## 9. Operation and Maintenance Check List

**Appendix**
Operation and Maintenance

**Table 1 Inspection Check List for Pump Station**

| Item | Inspection Item | Frequency |
|---|---|---|
| Daily inspection | pump operation | 1 or 2 times daily |
| | unusual vibration and noise | |
| | discharge pressure, voltage, ampere | |
| | function of lifting equipment | |
| | function of valves | |
| | function of lifting ventilation | |
| | function of emergency equipment/system | |
| Annual inspection and maintenance | function of removable system of pump unit | once a year |
| | function of level switch | |
| | cleaning of level switch | |
| | checking of maintenance tools | |
| Daily cleaning | removing and transportation of screenings | daily |
| | cleaning of channel | |
| | cleaning of floor and rooms | |

**Table 2 Items to be covered by Daily Inspection (Treatment Plant Operation)**

| Facility | Equipment | Item to be Inspected |
|---|---|---|
| Grit Chamber | Automatic screen | moving parts, chain, gears and bearings lubrication, vibration, noise |
| | Grit removal | function of sand pump |
| | Screenings container | amount of screenings, |
| | Bypass screen | removal of screenings, checking of tools |
| Reaction Tank | Aeration diffuser | uniformity of aeration on liquid surface |
| | Submersible mixer | condition of mixing, lubrication, vibration, noise removal of obstructs |
| | Blower | air flow, temperature, pressure, valve operation, vibration, noise, electricity supply cleaning of air filter, water drain |
| | Internal recycle pump (Birzai) | recycle amount, removal of obstructs |
| | Gates & Valves | checking function |
| Final sedimentation tank | Sludge collector | checking of function, lubrication, vibration, noise |
| | Scum skimmer | checking of function, amount of scum stuck at scum skimmer, cleaning of scum trough |
| | Sludge pump | discharge amount, pressure, valve operation, vibration, noise, electricity supply |
| Sludge thickener | Sludge mixer (picket fence) | checking of function, lubrication, vibration, noise |
| | Sludge pump | discharge amount, pressure, valve operation, vibration, noise, electricity supply |
| Sludge holding tank | Aerator | uniformity of aeration |
| | Blower | air flow, temperature, pressure, valve operation, vibration, noise, electricity supply cleaning of air filter, water drain |
| | Sludge pump | discharge amount, pressure, valve operation, vibration, noise, electricity supply |
| Sludge dewatering machine | Centrifuge | conditions of dewatered sludge, supernatant vibration, noise, electricity supply temperature at bearings |
| | Polymer dissolving tank (with mixer) | liquid amount, stock of polymer |
| | Feeding pump | discharge amount, pressure, valve operation, vibration, noise, electricity supply |
| Sludge composting (Skuodas) | Screw conveyor | checking of function, vibration, noise, lubrication, |
| Chemical coagulation for phosphorus removal | Chemical dissolving tank (with mixer) | liquid amount, stock of chemical |
| | Feeding pump | discharge amount, pressure, valve operation, vibration, noise, electricity supply |
| Sludge lagoon | inlet/outlet valves | checking of function |

**Table 3 Items to be covered by Daily Inspection (Treatment Plant Electrical System)**

| Facility | Equipment | Item to be Inspected |
|---|---|---|
| Power receiving system | Disconnecting switch & circuit breakers | checking conditions and connections |
| | Transformer | checking conditions and connections temperature, noise |
| | Auxiliaries | checking conditions and connections |
| Distribution system | Condenser | checking conditions and connections temperature, noise |
| | Circuit breakers | checking conditions and connections |
| | Auxiliaries | checking conditions and connections |
| | Wire & cable | checking conditions and connections corrosion, damage, label |
| Load | Motor | noise, rotation, vibration, temperature |
| | Lighting | noise, temperature |
| Alarm system | Annunciation | checking of function |

**Table 4 Items to be covered by Daily Inspection (Instrumentation)**

| Facility | Equipment | Item to be Inspected |
|---|---|---|
| Indicators & meters | Indicator | checking function, cleaning |
| | Manual setting | checking function, adjustment, cleaning |
| | Recorder | checking function, supply of recording sheet |
| Flow measurement | Parshall flume | removal of debris, obstructs |
| Water level meter | | checking function, cleaning, calibration as required |

# 10. Cost Estimates

**SKUODAS**
**CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK**

**PROJECT COST SUMMARY**

| | | Amount (Litas) | Remark |
|---|---|---|---|
| **Construction Cost** | | | |
| **Treatment Plant** | | | |
| 1 Structures | | 2,739,748 | |
| 1 Grit chamber | 11,729 | | |
| 2 Parshall flume | 2,380 | | |
| 3 Primary sedimentation tank | 42,867 | | |
| 4 Splitter box | 8,288 | | |
| 5 Oxidation ditch | 942,620 | | |
| 6 Sludge pump house | 101,673 | | |
| 7 Final sedimentation tank | 341,362 | | |
| 8 Sludge thickener | 61,352 | | |
| 9 Sludge storage tank | 28,143 | | |
| 10 Sludge treatment building | 159,960 | | |
| 11 Sludge composting yard | 721,447 | | |
| 12 Administration building | 287,928 | | |
| 13 Miscellaneous structures | 30,000 | | |
| 2 Earth Work | | 26,648 | |
| 3 In-plant Piping | | 122,364 | |
| 4 Site Development | | 437,764 | |
| 5 Plant Equipment and Electrical Works | | 2,885,000 | |
| 6 Water Supply Facility | | 80,000 | |
| 7 Landscaping | | 30,000 | |
| 8 Procurement of vehicles and maintenance equipment | | 300,000 | |
| **Pipeline Connection to the existing Pressure Mains** | | | |
| DIP dia.100 mm, L = 100 m | | 10,000 | |
| **Demilition of the Existing Treatment Plant** | | 30,000 | |
| Construction Cost Total | | 6,662,000 | |

SKUODAS
CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK

**CONSTRUCTION COST DETAILS**

| Item | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 Structures | | | | | | | | | | |
| 1 Gnt chamber | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 2.0 | 7.3 | | 14.6 | m2 | 14.6 | 55 | 803 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 2.0 | 7.3 | 0.2 | 2.9 | m3 | 2.9 | 878 | 2,564 | site concrete |
| | Wall | 0.2 | 17 | 1.5 | 5.1 | m3 | 5.1 | 1,196 | 6,100 | site concrete |
| | Miscellaneous (10% of above) | | | | 1.0 | m3 | 1.0 | 1,196 | 1,196 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 1,066 | |
| | | | | | sub-total | | | | 11,729 | |
| 2 Parshall flume | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 0.8 | 3.3 | | 2.6 | m2 | 2.6 | 55 | 145 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 0.8 | 3.3 | 0.2 | 0.5 | m3 | 0.5 | 878 | 464 | site concrete |
| | Wall | 0.2 | 6.5 | 1.0 | 1.3 | m3 | 1.3 | 1,196 | 1,555 | site concrete |
| | Miscellaneous (10% of above) | | | | 0.0 | m3 | 0.0 | 1,196 | 0 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 216 | |
| | | | | | sub-total | | | | 2,380 | |
| 3 Primary sedimentation tank | including | sludge pump room | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 6.0 | 6.0 | | 36.0 | m2 | 36.0 | 55 | 1,980 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 6.0 | 6.0 | 0.3 | 10.8 | m3 | 10.8 | 878 | 9,482 | site concrete |
| | Wall | 0.25 | 20 | 4.0 | 20.0 | m3 | 20.0 | 1,196 | 23,920 | site concrete |
| | Miscellaneous (10% of above) | | | | 3.0 | m3 | 3.0 | 1,196 | 3,588 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 3,897 | |
| | | | | | sub-total | | | | 42,867 | |
| 4 Splitter box | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 3.0 | 2.8 | | 8.4 | m2 | 8.4 | 55 | 462 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 3.0 | 2.8 | 0.2 | 1.7 | m3 | 1.7 | 878 | 1,475 | site concrete |
| | Wall | 0.2 | 9.2 | 2.0 | 3.7 | m3 | 3.7 | 1,196 | 4,401 | site concrete |
| | Miscellaneous (10% of above) | | | | 1.0 | m3 | 1.0 | 1,196 | 1,196 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 753 | |
| | | | | | sub-total | | | | 8,288 | |

SKUODAS
CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK

**CONSTRUCTION COST DETAILS**

| Item | | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 Oxidation ditch | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 39.0 | 36.0 | | | 1404.0 | m2 | 1,404.0 | 55 | 77,220 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 39.0 | 36.0 | 0.3 | | 421.2 | m3 | 421.2 | 878 | 369,814 | site concrete |
| | Outer Wall (curved wall) | 0.3 | 118.0 | 3.0 | | 106.2 | m3 | 106.2 | 1,196 | 127,015 | site concrete |
| | Miscellaneous (10% of other concrete volume) | | | | | 53.0 | m3 | 53 | 1,196 | 63,388 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | W (m) | L (m) | H (m) | | A (m2) | | | | | |
| | Outer Wall | | 63.0 | 3.0 | | 189.0 | m2 | 315 | 334 | 105,210 | pre-cast wall panel |
| | Partition wall | | 191.0 | 3.0 | | 573.0 | m2 | 210 | 98 | 20,580 | pre-cast wall panel |
| Blower room | Base slab | 6.5 | 19.0 | | | | m2 | 124 | 134 | 16,549 | pre-cast wall panel |
| | Top slab | 6.5 | 19.0 | | | | m2 | 124 | 73 | 9,016 | pre-cast wall panel |
| | Wall | | 51.0 | 4.0 | | | m2 | 204 | 334 | 68,136 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 85,693 | |
| | | | | | | sub-total | | | | 942,620 | |
| 6 Sludge pump house | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 7.0 | 13.5 | | | 94.5 | m2 | 95 | 55 | 5,198 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 7.0 | 13.5 | 0.4 | | 37.8 | m3 | 19 | 878 | 16,682 | site concrete |
| | Miscellaneous (10% of above) | | | | | 4.0 | m3 | 4 | 878 | 3,512 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | W (m) | L (m) | H (m) | | A (m2) | | | | | |
| | Top slab | 7.0 | 13.5 | | | 94.5 | m2 | 95 | 134 | 12,663 | pre-cast slab panel |
| | Underground wall | | 37.0 | 4.4 | | 162.8 | m2 | 163 | 334 | 54,375 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 9,243 | |
| | | | | | | sub-total | | | | 101,673 | |
| 7 Final sedimentation tank | | | | | | | | | | | |
| | | W (m) | L (m) | | no. | A (m2) | | | | | |
| Foundation | | 16.5 | 16.5 | | 2 | 544.5 | m2 | 545 | 55 | 29,948 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | no. | V (m3) | | | | | |
| | Base Slab | 16.5 | 16.5 | 0.3 | 2 | 163.4 | m3 | 163 | 878 | 143,421 | site concrete |
| | Miscellaneous (10% of above) | | | | | 16.0 | m3 | 16 | 878 | 14,048 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | | L (m) | H (m) | no. | A (m2) | | | | | |
| | Wall | | 46.0 | 4 | 2 | 368.0 | m2 | 368 | 334 | 122,912 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 31,033 | |
| | | | | | | sub-total | | | | 341,362 | |

SKUODAS
CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK

**CONSTRUCTION COST DETAILS**

| Item | | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 Sludge thickener | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 6.0 | 6.0 | | | 36.0 | m2 | 36.0 | 55 | 1,980 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 6.0 | 6.0 | 0.3 | | 10.8 | m3 | 10.8 | 878 | 9,482 | site concrete |
| | Wall | 0.25 | 22 | 4.7 | | 25.9 | m3 | 25.9 | 1,196 | 30,917 | site concrete |
| | Top slab | 6.0 | 6.0 | 0.2 | | 7.2 | m3 | 7.2 | 1,196 | 8,611 | site concrete |
| | Miscellaneous (10% of above) | | | | | 4.0 | m3 | 4.0 | 1,196 | 4,784 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 5,577 | |
| | | | | | | sub-total | | | | 61,352 | |
| 9 Sludge storage tank | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 6.0 | 3.0 | | | 18.0 | m2 | 18.0 | 55 | 990 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 6.0 | 3.0 | 0.3 | | 5.4 | m3 | 5.4 | 878 | 4,741 | site concrete |
| | Wall | 0.25 | 11 | 4.0 | | 11.0 | m3 | 11.0 | 1,196 | 13,156 | site concrete |
| | Top slab | 6.0 | 3.0 | 0.2 | | 3.6 | m3 | 3.6 | 1,196 | 4,306 | site concrete |
| | Miscellaneous (10% of above) | | | | | 2.0 | m3 | 2.0 | 1,196 | 2,392 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 2,558 | |
| | | | | | | sub-total | | | | 28,143 | |
| 10 Sludge treatment building | | | | | | | | | | | |
| | | W (m) | L (m) | | no. | A (m2) | | | | | |
| | | 10.0 | 12.0 | | 1.0 | 120 | m2 | 120.0 | 1,333 | 159,960 | |
| | | | | | | sub-total | | | | 159,960 | |
| 11 Sludge composting yard | | | | | | | | | | | |
| | | W (m) | L (m) | | no. | A (m2) | | | | | |
| Foundation | | 26.0 | 37.0 | | 1.0 | 962.0 | m2 | 962.0 | 55 | 52,910 | foundation base |
| | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| Concrete base (d=0.2 m) | | 26.0 | 37.0 | 0.2 | 1.0 | 192.4 | m3 | 192.4 | 878 | 168,927 | pre-cast slab panel |
| | | W (m) | L (m) | | no. | A (m2) | | | | | |
| Roofing | | 9.0 | 37.0 | | 2.0 | 333.0 | m2 | 333.0 | 1,390 | 462,870 | steel frame, tin-plate roofing |
| | | | L (m) | H (m) | no. | A (m2) | | | | | |
| Pre-cast side wall panel | | | 55.0 | 1.0 | 2 | 110.0 | m2 | 110.0 | 334 | 36,740 | |
| | | | | | | sub-total | | | | 721,447 | |

SKUODAS
CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK

**CONSTRUCTION COST DETAILS**

| Item | W (m) | L (m) | no. | A (m2) | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 12 Administration building | 18.0 | 12.0 | 1.0 | 216 | m2 | 216.0 | 1,333 | 287,928 | |
| sub-total | | | | | | | | 287,928 | |
| 13 Miscellaneous structures | | | | | | | | | |
| Sand bed | | | | | | | | | |
| Wastewater recycle pit | | | | | L.S. | | | 30,000 | |
| 2 Earth Work | | | | | | | | | |
| 1 Excavation | | | | | | | | | |
| 1 Primary sedimentation tank | | | | | m3 | 30 | 2.15 | 65 | |
| 2 Oxidation ditch | | | | | m3 | 2,720 | 2.15 | 5,848 | |
| 3 Final sedimentation tank | | | | | m3 | 3,600 | 2.15 | 7,740 | |
| 4 Sludge thickener | | | | | m3 | 60 | 2.15 | 129 | |
| 5 Sludge lagoon | | | | | m3 | 800 | 2.15 | 1,720 | |
| 2 Backfill to the existing ground | | | | | | | | | |
| 1 Primary sedimentation tank | | | | | m3 | 30 | 5.35 | 161 | |
| 2 Oxidation ditch | | | | | m3 | 293 | 5.35 | 1,568 | |
| 3 Final sedimentation tank | | | | | m3 | 210 | 5.35 | 1,124 | |
| 4 Sludge thickener | | | | | m3 | 20 | 5.35 | 107 | |
| 3 Fill above the existing ground (use excess soil from excavation) | | | | | m3 | 6,657 | 1.23 | 8,188 | = balance of excavation and backfi max. height = 2.0 m |
| sub-total | | | | | | | | 26,648 | |

SKUODAS
CASE 1- OXIDATION DITCH WITH PRIMARY SEDIMENTATION TANK

**CONSTRUCTION COST DETAILS**

| | Item | | | unit | Quantity | unit cost | Amount | Remark | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | In-plant Piping (all pipes laid in 1.0 m depth ) | | | | | | | dia. | material |
| | use | from | to | | | | | | |
| | 1 Sewage | End of the existing pressure line | Grit chamber | m | 20 | 302 | 6,040 | 300 mm | DIP |
| | 2 Sewage | Grit chamber | Parshall flume | m | 5 | 156 | 780 | 400 mm | RCP |
| | 3 Sewage | Parshall flume | Primary sedimentation tank | m | 5 | 156 | 780 | 400 mm | RCP |
| | 4 Sewage | Primary sedimentation tank | Oxidation ditch inlet box | m | 150 | 201 | 30,150 | 300 mm | PVC |
| | 5 Sewage | Oxidation ditch outlet box | Final sedimentation tank | m | 45 | 156 | 7,020 | 400 mm | RCP |
| | 6 Sewage | Final sedimentation tank | Discharge outlet | m | 150 | 156 | 23,400 | 400 mm | RCP |
| | 7 Prim. sludge | Primary sedimentation tank | Sludge thickener | m | 40 | 87 | 3,480 | 100 mm | PVC |
| | 8 Secondary sludge | Final sedimentation tank | Sludge thickener | m | 80 | 87 | 6,960 | 100 mm | PVC |
| | 9 Thickened sludge | Sludge thickener | Control building | m | 5 | 87 | 435 | 100 mm | PVC |
| | 10 Return sludge | Sludge pump room (at OD) | Oxidation ditch inlet box | m | 80 | 118 | 9,440 | 200 mm | PVC |
| | 11 Return supernatant | Sludge thickener | Wastewater pit | m | 20 | 87 | 1,740 | 100 mm | PVC |
| | 12 Return supernatant | Sludge treatment building | Wastewater pit | m | 20 | 87 | 1,740 | 100 mm | PVC |
| | 13 Scum | Primary sedimentation tank | Wastewater pit | m | 25 | 87 | 2,175 | 100 mm | PVC |
| | 14 Scum | Final sedimentation tank | Wastewater pit | m | 40 | 87 | 3,480 | 100 mm | PVC |
| | 15 Return wastewater | Wastewater pit | Grit chamber | m | 50 | 87 | 4,350 | 100 mm | PVC |
| | 16 Miscellaneous Works | (20 % of the total cost of In-plant pipings) | | | | | 20,394 | | |
| | | | sub-total | | 735 | | 122,364 | | |
| 4 | Site Development | | | | | | | | |
| | 1 Fence | | | m | 540 | 98 | 52,920 | | |
| | 2 Gate | | | unit | 2 | 1,951 | 3,902 | | |
| | 3 In-plant Road (w = 4 m, asphalt pavement) | | | m2 | 2,990 | 112 | 334,880 | | |
| | 4 Yard Lighting | | | L.S | 1 | 46,062 | 46,062 | | |
| | | | sub-total | | | | 437,764 | | |
| 5 | Plant Equipment | | | | | | | | |

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**SKUODAS**
**CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK**

**CONSTRUCTION COST SUMMARY**

| | | Amount (Litas) | Remark |
|---|---|---|---|
| 1 Structures | | 3,177,391 | |
| 1 Grit chamber | 11,729 | | |
| 2 Parshall flume | 2,380 | | |
| 3 Spitter box | 8,288 | | |
| 4 Oxidation ditch | 1,397,263 | | |
| 5 Sludge pump house | 101,673 | | |
| 6 Final sedimentation tank | 341,362 | | |
| 7 Sludge thickener | 61,352 | | |
| 8 Sludge storage tank | 28,015 | | |
| 9 Sludge treatment building | 159,960 | | |
| 10 Sludge composting yard | 747,443 | | |
| 11 Administration building | 287,928 | | |
| 12 Miscellaneous structures | 30,000 | | |
| 2 Earth Work | | 26,052 | |
| 3 In-plant Piping | | 111,752 | |
| 4 Site Development | | 403,622 | |
| 5 Water Supply Facility | | 80,000 | |
| 6 Landscaping | | 30,000 | |
| 7 Plant Equipment | | 3,173,500 | |
| 8 Procurement of vehicles and maintenance equipment | | 300,000 | |
| | | 7,300,000 | |

SKUODAS
CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK

CONSTRUCTION COST DETAILS

| Item | W (m) | L (m) | H (m) | A (m2) / V (m3) | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 Structures | | | | | | | | | |
| 1 Grit chamber | | | | | | | | | |
| Foundation | 2.0 | 7.3 | | 14.6 | m2 | 14.6 | 55 | 803 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 2.0 | 7.3 | 0.2 | 2.9 | m3 | 2.9 | 878 | 2,564 | site concrete |
| Wall | 0.2 | 17 | 1.5 | 5.1 | m3 | 5.1 | 1,196 | 6,100 | site concrete |
| Miscellaneous (10% of above) | | | | 1.0 | m3 | 1.0 | 1,196 | 1,196 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 1,066 | |
| | | | | sub-total | | | | 11,729 | |
| 2 Parshall flume | | | | | | | | | |
| Foundation | W (m) 0.8 | L (m) 3.3 | | A (m2) 2.6 | m2 | 2.6 | 55 | 145 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 0.8 | 3.3 | 0.2 | 0.5 | m3 | 0.5 | 878 | 464 | site concrete |
| Wall | 0.2 | 6.5 | 1.0 | 1.3 | m3 | 1.3 | 1,196 | 1,555 | site concrete |
| Miscellaneous (10% of above) | | | | 0.0 | m3 | 0.0 | 1,196 | 0 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 216 | |
| | | | | sub-total | | | | 2,380 | |
| 3 Spitter box | | | | | | | | | |
| Foundation | W (m) 3.0 | L (m) 2.8 | | A (m2) 8.4 | m2 | 8.4 | 55 | 462 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 3.0 | 2.8 | 0.2 | 1.7 | m3 | 1.7 | 878 | 1,475 | site concrete |
| Wall | 0.2 | 9.2 | 2.0 | 3.7 | m3 | 3.7 | 1,196 | 4,401 | site concrete |
| Miscellaneous (10% of above) | | | | 1.0 | m3 | 1.0 | 1,196 | 1,196 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 753 | |
| | | | | sub-total | | | | 8,288 | |

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**SKUODAS**
**CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK**

**CONSTRUCTION COST DETAILS**

| Item | | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 Oxidation ditch | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 66.0 | 39.0 | | | 2574.0 | m2 | 2,574.0 | 55 | 141,570 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 66.0 | 39.0 | 0.3 | | 772.2 | m3 | 772.2 | 878 | 677,992 | site concrete |
| | Outer Wall (curved w | 0.3 | 117.0 | 3.0 | | 105.3 | m3 | 105.3 | 1,196 | 125,939 | site concrete |
| | Miscellaneous (10% of other concrete volume) | | | | | 88.0 | m3 | 88 | 1,196 | 105,248 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | W (m) | L (m) | H (m) | | A (m2) | | | | | |
| | Outer Wall | | 153.0 | 3.0 | | 459.0 | m2 | 315 | 334 | 105,210 | pre-cast wall panel |
| | Partition wall | | 66.0 | 3.0 | | 198.0 | m2 | 210 | 98 | 20,580 | pre-cast wall panel |
| Blower room | Base slab | 6.5 | 19.0 | | | | m2 | 124 | 134 | 16,549 | pre-cast wall panel |
| | Top slab | 6.5 | 19.0 | | | | m2 | 124 | 73 | 9,016 | pre-cast wall panel |
| | Wall | | 51.0 | 4.0 | | | m2 | 204 | 334 | 68,136 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 127,024 | |
| | | | | | | sub-total | | | | 1,397,263 | |
| 5 Sludge pump house | | | | | | | | | | | |
| | | W (m) | L (m) | | | A (m2) | | | | | |
| Foundation | | 7.0 | 13.5 | | | 94.5 | m2 | 95 | 55 | 5,198 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| | Base Slab | 7.0 | 13.5 | 0.4 | | 37.8 | m3 | 19 | 878 | 16,682 | site concrete |
| | Miscellaneous (10% of above) | | | | | 4.0 | m3 | 4 | 878 | 3,512 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | W (m) | L (m) | H (m) | | A (m2) | | | | | |
| | Top slab | 7.0 | 13.5 | | | 94.5 | m2 | 95 | 134 | 12,663 | pre-cast slab panel |
| | Underground wall | | 37.0 | 4.4 | | 162.8 | m2 | 163 | 334 | 54,375 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 9,243 | |
| | | | | | | sub-total | | | | 101,673 | |
| 6 Final sedimentation tank | | | | | | | | | | | |
| | | W (m) | L (m) | | no. | A (m2) | | | | | |
| Foundation | | 16.5 | 16.5 | | 2 | 544.5 | m2 | 545 | 55 | 29,948 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | no. | V (m3) | | | | | |
| | Base Slab | 16.5 | 16.5 | 0.3 | 2 | 163.4 | m3 | 163 | 878 | 143,421 | site concrete |
| | Miscellaneous (10% of above) | | | | | 16.0 | m3 | 16 | 878 | 14,048 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | | |
| | | | L (m) | H (m) | no. | A (m2) | | | | | |
| | Wall | | 46.0 | 4 | 2 | 368.0 | m2 | 368 | 334 | 122,912 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 31,033 | |
| | | | | | | sub-total | | | | 341,362 | |

SKUODAS
CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK

CONSTRUCTION COST DETAILS

| Item | | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 Sludge thickener | | | | | | | | | | | |
| | W (m) | L (m) | | | A (m2) | | | | | | |
| Foundation | 6.0 | 6.0 | | | 36.0 | | m2 | 36.0 | 55 | 1,980 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | | V (m3) | | | | | | |
| Base Slab | 6.0 | 6.0 | 0.3 | | 10.8 | | m3 | 10.8 | 878 | 9,482 | site concrete |
| Wall | 0.25 | 22 | 4.7 | | 25.9 | | m3 | 25.9 | 1,196 | 30,917 | site concrete |
| Top slab | 6.0 | 6.0 | 0.2 | | 7.2 | | m3 | 7.2 | 1,196 | 8,611 | site concrete |
| Miscellaneous (10% of above) | | | | | 4.0 | | m3 | 4.0 | 1,196 | 4,784 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 5,577 | |
| | | | | | | sub-total | | | | 61,352 | |
| 8 Sludge storage tank | | | | | | | | | | | |
| | W (m) | L (m) | | | A (m2) | | | | | | |
| Foundation | 4.0 | 3.0 | | | 12.0 | | m2 | 12.0 | 55 | 660 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | | V (m3) | | | | | | |
| Base Slab | 4.0 | 3.0 | 0.3 | | 3.6 | | m3 | 3.6 | 878 | 3,161 | site concrete |
| Wall | 0.25 | 10 | 5.0 | | 12.5 | | m3 | 12.5 | 1,196 | 14,950 | site concrete |
| Top slab | 6.0 | 3.0 | 0.2 | | 3.6 | | m3 | 3.6 | 1,196 | 4,306 | site concrete |
| Miscellaneous (10% of above) | | | | | 2.0 | | m3 | 2.0 | 1,196 | 2,392 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | | L.S. | 1 | | 2,547 | |
| | | | | | | sub-total | | | | 28,015 | |
| 9 Sludge treatment building | | | | | | | | | | | |
| | W (m) | L (m) | | no. | A (m2) | | | | | | |
| | 10.0 | 12.0 | | 1.0 | 120 | | m2 | 120.0 | 1,333 | 159,960 | |
| | | | | | | sub-total | | | | 159,960 | |
| 10 Sludge composting yard | | | | | | | | | | | |
| | W (m) | L (m) | | no. | A (m2) | | | | | | |
| Foundation | 26.0 | 33.0 | | 1.0 | 858.0 | | m2 | 858.0 | 55 | 47,190 | foundation base |
| | W (m) | L (m) | H (m) | | V (m3) | | | | | | |
| Concrete base (d=0.2 m) | 26.0 | 33.0 | 0.2 | 1.0 | 171.6 | | m3 | 171.6 | 878 | 150,665 | pre-cast slab panel |
| | W (m) | L (m) | | no. | A (m2) | | | | | | |
| Roofing | 9.0 | 34.0 | | 2.0 | 306.0 | | m2 | 306.0 | 1,390 | 425,340 | steel frame, tin-plate roofing |
| | | L (m) | H (m) | no. | A (m2) | | | | | | |
| Pre-cast side wall panel | | 93.0 | 1.0 | 4 | 372.0 | | m2 | 372.0 | 334 | 124,248 | |
| | | | | | | sub-total | | | | 747,443 | |

**SKUODAS**
**CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK**

**CONSTRUCTION COST DETAILS**

| Item | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 11 Administration building | | | | | | | | | |
| | W (m) | L (m) | no. | A (m2) | | | | | |
| | 18.0 | 12.0 | 1.0 | 216 | m2 | 216.0 | 1,333 | 287,928 | |
| | | | | sub-total | | | | 287,928 | |
| 12 Miscellaneous structures | | | | | | | | | |
| Sand bed | | | | | | | | | |
| Wastewater recycle pit | | | | | | | | | |
| | | | | | L.S. | | | 30,000 | |
| 2 Earth Work | | | | | | | | | |
| 1 Excavation | | | | | | | | | |
| 1 Oxidation ditch | | | | | m3 | 2,810 | 2.15 | 6,042 | |
| 2 Final sedimentation tank | | | | | m3 | 3,600 | 2.15 | 7,740 | |
| 3 Sludge thickener | | | | | m3 | 75 | 2.15 | 161 | |
| 4 Sludge lagoon | | | | | m3 | 600 | 2.15 | 1,290 | |
| 2 Backfill to the existing ground | | | | | | | | | |
| 1 Oxidation ditch | | | | | m3 | 460 | 5.35 | 2,461 | |
| 2 Final sedimentation tank | | | | | m3 | 200 | 5.35 | 1,070 | |
| 3 Sludge thickener | | | | | m3 | 30 | 5.35 | 161 | |
| 3 Fill above the existing ground (use excess soil from excavation) | | | | | m3 | 5,795 | 1.23 | 7,128 | = balance of excavation and backfill max. height = 2.0 m |
| | | | | sub-total | | | | 26,052 | |

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SKUODAS
CASE 2 - OXIDATION DITCH WITHOUT PRIMARY SEDIMENTATION TANK

CONSTRUCTION COST DETAILS

| Item | | | | unit | Quantity | unit cost | Amount | Remark | |
|---|---|---|---|---|---|---|---|---|---|
| 3 In-plant Piping (all pipes laid in 1.0 m depth ) | | | | | | | | dia. | material |
| | use | from | to | | | | | | |
| 1 | Sewage | End of the existing pressure line | Grit chamber | m | 20 | 302 | 6,040 | 300 mm | DIP |
| 2 | Sewage | Grit chamber | Parshall flume | m | 5 | 156 | 780 | 400 mm | RCP |
| 3 | Sewage | Parshall flume | Oxidation ditch | m | 150 | 156 | 23,400 | 400 mm | RCP |
| 4 | Sewage | Oxidation ditch | Final sedimentation tank | m | 45 | 156 | 7,020 | 400 mm | RCP |
| 5 | Sewage | Final sedimentation tank | Discharge outlet | m | 150 | 156 | 23,400 | 400 mm | RCP |
| 6 | Secondary sludge | Final sedimentation tank | Sludge thickener | m | 80 | 87 | 6,960 | 100 mm | PVC |
| 7 | Thickened sludge | Sludge thickener | Sludge treatment building | m | 5 | 87 | 435 | 100 mm | PVC |
| 8 | Return sludge | Sludge pump room (at OD) | Oxidation ditch inlet box | m | 80 | 118 | 9,440 | 200 mm | PVC |
| 9 | Return supernatant | Sludge thickener | Wastewater pit | m | 20 | 87 | 1,740 | 100 mm | PVC |
| 10 | Return supernatant | Sludge treatment building | Wastewater pit | m | 20 | 87 | 1,740 | 100 mm | PVC |
| 11 | Scum | Final sedimentation tank | Wastewater pit | m | 40 | 87 | 3,480 | 100 mm | PVC |
| 12 | Return wastewater | Wastewater pit | Grit chamber | m | 50 | 87 | 4,350 | 100 mm | PVC |
| 13 | Miscellaneous Works | (20 % of the total cost of in-plant pipings) | | | | | 22,967 | | |
| | | | sub-total | | 665 | | 111,752 | | |
| 4 Site Development | | | | | | | | | |
| 1 | Fence | | | m | 560 | 98 | 54,880 | | |
| 2 | Gate | | | unit | 2 | 1,951 | 3,902 | | |
| 3 | In-plant Road (w = 4 m, asphalt pavement) | | | m2 | 2,270 | 112 | 254,240 | | |
| 4 | Yard Lighting | | | L.S. | 1 | 90,600 | 90,600 | | |
| | | | sub-total | | | | 403,622 | | |
| 5 Plant Equipment | | | | | | | | | |

**SKUODAS**
**CASE 3 - SEQUENCING BATCH REACTOR (SBR)**

**CONSTRUCTION COST SUMMARY**

| | | Amount (Litas) | Remark |
|---|---|---|---|
| 1 | Structures | 2,039,477 | |
| | 1 Grit chamber | 11,729 | |
| | 2 Parshall flume | 2,380 | |
| | 3 Batch reactor | 553,538 | |
| | 4 Flow Regulation Tank and Equipment Room | 183,000 | |
| | 5 Sludge thickener | 61,352 | |
| | 6 Sludge storage tank | 28,143 | |
| | 7 Sludge treatment building | 159,960 | |
| | 8 Sludge composting yard | 721,447 | |
| | 9 Administration building | 287,928 | |
| | 10 Miscellaneous structures | 30,000 | |
| 2 | Earth Work | 19,820 | |
| 3 | In-plant Piping | 66,972 | |
| 4 | Site Development | 437,764 | |
| 5 | Water Supply Facility | 80,000 | |
| 6 | Landscaping | 30,000 | |
| 7 | Plant Equipment and Electrical Works | 3,249,000 | |
| 8 | Procurement of vehicles and maintenance equipment | 80,000 | |
| | | 6,003,033 | |

**SKUODAS**
**CASE 3 - SEQUENCING BATCH REACTOR (SBR)**

**CONSTRUCTION COST DETAILS**

| Item | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 Structures | | | | | | | | | | |
| 1 Grit chamber | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 2.0 | 7.3 | | 14.6 | m2 | 14.6 | 55 | 803 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 2.0 | 7.3 | 0.2 | 2.9 | m3 | 2.9 | 878 | 2,564 | site concrete |
| | Wall | 0.2 | 17 | 1.5 | 5.1 | m3 | 5.1 | 1,196 | 6,100 | site concrete |
| | Miscellaneous (10% of above) | | | | 1.0 | m3 | 1.0 | 1,196 | 1,196 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 1,066 | |
| | | | | | sub-total | | | | 11,729 | |
| 2 Parshall flume | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 0.8 | 3.3 | | 2.6 | m2 | 2.6 | 55 | 145 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 0.8 | 3.3 | 0.2 | 0.5 | m3 | 0.5 | 878 | 464 | site concrete |
| | Wall | 0.2 | 6.5 | 1.0 | 1.3 | m3 | 1.3 | 1,196 | 1,555 | site concrete |
| | Miscellaneous (10% of above) | | | | 0.0 | m3 | 0.0 | 1,196 | 0 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 216 | |
| | | | | | sub-total | | | | 2,380 | |
| 3 Batch reactor | | | | | | | | | | |
| | | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | | 26.0 | 32.0 | | 832.0 | m2 | 832.0 | 55 | 45,760 | foundation base |
| Concrete Works (incl. Re-bar) | | W (m) | L (m) | H (m) | V (m3) | | | | | |
| | Base Slab | 26.0 | 32.0 | 0.4 | 332.8 | m3 | 332.8 | 878 | 292,198 | site concrete |
| | Miscellaneous (10% of other concrete volume) | | | | 33.0 | m3 | 33 | 1,196 | 39,468 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | | |
| | | | L (m) | H (m) | A (m2) | | | | | |
| | Outer Wall | | 109.0 | 7.0 | 763.0 | m2 | 315 | 334 | 105,210 | pre-cast wall panel |
| | Partition wall | | 30.0 | 7.0 | 210.0 | m2 | 210 | 98 | 20,580 | pre-cast wall panel |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | | L.S. | 1 | | 50,322 | |
| | | | | | sub-total | | | | 553,538 | |

**SKUODAS**
**CASE 3 - SEQUENCING BATCH REACTOR (SBR)**

**CONSTRUCTION COST DETAILS**

| Item | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 4 Flow Regulation Tank and Equipment Room | | | | | | | | | |
| | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | 11.0 | 20.0 | | 220.0 | m2 | 220 | 55 | 12,100 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 11.0 | 20.0 | 0.4 | 88.0 | m3 | 19 | 878 | 16,682 | site concrete |
| Miscellaneous (10% of above) | | | | 9.0 | m3 | 9 | 878 | 7,902 | site concrete |
| Pre-Cast Concrete Panel Work | | | | | | | | | |
| | W (m) | L (m) | H (m) | A (m2) | | | | | |
| Top slab | 11.0 | 20.0 | | 220.0 | m2 | 220 | 134 | 29,480 | pre-cast slab panel |
| Underground wall | | 40.0 | 4.0 | 160.0 | m2 | 160 | 334 | 53,440 | pre-cast wall panel |
| Above ground wall | | 40.0 | 3.5 | 140.0 | m2 | 140 | 334 | 46,760 | concrete block with plastering |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 16,636 | |
| | | | | sub-total | | | | 185,000 | |
| 5 Sludge thickener | | | | | | | | | |
| | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | 6.0 | 6.0 | | 36.0 | m2 | 36.0 | 55 | 1,980 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 6.0 | 6.0 | 0.3 | 10.8 | m3 | 10.8 | 878 | 9,482 | site concrete |
| Wall | 0.25 | 22 | 4.7 | 25.9 | m3 | 25.9 | 1,196 | 30,917 | site concrete |
| Top slab | 6.0 | 6.0 | 0.2 | 7.2 | m3 | 7.2 | 1,196 | 8,611 | site concrete |
| Miscellaneous (10% of above) | | | | 4.0 | m3 | 4.0 | 1,196 | 4,784 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 5,577 | |
| | | | | sub-total | | | | 61,352 | |
| 6 Sludge storage tank | | | | | | | | | |
| | W (m) | L (m) | | A (m2) | | | | | |
| Foundation | 6.0 | 3.0 | | 18.0 | m2 | 18.0 | 55 | 990 | foundation base |
| Concrete Works (incl. Re-bar) | W (m) | L (m) | H (m) | V (m3) | | | | | |
| Base Slab | 6.0 | 3.0 | 0.3 | 5.4 | m3 | 5.4 | 878 | 4,741 | site concrete |
| Wall | 0.25 | 11 | 4.0 | 11.0 | m3 | 11.0 | 1,196 | 13,156 | site concrete |
| Top slab | 6.0 | 3.0 | 0.2 | 3.6 | m3 | 3.6 | 1,196 | 4,306 | site concrete |
| Miscellaneous (10% of above) | | | | 2.0 | m3 | 2.0 | 1,196 | 2,392 | site concrete |
| Miscellaneous works (handrail, metal work etc. = 10% of the cost of above) | | | | | L.S. | 1 | | 2,558 | |
| | | | | sub-total | | | | 28,143 | |

SKUODAS
CASE 3 - SEQUENCING BATCH REACTOR (SBR)

CONSTRUCTION COST DETAILS

| Item | | | | | | unit | Quantity | unit cost | Amount | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 Sludge treatment building | | | | | | | | | | |
| | W (m) | L (m) | | no. | A (m2) | | | | | |
| | 10.0 | 12.0 | | 1.0 | 120 | m2 | 120.0 | 1,333 | 159,960 | |
| | | | | | sub-total | | | | 159,960 | |
| 8 Sludge composting yard | | | | | | | | | | |
| | W (m) | L (m) | | no. | A (m2) | | | | | |
| Foundation | 26.0 | 37.0 | | 1.0 | 962.0 | m2 | 962.0 | 55 | 52,910 | foundation base |
| | W (m) | L (m) | H (m) | | V (m3) | | | | | |
| Concrete base (d=0.2 m) | 26.0 | 37.0 | 0.2 | 1.0 | 192.4 | m3 | 192.4 | 878 | 168,927 | pre-cast slab panel |
| | W (m) | L (m) | | no. | A (m2) | | | | | |
| Roofing | 9.0 | 37.0 | | 2.0 | 333.0 | m2 | 333.0 | 1,390 | 462,870 | steel frame, tin-plate roofing |
| | | L (m) | H (m) | no. | A (m2) | | | | | |
| Pre-cast side wall panel | | 55.0 | 1.0 | 2 | 110.0 | m2 | 110.0 | 334 | 36,740 | |
| | | | | | sub-total | | | | 721,447 | |
| 9 Administration building | | | | | | | | | | |
| | W (m) | L (m) | | no. | A (m2) | | | | | |
| | 18.0 | 12.0 | | 1.0 | 216 | m2 | 216.0 | 1,333 | 287,928 | |
| | | | | | sub-total | | | | 287,928 | |
| 10 Miscellaneous structures | | | | | | | | | | |
| Sand bed | | | | | | | | | | |
| Wastewater recycle pit | | | | | | | | | | |
| | | | | | | L.S. | | | 30,000 | |

**SKUODAS**
**CASE 3 - SEQUENCING BATCH REACTOR (SBR)**

**CONSTRUCTION COST DETAILS**

| Item | | | | unit | Quantity | unit cost | Amount | Remark | |
|---|---|---|---|---|---|---|---|---|---|
| 2 Earth Work | | | | | | | | | |
| 1 Excavation | | | | | | | | | |
| 1 Batch reactor | | | | m3 | 3,760 | 2.15 | 8,084 | | |
| 2 Sludge thickener | | | | m3 | 100 | 2.15 | 215 | | |
| 3 Sludge storage tank | | | | m3 | 50 | 2.15 | 108 | | |
| 4 Sludge treatment building | | | | m3 | 50 | 2.15 | 108 | | |
| 5 Sludge composting yard | | | | m3 | 50 | 2.15 | 108 | | |
| 6 Administration building | | | | m3 | 50 | 2.15 | 108 | | |
| 2 Backfill to the existing ground | | | | | | | | | |
| 1 Batch reactor | | | | m3 | 1,280 | 5.35 | 6,848 | | |
| 2 Sludge thickener | | | | m3 | 150 | 5.35 | 803 | | |
| 3 Sludge storage tank | | | | m3 | 20 | 5.35 | 107 | | |
| 4 Sludge treatment building | | | | m3 | 10 | 5.35 | 54 | | |
| 5 Sludge composting yard | | | | m3 | 10 | 5.35 | 54 | | |
| 6 Administration building | | | | m3 | 10 | 5.35 | 54 | | |
| 3 Fill above the existing ground (use excess soil from excavation) | | | | m3 | 2,580 | 1.23 | 3,173 | = balance of excavation and backfil max. height = 2.0 m | |
| | | | sub-total | | | | 19.820 | | |
| 3 In-plant Piping (all pipes laid in 1.0 m depth ) | | | | | | | | | |
| | use | from | to | | | | | dia. | material |
| 1 | Sewage | End of the existing pressure line | Grit chamber | m | 20 | 302 | 6,040 | 300 mm | DIP |
| 2 | Sewage | Grit chamber | Flow regulation tank | m | 20 | 156 | 3,120 | 400 mm | RCP |
| 3 | Sewage | SBR | Discharge outlet | m | 150 | 156 | 23,400 | 400 mm | RCP |
| 4 | Secondary sludge | SBR | Sludge thickener | m | 20 | 108 | 2,160 | 150 mm | PVC |
| 5 | Thickened sludge | Sludge thickener | Sludge treatment building | m | 5 | 108 | 540 | 150 mm | PVC |
| 6 | Return supernatant | Sludge thickener | Wastewater pit | m | 50 | 108 | 5,400 | 150 mm | PVC |
| 7 | Return supernatant | Sludge treatment building | Wastewater pit | m | 50 | 108 | 5,400 | 150 mm | PVC |
| 8 | Scum | SBR | Wastewater pit | m | 50 | 108 | 5,400 | 150 mm | PVC |
| 9 | Return wastewater | Wastewater pit | Grit chamber | m | 50 | 87 | 4,350 | 100 mm | PVC |
| 10 | Miscellaneous Works | (20 % of the total cost of In-plant pipings) | | | | | 11,162 | | |
| | | | sub-total | | | | 66.972 | | |
| 4 Site Development | | | | | | | | | |
| 1 Fence | | | | m | 540 | 98 | 52,920 | | |
| 2 Gate | | | | unit | 2 | 1,951 | 3,902 | | |
| 3 In-plant Road (w = 4 m, asphalt pavement) | | | | m2 | 2,990 | 112 | 334,880 | | |
| 4 Yard Lighting | | | | L.S. | 1 | 46,062 | 46,062 | | |
| | | | sub-total | | | | 437.764 | | |

# 11. Financial Analysis Calculation

## Operating Profit Loss (Skuodas)

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operating Income | 489,060 | 509,733 | 583,448 | 606,899 | 692,604 | 721,528 | 749,670 | 856,453 | 888,269 | 919,225 | 1,045,918 | 1,082,080 |
| Energy | 63,102 | 69,058 | 75,452 | 82,409 | 89,772 | 98,197 | 107,128 | 116,824 | 127,222 | 138,239 | 150,142 | 163,100 |
| Cost of chemical | 44,113 | 48,277 | 52,747 | 57,610 | 62,757 | 68,647 | 74,890 | 81,669 | 88,938 | 96,639 | 104,960 | 114,019 |
| Wages Social Securities | 103,742 | 108,930 | 114,376 | 120,095 | 126,100 | 132,405 | 139,025 | 145,976 | 153,275 | 160,939 | 168,985 | 177,435 |
| Salaries | 79,802 | 83,792 | 87,982 | 92,381 | 97,000 | 101,850 | 106,942 | 112,289 | 117,904 | 123,799 | 129,989 | 136,488 |
| Social Insurance | 23,941 | 25,138 | 26,394 | 27,714 | 29,100 | 30,555 | 32,083 | 33,687 | 35,371 | 37,140 | 38,997 | 40,946 |
| Parts Maintenance | 55,131 | 55,427 | 55,724 | 56,029 | 56,326 | 56,668 | 57,001 | 57,344 | 57,687 | 58,020 | 58,360 | 58,714 |
| Feul | 8,511 | 9,314 | 10,177 | 11,115 | 12,108 | 13,244 | 14,449 | 15,757 | 17,159 | 18,645 | 20,251 | 21,998 |
| Analysis cost | 15,530 | 16,996 | 18,570 | 20,282 | 22,094 | 24,167 | 26,365 | 28,752 | 31,311 | 34,022 | 36,952 | 40,141 |
| Others outsourcing Service | 3,310 | 3,622 | 3,958 | 4,323 | 4,709 | 5,151 | 5,619 | 6,128 | 6,673 | 7,251 | 7,875 | 8,555 |
| W & S for Administration | 81,164 | 85,222 | 89,483 | 93,958 | 98,655 | 103,588 | 108,768 | 114,206 | 119,916 | 125,912 | 132,208 | 138,818 |
| Salaries | 62,434 | 65,556 | 68,833 | 72,275 | 75,889 | 79,683 | 83,667 | 87,851 | 92,243 | 96,855 | 101,698 | 106,783 |
| Social Insurance | 18,730 | 19,667 | 20,650 | 21,683 | 22,767 | 23,905 | 25,100 | 26,355 | 27,673 | 29,057 | 30,509 | 32,035 |
| Depriciation | 601,048 | 601,048 | 601,048 | 601,048 | 601,048 | 601,048 | 601,048 | 601,048 | 561,711 | 272,369 | 96,661 | 96,661 |
| Taxes | 44,500 | 44,500 | 44,500 | 46,725 | 46,725 | 46,725 | 49,061 | 49,061 | 49,061 | 51,514 | 51,514 | 51,514 |
| Other G/A | 13,893 | 15,204 | 16,611 | 18,143 | 19,764 | 21,619 | 23,585 | 25,720 | 28,009 | 30,435 | 33,055 | 35,908 |
| Pulution Chage | 4,141 | 4,316 | 4,491 | 4,905 | 5,089 | 5,302 | 5,784 | 6,007 | 6,230 | 6,770 | 7,003 | 7,245 |
| Preparing for Bad Receivables | 14,672 | 15,292 | 17,503 | 18,207 | 20,778 | 21,646 | 22,490 | 25,694 | 26,648 | 27,577 | 31,378 | 32,462 |
| Total Operating Cost | 1,052,858 | 1,077,207 | 1,104,640 | 1,134,849 | 1,165,925 | 1,198,406 | 1,235,215 | 1,274,286 | 1,273,841 | 1,028,231 | 899,344 | 946,570 |
| Operating Profit (loss) | -563,798 | -567,475 | -521,192 | -527,949 | -473,320 | -476,878 | -485,545 | -417,833 | -385,572 | -109,006 | 146,574 | 135,510 |

Operating Profit Loss (Skuodas)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operating Income | 1,119,688 | 1,274,680 | 1,319,424 | 1,365,958 | 1,555,789 | 1,611,154 | 1,668,733 | 1,901,476 | 1,969,982 | 2,041,227 | 2,226,855 | 2,411,620 | 2,499,775 |
| Energy | 177,207 | 192,567 | 209,292 | 227,508 | 247,346 | 268,956 | 292,496 | 318,142 | 346,084 | 376,530 | 409,708 | 445,865 | 485,272 |
| Cost of chemical | 123,881 | 134,618 | 146,311 | 159,045 | 172,914 | 188,020 | 204,477 | 222,405 | 241,939 | 263,223 | 286,417 | 311,693 | 339,241 |
| Wages,Social Securities | 186,307 | 195,622 | 205,403 | 215,673 | 226,457 | 237,780 | 249,669 | 262,152 | 275,260 | 289,023 | 303,474 | 318,647 | 334,580 |
| Salaries | 143,313 | 150,478 | 158,002 | 165,902 | 174,197 | 182,907 | 192,053 | 201,655 | 211,738 | 222,325 | 233,441 | 245,113 | 257,369 |
| Social Insurance | 42,994 | 45,143 | 47,401 | 49,771 | 52,259 | 54,872 | 57,616 | 60,497 | 63,521 | 66,698 | 70,032 | 73,534 | 77,211 |
| Parts Maintenance | 59,082 | 59,465 | 59,864 | 60,278 | 60,708 | 61,156 | 61,622 | 62,106 | 62,610 | 63,134 | 63,679 | 64,246 | 64,835 |
| Feul | 23,901 | 25,973 | 28,229 | 30,685 | 33,361 | 36,276 | 39,451 | 42,910 | 46,679 | 50,785 | 55,260 | 60,137 | 65,452 |
| Analysis cost | 43,613 | 47,393 | 51,509 | 55,992 | 60,875 | 66,193 | 71,987 | 78,298 | 85,175 | 92,668 | 100,834 | 109,732 | 119,431 |
| Others outsourcing Service | 9,295 | 10,101 | 10,978 | 11,933 | 12,974 | 14,108 | 15,342 | 16,688 | 18,153 | 19,750 | 21,490 | 23,387 | 25,454 |
| W & S for Administration | 145,759 | 153,047 | 160,699 | 168,734 | 177,171 | 186,030 | 195,331 | 205,098 | 215,352 | 226,120 | 237,426 | 249,297 | 261,762 |
| Salaries | 112,122 | 117,728 | 123,615 | 129,796 | 136,285 | 143,100 | 150,255 | 157,767 | 165,656 | 173,939 | 182,635 | 191,767 | 201,356 |
| Social Insurance | 33,637 | 35,319 | 37,084 | 38,939 | 40,886 | 42,930 | 45,076 | 47,330 | 49,697 | 52,182 | 54,791 | 57,530 | 60,407 |
| Depriciation | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 | 96,661 |
| Taxes | 54,090 | 54,090 | 54,090 | 56,795 | 56,795 | 56,795 | 59,634 | 59,634 | 59,634 | 62,616 | 62,616 | 62,616 | 65,747 |
| Other G/A | 39,014 | 42,395 | 46,078 | 50,088 | 54,456 | 59,213 | 64,396 | 70,042 | 76,194 | 82,897 | 90,201 | 98,162 | 106,837 |
| Pullution Chage | 7,871 | 8,146 | 8,432 | 9,166 | 9,491 | 9,829 | 10,689 | 11,072 | 11,471 | 12,480 | 12,934 | 13,405 | 14,589 |
| Preparing for Bad Receivables | 33,591 | 38,240 | 39,563 | 40,979 | 46,674 | 48,335 | 50,062 | 57,044 | 59,099 | 61,237 | 69,806 | 72,349 | 74,993 |
| Total Operating Cost | 1,000,270 | 1,058,318 | 1,117,128 | 1,183,536 | 1,255,881 | 1,329,350 | 1,411,816 | 1,502,252 | 1,594,311 | 1,697,124 | 1,810,505 | 1,926,196 | 2,054,854 |
| Operating Profit(loss) | 119,417 | 216,362 | 202,296 | 182,422 | 299,908 | 281,804 | 256,917 | 399,224 | 375,670 | 344,103 | 516,350 | 485,424 | 444,921 |

## Cash Flow Analysis (Skuodas)

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Financing of investment | | | | | | | | | | | | |
| State Grant | 282,202 | 3,988,939 | | | | | | | | | | |
| Foreign Loan | | 4,271,141 | | | | | | | | | | |
| Operating Income | | | 489,060 | 509,733 | 583,448 | 606,899 | 692,604 | 721,528 | 749,670 | 856,453 | 888,269 | 919,225 |
| Operating Profit(loss) | | | -563,798 | -567,473 | -521,192 | -527,949 | -473,320 | -476,878 | -485,545 | -417,733 | -385,572 | -109,106 |
| Interest Payment | | | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 | 106,779 |
| EBT | | | -670,576 | -674,252 | -627,971 | -634,728 | -580,099 | -583,657 | -592,323 | -524,511 | -492,351 | -215,884 |
| Corporate Profit Tax | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Profit | | | -670,576 | -674,252 | -627,971 | -634,728 | -580,099 | -583,657 | -592,323 | -524,511 | -492,351 | -215,884 |
| Cash Flow | | | -69,528 | -73,204 | -26,922 | -33,680 | 20,949 | 17,391 | 8,725 | 76,537 | 69,360 | 56,484 |
| Changing in Working Cap. | | | 61,132 | 2,584 | 9,214 | 2,931 | 10,713 | 3,615 | 3,518 | 13,248 | 3,977 | 3,870 |
| | | | 61,132 | 63,717 | 72,931 | 75,862 | 86,576 | 90,191 | 93,709 | 107,057 | 111,034 | 114,903 |
| | | | 61,132 | 2,584 | 9,214 | 2,931 | 10,713 | 3,615 | 3,518 | 13,348 | 3,977 | 3,870 |
| PrincipalRepayment | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Cash Flow | | | -130,661 | -76,788 | -36,137 | -36,611 | 10,236 | 13,776 | 5,207 | 63,189 | 65,383 | 52,615 |

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Financing of investment | | | | | | | | | | | | | | | |
| State Grant | | | | | | | | | | | | | | | |
| Foreign Loan | | | | | | | | | | | | | | | |
| Operating Income | 1,045,918 | 1,082,080 | 1,119,688 | 1,274,680 | 1,319,424 | 1,365,958 | 1,555,789 | 1,611,154 | 1,668,733 | 1,901,476 | 1,969,982 | 2,041,227 | 2,326,855 | 2,411,620 | 2,499,775 |
| Operating Profit(loss) | 146,574 | 135,510 | 119,417 | 216,362 | 202,296 | 132,422 | 299,908 | 281,804 | 256,917 | 399,224 | 375,670 | 344,103 | 516,350 | 485,424 | 444,921 |
| Interest Payment | 106,779 | 100,824 | 94,720 | 88,464 | 82,052 | 75,479 | 68,742 | 61,836 | 54,758 | 47,503 | 40,066 | 32,444 | 24,631 | 16,622 | 8,414 |
| EBT | 39,796 | 34,686 | 24,697 | 127,898 | 120,244 | 106,943 | 231,166 | 219,968 | 202,159 | 351,721 | 335,604 | 311,659 | 491,719 | 468,801 | 436,508 |
| Corporate Profit Tax | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Profit | 39,796 | 34,686 | 24,697 | 127,898 | 120,244 | 106,943 | 231,166 | 219,968 | 202,159 | 351,721 | 335,604 | 311,659 | 491,719 | 468,801 | 436,508 |
| Cash Flow | 136,456 | 131,347 | 121,358 | 224,558 | 216,905 | 203,604 | 327,827 | 316,629 | 298,820 | 448,382 | 432,265 | 408,320 | 588,380 | 565,462 | 533,168 |
| Changing in Working Cap | 15,837 | 4,520 | 4,701 | 19,374 | 5,593 | 5,817 | 23,729 | 6,921 | 7,197 | 29,093 | 8,563 | 8,906 | 35,703 | 10,596 | -312,472 |
| | 130,740 | 135,260 | 139,961 | 159,335 | 164,928 | 170,745 | 194,474 | 201,394 | 208,592 | 237,685 | 246,248 | 255,153 | 290,857 | 301,452 | 312,472 |
| | 15,837 | 4,520 | 4,701 | 19,374 | 5,593 | 5,817 | 23,729 | 6,921 | 7,197 | 29,093 | 8,563 | 8,906 | 35,703 | 10,596 | -312,472 |
| PrincipalRepayment | 238,186 | 244,141 | 250,245 | 256,501 | 262,913 | 269,486 | 276,223 | 283,129 | 290,207 | 297,462 | 304,899 | 312,521 | 320,334 | 328,343 | 336,551 |
| Net Cash Flow | -117,067 | -117,314 | -133,588 | -51,516 | -51,602 | -71,699 | 27,875 | 26,579 | 1,415 | 121,827 | 118,803 | 86,893 | 232,342 | 226,524 | 509,089 |

12. Supporting Report for the Environmental Impact Assessment

**Supporting Report (Skuodas)**
**Environmental Impact Assessment**

Table of Contents

# 1 INTRODUCTION

## 1.1 OBJECTIVE OF THE EIA STUDY

An "environmental impact" means a probable change in environment caused by proposed activities and structures. "Environmental impact assessment (EIA) " means the process of identification, prediction, and assessment of potential impact by the proposed activities and structures on the environment.

Objective of an EIA is to assess anticipated environmental impacts, which may result from implementation of the proposed sewerage project, and to prepare recommendations on necessary countermeasures to mitigate identified impacts.

Another objective is to provide the study results of an EIA to the Lithuanian proponent sides to take necessary procedures for an official approval on the EIA according to the Lithuanian law.

## 1.2 APPROACH AND METHODOLOGY

The general sequence of steps adopted in conducting an EIA is as follows:

Step 1: Understanding the project features

Step 2: Study the environmental laws, regulations and guidelines

Step 3: Collection and review of the existing reports and data on the environment
(Including the preliminary EIA by the JICA preliminary mission.)

Step 4: Survey of various environmental conditions in the project areas
(Such as major pollution sources, waste disposal, proposed sites, rivers & lakes, existing facilities, etc.)

Step 5: Identification of environmental impacts

Step 6: Supplementary/additional investigation on the identified impacts

Step 7: Study and evaluation of environmental impact assessment

Step 8: Study of mitigation measures

Step 9: Recommendation on environmental management

## 1.3 DATA COLLECTION

The JICA Team carried out data collection in Lithuania generally in the following manners:

(A) Field reconnaissance in and around the project areas

(a) Birzai town and the surrounding area

(b) Skuodas town and the surrounding area

Note: Excluding the territory of Latvia, although the project in Skuodas includes an international issue for the Bartuva River.

(B) Visit to the environmentally critical or significant areas/locations

(a) Existing sewage treatment plants (STP)

(b) Proposed STP sites (including alternative sites)

(c) Rivers and lakes/reservoirs in the project areas

(Especially the proposed alternative effluent discharge locations.)

(d) Major pollution sources

(Such as major factories and hospitals)

(e) Waste disposal site

(Solid waste and liquid/sludge waste)

(f) Protected areas

(C) Visit to the offices concerned (Major offices are listed below:)

(a) Ministries of Environment

- Environmental Impact Assessment Division
- Geological Survey
- Joint Research Center
- Fish Resources Department
- Water Division
- Department of Forest and Protected Territories
- Department of Biodiversity
- Hydrometeorological service

(b) Birzai Vandenys

(c) Skuodas Vandenys

(d) Municipality office of Birzai

(e) Municipality office of Skuodas

(f) Others (Central hospital of Skuodas, Human Health Center in Birzai, etc.)

The data collection was made through observation, measurement, and discussion with people (or staff) at respective location (or office). A checklist (or questionnaire) was used for the data collection during the field activities.

## 1.4 THE PROJECT

The detailed plan and design is presented in the main report. The salient features of the project facilities and works are presented as follows:

(1) Project in Birzai

- Design year : 2010
- Planned service area : Inside the urban area ( 1,783 ha )
- Population served : 11,720 (in 2010)
- Amount of sewage (2010) : Daily average 4,200 $m^3$

Daily maximum 5,000 $m^3$ (Design flow)
Hourly maximum 6,850 $m^3$

- Proposed STP site: The site proposed for the original plant located approximately 2 km southwest from the town area.
- Area of the STP : Approximately 3 ha
- Sewage treatment plant : Anaerobic-anoxic-aeration(A2O) system
- Sewer system : Existing system is used.
- Discharge location of the treated effluent : Option 1 ; Juodupe river, a tributary of Tatula river, Option 2 ; Obelaukias River
- Treatment of sludge : Gravity thickening and mechanical dewatering using a centrifuge
- Disposal of dewatered sludge : 4.6 $m^3$/day, Transported outside for composting treatment
- Use of the existing plant : Abandoned after completion of the project
- Tertiary treatment : Biological membrane filter for the secondary effluent (Option 2 only).

(2) Project in Skuodas

- Design year : 2010
- Planned service area : Inside the urban area ( 596 ha )
- Population served : 8,340 (in 2010)
- Amount of sewage (2010) : Daily average 1,270 $m^3$
  Daily maximum 1,600 $m^3$ (Design flow)
  Hourly maximum 3,200 $m^3$
- New STP site: The originally proposed site located at approximately 200 m west from the town area, called Kanyzelis district.
- Area of the STP : 1.8 ha
- Sewage treatment plant : Oxidation ditch method
- Sewer system : Existing system is used.
- Discharge location of the treated effluent : Bartuva river
- Treatment of sludge : Gravity thickening and mechanical dewatering using a centrifuge
- Disposal of dewatered sludge : 3.0 $m^3$/day, Mounting composting method and stored for agricultural use
- Use of the existing two plants : Abandoned after the completion of project

## 1.5 ORGANIZATIONS/AGENCIES RELATED TO ENVIRONMENT IN LITHUANIA

The major organizations/agencies concerned for the environmental study are listed as follows:

a) Ministry of Environmental (Former Ministry of Environmental Protection)

b) Ministry of Health Protection

c) Fire Protection Department of the Ministry of Domestic Affairs

d) Regional government offices

e) Municipal government offices (Birzai and Skuodas)

The Ministry of Environment (MOE) is the main and most significant organization for the environmental protection in Lithuania. The organization of the ministry was strengthened in 1998.

That is, the ministry was united with the former Ministry of Construction. Name of the ministry was changed from the Ministry of Environmental Protection (MEP).

## 1.6 ENVIRONMENTAL LAWS AND REGULATIONS IN LITHUANIA

The Lithuanian laws and regulations related to environmental protection are listed as follows:

a) Law on Environment Protection (1991, as revised in 1996)
b) Law on Environmental Impact Assessment (August 1996)
c) Government Resolution No.456 of 12 May 1997 concerning the approval of the list of proposed activities and projects that shall be made subject to the full environmental impact assessment.
d) Government Resolution No. 1305 of 11 November 1996 on the approval of the order of informing the public about the proposed activity and implementing the proposals of the public.
e) Government Resolution No. 233 of 17 March 1997 concerning the approval of the list of proposed activities and projects that shall be made subject to the state expertise of environmental impact assessment.
f) Government Resolution No. 1079 of 18 September 1996 on the approval of regulations regarding public hearings on the territorial planning documentation projects.
g) Republic Building Norms RSN 153-93
h) The Building Law
i) The Water Law(October 1997)
j) Law on Taxes on State Owned Natural Resources
k) Law on Taxes on Environmental Pollution
l) Law on Drinking Water (draft)
m) Law on Territorial Planning
n) Law on Reclamation
o) Land Law
p) Environmental Monitoring Law (draft?)
q) Law on Protection of Marine Environment (draft?)
r) Code on the Internal Water Transport
s) Code on the Violation of Administrative Right
t) Guidelines on the Establishment of Water Bodies Protection Zone
u) Conditions of the Use of Special Land and Forest
v) Regulations of drawing up a Program and Report on Comprehensive Evaluation of Impact of Planned Business Activity on the Environment(March 1998)

w) Resolution No. 1486 of December 29, 1997 concerning Establishment of New Reservations and Approval of Reservations List

x) Order of the Ministry of Environmental Protection No. 127 of 24 July 1997 concerning Environment Protection Standard Document "Waste Water Pollution Standards" (LAND 10-96)

y) Regulation for Issue of Permission for Use of Natural Resources and setting of Standards concerning Limits of Use of Natural Resources and Discharge of pollutants into the Environment.

"Law on Environment Protection of the Republic of Lithuania" was legislated in 1991. Amendment and supplement of the law was prepared in 1996. The law aims at the following matters:

- To regulate public relations in the environmental protection field,
- To define the main rights and duties of legal persons,
- To preserve biological diversity characteristics to Lithuania, ecological systems and landscape,
- To ensure healthy and clean environment, and
- To assure rational use of natural resources in Lithuania, including its territorial waters, continental shelf and economic zone.

"Law on Environmental Impact Assessment of the Republic of Lithuania" adopted on August 15, 1996 aims to provide regulations for the evaluation of a proposed activity which may cause negative impact on the environment and also to regulate relationships between parties involved in the process.

Beside the laws, " Lithuania's Environmental Protection Program" was established in 1995. This program was prepared by the MEP and officially approved by the Lithuanian Republic Parliament in 1996, consisting of the following three volumes:

Vol. 1 Strategy motivation, which contains the present environmental status assessment, national economy sector's review, environmental change trends' forecast, and a description of the institutional, legal and economic system in the environment sector

Vol. 2 Strategy methodology, which formulates the strategy concept based upon environmental status analysis, presents the techniques selected for the assessment of environmental problems, their urgency and implications, outlines priority goals.

Vol. 3 Action Program which presents the long-term strategy and short and medium-term action program in relation to environmental components. It also includes strategy implementation means, environmental protection funding aspects, etc.

## 1.7 EIA PROCEDURES AND OBJECTIVE CATEGORIES IN LITHUANIA

### 1.7.1 EIA Procedure

The EIA procedure is explained in the law on EIA. An EIA is carried out generally in the following procedure:

(a) Initial EIA to be conducted in the process of preparation of documents on territorial planning and project proposals.
- To be prepared by the proponent;
- To be included in the territorial planning as well as the project proposal for the decision of the relevant parties of EIA;
- To be presented to the public for their comments.

(b) Full EIA to be conducted in the preparation of technical proposals for the proposed activities and objects included in the list prepared by the MEP and adopted by the government, and also for a proposed activity recommended in the initial EIA.

(c) Full EIA program is to be prepared by the proponent in accordance with special regulations issued and approved by the MEP.
- To be submitted to the relevant parties of the EIA for approval and presented to the public.
- To be submitted to the MEP for ratification taking into account the public comments.

(d) EIA report is to be prepared under the EIA program
- To be submitted to the relevant parties which check whether the full EIA report meets requirements of the adopted program within one month, and forward the conclusions to the proponent.
- To be submitted to the MEP, together with conclusions issued by other relevant parties of the EIA , with analysis of public comments.

(e) MEP examines the EIA report.
- To be examined in consideration of the conclusions issued by other institutions that have also examined the report.
- To forward its decision and reasons to the proponent in a written form within one month.

(f) MEP shall make a decision concerning the proposed activities for which the State Expertise on the EIA is mandatory only if the State Expertise procedure has been performed. The State Expertise of the EIA is obligatory for the proposed activities and objects included into the list, which is prepared by the MEP and adopted by the Government. Only licensed EIA experts organized by the MEP may perform State Expertise.

Note: The MEP is the former body of the MOE.

### 1.7.2 Objective Categories of EIA

The list of proposed activities and projects that shall be made subject to a full environmental impact assessment is approved in the resolution No.456 of May 12 1997 as follows:

To approve the list (To be attached in the data book) of the categories of proposed activities and projects that shall be made subject to a full EIA.

A) To set that:

1 The proposed activities or projects listed in the aforementioned list shall be made subject to a full EIA if at least one of the following criteria are met:

(a) Production capacities or other indices match the value defined in the list;

(b) The volume of water consumed exceeds 250 cubic meters per 24 hours;

(c) The volume of waste water or sewage exceeding 100 cubic meters per 24 hour;

(d) The annual volume of emissions into the atmosphere exceeds 50 tons;

(e) During the production process, emissions belonging to the I and II risk categories are emitted into the atmosphere; and

(f) The annual volume of hazardous waste produced exceeds 5 tons

2 The environmental study on construction shall be prepared according to the Republican Construction Standards and coordinated according to the established order, for the categories of proposed activities and projects that are not subject to a full EIA pursuant to paragraphs above yet do have negative effects on the environment or use natural resources, as well as for the constructions planned to be erected on the territories of national parks and nature reserves,

An EIA is to be prepared in line with the EIA laws, regulations and guidelines of Lithuania and based on the results of survey. According to the law explained above, the proposed projects for Birzai and Skuodas are definitely categorized as projects subject to a full EIA, as the project facilities will discharge sewage exceeding 100 cubic meters per 24 hours.

## 1.8 INTERNATIONAL CONVENTIONS ON ENVIRONMENTAL PROTECTION

Although Lithuania has not ratified all international conventions aimed at the protection of environment, it has ratified the following:

(a) Convention on Biodiversity (1995)

(b) European Convention on Wildlife protection (Bern Convention, 1996)

Lithuania has acceded (already signed but not ratified yet) the following:

(a) Convention on the Protection of Wetlands of International Importance Particularly Waterfowl (Ramsar Convention, 1993)

(b) Convention on Fisheries and the Protection of Fish Resources in the Baltic Sea and Protection Belts (1992)

(c) Baltic Sea Marine Environment Protection Convention (HELCOM, 1974)

The Ministry of Environmental Protection (now changed to the Ministry of Environment) has signed cooperation agreements in environmental protection, and biodiversity conservation with the following:

(a) Environmental Protection and Energy Ministry of Denmark (1991)

(b) Environmental Protection Natural Resources and Forestry Ministry of Poland (1992)

(c) Environmental Protection Ministry of Finland (1992)

(d) Environmental Protection Ministry of Germany (1993)

(e) Federal Ministry for the Environment,Youth and Family of Austria (1994)

(f) Nature Resources and Environmental Protection Ministry of Belourussia (1995)

(g) Environmental Ministry of Slovak Republic (1996)

The Government of Lithuania has signed cooperation agreements in environmental protection, and biodiversity conservation with the following:

(a) Bilateral agreement with Sweden for cooperation in environmental protection with Sweden (1992)

(b) Trilateral agreement for cooperation in environmental protection with Estonia and Latvia (1995)

# 2 ENVIRONMENTAL BASELINE CONDITIONS

## 2.1 ENVIRONMENTAL CONDITIONS OF SKUODAS

### 2.1.1 Location and Area

Skuodas town is the capital of the municipality of Skuodas and located on the northern side of the municipality, near the northern border to Latvia, and 40 km away from the Baltic Sea on the west. The town is approximately 350km away from Vilnius to the northwest. The municipality belongs to the Klaipeda Region, which consists of 4 municipalities.

The study area for the EIA includes the area of Skuodas Town, its surrounding area and the Bartuva River, which flows down to Latvia. That is, in case of water pollution and aquatic fauna and flora in rivers, the areas of up and downstream of the project site have to be covered for the investigation.

The area of the municipality and the town is as follows:

- Municipality of Birzai: 910.95 $km^2$ in area ( 1.39 % of the country area)
- Town (District) of Birzai: 5.96 $km^2$ in area
- Lithuania (Country): 65,301 $km^2$ in area

### 2.1.2 Climate

There is no meteorological observatory in Skuodas Town. Records in Telsiai town, located approximately 55 km away from Skuodas, are used for reference. Telsiai is located almost in the same climate zone. Records of monthly mean air-temperature, summary of long-term records of temperature, monthly precipitation, summary of long-term records of precipitation, and monthly mean humidity are shown in the following tables:

Monthly Mean Temperature (Skuodas)

unit: ℃

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | -0.3 | -8.1 | -0.4 | 7.3 | 10.0 | 13.1 | 20.7 | 17.4 | 12.9 | 5.3 | 2.0 | -0.2 | 6.6 |
| 1995 | -3.5 | 1.3 | 1.2 | 6.0 | 10.7 | 16.2 | 17.2 | 16.9 | 11.8 | 9.2 | -0.3 | -5.7 | 6.8 |
| 1996 | -7.4 | -8.5 | -3.1 | 6.5 | 11.7 | 14.2 | 14.7 | 18.0 | 9.8 | 6.0 | 4.0 | -6.2 | 5.0 |
| Mean | -3.7 | -5.1 | -0.8 | 6.6 | 10.8 | 14.5 | 17.5 | 17.4 | 11.5 | 6.8 | 1.9 | -4.0 | 6.1 |

Summary of Long-term Records of Temperature (Skuodas)

Unit: °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum | 9.0 | 14.0 | 18.5 | 25.0 | 30.5 | 34.1 | 32.8 | 33.0 | 28.9 | 23.5 | 17.5 | 11.2 |
| Minimum | -36.6 | -35.5 | -26.0 | -16.3 | -7.3 | -1.7 | 3.1 | 0.0 | -4.8 | -10.5 | -24.0 | -29.8 |
| Mean | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. |

(Records : 1925-1927 and 1930-1990 for Maximum )
(Records : 1926--1990 for Minimum )

Monthly Precipitation (Skuodas)

Unit: mm

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 85 | 19 | 98 | 33 | 20 | 44 | - | 73 | 64 | 122 | 77 | 84 | - |
| 1995 | 107 | 91 | 69 | 39 | 54 | 95 | 93 | 45 | 115 | 40 | 58 | 24 | 830 |
| 1996 | 18 | 42 | 8 | 11 | 98 | 18 | 58 | 21 | 34 | 73 | 111 | 92 | 584 |
| Mean | 70 | 51 | 58 | 28 | 57 | 52 | 76 | 46 | 71 | 78 | 82 | 67 | 736 |

Summary of Long-term Records of Precipitation (Skuodas)

Unit: mm/month

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum | 160 | 97 | 105 | 111 | 88 | 138 | 166 | 302 | 251 | 265 | 174 | 150 |
| Minimum | 6 | 2 | 5 | 2 | 5 | 5 | 11 | 5 | 9 | 7 | 30 | 9 |
| Mean | 49 | 33 | 42 | 39 | 38 | 65 | 75 | 97 | 98 | 85 | 93 | 68 |

(Records : 1948-1990 excluding some years)

Monthly Humidity (Skuodas)

Unit: %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 87 | 85 | 81 | 75 | 70 | 73 | 77 | 79 | 83 | 86 | 89 | 89 | 81 |

(Note: 1961-1990 records)

The climate in the study area is characterized as follows:

- Temperatures from April to October are generally moderate.
- Temperatures from November to March are low. They go down below zero from December to March.
- Long-term records of temperature show that there are large differences between the maximum and the mean as well as between the minimum and the mean. Temperatures

higher than 30°C have been recorded from May to August while temperatures lower than -35°C have been recorded in January and February.

- Annual precipitation is 736 mm (1994-1996), which is relatively small.
- Long term records of precipitation show that there are some variation in a year. Annual change is not remarkable in general. The maximum annual precipitation is 1,112 mm, the minimum 510 mm, and the mean 782 mm in the records of 1948 – 1990. The maximum monthly precipitation is 302 mm.
- There is no definite rainy season. Variation in monthly rainfall is not remarkable all the year round.
- There is no considerable variation in monthly humidity, although the humidity in winter is higher than that in summer. Monthly mean humidity ranges from 69 % to 88 %.
- Wind direction to east prevails almost all the year round.

### 2.1.3 Topography and Geology

Skuodas town is located at the confluence of the Bartuva River and the Luoba River. The area is generally flat with undulations between El.20m to El.25m.

The quaternary deposit is generally 20 – 50 m in thickness, although it changes by the location. The quaternary geological map shows that the town area is mostly covered with the Nemunas glacial layer of either of the following:

(a) Glaciolacustrine deposits, sand or sand with gravel pebble

(b) Glaciolacustrine deposits, clay, silt, sand

The area along the rivers is mostly covered with alluvial sand and gravel. Surrounding area of the town shows a gently hilly terrain, and is generally covered with glaciolacustrine deposits of basal till composed of silty loam with lenses of clay, sand and gravel.

Beneath the quaternary deposit surface, the geological formation of the upper approximately 100 – 200 m, in the order from the upper layer to the lower layer, is classified as follows:

(a) Lower Triassic. Claystone, siltstone, sandstone

(b) Upper Permian. Limestone, dolomite, sandstone

(c) Lower carboniferous. Clays, siltstone, sandstone, dolomite, marlstone

Below the upper layer, there are several layers of Famenian formation of Devonian era mainly composed of dolomite, limestone, sandstone, etc.

There is no problematic condition from the geological viewpoint in the Skuodas area. For example, there is no remarkable Karst form in Skuodas area.

### 2.1.4 Rivers and Lakes

The major rivers for the study are as follows:

(a) Bartuva River

This river has a length of 101.3 km (55.3 km in the territory of Lithuania) and a catchment area of 2,020.0 $km^2$ (747.7 $km^2$ in the territory of Lithuania ). The river runs from southeast to northwest and discharges into the Skuodas Lake at the southern side of Skuodas town. Then, the river runs down to north and enters Latvia after collecting the Luoba River from the right-bank side, the Duobupis River from the left-bank side, and the Apse River from the right-bank side. The Bartuva River, after joining some tributaries in Latvia, finally flows into the Liepaja estuary of the Baltic Sea.

(b) Luoba River

This river has a total length of 52.2 km and a catchment area of 353.9 $km^2$. The Luoba River runs from east to west and joins the Bartuva River at the northern part of the town, after collecting water from the Sate River which is a main tributary coming down from the southwest.

Skuodas Town is located facing the international border with Latvia. The Bartuva River running through the town flows down into the Latvia territory and finally reaches the Baltic Sea. Accordingly, impacts on the adjacent country, as well as the Baltic Sea have to be studied.

### 2.1.5 Ecology

According to the bio-geographical regions of Lithuania, the study area is located in the "Western Zemaiciai Unit", which is characterized by mixed spruce and pine forest and wetland meadows in the loamy valleys and plains of the Pajuris lowland in agrarian and woody landscape.

The Lithuanian Red Data Book prepared in 1992 includes 501 species, consisting of 210 plants, 210 animals and 81 fungi. These species are grouped into six categories according to their rarity. However, there is no specific survey data for the ecology in the Skuodas area. No survey has been conducted on the location of habitats and the number of significant species, except that for fishes.

According to an interview with officials concerned, there are no endangered fauna and flora living in the Skuodas town area, although there are significant species in the Zemaitija national park located southeast of the municipality.

According to the survey (1994) of rivers and lakes by the Fish Resources Department of the MOE, there are otters in the Bartuva River.

According to the survey on rivers and lakes by the Fish Resources Department of the MOE, information concerning the types of fish fauna in rivers in the municipality of Skuodas is as follows:

(a) Fish fauna in rivers is rich and consists of 26 fish species. The greatest variety of species is in the Bartuva River- about 24; Luoba, Sventoji- about 13-15; while in other small rivers -- 8 – 11 species only.

(b) The most widely spread species in rivers are pike, roach, tripriekle, stickleback, perch, small trout, gudgeon, goby and small lamprey.

(c) According to 1983 data, trout are often in the middle section of the Luoba River. Comparative portion of their biomass among caught up fishes was 55 percent (or approximately 31.74 kg/ha).

(d) Among transit (migrating) fish species in the Bartuva River, there are salmon, hucho taiman, vimba, and among cyclostomata-small lamprey.

(e) Occurrence of salmon and hucho taiman in Bartuva basin has been studied insufficiently. Salmon and hacho taiman migrate through the Bartuva up to the Luoba estuary and spawn in the lower sections of the Luoba and Sate Rivers. During the flood periods in spring, vimba moves upstream in the Bartuva up to Skuodas dam, yet only individual fishes are met there. Small lamprey arrive for spawning in great numbers.

(f) Average density and biomass of fish in rivers (1983) are recorded at 631 specimen/ha and 58.2 kg/ha in Luoba, 266 specimen/ha and 23.5 kg/ha in Apse, 1,046 specimen/ha and 52.9 kg/ha in Sate-Sate.

(g) The Bartuva River is of medium thermal regime, with rapids, banks, destroyed millponds, dams and water reservoirs. Presently, it is a greatly affected by man's activity; reophilous fish do not come to this river for spawning due to the existing dams. Vimba and small lamprey moving upstream are able to reach only places below Skuodas dam. In autumn, salmon and hucho taiman migrate to the Luoba and Apse Rivers. In general, fish fauna in the Bartuva River is rich and mixed, i.e. fish of various ecological groups (rheophilous, limnophilous, and benthonic) may be found.

(h) Prevailing fish fauna in the Luoba River comprises cool water fishes. This river is productive, therefore, and there are many places with abundant trout and dace populations. At places with slower currents, one may find roach, pike, perch and other smaller rheophilous fishes. No precise information is available concerning salmon and hucho taiman although, each year, these species arrive to spawning places. The Luoba River is the most important and suitable in the district for reproduction of salmon species.

(i) The current law on protection of fishes has forms of violation to the use of fishing nets, harpooning, and disregard of fishing regulations. Every year, there are more than one hundred cases of disclosed violation and the fines are collected, although the current forms and measures fail to ensure full protection of fish resources.

(j) An amateur angling association has carried out fish breeding activity. But presently nobody is engaged in fish breeding activity.

There are many migrating birds stopping over in Lithuania including the Skuodas territory. There are 321 bird species recorded in Lithuania, of which 213 breed or have bred in Lithuania. Of 213 bird species, 53 show decreasing populations. Wetland drainage has had a drastic impact in the past. Resulting changes in habitat have reduced the number of birds nesting in shrub thickets and meadows by 90 percent, and in shrub and forest by 70 and 40 percent, respectively. The modified ecosystems due to economic activities have also had an adverse impact on the migration routes and wintering sites of migrating birds. It should be noted that the swamp area along the Bartuva River in the territory of Latvia is a significant area where many birds, including some endangered species, inhabit or migrate.

### 2.1.6 Land Use and Land Ownership

The land use condition in the municipality as of 1996 is summarized in the following table:

| Description | Area (ha) | Area (%) |
|---|---|---|
| 1.Agricultural land | | |
| (1) Cultivated land | 59,022 | (64.8) |
| (2)Grass land/Pasture | 5,352 | (5.9) |
| (3) Orchard/Strawberry | 459 | (0.0) |
| Sub-total of 1. | 64,833 | 71.2 |
| 2. Other use | 26,262 | 28.8 |
| Total Area | 91,095 | 100.0 |

As seen in the table, the agricultural land covers nearly 71 percent of the whole administrative area of the municipality of Skuodas. There are no detailed data of land use in the town area. Skuodas Town is used mostly for the residential area, industrial-commercial area, agricultural area, and grassland.

The land ownership is classified into the following categories in general:

(a) Private land

(b) State land

- Rented/Leased
- Not rented/leased

The proposed STP site is state land (rented) while private land is located next to the site.

### 2.1.7 Water Supply and Sanitation

The water supply conditions in Skuodas are as follows:

- In the urban area, ground water is pumped from deep wells.
- Served population is nearly 7,200, approximately 80 percent of total population in the urban area.

- The maximum capacity of the treatment plant is 1,050 $m^3$/day at present.
- The houses, buildings, and factories not connected with the water supply system use deep or shallow wells.
- The Water Company in Skuodas manages the water supply as well as the sewerage system.

There are no remarkable problems of sanitation for the water from these wells at present.

There are no particular local diseases in, and around, the study area, according to the information from the central hospital.

### 2.1.8 Drainage, Sewerage and Waste Disposal

The drainage system for rainwater is separated from the sewerage system. Approximately 56 percent (in case of the Bartuva River) of rainwater is drained directly to the rivers and lakes over the ground surface or in ditches. The remaining water seeps into the ground or evaporates. There are no records of major flooding or damage in the town area. There was wide inundation about 10 years ago in the suburban lowland areas, but not in the town area except some local areas along the rivers.

The present sewerage system was constructed in the 1960s and 1970s. There are two sewage treatment plants; Old-town (No.2) system and New-town (No.1) system as described in the Main Report.

There are two solid waste disposal sites for the town as follows:

(a) Old disposal site at Puodkaliai village

The site is located in the rural area, approximately 5 km south of the town area. A forest and an agricultural field surround the area. There are no data of waste volume or the site scale. The site area is 1 to 3 ha. There is no separation of waste. There is no significant odor at the site, while there are many flies. There is no hill-like pile of waste.

(b) New disposal site at Aleksandria village

This newly planned site is located approximately 10 km east of the town. The construction work is almost half completed at present. The site has two waste disposal areas, two tanks for liquid waste, one water reservoir, and drainage treatment pond. The disposal area is provided with plastic sheeting to prevent leachate from seeping into ground, and with a sand layer for drainage on the excavated bottom area. Embankments several meters high surround the disposal area. The site area is approximately 2 ha (100 wide and 200 m long) with the capacity of approximately 6,000 $m^3$. This site is considered to have a 20 years life. A forest and an agricultural field surround the area. There is no house nearby.

### 2.1.9 Protected Areas and Other Significant Sites

The aim of protected areas is to conserve and restore the following:

(a) Nature and culture heritage features
(b) Landscape ecological balance
(c) Biodiversity
(d) Gene pool for restoration of biota resources
(e) Creation of conditions for the development of interpretive tourism
(f) Research
(g) Promotion of nature and cultural heritage protection

There are four categories of protected area as follows:

(a) Conservation areas
    Strict nature or cultural reserves, protected landscape features, nature or cultural reserves
(b) Protection areas
    Protective zones for various purposes
(c) Restoration areas
    Site where natural resources are protected or restored
(d) Integration area
    National and regional parks, and biosphere monitoring areas

In the municipality of Skuodas, there are protected areas as follows:

(a) Zemaitija National park (only a part is in Skuodas)
(b) Salantai Regional park (Northern part is in Skuodas)
(c) Gesalai landscape reserve
(d) Apuole landscape reserve
(e) Laumiai botanical-zoological reserve
(f) Margininkai botanical-zoological reserve
(g) Bartuva ichtiological reserve

Among them, only "Bartuva ichtiological reserve" would be a significant protected area for the study. The protected area is 40.6 ha, and is distributed over a distance of 40.6 km. There are three zones in the reserve as follows:

(a) The Bartuva River between the confluence with the Luoba River and Apse River (2.6 km long).
(b) The Luoba River from the confluence with the Bartuva River to a point 31.5 km upstream.

(c) The Sate River from the confluence with the Luoba River to a point 6.5 km upstream.

This protected area aims mainly to reserve the spawning places of trout and taiman.

Concerning the culture and heritage sites in the study area, there is no remarkable site which will be impacted by the project implementation. Although there are some monuments and old buildings or structures in and around the Skuodas town area, it is not necessary to show them in detail. There is no such structure or place in the proposed site of the STP or in the proposed route/sites of the appurtenant facilities.

### 2.1.10 Other Special Concern

It is noteworthy that the local government units located in the Bartuva River basin in the territory of Latvia are about to implement a project to recover the clean water of the Bartuva River. The project is called "Bartava" and is now under preparation for study by nine parishes (represented by the mayor of Dunilea parish) located in, and around, the Bartuva River basin. The project is supported by the Ministry of Environmental Protection and Regional Development of Latvia and also by the government of Sweden.

The Latvian side has already issued letters to the municipality of Skuodas about the water quality of the Bartuva River in the upstream Lithuanian territory. In addition, the representative mayors of Latvia have visited Skuodas Town in last few years and discussed the participation and cooperation of Skuodas Town in the project.

The Bartuva River is very significant for the Latvian side, not only for the environmental protection, but also for economic development. The Bartuva has its source in Lithuania and flows down to the Baltic Sea through the Liepaja Lake. There is a significant swamp area on the way which is inhabited by some endangered fauna and flora. The project aims at not only environmental conservation but also other purposes such as recreation use and fish culture, including salmon. To recover clean water in the Bartuva River is the principal condition for this project. The project includes the improvement of the existing sewage treatment plants in the Latvian side which are old, ineffective, too large in capacity and costly for maintenance.