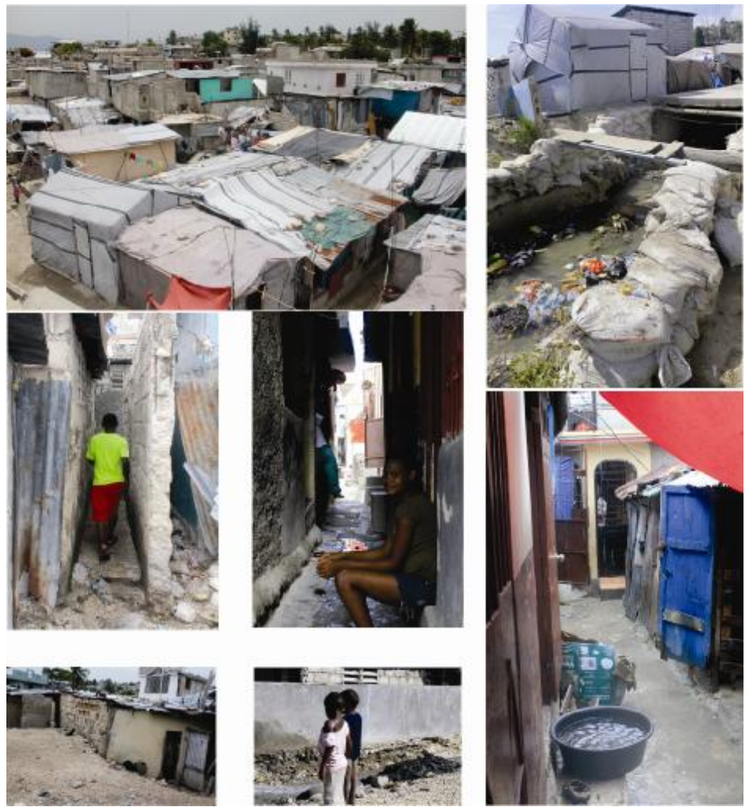


Delmas 19, Municipality of Delmas, Port-au-Prince, Haiti

Urban Development Plan

Haiti Urban Regeneration and Reconstruction Programme

July 2013

Contents

1 **Introduction**……..4
1.2 Haitian reconstruction context……4

2 **Programme Rationale**.....4
2.1 Assessment with community……4
PASSA (Participatory Approach for Safe Shelter Awareness)…...4
Livelihoods Programme……4

3 **Programme Description**……4
3.1 Programme summary: goal, objectives, outputs and target…..4

4 **Housing Challenges and Suggested Solutions**……6
4.1 Secure housing and land approach……6
4.2 House evaluation……..6
4.3 Beneficiary identification/vulnerability criteria……..7
4.4 Renters vs owners……8

5 Construction Programme Implementation……..8
5.1 Progress to date……8
5.2 Approach to remaining construction activities……..8
5.3 Timeframe……..8
5.4 Recruitment strategy……9
5.5 Training programme……9
5.6 Procurement strategy……9

6 Programme Transition……..9

7 British Red Cross Team……10

8 List of Agreements and Approvals……10

Annexe A……11

Data sources to support construction approach……..11
1 Physical information……..11
Topographical Survey……..11
GIS Information……..11
Soil-bearing Capacity……11
2 Social information……..12
3 Structural design information……13
4 Existing approval documents……14

Annexe B……..
Drawing Register

Drawing reference	**Drawing title**
A01	Location plan
A02	Topographical survey
A03	Master plan
A04	Canal design statement
A05	Canal drawings
A06	Paving and drainage
A07	Urban services statement (market, community facility, open space, water supply
A08	Market drawings
A09	Community centre
A10	Open space – junction
A11	Lampposts
A12	Solid waste
A13	House typologies
SP-1	Reinforced masonry house – specifications
SP-2	Reinforced masonry house – specifications
SP-3	Reinforced masonry house – specifications
SP-4	Reinforced masonry house – specifications
S1	Unit layout options
S2	Reinforced masonry house – foundation plan and ground floor plan
S3	Reinforced masonry house – first floor plan and first floor slab plan
S4	Reinforced masonry house – wall elevation on grid B and 2
S5	Reinforced masonry house – section A-A’ and detail 1, 2, 3
S6	Reinforced masonry house – detail 4, 4-A, 5, 6
S7	House repairs
S8	Typical progressive toilet

List of Acronyms

BRC	British Red Cross
CFPB	Contribution Foncière des Propriétés Bâties
DGI	Direction Générale des Impôts
GoH	Government of Haiti
HRC	Haitian Red Cross
IFRC	International Federation of Red Cross and Red Crescent
ILO	International Labour Organization
JMV	Jean Marie Vincent
LLH	Livelihoods
MFIs	Microfinance Institutions and services
MoD	Municipality of Delmas
MoU	Memorandum of Understanding
MTPTC	Ministère des Travaux Publics, Transports et Communications
PaP	Port-au-Prince
PASSA	Participatory Approach to Safe Shelter Awareness
RCRC	Red Cross/Red Crescent
SMCRS	Le Service Métropolitain de Collecte de Résidus Solides
SME	Small and Micro Enterprises
URRP	Urban Regeneration and Reconstruction Programme

1 Introduction

1.1 Background, strategic importance and approach

Following the earthquake in January 2010, BRC came to Haiti as part of the initial relief activities; it was decided to transition from emergency response to recovery support from April of that year.

BRC continued to provide public health assistance in two camps (JMV/La Piste and Automeca) and undertook livelihoods/shelter assessments including in the nearby area of Delmas 19. As a result of these findings, BRC designed its funding to enable support to a complex integrated programme to the urban populations of Automeca and Delmas 19.

BRC took the lead for supporting the decongestion of Automeca camp in 2010 after the owner of the land evicted three-quarters of the population. According to BRC Automeca assessment, 60% of the camp population came from Delmas 19. As a result, BRC decided to develop a reconstruction programme in this area to support the population to return to their neighbourhood of origin.

1.2 Haitian reconstruction context

The zone designated as the BRC Delmas 19 Target Area (see Figure 1) suffered a high level of destruction in the earthquake. The combination of poor quality construction (both materials and workmanship), weak ground conditions and density of construction contributed to the significant amount of damage sustained within the community. Fifty percent of the buildings were destroyed with a large loss of life from an already vulnerable population. These physical and social challenges have posed problems in what BRC can physically do in the area within the budget and timeframe, and have also exacerbated the potential speed of work.

BRC does not have a permanent presence in Haiti and as such will leave the country at the end of the planned programme in 2014. The involvement of the Mairie and a joint vision at this point is therefore vital to enable the implementation and sustainability of the programme. On its exit from Haiti, BRC can then hand over fully the development of the area to the Mairie of Delmas to continue this work collaboratively with the community.

2 Programme Rationale

2.1 Assessment with community

There were two major sets of assessment activities carried out in order to assess the recovery needs of the target communities – one in relation to shelter and urban reconstruction, the other in relation to urban livelihoods and economic regeneration.

PASSA (Participatory Approach for Safe Shelter Awareness)

The shelter- and habitat-focused participatory assessment involved the use of PASSA methodology, the first application of this recently developed tool in an urban context. The methodology is designed to both identify priority needs in terms of shelter as well as build community capacity to plan for change. It does so through the use of a number of participatory community planning meetings, and covers safe shelter priorities including broader issues of risks and vulnerability.

The community highlighted as their main concern the reconstruction of the drainage canal which runs through the Target Area. This was followed by health concerns, training, job creation and finally housing.

Livelihoods Programme

The second major set of assessment activities focused on understanding the target population's economic needs and how these can be better met through key area economic structures, services and institutions. The aim is to strengthen the population's livelihood and economic recovery in the longer term, building on the impact of the BRC's cash grants-based livelihoods blanket coverage programme.

As part of this area of assessment, two projects were created within the LLH programme: 1) small and micro enterprises (SME), and 2) microfinance institutions (MFIs) and services.

3 Programme Description

3.1 Programme summary: goal, objectives, outputs and target

Through PASSA, BRC designed its programme according to needs identified by the population – this became the BRC Urban Regeneration and Reconstruction Programme (URRP).

The overarching programme goal of this community-driven urban programme is the regeneration of the most affected and vulnerable communities within this selected area of Delmas and their improved resilience to future disasters/crises.

This will be done through a set of multi-sectoral interventions, covering the areas of:

1) Livelihoods (microfinance and SME initiatives)

2) Public health (canal drainage and grey water management; provision of safe drinking water and sanitation and solid waste management)

3) Urban planning (upgrading and regeneration of housing stock through repairs, new build and rental support, spatial planning and providing urban/social infrastructure)

There are three main outcomes:

- Outcome 1: Improved security and public health of the target population of Delmas 19
- Outcome 2: Improved economic security among residents of Delmas 19 (and former Automeca residents)
- Outcome 3: Improved community governance and resilience

The defined target area in Delmas 19 is:

- Cité Quatre, Cité Saint Ange, Cité Alou lou and Cité Romain

Figure 1: Delmas 19, Target Area

The estimated number of beneficiaries is 1,000 households

Table 1: Estimated construction programme

Target in topics	Target	Completed so far
Canal (linear metres)	302	302
Drainage (linear metres)	1,500	134
Paving / Pathway (square metres)	5,000	0
Open space (square metres)	800	500
Market (square metres)	191m^2 covered market (34 stalls and toilet facilities)	191m^2 covered market (34 stalls and toilet facilities)
Community facility (#)	1	1
Water points and committees (#)	4	0
Sanitation (#)	200	23 household toilets 1 public toilet block (4 toilets)
Solid waste management	Community promotion project	Not yet fully developed
Streetlights (#)	25	10
New houses (#)	140	0
Repairs (#)	60	0

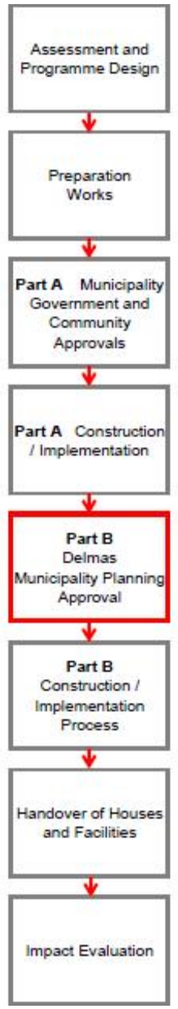
The continual development of the relationship with the Mairie of Delmas is key to the sustainability of this programme and the further regeneration of Delmas 19. BRC aims to complete the above activities during its time in Haiti. However, many other activities can be started or strengthened with the engagement of the community and the Mairie, using its links with other authorities to ensure sustainability e.g. SMCRS to improve solid waste management, the community to monitor and maintain streetlights, contractors for further footpaths for the zone using stronger reinforced concrete.

3.2 Programme profile and road map

The following flowchart states the BRC programme cycle, from the assessment process until the completion of the programme, including infrastructure and housing.

The graph identifies where the programme currently stands (see red frame).

Figure 2: Reconstruction process flow chart



4 Housing Challenges and Suggested Solutions

The URRP has been developed in alignment with the GoH Recovery and Reconstruction strategy that lead into the 16/6 project (whose strategic main pillars promoted the return to safe homes in safe neighbourhoods and the closure of temporary camps).

4.1 Secure housing and land approach

The Delmas 19 zone is considered state land, and as such, no resident has a legal right to claim ownership of his/her plot. As part of its programme, BRC would like to advocate to the Municipality to recognise the beneficiaries' rights to be on this land.

As the state has recognised that they can obtain taxes from house owners even if they have no formal right to the land, a municipal tax revenue scheme could therefore result in a step towards gaining security of tenure.

Land Tenure Security and the Reconstruction Process

As few people have land titles in Haiti and the predominant form of land occupation is informal (only 40% of plots are registered with an owner), BRC need to adopt an approach which allows the repair and reconstruction of houses as well as some re-planning of space to provide the affected population of Delmas 19 Target Area safer and adequate housing.

BRC cannot ask all owners (real, perceived or informal) to take part in land titling nor to obtain expensive property deeds. This process is too long and too expensive (4–15 months) and as the majority of the land is state owned, official titles as such do not exist and could only be obtained if the state was to give the land to private owners.

As there is already a precedent of the occupants paying CFPB taxes to the DGI through the registration with the Mayor's office, BRC recognises this payment of tax as the first step towards formalisation and encourages this acceptance for the benefit of the beneficiary and the Mayor's office.

Mairie of Delmas agreement: to have security of land against tax payments accepted by the Mairie and the beneficiaries of the housing programme. This can be leasehold but if beneficiaries are registered and pay taxes, some guarantee needs to be given to ensure a move to ownership. Without this agreement, BRC cannot start to build housing.

Construction Permit

Legitimately beneficiaries would have to have an official property title to apply for the construction permit but few people have the property title/deeds due to the informal exchange of land/house and losses during the earthquake, or they have never had it but believe they are the rightful owner.

<u>Permission to build new houses for the families:</u>

1. If the house is on state land:

The first step is to agree with the Mayor that these people can be recognised as having the right to be on the land (if state owned). The families will have to pay tax for the built building. They could also apply to rent the land from the state (leasehold).

2. If privately owned land – but no paperwork:

The Mayor will have to agree to accept the declaration of honour in place of official property titles and give the family/BRC permission to build.

BRC will then mobilise and raise awareness with the beneficiaries to register their house – using the 'declaration of honour', or other paperwork that can be suggested by the Mayor – and pay municipality construction taxes (CFPB).

Furthermore, outreach activities are needed that explain the process required for the beneficiary to pay the CFPB (this could be mandatory for the new builds) – and that properties are registered based on the planned dimensions of the reconstructed house.

Mairie of Delmas agreement: that the declaration of honour (or similar; including signed cadastre) and supporting documentation – including plot and house layout in neighbouring identified context – is accepted as official documentation by Mairie.

4.2 House evaluation

As Delmas 19 is a very densely populated area, with small plots per family, the simplest solution would be to build multi-storey properties. Following detailed assessments of the land, soil-bearing capacity and geological structure (see findings in Annexe), it was clear that the land could in no way support this type of building. The resulting recommendation is to maintain one- or, at most, two-storey properties.

BRC will try to ensure that most properties remain as close as possible to their original footprint. But in order to improve safety of the area, pathway width and provide the most useful space possible, certain realignment of housing and plots is necessary.

Mairie of Delmas agreement: that the Mairie accepts a certain small readjustment of existing plot division to benefit the largest number of beneficiaries in the available space.

The ensuing local house design assessment (Talk to the Buildings Approach) is a process that maps the architectural patterns within Delmas 19.

The conclusions based on the pattern data include:

- There is an interdependence of domestic and income-generation activities. For this design it suggests that the front porch could be used for income generation such as a shop, ironing, clothes repair or hair cutting.

§ That ‘spontaneous housing translates a great variety of domestic activities in the mixed use of indoor, outdoor, enclosed, open and semi-open spaces. Income-generation activities, children’s baths, laundry, eating, playing and a great variety of social activities occur very often in semi-open or enclosed (but not roofed) spaces outside of the house’. It suggests that there would be cost savings in providing such spaces in the ‘commons’ or public domain areas. Activities such as washing in Delmas 19 are routinely done in what appears to be common areas. It is not exactly clear how this could be advanced as it extends beyond the house design but is noted nonetheless.

§ The patterns strongly support a multiple-storey approach that beneficiaries can expand into as time and resources allow personalisation of external facades and recycling and reuse of materials such as windows and doors.

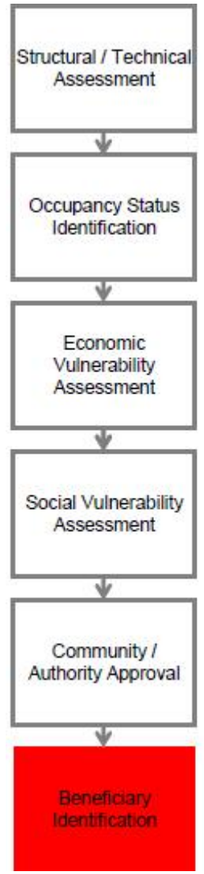
Figure 3: Common architectural patterns examples in Delmas 19

4.3 Beneficiary identification/vulnerability criteria

As a result of budget restrictions, population change, inequality of the needs of the inhabitants plus capacity and space limitations, a beneficiary identification process based on vulnerability criteria is needed to support those households most at risk.

The areas for identifying beneficiaries who are in need of reconstruction support are as follows:

Figure 4: Beneficiary identification flowchart



§ Structural/Technical Assessment

Assesses physical and structural vulnerability (undertaken in 2011 and 2012) to identify which buildings were affected by the earthquake and the level of support required (none, repair or reconstruction)

§ Occupancy Status Identification

To identify the nature of ownership e.g. whether the house is owner/renter occupied, single occupancy or multiple-family occupancy

§ Economic Vulnerability Assessment

Takes into account any other types of support the beneficiary may have received already, either from BRC or other parties

§ Social Vulnerability Assessment

Looks at social vulnerability factors for occupants of the houses identified as damaged or destroyed during the technical assessment phase. This covers extra vulnerabilities such as elderly residents, single parent, female-headed households etc

§ Community/Authority Approval

The rationale and criteria utilised to identify beneficiaries is discussed with the Mayor and local community so a final list of beneficiaries can be agreed by all and signed off

§ Beneficiary Identification

4.4 Renters vs owners

As part of the occupancy status and vulnerability work, BRC deem renters as more at risk than owners – they have no security of home and by default do not receive as much in-kind support as house owners. BRC would like to reach an agreement with the Mairie that it will support this section of the community after the exit of BRC. BRC have created housing agreements for the owner to sign, showing that they agree to the work to be done on their plot, that labour will be provided, and that where relevant, renters can remain in their property at zero/peppercorn rent for five years.

Mairie of Delmas agreement: that renters living in houses of beneficiaries of the housing programme will be able to remain in the house they currently rent for five years, with no change to the rental amount. This agreement will need to be reached by, signed off and enforced by the Mairie, especially in the absence of BRC to avoid eviction of the renters after the end of construction or repair of houses by BRC.

5 Construction Programme Implementation

5.1 Progress to date

In 2012 BRC worked with the community to identify their priorities for reconstruction. The community planning process prioritised repairing and reconstruction of the drainage canal to be followed by housing and additional drainage and footpaths aimed at reducing future flooding and improving the environmental health condition within the zone. The wider community also identified the need to provide training and capacity building in construction to the younger generation to provide skills for reconstruction and opportunities for future employment in Haiti.

BRC has completed several activities so far (see page 5 for highlights) which has helped inform the remainder of activities, particular in relation to skills and capacities present in the Delmas 19 zone.

Most notably, the canal was designed and built in 2012, providing the community with a main drainage route, reducing the frequency of flooding to the target zone. Further channels will feed into the main canal, providing run-off from areas higher up the hill, so improving the drainage for the whole area.

The construction of this canal enabled BRC to work with the community and observe the competency and experience of construction people (masons, carpenters, steelworkers etc), supervisors (foremen and boss masons) and the availability of construction managers who have the aptitude to deliver quality construction to tight time schedules. The construction team identified that there is very limited construction skills capacity and management within the community to deliver a rapid high-quality and high-volume construction programme.

5.2 Approach to remaining construction activities

The BRC does not have sufficient resources to meet the total needs of the entire community but it is possible to target the most vulnerable households using housing construction and repairs and also providing physical infrastructure in the form of pavements, drainage and water points to improve the total environmental condition of the zone. This should, in turn, have an impact on public health and facilitate individual families to rebuild themselves in a safe environment. The BRC reconstruction works can also be used to develop labour skills and improved future employment opportunities through a specifically targetted training programme.

BRC will provide the full design service including obtaining the relevant approval of designs by the Haitian authorities before construction work commences. A competent and qualified construction management team needs to be put in place to ensure full quality control, compliance with approved designs and timeliness of construction.

Housing Aim and Objectives

The aim of the BRC reconstruction programme is to provide a secure environment to encourage self-reconstruction and to assist the most vulnerable households to have a safe habitable progressive house.

BRC plans to construct houses on a block-by-block basis to facilitate efficient and safe construction cycles. During construction, beneficiaries will be relocated to temporary accommodation and will return to their house on completion of the build.

The construction manager and engineer will provide management leadership and quality control to ensure that the construction quality meets the standards approved by the local authorities and that deadlines are achieved.

BRC will work with the individual house owners and community to provide general distribution labour to deliver materials to individual construction sites throughout the programme cycle. The aim of individual family and community labour is to contribute to the labour costs of the programme to maximise the volume of infrastructure and the number of houses that can be physically built.

5.3 Timeframe

The planned construction timeframe is estimated to be eight months from start to finish. To enable this to happen, BRC will build a number of blocks in parallel, with each group of blocks being managed by a qualified supervisor and an individual block

having one boss mason working with and training a group of trainee masons.

The efficiency of the construction process (cost and time) relies on cooperation and partnership between the community, individual beneficiary families, the committee, municipal authorities and BRC. This is an ambitious timeframe and needs the complete buy-in of all parties to enable the process to successfully work to time.

5.4 Recruitment strategy

Construction Team

The proposed programme requires a new recruitment drive to fill supervisors, boss masons and trainee masons to deliver the construction programme for the community. As this is a community-based programme, where physically possible, BRC will aim to fill these roles from within the greater BRC Delmas 19 zone (Target Area, Zones 3 and 5).

All the positions identified in the plan have specific requirements for demonstrable skills, experience and commitment to both learn and deliver the programme. To ensure best use of time and resources, the programme will need to be run on a very tight schedule, only using high-performing workers and trainees. As a result, only the best on offer can be recruited, so where the skills and required numbers of people are not available from within Delmas 19, BRC will open recruitment external to the programme area.

5.5 Training programme

To ensure quality control of the house build, BRC will continue to train local workers as it has been doing for the last 12 months during its wider construction programme. This will be done through a mixture of induction sessions, an apprentice scheme with the collaboration of the International Labour Organization (ILO) and continual on-the-job training.

This will be delivered to a team hierarchy: BRC construction manager managing four site supervisors leading two or three boss masons each. The boss masons will have under their individual supervision up to four trainee masons each who they will teach and guide (under the aegis of the ILO training scheme) during the programme.

This professional and continual capacity building will improve the overall capabilities of the local workforce and lead to improved quality and learning on any future construction projects.

5.6 Procurement strategy

A wide variety of house building materials are available in Haiti at competitive prices, and the majority of what BRC has decided to use in its house design is locally made. In order to make use of this market, support the economy and ensure the house design can be used and replicated by the population, it was decided to source all materials in country. A tender process was carried out, complying with Red Cross Red Crescent transparent procedures. Following this, eight suppliers were awarded tenders for the housing and other infrastructure materials, up to a value of $2 million.

Mairie of Delmas agreements:

1 In principle to the overall planning proposal to enable BRC to inform the community that the project can move forwards and allow beneficiary identification and recruitment of construction workers.

2 The detail of house and infrastructure design for construction within two weeks to allow the construction work to be planned to commence mid-August.

3 Adoption of public infrastructure on completion of construction works.

6 Programme Transition

In order to ensure a smooth and successful exit from operations in Haiti, a number of key guiding principles shape the BRC's approach to the transitional phase:

- Honouring our commitments to beneficiaries: the BRC is most accountable to the wider community of Delmas 19 and its most vulnerable households. It must ensure that it has helped meet the most pressing recovery needs of the community, and that it has honoured commitments made.
- Sustaining impact: the BRC must ensure that the outcomes and long-term objectives of its recovery programme operations are sustained well beyond exit.
- Cooperation and coordination with local stakeholders: local stakeholders, organisations and authorities such as the Mairie of Delmas, Haitian Red Cross and others, hold ultimate responsibility for the well-being of the community. Supporting these actors to fulfil their roles and responsibilities is a critical aspect of BRC's exit strategy.
- Transparency and communication: transparency and honest communication are critical to maintaining trust and accountability. A strategy and plan of who takes over what responsibilities will play a key role in the transition plan.
- Responsibility for our legacy: after the BRC has left, it will be held to account for the consequences of its time in Haiti; proactive management of any potential risks and liabilities is a key consideration of transition.

The only way to achieve these principles is by working collaboratively with the existing stakeholders prior to departure. Having an overall construction vision and plan of action developed in conjunction with the Mairie will enable continuity of regeneration once BRC has left. The plans, calculations, drawings and technical data which already exist will be given to the Mairie for future implementation of the global plan. The capacity building in which BRC engages with the committee and the community will also help strengthen the ongoing relationship with the Mairie for the future. The Mayor will therefore have a ready communication link to this area in order to work with the community in improving further Delmas 19.

List of current stakeholders includes:

- Mairie of Delmas
- Committee and community of Target Area
- Haitian Red Cross
- French Red Cross/IFRC
- DASH (BRC partner)
- HelpAge (BRC partner)

- Zafen/Fonkoze (BRC partner)
- ID Microfinance (BRC partner)

7 British Red Cross Team

The technical team is formed by national and international professionals related to the construction industry.

The following table does not include all the support service, community mobilisation and coordination team that supported the development of the BRC programme.

Table 2: Technical team.

Melvin Tebbutt	Head of Delegation
Gabriel Constantine	URRP Project Manager
Regan Potangaroa	Civil Engineer / seismic-design specialist
Rafael Mattar Neri	Architect–Planner / Urban recovery programmes specialist.
Jean Denis Noel	Architect
Jean Anthony Jean	Construction Manager
Alix Abraham	Civil Engineer
Wendy Diogene	Civil Engineer
Oriol Widmark	Civil Engineer
Baudelaire Joseph	AutoCAD technician

8 List of Agreements and Approvals

BRC have received a number of agreements with different stakeholders for the purpose of the Delmas 19 reconstruction programme.

Municipal and Governmental Authorities (see Annexe A):

- Agreement to build between MoD and BRC
- Agreement to build housing between MoD and BRC
- Agreement to build canal between MoD and BRC
- Agreement to build canal between MTPTC and BRC
- Agreement to build housing between MTPTC and BRC
- Statement of intent letter between MoD and RCRC

Pending agreement with other stakeholders:

- MoU between ILO and BRC

Annexe A

Data sources to support construction approach

Supplementing the above planning of activities were a number of additional data collections and assessments such as integrated beneficiary registration, surveys of area residents and an enumeration survey of the Target Area.

1 Physical information

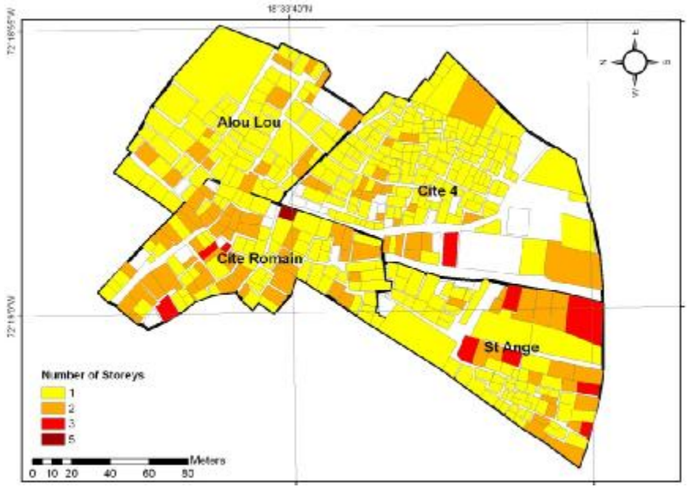
Topographical Survey

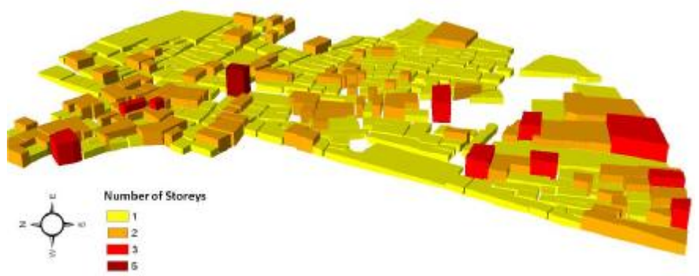
A survey was contracted to a local firm which served the basis for the topographical findings (reference drawing A02).

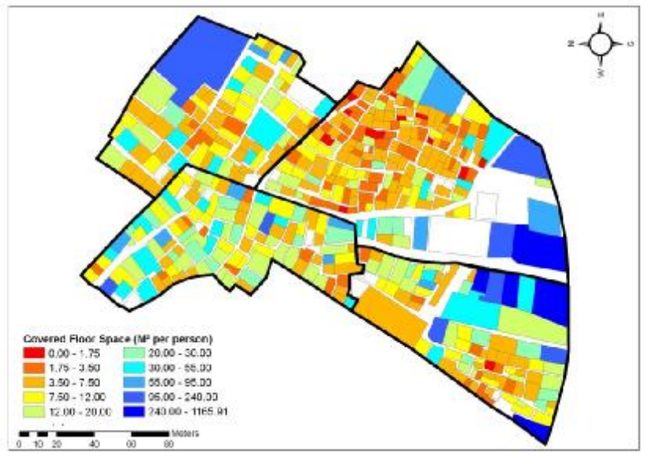
GIS Information

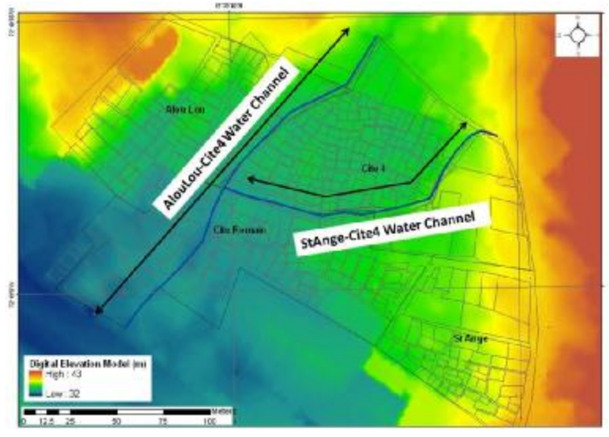
This enables a comparison of physical data in a geographical map to assist in defining levels of complex physical vulnerability e.g. mapping density: covered floor space (square metre per person), see Figure 5.

Figure 5: Physical data maps









Soil-bearing Capacity

The measurement of the soil-bearing capacity within Delmas 19 was required to globally confirm foundation design but also check potential procedures for specific house testing. Construction in informal settlements is usually on less than adequate ground and hence testing such as this is required to not only ‘prove’ the ground but also economise the foundation in terms of cost and time to construct.

The interpolated values derived from the 19 tests (see Figure 6) that were accessible suggested 51 plots would not have sufficient soil-bearing capacity (less than 50kPa) to build on. Selection of any of these 51 families would need to be conditional on site-specific testing to ascertain actual values and this was noted on the GIS database. A bearing capacity of 50kPa is already at the lower bound of soil bearing (and would be characterised as a swampy mud) and hence it is not an issue of simply increasing the width of the footing. Significant settlement and in particular cases differential settlement resulting in the house tilting could occur. In addition, such areas (typically close to the canal) could also expect issues of seismic liquefaction and the added potential for lateral spreading of the ground towards the canal resulting in more damage than other areas. This seems to be correlated with the damage seen in Figure 7 (right-hand side) based on a ‘damaged’ review of all the buildings in Delmas 19.
One pocket of damage was also noted in the south-western corner and this was probably due to the poor soils located in that area.

Figure 6: Soil-bearing capacity test for Delmas 19

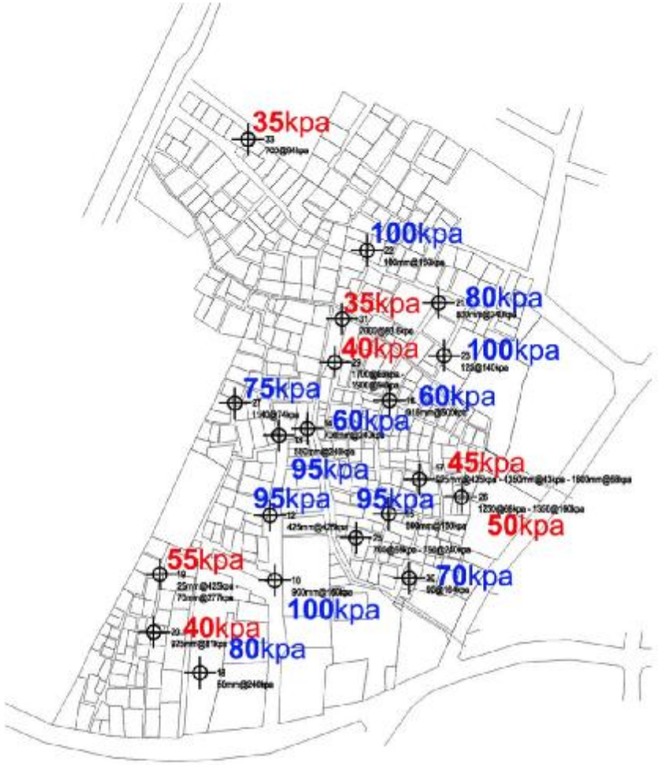
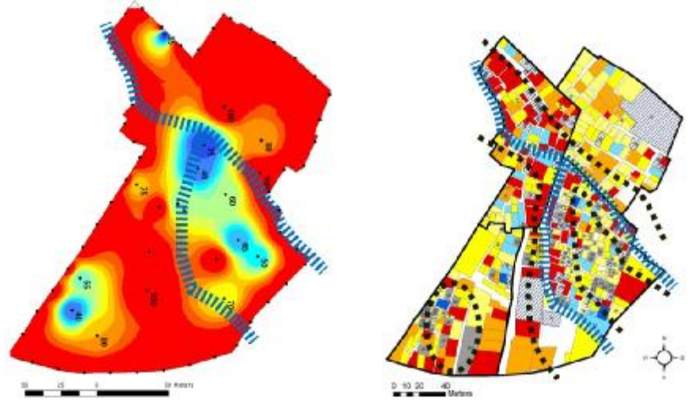


Figure 7: Soil-bearing capacities (left) and damage vs. proximity to the canal (right) for Delmas 19



*Note: Approximate stream/canal shown in both as a blue dashed line. The black dashed lines outline the damaged areas.
* North is at the top of the page.

However, the soil testing also allowed the optimisation of the house foundation design in terms of width and depth of foundations, type of material and construction details to maximise the use of space. This enabled analysis of constructing houses in close proximity to each other and to compare costs of different foundation options.

The existing design of many houses in the Target Area utilised mountain rock and wide concrete strip footings which are expensive in time and materials to construct and also add mass to the foundation of the house. Reinforced concrete masonry as an alternative was considered as a foundation design option.

Reinforced concrete masonry proved to have significant advantages over traditional rock and reinforced concrete foundations:

- It provides a smaller foundation footprint resulting in lower material use and cost.
- It is easier to build and quality control the construction.
- Concrete blocks can be factory fabricated ensuring strength and quality of materials.
- The lighter structure results in a narrower footing width which allows for adjacent houses to be located close together and maximise space.
- It reduces the number of skilled trades needed to build concrete reinforced masonry block-work walls compared to rock and reinforced concrete walls which results in more rapid construction.

The decision to use reinforced masonry was made for the following reasons:

- It was a known material to builders
- Supplies were available locally
- It had acceptance within the community
- It is easier and faster to build.
- It is cost effective
- The footing width can be reduced to 200mm (design calculations confirmed that a nominal excavation depth of 400mm met the 50kPa ‘allowable’ bearing capacity criteria)
- The block-work footing can be seated on a simple concrete blinding screed (serving as a level clean platform for the foundation block construction)

The foundation was also checked for its load distribution qualities. These calculations (included in the set of calculations) suggested that the footing would be significantly stiffer than the soil and hence the load of the superstructure above would be spread across the entire footing and not just that section beneath any walls/columns.

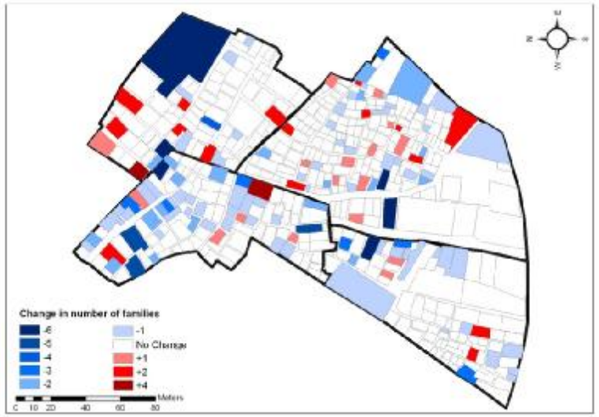
This loading calculation included future external and internal masonry walls at ground and first floor levels, together with roof and ceiling loads. The seismic allowable bearing pressures were also calculated. These will be rechecked once beneficiaries and sites are determined.

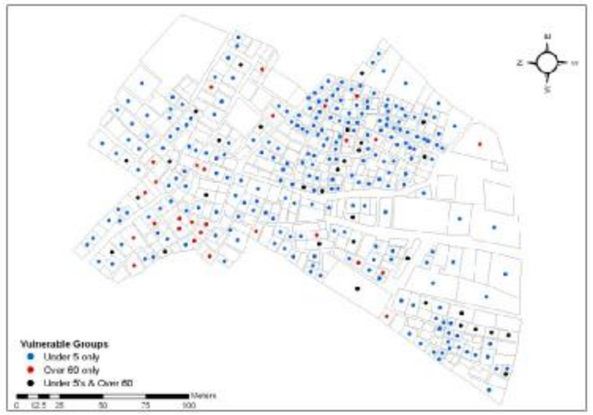
2 Social information

Social Data (GIS)

This mapping of data helped compare social and structural information to assist in defining levels of complex vulnerability.

Figure 8: Social data maps





3 Structural design information

VERIFICATION SUR LE DIMENSIONNEMENT DU CANAL DE DRAINAGE

Intensité de la pluie a Delmas 19

I = 32 mm/h ou 88.96 l/s/ha

A = 32200 m2 ou 3.22 ha

Déterminons le débit transite par la pluie à Delmas 19

Q = C.I.A.kr

Déterminons le coefficient de ruissellement

Kr =surface bâtie/surface total

Kr = 24412/32200

Kr = 0.75%

Q = 0.278 X 88.96 X 3.22 X 0.75

Q = 0.059 m3/s

Déterminons le débit transiter par le canal

Qcan = V.Am

V= 1/n x RH2/3 x I1/2

Pour les ouvrages en béton n = 0.015

Am = by => A = 1.70m x 1.85m

Am = 3.145 m^2

Périmètre mouillé

Pm = b + 2y

Pm = 1.70m + 2x 1.85m

Pm = 5.4 m

Rayon Hydraulique

RH = by/2+2y

RH = 3.145 m^2/5.4m

RH = 0.582 m

V= k x $Rh^{2/3}$ x $I^{1/2}$

V = 67 x (0.69) x (0.0247)

V = 1.141 m/s

Q = 3.145m^2 x 1.141m/s

Q = 3.59 m^3/s

Conclusion

Q pluie = 0.059 m^3/s < Q canal = 3.59 m^3/s

Le débit de l'averse est vachement inferieur au débit que peut transporter le canal, donc il n'y aura pas eu de débordement.

CALCUL STRUCTURAL DU CANAL DE DRAINAGE

Donnée

Q Sol = 30 KPA

L can = 2m

H can = 2m

Ep béton radier = 0.15 m

Ep mur en bloc = 0.15 m

L arg eau = 1.70 m

H eau = 1.85 m

Calculons les charges transmises par le canal au sol

Q canal < Q sol

Q canal = poids de l'eau + poids mur en aggloméré de bloc + poids du béton arme

Poids de l'eau

Surface mouillée

Am = by => A = 1.70m x 1.85m

Am = 3.145 m^2

Périmètre mouillé

Pm = b + 2y

Pm = 1.70m + 2x 1.85m

Pm = 5.4 m

Rayon Hydraulique

RH = by/2+2y

RH = 3.145 m^2/5.4m

RH = 0.582 m

V= Rh $^{2/3}$ x Am

V = 0.352m^3

On sait que le poids de l'eau est de 1000kg/m^3

Donc

P H2o = 0.352 x 1000

P H2o = 352.24 kg or 1kk d'H2o = 0.98 daN pour 352.24 kg on a : 345.19 daN

PH2o = 345.19 daN

Poids mur en aggloméré de bloc

Surface bloc

Sb = 1.75 *0.15 *2

Sb = 0.525 m^2

Or on sait que le poids d'un mur de 15 cm est de 225 daN /m^2

P mur = 0.525 m^2 x 225 daN/m^2

P mur = 118.125 daN

Poids du béton arme

S chain = 0.15*0.15*2 =0.045 m^2

S col vert = 0.10*0.10*2*2 = 0.04 m^2

S chain Hor = 0.05*0.15*4*2 = 0.06m^2

S radier = 0.15*2 = 0.30 m^2

St béton = 0.045 + 0.04 + 0.06 + 0.30

St béton = 0.445 m^2

On sait que le poids du béton arme est de 400 daN/m^2

Donc pour 0.004 on a : 0.445*400 =178 daN

Le poids du grillage métallique = 45 daN

Poids du béton arme = 178 + 45

Pba = 223 daN

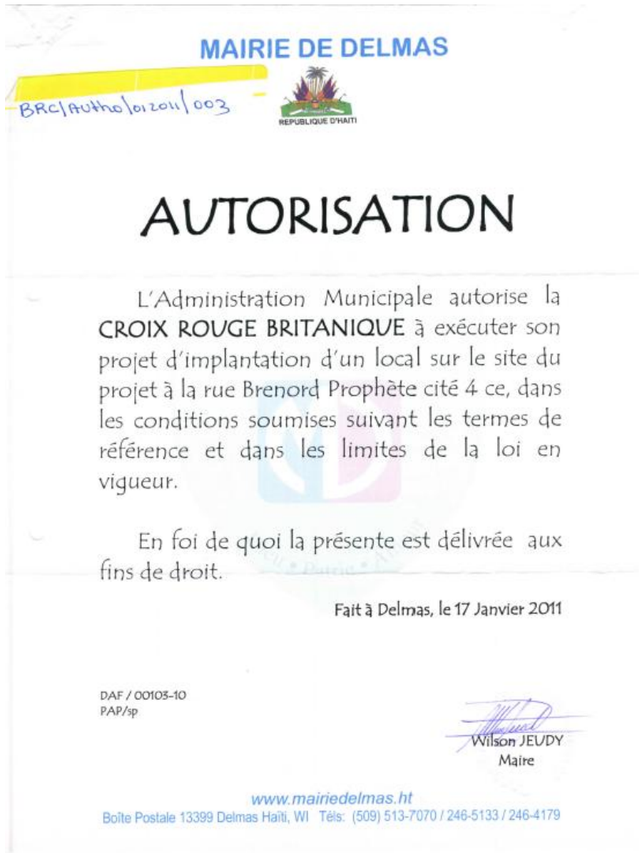
Donc

Q canal = 345.19 + 118.125 + 223 =686.315 daN. On sait que : 1KPA =100 daN or 686.316 daN = 6.87 KPA

Donc : Q canal = 6.87 KPA < Q sol = 30 KPA

4 Existing approval documents

Agreement to build between MoD and BRC



MAIRIE DE DELMAS

BRC/Autho/01/2011/003

REPUBLIQUE D'HAITI

AUTORISATION

L'Administration Municipale autorise la CROIX ROUGE BRITANIQUE à exécuter son projet d'implantation d'un local sur le site du projet à la rue Brenord Prophète cité 4 ce, dans les conditions soumises suivant les termes de référence et dans les limites de la loi en vigueur.

En foi de quoi la présente est délivrée aux fins de droit.

Fait à Delmas, le 17 Janvier 2011

DAF / 00103-10
PAP/sp

Wilson JEUDY
Maire

www.mairiedelmas.ht
Boîte Postale 13399 Delmas Haïti, WI Tèls: (509) 513-7070 / 246-5133 / 246-4179

Agreement to build housing between MoD and BRC

MAIRIE DE DELMAS

Ref: BRC|Autho|022011|004

REPUBLIQUE D'HAITI

Delmas, le 14 Février 2011

Monsieur David MONNIER
Responsable des Programmes
Croix Rouge Britannique
En ses bureaux.-

Monsieur,

L'Administration Municipale accuse réception de votre lettre en date du 10 Février par laquelle vous l'informez de vos démarches visant à supporter les propriétaires qui ont vu leurs bâtiments endommagés ou détruits à Delmas 19. Elle vous félicite pour votre engagement et votre dévouement et vous remercie au nom de la population de Delmas.

En outre, l'Administration Municipale vous donne son accord et son approbation, dans les limites de la loi, pour la reconstruction de ces dits bâtiments suivant le concept de « Bloc » relaté dans votre correspondance et également à ce programme de réparation pour ceux qui ont subit des dommages dans la zone ciblée par votre Institution.

Elle saisit l'occasion pour vous renouveler, Monsieur, l'assurance de sa parfaite considération.

Wilson JEUDY
Maire

www.mairiedelmas.ht
Boîte Postale 13399 Delmas Haïti, WI Tèls: (509) 513-7070 / 246-5133 / 246-4179

Agreement to build canal between MoD and BRC

Ref: BRC|Autho|082011|007

CONSEIL MUNICIPAL DE DELMAS

REPUBLIQUE D'HAITI

AUTORISATION

Le Conseil Municipal dans le cadre de partenariat entre les ONG et la dite commune autorise l'Organisation dénommée **Croix Rouge BRITANIQUE** à intervenir à Delmas 19 afin d'entreprendre des travaux de curage et de rénover le canal de cette zone.

A noter que cet espace est le propriété de l'Etat Haitien. Cette organisation peut disposer des parcelles de terre situées tout au long du canal pour la réalisation du projet. .

La présente est délivrée aux fin de droit.

Fait à Delmas, le 06 Septembre 2011.

Wilson JEUDY
Maire

www.mairiedelmas.ht
Boîte Postale 13399 Delmas Haïti, WI ■ Tèls: (509) 513-7070 / 246-5133 / 246-4179

Agreement to build canal between MTPTC and BRC

Ref: BRC|Autho|062012|008

MINISTÈRE
DES TRAVAUX PUBLICS,
TRANSPORTS
ET COMMUNICATIONS

Direction des Travaux Publics

Réf : DTP/BRCCB/
No : 0433

REPUBLIQUE D'HAITI
Repiblik d'Ayiti

MINISTÈ
TRAVO PIBLIK,
TRANSPÒ
AK KOMINIKASYON

Direksyon Travo Piblik

Port-au-Prince, le 25 JUIN 2012
Pòtoprens

Monsieur Gabriel **CONSTANTINE**
Coordinateur du Programme
de Régénération et de Construction
Croix-Rouge Britannique
En Ses Bureaux.-

Réf. : Projet de réhabilitation intégrée de Delmas 19 (Construction d'un canal de drainage à Delmas 19)

Objet : Approbation des plans de construction

Monsieur le Coordinateur de Programme,

La Direction des Travaux Publics (DTP) du Ministère des Travaux Publics Transports et Communications vous présente ses compliments et vous informe qu'après analyse des derniers documents reçus concernant la construction d'un canal à Delmas 19, elle constate que toutes les recommandations formulées par courrier en date du 18 juin 2012 ont été prises en considération.

La DTP vous autorise par conséquent à procéder à la construction dudit canal.

La Direction des Travaux Publics vous présente, **Monsieur le Coordinateur de Programme**, l'expression de ses salutations distinguées.

Alfred PIARD
Directeur

Local du Laboratoire National du Bâtiment et des Travaux Publics (LNBTP) – Delmas 33, Rue Toussaint Louverture # 27
Lokal Laboratwa Nasyonal Batiman ak Travo Piblik (LNBTP) – Delmas 33, Ri Toussaint Louverture # 27

Agreement to build housing between MTPTC and BRC

MINISTÈRE
DES TRAVAUX PUBLICS,
TRANSPORTS
ET COMMUNICATIONS

Direction des Travaux Publics

Réf : DTP/CRB/
No : 0301

REPUBLIQUE D'HAITI
Repiblik d'Ayiti

MINISTÈ
TRAVO PIBLIK,
TRANSPÒ
AK KOMINIKASYON

Direksyon Travo Piblik

Port-au-Prince, le 10 AVR. 2013
Pòtoprens le 10 AVR. 2013

Monsieur Gabriel **CONSTANTINE**
Coordinateur de Programme de
Régénération et de Construction
Croix Rouge Britannique
En Ses Bureaux.-

Monsieur le Coordinateur,

La Direction des Travaux Publics (DTP) vous présente ses compliments et vous informe qu'elle donne son approbation pour les modèles de maisons proposés pour être construits dans le cadre du **« Projet de Construction de maisons dans les Quatre cités à Delmas 19 (cité 4, cité aloulou, cité Saint Ange, cité Romain) »**, après analyse structurelle de la version corrigée du dossier, qui lui a été soumise le 19 mars 2013 par la Croix Rouge Britannique.

La Direction des Travaux Publics vous présente, **Monsieur le Coordinateur,** ses meilleures salutations.

Alfred **PIARD**, Ing.
Directeur

Local du Laboratoire National du Bâtiment et des Travaux Publics (LNBTP) – Delmas 33, Rue Louverture # 27
Lokal Laboratwa Nasyonal Batiman ak Travo Piblik (LNBTP) – Delmas 33, Ri Louverture # 27

Statement of intent letter between MoD and RCRC

International Federation
of Red Cross and Red Crescent Societies

Alexandre CLAUDON de VERNISY
Représentant Pays
Fédération internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge

Port au Prince
Le 01 août 2012

Objet: Validation des activités de la Fédération Internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge (FICR) dans le cadre du programme de l'Approche Quartier à Logique Intégrée (INA Integrated Neighborhood Approach) à Delmas, Port-au-Prince

Monsieur le Maire,

La Fédération Internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge (FICR), vous remercie par la présente de lui avoir accordé un rendez-vous le 14 juin dernier et à nouveau pour votre collaboration.

Votre appui est précieux pour la mise en œuvre du programme d'aide aux populations victimes du séisme du 12 Janvier 2010 et conforte la FICR dans la poursuite de son action.

Comme convenu précédemment, et afin de valider nos activités et de poursuivre l'effort de collaboration entre la Mairie de Delmas et la FICR, vous trouverez en pièce jointe un document récapitulatif des activités à Delmas dans le cadre du programme cité ci-dessus. Etant donné que ce document n'est qu'une manière formelle de coordonner les activités avec les autorités municipales, il se pourrait dans certains cas qu'il y ait des changements ou des modifications quant au déroulement de celles-ci. Sans qu'il ne s'agisse d'un accord à caractère juridique, nous vous assurerons néanmoins que tout changement ou modification soit porté à votre attention dans les meilleurs délais.

En outre, nous aimerions attirer votre attention sur le fait qu'après avoir fait une évaluation de la vulnérabilité des communautés et selon nos propres capacités nous avons donné priorité aux quartiers dans lesquels nous travaillerons.

Dans l'espoir de répondre au mieux aux besoins des habitants et de la collectivité de Delmas et dans un esprit de coopération avec les autorités locales, la FICR vous saura gré de bien vouloir lui faire savoir dans les meilleurs délais si l'une ou l'autre de ces activités nécessiterait des informations additionnelles ou la mise en place d'une démarche de validation complémentaire.
Afin de signifier votre consentement, nous vous prions de bien vouloir signer et de nous retourner la lettre.
La FIRC vous remercie de votre soutien, et vous prie d'agréer, Monsieur le Maire, à l'assurance de sa haute considération.

A l'attention de Monsieur le Maire de Delmas
Monsieur Wilson Jeudy
Mairie de Delmas
Delmas 33