prior explanation so as to build consensus with them. |
| 2 | **BIWASE/BDPC** | Planning & Design | Land acquisition failure | Land for the water treatment plant, raw water intake pipelines, and distribution main pipelines cannot be acquired. | 1. To conduct due diligence concerning land related legislation.<br>2. Under BOT contract, BDPC is to be responsible for the site preparation and the payment of all necessary acquisition costs. |
| 3 | **BIWASE/BDPC** | SPC settlement | Acquiring business certificate failure | Investment license cannot be obtained. | 1. To conduct legal due diligence in relation to necessary permits and approvals.<br>2. To verify detailed conditions of permits and approvals and requirements, etc. for the project.<br>3. Under BOT contract, BDPC is to support sponsors and/or the project company to obtain all necessary permits and approvals. |
| 4 | **BIWASE/BDPC** | SPC settlement | Permissions not available. | Permissions and approvals for the project cannot be obtained (Construction/water resource | 1. To conduct legal due diligence in relation to necessary permits and approvals.<br>2. To verify detailed conditions of permits and approvals and requirements, etc. for the project. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | exploitation right/land use rights etc.) | 3. Under BOT contract, BDPC is to support sponsors and/or the project company to obtain all necessary permits and approvals. |
| 5 | **BIWASE/BDPC** | SPC settlement | Acceptance of EIA cannot be reached | EIA report cannot meet Vietnamese environmental Standard. | 1. To conduct due diligence (To confirm the environmental standard of the country).<br>2. To conduct Environmental Impact Assessment (EIA) from the early stage.<br>3. Under BOT contract, BDPC is to support sponsors and/or the project company to obtain permits and approvals |
| 6 | **SPC** | Equity procurement | Equity cannot be procured | Necessary equity capital commitment cannot be obtained as expected. | 1. To ensure candidates of sponsors from the early stage.<br>2. To examine the partners' creditworthiness.<br>3. To formulate concrete investment principle including capital ratio, an arrangement of voting rights, and number of executives to be dispatched, etc. under the shareholders agreement from the early stage. |
| 7 | **SPC** | Loan arrangement | Loan cannot be procured | Necessary loan commitment cannot be obtained as expected. | To build the project structure and the financing structure based on the opinions from a potential lender (e.g. JICA). |
| 8 | **SPC** | Loan Arrangement | EIA cannot be accepted | Financial institution's environmental standards cannot be satisfied. | 1. Prior consultation with a potential lender (e.g. JICA).<br>2. To check their environmental screening standards. |
| B. Construction Phase | | | | | |
| 1 | **SPC/BIWASE/BDPC** | Under Construction | Equity cannot be procured | Sponsors cannot contribute necessary amount of equity capital in the necessary | 1. Under Shareholders Agreement, to formulate a penalty in case of any failure to contribute equity capital.<br>2. To verify the partners' creditworthiness. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | timing as agreed in advance. | 3. To procure credit enhancement (e.g. guaranty) from the third party. |
| 2 | **BIWASE／BDPC** | Completion | Delay in public scope of work | Delay in the construction of raw water intake pipelines, regulating reservoir, and distribution main pipelines. | 1. Under Water Purchase Agreement, BIWASE is to be responsible for the construction and the completion of the related infrastructure.<br>2. Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it as Government Event.<br>3. Under BOT contract, BDPC shall agree to extend construction duration and the term of contract as Government Event. |
| 3 | **BIWASE/BDPC** | Under Construction | Objection by local residents | Rise of protest movement by residents of the project site and the surrounding area during construction period. | 1. Under BOT contract, BDPC is to be responsible for the local residents' issues as Government Event.<br>2. Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it as Government Event. |
| 4 | **SPC** | Completion | Completion delay caused by the EPC Contractor | Completion delay by EPC Contractor (Except for Government Event and Natural Force Majeure Events). | 1. Under EPC contract, to procure completion guarantee from EPC contractor on a basis of fixed price and date certain.<br>2. To set up Liquidated Damages (LD) on EPC contract.<br>3. To procure private insurance against damage by completion delay and loss of expected profit.<br>4. To budget sufficient contingency cost. |
| 5 | **BIWASE/BDPC** | Under Construction | Cost overrun caused by a design change. | Construction cost increase due to design change by the | 1. To implement preliminary design through FS, and gain approval from BDPC<br>2. In case the design change is made by the |

| | | | | | |
|---|---|---|---|---|---|
| | | | | authority. | authority, extension of construction period and BOT period, etc. needs to be permitted under the BOT Contract.<br>3. Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it as Government Event |
| 6 | **BIWASE/BDPC** | Under Construction | Delay and cost overrun by Labor dispute | Labor dispute by construction worker. | Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it as Government Event.*1<br>*1. Provided, however, Construction All Risks Insurance may be available in regard to the damage of the equipment. |
| 7 | **BIWASE/BDPC** | Under Construction | Delay and cost overrun by political force majeure | Completion Delay and the damage of equipment made by terrorism and civil conflict. | Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it as Government Event. *2<br>*2 Terrorisms, civil conflicts, and war are not likely to be included in the warranty of private insurance. |
| 8 | **SPC/BIWASE/BDPC** | Under Construction | Delay and cost overrun by natural force majeure | Completion delay and the damage of equipment by natural disaster and epidemic. | 1. To procure private insurance against it.<br>2. Under Water Purchase Agreement, BIWASE shall agree to extend construction period, adjust water charges and bear all costs arising out of it. |
| 9 | **SPC** | Under Construction | Destruction of the facilities | Destruction of the facilities caused by accidents and/or fire during the construction period. | 1. Under EPC contract, EPC contractor is to guarantee the project completion with the conditions of fixed price and the date certain.<br>2. To procure a necessary insurance for construction. |

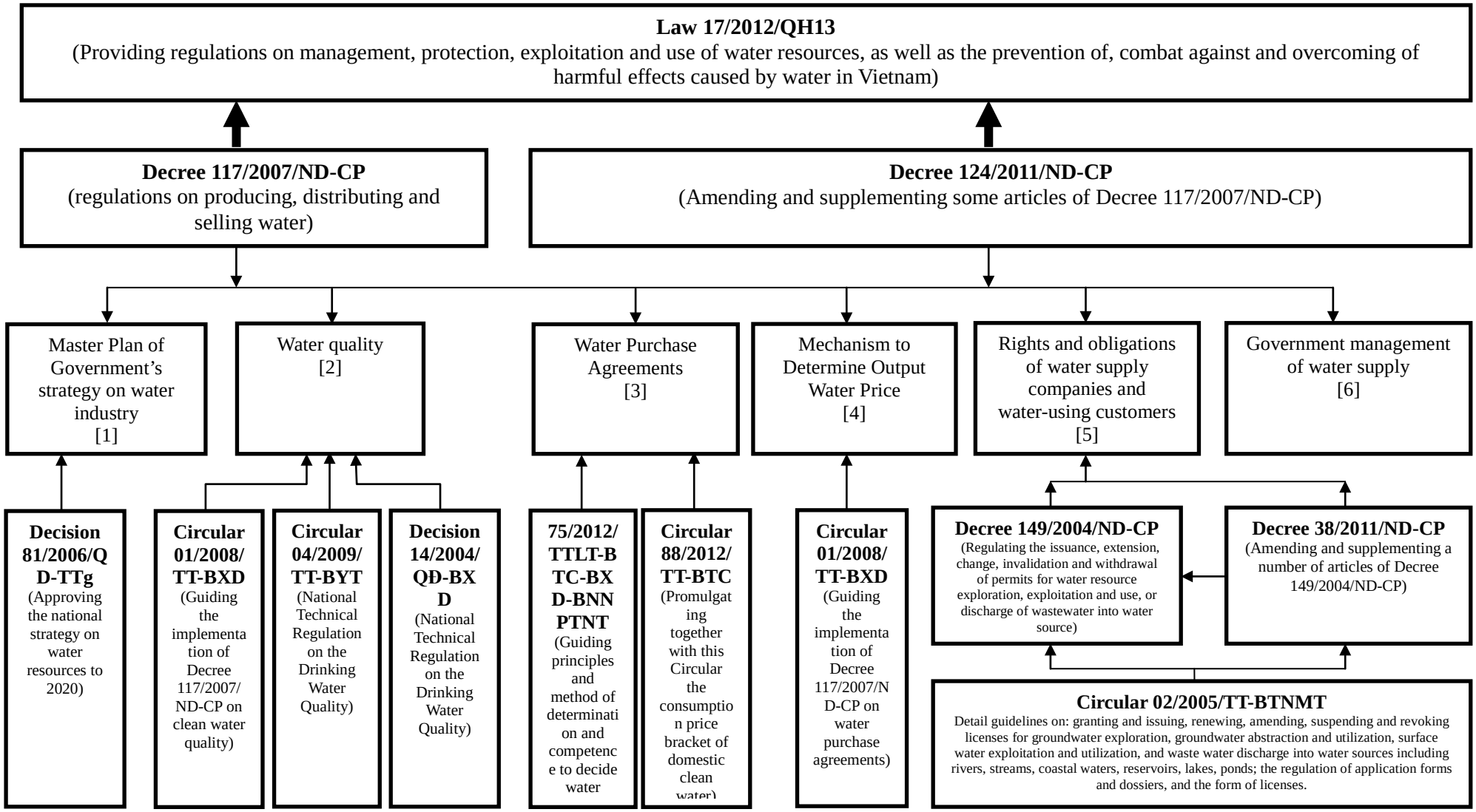
| | | | | | |
|---|---|---|---|---|---|
| 10 | **BIWASE/BDPC** | Under Construction | Cultural Property be found | Risk that historically important cultural property is unearthed in the project site. | 1. To conduct prior investigation if there is any such risks through environmental and/or technical due diligence.<br>2. For those risks that are impossible to be identified through prior survey, under BOT contract, BDPC is to be responsible for the site related issues as Government Event.,<br>3. Under Water Purchase Agreement, BIWASE is also to be responsible for the risk as Government Event. |
| 11 | **BIWASE/BDPC** | Under Construction | Land contamination be found | Soil of the project site is polluted prior to the development stage | 1. To conduct prior investigation if there is any such risks through environmental and/or technical due diligence.<br>2. For those risks that are impossible to be identified through prior survey, under BOT contract, BDPC is to be responsible for the site related issues as Government Event.<br>3. Under Water Purchase Agreement, BIWASE is also to be responsible for the risk as Government Event. |
| C. Commercial Operation Phase | | | | | |
| 1 | **SPC** | In operation | Technical performance cannot be reached | Facility cannot maintain necessary performance | 1. To conduct prior sufficient survey on technical capability and creditworthiness of EPC Contractor.<br>2. Under EPC contract, EPC contractor is to be responsible for the performance of the plant regarding the design and the construction (including post-completion warranty for a certain period). |
| 2 | **SPC** | In operation | Inappropriate operation | Operation and maintenance cost increase and a damage of the facility caused by an | 1. Under O&M Contract, the operator is to be responsible for its operation and maintenance for the facility. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | inappropriate operation. | 2. To make a contract of technical support with some technical advisor as needed. |
| 3 | **BIWASE/BDPC** | In operation | Raw water quality change | Operation and maintenance cost increase caused by the decreased quality of raw water. | 1. To specify a quality level of raw water under Water Purchase Agreement.<br>2. Under Water Purchase Agreement, BIWASE is to be responsible for the risk as Government Event. |
| 4 | **BIWASE/BDPC** | In operation | Labor dispute | Interruption of operation caused by the labor dispute | For those risks that are impossible to be identified through prior survey, under Water Purchase Agreement, BIWASE is to be responsible for the risk as Government Event. |
| 5 | **SPC** | In operation | Operation and Maintenance provider's capability change | Interruption of operation by the bankruptcy of the Operation and Maintenance provider, or beach of contract. | 1. To conduct prior investigation of the operator's capability, experience for the technology for this type of projects, and creditworthiness.<br>2. The operator is to provide performance guarantee as needed. |
| 6 | **SPC/BIWASE/BDPC** | In operation | Accident in operation | Interruption of operation caused by operational accident. | 1. To procure private insurance.<br>2. Under Water Purchase Agreement, BIWASE is to be responsible for the risk as Natural Force Majeure Event, to the extent not to be covered by private insurance. |
| 7 | **BIWASE/BDPC** | In operation | Raw water shortage | Raw water cannot be delivered for some reasons such as drought or contamination of water source | 1. Under Water Purchase Agreement, BIWASE is to be responsible for the risk as Government Event or Natural Force Majeure Event.<br>2. To make Off-Taker's payment available, Take-or-Pay contract to be agreed in the Water Purchase Agreement. |
| 8 | **BIWASE/BDPC** | In operation | Electric power failure (Black out) | Interruption of operation by electric power failure (events occurred for reasons which is | 1. Under BOT contract, BDPC is to be responsible for the obligation of electric power supplier under Electric Purchase Contract. |

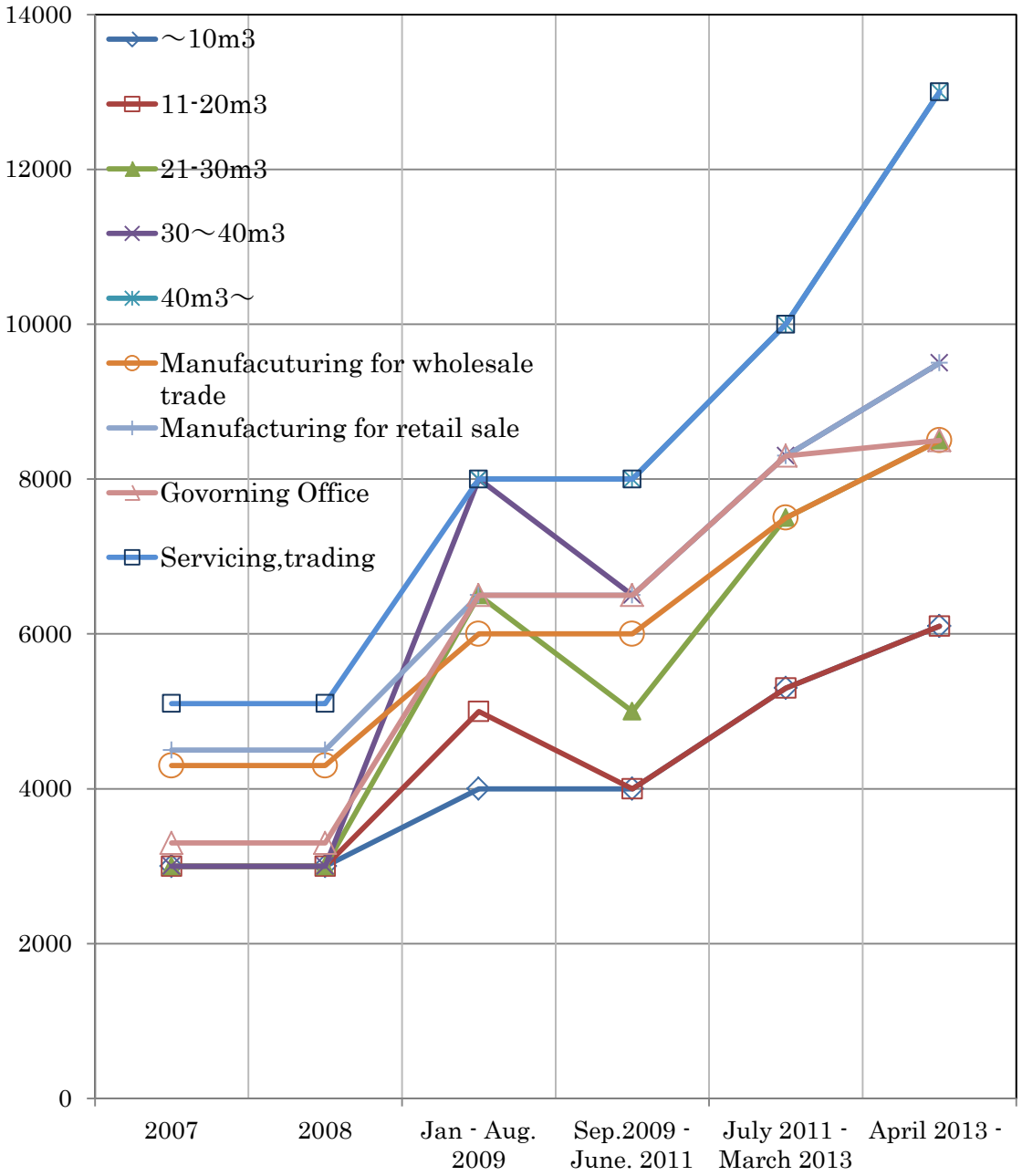
| | | | | | |
|---|---|---|---|---|---|
| | | | | not with SPC's fault) | Any such failure will be a breach of agreement and be treated as Government Event.<br>2. Under Water Purchase Agreement, BIWASE is also to be responsible for the risk as Government Event |
| 9 | **BIWASE/BDPC** | In operation | Prices of good for operation goes higher. | Operating cost increase caused by fluctuation of price of goods for operation. | Water Tariff covering operating cost is to be subject to inflation adjustment under Water Purchase Agreement. |
| 10 | **BIWASE/BDPC** | In operation | Water demand decrease | Decreased revenue caused by less water demand than expected. | 1. Availability payment needs to be made based on the availability of the plant under Water Purchase Agreement.<br>2. Contractual period of Water Purchase Agreement is set to be consistent with that of BOT Contract. |
| 11 | **BIWASE/BDPC** | In operation | Payment delay by BIWASE | Decreased revenue caused by payment delay by BIWASE | 1. To investigate BIWASE's creditworthiness thoroughly.<br>2. To consider security package such as escrow accounts as needed. |
| 12 | **BIWASE/BDPC** | In operation | Devaluation of Vietnamese Dong | Currency exchange loss caused by devaluation of Vietnamese Dong | Under Water Purchase Agreement, water tariff is to be set to allow an adjustment to reflect the change in foreign exchange rate between local currency and investment currency. |
| 13 | **BDPC** | In operation | Regulation change | Incurring additional cost caused by new regulation. | 1. Under BOT contract, BDPC is to be responsible for the risk as Government Event.<br>2. Under BOT contract, in case Project Company incurs any loss by the regulation change, BDPC is to be responsible for paying the cost. |
| 14 | **BDPC** | In operation | Tax law change | Unexpected new tax imposition due to the change | 1. Under BOT contract, BDPC is to take the risk as Government Event.<br>2. Under BOT contract, BDPC is to take |

| | | | | | |
|---|---|---|---|---|---|
| | | | | in tax law | responsibility to pay the cost in case Project Company incurs any loss by the change in tax law. |
| 15 | **SPC** | In operation | Heavy maintenance cycle accelerated | Heavy maintenance cost increase by accelerated maintenance cycle. | 1. To set water tariff taking it into consideration of heavy maintenance cost of facility.<br>2. To budget sufficient reserve for heavy maintenance. |

# Appendix 11 – A Laws and Regulations for Water Supply Service



# Appendix 11 - B Water Tariff in Binh Duong



# Appendix11-C Term Sheet For BOT Contract – North Binh Duong Water Treatment Plant Project

| 1 | DEFINITIONS AND INTERPRETATION | |
|---|---|---|
| 1.1 | BOT Contract | Being this BOT contract (Contract) for building, operating and transfer of a water treatment plant with the design capacity of 150,000 m3/ day at the Project Site. |
| 1.2 | Project | Being the BOT Project to construct and operate of a water treatment plant with the design capacity of 150,000 m3/ day at the Project Site under BOT regulations and the terms and conditions of this Contract. |
| 1.3 | Project Company | Being the BOT company to be established to implement this Project. |
| 1.4 | Laws and regulations | Unless otherwise specified, being Vietnamese laws and regulations. |
| 1.5 | Investors | Being shareholders of the Project Company, including: [TBD] |
| 1.6 | Facilities | Main facilities to be constructed under the Project as specified under Article 4.1 of this Contract. |
| 1.7 | Financial Plan | Being the plan of expected project revenue and costs as detailed in Article 6.4 of this Contract. |
| 1.8 | Project Site | The land area of … square meter is located at Chanh Phu Hoa Commune, Ben Cat District, Binh Duong Province, Vietnam. |
| 1.9 | Vietnam Key Project Contracts | Vietnam Key Project Contracts include:<br><br>Water Purchase Agreement (WPA) to be signed between Project Company and Binh Duong Water Supply Sewerage – Environment Co.,Ltd (BIWASE) which shall include procurement of raw water.<br><br>Land Lease Contract: contract to be signed between Project Company and Binh Duong People Committee (BDPC) in relation to the leasing of the land area at Chanh Phu Hoa Commune, Ben Cat District, Binh Duong Province to the Project Company to implement the Project.<br><br>Electricity purchase contract: contract to be signed between Project Company and Binh Duong Power Company in relation to electricity supply for the Project. |

| | | |
|---|---|---|
| | | this Contract |
| **2** | **PROJECT OBJECTIVES** | |
| 2.1 | Project Objective | To provide treated water for households and business of the Binh Duong New City, a new urban zone which is being developed and expected to have the population of approximate [500,000] people. Treated water will be off-taken and distributed to the end-users by BIWASE. |
| **3** | **PROJECT LOCATION AND DURATION** | |
| 3.1 | Project Location | Project's Facilities will be constructed on the land area of … square meter is located at Chanh Phu Hoa Commune, Ben Cat District, Binh Duong Province, Vietnam. |
| 3.2 | Project Duration and Schedule | Unless the project is extended as stipulated under Article 16.2 of this Contract or terminated early as stipulated under Article 16.3 of this Contract, the duration of the Project is … years from the date when the Project Company receives the Investment Certificate and the Project Site has been handed over (including by way of lease, the same hereinafter) to the Project Company.<br><br>Detailed tentative schedule of Project implementation is as follows:<br><br>▪ Expected date of Investment Certificate and land lease: [TBD]<br>▪ Construction period: [TBD]<br>▪ Trial operation: [TBD]<br>▪ Commercial Operate Date (COD): [TBD]<br>▪ Transfer Date: [TBD] |
| **4** | **SCOPE, DESIGN SOLUTION AND TECHNICAL STANDARDS OF PROJECT FACILITIES** | |
| 4.1 | Scope of Facilities | Main facilities to be constructed under the Project includes:<br><br>▪ A pumping station at the intake point<br>▪ A water treatment plant with the design capacity of [150,000 m3/ day]. |
| 4.2 | Design Solution | [TBD] |
| 4.3 | Requirements on Design | The Project Company will apply three-step designing: basic designing, technical designing, working drawing designing. |

| | | |
|---|---|---|
| | | The designs must comply with provisions of all relevant regulations i.e. Decree 12/2009/ND-CP of the Vietnamese Government (Government) on management of investment projects on the construction works dated 12 February 2009.<br><br>The designs of the Facilities will be approved by the BDPC prior to construction. |
| 4.4 | Technical Standards of Facilities | The Facilities must meet all the relevant Vietnamese technical standards applicable to industrial construction works, specifically: [TBD] |
| 4.5 | Requirement on Quality of Facilities | Project Facilities must be constructed and finished in accordance with the quality standards stipulated in this Contract, the designs approved by the BDPC and other laws and regulations. |
| 4.6 | Selection of Design Consultant, Construction Contractors and other Consultants/ Contractors | The Project Company will be self-responsible for selection of a competent design consultant(s), a construction contractor(s) and other consultants and contractors required for the constructions of the Facilities.<br><br>Decisions with regard to selection of consultants and/or contractors must be notified to the BDPC as stipulated under Article 29 of Decree 108/2009/NĐ-CP. |
| 4.7 | Supervision Rights of BDPC | During the construction stage, BDPC shall have the rights to inspect and monitor the quality of construction works performed by the Project Company and its contractors.<br><br>BDPC can engage an independent organization in order to perform its rights to inspect and supervise the Project Company's construction works during design, construction and operation stage of the Project.<br><br>In case the results of inspection or supervision prove that quality of the design or construction works is not up to the required standards due to the fault of the Project Company or the contractors chosen by the Project Company, all inspection, supervision fee will be charged to the Project Company. If not, this fee will be borne by BDPC and will be calculated as expenditures of the State under the regulations of Decree No. 108/2009/ND-CP and the guidance of the Ministry of Finance. The inspection or supervision of BDPC must comply with provisions of Article 63 of Decree No. 108/2009/ND-CP and the provisions of the Law on Construction.<br><br>All costs to remedy the quality of the construction works due to the fault of the Project Company or the Project Company's contractors including construction, procurement, or installation contractors or the Project Company's consultants will be borne by the Project Company and not included in the Project's Financial Plan (for calculation of water tariff). |
| **5** | **PRODUCTION TECHNOLOGY AND REQIREMENT ON QUALITY OF TREATED WATER** | |

| | | |
|---|---|---|
| | | |
| 5.1 | Production Technology | [TBD] |
| 5.2 | Requirement on Quality of Treated Water | The treated water of the Project Company must meet the quality standards of drinking water as stipulated under Circular 04/2009/TT-BYT issued by the Vietnamese Ministry of Health. |
| **6** | **INVESTMENT CAPITAL AND FINANCIAL PLAN** | |
| 6.1 | Total investment capital | Total investment capital of the Project is USD …, of which:<br><br>The total investment capital of the Project might be adjusted in the following circumstances:<br><br>▪ There is unexpected significant fluctuation of prices of goods and services consumed by the Project;<br>▪ Other circumstances prescribed under Vietnamese laws and regulations or under other terms and conditions of this Contract. |
| 6.2 | Sources and Structure of Investment Capital | The Project's investment capital will consist of equity capital of the Project Company and loan capital from the Project's Lender(s).<br><br>The Project Company is responsible for arranging the necessary capital sources to implement the Project as stipulated under Article 5 (1) of Decree 108/2009/ND-CP. The Project Company must commit to arrange the capital sources as per the capital arrangement schedule agreed in this Contract and is responsible for registering for any necessary adjustment of the total investment capital.<br><br>The total investment capital is structured as follows:<br>▪ Equity capital: USD ... (…%)<br>▪ Loan capital: USD … (…%)<br><br>The capital needed for the construction of the Facilities is structured as follows:<br>▪ Equity capital: USD ... (…%)<br>▪ Loan capital: USD … (…%). |
| 6.3 | Financial Capacity | The equity capital of the Project Company consists of charter capital and other lawful source of equity capital. The schedule for the Investors to make equity capital contribution into the Project Company is as follows:<br><br>▪ Upon the Project Company's receipt of Investment Certificate: … |

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| | | ▪ …<br><br>With regard to the loan capital portion, the Project Company shall enter into Loan Agreements and ensure that loan capital shall be disbursed from time to time to enable the timely implementation of the Project Schedule.<br><br>The Investors shall have the right to provide the Lenders with securities for [repayment] including; a) assignment, mortgage and/or pledge of their charter capital and their interests in this contract and b) assignment, mortgage and/or pledge of their rights under the government guarantee.<br><br>Further, the Project Company shall have the right to provide the Lenders with securities for repayment including; a)movable assets, b)land and land use rights, c)project contracts, d) income streams under any of project contracts, e) domestic and overseas bank accounts, and f) others reasonably required by financing parties.<br><br>BDPC, within its authority, shall procure all necessary authorizations for the purpose of providing securities required under financing documents. |
| 6.4 | Financial Plan for Capital Recovery and Profit Generation | **Source of Revenue**<br>BDPC guarantees that BIWASE will off-take the entire volume of [TBD] m3 of treated water produced by the Project Company through a Water Purchase Agreement to be entered between the Project Company and BIWASE.<br><br>Main source of revenue of the Project Company will be the water tariff charged to BIWASE, which will be determined as follows:<br><br>✓ Availability Payment consisting of:<br>1) Capital Cost Recovery Payment,<br>2) Fixed O&M Payment, and<br>3) Fixed Power Payment<br><br>✓ Output Payment consisting of:<br>1) Variable O&M Payment, and<br>2) Variable Power Payment<br><br>**[Costs of Investment and Operation**<br>Costs of investment and cost of operation and maintenance of the Project are as follows: |

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| | | ▪ Land resettlement and clearance costs:<br>▪ Costs of construction:<br>▪ Annual operation costs:<br>▪ Annual maintenance costs:<br>….] |
| **7** | **HANDING-OVER OF PROJECT SITE** | |
| 7.1 | Handing-over of Project Site | BDPC shall be responsible for resettlement of inhabitants out of site to construct the raw water pipeline and the Project Site and for land clearance at its own expense (including but not limited to costs of land compensation, resettlement and clearance) as stipulated under Article 6 (2, 3) of Decree 108/2009/ND-CP.<br><br>BDPC undertakes to hand-over the clean Project Site ready for construction works 90 days prior to the scheduled date of construction commencement as agreed under Article 3.2 of this Contract.<br><br>After the land required for the Project Site have been handed-over to the Project Company but the Project Company fails to meet the agreed construction schedule as agreed under Article 9.1 of this Contract or uses the handed-over land for purposes other than the approved purpose of this Contract, both the concerning land area and the Project Company's Investment Certificate shall be revoked as stipulated under the Law on Land and Law on Investment.<br><br>The Project Company is responsible for complying with the Law on land and other relevant regulations with regard to the land area of the Project.<br><br>During the construction and operation stage of the Project, BDPC has the rights to supervise the use of land and of construction works on the land area of the Project, including supervision of the construction and installation of all technical systems on the concerning land area. |
| **8** | **PROVISIONS ON ENVIRONMENTAL PROTECTION** | |
| 8.1 | Provisions on environmental protection | During the construction and operation of the Project, the Project Company has to implement environmental protection methods in accordance with the regulations of the Law Environmental Protection and the Law on Construction Law and with contents of the Environment Impact Assessment Report appraised and approved by the competent authority.<br><br>During the duration of the Project, the Project Company is also subject to the control and supervision of the environmental protection authority. |

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| | | The Project Company is responsible to cooperate with authorized state agencies in preventing the following actions:<br>▪ Preventing individuals or organizations from discharging waste polluting air, water or dumping solid waste, hazardous waste on the land area which has been assigned to the Project Company or from having other behaviors negatively affecting the environment or causing damage to the Project Company, delaying or affecting the construction or operation of the Project.<br>▪ Polluting the environment, causing an event, a condition, or a situation impeding the construction or operation of the Project or hindering the Project Company from complying with environmental regulations or standards. |
| **9** | **TIMELINE AND CONSTRUCTION SCHEDULE OF PROJECT FACILITIES** | |
| 9.1 | Commencement of Construction | Providing that the Project Company will receive the Investment Certificate by… and Project Site will be hand over to Project Company on..., and all the conditions precedent is satisfied (or waived) under the WPA, the construction of the Project Facilities shall commence on [TBD] |
| 9.2 | Completion of Construction | The Project Company shall complete the construction and trial operation of the Facilities within [TBD] months from the date of commencement of construction, unless the construction schedule is adjusted in accordance with Article 9.3 of this Contract. |
| 9.3 | Adjustment of Construction Schedule | The construction duration as mentioned in Article 9.2 of this Contract shall be extended under the following circumstances:<br>▪ Force Majeure Events as stipulated under Article 15.1 of this Contract ;<br>▪ The approved design is changed as per the request of competent authority, resulting in an adjusted total investment capital;<br>▪ Serious incidents occur during the construction process, not due to the mistakes of the Project Company or its contractors/ consultants;<br>▪ The land area of the Project is not handed over to the Project Company as scheduled under Article 7.1 of this Contract.<br>▪ Other unexpected circumstances considered and approved by BDPC.<br>In the above circumstances, the extended construction schedule will be discussed and agreed between BDPC and the Project Company. |

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| **10** | **PROVISIONS ON APPRAISAL, OPERATION, MAINTENANCE AND COMMERCIAL EXPLOITATION OF THE PROJECT FACILITIES** | |
| 10.1 | Rights of Project Company | During the operation of the Project, the Project Company is entitled to have rights as stipulated in Decree No.108/2009/ND-CP, specifically as follows:<br>▪ The Project Company has the rights to operate, exploit and maintain the Facilities under the provisions of relevant laws and regulations and the terms and conditions of this Contract until the Facilities are transferred in accordance with Article 11 of this Contract.<br>▪ The Project Company has the rights to decide its organizational structure, management and operation practices, providing that those are not contrary to the provisions of existing laws and regulations and the terms and conditions of this Contract.<br>▪ The Project Company can self-operate and manage the Facilities or engages a contractor(s) to operate and manage the Facilities.<br>▪ The Project Company can suspend the operation of the Facilities to conduct routine maintenance and/or planned repairs.<br>▪ In an emergency situation where the Facilities' operation needs to be suspended for remedial works to be taken, the Project Company can suspend the operation of the Facilities and inform BDPC within 24 hours since having decision to suspend. |
| 10.2 | Obligations of Project Company | During the operation stage of the Project, the Project Company is obligated to:<br>▪ Operate, and manage the Facilities in accordance with relevant laws and regulations and the terms and conditions of this Contract;<br>▪ Make available water capacity and water output to BIWASE;<br>▪ Conduct necessary periodical maintenance to ensure that the Facilities can function properly during the project duration and upon transfer;<br>▪ Submit periodic reports in accordance with the relevant laws and regulations;<br>▪ Procure and maintain required insurance (all risks insurance, machinery breakdown, business interruption and any other insurance required under relevant laws and regulations);<br>▪ Pay all taxes and other fees in accordance with the relevant taxation regime;<br>▪ Transfer the Facilities without reimbursement upon the expiry of this Contract. |

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| 10.3 | Rights of BDPC | The rights of BDPC during the operation of the Project are as follows:<br>▪ During the operation of the Project, BDPC has the rights to inspect and supervise the implementation of Project Company's obligations with regard to operation and maintenance of the Facilities as stipulated under Article 10.2 of this Contract.<br>▪ BDPC, at its own discretion, can assign or authorize in written for one or more organization directly under BDPC to implement BDPC's inspection/ supervision rights. In this case, BDPC shall notify Project Company about its assignment or authorization.<br>▪ During the operation stage, BDPC has the rights to suspend the operation of any Facilities and require the Project Company to repair such Facility if serious quality issues are identified.<br>▪ BDPC is entitled to get periodic reports from Project Company.<br>▪ BDPC is entitled to receive the transfer of BOT project upon the expiration of this Contract. |
| 10.4 | Obligations of BDPC | The obligations of BDPC during the operation of the Project are as follows:<br>▪ Respect and assist the Project Company in performing its rights and obligations as stipulated under Article 10.1 and 10.2 of this Contract;<br>▪ Comply and fulfill other obligations stipulated in this Contract and the relevant laws and regulations;<br>▪ Cause BIWASE to:<br>i) complete pipeline facilities by the relevant milestone date,<br>ii) ensure the maintenance of such facility,<br>iii) ensure connection to the Project Company, and<br>iv) ensure providing raw water to the Project Company (raw water shall meet certain quality and quantity);<br>▪ Ensure the connection and supply of other necessary utilities including electricity; and<br>▪ Ensure that the Project Company acquires and maintains all the required licenses and approvals to construct, operate and maintain the Facilities and perform its rights and obligations under this Contract. |
| **11** | **TRANSFER OF PROJECT FACILITIES** | |
| 11.1 | Responsibility for transfer and receipt of the Facilities | Upon the expiry of this Contract as stipulated under Article 16.1 of this Contract, the Project Company must transfer, without being compensated, the Facilities, together with all the technical documents concerning the operation and management of the Facilities to BDPC or an authorized organization appointed by BDPC or the Government. |

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| 11.2 | Conditions of the Facilities | Upon the transfer, it is the responsibility of the Project Company to ensure that the Facilities must meet the following conditions:<br>▪ All Facilities must be able to operate normally and in compliance with the approved design.<br>▪ The actual remaining quality of the Facilities must match with the remaining book value of Facilities, which is calculated in accordance with the depreciation rates in the approved Financial Plan.<br>▪ BDPC or the authorized organization shall have the rights to inspect the quality, value and practical conditions of the Facilities prior to transfer. If any damage is identified, BDPC can request the Project Company, at its own expenses, to conduct necessary remedy work before the Facilities are transferred. |
| 11.3 | Transfer Procedures | The procedures for transfer of the Facilities are as follows:<br>▪ One year before the date of transfer, the Project Company must publish on newspapers about such transfer and issues relating to procedures and time limit for liquidation of contracts and payment of debts to third parties;<br>▪ BDPC or an organization authorized by BDPC or the Government shall inspect the quality, value and practical conditions of the Facilities. If any damage is identified, BDPC can request the Project Company, at its own expenses, to conduct necessary remedy work before the Facilities are transferred.<br>▪ The Project Company shall ensure that at the point of transfer, the Facilities are neither used as assets for guaranteeing the fulfillment of financial obligations nor mortgaged or pledged for securing the fulfillment of other obligations of the Project Company or its Investors, unless otherwise agreed under the terms and conditions of this Contract;<br>▪ Together with the transfer of the Facilities, the Project Company shall transfer the technology and provide adequate training, on a no cost basis, to the personnel of BDPC or the organization authorized by BDPC or the Government to operate and manage the Facilities. |
| **12** | **INVESTMENT INCENTIVES AND GUARANTEES** | |
| 12.1 | Tax Incentives | The Project Company shall enjoy all tax incentives applicable for a water treatment plant project and for a BOT project, specifically as follows:<br>▪ The Project Company will pay corporate income tax at the rate of 10% for 30 years from the first revenue generation year and will enjoy 4 year of corporate income tax exemption and subsequent 9 year of 50% corporate income tax reduction as stipulated under Article 15 (1,2) and Article 16 (1) of Decree 124/2008/ND-CP.<br>▪ Imports of the Project Company or the Project Company's contractors will be exempt from import duty as |

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| | | stipulated under Article 12 (6) and Article 12 (14) of Decree 87/2010/NĐ-CP.<br>▪ Other tax incentives available for a water treatment plant project and a BOT project under the Vietnamese tax laws and regulations. |
| 12.2 | Land rental | The Project Company is exempt from paying land rental during the whole duration of the Project (including any extended duration as stipulated under Article 16.2 of this Contract) as stipulated under Article 38 (3) of Decree 108/2009/NĐ-CP. |
| 12.3 | Capital and Asset Guarantee | During the duration of this Contract, Investors' investment capital and lawful assets will not be nationalized or confiscated through administrative measures.<br><br>When it is necessary for the Parties to terminate this Contract prior to the agreed duration stipulated under Article 16.3 of this Contract, the Investors [and financing party] will be entitled to receive the transfer payment calculated as stipulated under Article 16.5 of this Contract. |
| 12.4 | Guarantee for BIWASE's obligations | BDPC shall guarantee the obligations of BIWASE under the WPA (BDPC Guarantee).<br>BDPC shall assist the Project Company to obtain guarantee from the Government guaranteeing the obligations of BDPC under the BDPC Guarantee and this Contract. |
| 12.5 | Guarantee for the rights to purchase foreign currency | BDPC shall assist the Project Company to obtain a guarantee from a the State Bank of Vietnam or the Government that the Project Company shall be given necessary support from the State Bank of Vietnam to or to make converting bank (to be determined among the parties hereto) i) convert its revenue into a foreign currency for its constructions or operation purposes or for its shareholders' profit or capital remittance purposes and ii) make remittance to overseas. |
| 12.6 | Guarantee in case of changes in laws and regulations | In case a new law or regulation is issued or an existing law or regulation is renewed, amended or changed in any other way, providing more favorable incentives or treatments compared to those that the Project Company has been granted, [BDPC shall ensure that and BDPC shall make its best efforts to cause the Government to ensure that ]the Project Company is entitled to apply such more favorable incentives from the effective date of the concerning new law or regulation.<br><br>In case a new law or regulation is issued or an existing law or regulation is renewed, amended or changed in any other way, which negatively affects the lawful interests of the Project Company and/or the Project Company's Investors, then [BDPC shall ensure that and BDPC shall make its best efforts to cause the Government to ensure that] it is guaranteed the that the incentives given to the Project Company and/or the Project Company's Investors will be maintained the same as stipulated under this Contract and/or the Project Company's Investment Certificate. Otherwise, |

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| | | the interests of the Project Company and/or the Project Company's investors will be protected using either of the following methods:<br><br>▪ Adjustment of the water tariff;<br>▪ Extending the duration of this Contract;<br>▪ Incurred losses will be deductible against taxable incomes;<br>▪ Direct compensation of the State Budget; or<br>▪ Project Company's terminating this Contract prior to expiry date and receiving compensation as stipulated under Article 16.3 and 16.5 of this Contract. |
| **13** | **CONTRACT AMENDMENT AND/ OR SUPPLEMENTATION** | |
| 13.1 | Circumstances for Contract Amendment and/or Supplementation | Parties to this Contract agree that the following cases are considered as circumstances, under which this Contract will need to be amended/ supplemented:<br><br>▪ Change in scale, technical standards or total investment capital as per requirement of BDPC;<br>▪ The actual costs of constructions is different from the costs planned and agreed under this Contract;<br>▪ Any changes in the BOT law and regulations which affects the capital recovery and expected profit of the Project Company and its investors;<br>▪ Other circumstances as stipulated under other terms and conditions of this Contract; and<br>▪ Other circumstances as proposed by one Party and accepted by the other Party. |
| 13.2 | Content of Contract Amendment and/or Supplementation | Where circumstances for contract amendment/ supplementation occur, the following changes to the content of this Contract might be considered and agreed between the Parties to ensure the reasonable rights and interests of the parties are protected:<br><br>▪ Extending the contract duration if the circumstances are in accordance with Article 16.2 of this Contract;<br>▪ Adjusting the Financial Plan;<br>▪ Applying a specific support policy if approved by the Government; and<br>▪ Another approach proposed by one Party and be accepted by other Party but must not be contrary to the laws and regulations.<br><br>Terms and conditions of this Contract can be directly amended or the two Parties can sign an Annex or Appendix to the Contract to reflect the amended/ supplemented content. |

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| 13.3 | Procedures for Contract Amendment and/or Supplementation | Any amendments and supplements to the Contract or to any annex of the Contract shall be carried out following the following procedures:<br>▪ The Party requesting for contract amendment or supplementation to the Contract or annexes of the Contract has to inform the other party of its intent to amend, supplement the Contract and draft the amended, supplemented content at least 30 days (thirty days) prior to the expected effective date of the amendment or supplementation.<br>▪ Within 30 days of receiving of the notification and draft amended/ supplemented content, the other Party must reply to the request.<br>▪ In case the proposed amended or supplemented content is agreed, within 30 days, the parties will negotiate and decide on these amendments and supplements.<br>▪ The amendments or supplements as mentioned above shall take effect after being approved by the legal representatives of the two Parties.<br>In case these amendments or supplementations need to be approved by the Government or a competent authority, these amendments or supplementations will only take effect when the approval of the Government or competent state agencies is obtained and becomes effective.<br>▪ In all situations, the terms and provisions of this contract that have not been amended and supplemented shall remain in full effect and are legally binding on both Parties. |
| **14** | **TRANSFER OF RIGHTS AND OBLIGATIONS OF THE BOT CONTRACT** | |
| 14.1 | Transfer of equity capital of Investors | The Investors of the Project Company can, at its own discretion, transfer part or whole of its paid-in equity capital in the Project Company as stipulated under the Law on Investment and other relevant laws and regulations. |
| 14.2 | Transfer of rights and obligations of the Contract | After receiving an Investment Certificate, the Project Company can assign part or whole if its rights and obligations under the Contract to a third party (including its lenders) following the following provisions:<br>▪ The transfer must not affect the objectives, scope, technical standards, project's implementation schedule and terms and conditions of this Contract.<br>▪ The transfer must be approved by BDPC and other competent authority, if required under the laws and regulations.<br>▪ The Project Company is responsible for reporting on the progress of the Project up to the date of the intended transfer, and for submitting proposals for the transfer, drafting the transfer contract, and other necessary documents to BDPC and for considering and approving the transfer.<br>▪ The Project Company is responsible for conducting necessary procedures to ensure that the third party (transferee) |

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| | | will fulfill all rights and obligations transferred from the Project Company in relation to the signed Contract.<br>▪ The parties to the transfer must comply with the terms and conditions of this Contract and conditions and procedures stipulated in the Law on investment, Law on Construction and other related laws and regulations. |
| **15** | **EVENTS OF FORCE MAJEURE** | |
| 15.1 | Cases of force majeure and principle to define force majeure events. | Force majeure events can be categorized as A)natural force majeure, B)government event and C)foreign political event.<br><br>A. Natural force majeure events<br><br>Any events that wholly or partly or unavoidably delays a party in the performance of its obligations to the extent that such events<br><br>1) actually prevent the affected party's performance;<br>2) are not within the reasonable control of the affected party; and<br>3) The force majeure events include, but not limited to:<br>▪ epidemic, plague or quarantine etc.,<br>▪ explosion, accident, contamination, ionizing radiation or fire etc.,<br>▪ unusually severe weather (lightning, typhoons, floods, droughts) and/or, falling from sky (meteorites, devices, etc.)<br>▪ accidents of navigation, air crash, shipwreck, train wreck etc.,<br>▪ any failure of a contractor (EPC /O&M) caused by natural force majeure, and<br>▪ any event of a nature analogous to any of the foregoing.<br><br>B. Government events<br><br>Any of the following events which occurs within Vietnam or directly involves Governments and/or local governments and which adversely affects Project Company, including but not limited to:<br><br>▪ acts of war, invasion, actions of terrorists, etc., which acts are in or involve Vietnam,<br>▪ strikes, work to rule actions, etc., such as similar labor difficulties,<br>▪ inability of the Project Company to obtain any government authorization,<br>▪ any Vietnam key project counterparties repudiating the relevant key project contract,<br>▪ any failure to perform by a Vietnam key project counterparties (except for Project Company's default), |

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| | | ▪ any failure of a contractor (EPC / O&M) caused by the government events,<br>▪ the Government failing to perform any of its material obligations under the government guarantee,<br>▪ issuance of an order denying the validity of any project contract by any authorized state body and any event of a nature analogous to any of the foregoing<br>▪ repudiation by a Vietnam state body<br>▪ nationalization /termination of the project by any Vietnam state body<br>▪ any failure of the Vietnamese customs to clear and release equipment required for the construction<br>▪ any site condition risks including; a) discovery on the site of any unexploded ordnance or historical find, b)site contamination, and/or c)Vietnam state body causing any pollution to the site<br>▪ any failure or delay in supply of raw water within agreed quality and quantity level<br>▪ any government event materially affecting the performance of Vietnam project counterparties<br>▪ any event of circumstance of a nature analogues to any of the foregoing.<br><br>C. Foreign political events<br><br>Any of the following events which occurs outside Vietnam and does not directly involve Vietnam but adversely affects Project Company, including but not limited to:<br><br>▪ act of war, invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, civil commotion, or act of terrorism, or politically motivated sabotage or kidnapping in each case outside Vietnam,<br>▪ strikes, work to rule actions, go slows or other similar labor difficulties that occur outside Vietnam,<br>▪ any failure of a contractor (EPC /O&M) caused by foreign political event,<br>▪ any event of a nature analogous to any of the foregoing. |
| 15.2 | Consequences, rights and obligations of force majeure events. | In case the Project Company faces one of the events or BDPC faces a natural force majeure events listed under Article 15.1 above (government events and foreign political events is not considered as force majeure events for BDPC), which hinders or delay the concerning Party from timely fulfilling its obligations under this Contract, such Party must inform the other Party no later than 72 hours from the point when the event occurs.<br><br>The Party affected by a force majeure event must not suspend the implementation of its obligations for a scale or a timeframe greater than the ones affected by the force majeure events. Such party will also use all of its reasonable effort to continue its obligations under this Contract as soon as practicable.<br><br>The Party affected by a force majeure event can terminate this Contract following the provisions of Article 16 of this Contract. |

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| **16** | **TERM AND TERMINATION OF CONTRACT** | |
| 16.1 | Term of Contract | This Contract shall become effective from the date of the Project Company's Investment Certificate until … (Date of Contract Expiry) unless the term of the Contract is extended as stipulated under Article 16.2 or the Contract is terminated early under the circumstances as stipulated under Article 16.2 of this Contract.<br><br>Rights and obligations of the Parties upon the expiry of Contract are as mentioned under Article 16.4 of this Contract. |
| 16.2 | Extension of Contract Term | The term of this Contract can be extended under the following circumstances:<br><br>▪ The total investment capital of the Project is adjusted as stipulated under Article 6.1 of this Contract.<br>▪ The construction duration is extended as stipulated under Article 9.3 of this Contract. In this case, the term of the contract will be extended corresponding to the extended construction period agreed by the Parties.<br>▪ Force Major Events as stipulated under Article 15.1 of this Contract, under which the Project is suspended. In this case, the term of the Contract can be extended corresponding to the time needed to recover the normal operation of the Project Company.<br>▪ Where changes in laws and regulations negatively affects the lawful interests of the Project Company and/or the Project Company's Investors and contract extension is agreed to be the method to protect the interests of the Project Company and/or the Project Company's Investors as stipulated under Article 12.6 of this Contract.<br>▪ Other unexpected circumstances affecting the recovery of investment or profit generation of the Project Company but not reflected in the formula to determine water tariff.<br><br>The length of the extended term of Contract shall be agreed between the Parties upon the occurrence of the above circumstances.<br><br>The procedures to extend the term of the Contract shall be in accordance with Article 13.3 of this Contract. |
| 16.3 | Early Termination | BDPC can send a request to terminate this Contract prior to the Date of Contract Expiry as stipulated under Article 16.1 if the Project Company is in a default situation and such default situation is not effectively remedied within [180] days after receiving a BDPC's notice and a request to remedies a default situation. |

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| | | The Project Company's default situations include:<br><br>▪ The Project Company fails to comply with any material provision of Contract or the Water Purchase Agreement.<br>▪ Payment default by the Project Company's Investors including necessary capital contribution.<br>▪ Termination of Vietnam Key Project Contracts caused by a material breach by the Project Company.<br><br>The Project Company can also send a request to terminate this Contract prior to the Date of Contract Expiry as stipulated under Article 16.1 of this Contract:<br><br>▪ if the consequences of a force majeure event as defined under Article 15.1 cannot be remedied within [180] days after all reasonable efforts of the Party; or<br>▪ There exists a default situation of BDPC or other Vietnamese counterparties and such default situation is not effectively remedied within [180] days after the Project Company sends a notice and a request to remedies a default situation to BDPC.<br><br>A. The Vietnam side's default situations include:<br><br>▪ Occurrence of one or more Government Event as stipulated under Article 15.1;<br>▪ BDPC fails to comply with any material provision of this Contract (including the guarantee obligations in case of change in laws under Article 12.6);<br>▪ BIWASE fails to comply with any material provision of the Water Purchase Agreement<br>▪ Payments default by BIWASE unless BDPC pays the due water tariff on behalf of BIWASE as stipulated under Article 12.4 of this Contract.<br>▪ Termination of Vietnam key project contracts except because of a material breach by the Project Company.<br><br>In case the Contract is terminated prior to the Date of Contract Expiry, the Project Company will transfer the Construction in Progress/ the Facilities to BDPC and will receive a compensation payment from BDPC.<br><br>The conditions and procedures for transferring the Facilities will be in accordance with Article 11.2 and Article 11.3 of this Contract.<br><br>The compensation payment receivable by the Project Company will be calculated as stipulated under Article 16.5 of this Contract. |

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<tr><td>16.4</td><td>Lenders' Step-in Right in case of Early Termination</td><td>BDPC shall not, upon a Project Company's default, terminate this Contract without first complying with its obligations as acknowledged among the necessary parties as a lenders' step-in right.<br><br>BDPC shall acknowledge and agree to the rights of the Project Company and the project lenders in relation to the lenders' step-in right.</td></tr>
<tr><td>16.5</td><td>Calculation of Compensation Payment in case of Early Termination</td><td>Compensation payment payable by BDPC to the Project Company/ its Investors shall be as follows:<br><br><table><tr><th>No.</th><th>Description</th><th>Amount</th></tr><tr><td>1.</td><td>Vietnam side default / Government event</td><td>A + B + C</td></tr><tr><td>2.</td><td>Project Company's default</td><td>A + B</td></tr><tr><td>3.</td><td>Natural force majeure / Foreign political event (affected party: BOT company)</td><td>A + B + D</td></tr><tr><td>4.</td><td>Natural force majeure / Foreign political event (affected party: Vietnam project counterparty)</td><td>A + B + C</td></tr></table><br>Of which:<br><br>A: Outstanding and payable loan capital (including any additional loan capital contributed) – Insurance proceeds<br><br>B: Charter capital in existence of the termination date (including any additional charter capital contributed)<br><br>C: Expected profit of the Project Company, which is the net present value (at the termination date determined by application of a discounted rate which is [10%]) of the "operating income less taxes and other expenses", which "operating income less taxes and other expenses" would have been earned by the Project Company for a period commencing on the later of the termination date or the COD and ending on the last day of the term of the operation<br><br>D: Cost incurred by the Project Company in overcoming the effects of the natural force majeure event or foreign political event.</td></tr>
<tr><td>17</td><td colspan="2">DISPUTE RESOLUTION</td></tr>
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| 17.1 | Dispute Resolution | Any disputes BDPC and the Project Company or the Project Company's Investors regarding this Contract must be first settled through negotiation or conciliation.<br><br>If failing to settle the disputes through negotiation or conciliation, the Parties may bring such disputes to Vietnamese arbitral bodies or courts for settlement under Vietnamese laws and regulations. |

# Appendix11-D Term Sheet For Water Purchase Agreement – North Binh Duong Water Treatment Plant Project

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| **1** | **DEFINITIONS AND INTERPRETATION** | |
| 1.1 | BOT Contract | Being the BOT Contract (BOT Contract) entered between the Company, Binh Duong People's Committee (BDPC) and sponsors on … |
| 1.2 | Commercial Operation Date (COD) | 2020 and after |
| 1.3 | Effective Date | Meaning the date on which each of the Conditions Precedent is satisfied or waived, as the case may be, in accordance with Article 4 of this Agreement. |
| 1.4 | Facilities | Main facilities to be constructed under the Project as specified under Article 4.1 of the BOT Contract. |
| 1.5 | Offtaker | Binh Duong Water Supply Sewerage Environment Co., Ltd (BIWASE) |
| 1.6 | Offtake Facilities | The following facilities to be constructed by the Offtaker;<br>- A raw water pipeline from Phuoc Hoa Lake to an Intermittent Lake;<br>- A raw water pipeline from the intermittent lake to the water treatment plant;<br>- Intermittent Lake; and<br>- Treated Water pipeline from Water Dispatch Points. |
| 1.7 | Water Dispatch Points | Designated points at Facilities where the Treated Water is being metered before delivery (Water Dispatch Point) |
| 1.8 | Vietnam Key Project Contracts | Vietnam Key Project Contracts (Vietnam Key Project Contracts) include:<br><br>BOT Contract<br><br>Land Lease Contract: contract to be signed between Company and BDPC in relation to the leasing of the land area at Chanh Phu Hoa Commune, Ben Cat District, Binh Duong Province to the Project Company to implement the Project.<br><br>Electricity purchase contract: contract to be signed between Company and Binh Duong Power Company in relation to electricity supply for the Project. |

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| | | this Agreement |
| **2** | **SCOPE OF AGREEMENT** | |
| 2.1 | Sale and Purchase of Treated Water | The Offtaker shall provide raw water, in requested quality and quantity, to the Company, the Company shall sell treated water (Treated Water) to the Offtaker and the Offtaker shall purchase and take at the Water Dispatch Points or, if not taken, pay for the Available Capacity of the Treated Water on and from the Commercial Operation Date, subject to and in accordance with the terms and conditions of this Agreement. |
| **3** | **EFFECTIVENESS AND TERM** | |
| 3.1 | Effectiveness, Term and Termination | This Agreement shall have a term commencing from the Effective Date as defined Article 1.3 and ending on the expiry of the BOT contract.<br><br>In case the term of the BOT contract is extended as stipulated under Article 16.2 of the BOT contract or the BOT contract is terminated as stipulated under Article 16.3 of the BOT contract, the term of this Agreement will be accordingly adjusted. |
| **4** | **CONDITIONS PRECEDENT** | |
| 4.1 | Conditions Precedent | ▪ The Company shall have achieved Financial Close with respect to the Project;<br>▪ The Company shall have received Investment Certificate to conduct the Project under Build – Operation – Transfer ("BOT") framework from relevant authorities;<br>▪ The BOT contract entered between the Company and BDPC shall have become effective;<br>▪ The Offtaker has supported the Company to receive and the Company shall have received a valid Letter of Guarantee for the Offtaker's payment obligations from a competent Vietnamese government (Government) and BDPC in accordance |

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| | | with the BOT Contract;<br>▪ The Company shall have received from the BDPC, in accordance with the BOT Contract, the possession of the Site (which shall have been levelled and shall be free of trees and bushes) and the Company, its personnel, Contractors, agents and/or consultants have been enabled to have full access to the Site;<br>▪ The Company shall have entered into all required Project Agreements required for the Project and the Facilities, including the contracts for engineering, procurement and construction of the Facilities, and the Vietnam Key Project Contracts, and such contracts are in full force and effect;<br>▪ The Company and Offtaker shall have necessary approvals/ clearances from competent authorities as may be required for the commencement of construction activities for Project. |
| **5** | **TAXES, DUTIES AND CHARGES** | |
| 5.1 | Taxes and Charges | ▪ The Total Charges are exclusive of Vietnamese Value Added Tax and other indirect taxes and fees imposed by the Vietnamese Government on treated water. Any of such taxes will be additional charged on invoices issued by the Company to the Offtaker. |
| **6** | **OBLIGATIONS AND UNDERTAKINGS** | |
| 6.1 | Obligations of the Company | The Company shall at its own cost and expense observe, undertake, comply with and perform, in addition to and not in derogation of its obligations elsewhere set out in this Term Sheet, the following:<br>▪ to construct the Facilities with the quality satisfying the technical requirements and standards stipulated under the BOT Contract;<br>▪ to extract, process, treat the Raw Water so draw and supply the Treated Water to the Offtaker at …Water Dispatch Point(s), within the Project Site in accordance with the relevant drinking water standards prescribed by the Vietnamese Ministry of Health; |

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| | | ▪ to cause to be made, necessary applications to the Competent Authority with such particulars and details, as may be necessary for obtaining all necessary approval/clearances for the construction of the Facilities, and to use reasonable endeavours to obtain such approvals/clearances in conformity with the applicable laws and regulations;<br>▪ procure, as required, the appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes and systems used or incorporated into the Facilities; and<br>▪ observe and comply with all its obligations set forth in this Agreement. |
| 6.2 | Obligations of the Offtaker | ▪ To observe and comply with all its obligations set forth in this Agreement, including, but not limited to provision of raw water, in requested quality and quantity, to the Company. |

| 7 | **PROJECT DEVELOPMENT, SYNCHRONISATION AND OPERATIONS** | |
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| 7.1 | Project Development and Delay in COD | ▪ The Company shall undertake the development of the Facilities in accordance with the terms and conditions of the BOT Contract and shall use all reasonable endeavours to achieve COD on or prior to the Required COD.<br>▪ The Offtaker shall undertake the development of all Offtake Facilities. Offtake Facilities shall be of a capacity adequate to offtake at least the Design Capacity of the entire Facilities.<br>▪ The Offtaker shall complete the construction, testing and commissioning of the Offtake Facilities, as evidenced by a certificate of the Independent Consultant confirming that the Offtake Facilities have been constructed, tested and commissioned in accordance with Prudent Utility Practices, no later than 3 (Three) months prior to the COD.<br>▪ The Parties agree that the Offtaker's obligation to purchase, the Available Capacity of Treated Water shall commence on the COD, [irrespective of whether the Offtake Facilities have been duly commissioned. ] |
| 7.2 | Commissioning and Performance Testing | ▪ The Company shall give the Offtaker at least 30 (Thirty) days advance written notice of the date on which it intends to commission the Facility and shall notify the Offtaker in writing of the commencement date of commissioning and, upon completion of Performance Testing, the completion of commissioning.<br>▪ Testing and measuring procedures applied during Performance Testing shall be mutually agreed prior to Financial Close.<br>▪ The Facility shall be assumed to have achieved COD when:<br>✓ the Performance Testing has been carried out in accordance with agreed schedule;<br>✓ the results of the Performance Testing show that the Tested Capacity of the Facility is not less than 95% (Ninety Five Percent) of its Design Capacity;<br>✓ the results of the Performance Testing show that the Facility is capable of operating.<br>▪ If the Facility fails any Performance Testing, the Company may retake the relevant test within 7 (Seven) days after the |

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| | | end of the previous test. |
| 7.3 | Operating Requirements and Procedures | ▪ No later than 6 (Six) months before Required COD, the Company shall provide the Offtaker with a first draft of the operating procedures (the Operating Procedures) dealing with all operational interfaces between the Company and the Offtaker including, but not limited to:<br>✓ methods of day to day communication between the Company and the Offtaker;<br>✓ water supply procedures;<br>✓ detailed payment procedures to the extent required and not inconsistent with this Agreement;<br>✓ safety co-ordination;<br>✓ incident reporting; and<br>✓ testing and monitoring of the Facility.<br>▪ The Operating Procedures shall be agreed between the Parties and shall take effect on the date agreed by the Parties. |
| 7.4 | Operation and Maintenance of the Facility | ▪ The Company shall be responsible at its own expense for ensuring that the Facility is operated and maintained in accordance with applicable laws and regulations and the BOT Contract so as to meet its obligations under this Agreement.<br>▪ The Offtaker shall be responsible at its own expense for ensuring that the Offtake Facilities are operated and maintained in accordance with applicable laws and regulations, so as to meet its obligations under this Agreement. |
| 7.5 | Inspections | ▪ The Offtaker shall have the right to designate at a period of every 3 (three) months in a written notice to the Company up to 5 (Five) of its personnel/ a certified agency, who shall be responsible for inspecting the Facility for the purpose of |

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| | | verifying the Company's compliance with procedures agreed upon later between the Parties and who have access to the Facility.<br>▪ In the exercise of any of its inspection rights, the Offtaker shall ensure that its employees do not interfere with the proper operation or maintenance of the Facility. |
| 7.6 | Maintenance of Records | ▪ Each Party hereto shall keep complete and accurate records and all data required by each of them for the purposes of proper administration of this Agreement.<br>▪ All records shall be maintained for a minimum period of 60 (Sixty) months after the creation of such records or data.<br>▪ Either Party shall have the right, upon reasonable prior notice, to examine the records and data of the other Party regarding the operation and maintenance of the Facility at any time during normal office hours. |
| **8** | **CAPACITY, AVAILABILITY AND SUPPLY** | |
| 8.1 | Capacity of the Facility | ▪ The Design Capacity of the Facility shall be 150,000m3/d, and the term Design Capacity shall be constructed accordingly.<br>▪ The Available Capacity of the Facility shall mean the Tested Capacity of the Facility achieved upon COD<br>▪ The Company guarantees that it shall make available for supply, and the Offtaker guarantees that it shall purchase, on any day after the COD, the Available Capacity.<br>▪ In all cases, the Available Capacity shall be measured at the Water Dispatch Points. |
| 8.2 | Purchase and Sale of Available Capacity and | ▪ the Company undertakes to sell to the Offtaker and the Offtaker agrees to purchase from the Company, on each day commencing from the COD and ending upon the Termination of the Agreement Period, Treated Water up to the |

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| | Water Supply | Available Capacity.<br>▪ The Offtaker further undertakes to pay the Total Charges to the Company, for the Treated Water so sold by the Company to the Offtaker, in accordance with the agreed terms and conditions. Total Charge shall be comprised of the Availability Payment and the Output Payment.<br>▪ The Offtaker guarantees that, [it shall take 100% (One Hundred Percent) of the Available Capacity on each day during the Operation Period and where the Offtaker fails to take such Available Capacity on any day during the Operation Period, for any reasons whatsoever, the Offtaker shall nevertheless be required to pay:<br>+ Availability Payment for Available Capacity as determined under Article 10.1.<br>+ Output Payment for the actual volume provided to the Offtaker as determined under Article 10.1. |
| 8.3 | Maintenance of Facility | ▪ The Company shall be relieved of its obligation to supply Treated Water to the extent impacted, during periods of maintenance of the Facility in accordance with the Operating Procedures, whether scheduled or unscheduled. |
| **9** | **METERING AND QUALITY CHECK** | |
| 9.1 | Ownership of Meters | ▪ The Company shall, at its own costs, procure and install the meters at Water Dispatch Points. The Company shall own the meters at Water Dispatch Points and shall be responsible for and undertake, at its own costs, to maintain and install meters at the Water Dispatch Points in order to measure the volume of Treated Water dispatched and supplied to the Offtaker each month. |
| 9.2 | Quality Check | ▪ The Company shall carry out tests at a pre-determined periodicity at the Water Dispatch Points to confirm that the Quality of the Treated Water being made available to be delivered by the Company is of the Quality that meets the requirements of the BOT Contract and of this Agreement. |

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| | | ▪ In the event that the Quality of Treated Water is not in conformity the requirements of the BOT Contract and this Agreement and re-tests confirm this fact, the Company shall, immediately upon receipt of the aforesaid reports, initiate necessary and appropriate corrective action and, ensure as soon as practicable the quality of Treated Water made available to be delivered by the Company at the Water Dispatch Points is in conformity with the requirements of the BOT Contract and this Agreement. In the event that the quality parameters of the Treated Water are not in conformity with the Quality requirements, the Offtaker shall not be obliged to accept such off-specification water and will consequently not be obliged to make payments under this Agreement, in respect of such off-specification water that is not accepted.<br>▪ The Company shall not have any responsibility or liability in relation to a fall in the quality or quantity of Treated Water beyond the Water Dispatch Points. |
| 9.3 | Inspection by the Offtaker | ▪ The Offtaker shall have the right, by itself or through its authorised representative, to inspect the Facility after serving on the Company a notice of such inspection 48 (Forty Eight) hours prior to such inspection. Such notice shall also specify the date, time, place and purpose for such inspection.<br>▪ The Offtaker shall be accompanied by a representative of the Company during such inspections.<br>▪ The Company agrees to provide the Offtaker such information and records and copies thereof as may reasonably be requested for by the Offtaker during the course of such inspection, at the cost of the Offtaker. |
| **10** | **CHARGES, PAYMENT AND INVOICING** | |
| 10.1 | Charges Payable | ▪ The Offtaker shall pay to the Company for supply of Treated Water:<br>✓ Availability Payment (Availability Payment) consisting of:<br>1) Capital Cost Recovery Payment, |

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| | | 2) Fixed O&M Payment, and<br>3) Fixed Power Payment<br>✓ Output Payment (Output Payment) consisting of:<br>1) Variable O&M Payment, and<br>2) Variable Power Payment<br><br>✓ [Both Availability Payment and Output Payment are subject to deduction based on Performance Testing.]<br>✓ Detailed tariff formula is to be [set forth in the attachment / further discussed], but the basic concept of the tariff formula shall be as follows:<br>- Availability Payment shall be calculated based on Available Capacity and total operating hours in the billing period ("Availability").<br>- Output Payment shall be calculated based on net output of water supplied by the Project.<br>- In the event that the Available Capacity and/or Availability of the Project are/is reduced due to a Company Event of Default, the Offtaker shall pay the Availability Payment based on actual Availability of the Project and Output Payment based on the actual volume provided to the Offtaker.<br>- In the event that Available Capacity and/or Availability of the Project are/is reduced due to an Offtaker Event of Default, Government Event, and Natural FM Events or Foreign Political Events whose Affected Party is a party to Vietnam Key Project Contracts, the Offtaker shall pay the (i) Availability Payment in whole (the Project shall be deemed to be fully available with Available Capacity and Availability) and (ii) Output Payment based on the actual volume provided to the Offtaker. In the event that the Available Capacity and/or Availability of the Project are/is reduced due to a Natural FM Events or Foreign Political Events whose Affected Party is Project Company, the Offtaker shall pay the (i) adjusted Availability Payment in whole and (ii) Output Payment based on the actual volume provided to the Offtaker. |

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| | | The adjustments shall be [set forth in the attachment / further discussed] in accordance with the categories of Force Majeure stated herein. |
| 10.2 | Billing and Payment | **Invoice**<br>▪ In respect of each calendar month, the Company shall invoice the Offtaker for the Water Tariff (or, if such day is not a Business Day, the immediately succeeding Business Day), (the Invoice), in duplicate, stating with supporting calculations:<br><br>**Due Date, Penalty etc.**<br>▪ Invoice Amounts are payable within 30 (Thirty) days from the date of the Invoice (the Due Date).<br>▪ The Offtaker shall pay the Invoice Amount to the Company on or before the Due Date of the Invoice Amount in immediately available and freely transferable cleared funds to the account of the Company at a bank to be notified by the Company in writing (the Operating Account).<br>▪ If the payment in full, of the Invoice, is not made by the Offtaker into the Operating Account on or before the close of business on the Due Date, a delayed payment charge on the unpaid amount due, for each day from the date of issuance of Invoice till date of actual payment thereof, will be payable at the Delay Rate. |
| 10.3 | Support for Offtaker's Payment Obligations | ▪ In addition to all the support for Offtaker's payment obligations as set forth in this Agreement and the BOT Contract, the Offtaker shall arrange the following agreements (Support Agreements):<br>✓ Trust and Retention Account Agreement<br>- The Offtaker shall undertake that all revenues from all end users of the Offtaker shall be directly deposited in an account ("Trust and Retention Account") opened in a bank designated by the Company. The Trust and Retention |

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| | | Account Agreement shall *inter alia* provide for the following key terms:<br>(i) the Offtaker shall deposit in the Trust and Retention Account, an amount equal to the Total Charges in the next succeeding month on a monthly basis and maintain the said amount for the entire Agreement period.<br>(ii) the minimum reserve amount will be recalculated periodically to reflect an amount equal to the Total Charges in the next succeeding month.<br>(iii) any amounts deposited in the Trust and Retention Account shall be utilised, (a) firstly, towards the Offtaker for the payment of money to the Company in accordance with this Agreement; (b) secondly, towards the replenishment/maintenance of reserve amount stated in (i) above; and (iii) lastly, may be utilised by the Offtaker at its discretion following release from the Trust and Retention account<br>✓ Security and Hypothecation Agreement<br>The Offtaker shall hypothecate and charge by way of first ranking and sole and exclusive charge in favour of the Company the Trust and Retention Account (and any sub-accounts thereof). In case of any event of default by the Offtaker, the Company may draw upon the Security and Hypothecation Agreement. |
| 10.4 | Dispute in Invoice | ▪ If the Offtaker does not question or dispute an Invoice within 15 (Fifteen) days' of receiving it, the Invoice shall be considered correct and complete and conclusive between the Parties except in the case where the Offtaker could not reasonably have identified any error or omission in the Invoice, taking into account the information then available to it during the above 15 (Fifteen) days' period.<br>▪ If the Offtaker disputes any item or part of an item set out in any Invoice then the Offtaker shall serve a notice (an Invoice Dispute Notice) on the Company setting out the item or part of an item set out in such Invoice which is in Dispute together with its estimate of what such item or part of an item should be. |

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| | | ▪ In the event that the Offtaker disputes all or any portion of the Invoice, it shall nevertheless pay, on the Due Date, the greater of: (i) minimum of the moving average of the preceding 3 (Three) months (excluding any shutdown month) or (ii) the full amount of the undisputed charges.<br>▪ In the event that the Parties do not, within 14 (Fourteen) days of the delivery of an Invoice Dispute Notice, resolve any Dispute, then, the Dispute will be resolved, within 15 (Fifteen) days, by a committee comprising two representatives each of the Company and the Offtaker.<br>▪ Upon resolution of any Dispute, the amount (if any) due to the prevailing Party shall be paid within 7 (Seven) days together with interest accrued from the date on which the prevailing Party had originally made the payment until the date of receipt of refund of this payment by the prevailing Party, at the Delay Rate. |
| **11** | **FORCE MAJEURE EVENT** | |
| 11.1 | Force Majeure Event | Force majeure events can be categorized as A) natural force majeure, B) government event and C) foreign political event.<br><br>A. Natural force majeure events (Natural FM Events)<br><br>Any events that wholly or partly or unavoidably delays a party in the performance of its obligations to the extent that such events<br><br>1) actually prevent the affected party's performance;<br>2) are not within the reasonable control of the affected party; and<br>3) The force majeure events include, but not limited to:<br><br>▪ epidemic, plague or quarantine etc.,<br>▪ explosion, accident, contamination, ionizing radiation or fire etc.,<br>▪ unusually severe weather (lightning, typhoons, floods, droughts) and/or, falling from sky (meteorites, devices, etc.)<br>▪ accidents of navigation, air crash, shipwreck, train wreck etc.,<br>▪ any failure of a contractor (EPC /O&M) caused by natural force majeure, and<br>▪ any event of a nature analogous to any of the foregoing. |

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| | | B. Government events (Government Events)<br><br>Any of the following events which occurs within Vietnam or directly involves Governments and/or local governments and which adversely affects Project Company, including but not limited to:<br><br>▪ acts of war, invasion, actions of terrorists, etc., which acts are in or involve Vietnam,<br>▪ strikes, work to rule actions, etc., such as similar labor difficulties,<br>▪ inability of the Project Company to obtain any government authorization,<br>▪ any Vietnam key project counterparties repudiating the relevant key project contract,<br>▪ any failure to perform by a Vietnam key project counterparties (except for Project Company's default),<br>▪ any failure of a contractor (EPC / O&M) caused by the government events,<br>▪ the Government failing to perform any of its material obligations under the government guarantee,<br>▪ issuance of an order denying the validity of any project contract by any authorized state body and any event of a nature analogous to any of the foregoing<br>▪ repudiation by a Vietnam state body<br>▪ nationalization /termination of the project by any Vietnam state body<br>▪ any failure of the Vietnamese customs to clear and release equipment required for the construction<br>▪ any site condition risks including; a) discovery on the site of any unexploded ordnance or historical find, b)site contamination, and/or c)Vietnam state body causing any pollution to the site<br>▪ any failure or delay in supply of raw water within agreed quality and quantity level<br>▪ any government event materially affecting the performance of Vietnam project counterparties<br>▪ any event of circumstance of a nature analogues to any of the foregoing.<br><br>C. Foreign political events (Foreign Political Events)<br><br>Any of the following events which occurs outside Vietnam and does not directly involve Vietnam but adversely affects Project Company, including but not limited to:<br>▪ act of war, invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, civil commotion, or act of terrorism, or politically motivated sabotage or kidnapping in each case outside Vietnam,<br>▪ strikes, work to rule actions, go slows or other similar labor difficulties that occur outside Vietnam,<br>▪ any failure of a contractor (EPC /O&M) caused by foreign political event,<br>▪ any event of a nature analogous to any of the foregoing. |
| 11.2 | Duty to report Force | ▪ Upon occurrence of a Force Majeure Event, the affected Party (Affected Party) shall by notice report such occurrence to |

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| | Majeure Event | the other Party forthwith. Any notice pursuant hereto shall include full particulars of:<br>✓ the nature and extent of each Force Majeure Event which is the subject of any claim for relief under this Article 11 with evidence in support thereof;<br>✓ the estimated duration and the effect or probable effect which such Force Majeure Event is having or will have on the Affected Party's performance of its obligations under this Agreement;<br>✓ the measures which the Affected Party is taking or proposes to take for alleviating the impact of such Force Majeure Event; and<br>✓ any other information relevant to the Affected Party's claim.<br>▪ The Affected Party shall not be entitled to any relief for or in respect of a Force Majeure Event unless it shall have notified the other Party of the occurrence of the Force Majeure Event as soon as reasonably practicable, and in any event not later than 14 (fourteen) days after the Affected Party knew, or ought reasonably to have known, of its occurrence, and shall have given particulars of the probable material effect that the Force Majeure Event is likely to have on the performance of its obligations under this Agreement.<br>▪ For so long as the Affected Party continues to claim to be materially affected by such Force Majeure Event, it shall provide the other Party with regular (and not less than weekly) reports containing information as required by Article 11.2, and such other information as the other Party may reasonably request the Affected Party to provide. |
| 11.3 | Effect of Force Majeure Event before Effective Date | ▪ Upon the occurrence of any Force Majeure Event prior to Effective Date, the date for achieving Effective Date shall be extended by the period for which such Force Majeure Event shall subsist. |
| 11.4 | Effect of Force Majeure | ▪ Upon occurrence of any Force Majeure Event after Effective Date, the following shall apply: |

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| | Event after Effective Date | ✓ where the Force Majeure Event occurs before COD, the dates for the Required COD, and the Agreement Period shall be extended by the period for which such Force Majeure Event shall subsist and where a Force Majeure Event occurs after the COD, at the request of the Company, the Agreement Period shall stand extended by the period for which such Force Majeure Event subsists, provided that the Agreement Period shall not cumulatively exceed the term of the BOT Contract.<br>✓ where a Force Majeure Event occurs after COD, the Company shall be relieved of its obligations under this Agreement, including its obligation to provide the Available Capacity of Treated Water to the Offtaker for as long as the Force Majeure Event persists and for the period of time required for the Company or the Facility to recover from the Force Majeure Event, but the Company shall continue to make all reasonable efforts to operate the Facility safely as far as possible without jeopardizing the Facility.<br>✓ where any of the Non-Political Force Majeure Events can be overcome or cured by construction works requiring additional investment, the Company shall submit the investment plan for doing so including cost estimates to the Offtaker and, if the cost estimates and the method of compensation for such works are agreed by both Parties, the Company will engage in the relevant construction works. Such costs shall be compensated by the Offtaker either by an adjustment to the Total Charges or by such other mechanism as mutually agreed between the Parties.<br>✓ all Costs arising out of or concerning such Force Majeure Event shall be borne in accordance with the provisions of Article 11.5 |
| 11.5 | Allocation of costs arising out of Force Majeure | ▪ Upon occurrence of any Force Majeure Event prior to the Effective Date, the Parties shall bear their respective costs and no Party shall be required to pay to the other Party any costs thereof.<br>▪ Upon occurrence of a Force Majeure Event after the Effective Date, the costs incurred and attributable to such event and directly relating to the Project (the "Force Majeure Costs") shall be allocated and paid as follows:<br>✓ upon occurrence of a Natural FM Event or Foreign Political Event, all Force Majeure Costs attributable to such Natural FM Event or Foreign Political Event to the extent actually covered by insurance on a commercially reasonable basis, shall be borne by the Company, and to the extent Force Majeure Costs exceed such insurance |

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| | | claims actually received, all such excess amount shall be reimbursed by the Offtaker to the Company; and<br>✓ upon occurrence of a Government Event, all Force Majeure Costs attributable to such Government Event shall be reimbursed by the Offttaker to the Company.<br>▪ For the avoidance of doubt, Force Majeure Costs shall, without limitation, include interest payments and principal repayments on debt, O&M Expenses, any increase in the cost of construction on account of inflation and all other costs directly attributable to the Force Majeure Event.<br>▪ Save and except as expressly provided in this Agreement, neither Party shall be liable in any manner whatsoever to the other Party in respect of any loss, damage, cost, expense, claims, demands and proceedings relating to or arising out of the occurrence of any Force Majeure Event or the exercise of any right pursuant hereto. |
| **12** | **EVENT OF DEFAULT** | |
| 12.1 | Company Event of Default | ▪ The following events shall constitute an event of default by the Company (Company EoD) if the Company has failed to cure such breach or default within a time period agreed between the Parties.<br>✓ the Company is in material breach of this Agreement<br>✓ the transfer, pursuant to Applicable Laws or otherwise, either the rights and/or obligations of the Company under this Agreement or all or material part of the assets or undertaking of the Company<br>✓ a resolution is passed by the shareholders of the Company for the voluntary winding up of the Company<br>✓ the Company is adjudged bankrupt or insolvent or if a trustee or receiver is appointed for the Company or for any of its property that has a material adverse effect on the Project<br>✓ any petition for winding up of the Company is admitted by a court of competent jurisdiction or the Company is ordered to be wound up by Court |

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| | | ✓ the Company abandons the Project without the prior consent of the Offtaker<br>✓ the Company suffers an execution being levied on a material part of the Facility causing a material adverse effect<br>✓ the Company has delayed any payment that has fallen due under this Agreement<br>✓ the Company fails to achieve the COD within [TBD] months of the Required COD save to the extent caused by Force Majeure Event or breach by the Offtaker<br>✓ the Company fails to comply with the terms of the Supply Capacity Allocation (Supply Capacity Allocation means [TBD]% of the Available Capacity on a rolling 24-months basis)<br>✓ **THE KEY PROJECT AGREEMENT IS TERMINATED DUE TO COMPANY'S BREACH** |
| 12.2 | Offtaker Event of Default | ▪ The following events shall constitute an event of default by the Offtaker (Offtaker EoD) if the Company has failed to cure such breach or default within a time period agreed between the Parties.<br>✓ the Offtaker has delayed any payment that has fallen due under this Agreement, irrespective of whether any amounts are available in the Trust and Retention Account.<br>✓ the Offtaker has failed to comply with its obligations under the Trust and Retention Account Agreement or any other arrangements<br>✓ the Offtaker is in material breach of this Agreement<br>✓ the Offtaker repudiates this Agreement or otherwise evidences an irrevocable intention not to be bound by this Agreement<br>✓ a resolution is passed by the shareholders of the Offtaker or a Vietnam Side Sponsor (being the shareholders of the Offtaker) for the voluntary winding up of the Offtaker or a Vietnam Side Sponsor<br>✓ the Offtaker or a Vietnam Side Sponsor is adjudged bankrupt or insolvent or if a trustee or receiver is appointed for the Offtaker or a Vietnam Side Sponsor or for any of its property |

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| | | ✓ any petition for winding up of the Offtaker or a Vietnam Side Sponsor is admitted by a court of competent jurisdiction or the Offtaker or a Vietnam Side Sponsor is ordered to be wound up by Court<br>✓ the Offtaker has failed to procure any clearances required by COD, or fails to assist the Company in obtaining any required clearances<br>✓ the Key Project Agreement is terminated due to Offtaker's breach. |
| **13** | **TERMINATION** | |
| 13.1 | [Suspension] | ▪ If the Offtaker is in Material Breach of this Agreement and has failed to remedy such Material Breach within a Rectification Period of [45 (Forty Five)] days from the date of notification by the Company of such Material Breach, the Company shall be entitled in its sole discretion and without prejudice to its other rights and remedies under this Agreement, including its right of Termination hereunder, to suspend the supply of Treated Water to the Offtaker. Provided that, any suspension on account of this Article 13.1, shall not relieve the Offtaker of its obligation to pay the Capacity Payment established under Article 10.1.<br>▪ Any suspension by the Company shall be by a communication in writing to the Offtaker and shall be effective forthwith upon the receipt thereof by the Offtaker. Provided, however, that the period of such suspension under this Article shall not exceed 45 (Forty Five) days. Any suspension pursuant to this Article shall be revoked by the Company forthwith upon the Offtaker having remedied the Material Breach during such suspension period to the satisfaction of the Company, unless in the meantime this Agreement has been terminated by the Company Party in accordance with Article 13.2 |
| 13.2 | Termination | **Termination for Company EoD**<br>Without prejudice to any other right or remedy which the Offtaker may have in respect thereof under this Agreement, upon the occurrence of a Company EoD, the Offtaker shall be entitled to terminate this Agreement by a Termination Notice to the Company provided that before issuing the Termination Notice, the Offtaker shall by a notice in writing inform the |

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| | | Company of its intention to issue the Termination Notice (the Preliminary Notice) and grant [30 (Thirty)] days time to the Company to make its representation, if any, against such intended Termination Notice and shall after the expiry of the said [30 (Thirty)] days' period, whether or not it is in receipt of such representation, in its sole discretion issue the Termination Notice.<br><br>**Termination for Offtaker EoD**<br><br>Without prejudice to any other right or remedy which the Company may have in respect thereof under this Agreement, upon the occurrence of a Offtaker EoD, the Company shall be entitled to terminate this Agreement by a Termination Notice to the Offtaker provided that before issuing the Termination Notice, the Company shall by a notice in writing inform the Offtaker of its intention to issue the Termination Notice (the Preliminary Notice) and grant [30 (Thirty)] days time to the offtaker to make its representation, if any, against such intended Termination Notice and shall after the expiry of the said [30 (Thirty)] days' period, whether or not it is in receipt of such representation, in its sole discretion issue the Termination Notice.<br><br>**Termination in case of Force Majeure Events**<br><br>Upon occurrence of a Force Majeure Event as defined under Article 11 and such event cannot be remedied within 180 days after all reasonable efforts of the Parties, either Party shall have the right to terminate this Agreement upon [30 (Thirty)] day's prior notice. |